INFORMATION HANDOUT

AGREEMENTS

California Coastal Commission

US Fish and Wildlife Service Biological Opinion

MATERIALS INFORMATION

Foundation Report for Cathedral Oaks OC (Replace), Bridge No. 51-0331, March 30, 2007, Caltrans

Foundation Report for Cathedral Oaks OH (Replace Ellwood OH), Bridge No. 51c-0130, April 8, 2008, Caltrans

Summary of Laboratory Tests for Cathedral Oaks OC, March 30, 2007, Caltrans

Summary of Laboratory Tests for Cathedral Oaks OH, April 8, 2008, Caltrans

Preliminary Foundation Report for Bridge Type Selection for Cathedral Oaks OC and OH, February 23, 2001, Earth Mechanics Incorporated

Preliminary Materials Report, Summer 2000, Earth Mechanics Incorporated.
Preliminary Geotechnical Information for Bridge Type Selection, July 27, 1998, Earth Mechanics Incorporated

Foundation Review for Cathedral Oaks OC, Bridge No. 51-0331

Foundation Review for Cathedral Oaks OH, Bridge No. 51C-0344

ROUTE: 05-SB-101-42.6/43.6 (KP)

California Coastal Commission

CALIFORNIA COASTAL COMMISSION
SOUTH CENTRAL COAST AREA
89 SOUTH CALIFORNIA ST., SUITE 200
VENTURA, CA 93001
(805) 585-1800

Date: March 10, 2009
Permit Application No. 4-07-116

COASTAL DEVELOPMENT PERMIT

On February 5, 2009, the California Coastal Commission granted to California Department of Transportation (Caltrans) & City of Goleta, permit 4-07-116, subject to the attached Standard and Special Conditions, for development consisting of: Reconstruct the existing Hollister Avenue/Highway 101 intersection, including replacement of the existing overpass structures over the highway and Union Pacific Railroad (UPRR), and realignment with Cathedral Oaks Road. This permit is more specifically described in the application on file in the Commission offices.

The development is within the coastal zone in Santa Barbara County at Highway 101, at Hollister Avenue and Cathedral Oaks Road, City of Goleta (includes portion of APN 079-210-48). Also includes a small adjacent area within APN 079-090-20 in the unincorporated area of Santa Barbara County.

Issued on behalf of the California Coastal Commission by,

PETER DOUGLAS
Executive Director

Shana Gray

FOR Lee Otter
Coastal Planner

ACKNOWLEDGMENT:

The undersigned permittee acknowledges receipt of this permit and agrees to abide by all terms and conditions thereof.

The undersigned permittee acknowledges that Government Code Section 818.4 which states in pertinent part, that: "A public entity is not liable for injury caused by the issuance. . . of any permit. . . " applies to the issuance of this permit.

IMPORTANT: THIS PERMIT IS NOT VALID UNLESS AND UNTIL A COPY OF THE PERMIT WITH THE SIGNED ACKNOWLEDGEMENT HAS BEEN RETURNED TO THE COMMISSION OFFICE. 14 Cal. Admin. Code Section 13158(a).

3/18/09
Date

Paul J Martinez
Permittee

STANDARD CONDITIONS:

1. **Notice of Receipt and Acknowledgment.** The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. **Expiration.** If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. **Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.

4. **Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

SPECIAL CONDITIONS:

1. **Revised Project Plans.**

   A. PRIOR TO ISSUANCE of this coastal development permit (CDP), four sets of final project plans shall be submitted for review and approval by the Executive Director. The revised construction plans shall show the adjusted road configuration/design southeasterly of the (future) intersection of Hollister Avenue and the extended Cathedral Oaks Road, as modified to achieve maximum feasible retention of existing large trees in accordance with Special Condition no. 2.d(6), below. Specifically, the revised construction plans shall show that trees numbered 9 and 11-15 will be retained—unless, for any particular tree, permittee demonstrates to the satisfaction of the Executive Director that such retention is not feasible (Ref.: previously-submitted tree removal plan, file document "Project Development/Sheet Q-4," plotted Jan.12, 2009).

   B. The permittee (Caltrans & City of Goleta) shall undertake development in accordance with the final approved plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Coastal Commission - approved amendment to the coastal development permit, unless the Executive Director determines that no amendment is legally required.

2. **Environmental Avoidance, Minimization & Mitigation requirements.**

   a. Incorporation of City conditions. The permittee shall comply with all environmental avoidance, minimization, and mitigation measures identified in the project *Natural Environment Study* (*NES*), Caltrans District 5, May 2005, and referenced by the City of Goleta's approval (Conditions of Approval attached, as Exhibit 5). By reference, conformance with these mitigation measures is required as a condition of this permit, unless otherwise modified by any other condition of this permit including, but not limited to, changes to mitigation measures

identified below regarding bat roosts, nesting bird habitats, tree retention, and modification of landscaping plans to serve as a habitat enhancement plan.

b. Exclusion of construction activities from adjacent ESHAs. The project's identified environmental avoidance measures provide for exclusion of construction impacts to nearby environmentally sensitive habitat areas, including upland habitat for *Santa Barbara honeysuckle* and a culvert outlet scour pool that may periodically function as *California red-legged frog* (CLRF) habitat. Ecologically sensitive area (ESA) designations, excluding all construction equipment and personnel, will be established around each.

Direct impacts to aquatic habitat are neither proposed nor authorized. To minimize upland disturbances, the ESA will be applied to contiguous vegetated habitat areas that will be retained within 300 ft. of the scour pool, as delineated in the above-referenced *NES* report. The *NES* report also lists 18 additional specific measures for CRLF protection, reflecting the Endangered Species Act Section 7 consultation with the U.S. Fish & Wildlife Service. Permittee agrees to observe all identified CRLF protection measures.

c. Measures to protect bat roosts. The *NES* report includes specific measures for replacement of bat roosting habitat found within the existing railroad overhead structure. These measures, detailed in the attached Findings, shall be supplemented, or modified, as follows:

1) *Replacement bat roosting habitat required*. The proposed new railroad overcrossing shall be designed with sufficient crevice and cavity capacity on the underside of the bridge to accommodate the entire peak period bat population(s) from the existing railroad overcrossing (approx. 2,000 animals). The dimensions and total surface area of the crevices shall be optimized for the two species known to occupy the site, the Mexican free-tailed bat and pallid bat; and, shall in other respects approximately replicate the habitat conditions of the existing bat roost area.

Unless sufficient crevice space is integral to the new bridge design, the required capacity shall be obtained through installation of bat habitat units of an appropriate proven design (e.g., the "Oregon Wedge" or the "Type 1/Type 2 Bat Habitat"), which shall be affixed to or within the bridge structure. See Exhibit 7, attached.

2) *Alternate bat roosting habitat measures*. If biological monitoring reveals that in-bridge bat habitat replacement measures will not be sufficient to fully offset the removal of the existing roosting habitat, alternate bat roost devices may be used, subject to approval of the Executive Director. Such alternate device shall be of a proven design that will provide the same level of suitable roosting environment required by these species of bats.

Potentially acceptable alternate devices include, but are not limited to, off-bridge free-standing bat roost structures. Any such free-standing mitigation structure shall provide equal or greater roosting habitat than that which would be afforded on-bridge; shall be installed on publicly-owned lands or railroad right of way or conservation easement within the immediate vicinity of the project limits; and, shall be permanently marked to prevent removal or disturbance (e.g., "Mitigation Structure—Do Not Disturb"). Prior to installation, the design and location of the mitigation structure shall be submitted for review and approval by the Executive Director, in consultation with the City of Goleta.

d. Red-tailed hawk and other nesting bird protection measures. The nearest observed hawk nest is in a large eucalyptus tree approximately 150 ft. distant from the area to be cleared for the proposed Cathedral Road extension (Exhibit 11, attached). Other eucalyptus trees on the site, near the observed nesting site, serve as buffers and sentinel trees, and represent *potential* nesting habitat for raptors and other birds. The *NES* report recommends that disturbance of nesting raptors be avoided during nesting season. According to best available information, this period is Feb.15-Aug.15 of each year. Consistent with this information, permittee shall implement enhanced measures for protecting bird nesting habitat within the eucalyptus stand, as follows:

1) *Pre-construction bird surveys required*. Permittee shall ensure that a qualified biologist, with experience in conducting bird surveys, shall conduct bird surveys 30 calendar days prior to construction activities to detect any active bird nests in the eucalyptus trees to be impacted, and any other such habitat within 500 feet of the construction area (exclusive of the freeway itself and other areas that can not be safely or legally accessed on foot). The last survey must be conducted 3 calendar days prior to the initiation of clearance/construction.

2) *Construction Monitoring*. The permittee shall retain the services of a qualified biologist or environmental resources specialist with appropriate qualifications as the biological monitor. The biological monitor shall be present during all construction activities within 300 ft. (500 ft. for raptors) of an identified nest that is actively used by raptors or federally or state-listed species, state fully-protected species or state species of concern. A qualified biologist shall be present at all relevant construction meetings and during all significant construction activities to ensure that nesting birds are not disturbed by construction related noise. The qualified biologist shall be onsite monitoring birds and noise every day at the beginning of the project during the period of concentrated heavy equipment use.

3) *Disturbance during nesting prohibited*. If an active raptor, rare, threatened, endangered, or species of concern nest is found, clearing/construction activities within 300 ft. (500 ft. from any identified raptor nest) shall be postponed until the nest(s) is vacated and juveniles have fledged and there is no evidence of a second attempt at nesting.

If an active nest of a raptor, federally or state-listed species, state fully-protected species or state species of concern is found, Caltrans will notify the appropriate State and Federal Agencies within 24 hours, and appropriate action specific to each incident will be developed. Caltrans will notify the California Coastal Commission by e-mail within 24 hours and consult with the Commission regarding determinations of State and Federal agencies.

Construction activities may occur within 300 ft. (500 ft. for raptors) from an active nest of any raptor, rare, threatened, endangered, or species of concern only if noise levels generated by the construction activities will not increase noise levels beyond a peak of 80 dB at any active nesting sites. If construction noise exceeds 80 dB sound mitigation measures such as sound shields, blankets around smaller equipment, mixing concrete batches offsite, use of muffler, and minimizing the use of back-up alarms shall be employed. If these sound mitigation measures do not reduce noise levels, construction within 300 ft. (500 ft. for raptors) of the nesting trees shall cease and shall not recommence until either new sound mitigation can be employed or nesting is complete. In support of this, a focused nest site noise impact study shall be conducted concurrent with the pre-construction bird surveys required in number 2.d.1

above. The peak noise level criterion of 80 dB may be reduced to a peak criterion value between 68 and 80 dB based on the results of the focused noise impact study.

4) *Temporary exclusionary fencing*. Limits of construction to avoid a nest shall be established in the field with flagging and stakes or construction fencing, except where already within a fenced ESA. The 300/500 foot temporary buffer areas may be adjusted to exclude barren and/or non-contiguous areas not part of the potential nesting habitat, such as the freeway, railroad, surface streets, quarry (borrow) sites, and residential neighborhoods separated by the freeway. Construction personnel shall be instructed on the sensitivity of the area, and the importance of staying outside the exclusionary fencing around the ESA.

5) *Documentation of compliance*. Permittee Caltrans shall ensure that the project biologist records the results of the recommended protective measures described above, to document compliance with applicable State and Federal laws pertaining to protection of nesting birds.

6) *Maximum feasible tree retention*. In the vicinity of the new Cathedral Oaks-Hollister Avenue intersection, modification of the curb and gutter design, installation of protective guardrails between the trees and motor traffic, retaining walls, grading adjustments or other appropriate measures shall be employed to achieve maximum feasible retention of existing large mature trees near the nesting site. These identified large trees near this future intersection are numbered 9 & 11-15 on the previously-submitted tree removal plan (file document "Project Development/Sheet Q-4," plotted Jan.12, 2009).

PRIOR TO ISSUANCE of this Coastal Development Permit, a revised table of trees to be removed shall be provided, together with plan detail to identify the measures to be employed to protect each of these identified trees (or an explanation of why retention of the identified tree is not feasible). Feasibility considerations shall include, but not be limited to, public safety standards, operational requirements, public access needs, aesthetics, tree sustainability during project life, relative habitat value, and cost in proportion to benefit. This requirement shall be fulfilled concurrently with Special Condition 1, above, regarding submittal of revised construction plans.

7) *Habitat enhancement plan.* To achieve maximum feasible tree cover near the observed raptor nesting site, a *habitat enhancement plan* shall be submitted for Executive Director review and approval PRIOR TO COMMENCEMENT OF SITE CLEARING OR OTHER DEVELOPMENT. The project Landscape Planting and Revegetation Plan, as revised in accordance with Special Condition 4 below, may be submitted in satisfaction of this requirement.

3. Environmental Monitoring.

Permittee shall submit environmental monitoring reports documenting installation and effectiveness of the avoidance, minimization, and mitigation measures identified in the above-referenced *NES* report, for review and approval of the Executive Director. These reports shall be prepared by the USF&WS-approved biologist (i.e., the Project Biologist) assigned to the project. The required reports shall be in writing, brief, and submitted consistent with the following timing and informational requirements:

a. commencing with a baseline conditions report prior to commencement of site clearing work, documenting any changed conditions since May 2005, and including any updated recommendations for bat roost replacement;

b. after installation of sediment containment measures and equipment exclusion barriers near drainageways, but prior to commencement of clearing or grading;

c. while construction is in progress, prior to the onset of the rainy season (Nov. 1 of each year, unless another date is specified by the Executive Director);

d. while construction is in progress, following the end of the wet season (March 31 of each year, unless another date is specified by the Executive Director);

e. after bat habitat mitigation measures are in place, but prior to demolition of the existing railroad overhead structure;

f. upon completion of project; and,

g. each year, at the height of bat roosting activity, for purposes of determining the effectiveness of the installed bat habitat mitigation measures (for three years following installation of the measures). Such annual reports shall also report success of the approved landscape plan/habitat enhancement plan required to offset loss of raptor nesting habitat.

The submitted monitoring reports shall also identify any adjustments needed to effectively achieve the adopted mitigation objectives. Any substantive modifications of the mitigation program shall be subject to prior review and approval by the Executive Director. Any such adjustment requiring modification of project design will potentially necessitate amendment of this permit.

4. Final Landscaping & Revegetation Program

a. Revised Landscape Planting and Revegetation Plans. PRIOR TO COMMENCEMENT OF SITE CLEARING OR OTHER DEVELOPMENT, permittee shall submit a revised Landscape Planting and Revegetation Plan, prepared by a licensed landscape architect or a qualified resource specialist, for review and approval by the Executive Director. The plans shall incorporate the criteria set forth below:

1) The required final Landscape Planting and Revegetation Plans shall encompass all areas of the project site, including, but not limited to, areas of the site within City of Goleta right-of-way as well as the Caltrans right-of-way. Separate plan sheets may be submitted for the City's portion.

2) The final Landscape Planting and Revegetation plans shall provide for mulching, erosion control and replanting of all exposed natural soil areas remaining within (60) days after construction is completed. These requirements shall also apply to: the on-site quarry (borrow) area; areas along the southbound on/off ramps; and the area seaward of the railroad (UPRR) right of way, including the road surfaces to be vacated and scarified.

3) The final Landscape Planting and Revegetation Plans shall provide for enhancement of woodland and raptor habitat on site by providing for new woodland habitat within the quarry area ("borrow site"), the vacated southbound off-ramp, and the vacated portions of Hollister Avenue.

In particular, the plan shall provide for strategic tree retention and planting in the vicinity of the known raptor nesting site, to enhance the overall quality of nesting habitat. Existing mature trees shall be retained to the maximum extent feasible, and new plantings provided at appropriate densities. In addition, larger tree plantings (e.g., 36" box size) shall be intermingled with the permanent (smaller) tree plantings, as appropriate, to provide for *interim* raptor habitat enhancement until the smaller plantings are well-established.

The total woodland habitat area shown for replanting on the final Landscape Planting and Revegetation Plans shall offset the cleared woodland area at a ratio of 2:1 or better (so that the total area replanted will include at least 2.74 acres of tree species suitable for red-tailed hawk nesting). All such plantings shall be within lands or conservation easements owned or controlled by either permitee. The total crown area of the trees to be planted, together with existing trees to be retained within the site's biologic study area (BSA) as defined in the *NES*, shall be at least 6.62 acres or more at tree maturity.

4) Selection of species and varieties of plantings shall emphasize drought tolerance and compatibility with native plant habitats nearby, and should complement the aesthetic treatment approved for the Highway 101 overpass structure, consistent with the recommendations by the City of Goleta.

Except for tree replacement intended to supplement or provide monarch butterfly habitat, landscaping shall consist primarily of native plant species that are appropriate to the surrounding region (e.g., sycamore or oak) and shall be of local genetic stock. Consistent with recommendations by the City of Goleta, these indigenous plantings may be augmented by selected specimens of other California native tree species known to be utilized by red-tailed hawks and other raptors (e.g., Bigleaf maple, Monterey cypress). The redbud species listed for the preliminary plan shall be corrected to indicate the local native variety. No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or by the State of California shall be employed or allowed to naturalize or persist on the landscaped areas of the site.

5) The submitted landscape and revegetation plans shall specify reliance on reclaimed water as the primary plant establishment and irrigation measure. Any permanent irrigation installations shall be identified.

6) Plantings will be maintained in good growing condition throughout the life of the project and, whenever necessary, shall be replaced with new plant materials to ensure continued compliance with applicable landscape requirements;

b. Conformance with approved plans. All development shall conform to the approved landscaping, revegetation and erosion control plans. Permittee shall undertake site revegetation in accordance with the approved final Landscape Planting and Revegetation Plans. Any changes to the approved plans shall be reported to the Executive Director. No changes to the approved final site/development plans shall occur without an amendment to the

coastal development permit, unless the Executive Director determines that no amendment is legally required.

c. Monitoring of landscape/habitat enhancement plantings. Five years from the date after construction is completed, the permittee shall submit to the Executive Director, a Landscaping and Revegetation Program Monitoring Report, prepared by a licensed Landscape Architect or qualified Resource Specialist, that certifies the on-site landscaping is in conformance with the plan approved pursuant to this Special Condition. The monitoring report shall include photographic documentation of plant species and plant coverage.

5. Interim Erosion Control & Construction Best Management Practices Plan

A. PRIOR TO COMMENCEMENT OF SITE CLEARING OR OTHER DEVELOPMENT, permittee shall submit to the Executive Director an Interim Erosion Control and Construction Best Management Practices plan, prepared by licensed civil engineer or qualified water quality professional. The consulting civil engineer/water quality professional shall certify in writing that the Interim Erosion Control and Construction Best Management Practices (BMPs) plan is in conformance with the following requirements:

1) *Erosion Control Plan*

(a) The plan shall delineate the areas to be disturbed by grading or construction activities and shall include any temporary access roads, staging areas and stockpile areas. The natural areas to be protected on the site (i.e., the ESAs) shall be clearly delineated on the plan and on-site with fencing or survey flags.

(b) Include a narrative report describing all temporary run-off and erosion control measures to be used during construction.

(c) The plan shall identify and delineate on a site or grading plan the locations of all temporary erosion control measures.

(d) The plan shall specify that should grading take place during the rainy season (November 1 – March 31) the applicant shall install or construct temporary sediment basins (including debris basins, desilting basins or silt traps); temporary drains and swales; sand bag barriers; silt fencing; stabilize any stockpiled fill with geofabric covers or other appropriate cover; install geotextiles or mats on all cut or fill slopes; and close and stabilize open trenches as soon as possible.

(e) The erosion measures shall be required on the project site prior to or concurrent with the initial grading operations and maintained throughout the development process to minimize erosion and sediment from runoff waters during construction. All sediment should be retained on-site unless removed to an appropriate approved dumping location either outside the coastal zone or to a site within the coastal zone permitted to receive fill.

2) *Construction Best Management Practices*

(a) No demolition or construction materials, debris, or waste shall be placed or stored where it may enter sensitive habitat, receiving waters or a storm drain, or be subject to wave, wind, rain, or tidal erosion and dispersion.

(b) No demolition or construction equipment, materials, or activity shall be placed in or occur in any location that would result in impacts to environmentally sensitive habitat areas, streams, wetlands or their buffers.

(c) Any and all debris resulting from demolition or construction activities shall be removed from the project site within 24 hours of completion of the project.

(d) Demolition or construction debris and sediment shall be removed from work areas each day that demolition or construction occurs to prevent the accumulation of sediment and other debris that may be discharged into coastal waters.

(e) All trash and debris shall be disposed in the proper trash and recycling receptacles at the end of every construction day.

(f) The applicant shall provide adequate disposal facilities for solid waste, including excess concrete, produced during demolition or construction.

(g) Debris shall be disposed of at a legal disposal site or recycled at a recycling facility. If the disposal site is located in the coastal zone, a coastal development permit or an amendment to this permit shall be required before disposal can take place unless the Executive Director determines that no amendment or new permit is legally required.

(h) All stock piles and construction materials shall be covered, enclosed on all sides, shall be located as far away as possible from drain inlets and any waterway, and shall not be stored in contact with the soil.

(i) Machinery and equipment shall be maintained and washed in confined areas specifically designed to control runoff. Thinners or solvents shall not be discharged into sanitary or storm sewer systems.

(j) The discharge of any hazardous materials into any receiving waters shall be prohibited.

(k) Spill prevention and control measures shall be implemented to ensure the proper handling and storage of petroleum products and other construction materials. Measures shall include a designated fueling and vehicle maintenance area with appropriate berms and protection to prevent any spillage of gasoline or related petroleum products or contact with runoff. The area shall be located as far away from the receiving waters and storm drain inlets as possible.

(l) Best Management Practices (BMPs) and Good Housekeeping Practices (GHPs) designed to prevent spillage and/or runoff of demolition or construction-related materials, and to contain sediment or contaminants associated with demolition or construction activity, shall be implemented prior to the on-set of such activity

(m) All BMPs shall be maintained in a functional condition throughout the duration of construction activity.

B. The final Interim Erosion Control and Construction Best Management Practices plan, shall be in conformance with the site/ development plans approved by the Coastal Commission. Any changes to the Coastal Commission approved site/development plans required by the consulting civil engineer/water quality professional shall be reported to the Executive Director. No changes to the Coastal Commission approved final site/development plans shall occur without an amendment to the coastal development permit, unless the Executive Director determines that no amendment is required.

6. Supplemental GHG Analysis Minimization Measures

Permittee shall implement all minimization measures listed in the supplemental Supplemental Greenhouse Gases (GHG) Analysis (Exhibit 12), including: 1) use of reclaimed water, to reduce electricity demand; 2) landscaping, to reduce surface warming and promote photosynthesis; 3) use of special Portland cement formulations containing fly ash, to reduce GHG emissions resulting from cement production; and, 4) installation of energy-efficient lighting fixtures. A final landscaping and revegetation program, specifying the use of reclaimed water, shall be implemented over the entire project area (see Special Condition 4, above). Special fly-ash Portland cement formulations shall be utilized, as proposed by permittee. Further, the permittee shall coordinate with the applicable electrical power utility to encourage the installation of LED traffic signals and other energy-efficient fixtures.

7. Conformance with Plans

The Permittee shall undertake development in accordance with the final approved plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. Such reportable changes include any alteration that could potentially affect the kind, location, intensity or other substantive aspect of the approved development, or any avoidance, minimization or mitigation measure to be employed in conjunction with the approval.

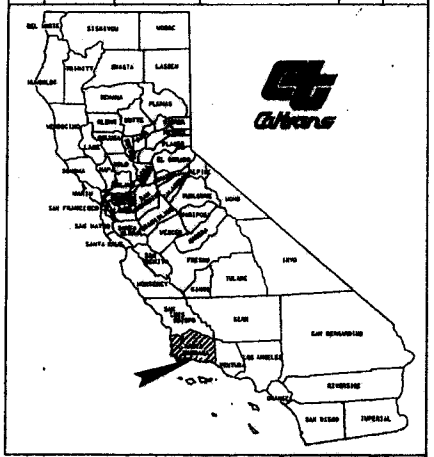
In event the proposed change will require modification of the development approved by this permit, or modification of the mitigation measures required under the terms of this permit, permittee shall submit a timely request for Executive Director review of materiality, as provided by Commission Regulations (Section 13166(b)). If the change is determined to be material, then it shall be reviewed in accordance with the process prescribed for amendments of coastal development permits, as detailed in Commission Regulations, Sections 13164 & 13166.

8. Required Agency Approvals

By acceptance of this permit, the applicant agrees to obtain all other necessary State or Federal permits that may be necessary for all aspects of the proposed project (including the California Department of Fish and Game, Regional Water Quality Control Board and the U.S. Army Corps of Engineers).

INDEX OF SHEETS

Dist	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SB	101	42.6/43.6		



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY

IN SANTA BARBARA COUNTY
IN GOLETA
FROM 0.7 KM SOUTH TO 0.3 KM NORTH OF HOLLISTER AVENUE OVERCROSSING

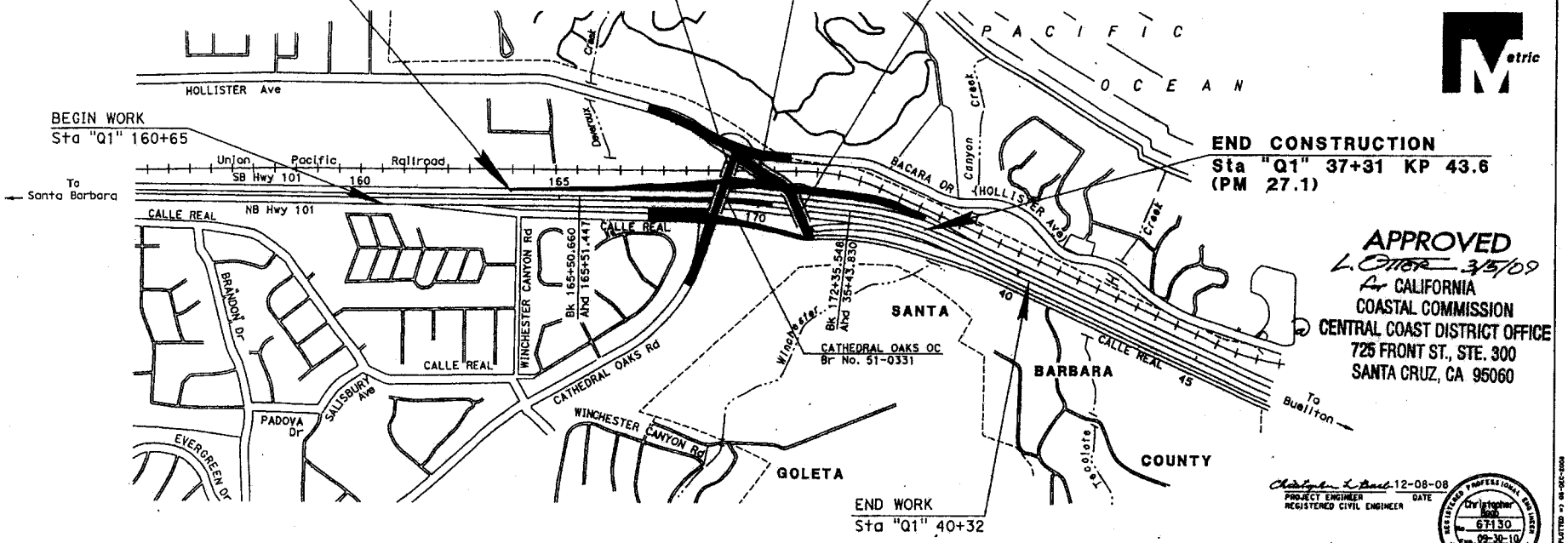
TO BE SUPPLEMENTED BY STANDARD PLANS DATED JULY 2004

BEGIN CONSTRUCTION
Sta "Q1" 163+78 KP 42.6
(PM 26.5)

BEGIN WORK
Sta "Q1" 160+65

END CONSTRUCTION
Sta "Q1" 37+31 KP 43.6
(PM 27.1)

END WORK
Sta "Q1" 40+32



NO SCALE

APPROVED
L. Ethor 3/5/09
For CALIFORNIA
COASTAL COMMISSION
CENTRAL COAST DISTRICT OFFICE
725 FRONT ST., STE. 300
SANTA CRUZ, CA 95060

Christopher L. Baab 12-08-08
PROJECT ENGINEER REGISTERED CIVIL ENGINEER — DATE

Christopher Baab No. 67130 Exp. 09-30-10 CIVIL
REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

DESIGN ENGINEER: CHRISTOPHER BAAB
PROJECT MANAGER: PAUL MARTINEZ

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

CONTRACT No.	05-0M14U4
CU 06234	EA 0M14U1

DATE PLOTTED => 08-DEC-2008
TIME PLOTTED => 11:19
LAST REVISION 12-08-08

BORDER LAST REVISED 3/1/2007 | CALTRANS WEB SITE IS: HTTP://WWW.DOT.CA.GOV/ | RELATIVE BORDER SCALE IS IN MILLIMETERS 0 20 40 60 80

US Fish and Wildlife Service Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
PAS 2157.3152.3728

June 22, 2005

Gene Fong, Division Administrator
California Division
Federal Highway Administration
980 Ninth Street, Suite 400
Sacramento, California 95814-2724

Subject: Biological Opinion for Replacement of the Hollister Avenue Interchange on Highway 101, Santa Barbara County, California (SB-101-26.25/27.4) (CON-1-8-05-F-21)

Dear Mr. Fong:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the subject project, prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The proposed replacement of the Hollister Avenue interchange on Highway 101, Santa Barbara County, California will be conducted by Federal Highways Administration (FHWA), in conjunction with California Department of Transportation (Caltrans) and the City of Goleta. Your project is likely to adversely affect the federally threatened California red-legged frog (*Rana aurora draytonii*). Your request for formal consultation notes that you determined the proposed action meets the suitability criteria contained in the programmatic biological opinion for the California red-legged frog, dated April 24, 2003. We concur with your determination. Your request for formal consultation, dated April 5, 2005, was received in our office on April 11, 2005.

This biological opinion is based on the information that accompanied your request for consultation, including the biological assessment (Caltrans and FHWA 2004), and information in our files. A complete administrative record of this consultation is on file at the Ventura Fish and Wildlife Office.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

FHWA proposes to replace the Hollister Avenue interchange on Highway 101, from postmile 26.2 to 27.4. The Hollister Avenue overhead, which crosses Highway 101, needs to be replaced because it was built with reactive concrete, which has been causing the rebar within the structure

to oxidize. Oxidation causes the rebar to expand, which will cause the concrete to break apart. The Hollister Avenue overhead would be removed and replaced 650 feet east. The Union Pacificoverhead, which crosses the railroad tracks south of Highway 101, would also be removed and replaced 260 feet east, and be aligned with the Hollister Avenue overhead. The southbound onramp and offramp would be extended to match the new interchange location. The total project impact area would be approximately 8.42 acres. Construction would begin in August 2007.

Devereux Creek flows from storm drains in a residential neighborhood on the north side of Highway 101, underneath 101 via a culvert, to an outlet pool on the south side of 101. The southbound onramp would be moved approximately 12 feet south to within 40 feet of the culvert outlet pool in upland habitat. The slope above the culvert would be rebuilt at a steeper angle to accommodate the southbound onramp. Approximately 0.21 acre of upland habitat near the culvert would be paved, and 0.27 acre would be temporarily affected by rebuilding the slope above the culvert.

FHWA proposes to implement protective measures for the California red-legged frog that are contained in the programmatic biological opinion (Service 2003). Additionally, FHWA has proposed the following measures to minimize adverse effects to California red-legged frogs:

1. The Devereux Creek culvert outlet pool and surrounding upland areas within 300 feet east and west of the pool will be off-limits to construction equipment and personnel.

2. Impacts to water quality from increased erosion during slope rebuilding will be reduced or avoided by implementing best management practices, required through Caltrans' National Pollution Discharge Elimination System permit.

STATUS OF THE SPECIES

The programmatic biological opinion for the California red-legged frog describes its basic ecology and reasons for listing (Service 2003). The Service issued a recovery plan in 2002 (Service 2002). Critical habitat for the California red-legged frog was designated on March 13, 2001 (66 Federal Register (FR) 14626); however, this rule was vacated and a revised critical habitat designation was proposed on April 13, 2004. The final revised critical habitat designation is scheduled to be published in November 2005 (69 FR 19620).

ENVIRONMENTAL BASELINE

California red-legged frogs have been found in several locations within 4 miles of the proposed project (Caltrans and FHWA 2004). One subadult California red-legged frog was observed in the Devereux Creek culvert outlet pool in 2001 (Scientific Applications International Corporation 2001). No California red-legged frogs were observed during protocol surveys of the Devereux Creek culvert outlet pool in August and September 2004 (Caltrans and FHWA 2004). The project area is not within proposed critical habitat for the California red-legged frog.

EFFECTS OF THE ACTION

The programmatic biological opinion generally describes how California red-legged frogs could be affected by actions such as replacement of bridges, temporary construction, and replacement of slopes. Therefore, use of the programmatic biological opinion is appropriate and we will not repeat that analysis herein.

The proposed project would affect a small number of California red-legged frogs that occur within the action area. Because of the small size of the action area and the fact that FHWA has proposed to use the protective measures within in the programmatic biological opinion, we anticipate that few, if any, California red-legged frogs are likely to be killed or injured during this project.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. We are unaware of any non-federal actions that are reasonably certain to occur in the action area.

CONCLUSION

After reviewing the current status of the California red-legged frog, the environmental baseline for the action area, effects of the proposed project, and cumulative effects, it is the Service's biological opinion that the proposed project is not likely to jeopardize the continued existence of the California red-legged frog.

We have reached these conclusions because:

1. Only 0.21 acre of upland habitat within 300 feet of the Devereux Creek culvert outlet pool would be permanently affected;

2. The project would not further isolate or fragment California red-legged frog habitat;

3. Few, if any, California red-legged frogs are likely to be killed or injured during project activities; and

4. FHWA has proposed measures to reduce adverse effects of the proposed work on the California red-legged frog.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined

as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and FHWA must ensure that they become binding conditions for the exemption in section 7(o)(2) to apply. FHWA has a continuing duty to regulate the activity covered by this incidental take statement. If FHWA fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

We anticipate that few California red-legged frogs will be taken through injury or mortality during replacement of the Hollister Avenue interchange. Incidental take of the California red-legged frog will be difficult to detect because of its small body size and finding a dead or injured specimen is unlikely. If more than one individual is found dead or injured, FHWA shall contact our office immediately so we can review the project activities to determine if additional protective measures are needed. Project activities may continue during this review period, provided that all protective measures proposed by FHWA and the terms and conditions of this biological opinion have been and continue to be implemented.

California red-legged frogs may be taken only within the defined boundaries of the 8.42-acre project area, along the proposed Hollister Avenue interchange on Highway 101.

REASONABLE AND PRUDENT MEASURE

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take of the California red-legged frog:

> Only qualified biologists, authorized by the Service, shall survey for, capture, and move California red-legged frogs from work areas.

The Service's evaluation of the effects of the proposed action includes consideration of the measures to minimize the adverse effects of the proposed action on the California red-legged frog that were developed by FHWA and cited in the Description of the Proposed Action portion of this biological opinion. The proposed measures include those contained in the programmatic

biological opinion for the California red-legged frog (Service 2003). Any subsequent changes in these measures proposed by FHWA may constitute a modification of the proposed action and may warrant re-initiation of formal consultation, as specified at 50 CFR 402.16. This reasonable and prudent measure is intended to supplement the protective measures that were proposed by FHWA as part of the proposed action.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, FHWA must comply with the following terms and conditions, which implements the reasonable and prudent measure described above. These terms and conditions are non-discretionary.

The following terms and conditions implement the reasonable and prudent measure.

1. Only biologists authorized by the Service under the auspices of this biological opinion shall survey for, capture, and move California red-legged frogs from work areas. FWHA shall request our approval of any biologists it wishes to employ to survey for, capture, and move California red-legged frogs from work areas. The request must be in writing and received by the Service at least 15 days prior to any such activities being conducted.

2. To avoid transferring disease or pathogens between aquatic habitats during the course of surveys and handling of California red-legged frogs, the Service-approved biologist shall follow the Declining Amphibian Population Task Force's Code of Practice. A copy of this Code of Practice is enclosed. You may substitute a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) for the ethanol solution. Care shall be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

REPORTING REQUIREMENTS

The reporting requirements for projects tiered from the programmatic biological opinion are described in the document. FHWA should review the programmatic biological opinion regarding the information we require.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Within three days of locating any dead or injured California red-legged frogs, you must notify our office at (805) 644-1766 (2493 Portola Road, Suite B, Ventura, California 93003) by telephone and in writing. The report shall include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Care shall be taken in handling dead specimens to preserve biological material in the best possible state for later analysis. Should any injured California red-legged frogs survive, the Service shall be contacted regarding their final disposition. The remains of California red-legged frogs shall be placed with the Santa Barbara Natural History Museum (Contact: Paul Collins, Santa Barbara Natural History Museum, Vertebrate Zoology Department, 2559 Puesta Del Sol,

Santa Barbara, California 93105, (805-682-4711 ext.321). Arrangements regarding proper disposition of potential museum specimens shall be made with the Museum by FHWA prior to implementation of any actions.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

> We recommend that any non-native predators of the California red-legged frog be permanently removed from the wild if they can be captured while monitoring project activities. Anyone conducting such removals should be in compliance with the California Fish and Game Code.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on your proposed authorization of the Hollister Avenue interchange replacement. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have questions, please contact Christine Hamilton of my staff at (805) 644-1766, ext. 369.

Sincerely,

Richard E. Farris

Rick Farris
Division Chief
Santa Barbara/Ventura/Los Angeles

LITERATURE CITED

California Department of Transportation and Federal Highway Administration. 2004. Biological assessment: replace Hollister overhead Highway 101 in the City of Goleta, Santa Barbara Count SB-101-26.2/27.4 05-371500.

Scientific Applications International Corporation. 2001. California red-legged frog survey report Sandpiper Residences. Santa Barbara, California.

U.S. Fish and Wildlife Service. 2002. Recovery plan for the California red-legged frog *(Rana aurora draytonii)*. Portland, Oregon.

U.S. Fish and Wildlife Service. 2003. Programmatic Biological Opinion for projects funded or approved under the Federal Highways Administration Federal Aid Program that may affect the California red-legged frog. Dated April 24. Issued to; Gary N. Hamby, Federal Highways Administration, California Division, Sacramento. Issued by: Ventura and Sacramento Fish and Wildlife Offices, Ventura and Sacramento, California.

The Declining Amphibian Populations Task Force Fieldwork Code of Practice

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires, and all other surfaces. Rinse cleaned items with sterilized (*e.g.*, boiled or treated) water before leaving each study site.

2. Scrub boots, nets, traps, and other types of equipment used in the aquatic environment with 70 percent ethanol solution or a bleach solution of one-half to one cup of bleach in one gallon of water and rinse clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area.

3. In remote locations, clean all equipment with 70 percent ethanol or a bleach solution, and rinse with sterile water upon return to the lab or a "base camp." Elsewhere, when laundry facilities are available, remove nets from poles and wash (in a protective mesh laundry bag) with bleach on a "delicate" cycle.

4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolated species, wear disposable gloves and change them between handling each animal. Dedicate separate sets of nets, boots, traps, and other equipment to each site being visited. Clean and store them separately at the end of each field day.

5. Safely dispose of used cleaning materials and fluids. Do not dispose of cleaning materials and fluids in or near ponds, wetland, and riparian areas; if necessary, return them to the lab for proper disposal. Safely dispose of used disposable gloves in sealed bags.

6. When amphibians are collected, ensure the separation of animals from different sites and take great care to avoid indirect contact *(e.g.*, via handling or reuse of containers) between them or with other captive animals. Do not expose animals to unsterilized vegetation or soils which have been taken from other sites. Always use disinfected and disposable husbandry equipment.

7. If a dead amphibian is found, place it in a sealable plastic bag and refrigerate (do not freeze). If any captured live amphibians appear unhealthy, retain each animal in a separate plastic container that allows air circulation and provides a moist environment from a damp sponge or sphagnum moss. For each collection of live or dead animals, record the date and time collected, location of collection, name of collector, condition of animal upon collection, and any other relevant environmental conditions observed at the time of collection. Immediately contact the Ventura Fish and Wildlife Office at (805) 644-1766 for further instructions.

The Fieldwork Code of Practice has been produced by the Declining Amphibian Populations Task Force with valuable assistance from Begona Arano, Andrew Cunningham, Tom Langton, Jamie Reaser, and Stan Sessions.

For further information on this Code, or on the Declining Amphibian Populations Task Force, contact John Wilkinson, Biology Department, The Open University, Walton Hall, Milton Keynes, MK7 6AA, UK.
E-mail: DAPTF@open.ac.uk; Fax: +44 (0) 1908-654167

Foundation Report for Cathedral Oaks OC (Replace), Bridge No. 51-0331, March 30, 2007, Caltrans

State of California Business, Transportation and Housing Agency

Memorandum

To: KELLY ANN HOLDEN
Branch Chief
Division of Engineering Services, Structure Design
Office of Bridge Design – Central, Branch 7

Date: March 15, 2007

File: 05-371501
05-SB-101-26.3/27.5
(kP 42.3/44.3)
Cathedral Oaks OC
(Replace)
Bridge No. 51-0331

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Foundation Report

A Foundation Report (FR) is provided for the above referenced project per your request dated March 23, 2006. This report is based in part, on a review of the As-built General Plan, Foundation Plan, Pile Details and Log of Test Borings (LOTB) for construction of the Hollister Avenue Overcrossing, Bridge No. 51-0123, all dated April 25, 1962.. Pertinent information was also found in the three reports, three auger borings and laboratory test data produced by Earth Mechanics, Inc. for the County of Santa Barbara. The three reports are entitled "Preliminary Foundation Report for Bridge Type Selection" (February 23, 2001), "Preliminary Materials Report" (Summer 2000), and "Preliminary Geotechnical Information for Bridge Type Selection" (July 27, 1998). These reports and the laboratory data are attached to this memorandum. One additional borehole and additional laboratory testing were performed in 2006 by Caltrans personnel. The Geologic Map of the Dos Pueblos Quadrangle by Thomas W. Dibblee Jr. (1987) was also reviewed.

Proposed Improvements

The proposed improvements include construction of a replacement structure at a location approximately 195 meters south of the existing structure. This is the alternative 2 location discussed in the Preliminary Foundation Report for the Cathedral Oaks Overcrossing.

Physical Setting

The project is located within the Transverse Ranges Geomorphic Province. It lies at the southern margin of the Santa Ynez Mountains, on an uplifted alluvium filled basin. In the immediate vicinity of the project, the terrain is gently rolling with a general slope toward the ocean. The surface drainage is moderately well developed. The prevalent land uses in

the project vicinity are residential and agricultural. The surface elevation in the vicinity of the bridge replacement lies between approximately 36.5 meters (120 feet) and 37.5 meters (123 feet). The railroad is constructed in a through-cut. All supports of the existing structure are founded in natural soil.

Geology and Soil Conditions

The surficial deposits within the project area are Quaternary (Pleistocene) Aged older alluvium. Dibblee describes this soil as deposits of silt, sand and gravel. The soils are described as weakly consolidated in some places.

The 1997 field investigation by Earth Mechanics, Inc., consisted of three 203-millimeter (eight-inch) diameter auger borings. The borings are designated B-1, B-2 and B-3. The deepest point reached by the Earth Mechanics Inc. boreholes was approximately elevation 9.4 meters (30.8 feet). In summary, the older alluvial soils observed were described as interbedded dense to very dense silty sand, silt and gravelly sand, and firm to hard silty clay and clay. Monterey Formation siltstone and diatomaceous siltstone were encountered at elevation 20.3 meters (66.6 feet) in the vicinity of abutment 1, and at elevation 22.7 meters (74.5 feet) in the vicinity of abutment 2. This data is attached to this report.

The 2006 field investigation by Caltrans for the Overhead structure consisted of one rotary wash borehole, B-02-06, located in the proximity of bent 2. The deepest point reached by B-02-06 was approximately elevation 10.7 meters (35.1 feet). The observed subsurface materials include recent fill, older alluvium and Monterey Formation Mudstone. Wet sandy soil was observed at approximately elevations 23.5 meters.

Laboratory Data

Earth Mechanics, Inc. performed numerous laboratory tests on soil samples collected during their field investigation. This data is attached to this report. Selected soil samples from Caltrans borehole B-02-06 were submitted to the Caltrans Soils Lab for testing. The tabulated test results are attached to this memorandum.

Groundwater

Groundwater was not recorded on the borehole logs for the auger borings performed by Earth Mechanics, Inc., in November 1997. EMI personnel describe the soils as damp and moist. As described above, saturated soils were observed in Caltrans borehole B-2-2006. The saturated soils are shown as "wet" on the Log-of-Test Borings.

Seismic Data and Liquefaction Potential

Upon request, the Seismic Design Recommendations will be prepared by Reza Mahallati, Office of Geotechnical Design North.

Corrosion Testing

Representative soil samples taken during the foundation investigation were tested for corrosion potential. The results of the corrosion tests are included in the Table attached to this memorandum. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

The tests for sulfate and chloride are usually not performed unless the resistivity of the soil is 1,000 ohm-cm or less.

Based on corrosion test results on samples obtained during the field investigation, and because the project area is not within 300 meters (1000 feet) of salt or brackish water, the site is considered non-corrosive.

Foundation Recommendations

Twenty-four inch diameter drilled shafts, (Cast-In-Drilled-Hole) piles are the recommended foundation type. The drilled shaft diameters, lengths and spacing at abutment 1 and abutment 3 have been determined to meet the Service Limit State I Loads provided on the "Final Foundation Data Sheet", which is attached to this report. A safety factor of 2 has been applied to the drilled shaft nominal resistances at the abutments, as is appropriate for WSD foundation design.

Location	Pile Type	Allowable Resistance	Nominal Resistance kN		Design Tip Elev.	Specified Tip Elev.
			Compression	Tension		
Abutment 1	610 mm drilled shaft	625 kN	1250	0	19.3 (1)	19.3
Abutment 3	610 mm drilled shaft	625 kN	1250	0	20.7 (1)	20.7

Design Tip elevation controlled by the following demands :(1)Compression;(2)Tension

70 +

The drilled shafts that will support bent 2 have been designed to satisfy strength I and extreme I load demands, both in tension and in compression. Single drilled shaft and drilled shaft group capacities were considered for both loading cases. A resistance factor of 0.7 was applied to nominal single and group drilled shaft resistances for comparison with

strength I limit state loads. A resistance factor of 1.0 was applied to the nominal single and group drilled shaft resistances for comparison with extreme I limit state loads. The foundation resistances and specifications per each of the proposed drilled shafts are provided in the following table. For the configuration shown on the "Final Foundation Data Sheet", the pile group resistances in compression and tension exceed the load demands for the controlling strength and extreme limit states.

Location	Pile Type	Factored Resistance For Strength I (kN)		Nominal Resistance kN		Design Tip Elev.	Specified Tip Elev.
		Compression	Tension	Compression	Tension		
Bent 2	610 mm drilled shaft	1440	1000	2060	1400	20.3 (1)	20.3

Design Tip elevation controlled by the following demands :(1)Compression;(2)Tension

160 T 230 T

Drilled shafts having the lengths and diameters recommended here will meet the requirements for permissible movement under service load provided on the "Final Foundation Data Sheet". An analysis of the lateral capacity of the drilled shafts was not requested.

Construction

Saturated strata of sand were encountered during the 2006 field investigation. The locations of the saturated soils are shown on the Log-of-Test Borings. The "wet" specification should be provided in the contract specifications.

A request for production of a Log-of-Test Boring sheet has been made to the Engineering Graphics Branch of the Office of Geotechnical Services. When complete, the As-Built Log-of-Test Borings will be provided to you for attachment to the contract plans.

If you have any questions or comments, please call me at (805) 549-3385 (CalNet 629-3385).

RON RICHMAN, P.E., C.E.G., Chief
Office of Geotechnical Design – North

c: Roy Bibbens (GDN Records)
GS Records
John Stayton – Structure Office Engineer (4)
Job File (Branch D Records)

Foundation Report for Cathedral Oaks OH (Replace Ellwood OH), Bridge No. 51C-0130, April 8, 2008, Caltrans

State of California — Business, Transportation and Housing Agency

Memorandum

To: KELLY ANN HOLDEN
Branch Chief
Division of Engineering Services, Structure Design
Office of Bridge Design – Central, Branch 7

Date: April 8, 2008

File: 05-0M1401
05-SB-101-26.3/27.5
(kP 42.3/44.3)
Cathedral Oaks OH
(Replace Ellwood OH)
Bridge No. 51c-0344

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES – MS 5

Subject: Revised Foundation Report

A Revised Foundation Report (FR) is provided for the above referenced project per your request dated January 18, 2008. This report is based in part, on a review of the As-built General Plans for construction of the Elwood Overhead, Bridge No. 51c-0130 (formerly 51-0035). Pertinent information was also found in the three reports, two auger borings and laboratory test data produced by Earth Mechanics, Inc. for the County of Santa Barbara. The three reports are entitled "Preliminary Foundation Report for Bridge Type Selection" (February 23, 2001), "Preliminary Materials Report" (Summer 2000), and "Preliminary Geotechnical Information for Bridge Type Selection" (July 27, 1998). One borehole and laboratory testing of selected soil specimens were performed in 2006 by Caltrans personnel. The Geologic Map of the Dos Pueblos Quadrangle by Thomas W. Dibblee Jr. (1987) was also reviewed.

Proposed Improvements

The proposed improvements include construction of a replacement structure at a location approximately 50 meters south of the existing overhead bridge.

Physical Setting

The project is located within the Transverse Ranges Geomorphic Province. It lies at the southern margin of the Santa Ynez Mountains, on an uplifted alluvium filled basin. In the immediate vicinity of the project, the terrain is gently rolling with a general slope toward the ocean. The surface drainage is moderately well developed. The prevalent land uses in the project vicinity are residential and agricultural. The surface elevation in the vicinity of the bridge replacement lies between approximately 36.5 meters (120 feet) and 37.5 meters

(123 feet). The railroad is constructed in a through-cut. All supports of the existing structure are founded in natural soil.

Geology and Soil Conditions

The surficial deposits within the project area are Quaternary (Pleistocene) Aged older alluvium. Dibblee describes this soil as deposits of silt, sand and gravel. The soils are described as being weakly consolidated in some places.

The 1997 field investigation by Earth Mechanics, Inc., consisted of two 203-millimeter (eight-inch) diameter auger borings. The borings are designated R-1 and R-2. The deepest point reached by the Earth Mechanics Inc. boreholes was approximately elevation 11.8 meters (38.7 feet). In summary, the older alluvial soils observed were described as interbedded dense to very dense silty sand, silt and gravelly sand, and firm to hard clay. Monterey Formation siltstone and diatomaceous siltstone were encountered at elevation 18.9-meters (62.0 feet) in the vicinity of abutment 1, and at elevation 17.7 meters (58.1 feet) in the vicinity of abutment 2. This data is attached to this report.

The 2006 field investigation by Caltrans for the Overhead structure consisted of one rotary wash borehole, B-01-06, located in the proximity of abutment 2. The deepest point reached by B-01-06 was approximately elevation 14.9 meters (48.9 feet). The observed subsurface materials include recent fill, older alluvium and Monterey Formation Mudstone. Wet sandy soils were observed at approximately elevations 31.7, 30.5 and between elevations 20.7 and 23.5 meters.

Laboratory Data

Earth Mechanics, Inc. performed numerous laboratory tests on soil samples collected during their field investigation. Selected soil samples from Caltrans borehole B-01-06 were submitted to the Caltrans Soils Lab for testing. Laboratory data will be provided in "pdf" format for inclusion in the Information Handout.

Groundwater

Groundwater was not recorded on the borehole logs for the auger borings performed by Earth Mechanics, Inc., in November 1997. EMI personnel describe the soils as damp and moist. As described above, saturated soils were observed in Caltrans borehole B-1-2006. The saturated soils are shown as "wet" on the Log-of-Test Borings.

Seismic Data and Liquefaction Potential

The Seismic Design Recommendations are provided under separate cover by Reza

Mahallati, Office of Geotechnical Design North.

Corrosion Testing

Representative soil samples taken during the foundation investigation were tested for corrosion potential. The results of the corrosion tests are included in the Table attached to this memorandum. The Department considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil and/or water samples taken at the site:

- Chloride concentration is greater than or equal to 500 ppm
- Sulfate concentration is greater than or equal to 2000 ppm
- The pH is 5.5 or less

Based on corrosion test results on samples obtained during the field investigation, and because the project area is not within 300 meters (1000 feet) of salt or brackish water, the site is considered non-corrosive.

Foundation Recommendations

Twenty-four inch diameter drilled shafts, (Cast-In-Drilled-Hole) piles are the recommended foundation type. The drilled shaft diameters, lengths and spacing have been determined to meet the Service Limit State I Load demands provided on the "Final Foundation Data Sheet", which is attached to this report. A safety factor of 2 has been applied to the drilled shaft nominal resistances, as is appropriate for the Working Stress foundation design method. The foundation recommendations for the proposed drilled shafts are provided in the following table:

Foundation Recommendations

Support Location	Pile Type	Cut-off Elevation (m)	LRFD Service-I Limit State Load (kN) per Support		LRFD Service-I Limit State Total Load (kN) per Pile (Compression)	Nominal Resistance (kN)	Design Tip Elevations (m)	Specified Tip Elevation (m)
			Total	Permanent				
Abut. 1	610 mm drilled shaft	31.99	12,188	10,877	785	1570	23.5 (a)	23.5
Abut. 2	610 mm drilled shaft	33.83	13,344	12,033	670	1340	25.0 (a)	25.0

Notes:

1) *Design tip elevations are controlled by (a) Compression.*
2) *The specified tip elevations shall not be raised above the design tip elevations for compression.*

Drilled shafts having the lengths and diameters recommended here will meet the requirements for permissible movement under the Service Limit State loads provided on the "Final Foundation Data Sheet". An analysis of the lateral capacity of the drilled shafts was not requested.

Construction

Saturated strata of sand were encountered during the 2006 field investigation. The locations of the saturated soils are shown on the Log-of-Test Borings. The "wet" specification should be provided in the contract specifications.

Project Information

Standard Special Provision S5-280, "Project Information", discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from Geotechnical Services. Items listed to be included in the Information Handout will be provided in "pdf" format to the addressee of this report via electronic mail.

Data and information attached with the project plans are:

A. Log of Test Borings for the Cathedral Oaks Overhead

Data and Information included in the Information Handout provided to the bidders and Contractors are:

A. Foundation Report for the Cathedral Oaks Overhead, April 8, 2008, Caltrans.
B. Summary of Laboratory Tests for Foundation Report, April 8, 2008, Caltrans.
C. Preliminary Foundation Report for Bridge Type Selection, February 23, 2001, Earth Mechanics Incorporated.
D. Preliminary Materials Report, summer 2000, Earth Mechanics Incorporated.
E. Preliminary Geotechnical Information for Bridge Type Selection, July 27, 1998, Earth Mechanics Incorporated.

Data and information available for inspection at the District 5 Office:

A. None

Data and information available for inspection at the Transportation Laboratory:

A. None

If you have any questions or comments, please call me at (805) 549-3385 (CalNet 629-3385).

RON RICHMAN, P.E., C.E.G.
Office of Geotechnical Design – North

c: Roy Bibbens (GDN Records)
GS Records
John Stayton – Structure Office Engineer (4)
Job File (Branch D Records)

Summary of Laboratory Tests for Cathedral Oaks OC, March 30, 2007, Caltrans

SB-101-KP 42.3
05-371501
Cathedral Oaks Overcrossing

SUMMARY OF LABORATORY TESTS

DESCRIPTION	BORING OR SAMPLE No.	B-02-06	B-02-06	B-02-06	B-02-06	B-02-06	B-02-06
	DATE SAMPLED	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006
	STATION	11+30	11+30	11+30	11+30	11+30	11+30
	LINE	centerline	centerline	centerline	centerline	centerline	centerline
	DISTANCE FROM LINE (RT. OR LT.)	on centerline	on centerline	on centerline	on centerline	on centerline	on centerline
	DEPTH OR ELEVATION (meters)	1.52 m	8.53 m	11.58 m	13.10 m	16.31	18.14
	USCS CLASSIFICATION	CL					
SIEVE ANALYSIS	38 mm (1 1/2")						
	19 mm (3/4")						
	9.5 mm (3/8")						
	4.75 mm (No. 4)						
	2.36 mm (No. 8)						
	1.18 mm (No. 16)						
	600 µm (No. 30)						
	300 µm (No. 50)						
	75 µm (No. 200)						
	5 µm						
	1µm						
CLASSIFICATION TEST SUMMARY	IN-PLACE DENSITY (DRY WT. kN/cu.m.)			10.5	10.02	10.3	10.6
	IN-PLACE MOISTURE (PERCENT)	20.9	28.4	40.53	46.7	44.94	45.74
	SPECIFIC GRAVITY						
	LIQUID LIMIT	49	not plastic				
	PLASTICITY INDEX	29	not plastic				
	SAND EQUIVALENT						
SOIL STRENGTH	UNCONFINED COMPRESSIVE STRENGTH (Mpa)			2.7	1.78	1.95	1.91
	CUe TRIAXIAL TEST						
	EFFECTIVE STRESS						
	FRICTION ANGLE (DEGREES)						
	COHESION (kPa)						
	TOTAL STRESS						
	FRICTION ANGLE (DEGREES)						
	COHESION (kPa)						
CORROSION	RESISTIVITY (ohm-cm)	1100	5100				
	pH	7.5	7.2				
	SULFATES (ppm)						
	CHLORIDES (ppm)						

Attachment 2

Summary of Laboratory Tests for Cathedral Oaks OH, April 8, 2008, Caltrans

SB-101-KP 42.3
05-0M1401
Cathedral Oaks Overhead

SUMMARY OF LABORATORY TESTS

DESCRIPTION	BORING OR SAMPLE No.	B-01-06	B-01-06	B-01-06	B-01-06
	DATE SAMPLED	8/15/2006	8/15/2006	8/15/2006	8/15/2006
	STATION	10+80	10+80	10+80	10+80
	LINE	centerline	centerline	centerline	centerline
	DISTANCE FROM LINE (RT. OR LT.)	on centerline	on centerline	on centerline	on centerline
	DEPTH OR ELEVATION (meters)	4.33 m	7.92 m	8.53 m	17.07 m
	USCS CLASSIFICATION	CL	CH	CL	MH
SIEVE ANALYSIS	38 mm (1 1/2")				
	19 mm (3/4")				
	9.5 mm (3/8")				
	4.75 mm (No. 4)				
	2.36 mm (No. 8)				
	1.18 mm (No. 16)				
	600 µm (No. 30)				
	300 µm (N0. 50)				
	75 µm (N0. 200)				
	5 µm				
	1µm				
CLASSIFICATION TEST SUMMARY	IN-PLACE DENSITY (DRY WT. kN/cu.m.)	1.8			
	IN-PLACE MOISTURE (PERCENT)	9.5	18.6	12.2	56.3
	SPECIFIC GRAVITY				
	LIQUID LIMIT	31	52	36	67
	PLASTICITY INDEX	15	26	16	15
	SAND EQUIVALENT				
SOIL STRENGTH	UNCONFINED COMPRESSIVE STRENGTH (Mpa	0.77			
	CUe TRIAXIAL TEST				
	EFFECTIVE STRESS				
	FRICTION ANGLE (DEGREES)				
	COHESION (kPa)				
	TOTAL STRESS				
	FRICTION ANGLE (DEGREES)				
	COHESION (kPa)				
CORROSION	RESISTIVITY (ohm-cm)		1250	1500	2400
	pH		7.2	7.5	7.6
	SULFATES (ppm)				
	CHLORIDES (ppm)				

Preliminary Foundation Report for Bridge Type Selection for Cathedral Oaks OC and OH,
February 23, 2001
Earth Mechanics Incorporated

Earth Mechanics, Inc.

Geotechnical and Earthquake Engineering

TECHNICAL MEMORANDUM

DATE: February 23, 2001 **EMI PROJECT NO:** 97-156

PREPARED FOR: Mr. M. Wahiduzzaman/ County of Santa Barbara

PREPARED BY: Lino Cheang / Earth Mechanics, Inc.

SUBJECT: Cathedral Oaks Overcrossing and Overhead
Preliminary Foundation Report for Bridge Type Selection

Introduction

This memorandum has been prepared to provide the necessary geotechnical information to assist the structural designers in the type selection process for the Cathedral Oaks Overcrossing (OC) and Overhead (OH). It includes preliminary geologic, geotechnical, seismic, and foundation recommendations for the subject structures. The recommendations provided in this memo are based on five site-specific soil borings drilled in November 1997. A boring location plan (Figure 1) and Standard Penetration Test (SPT) profile (Figure 2) are attached; Log-of-Test-Borings (LOTB) sheets are currently being prepared. The recommendations contained in this memorandum should be considered as preliminary; final design recommendations will be developed after the bridge type selection has been approved.

Subsurface Conditions

Along the overhead, the soil condition from the existing approach area down to approximately El. +23 meters consists primarily of very stiff to hard sandy silt. Layers of dense to very dense silty sand were encountered between El. +31 and +29 meters and El. +22 and +20 meters. A layer of firm to very stiff clay exists between El. +20 and +18 meters. The above materials are underlain by bedrock composed of clayey siltstone and shale down to a boring termination depth near El. +12 meters.

Below the overcrossing alignment, very stiff to hard sandy silt is present below the SR-101 freeway surface down to about El. +21 meters. A very dense silty sand layer exists between El. +26 and El. +24 meters. The above materials are underlain by bedrock down to a boring termination depth near El. +10.0 meters. The soil material between Calle Real and SR-101 freeway (El. +39 to +31 meters) consists of stiff to hard silty clay and medium dense clayey sand.

Attachment 5

The siltstone and shale bedrock is classified as diatomaceous, characterized by relatively low in-situ density and high moisture content. In-situ dry unit weight as low as 8.7 kN/m^3 and moisture content as high as 70% were measured in this material.

As-Built Data

Since the proposed structures are new and not replacements, no as-built data is available.

Seismic Data

Maximum Horizontal Bedrock Acceleration[1]:	0.5 g
Causative Fault:	More Ranch-Mission Ridge-Arroyo Parida-Santa Ana (MMA)
Causative Fault Type:	Normal-Oblique
Distance to Causative Fault	1 km
MCE Magnitude[2]:	7.5
ARS Curve Recommendation (Caltrans SDC, 1999):	Figure B.8 ARS @ 0.7g/Soil Type D[3]

Notes:

1. *Maximum horizontal bedrock acceleration recommendations are based on the Caltrans California Seismic Hazard Map, dated July 1996.*
2. *MCE = Maximum Credible Earthquake generated by causative fault.*
3. *Due to the proximity of the subject structure to the causative fault, the ARS Curve should include a 20 percent increase of spectral accelerations for periods greater than 1 sec., no increase for periods less than 0.5 sec., and linear interpolation between 0.5 and 1 sec.*

Liquefaction Evaluation

Based on the soil borings information, the subject site appears to have a low liquefaction potential because groundwater was not encountered and the onsite soils are predominantly fine-grained with generally high blowcounts.

Scour Evaluation

The proposed structure will not cross a channel or basin that conveys water; therefore, scour potential should not be a design issue at the site.

Corrosion Evaluation

Corrosion tests have been performed and the site soils are found to be corrosive to concrete and steel. The measured levels of soluble sulfates are not sufficient to require the use of Type V cement; therefore, Type II Modified cement can be used for concrete in contact with on-site soils. Minimum concrete cover should be based on Table 8.22.1 of Caltrans BDS dated July 2000 for chloride concentration between 500 and 5,000 ppm. For steel piles, Caltrans recommends a steel corrosion rate of 0.0254 mm per year for each side of steel surface; for a 75-year design life, the total sacrificial steel thickness is 3.81 mm.

Preliminary Foundation Recommendations for Overhead

As-built plans for the existing Hollister Avenue Overhead (located about 70 meters away from the proposed OH) show spread footings at all support locations with a "maximum" soil pressure of 240 kPa. The General Plans for Type Selection for the proposed OH shows two simple-span bridge alternatives: (1) "tall" cantilevered abutments and (2) "short" seat-type abutments. We propose using spread footings with allowable bearing pressures of 240 and 190 kPa for Alternatives (1) and (2), respectively. Prior to footing construction, the excavation bottom should be scarified a minimum depth of 200 mm and recompacted to at least 95% of maximum density per California Test 216. For Alternative 2, in order to reduce the likelihood of undermining the spread footings due to erosion of the adjacent steep slope, the nearest edge of the abutment footings should be set back a minimum distance of 4.6 meters from the top of the slope or the slope face, whichever results in the farthest set-back from the slope.

In addition to the set-back requirement for Alternative 2, we would like to emphasize the need for some remedial measures to minimize the potential of future excessive slope erosion. Such mitigation measures could include channeling of surface runoff away from the slope face and/or application of shot-concrete on the slope face. A more permanent solution would be to re-grade the slope and construct slope paving.

Preliminary Foundation Recommendations for Overcrossing

The as-built plans for the existing Hollister Avenue OC (located about 150 meters away from the proposed OC) show a mixed foundation system was used: spread footings at Abutment 1 and Bents 2 to 4 and driven concrete piles at Abutment 5. The as-built plans list the allowable bearing pressure for the spread footings as 287 kPa and list the pile-type as driven precast concrete but do not include a pile details sheet with the pile-size and design (service) loading.

Caltrans recently rejected the use of a mixed foundation system for one of our bridge projects located in Santa Clarita. In addition, according to Caltrans Memo to Designers 5-1, deep foundations are to be used at abutments when the peak rock acceleration is 0.6g or greater and the embankment height is 3.05 meters or greater and the structure has multiple spans. With these Caltrans requirements in mind, we recommend using deep foundation at all support locations. Based on the soil boring information, we anticipate hard driving at Abutment 1 and possibly Bent 2, therefore, we recommend using steel HP-piles: HP 360x132 for 900 kN, HP 250x85 for 625 kN and HP 250x62 for 400 kN service demands. Since the site is considered corrosive, a sacrificial steel thickness of 3.81 mm was used in the geotechnical capacity calculations.

Resulting pile lengths for the 625 kN and 400 kN piles are 15.9 and 12.2 meters at the abutments. At the center bent, estimated pile length is 14.9 meters for service demands of 900 kN.

Embankment fill will be required at both abutments to raise existing grade to proposed grade. Due to the anticipated presence of compressible soils below the proposed structure, consolidation settlements should be expected following fill placement. A settlement period up to 55 days may

be required prior to initiating pile driving. A 1.52-meter surcharge can be used to accelerate the settlement period to about 35 days.

Additional Field Work and Laboratory Testing

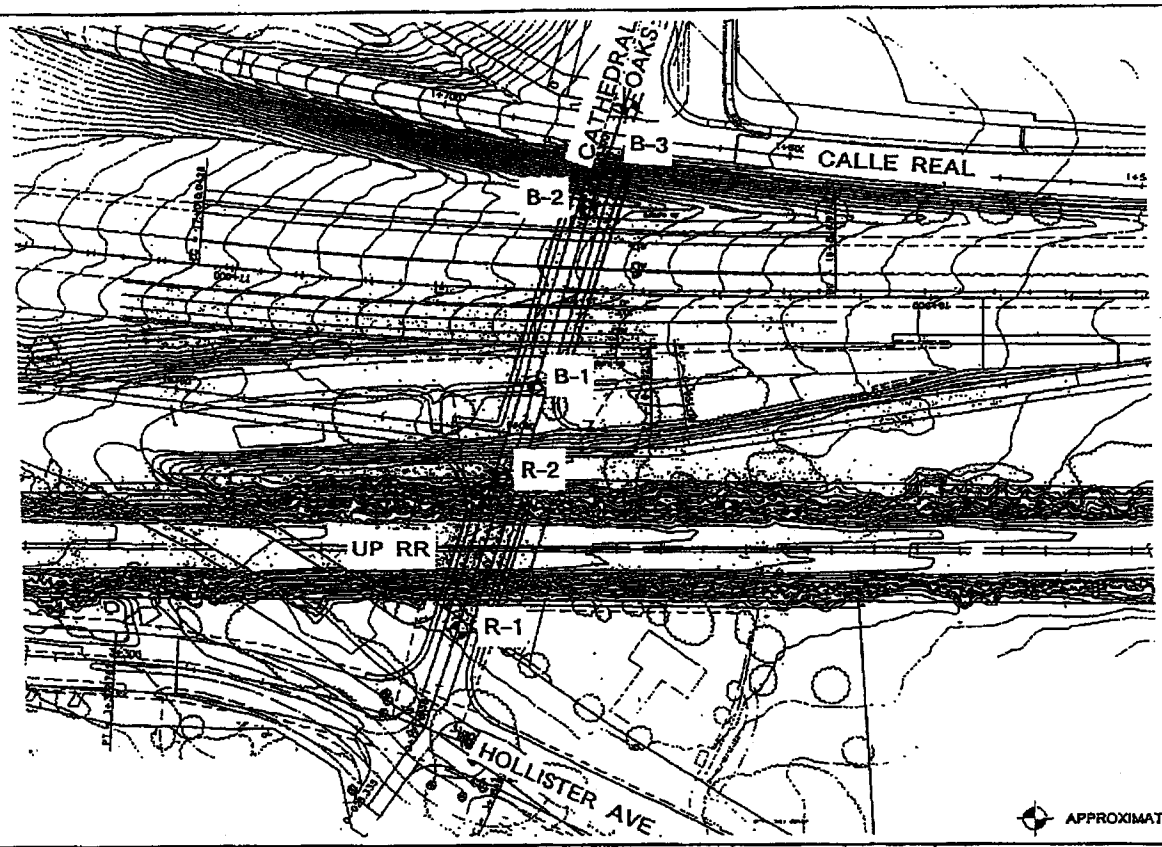
Since five site–specific soil borings have already been completed for the structures, no additional borings are proposed. Laboratory testing on selected samples from the five borings included moisture content/in-place unit weight, sieve analysis, percent passing No. 200 sieve, Atterberg Limits, consolidation, direct shear and soil corrosivity.

References

Mualchin, L. (1996). *California seismic hazard map, 1996,* California Department of Transportation, Revision 1, July.

Mualchin, L. (1996). *A Technical Report to Accompany the Caltrans Seismic Hazard Map, 1996,* California Department of Transportation, Revision 1, July.

California Department of Transportation, 1999, *Seismic Design Criteria.*



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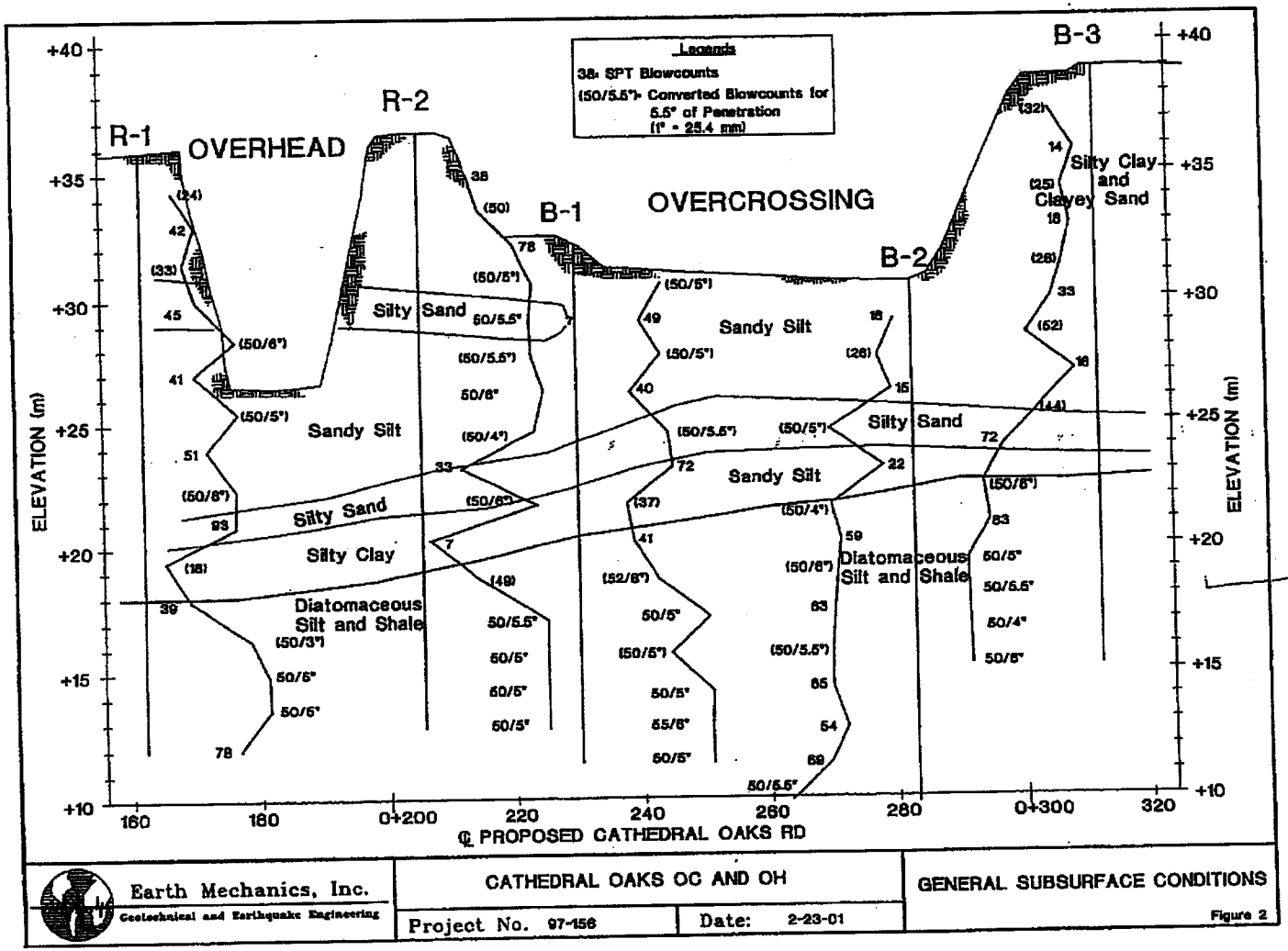
CATHEDRAL OAKS OH AND OC

Project No. 97-156 | Date: 10-24-97

APPROX. BORING LOCATIONS

Figure 1



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CATHEDRAL OAKS OC AND OH

Project No. 97-156

Date: 2-23-01

GENERAL SUBSURFACE CONDITIONS

Figure 2

11+07 Alt 2 ℄

LOG OF BORING NO. B-1

Grade Elevation ~ 32.6m	BOH elev. 11.0m		SHEET 1 OF 3
Boring Depth 71 feet (21.6m)	Driller ZR		
Borehole Diameter 8"	Type of Rig HS	Comments: DRAFT	
Date Drilled 11/20/97	Drive Wt. (lbs) 140#		
Logged By EAB	Drop (in) 30"		

Depth (ft)	Sample Type	Sample	Blows/ft.	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
0						DIRT SHOULDER, LOOSE SAND & GRAVEL, ICE-PLANT			
5	D	1	27 31 50/5"			SILTY FINE SAND, PALE-RED BROWN, DAMP, V. FINE-FINE, DENSE CEMENTED, DIFFICULT TO BREAK APART W/ HANDS	5.2	115.6	
10	S	2	11 (21 26)			SILTY CLAY (SIMILAR TO MOST OF UPPER 40' OF B-2) LT. REDDISH BROWN W/ LT GREY SPLOTCHES, DRY TO DAMP, SOME FINE SAND (?), HARD, CEMENTED	11.5		
15	D	3	47 50/5"			SILTY SAND W/ GRAVEL, RED-BROWN, DAMP, PREDOMINANTLY FINE W/ SOME COARSE & V. SMALL SUB-ROUNDED GRAVEL UP TO 3/8", V. DENSE, LOOSE WHEN HANDLED	5.5	84.3	
20	S	4	12 (18 22)			CLAY, LT PINK-BROWN, GREY, & RED-BROWN IN SPLOTCHES, DAMP, CEMENTED, HARD	17.?		
25	D	5	17 50/5"			SAME, DAMP - MOIST	11.8	102.7 @ TOP	
30	S	6	17 (30 42)	72		SILTY FINE SAND, PALE RED-BROWN, DAMP; V. FINE TO FINE, DENSE -> V.D., LOOSE WHEN HANDLED, LIGHTLY CEMENTED W/ CLAY INCLUSIONS, @ ~31' BECOMES LT YELLOW-BROWN, NO CLAY, VERY DENSE	2.2 5.1		LT RED-BROWN, PINK-BR & LT GREY SPLOTCHES

SAMPLE TYPES: S SPLIT SPOON; B BULK SAMPLE; D DRIVE SAMPLE; b SMALL BAG; C ROCK CORE; T TUBE SAMPLE

GROUND WATER: GW ENCOUNTERED DURING DRILLING; GW MEASURED AFTER ____ HRS.

ATTITUDES: B BEDDING PLANE; J JOINTING; C CONTACT; F FAULT; S SHEAR

LABORATORY TESTS: SA Sieve Analysis; UU Unconfined Triaxial Compression

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Project No. [illegible] 11/97

(CONTINUED) LOG OF BORING NO. B-1

SHEET 2 OF 3

Date Drilled 11/20/97

Logged By ECB

Comments **DRAFT**

Depth (ft)	Sampler Type	Sample	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
30	S	6							
35	P	7	32 31 31			CLAYEY GRAVEL & SAND; LT CHOCOLATE BROWN W/ DARK ~~CLAY, SAND & GRAVEL,~~ BROWN HEAVY STREAKS, CLAY IS MOIST, SAND IS DAMP, FINE TO MEDIUM SAND, GRAVEL IS SUB-ANGULAR, SIZES UP TO 1", CLAY IS SOFT	9.02	111.05	
40	S	8	4 15 26	41		Firm CLAY, DARK BROWN TO BLACK, MOIST, SOFT, SAME AS IN ← residual soil B-2 elev. 2003m	25.6 48.9		
					Rock	SILTY V. FINE SAND, YELLOW-LT BROWN, DAMP, V. FINE ALMOST POWDERY SOFT, COMPACT, LOOSE WHEN HANDLED, V. SHARP CONTACT @ TOP & BOTTOM			
45	D	9	52/6"			CLAYEY SILT, DARK BROWN TO BLACK, MOIST, STIFF, V. WEATHERED MATERIAL THAT LOOKS LIKE CLAYEY SILTSTONE & SAME, W/ VERTICAL LT BROWN & BROWN STRIPING, IN TIP OF SAMPLER V. WHITE [illegible] SILT, DAMP TO MOIST, V. FINE, SOFT TO TOUCH, V. SHARP CONTACT ONLY ABOUT 1/8" OF P.E.	44.0	58.4	
50	S	10	50/5"	>70		ALMOST ALL P.E. (ABOUT 12" OF RECOVERY) & TIP IS ABOUT 2" OF WEATHERED CLAYEY SILTSTONE/SHALE	20.5		
55	D	11	80/5"			PRED. P.E., TIP IS WEATHERED CLAYEY SILTSTONE/SHALE	12.5	66.3	
						NO P.E. COMING UP IN CUTTINGS, ALL ARE DK BROWN, LOOKS LIKE MOST OF P.E. IS IN POCKETS BUT SHOWING UP IN LARGE SAMPLE RECOVERY BECAUSE OF SLUFF			
60	S	12	28 50/5.5"	>70		ALL OF RECOVERY IS DK BROWN WEATHERED STONE/SHALE	65.1		
65	S	13	55/6"	>70		18" OF RECOVERY, TOP 12" P.E., NO BEDDING, OR SIGNS THAT ITS NOT SLUFF			

(NEXT PAGE)

(CONTINUED) LOG OF BORING NO. B-1

SHEET 3 OF 3

Comments **DRAFT**

Date Drilled 11/20/97

Logged By EB

Depth (ft)	Sampler Type	Sample	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
65	S	13	55/6"			BOTTOM 4" (SEPERATE BAG) IS ABOUT 80% SHALE SOFT SHALE, 20% D.E., D.E. IN THIN LAYERS (~½") DIPPING ABOUT 60° IN 4" RECOVERY, & THIN LAYERS OF D.E.	23.6 20.0		
70	S	14	28 50/5"	>70		ALL WEATHERED STONE, ~10" OF RECOVERY	40.4		
						BORING TERMINATED @ 71.5' NO GROUNDWATER ENCOUNTERED			
						AFTER BACKSPINNING AUGERS, HOLE MEASURED, 56' DEEP			

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CARLSBAD

Project No. 97-136 Date: 11/20/97

11+58. Alt 2 ℄

LOG OF BORING NO. B-2

Grade Elevation ~31.2m	BOH elev. 9.4m		SHEET 1 OF 3
Boring Depth 71.5 ft (21.8m)	Driller ZR		
Borehole Diameter 8"	Type of Rig HS	Comments	DRAFT
Date Drilled 11/20	Drive Wt. (lbs) 140		
Logged By EMB	Drop (in) 30		

Depth (ft)	Casing	Sample	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
0						LOOSE GRAVELLY SAND (SPOILDEBRIS)			
5	3" FLUSH	S 1	6 6 10	16		SILT w/ SAND & CLAY (SOME DARK'S) OLIVE & RUST BROWN IN SPLOTCHES, DAMP → MOIST, V. FINE - F. SAND, STIFF very stiff medium dense	15.4		
10		S 2				SILTY CLAY TO CLAYEY SILT w/ BEDS OF SILTY SAND, OLIVE & RUST BROWN IN SPLOTCHES, MOIST, FINE SAND, STIFF, SILTY SAND BEDS FROM 1" TO 2 INCHES TO 2" LAYERS IN SAMPLER	15.5	114.8	
15		S 3	4 5 10	15		CLAY, RED-BROWN & OLIVE SPOTS & STREAKS, STIFF	24.4		
						SILT, LT-OLIVE & TAN w/ CLAY LAYERS, MOIST, STIFF & SOME			
20		S 4	15 31 50/5"			SANDY SILT GRADING TO SILTY SAND, SAME COLORS AS ABOVE, SAND IS F-FINE → FINE, DENSE	10.7	114.6	
25		S 5	16 17 11	22		SILTY SAND FROM ABOVE, medium dense	18.7		
						SILT, CHOCOLATE BROWN & TAN IN SPLOTCHES, MOIST, STIFF			
						el. 22.7 m			
						Rock SILT, DARK BROWN, MOIST, V. HARD, (WEATHERED SHALE?)	60.5	60.6	
30		S 6	12 33 50/4"						

SAMPLE TYPES
- S SPLIT SPOON
- B BULK SAMPLE
- D DRIVE SAMPLE
- B SMALL BAG
- C ROCK CORE
- T TUBE SAMPLE

GROUND WATER
- GW ENCOUNTERED DURING DRILLING
- GW MEASURED AFTER ____ HRS.

ATTITUDES
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

LABORATORY TESTS
- SA Sieve Analysis
- HA Hydrometer Analysis
- AL Atterberg Limits
- CN Consolidation
- DS Direct Shear
- PI Plasticity Index
- UU Unconsolidated Undrained Triaxial
- U Compression
- R R-Value
- CC Chemical Analysis @ Corrosivity

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CONFIDENTIAL

Project No. [illegible]156 Date: 11/21/97

(CONTINUED) LOG OF BORING NO. ED-2

SHEET 2 OF 3

Comments **DRAFT**

Date Drilled 11/20/17

Logged By ECD

Depth (ft)	Sample Type	Sample #	Blows/ft	Graphic Log	USCS	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
35	S	7	9 (11) (41)	59		SAME; SOFTER, EASIER TO BREAK APART W/ HANDS	71.9		
40	D	8	25 50/6"			SAME	68.7	55.1	
45	S	9	10 (22) (41)	63		SAME	62.3		
50	D	10	37 50/5½"			SAME	68.7	56.3	
55	S	11	11 (21) (44)	65		SAME	59.6		
60	S	12	16 22 32			SAME	59.1		
65	S	13	17 26 (43)	69			55.8		

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CATHEDRAL

Project No. 97-156

Date: 11/20/17

(CONTINUED) LOG OF BORING NO. B-L

SHEET 3 OF 3

Comments **DRAFT**

Date Drilled 11/20/97

Logged By GSB

Depth (ft)	Sampler Type	Sample #	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
70	S	14	15 26 50/5½"			SAME	66.0		
						BORING TERMINATED @ 71.5' NO GROUNDWATER ENCOUNTERED			

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CATHEDRAL

Project No. 97-156 Date: 11/20/97

~1 mi. Rt 11+87 Alt 2 ℄

LOG OF BORING NO. B-3

Grade Elevation ~3908m	Bottom elev. 15.1m		SHEET 1 OF 3
Boring Depth 80' (24.7m)	Driller ZR		
Borehole Diameter 8"	Type of Rig AS	Comments: DRAFT	
Date Drilled 11/13/17	Drive Wt. (lbs) 140		
Logged By ECO	Drop (in) 30"		

Depth (ft)	Sample Type	Sample	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
0						SHORT GRASS, GROUND COVER			
	B					CLAY, RED-BROWN W/ LT BROWN, MOIST, STIFF			
5	D	1	9 18 36			CLAYEY SAND, RED-BROWN, MOIST, FINE SAND, COMPACT	13.3	119.7	
10	S	2	25 (50/5")	14		SANDY CLAY, RED-BROWN MOIST, V. FINE SAND, SOFT	20.0		
						@ 11.5' SAND, RED-BROWN, MOIST, V. FINE-FINE, COMPACT, CAVED WHEN HANDLED medium dense			
15	D	3	10 17 24			CLAY, RED-BROWN W/ LT OLIVE MOTTLES, MOIST STIFF	12.9	119.3	
						SANDY CLAY, SAME COLORS AS ABOVE, MOIST, V. FINE-FINE SAND, STIFF			
20	S	4	5 (50/4")	18		CLAY W/ SAND LENSES, RED-BROWN W/ BLACK IRON SPOTS, MOIST, V. FINE SAND, W/ ≤ 5mm LENSES, STIFF VERY STIFF	16.9		
						CLAYEY SILT, RED-BROWN W/ TAN SPOTS, MOIST, STIFF SAME			
25	D	5	9 14 24			CLAYEY SAND, RED-BROWN, MOIST, V. FINE-FINE SAND, STIFF			
						CLAY, GRADES FROM OLIVE-GREY TO RED-BROWN, MOIST, STIFF			
30	S	6	5 (11/12")	13		CLAYEY SAND, RED-BROWN, MOIST, COMPACT, MED-COARSE SAND	22.0		

medium dense

SAMPLE TYPES: S SPLIT SPOON; B BULK SAMPLE; D DRIVE SAMPLE; E SMALL BAG; C ROCK CORE; T TUBE SAMPLE

GROUND WATER: ▽ GW ENCOUNTERED DURING DRILLING; ▽ GW MEASURED AFTER ___ HRS

ATTITUDES: B BEDDING PLANE; J JOINTING; S SHEARS; F FAULT; V VEINS

LABORATORY TESTS: Sieve Analysis; UU Unconsolidated Triaxial; Consolidation; Direct Shear; Expansion Index; Corrosivity

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Geotechnical & Earthquake Engineering

Project No. 17-156 Date: 11/19/17

(CONTINUED) LOG OF BORING NO. B-3

SHEET 2 OF 3

Comments: **DRAFT**

Date Drilled 11/19/97

Logged By GD

Depth (ft)	Sample Type	Sample #	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
30			11 12 15						
35	D	7	18 37 49			SILTY SAND, RED-BROWN, MOIST, FINE TO MEDIUM, COMPACT, LOOSE WHEN HANDLED; 1 2" THICK CLAY GLOBULE, SOFT, IN UPPER PORTION OF SAMPLE	11.3	111.0	
40	S	8	7 (8) 8	16		CLAY, PREDOM. LT-RED TO PALE RED-BROWN W/ OLIVE BLACK, LT-GREY, & LT BROWN MOTTLES, MOIST, STIFF, SAND LENSES ARE ~ 1" THICK (2 IN PULL 18" SAMPLE) FINE, SILTY SAND ↙ W/ SAND LENSES very stiff	22.9		
45	D	9	24 26 48			CLAY W/ SAND, RED-BROWN W/ OLIVE MOTTLING, MOIST, SAND IS FINE TO MEDIUM SIZED	15.7	121.7	
						SILTY FINE SAND, RED-BROWN, MOIST FINE, COMPACT			
50	S	10	18 (36) 36	72		LT BROWN W/ RUST BROWN STAINING Elev. 24.4 m	10.2		
						Rock @ TOP SILT, DARK BROWN W/ LT BROWN STREAKS, DAMP, HARD, V. SHARP CONTACT, ~ 1" OF RECENTLY OF SILT			
55	D	11	19 32 50/6"			CLAY, SHADES OF BROWN, PREDOMINANTLY DK BRN W/ LT BROWN STREAKS, DAMP, W/ SHARP	47.2	65.4	
60	S	12	19 (53) 80	83		SILT, DARK GREY W/ LT GREY WAVY STREAKS & LT BROWN SPOTS, DAMP TO MOIST, HARD	59		
65	S	13	14 25 50/5"	>70		SAME			

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Geotechnical & Earthquake Engineering

CAMARILLO

Date: 11/19/97

(CONTINUED) LOG OF BORING NO. B-3

SHEET 3 OF 3

Comments **DRAFT**

Date Drilled 11/19/97

Logged By EGB

Depth (ft)	Sample Type	Sample #	Blows/ft	Graphic Log	U.S.C.S.	GEOTECHNICAL DESCRIPTION	Moisture (%)	Dry Density (pcf)	Tests/ Results
65	S	13	25 50/5"			SAME	58.4		
70	S	14	15 27 50/5½	>70		SAME	62.8		
75	S	15	25 44 50/4	>70		SAME	70.0		
80	S	16	25 50/6"	>70		SAME BORING TERMINATED @ 81' NO GROUNDWATER	56.3		

Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

CALTRANS

Project No. 97-156 Date: 11/19/97

AP Engineers
Geotechnical Testing Laboratory

MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)	
R-1, D-1	5	Yell. Brn. Silty Clay	CL	12.7	110.0	19.5
R-1, D-3	15	Yell. Brn. Silty Clay	CL	13.1	103.9	18.4
R-1, D-5	25	Red. Brn. Sandy Silt	ML	10.0	113.8	19.7
R-1, D-7	35	Yell. Brn. Silt w/ gravel	ML	7.6	122.5	20.7
R-1, D-9	46	Yell. Brn. Sandy Silt	ML	9.4	92.8	15.9
R-1, D-11	55	Strong Brn Clay	CH	65.7	58.6	15.2
R-1, D-13	65	Dk. Brn. Claystone		54.4	62.5	15.1
R-1, D-15	75	Dk. Brn. Claystone		49.3	66.2	15.5

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture content (%)	Dry Density (pcf)
R-1, S-2	10		ML	8.9	NA
R-1, S-4	20		SM	5.9	NA
R-1, S-6	30		ML	9.5	NA
R-1, S-8	40		ML	10.3	NA
R-1, S-10	50		SM	7.7	NA
R-1, S-12	60		ML	60.0	NA
R-1, S-14	70		ML	50.8	NA
R-1, S-16	80		ML	50.6	NA

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)	
R-2, D-2	10	Red. Brn. Clayey Silt	ML	14.1	86.6	15.5
R-2, D-4	20	Red. Brn. Sandy Silt	ML	7.0	110.4	18.5
R-2, D-6	30	Yell. Brn. Silty Clay	CL	14.4	110.5	19.8
R-2, D-8	40	Yell. Brn. Silty Clay	CL	12.2	118.5	20.9
R-2, D-12	60	Drk. Brn. Clayey Silt	ML	59.3	61.0	15.3

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/15/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)
R-2, S-1	5	NA	ML	10.9	NA
R-2, S-3	15	NA	SM	5.5	NA
R-2, S-5	25	NA	SM	3.8	NA
R-2, S-5	25	NA	ML	9.5	NA
R-2, S-7	35	NA	ML	12.6	NA
R-2, S-9	45	NA	SM	3.9	NA
R-2, S-9	45	NA	CL	14.3	NA
R-2, S-11	55	NA	SM	2.6	NA
R-2, S-11	55	NA	CL	73.0	NA
R-2, S-13	65	NA	ML	41.1	NA
R-2, S-14	70	NA	ML	40.3	NA
R-2, S-15	75	NA	ML	53.2	NA
R-2, S-16	80	NA	ML	53.7	NA

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

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Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)
B-1, D-1	5	Red. Brn. Sandy Silt	ML	5.2	115.6
B-1, D-3	15	Olive Brn. Silty Sand	SM	5.5	84.3
B-1, D-5	25	Olive Brn. Sandy Silt/Silty Sand	SM/ML	11.8	102.3
B-1, D-7	35	Olive Brn. Sandy Silt	ML	9.2	111.5
B-1, D-9	45	Drk. Olive Sandy Silt	ML	44.0	58.4
B-1, D-11	55	Lt. Gray to White Silty Fine Sand	SM	12.5	66.3

Wet Pcf
121.6 (19.1)
88.9 (14.0)
114.4 (18.0)
121.8 (19.1)
84.1 (13.2)
74.6 (11.7)

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/15/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)
B-1, S-2	10		ML	11.5	NA
B-1, S-4	20		ML	17.3	NA
B-1, S-6	30		ML	12.9	NA
B-1, S-6	30		SM	5.4	NA
B-1, S-8	40		SM-ML	25.6	NA
B-1, S-8	40		ML	48.9	NA
B-1, S-10	50		ML	20.5	NA
B-1, S-12	60		ML	65.1	NA
B-1, S-13	65		ML	23.6	NA
B-1, S-13	65		SM	20.0	NA
B-1, S-14	70		ML	40.4	NA

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (visual)	Moisture Content (%)	Dry Density (pcf)	Wet Density
B-2, D-2	10	Yell. Brn. Sandy Silt	ML	15.5	114.9	132.7 (20.8)
B-2, D-4	20	Olive Silty Sand	SM	10.7	114.6	126.9 (19.9)
B-2, D-6	30	Drk. Brn. Clayey Silt	ML	60.5	60.6	97.3 (15.1)
B-2, D-8	40	Drk. Olive Clayey Silt	ML	68.7	55.1	92.8 (14.6)
B-2, D-10	50	Drk. Olive Siltstone	ML	68.7	56.3	95.0 (14.9)

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)
B-2, S-1	5		ML	15.4	NA
B-2, S-3	15		CL	22.4	NA
B-2, S-5	25		ML	48.7	NA
B-2, S-7	35		ML	71.9	NA
B-2, S-9	45		ML	62.3	NA
B-2, S-11	55		ML	59.6	NA
B-2, S-12	60		ML	59.1	NA
B-2, S-13	65		ML	55.8	NA
B-2, S-14	70		ML	66.0	NA

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MOISTURE AND DENSITY TEST RESULTS

AP Job No.: 97-1138
Date: 12/10/97

DRAFT

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)	
B-3, D-1	5	Yell. Brn. Sandy Clay	CL	13.3	119.7	(135.6 (21.3)
B-3, D-3	15	Red. Brn. Clayey Sand	SC	12.9	119.3	134.7 (21.1)
B-3, D-5	25	Red. Brn. Clayey Sand	SC	15.9	110.3	127.8 (20.1)
B-3, D-7	35	Yell. Brn. Silty Sand	SM	11.3	111.0	123.5 (19.4)
B-3, D-9	45	Red. Brn. Clayey Sand	SC	5.7	121.7	128.6 (20.2)
B-3, D-11	55	Red. Brn. Clayey Silt	ML	47.2	65.4	96.3 (15.1)

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MOISTURE AND DENSITY TEST RESULTS

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AP Job No.: 97-1138
Date: 12/10/97

Project Name: Cathedral Oaks
Project No.: 97-156

Sample Identification	Depth (ft)	Soil Description	USCS (VISUAL)	Moisture Content (%)	Dry Density (pcf)
B-3, S-2	10		CL	20.0	NA
B-3, S-4	20		CL	16.9	NA
B-3, S-6	30		CL	22.8	NA
B-3, S-8	40		CL	22.9	NA
B-3, S-10	50		SM	10.7	NA
B-3, S-12	60		ML	59.1	NA
B-3, S-14	70		ML	62.8	NA
B-3, S-16	80		ML	56.3	NA
B-3, S-13	65		ML	58.4	NA
B-3, S-15	75		ML	70.0	NA

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GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: R-1
Sample No.: D-1 Depth: 5'
Soil Description: Olive Silty Clay

DRAFT

	Before Washing	After Washed Sieve
Container No.:	M2	M2
Wt of Cont. (gm):	104.45	104.45
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	222.33	129.55
Dry Wt of Soil (gm)	117.88	25.1

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	25.1	21	79
Pan			

Percent Passing #200 78.7

Remark:

AP Engineers
Geotechnical Testing Laboratory

GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: R-2
Sample No.: D-4 Depth: 20'
Soil Description: Brown Sandy Silt

DRAFT

	Before Washing	After Washed Sieve
Container No.:	M3	M3
Wt of Cont. (gm):	102.24	102.24
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	244.85	164.18
Dry Wt of Soil (gm)	142.61	61.94

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	61.94	43	57
Pan			

Percent Passing #200 56.6

Remark:

AP Engineers
Geotechnical Testing Laboratory

GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: R-2
Sample No.: D-6 Depth: 30'
Soil Description: Brown Silty Clay

DRAFT

	Before Washing	After Washed Sieve
Container No.:	FG4	FG4
Wt of Cont. (gm):	198.91	198.91
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	317.9	200.73
Dry Wt of Soil (gm)	118.99	1.82

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	1.82	2	98
Pan			

Percent Passing #200 98.5

Remark:

AP Engineers
Geotechnical Testing Laboratory

GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: B-1
Sample No.: D-5 Depth: 25'
Soil Description: Red. Brown Silty Sand

DRAFT

	Before Washing	After Washed Sieve
Container No.:	AB8	AB8
Wt of Cont. (gm):	198.15	198.15
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	330.89	295.21
Dry Wt of Soil (gm)	132.74	97.06

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	97.06	73	27
Pan			

Percent Passing #200 26.9

Remark:

AP Engineers
Geotechnical Testing Laboratory

GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: B-2
Sample No.: D-6 Depth: 30'
Soil Description: Drk. Olive Silty Clay

DRAFT

	Before Washing	After Washed Sieve
Container No.:	JPE	JPE
Wt of Cont. (gm):	197.42	197.42
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	231.06	200.81
Dry Wt of Soil (gm)	33.64	3.39

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	3.39	10	90
Pan			

Percent Passing #200 89.9

Remark:

AP Engineers
Geotechnical Testing Laboratory

GRAIN SIZE ANALYSIS OF SOIL
ASTM D422 / C136
PASSING #200

Project Name: Cathedral Oaks Tested By: BL Date: 12/07/97
Project No.: 97-156 Checked B SY Date: 12/10/97
Boring No.: B-3
Sample No.: D-7 Depth: 35'
Soil Description: Red. Brown Silty Fine Sand

DRAFT

	Before Washing	After Washed Sieve
Container No.:	FG1	FG1
Wt of Cont. (gm):	198.59	198.59
Wt of Wet Soil + Cont. (gm)		
Wt of Dry Soil + Cont. (gm):	370.5	307.58
Dry Wt of Soil (gm)	171.91	108.99

U.S. SIEVE SIZE	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
6"	0	0	NA
1 1/2"	0	0	NA
1"	0	0	NA
3/4"	0	0	NA
3/8"	0	0	NA
No. 4	0	0	NA
No. 10	0	0	NA
No. 20	0	0	NA
No. 40	0	0	NA
No. 60	0	0	NA
No. 140	0	0	NA
No. 200	108.99	63	37
Pan			

Percent Passing #200 36.6

Remark:

AP Engineers

Geotechnical Testing Laboratory

CORROSION TEST RESULTS

DRAFT

AP Job No.: 97-1138
Date 12/06/97

Client Name: Earth Mechanics, Inc.
Project Name: Cathedral Oaks
Project No.: 97-156

Boring No.	Sample No.	Depth (ft)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
R-1	D-5	25'	ML	550	6.6	25	898
R-2	D-2	10'	CL	650	6.6	594	388
B-2	D-2	10'	ML	870	6.7	65	133
B-3	~~D-4~~ S-4	20'	SC	11,000	6.8	46	129

NOTES:

Resistivity Test and pH: California Test Methods 532 and 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Request

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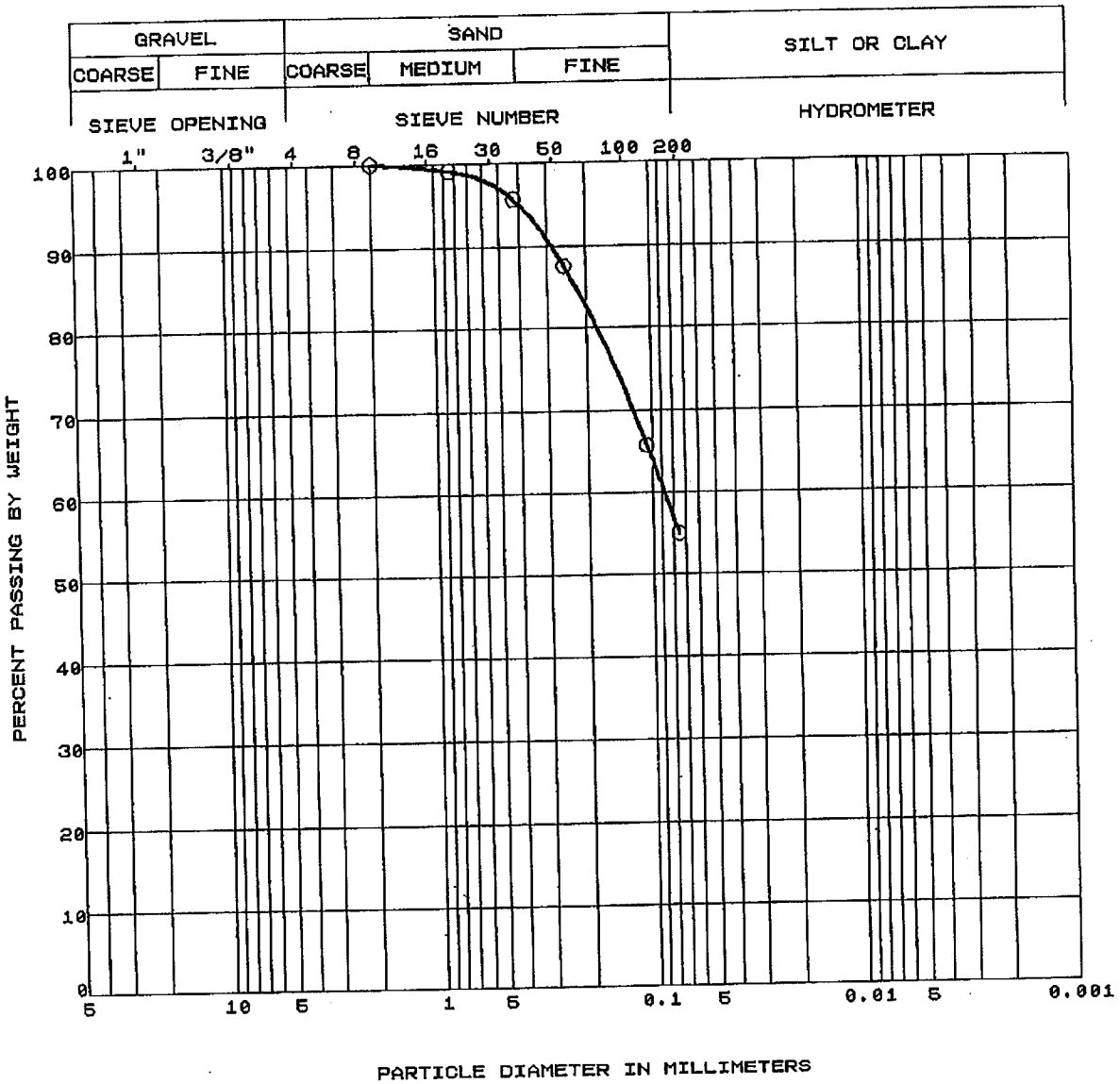


Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	R-2	D-4	20.0	55.0	ML

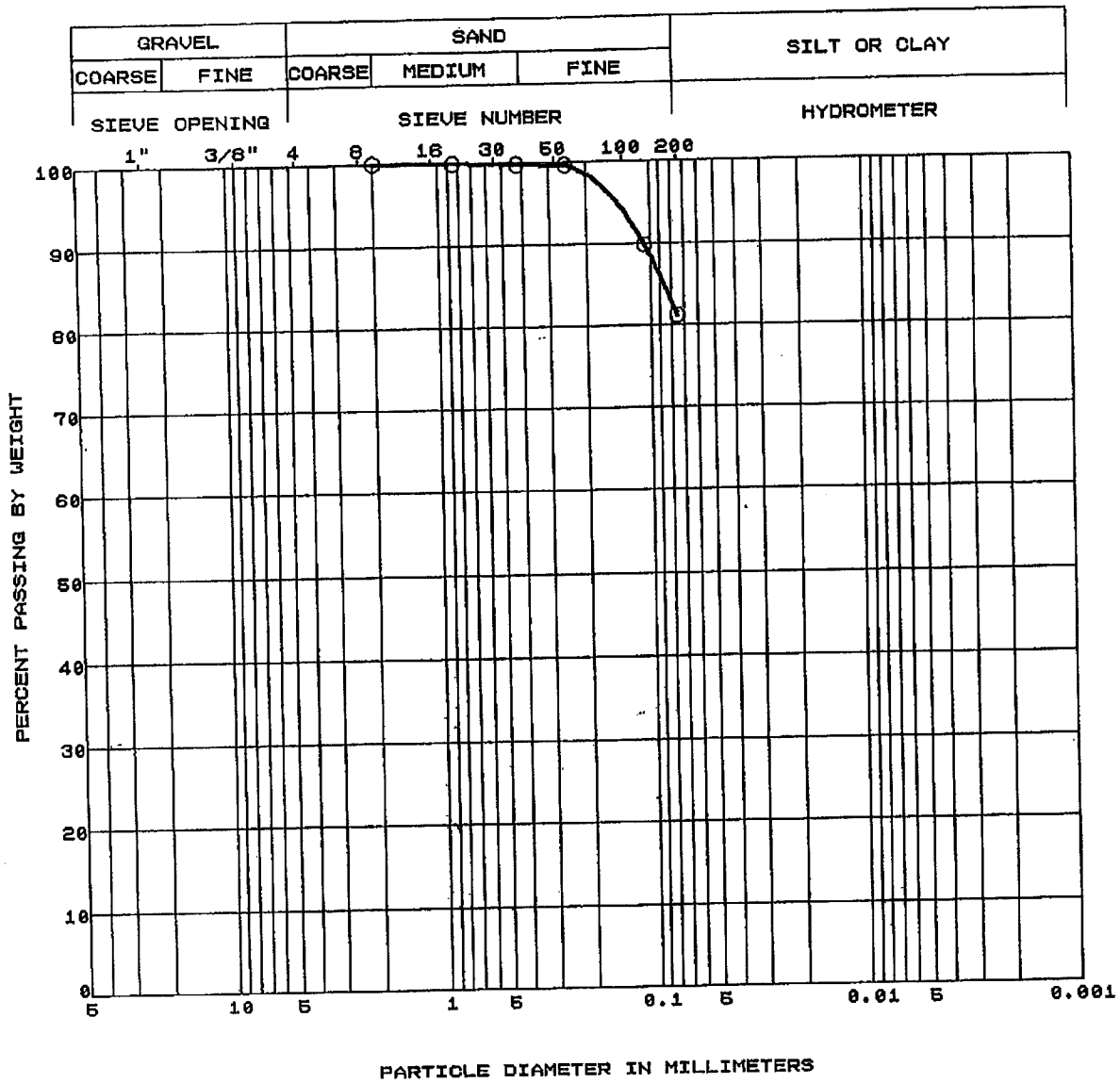
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project No. 97-156

Project Name Cathedral Oaks

Date 12/15/97 Figure No. _____

DRAFT



Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
O	B-1	S-8	40.0	81.2	ML

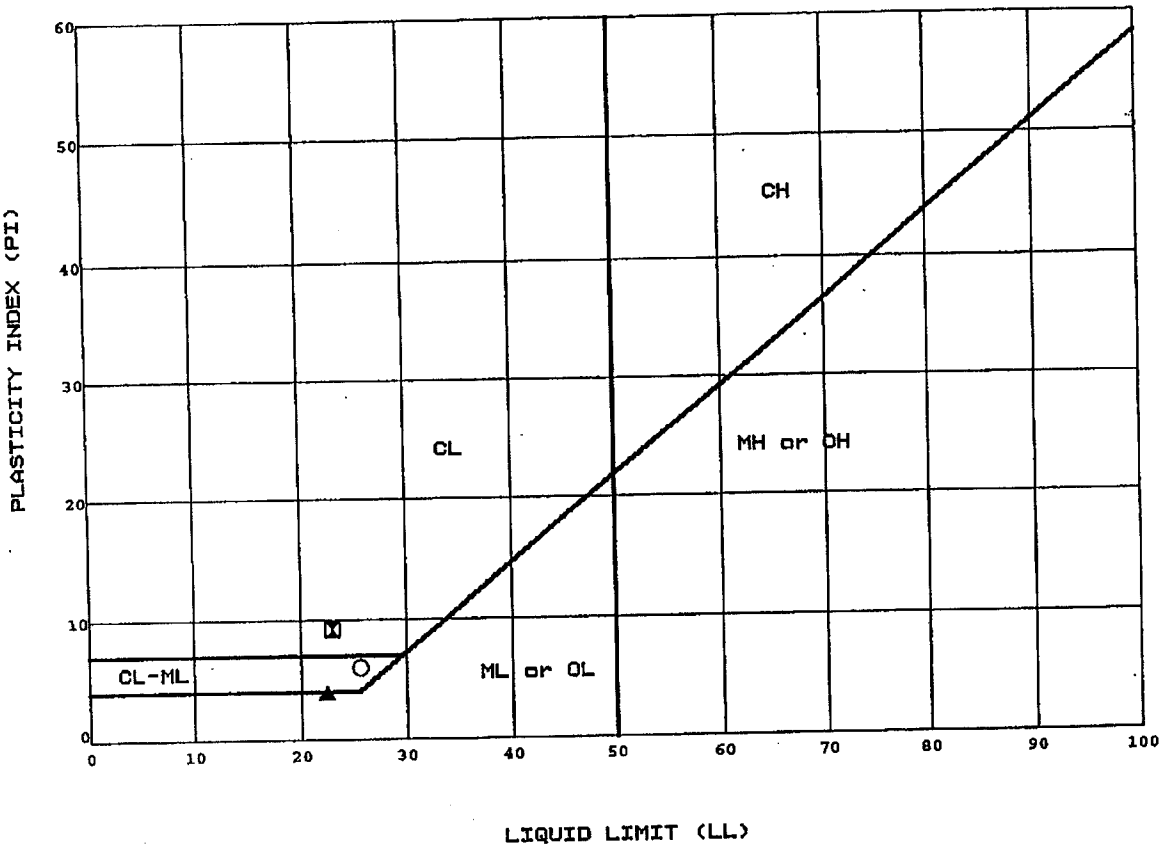
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project No. 97-156

Project Name Cathedral Oaks

Date 12/14/97 Figure No. _____

DRAFT



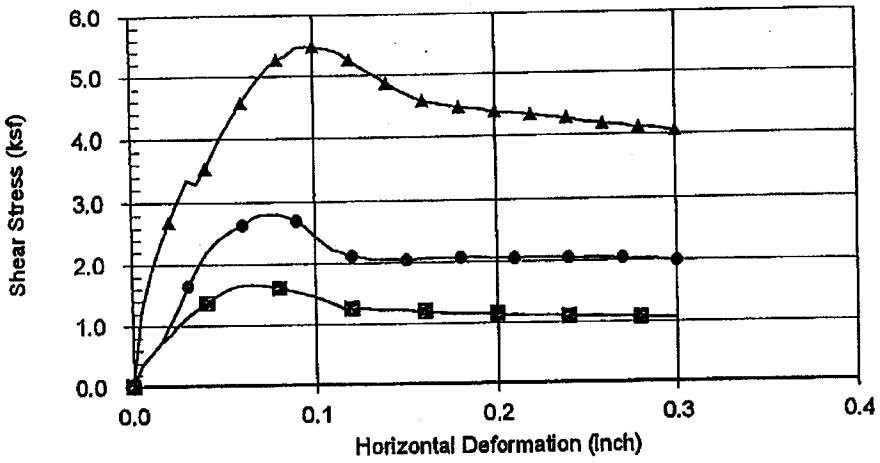
Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S. Symbol
○	B-2	D-2	10.0	26	20	6	CL-ML
⊠	B-3	D-1	5.0	23	14	9	CL
▲	B-3	D-9	45.0	22	18	4	ML

ATTERBERG LIMITS
ASTM D 4318-93

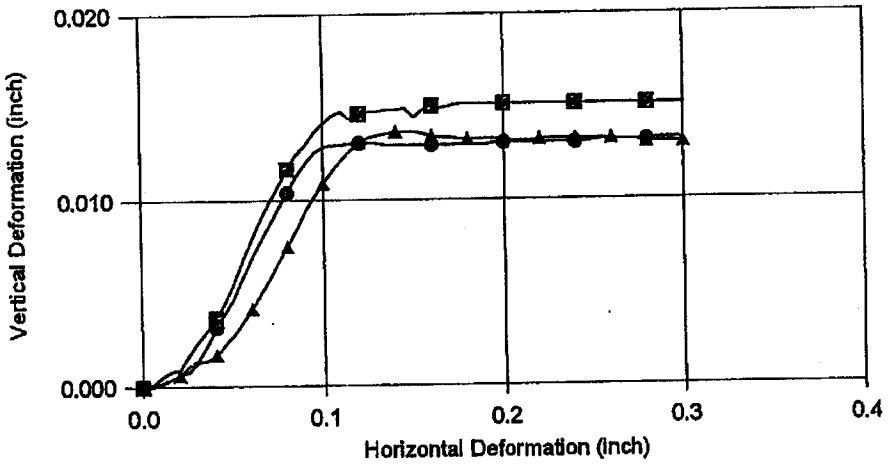
Project No. 97-156

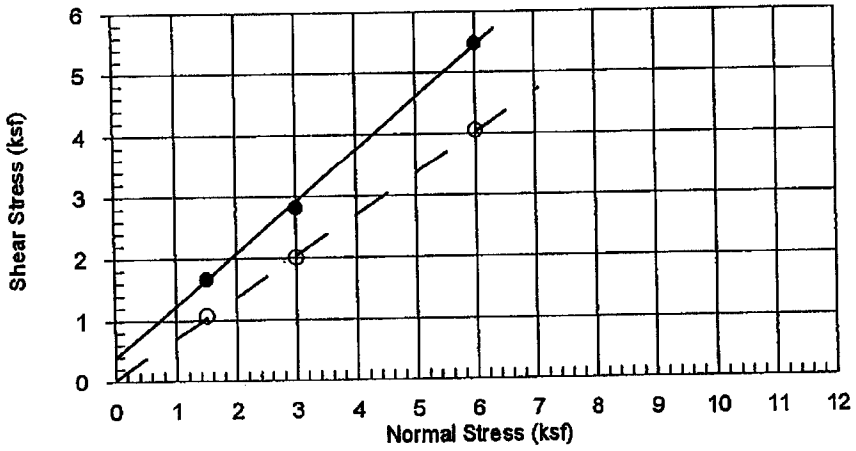
Project Name Cathedral Oaks

Date 12/14/97 Figure No. _____



DRAFT





Project Name	: Cathedral Oaks
Boring No.	: R-1
Sample No.	: D-5
Depth (ft)	: 25'
Sample Type	: Undisturbed
Soil Type	: Reddish Brown Sandy Silt
Initial Dry Density	: 103.1 pcf
Moisture Content	: 18.2 % (before)
Strain Rate	: 0.05 inch/minute

	Peak	Residual
Cohesion (ksf)	0.4	0.0
Phi (Degrees)	40	34

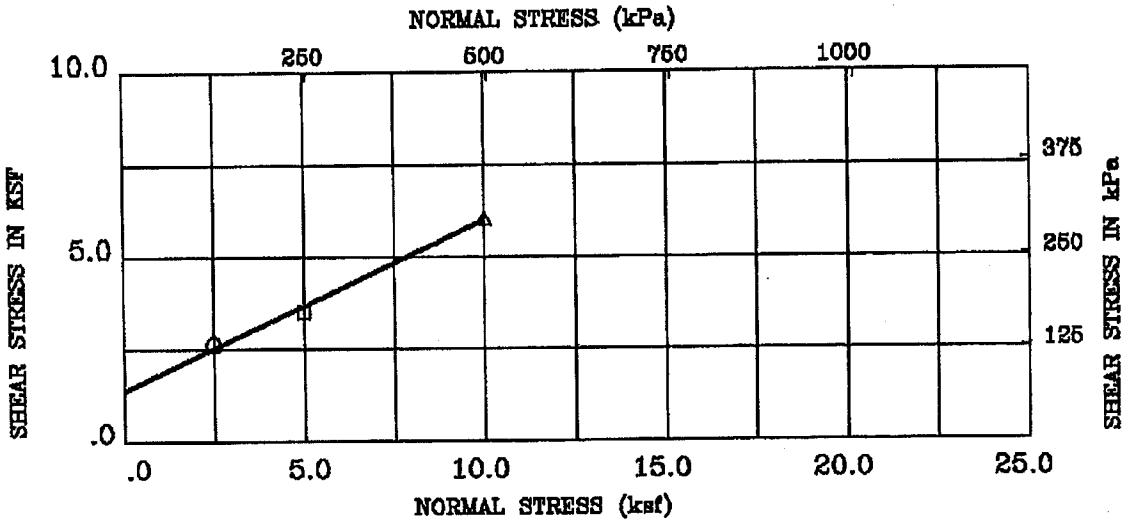
AP Engineers

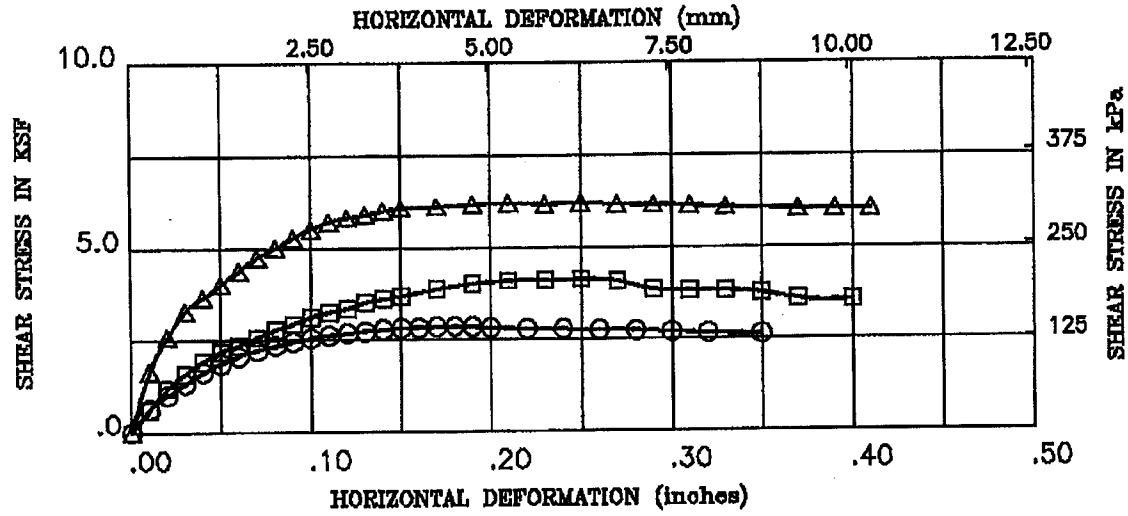
DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.

DRAFT





BORING/SAMPLE : R-1/D-9 DEPTH (ft)/(m) : 45.0/13.73

DESCRIPTION : Dark Yellowish Brown, Sandy Lean Clay Stone (CL)

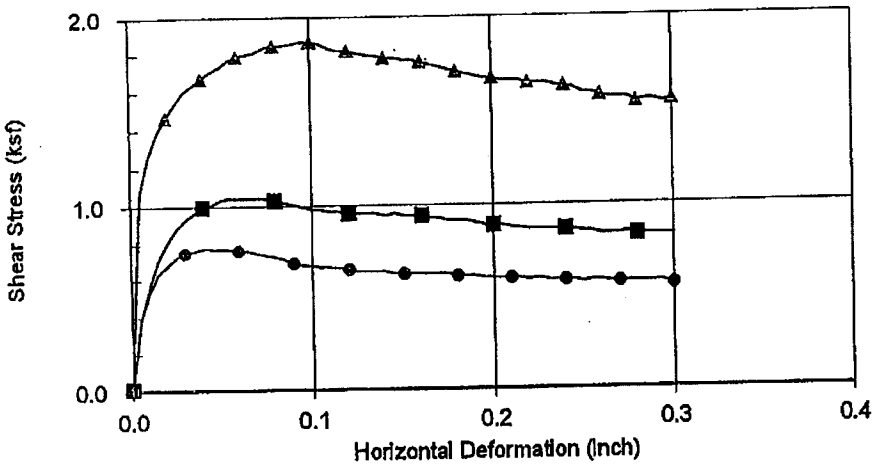
STRENGTH INTERCEPT (C) : 1.362 /85.234 (ksf)/(kPa) (RESIDUAL STRENGTH)

FRICTION ANGLE (PHI) : 24.9 DEG

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)/(kN/m3)	VOID RATIO	NORMAL STRESS (ksf) / (kPa)	PEAK SHEAR (ksf) / (kPa)	RESIDUAL SHEAR (ksf) / (kPa)
○	20.6	103.2 /16.20	.633	2.50 / 119.8	2.86 /137.2	2.62 /125.7
□	21.1	103.2 /16.21	.632	5.00 / 239.5	4.14 /198.1	3.52 /168.8
△	24.0	99.3 /15.59	.697	10.00 / 479.0	6.23 /298.5	6.05 /289.8

Remark : Slightly Disturbed, Inundated Shear at Rate: 0.030inch/minute

Project No. 97-156	County of Santa Barbara/Cathedral Oak Interchange
Earth Mechanics Incorporated	DIRECT SHEAR TEST Figure No.



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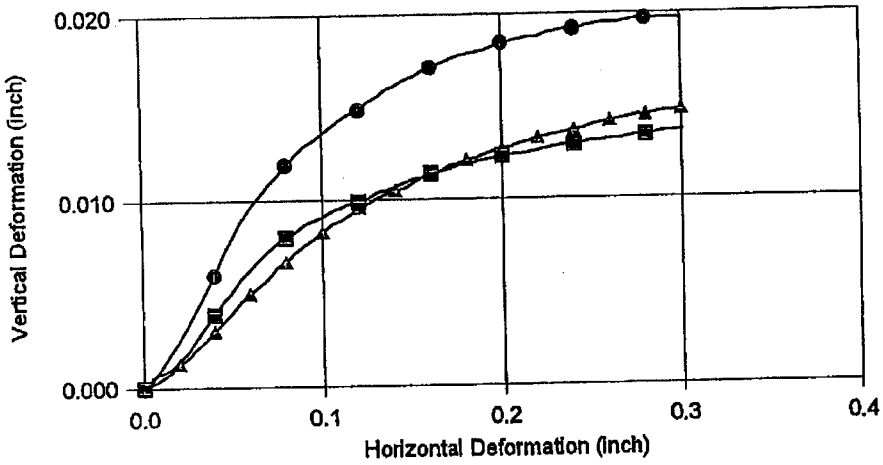
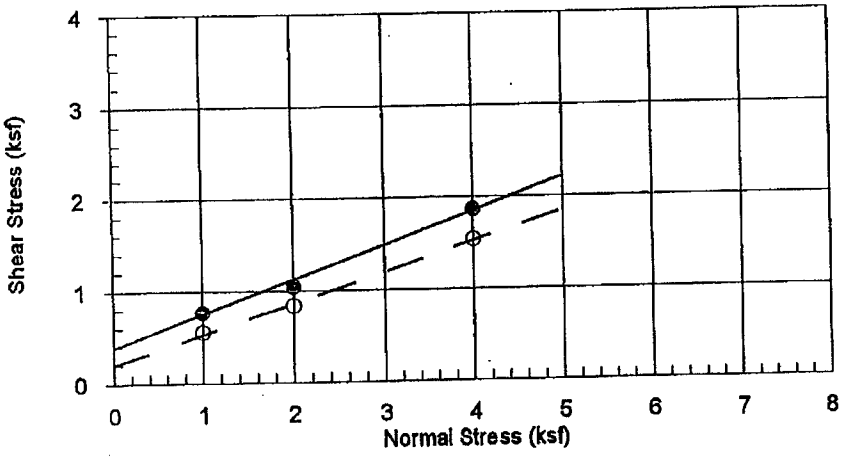




Project Name : Cathedral Oaks
Boring No. : R-2
Sample No. : D-2
Depth (ft) : 10'
Sample Type : Undisturbed
Soil Type : Reddish Brown Sandy Clay
Initial Dry Density : 107.1 pcf
Moisture Content : 13.3 % (before)
Strain Rate : 0.05 inch/minute

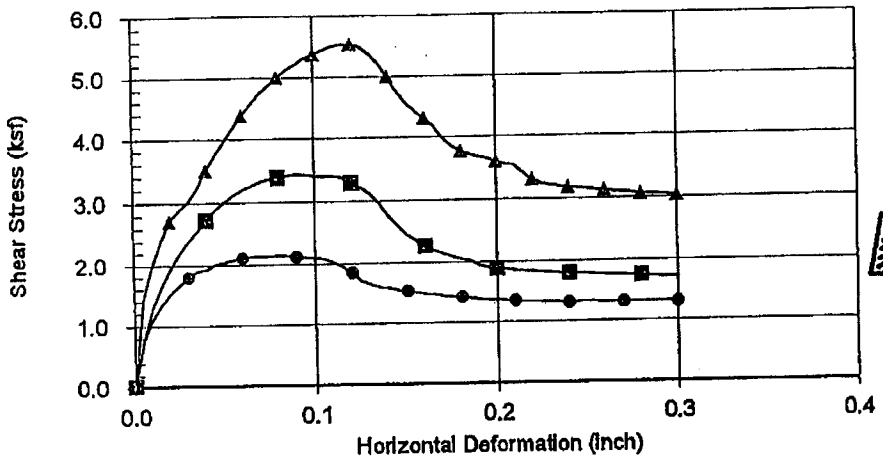
	Peak	Residual
Cohesion (ksf)	0.4	0.2
Phi (Degrees)	20	18

AP Engineers

DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.



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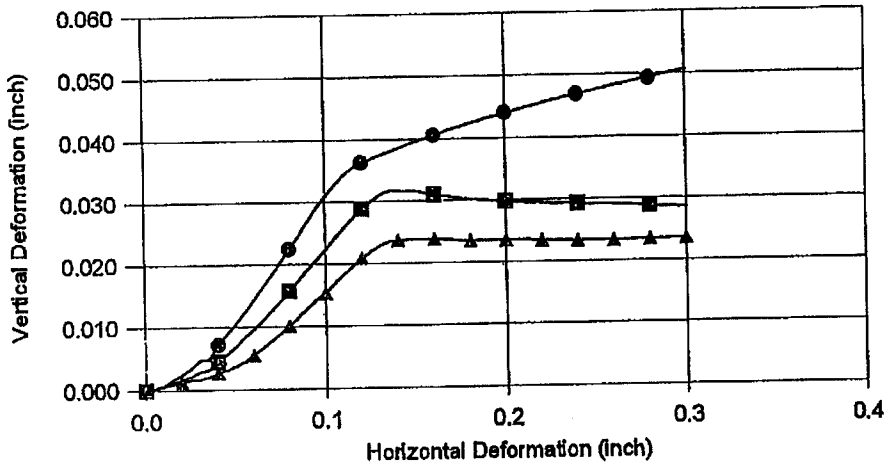
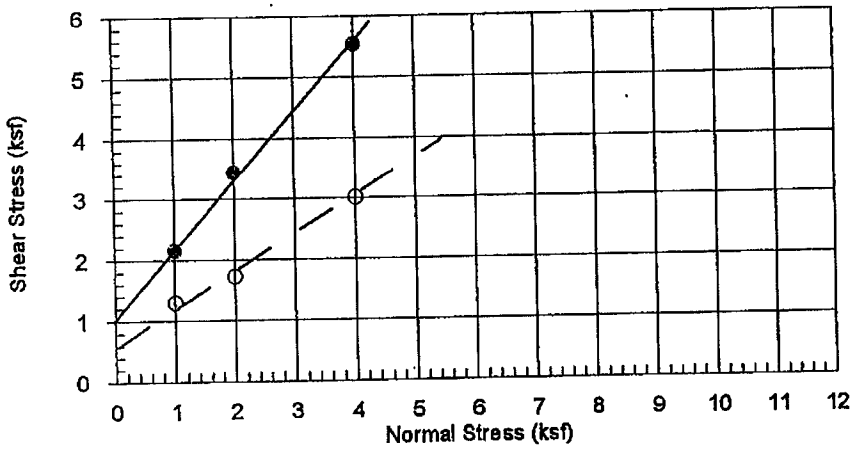




Project Name	: Cathedral Oaks
Boring No.	: R-2
Sample No.	: D-8
Depth (ft)	: 40'
Sample Type	: Undisturbed
Soil Type	: Yell. Brown Silty Clay very stiff
Initial Dry Density	: 120.0 pcf
Moisture Content	: 10.9 % (before)
Strain Rate	: 0.05 inch/minute

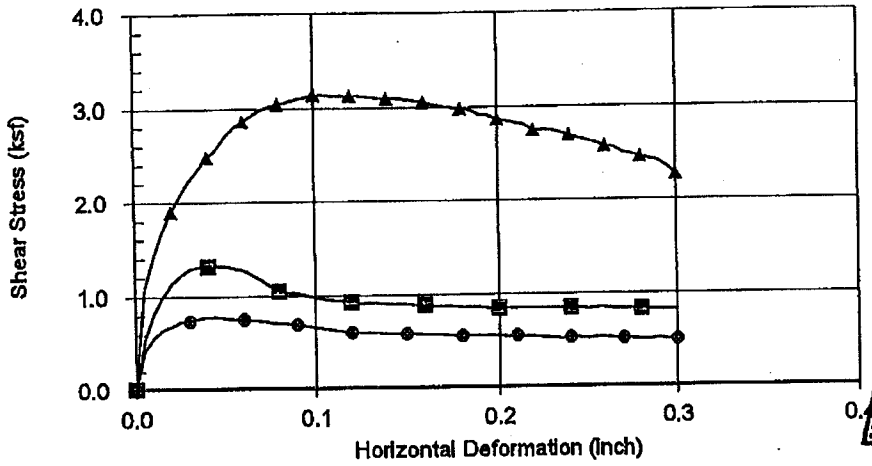
	Peak	Residual
Cohesion (ksf)	1.0	0.6
Phi (Degrees)	49	32

AP Engineers

DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.



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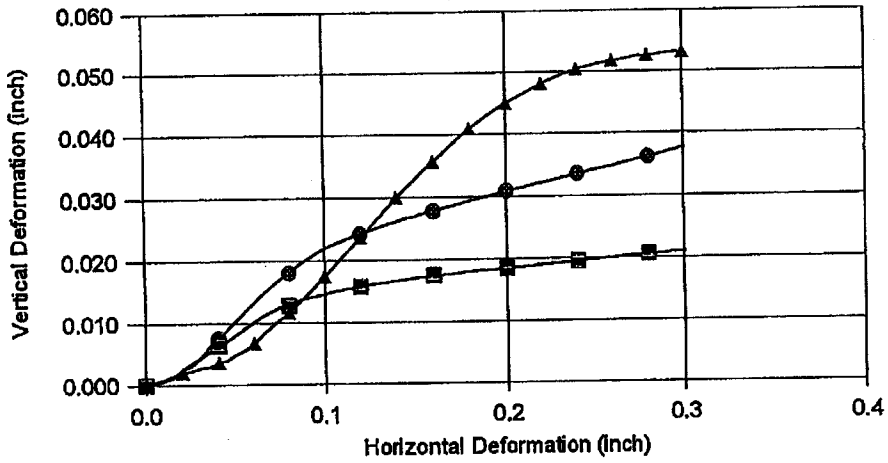
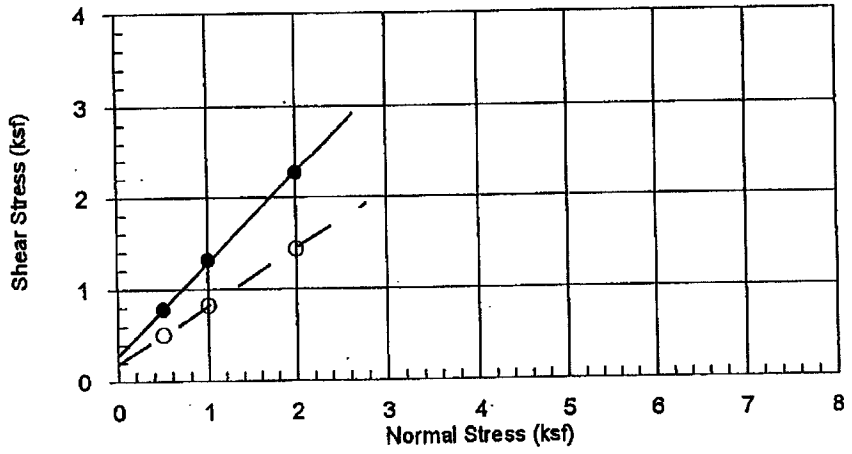




Project Name : Cathedral Oaks
Boring No. : B-1
Sample No. : D-1
Depth (ft) : 5'
Sample Type : Undisturbed
Soil Type : Yell. Brown Sandy Silt
Initial Dry Density : 118.2 pcf
Moisture Content : 8.4 % (before)
Strain Rate : 0.05 inch/minute

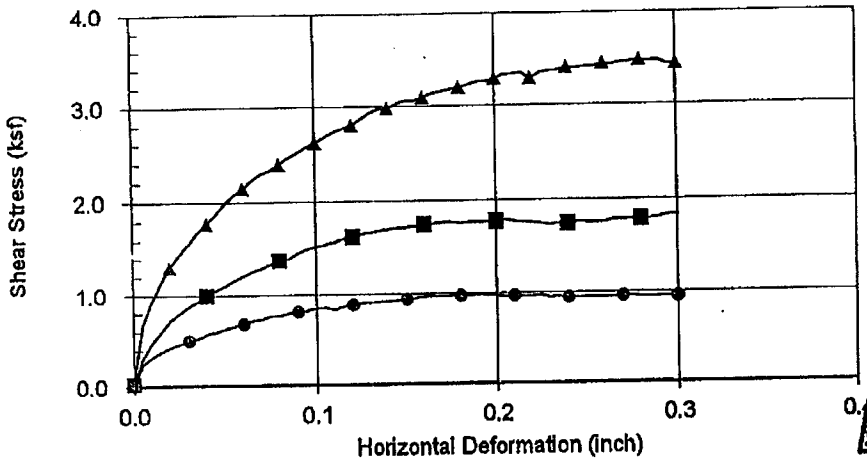
	Peak	Residual
Cohesion (ksf)	0.3	0.2
Phi (Degrees)	45	32

AP Engineers

DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.



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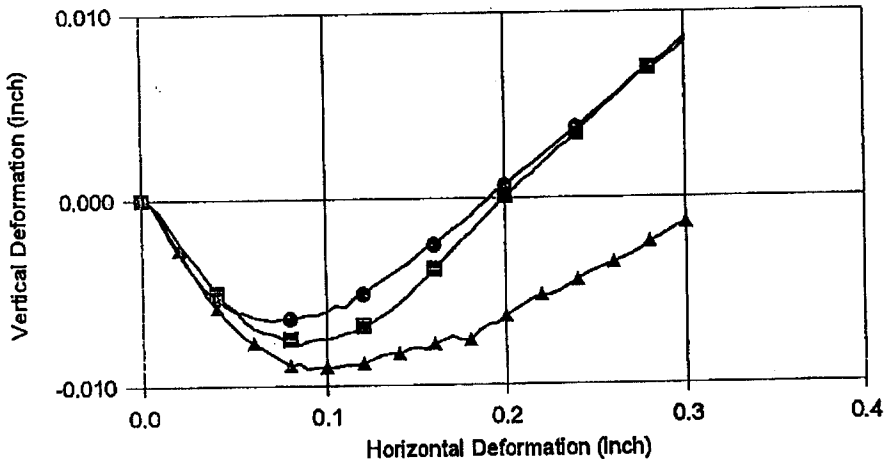

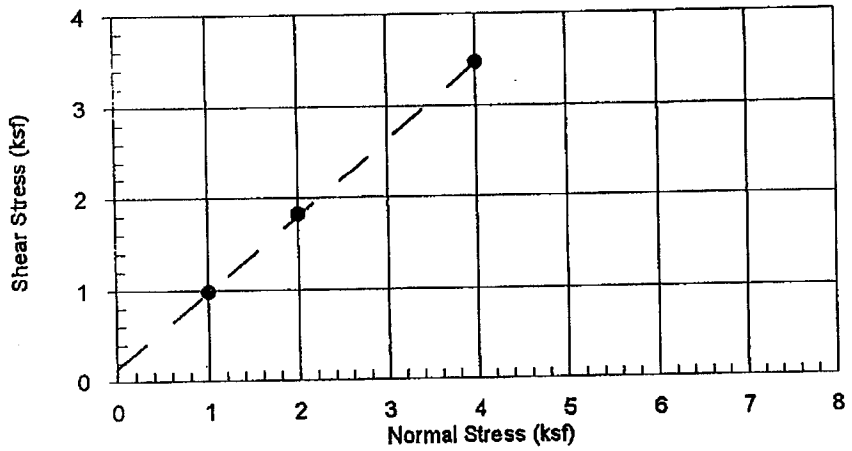

Project Name	:	Cathedral Oaks
Boring No.	:	B-1
Sample No.	:	D-3
Depth (ft)	:	15'
Sample Type	:	Undisturbed
Soil Type	:	Brown Silty Sand w/ gravel
Initial Dry Density	:	99.4 pcf
Moisture Content	:	5.2 % (before)
Strain Rate	:	0.05 inch/minute

	Peak	Residual
Cohesion (ksf)	----	0.2
Phi (Degrees)	----	40

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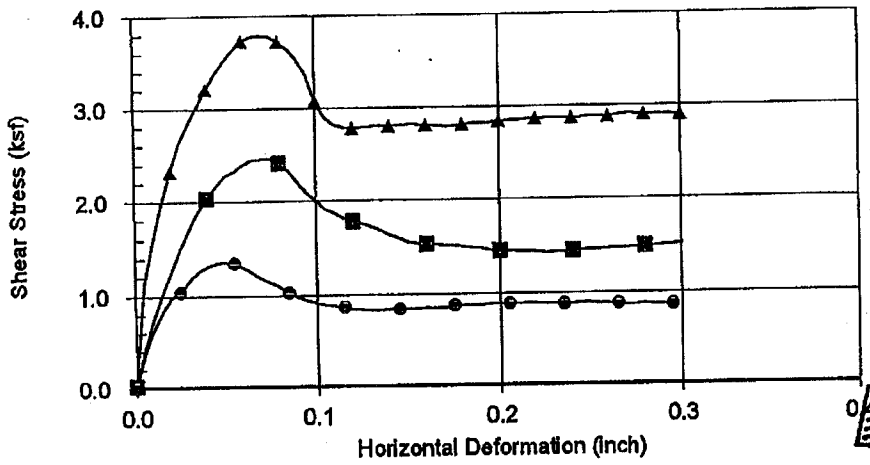
DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.



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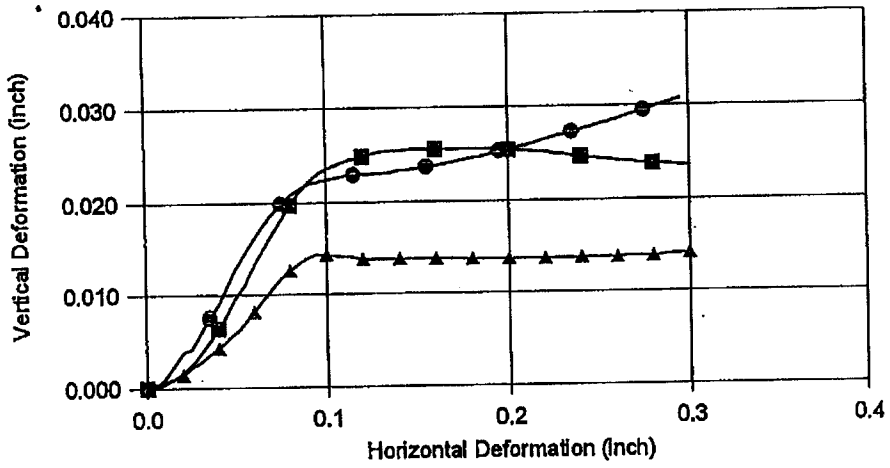

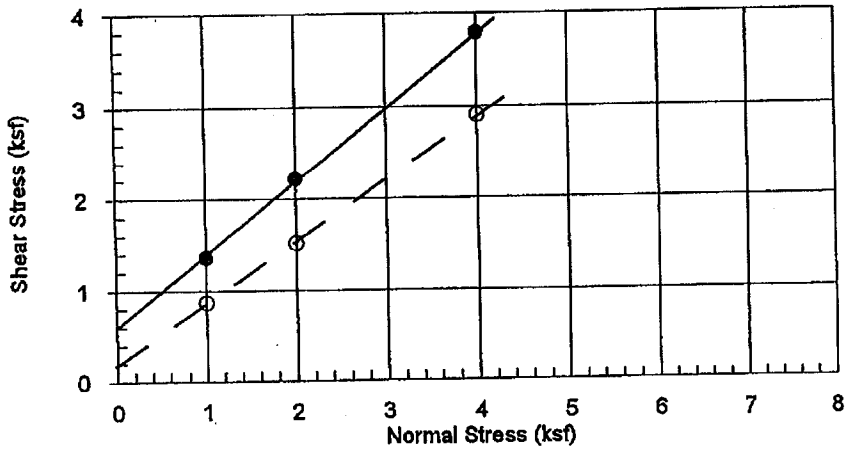

Project Name : Cathedral Oaks
Boring No. : B-2
Sample No. : D-4
Depth (ft) : 20'
Sample Type : Undisturbed
Soil Type : Olive Brown Silty Sand
Initial Dry Density : 114.5 pcf
Moisture Content : 9.7 % (before)
Strain Rate : 0.05 Inch/minute

	Peak	Residual
Cohesion (ksf)	0.6	0.2
Phi (Degrees)	38	34

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DIRECT SHEAR TEST RESULTS
(ASTM D3080)

12-97

Figure No.

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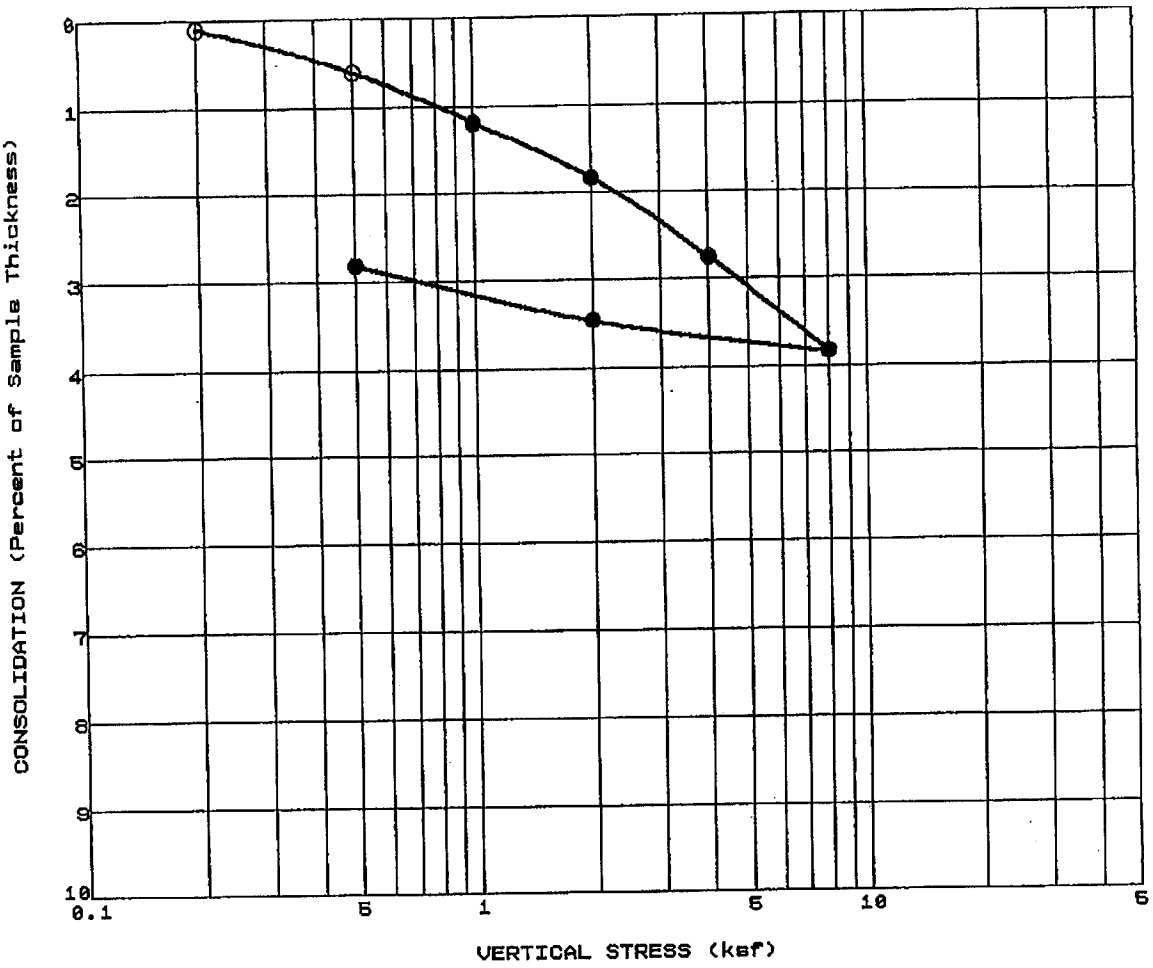
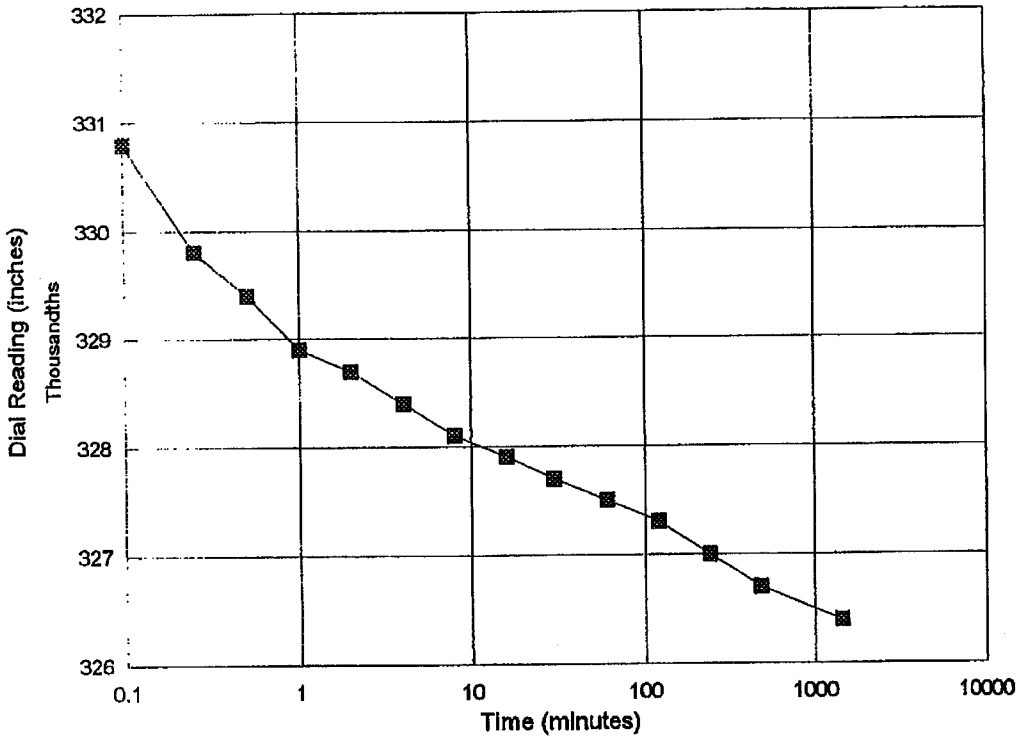


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	B-2	Initial Dry Density (pcf)	115.9
Sample No.	D-2	Moisture Content (%):	
Depth (feet)	10.0	Before	13.6
Soil Type	CL-ML	After	19.9
Soil Description	Yell Brn. Sandy Silt		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 97-156
Project Name Cathedral Oaks
Date 12/15/97 Figure No. ____



Boring No.	B-2	Sample Type:	Undisturbed
Sample No.:	D-2	Soil Description:	Yell. Brn. Sandy Silt
Depth (feet):	10	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	Dial Rdg (inches)
0.1	0.3308
0.25	0.3298
0.5	0.3294
1	0.3289
2	0.3287
4	0.3284
8	0.3281
16	0.3279
30	0.3277
60	0.3275
120	0.3273
240	0.3270
480	0.3267
1440	0.3264

DRAFT

Time Rate Consolidation Curve

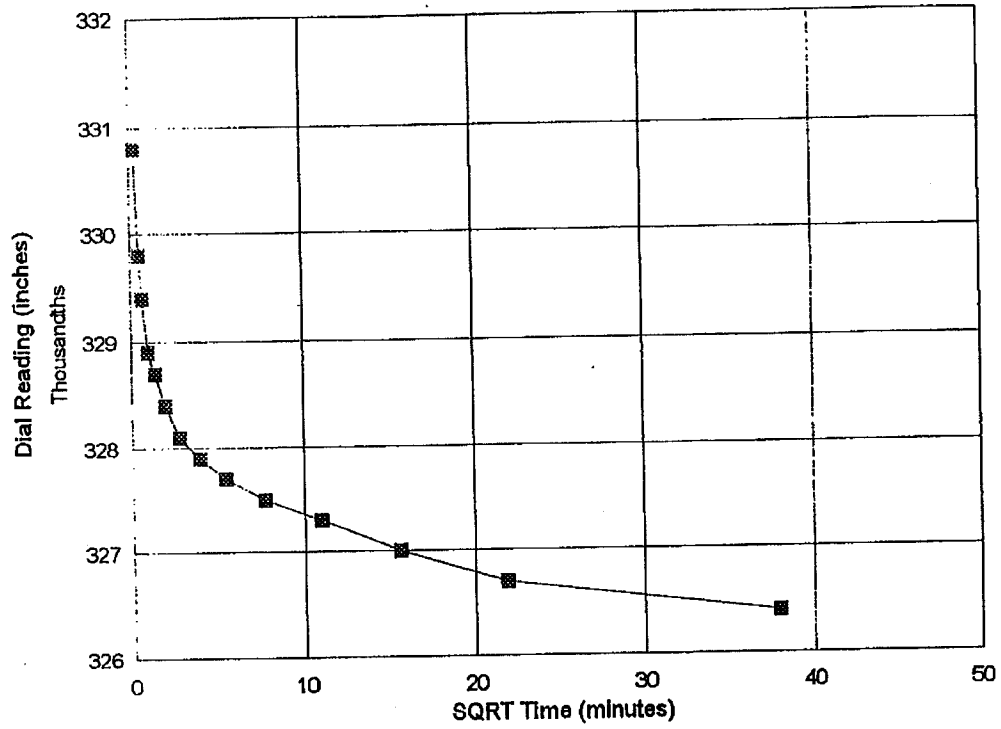
ASTM D2435

AP Engineers

97-1138

Project Name : Cathedral Oaks

Project No. : 97-156



Boring No.	B-2	Sample Type:	Undisturbed
Sample No.:	D-2	Soil Description:	Yell. Brn. Sandy Silt
Depth (feet):	10	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	SQRT Time Rdg	Dial Rdg (inches)
0.1	0.3162	0.3308
0.25	0.5000	0.3298
0.5	0.7071	0.3294
1	1.0000	0.3289
2	1.4142	0.3287
4	2.0000	0.3284
8	2.8284	0.3281
16	4.0000	0.3279
30	5.4772	0.3277
60	7.7460	0.3275
120	10.9545	0.3273
240	15.4919	0.3270
480	21.9089	0.3267
1440	37.9473	0.3264

DRAFT

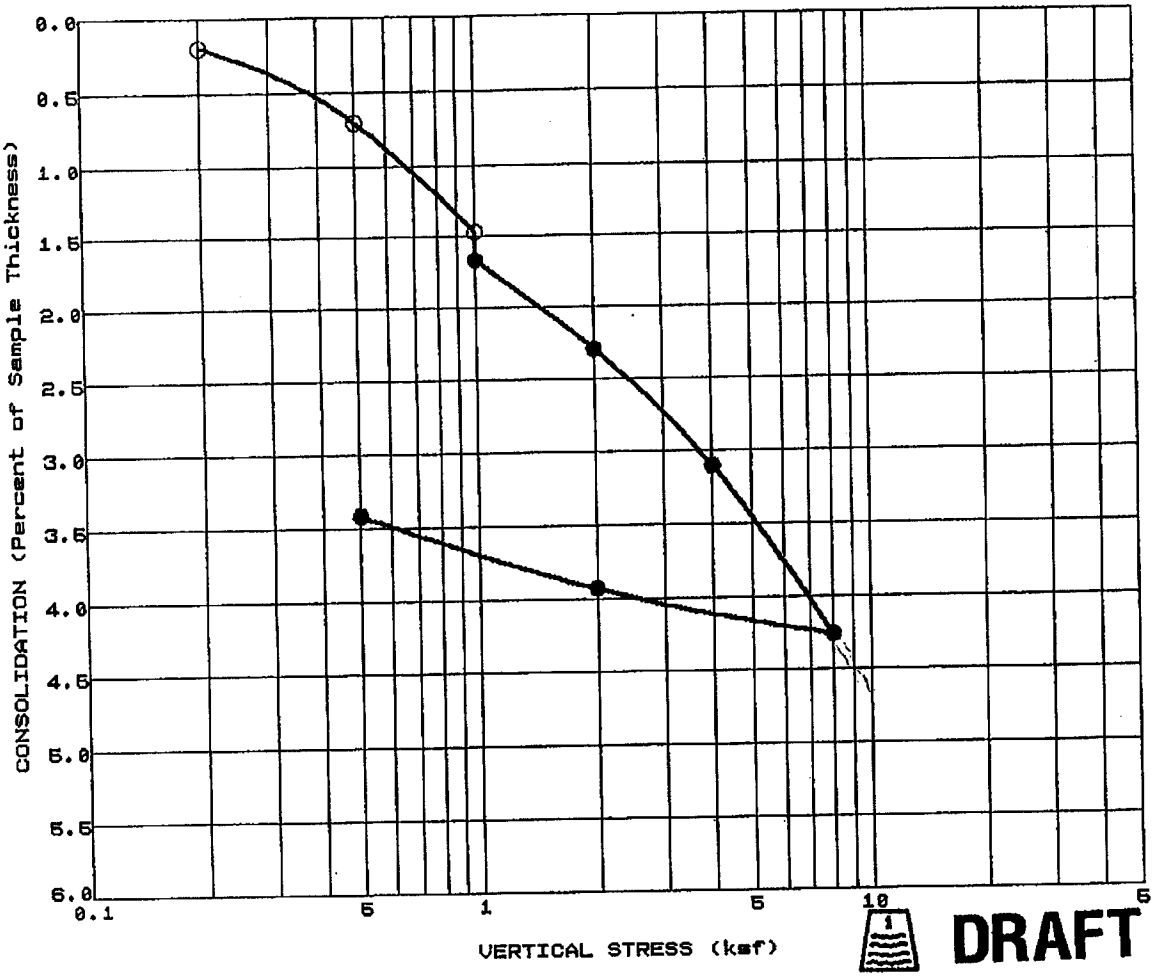
Time Rate Consolidation Curves
ASTM D2435

AP Engineers

97-1138

Project Name : Cathedral Oaks

Project No. : 97-156



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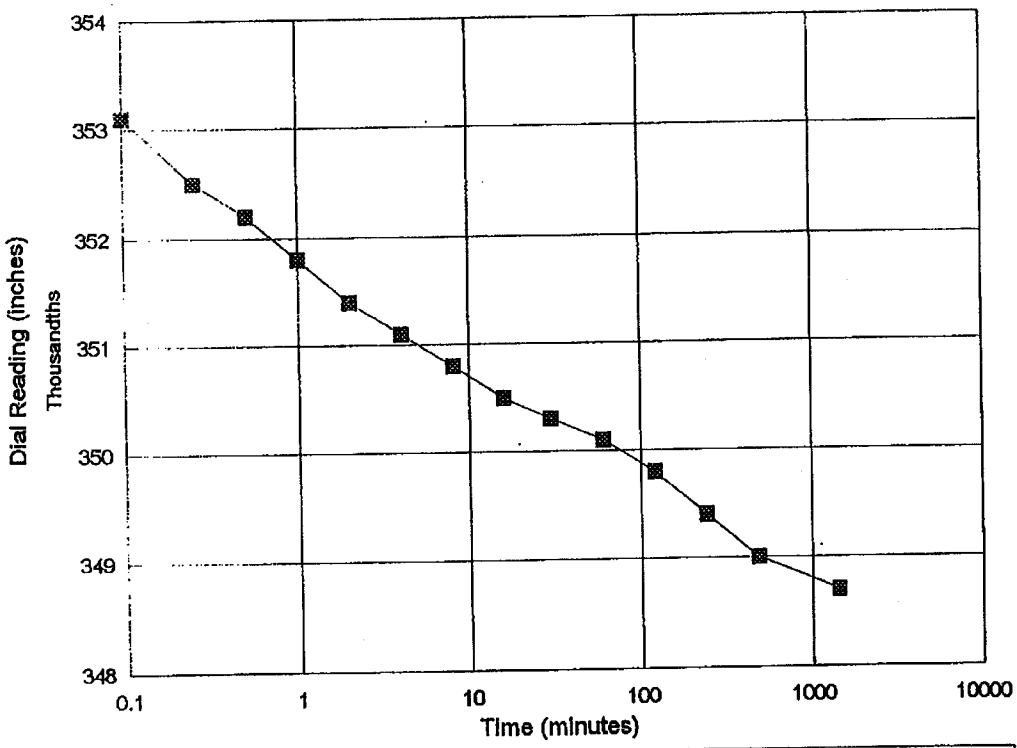
LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	B-3	Initial Dry Density (pcf)	118.7
Sample No.	D-3	Moisture Content (%):	
Depth (feet)	15.0	Before	12.5
Soil Type	SC	After	14.7
Soil Description	Red Brn. Clayey Sand		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 97-156
Project Name Cathedral Oaks
Date 12/14/97 Figure No. _____



Boring No.	B-3	Sample Type:	Undisturbed
Sample No.:	D-3	Soil Description:	Red. Brn. Clayey Sand
Depth (feet):	15	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	Dial Rdg (inches)
0.1	0.3531
0.25	0.3525
0.5	0.3522
1	0.3518
2	0.3514
4	0.3511
8	0.3508
16	0.3505
30	0.3503
60	0.3501
120	0.3498
240	0.3494
480	0.3490
1440	0.3487

DRAFT

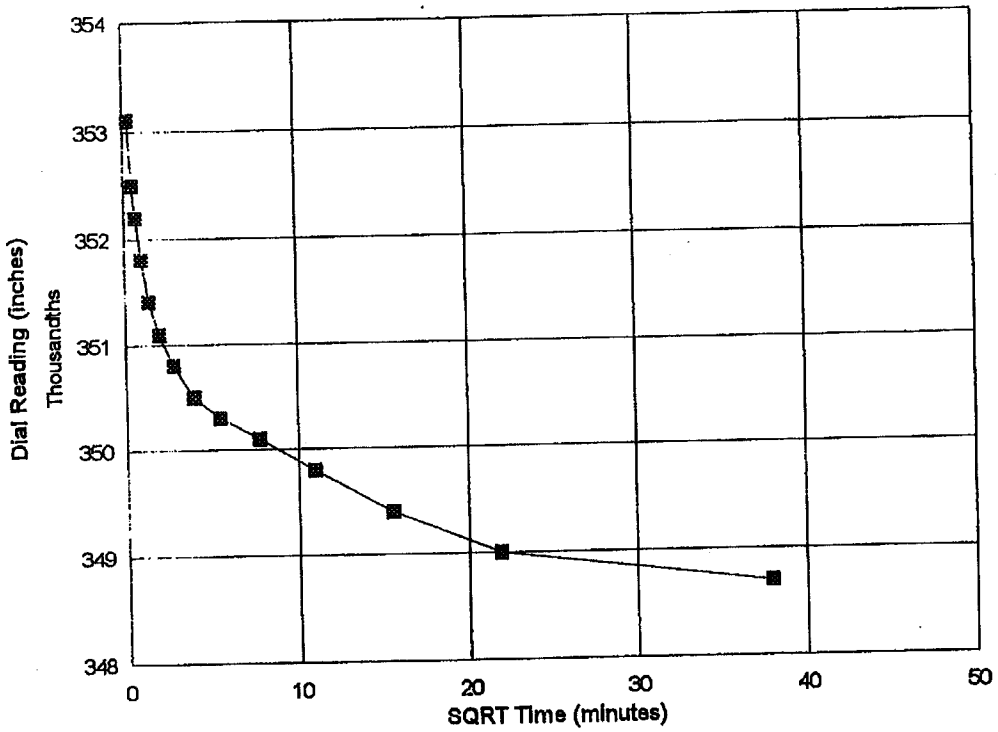
Time Rate Consolidation Curve

ASTM D2435

AP Engineers

97-1138

Project Name :	Cathedral Oaks
Project No. :	97-156



Boring No.	B-3	Sample Type:	Undisturbed
Sample No.:	D-3	Soil Description:	Red. Brn. Clayey Sand
Depth (feet):	15	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	SQRT Time Rdg	Dial Rdg (inches)
0.1	0.3162	0.3531
0.25	0.5000	0.3525
0.5	0.7071	0.3522
1	1.0000	0.3518
2	1.4142	0.3514
4	2.0000	0.3511
8	2.8284	0.3508
16	4.0000	0.3505
30	5.4772	0.3503
60	7.7460	0.3501
120	10.9545	0.3498
240	15.4919	0.3494
480	21.9089	0.3490
1440	37.9473	0.3487

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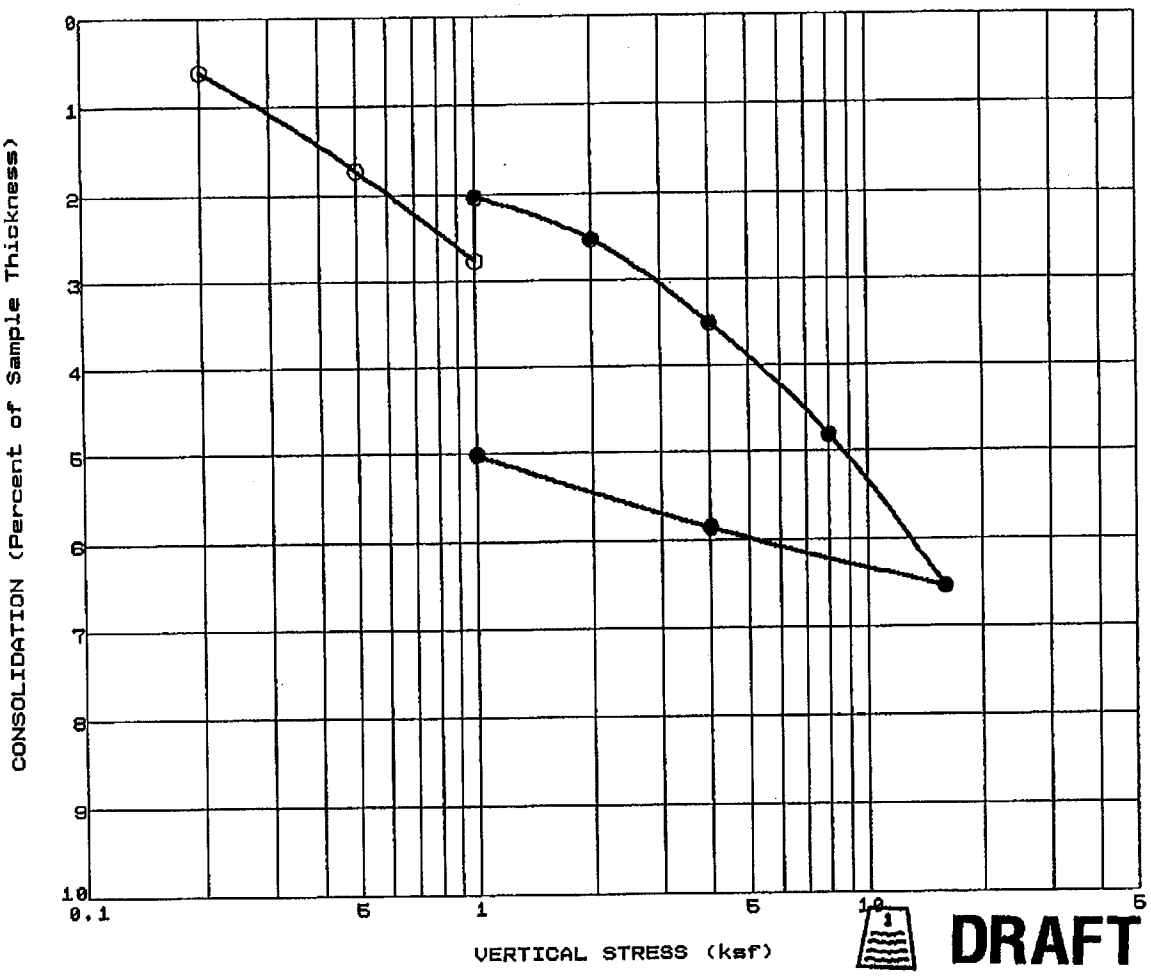
Time Rate Consolidation Curves
ASTM D2435

AP Engineers

97-1158

Project Name : Cathedral Oaks

Project No. : 97-156



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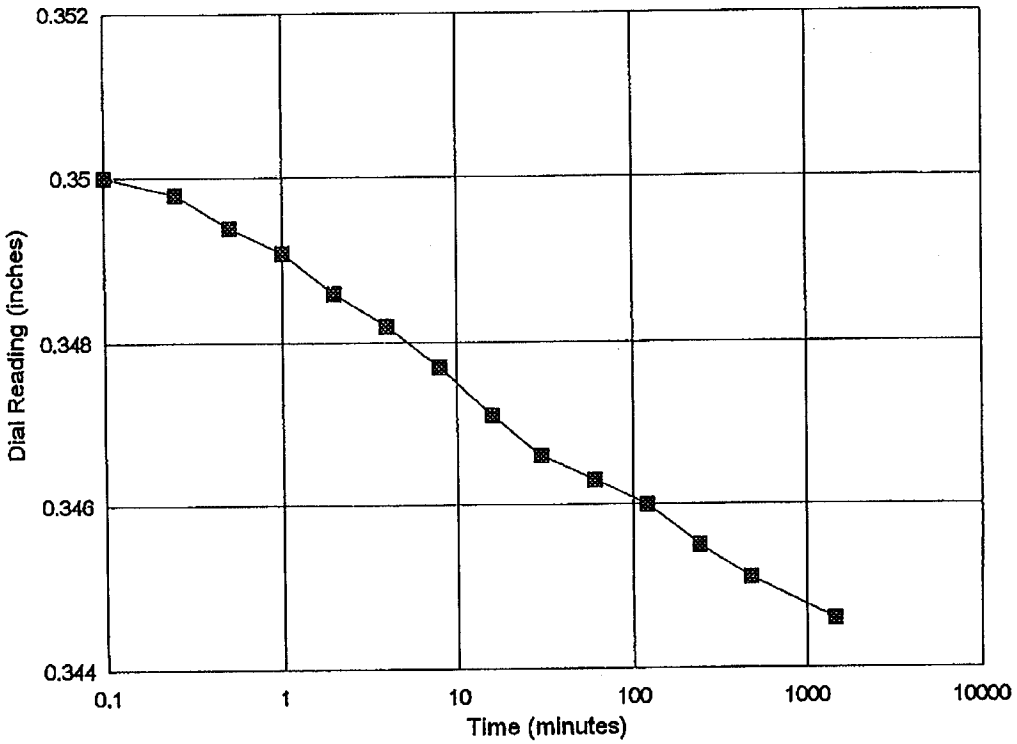
LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	B-3	Initial Dry Density (pcf)	122.6
Sample No.	D-9	Moisture Content (%):	
Depth (feet)	45.0	Before	8.1
Soil Type	SC	After	24.5
Soil Description	Red Brn. Clayey Sand		

CONSOLIDATION CURVE
ASTM D 2435

Project No. 97-156
Project Name Cathedral Oaks
Date 12/15/97 Figure No. ____



Boring No.	B-3	Sample Type:	Undisturbed
Sample No.:	D-9	Soil Description:	Red Brn. Silty Sand
Depth (feet):	45	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	Dial Rdg (inches)
0.1	0.3500
0.25	0.3498
0.5	0.3494
1	0.3491
2	0.3486
4	0.3482
8	0.3477
16	0.3471
30	0.3466
60	0.3463
120	0.3460
240	0.3455
480	0.3451
1440	0.3446

DRAFT

Time Rate Consolidation Curve

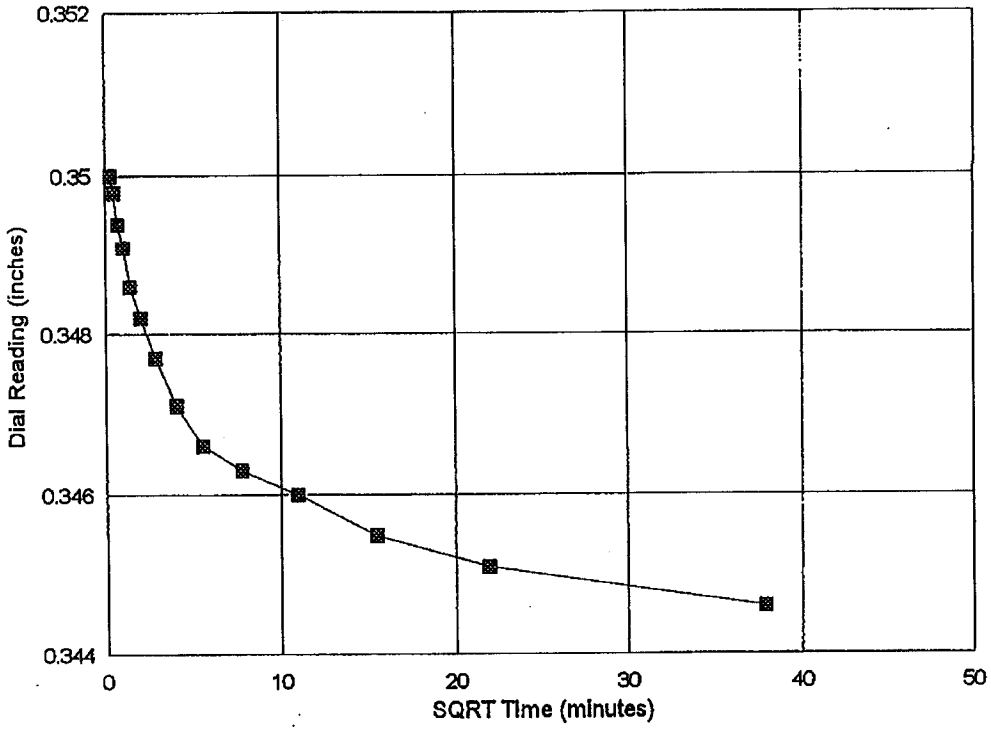
ASTM D2435

AP Engineers

97-1138

Project Name : Cathedral Oaks

Project No. : 97-156



Boring No.	B-3	Sample Type:	Undisturbed
Sample No.:	D-9	Soil Description:	Red Brn. Silty Sand
Depth (feet):	45	Vertical Pressure:	4 ksf
		Test Condition:	Saturated

Time (minutes)	SQRT Time Rdg	Dial Rdg (inches)
0.1	0.3162	0.3500
0.25	0.5000	0.3498
0.5	0.7071	0.3494
1	1.0000	0.3491
2	1.4142	0.3486
4	2.0000	0.3482
8	2.8284	0.3477
16	4.0000	0.3471
30	5.4772	0.3466
60	7.7460	0.3463
120	10.9545	0.3460
240	15.4919	0.3455
480	21.9089	0.3451
1440	37.9473	0.3446

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Time Rate Consolidation Curves
ASTM D2435

AP Engineers

97-1138

Project Name : Cathedral Oaks

Project No. : 97-156

Preliminary Materials Report, Summer 2000, Earth Mechanics Incorporated

Preliminary Geotechnical Information for Bridge Type Selection, July 27, 1998, Earth Mechanics Incorporated

PRELIMINARY MATERIALS REPORT

RECONSTRUCTION OF THE HOLLISTER AVENUE (CATHEDRAL OAKS ROAD) INTERCHANGE AT U.S. HIGHWAY 101

COUNTY PROJECT NO. 862017
05-SB-101-KP 42.29
05-225-371500

Summer, 2000

SANTA BARBARA COUNTY
DEPARTMENT OF PUBLIC WORKS

REPORT BY:
CHRISTIAN J. DOOLITTLE

Attachment 4

TABLE OF CONTENTS

Attachments

1. Vicinity Map/Traffic Indices Map

2. Stockpile Location Map

3. Soil Tests Summary

5. Preliminary Geotechnical Information for Bridge Type Selection, Cathedral Oaks/Hollister Ave. Overhead and overcrossing, County of Santa Barbara

   Figure 1- Soil Boring Location Map
   Figure 2- General Subsurface Conditions

PRELIMINARY MATERIALS REPORT

RECONSTRUCTION OF THE HOLLISTER AVENUE (CATHEDRAL OAKS ROAD) INTERCHANGE AT U.S. HIGHWAY 101

I. General

Project Description

The project consists of replacing the existing overcrossing and overhead structures at State Highway 101 and Hollister Ave. with newly aligned overcrossing and overhead structures designed to intersect the new alignments of Hollister Ave. and Cathedral Oaks Rd. The newly built overcrossing will provide additional traffic capacity, a protected Highway 101 southbound right turn movement, and replace two structures deemed unfit because of concrete deterioration resulting from the presence of reactive aggregate. These two structures were inspected by Caltrans bridge inspectors at the request of the Santa Barbara County Public Works Department.

The new overcrossing and overhead structures will be located approximately 215 meters east of the existing structures, and will include re-aligned southbound 101 on and off ramps.

Terrain, Climate, and Geology

The project area is located in a relatively flat area of the Goleta Basin, an urbanized area surrounded by small agricultural operations and undeveloped land. The basin is a narrow coastal lowland occurring along the southwestern foot of the Santa Ynez Mountains, consisting of a low-lying alluvial plain with bordering mountain slopes and terraces. The project location lies generally on the western edge of the urbanized area at an elevation approximately 35 meters above mean sea level.

The climate in the project area is mild, with low freeze-thaw potential. Mean annual temperature is 14.7 degrees Celsius, with mean minimum and maximum temperature of 8.8 degrees and 20.7 degrees, respectively. Average annual rainfall is 35.4 centimeters, concentrated mainly in the months of November through April. 100-year frequency rainfall intensity is estimated at 3.8 cm in one hour, 9.9 cm in six hours, and 13.7 cm in 24-hours (Ref 2).

Soils in the project area are generally moist clayey sands, sandy clays and sandy silty clays of the Milpitas-Positas series, in mixed alluvial terrace deposits (Ref 3). These soils are considered acceptable for roadway foundations and embankments.

Dominant features in the area include the Santa Ynez Mountain Range and the Santa Ynez fault, as well as the More Ranch fault zone. Most of these structures are east west trending. The nearest active fault[1] is the More Ranch-Mission Ridge-Arroyo Parida-Santa Ana fault (More Ranch), located less than 1 km east of the subject site. The More Ranch fault is capable of a magnitude 7.5 on the Richter Magnitude scale. Using the 1996 Caltrans Seismic Hazard Map, the peak ground acceleration at this site is 0.7g.

Detailed information regarding underlying geologic structures and seismicity may be found in the Draft "Preliminary Geotechnical Information for Bridge Type Selection" report (Ref 1).

II. Existing Facilities

The existing Hollister Avenue Interchange at U.S. Highway 101, Bridge Number 51-123, was constructed in 1961 as a modified diamond interchange. In 1992, the overcrossing (Bridge Number 51-123) was listed as in need of replacement due to concrete deterioration brought on by chemical reactions involving reactive aggregate and water. The existing Union Pacific Railroad overhead (Bridge No. 51C-130) was listed as in need of rehabilitation. The extension of Cathedral Oaks Road, realignment of Hollister Ave., and recent residential and commercial development in the area makes this project consistent with local planning documents (Ref 4).

III. Roadway, Culvert and Embankment Foundations

Five test borings were made during the bridge foundation study (Ref 1) to a depth of approximately 25 meters. Test hole locations and general results are shown in Attachment 6, Figs. 1 & 2. From the boring findings it was determined that the in situ foundation materials are suitable for roadway construction. Soil samples were retained from the first two meters of each of the foundation study borings. Results of soil tests on this material are presented herein. The bridge foundation study encountered no ground water in any of the borings.

Fills on the proposed Hollister and Cathedral Oaks alignments are generally less than one meter, so no further consideration of foundation suitability is warranted. Fills on the proposed 101 southbound on and off ramps vary to approximately five meters. The foundation soils on the ramp alignments were found to be dense to very dense sandy silt and silty sand to a depth of at least 10 meters. These are considered suitable for planned embankment construction with adequate standard preparation and construction methods. No further foundation investigation is warranted, as no problems pertinent to construction or special construction techniques were discovered. No significant settlements are anticipated below embankment (Ref 1).

[1] Active faults are defined as those which have moved within geologically recent time (approximately the last 11,000 years)

IV. Cuts and Excavations

No special features are required for cuts and excavations in the project area. The recommended minimum slope ratio for exposed cut slopes is 1 1/2:1. Exposed slopes should be well planted to deter erosion.

V. Embankments

All roadway areas subject to embankment construction should be cleared and grubbed in accordance with Section 16, Clearing and Grubbing of the Standard Specifications. Embankments should be constructed in accordance with Section 19, Earthwork of the Standard Specifications. Existing structural sections, if to remain in place, should be scarified, mixed and recompacted.

Soils in the project area are suitable for embankment construction. Some of the surveyed soils exhibited expansive properties, but no related construction problems are anticipated. Embankment slopes should be constructed at a minimum slope ratio of 1 1/2:1. Expansive soils should be limited to use a minimum of 0.9 meters below finish grade where feasible.

VI. Earthwork Factors

Approximately 18,000 cubic meters of imported soil will be needed to complete embankments. Import soils should be examined and found suitable for the purpose intended prior to incorporation into the project. A supplemental materials report may be requested for this purpose.

Three (3) mandatory import borrow site stockpiles are located within a short distance from the project. These stockpile soils were studied and the results reported in Attachment 5. The soils are considered generally suitable for use as roadway embankment with no special design or construction considerations after conditioning to near optimum moisture as needed prior to construction. The Cathedral Oaks Road stockpile material consists of fine sandy clay with coarse sized aggregates and large rocks, and was generated from slip-outs along Highway 154 during the 1998 storms. A second stockpile, excess material from Caltrans' La Cumbre Road overcrossing, has been deposited along the southern edge of the Highway 101 southbound on-ramp. This stockpile material is clayey sand, fine in nature. A third stockpile is located along the 101 corridor, north of the Union Pacific Railroad tracks. This material, a fine silty loam, will be used for landscaping purposes and surficial fill along the 101 corridor.

When the exact location and extent of imported embankment soils is identified, testing for potential adjustment of structural sections is recommended. For the purpose of this report, structural section recommendations are based on R-value test results of project site soils and the Cathedral Oaks Road stockpile material. This material is non-plastic, so 2:1 embankment slopes are recommended where feasible.

Soils to receive embankment construction vary from existing roadway embankments to previously landscaped areas.

Average earthwork shrinkage of 0.85 is recommended for this project.

VII. Corrosion Investigations

Five locations in the project site were sampled for laboratory Soil Resistivity. Four of the laboratory Soil Resistivities ranged from 1400 to 16000 Ohm-cm. Laboratory pH of these four soil samples ranged from 6.6 to 8.1. Estimated service life of steel culverts in these soils based on the Soil Resistivity and pH tests is 30 years minimum for 18-gage steel. The fifth soil sample, borehole sample B-2, was shown to have a Soil Resistivity value of 1334 and a pH value of 6.9. This soil is moderately to highly corrosive in nature, with a minimum estimated service life of 18 years for an 18-gage steel culvert.

VIII. Structural Sections

Recommended structural sections and relevant design factors are shown in the following table. R-values of soil samples were determined from laboratory tests on soil samples obtained from foundation study borings and proposed import site sampling. R-values varied from a low of 7 to a high of 25. An R-value of 25 is assumed for all import material for the following recommended structural section, based on the proposed import site at the County stockpile on Cathedral Oaks (from Highway 154/Cathedral Oaks Rd stockpile). Where more than 0.6 meters of import fill is anticipated to be placed, the 25 R-value of the imported soil is assumed. Where less than 0.6 meters of fill is anticipated to be placed, the R-value of the in-site soil is assumed. The structural section table below lists recommended structural sections for both cut and fill circumstances.

Recommended Structural Section Thickness (mm)[2]

Roadway	Cut/Fill	R-val	T.I.	A.C.	CL-2 A.B.	Subbase	Soil
101 SBOFF	C	8	10.0	150	260	350	Native
(Alt. Section)	F	25		150	260	180	Import
101 SBON	C	8	10.0	150	260	350	Native
(Alt. Section)	F	25		150	260	180	Import
101 NBON	C	7	10.0	150	260	350	Native
Calle Real Ave. West	C[3]	7	6.5	110	150	200	Native
Calle Real Ave. East	C	7	6.5	110	150	200	Native
Hollister Ave. East	C	24	7.5	120	170	150	Native
(Alt. Section)				120	290	-----	
Hollister Ave. West	C	24	6.5	110	230	-----	Native
Cathedral Oaks Rd. North	C	7	7.0	110	170	230	Native

2 Structural sections should be adjusted prior to construction as appropriate based on actual R-values of selected imported material.

3 No fill section structural section is recommended because the proposed grade nearly meets the existing grade.

Standard Special Provisions are recommended for all structural section materials. Asphalt Concrete should be Type B, Medium, 19 mm or 12.5 mm maximum aggregate size for all roadways. Paving asphalt should be grade AR-8000. The 95 percent A.C. relative compaction specification is recommended.

In the event salvage and reuse of existing structural section materials is desired, special provisions will be needed. Existing A.C. pavement may be milled and used as aggregate base. Existing aggregate base may be reused. All reused material shall meet minimum Standard Specifications.

IX. Earthquake Considerations

A preliminary seismic slope stability analysis was performed by Earth Mechanics, Inc. for determining bridge type selection and reported in Reference 1.

The Seismic setting is reported in the body of the referenced report, which concludes that the maximum credible event is a magnitude 7.5 earthquake on the More Ranch-Mission Ridge-Arroyo Parida-Santa Ana Fault, generating an approximate 0.7g peak bedrock acceleration at the site. It was concluded that soil liquefaction is not likely considering the fine-grained soils present at the project site.

X. Materials Available

All required materials are available locally. Three mandatory import borrow sources have been identified. The County stockpile south of State Highway 101 at Hollister Ave, adjacent to the existing southbound onramp, is a mandatory borrow site, and will be utilized as needed for embankment construction purposes. The County stockpile on Cathedral Oaks Road, material removed from Highway 154, is within a 6-km haul distance from the project area. These two sources have been sampled and laboratory tests indicate that this material is ***suitable for use as roadway embankment.*** A third mandatory import borrow stockpile, consisting of fine silty loam (Rval=21), is located in the immediate vicinity of the project area, between the Highway 101 Southbound lanes and the Union Pacific Railroad tracks. This loamy material will be used for landscaping along the Highway 101 Corridor.

References

1) Draft Preliminary Geotechnical Information for Bridge Type Selection, Cathedral Oaks Rd/ Hollister Ave overhead and overcrossing, Earth Mechanics, Inc., January 20th, 1998, Santa Barbara County Public Works Dept.

2) The Climate of Santa Barbara County Plantclimate Map and Climatological Data, University of California Agricultural Extension Service, January 1965.

3) Soil Survey of Santa Barbara County, California South Coastal Part, U.S. Dept of Agriculture Soil Conservation Service, August 1977.

4) Reconstruction of the Hollister Avenue (Cathedral Oaks Rd.) Interchange at U.S. Highway 101 Draft Project Report, California Department of Transportation, 1998

5) Report on Foundation Conditions between El Sueno Rd. and Elwood Overcrossing, California Department of Transportation, July 1958

6) Storke/Glenn Annie Geotechnical and Materials Report, California Department of Transportation, October 1993

ATTACHMENT 3

Soils Tests Survey

Date		11/20/97	11/20/97	11/20/97	11/20/97	11/20/97	4/1/98	8/21/98	4/25/00	7/31/00
Lab I.D.		5591	5593	5592	5594	5595	5647	5745	7924	
Location		B-1	B-2	B-3	R-1	R-2	Cathedral Oaks	HWY 101 SBON	Mtn. View Top Soil	Granite's UCSB Site
Elevation		0-1.5 m	0-1.5 m	0-1.5 m	0-1.5 m	0-1.5 m	Stockpile	Stockpile	Stockpile	Stockpile
Sieve Analysis	**51 mm**						100			x
	37.5 mm						97			x
	25 mm						94			x
	19 mm						90			x
	12.5 mm						84			x
	9.5 mm		100				80			x
	4.75 mm	100	98	100	100	100	73	100		x
	2.36 mm	98	96	99	97	99	69	98		x
	1.18 mm	97	94	98	93	97	66	97		x
	.60 mm	95	91	96	90	96	64	95		x
	.30 mm	84	85	85	83	91	52	87		x
	.15 mm	63	72	68	71	81	38	66		x
	.075 mm	48	60	53	60	70	26	48		x
Sand Equivalent		9	9	13	8	4	13	8	9	x
R-Value		24	9	7	24	8	25	8	21	x
In-Situ Moisture		5.3%	9.8%	11.4%	7.6%	8.2%	14.2%	3.2%	7.7%	x
Moisture Density Rel. Curve		2.00 G/CC @ 10.6%	N/A	N/A	2.02 G/CC @ 8.4%	N/A	2.10 G/CC @ 7.2%	2.00 G/CC @ 9.4%		
Plasticity Index		5	N/A	17	11	13	NP	12		
Mechanical Anal.		21.2	33	33.7	27	30.4	15	24		
Soil Resistivity		10,672	1334	8338	16,008	6003	1400	5336		
pH		8.1	6.9	7.5	6.6	7.5	7.5	7.6		
Soil Type		Clayey Sand	Sandy Silty Clay	Sandy Clay	Sandy Silty Clay	Sandy Silty Clay	Clayey Sand	Clayey Sand	Silty Loam	

not corrosive per E

Memorandum **DRAFT**

EMI Project No. 97-156

TO: Mr. M.D. Wahiduzzaman, County of Santa Barbara

FROM: Lino Cheang, Earth Mechanics, Inc. (EMI)

DATE: July 27, 1998

SUBJECT: Preliminary Geotechnical Information for Bridge Type Selection, Cathedral Oaks/Hollister Avenue Overhead and Overcrossing, County of Santa Barbara

Introduction

This Geotechnical Memorandum was prepared for the subject project to assist Santa Barbara County in bridge type selection. It presents preliminary design and construction recommendations for the proposed structures. Final geotechnical design will be conducted when bridge type selection is approved.

Site Conditions

At the subject site, SR 101 and the Southern Pacific (SP) RR track are cut sections and Hollister Avenue to the south and Calle Real to the north appear to lie near original grade. The RR track is on a 15-meter± wide flat bench located between steep cut slopes extending upto Hollister Avenue at one side and the freeway on-ramp on the other side. The gradient of the cut slope is about 1:1.

SR-101 lies approximately 5.1 meters below and north of Hollister Avenue, and approximately 7.4 meters below and south of Calle Real. Including the eastbound freeway on-ramp, the roadway cut section is approximately 75 meters wide with side slopes extending upward at gradients of about 2:1 and 3:1 on the north and south sides, respectively. The existing grade at Hollister Avenue and Calle Real is near El. +36.6 and +39.4 meters, respectively.

Available Information

Existing Hollister Avenue Overcrossing, Bridge No. 51-123. The as-built plans for the existing two-lane four-span bridge indicate concrete abutments and dual-column bents supported on a "mixed" foundation system. Abutment 1 and Bents 2 to 4 are supported on spread footings with an allowable bearing pressure of 287 kPa (3 tsf). Abutment 5 is supported on driven precast concrete piles. The design (service) load and pile-size are not shown on the plans.

The log of test borings (LOTB) sheet included with the plans consists of three rotary borings and five penetration borings.

Attachment 3

Existing Hollister Avenue Overhead, Bridge No. 51C-130. The as-built plans show the bridge name as "Crossing Over SPRR at Elwood". This is a seven-span bridge supported on six multi-column bents (Bents 1 to 6) and two abutments (Abutments 1 and 2). The abutments and the two bents immediately adjacent to the railroad track are supported on continuous spread footings; the remaining bent foundations consist of individual square footings at the base of each column. The bents placed on the slopes have significant soil cover. The maximum soil pressure as shown on the as-built plans is 240 kPa for all footings.

Field Investigation

On November 19th and 20th, 1997, EMI conducted a geotechnical field investigation along the alignment of the two proposed structures. The investigation consisted of two hollow-stem auger borings for the overhead bridge and three hollow-stem auger borings for the overcrossing. The approximate locations of the soil borings are shown in Figure 1.

The two borings for the overhead bridge (R-1 and R-2) were drilled at the bluff top above the railroad track, each to a depth of 24.4 meters. For the overcrossing, Boring B-1 was drilled on the shoulder on the eastbound freeway on-ramp down to a depth of 21.8 meters. Boring B-2 was drilled in a small open area below the proposed north abutment adjacent to westbound SR 101 freeway level to a depth of 21.3 meters. The third boring (B-3) was drilled at the proposed north abutment to a depth of 24.4 meters.

The soil stratigraphy and measured Standard Penetration Test (SPT) blowcounts obtained from the five soil borings are presented in Figure 2. The approximate bent support locations of the overcrossing are also included in Figure 2. Support locations for the overhead are unknown at this time because they are dependent on the bridge type selection.

General Subsurface Conditions

Overall, the subsurface conditions observed in the five borings were found to correlate well with the conditions encountered in the borings drilled in 1957 for the existing Hollister Avenue Overcrossing. Along the overhead and a majority of the overcrossing alignment, the soil condition from existing grade down to approximately El. 23.2 meters consists of dense to very dense sandy silt and silty sand. Between El. 23.2 and 21.3 meters lies a dense layer of silty sand and sand. A layer of stiff clay exists between El. 21.3 and 19.0 meters. This material is underlain by bedrock composed of clayey siltstone and shale down to a boring termination depth near El. 10.0 meters.

Below Calle Real down to about El. 26.2 meters lies stiff to very stiff, low plastic, sandy clays and compact clayey sands. Between El. 26.2 and El. 20.9 meters lies compact to dense sandy silt, silty sand and sand. This material is underlain by bedrock described above down to a boring termination depth near El. 10.0 meters.

The siltstone and shale bedrock is classified as diatomaceous, characterized by relatively low in-situ density and high moisture content. In-situ dry density as low as 8.7 kN/m^3 and moisture content as high as 70% were measured in this bedrock formation. In general, diatomaceous materials are highly compressible with very long settlement time. If deep foundations are embedded within or slightly above this bedrock unit, the end bearing resistance must be limited to minimize the potential for excessive pile-group settlements.

Table 1 lists the idealized soil profiles and strength parameters used for foundation design based on correlations with overburden and fines-corrected SPT blowcounts and average peak friction angles and cohesion values. Some of this data are also given in Figure 2. Due to the different soil conditions encountered across the project limits, one profile was developed for the material below the proposed overhead and the southern half of the overcrossing and another profile was developed for the northern half of the overcrossing.

Groundwater was not encountered in any of the borings during our 1997 investigation or during the investigation for the existing Hollister Avenue Overcrossing performed in March of 1957.

Seismic Design

Peak Bedrock Acceleration. Using the coordinates (34°25' 56" Longitude and 119°54' 24" Latitude) taken from the USGS Dos Pueblos Canyon, California Quadrangle map, the subject site is located less than 1 km west of the More Ranch-Mission Ridge-Arroyo Parida-Santa Ana fault which is capable of generating a magnitude 7.5 event. Using the attenuation relationship published by Mualchin and Jones (1992) and the 1996 Caltrans Seismic Hazard Map, the peak bedrock acceleration at this site (after rounding upward to the nearest one-tenth g) is 0.7g.

Table 1. Idealized Soil Profile and Strength Parameters for Design

Stratum	Elevation (m)	Soil Type	SPT Blowcount (blows/0.3m)	Total Unit Weight (kN/m^3)	Friction Angle (deg)	Cohesion (kPa)
Overhead and Southern Half of Overcrossing						
I	+36.6 to +21.3	Sandy Silt and Silty Sand	41 to >70	18.50	38	0
II	Below +21.3	Diatomaceous Siltstone and Shale	>70	15.50	0	240
Northern Half of Overcrossing						
I	+39.4 to +26.2	Sandy Clay and Clayey Sand	14 to 31	18.85	30	0
II	+26.2 to +21.5	Sand Silt and Silty Sand	16 to >70	18.85	38	0
III	Below +21.5	Diatomaceous Siltstone and Shale	>70	15.50	0	240

Note: 1 kN/m^3 = 6.369 pcf ; 1 kPa = 2.089 x 10^{-2} ksf ; 1 m = 3.28 ft

Response Spectra. In recent Caltrans bridge projects where the site is located close (less than 5 km) to a fault, Caltrans Office of Structural Foundations (OSF) has proposed increasing the ATC-32 spectral acceleration by 20 percent. As a result, we recommend using the ATC-32 R3-8 for 0.7g, Soil Profile Type D, and increase the spectral acceleration by 20 percent.

Soil Liquefaction Potential. Due to the deep groundwater and the presence of fine-grained and dense sandy materials at the site, the liquefaction potential is considered low.

Existing Foundation Types of Nearby Structures

As-built plans for the existing Hollister Avenue Overhead show spread footings at all support locations with a maximum soil pressure of 240 kPa. The as-built plans for Hollister Avenue OC show spread footings at Abutment 1 and Bents 2 to 4 and driven concrete piles at Abutment 5. The plans list the allowable bearing pressure for the spread footings as 287 kPa and list the pile-type as driven precast concrete but do not include a pile details sheet with the pile-size and design (service) loading.

Proposed Foundation Types - Overhead

The overhead will be a three-span bridge and we propose using spread footings at all support locations. The allowable bearing pressure for spread footings is estimated to be 287 kPa. In order to reduce the likelihood of undermining of the spread footings due to erosion of the steep slopes, the abutment footings would need to be set back from the top of the slopes a minimum distance of 3.66 meters. We would emphasize the need for some remedial measures to minimize the potential of future excessive slope erosion. This could include deeper embedments for the spread footings founded on the slope or at the top-of-slope.

Proposed Foundation Types - Overcrossing

Based on preliminary layout and profile sheets provided by the County, the overcrossing is proposed to be a three-span bridge. As discussed in the description of the subsurface soil conditions, the material below proposed Bent 3 and Abutment 4 (north abutment) contains compressible material not found throughout the remainder of the project site. Because of this differing subsurface conditions, a mixed foundation system similar to the existing Hollister Avenue Overcrossing may have to be used. However, there are existing Caltrans foundation design guidelines concerning the use of spread footings at abutments and mixed foundation system for bridge sites with expected peak bedrock acceleration of 0.6g or greater. These Caltrans guidelines and their impact on the subject overcrossing are discussed below.

Caltrans Design Guidelines. According to Caltrans Memo to Designers 5-1, deep foundations are to be used at abutments when the peak rock acceleration is 0.6g or greater and the embankment height is 3.05 meters or greater, or if the bents are on piles and significant densification of the

foundation material during an earthquake is expected. This guideline was published by Caltrans because of their concern for relative movements between bridge support locations when the subsurface soils densifies and settles under intense ground shaking. However, we interpret that this criteria is more applicable for fill embankments where seismic-induced ground subsidence is generally larger than embankments consisting of native soils. Furthermore, there are significant fine contents (silts and clays) in the near-surface relatively weaker materials at this site, and the presence of this material type also reduced the magnitude of seismically-induced settlements. Based on the above discussion, we believe a mixed foundation system is feasible, particularly from a cost saving point of view.

We propose the following foundation configurations.

Configuration One: Mixed Foundation. Spread footings with an allowable bearing capacity of 287 kPa are recommended at Abutment 1 and Bent 2. The compressible material below proposed Bent 3 and Abutment 4 requires that it be supported on deep foundations. The foundation type can either be driven piles or CIDH piles.

Using an assumed footing bottom elevation of +36.5 meters at Abutment 4, driven square precast concrete or steel HP-piles will have a pile tip elevation of about +22 meters for either 625 or 900 kN service loads. At Bent 3 and using an assumed footing bottom elevation of +29.5 meters, the corresponding pile-tip elevation is +18 meters. The dimensions of the concrete piles are 305 mm and 355 mm for 625 and 900-kN service load, respectively. The corresponding HP-pile dimensions are HP 250x85 and HP 360x132, respectively.

Since ground water is anticipated to be deep, CIDH piles are also a feasible option. 405-mm and 610-mm diameter CIDH piles at Abutment 4 will have a preliminary tip elevation of +22 meters for 625 and 900 kN service loads, respectively. At Bent 3, the corresponding pile-tip elevation is +18 meters.

Configuration Two: Deep Foundations. If the County and Caltrans are concerned about differential settlements between supports when a "mixed" foundation system is used, deep foundations will be required at all supports. Concrete driven piles are not recommended at Abutment 1 and Bent 2 because of the presence of dense material at these locations. For uniformity, we recommend either steel HP-piles or CIDH piles at all the supports.

CIDH and steel HP-piles at Bent 3 and Abutment 4 would have the same tip elevations given earlier in Configuration One. CIDH and steel HP-piles at Bent 2 would have an estimated pile-tip elevation of +17 meters (for an assumed footing bottom elevation of +29.5 meters) for both 625 and 900 kN design load requirement. At Abutment 1 and for an assumed footing bottom elevation of +33.5 meters, a preliminary pile-tip elevation of +22.5 meters is recommended for 625 and 900 kN steel or CIDH piles.

Preferred Foundation. We recommend Configuration One (Mixed Foundation) using steel HP piles at Bent 3 and Abutment 4. Steel piles are preferred because hard driving is anticipated within the bedrock and the sandy silt/silty sand layer above the bedrock.

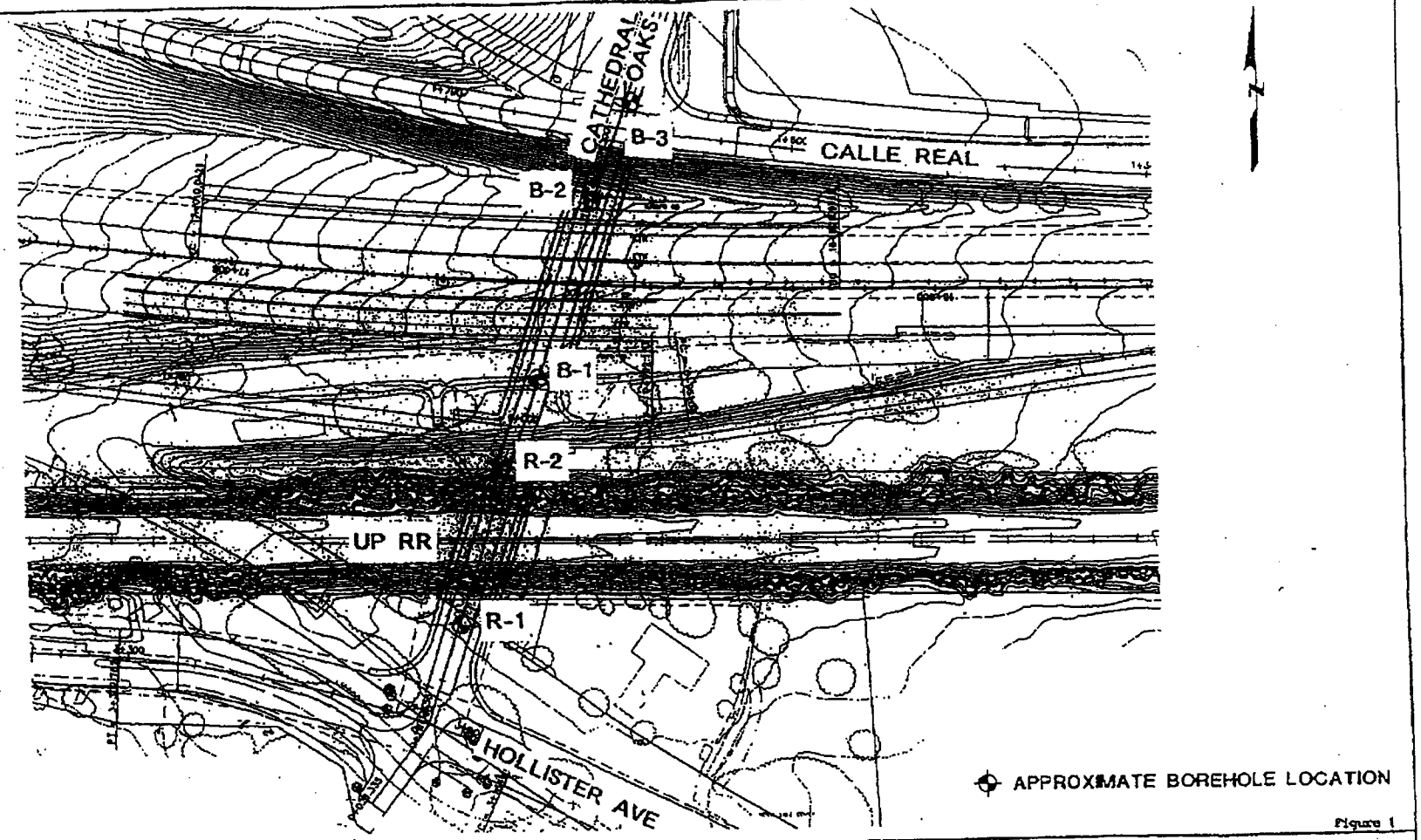
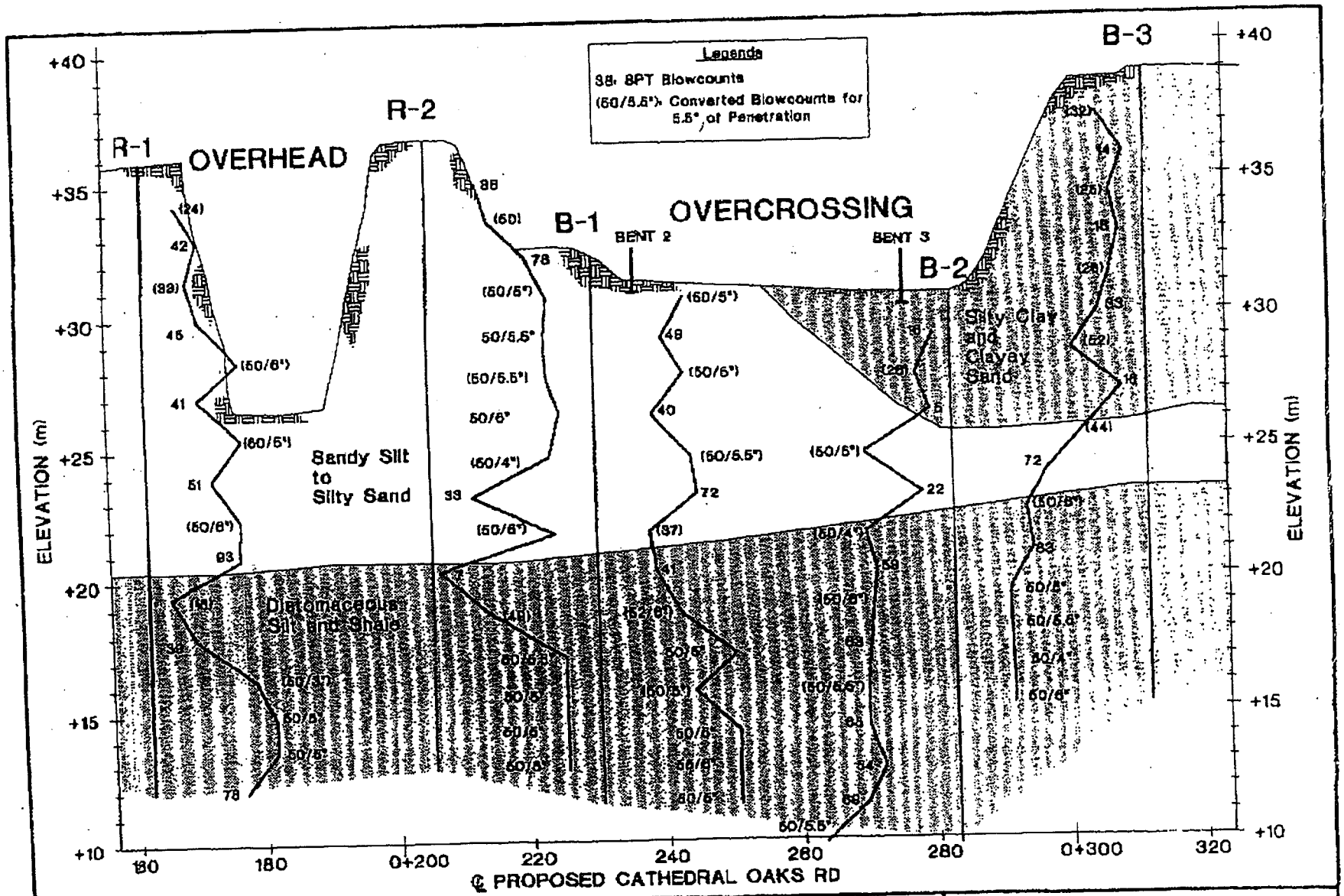


Figure 1

Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	CATHERAL OAKS/HOLLISTER OC AND OH		PROPOSED SOIL BORING LOCATIONS
	Project No. 97-157	Date: 10-24-97	



Earth Mechanics, Inc. Geotechnical and Earthquake Engineering	CATHEDRAL OAKS/HOLLISTER OC AND OH	GENERAL SUBSURFACE CONDITIONS
	Project No. 97-158 Date: 1-14-98	Figure 2

Foundation Review for Cathedral Oaks OC, Bridge No. 51-0331

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

Date: 7/30/08

To: **Structure Design**
1. Preliminary Report
2. R.E. Pending File
3. Specifications & Estimates
4. File

Cathedral Oaks OC
Structure Name

5 - SB - 101 - 42.3
District County Route Post Km

Geotechnical Services
1. GS (Sacramento)
2. GS

District Project Development
District Project Engineer

05 - 371501 51-331
E.A. Number Structure Number

Foundation Report By: R. Richman
Dated: 3/15/07

Reviewed By: J.D. Gramley (OSD) R. Price (GS)

General Plan Dated: 6/6/08
Foundation Plan Dated:

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

- ✓ Pile Types and Design Loads
- ✓ Pile Lengths
- ✓ Predrilling
- ✓ Pile Load Test
- ✓ Substitution of H Piles For Concrete Piles ☐ Yes ☐ No
- ✓ Footing Elevations, Design Loads, and Locations
- ✓ Seismic Data
- ✓ Location of Adjacent Structures and Utilities
- ✓ Stability of Cuts or Fills
- ✓ Fill Time Delay
- ✓ Effect of Fills on Abutments and Bents
- ✓ LOTB's
- ✓ Fill Surcharge
- ✓ Approach Paving Slabs
- ✓ Scour
- ✓ Ground Water
- ✓ Tremie Seals/Type D Excavation

Office of Structure Design Branch No. Geotechnical Services

Rev. 10/02

Foundation Review for Cathedral Oaks OH, Bridge No. 51C-0344

FOUNDATION REVIEW

DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES

To: **Structure Design**
1. Preliminary Report
2. ~~R.E. Pending File~~
3. Specifications & Estimates
4. ~~File~~

Geotechnical Services
1. GS (Sacramento)
2. GS

District Project Development
District Project Engineer

Date: 7/30/08

Cathedral Oaks OH
Structure Name

5 - SB - 101 - 42.3
District County Route Post Km

05-371-50011 5/c-344
E.A. Number Structure Number

Foundation Report By: R. Richman
Dated: 3/14/07

Reviewed By: J.D. Gramlay (OSD) R. Price (GS)

General Plan Dated: 5/8/08 Foundation Plan Dated: 4/28/06

☒ No changes. ☐ The following changes are necessary.

FOUNDATION CHECKLIST

- ✓ Pile Types and Design Loads
- ✓ Pile Lengths
- ✓ Predrilling
- ✓ Pile Load Test
- ✓ Substitution of H Piles For Concrete Piles ☐ Yes ☒ No
- ✓ Footing Elevations, Design Loads, and Locations
- ✓ Seismic Data
- ✓ Location of Adjacent Structures and Utilities
- ✓ Stability of Cuts or Fills
- ✓ Fill Time Delay
- ✓ Effect of Fills on Abutments and Bents
- ✓ LOTB's
- ✓ Fill Surcharge
- ✓ Approach Paving Slabs
- ✓ Scour
- ✓ Ground Water
- ✓ Tremie Seals/Type D Excavation

Office of Structure Design Branch No. Geotechnical Services

Rev. 10/02