ENVIRONMENTAL AUDIT, INC.®

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City of Huntington Beach

MAR 20 2007

March 19, 2007

Project No. 2523

First Christian Church - Huntington Beach
1207 Main Street
Huntington Beach, CA 92648

Attn: Mr. Norm Dyson

Subject: Air Quality Analysis for the Proposed Modifications to the First Christian Church - Huntington Beach

Mr. Dyson:

Environmental Audit, Inc (EAI) has been retained by the First Christian Church - Huntington Beach (FFC-HB) to prepare an air quality analysis of the proposed modifications to FFC-HB using the California Air Resources Board (CARB) modeling program URBEMIS 2002.

Project Description

The proposed project consists of modifications to FCC-HB that include:

- Demolition of four existing buildings (Church School, Children's Ministry, Youth Ministry, and Small Chapel);
- Removal of existing modular structures currently used for adult Sunday School classes;
- Construction of three new buildings (Children's Building, Multipurpose Building, and Administrative/Café Building);
- Renovation of Existing A-Frame Chapel;
- Expansion and renovation of the Worship Center's nursery and bathroom facilities;
- Construction of a new tower to serve as the Church's new focal feature;
- Landscape/Hardscape Improvements;
- Restriping of existing parking lot; and,
- Construction of a multi-level parking structure.

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Air Emission Estimate Basis

The proposed project has been scheduled in phases to allow for continued use of the campus while renovation occurs. The largest construction phase of the project will be the demolition of the existing Church School and Children's Ministry and construction of the replacement Children's Building. The operational changes of the facility will remain the same as current activities with the exception of an estimated 60 additional vehicle trips to the facility on a peak day. The air quality analysis has been performed on the largest phase of the project to evaluate the peak potential emissions from construction from the proposed project. The operational emissions evaluation for the proposed project is limited to the increases associated with the proposed project (i.e., additional vehicle trips as a result of the proposed project).

The CARB URBEMIS2002 model is designed to estimate air emissions from land use development projects. Both construction and operational emissions can be calculated using URBEMIS2002. Therefore, use of the URBEMIS2002 model (version 8.7) is appropriate for this project.

Construction Emissions

Construction emission estimates are based on a June 2007 start date and take four months to complete for the Children's Building. Construction equipment used during demolition of the existing structure and grading for the new structure is expected to be one small bulldozer (similar in size to a Caterpillar D4) and one backhoe. Construction equipment used during building construction is expected to be one forklift, one crane, two diesel-powered welding machines, and two electric manlifts. The equipment estimates are for the peak equipment usage day during the respective phases of the construction.

The URBEMIS2002 modeling results for construction are shown in Table 1. The results are below the South Coast Air Quality Management District (SCAQMD) emissions thresholds established for construction activities. The URBEMIS2002 model output is presented in Attachment A.

Operational Emissions

The operations at FCC-HB will remain unchanged with hot water and heat generation remaining the same following the proposed project. Landscaping maintenance activities are not expected to increase as a result of the proposed project. The Trip Generation Study prepared by Kimley-Horn and Associates, Inc. (dated March 7, 2007) identified a maximum increase in peak traffic of 60 trips. The operational emissions increase associated with traffic has been included in the URBEMIS 2002

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modeling. The results are presented in Table 2 and the URBEMIS2002 model output is presented in Attachment A. The results are below the SCAQMD emissions thresholds established for operational activities.

TABLE 1

PEAK CONSTRUCTION EMISSION ESTIMATES
(lbs/day)

Project Phase	ROG	NOx	CO	SO2	PM10	PM2.5[1]
Demolition	2.56	34.63	14.07	0.06	10.57	6.13
Grading	1.09	8.15	8.69	0.00	2.36	1.37
Construction	2.12	8.71	12.64	0.00	0.31	0.18
Peak Phase	2.56	34.63	14.07	0.06	10.57	6.13
SCAQMD Significance Threshold	75	100	550	150	150	55
Significant?	No	No	No	No	No	No

(1) PM2.5 fraction of PM10 calculated using Profile ID #391 (Road and Building Construction dust) from the SCAQMD PM10 to PM2.5 fraction file available at https://www.aqmd.gov/ceqa/handbook/PM2_5/pm2_5ratio.xls.

TABLE 2

PEAK OPERATIONAL EMISSION ESTIMATES
(lbs/day)

Activity	ROG	NOx	CO	SO2	PM10	PM2.5[1]
Traffic Increase	7.23	9.78	102.94	0.07	10.23	6.13
SCAQMD Significance Threshold	55	55	550	150	150	55
Significant?	No	No	No	No	No	No

(1) PM2.5 fraction of PM10 calculated using Profile ID #117 (Vehicular Sources - Gasoline) from the SCAQMD PM10 to PM2.5 fraction file available at https://www.aqmd.gov/ceqa/handbook/PM2_5/pm2_5ratio.xls.

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Conclusions

The construction and operational emissions calculated for the proposed project are not expected to exceed the establish SCAQMD emissions thresholds. Therefore, no further air quality analysis is required and the project is not expected to cause a significant impact to air quality.

Sincerely,

ENVIRONMENTAL AUDIT, INC.

Marcia Bav

Marcia Baverman, P.E.
Senior Engineer

cc: Art Cueto, Visioneering Studios

m:\mrb\2523\Air Quality Analysis Letter.doc

ATTACHMENT A

URBEMIS2002 Model Output

ATTACHMENT NO. 8.5

URBEMIS 2002 For Windows 8.7.0

File Name: D:\URBEMIS 2002\Projects2k2\2523 FCC-HB.urb
Project Name: 2523 FCC-HB
Project Location: South Coast Air Basin (Los Angeles area)
On-Road Motor Vehicle Emissions Based on EMFAC2002 version 2.2

SUMMARY REPORT
(Pounds/Day - Summer)

CONSTRUCTION EMISSION ESTIMATES

*** 2007 ***	ROG	NOx	CO	SO2	PM10 TOTAL	PM10 EXHAUST	PM10 DUST
TOTALS (lbs/day,unmitigated)	2.56	34.63	14.07	0.06	10.57	0.99	9.58

*** 2008 ***	ROG	NOx	CO	SO2	PM10 TOTAL	PM10 EXHAUST	PM10 DUST
TOTALS (lbs/day,unmitigated)	1.47	8.54	12.61	0.00	0.28	0.27	0.01

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day,unmitigated)	0.13	0.17	0.83	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day,unmitigated)	7.23	9.78	102.94	0.07	10.23

SUM OF AREA AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10
TOTALS (lbs/day,unmitigated)	7.37	9.95	103.77	0.07	10.24

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URBEMIS 2002 For Windows 8.7.0

File Name: D:\URBEMIS 2002\Projects2k2\2523 FCC-HB.urb
Project Name: 2523 FCC-HB
Project Location: South Coast Air Basin (Los Angeles area)
On-Road Motor Vehicle Emissions Based on EMFAC2002 version 2.2

DETAIL REPORT
(Pounds/Day - Summer)

Construction Start Month and Year: June, 2007
Construction Duration: 4
Total Land Use Area to be Developed: 0.8 acres
Maximum Acreage Disturbed Per Day: 0.2 acres
Single Family Units: 0 Multi-Family Units: 0
Retail/Office/Institutional/Industrial Square Footage: 17411

CONSTRUCTION EMISSION ESTIMATES UNMITIGATED (lbs/day)

Source	ROG	NOx	CO	SO2	PM10 TOTAL	PM10 EXHAUST	PM10 DUST
*** 2007***							
Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	9.45	-	9.45
Off-Road Diesel	1.06	8.11	7.87	-	0.36	0.36	0.00
On-Road Diesel	1.48	26.48	5.51	0.06	0.76	0.63	0.13
Worker Trips	0.02	0.04	0.69	0.00	0.00	0.00	0.00
Maximum lbs/day	2.56	34.63	14.07	0.06	10.57	0.99	9.58
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	2.00	-	2.00
Off-Road Diesel	1.06	8.11	7.87	-	0.36	0.36	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.03	0.04	0.82	0.00	0.00	0.00	0.00
Maximum lbs/day	1.09	8.15	8.69	0.00	2.36	0.36	2.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	1.44	8.70	12.24	-	0.30	0.30	0.00
Bldg Const Worker Trips	0.03	0.02	0.40	0.00	0.01	0.00	0.01
Arch Coatings Off-Gas	2.06	-	-	-	-	-	-
Arch Coatings Worker Trips	0.06	0.10	1.92	0.00	0.01	0.00	0.01
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	2.12	8.71	12.64	0.00	0.31	0.30	0.01
Max lbs/day all phases	2.56	34.63	14.07	0.06	10.57	0.99	9.58
*** 2008***							
Phase 1 - Demolition Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 2 - Site Grading Emissions							
Fugitive Dust	-	-	-	-	0.00	-	0.00
Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 3 - Building Construction							
Bldg Const Off-Road Diesel	1.44	8.52	12.24	-	0.27	0.27	0.00
Bldg Const Worker Trips	0.03	0.02	0.37	0.00	0.01	0.00	0.01
Arch Coatings Off-Gas	0.00	-	-	-	-	-	-
Arch Coatings Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Off-Gas	0.00	-	-	-	-	-	-
Asphalt Off-Road Diesel	0.00	0.00	0.00	-	0.00	0.00	0.00
Asphalt On-Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum lbs/day	1.47	8.54	12.61	0.00	0.28	0.27	0.01
Max lbs/day all phases	1.47	8.54	12.61	0.00	0.28	0.27	0.01

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Phase 1 - Demolition Assumptions
Start Month/Year for Phase 1: Jun '07
Phase 1 Duration: 0.6 months
Building Volume Total (cubic feet): 225000
Building Volume Daily (cubic feet): 22500
On-Road Truck Travel (VMT): 1251
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
1	Rubber Tired Dozers	40	0.590	8.0
1	Tractor/Loaders/Backhoes	79	0.465	8.0

Phase 2 - Site Grading Assumptions
Start Month/Year for Phase 2: Jun '07
Phase 2 Duration: 1.2 months
On-Road Truck Travel (VMT): 0
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
1	Rubber Tired Dozers	40	0.590	8.0
1	Tractor/Loaders/Backhoes	79	0.465	8.0

Phase 3 - Building Construction Assumptions
Start Month/Year for Phase 3: Jul '07
Phase 3 Duration: 10.2 months
Start Month/Year for SubPhase Building: Jul '07
SubPhase Building Duration: 10.2 months
Off-Road Equipment

No.	Type	Horsepower	Load Factor	Hours/Day
1	Cranes	190	0.430	8.0

Start Month/Year for SubPhase Architectural Coatings: Apr '07
SubPhase Architectural Coatings Duration: 1 months
SubPhase Asphalt Turned OFF

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AREA SOURCE EMISSION ESTIMATES (Summer Pounds per Day, Unmitigated)

Source	ROG	NOx	CO	SO2	PM10
Natural Gas	0.01	0.17	0.14	0	0.00
Hearth - No summer emissions					
Landscaping	0.10	0.00	0.69	0.00	0.00
Consumer Prdcts	0.00	-	-	-	-
Architectural Coatings	0.02	-	-	-	-
TOTALS(lbs/day,unmitigated)	0.13	0.17	0.83	0.00	0.00

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UNMITIGATED OPERATIONAL EMISSIONS

	ROG	NOx	CO	SO2	PM10
Elementary school	7.23	9.78	102.94	0.07	10.23
TOTAL EMISSIONS (lbs/day)	7.23	9.78	102.94	0.07	10.23

Does not include correction for passby trips.
Does not include double counting adjustment for internal trips.

OPERATIONAL (Vehicle) EMISSION ESTIMATES

Analysis Year: 2008 Temperature (F): 90 Season: Summer

EMFAC Version: EMFAC2002 (9/2002)

Summary of Land Uses:

Unit Type	Acreage	Trip Rate	No. Units	Total Trips
Elementary school		60.00 trips/1000 sq. ft.	17.41	1,044.66
			Sum of Total Trips	1,044.66
			Total Vehicle Miles Traveled	6,748.50

Vehicle Assumptions:

Fleet Mix:

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	55.00	1.60	98.00	0.40
Light Truck < 3,750 lbs	15.00	2.70	95.30	2.00
Light Truck 3,751- 5,750	16.20	1.20	97.50	1.30
Med Truck 5,751- 8,500	7.20	1.40	95.80	2.80
Lite-Heavy 8,501-10,000	1.10	0.00	81.80	18.20
Lite-Heavy 10,001-14,000	0.40	0.00	50.00	50.00
Med-Heavy 14,001-33,000	1.00	0.00	20.00	80.00
Heavy-Heavy 33,001-60,000	0.90	0.00	11.10	88.90
Line Haul > 60,000 lbs	0.00	0.00	0.00	100.00
Urban Bus	0.20	0.00	50.00	50.00
Motorcycle	1.70	76.50	23.50	0.00
School Bus	0.10	0.00	0.00	100.00
Motor Home	1.20	8.30	83.30	8.40

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	11.5	4.9	6.0	10.3	5.5	5.5
Rural Trip Length (miles)	11.5	4.9	6.0	10.3	5.5	5.5
Trip Speeds (mph)	35.0	40.0	40.0	40.0	40.0	40.0
% of Trips - Residential	20.0	37.0	43.0			
% of Trips - Commercial (by land use)						
Elementary school				20.0	10.0	70.0

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Changes made to the default values for Land Use Trip Percentages

Changes made to the default values for Construction

The user has overridden the Default Phase Lengths
Architectural Coatings: # ROG/ft2 (residential) changed from 0.0185 to 0.0013
Architectural Coatings: # ROG/ft2 (non-res) changed from 0.0185 to 0.0013
Phase 2 mitigation measure Soil Disturbance: Watering 3x per day
has been changed from off to on.

Changes made to the default values for Area

The landscape year changed from 2005 to 2008.
The residential Arch. Coatings ROG emission factor changed from 0.0185 to 0.0013.
The nonresidential Arch. Coatings ROG emission factor changed from 0.0185 to 0.0013.

Changes made to the default values for Operations

The operational emission year changed from 2005 to 2008.

ATTACHMENT NO. 8.12

KFM
GEOSCIENCE

Geotechnical Engineering • Engineering Geology

Geotechnical Engineering Report

First Christian Church

1207 Main Street
Huntington Beach, California

Prepared for:

First Christian Church
c/o Visioneering Studio.
5 Peter Canyon Road, #330
Irvine, CA 92606

Prepared by:

KFM GeoScience
1360 Valley Vista Drive
Diamond, California 91765

January 24, 2007
Project No. BUN 06-02E

ATTACHMENT NO. 9.1

KFM
GEOSCIENCE

Project No. BUN 06-02E
January 24, 2007

First Christian Church
c/o Mr. Art Cueto
Visioneering Studios
5 Peter Canyon Road, #330
Irvine, CA 91732

Subject: **Geotechnical Engineering Report**
First Christian Church
1207 Main Street
Huntington Beach, California

Dear Mr. Cueto:

KFM GeoScience (KFMg) is pleased to submit the results of our geotechnical investigation at the subject site. The purpose of this study was to evaluate the subsurface conditions and provide recommendations for the design and construction of the proposed construction of 4 new buildings, addition to the existing chapel, reconfiguration of parking, additional appurtenances, landscaping, and in the future planned at-grade parking structure at the First Christian Church campus in Huntington Beach. The results of the geotechnical field explorations and laboratory tests are presented herein.

The recommendations provided within are based on our current understanding of the proposed project. Once the project configuration is finalized and the design is complete, KFMg should review the plans and specifications to evaluate if the geotechnical design recommendations remain appropriate and have been incorporated as intended.

We appreciate the opportunity to provide our professional services on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
KFM GeoScience

CERTIFIED ENGINEERING GEOLOGIST
EDWARD H. SABINS
No. EG 1571
Exp. 8-31-07
STATE OF CALIFORNIA

Edward Sabins, C.E.G. 1571
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
PETER SKOPEK
GE 2635
EXP. 06/30/07
GEOTECHNICAL
STATE OF CALIFORNIA

Peter Skopek, Ph.D., G.E. 2635
Principal Engineer

Filename: 1st Christian Church - Huntington Beach RPT
Distribution: (4) Addressee

ATTACHMENT NO. 9.2

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ATTACHMENT NO. 9.3

Aerial photo of project site, located on Main Street

1. INTRODUCTION

This report presents the results of KFM GeoScience's (KFMg) geotechnical engineering evaluation for the proposed additions and improvements to the First Christian Church Campus in Huntington Beach. The present layout of the subject project is shown on the aerial photo above. The regional site location is shown in Figure 1 – Site Location Map.

The purpose of this study was to evaluate the subsurface conditions at the site and to provide recommendations for the design and site grading of the proposed construction. This report summarizes the data collected and presents the findings, conclusions, and recommendations. This study was performed in accordance with KFMg's proposal dated December 1, 2006.

2. SCOPE OF SERVICES

KFMg's scope of services for this project consisted of the following tasks:

- Review of readily available background data, including in-house geotechnical data, geotechnical literature, geologic maps, and seismic hazard maps relevant to the subject site.

- A site reconnaissance to observe the site surficial conditions and to mark boring locations.

- A subsurface evaluation, including the excavating, logging, and sampling of 5 exploratory borings to depths of up to approximately 46 feet below the existing grade. Soil samples obtained from the borings were transported to a geotechnical laboratory for further visual classification and testing.

- Laboratory testing on selected soil samples to evaluate geotechnical engineering properties of the on-site soils.

- Engineering evaluation of the collected geotechnical data to develop geotechnical recommendations for the design and construction of the proposed residential development, including the following items:

  - Evaluation of general subsurface conditions and description of types, distribution, and engineering characteristics of subsurface materials.
  - Evaluation of geologic hazards, including liquefaction and seismic settlement potential and recommendations for appropriate mitigation measures.
  - Evaluation of general groundwater conditions and potential impact on design and construction.
  - Provision of seismic parameters as per UBC/CBC.
  - Provision of general evaluation of project feasibility and suitability of on site soils for foundation and fill support.
  - Provision of geotechnical recommendations for design of foundations.
  - Provision of geotechnical recommendations for design of site flatwork and appurtenant structures.
  - Provision of drainage and subdrainage recommendations.
  - Provision of retaining wall design recommendations.
  - Preliminary design of asphalt pavement sections.
  - Evaluation of suitability of on-site soils for backfill including evaluation of the corrosion potential of the on-site materials.

- Preparation of this report, including reference maps and graphics, summarizing the collected data and presenting the findings, conclusions, and geotechnical recommendations for the design and construction of the proposed project.

3. PROPOSED DEVELOPMENT AND SITE DESCRIPTION

The project site is located in a residential area of Huntington Beach on the southwest corner of Adams Street and Main Street. More specifically, the site is bordered by 17th Street to the northwest, Adams Street to the Northeast, Main Street to the east, 14th Street to the southeast, Loma Avenue and San Nicolas Circle to the south, and office buildings to the southwest. The site is essentially flat with gentle gradient sloping down to the northeast.

The project will consist of 4 new buildings, addition to the existing chapel, reconfiguration of parking, additional appurtenances, landscaping, and in the future planned at-grade parking structure in the southwest corner of the site. The site is presently occupied by a chapel, main sanctuary, and several administration buildings and preschool classroom. With the exception of the chapel and main sanctuary, the existing buildings will be removed to be replaced with the new construction.

A new multi-purpose building is planned at the location of the existing pre-school. New pre-school classrooms will be constructed at the site of current portable classrooms, and a new administration building will be constructed in the northeast parking lot.

The site was previously subject to geotechnical investigation performed by Soils International and the findings were summarized in a report entitled "Report – soils And Foundation Investigation – Proposed New Sanctuary – First Christian Church – 1207 Main Street, Huntington Beach, California", project S-0492-F dated October 11, 1979. This report was reviewed as a part of the scope of this study.

4. FIELD EXPLORATIONS AND LABORATORY TESTING

4.1. Field Explorations

The field investigation was performed on December 20, 2006, and consisted of excavating 5 borings as outlined in the following table:

Table 1
Field Borings Summary

Boring Identification	Approximate Depth	Objective
B-4	46 feet	Liquefaction potential and foundation design
B-1, -2, -3, & -5	31.5 feet	Foundation design

The borings were excavated using a CME-75 rig with an 8-inch diameter hollow stem auger. The approximate locations of the borings are presented on Figure 2 – Borehole Location Plan. The borings were observed by a KFMg field geologist, who logged the borings and obtained soil samples. Relatively undisturbed soil samples were collected using a Modified California Sampler and disturbed samples were collected from a Standard Penetration Test (SPT) sampler tube. The samples were collected by driving the sampler using an auto-trip hammer. In addition, bulk samples of selected materials were collected in plastic bags. During the logging, the description of the material type, color, moisture, grain size, density/consistency, and other pertinent geologic characteristics were recorded. Following completion of each boring, the borehole was backfilled with cuttings tamped periodically with the downhole hammer. Logs of Borings B-1 through B-5 are presented in Appendix A.

Prior to performing the field exploration program, a site reconnaissance was conducted to observe site surface conditions and to mark the locations of the planned borings. As required by the law, Underground Service Alert was notified of the locations of the exploratory excavations more than 48 hours prior to drilling.

4.2. Laboratory Testing

Laboratory tests were performed on selected samples obtained from the borings in order to aid in the soil classification and to evaluate the engineering properties of the foundation soils. The following tests were performed:

- In-situ moisture content and dry density;
- Grain size distribution;
- Plasticity (Atterberg Limits);
- Compressibility of undisturbed samples;
- Expansion potential;
- Soluble sulphates content; and
- Corrosion potential.

Testing was performed in general accordance with applicable ASTM standards and California Test Methods. The moisture content and density data are presented on the borehole logs in Appendix A. The remaining laboratory test results are presented in Appendix B. Details of the laboratory testing program are also included in Appendix B.

5. SITE AND SUBSURFACE CONDITIONS

Soil materials encountered during the subsurface explorations consisted of localized minor fill overlying native alluvial soils. Generalized descriptions of the encountered units are provided below. More complete descriptions of the soil conditions encountered are presented on the boring logs in Appendix A.

5.1. Fill

Apparent fill material was encountered in boring B-4. The fill soil consisted of medium dense, medium brown sandy silt, slightly moist, containing brown topsoil and siltstone fragments. As observed in the boring, the fill depth was 5.5 feet below the existing grade.

5.2. Native Terrace Deposits

Except for the occurrence of fill noted above, native terrace deposits typical to the project area were observed in all borings from the ground surface to the terminated depth of the borings. The terrace deposits consisted primarily of interlayered, loose to medium dense moist silty sand, sandy silt, and sand.

Localized stiff to hard silty/sandy clay zones up to several feet thick were encountered at various depths in borings B-1 and B-4 and at a depth of approximately 30 feet in borings B-2 and B-3.

5.3. Groundwater

Groundwater or seepage was not observed in the exploratory borings with the exception of B-4 where groundwater was encountered in the dense to very dense silty sand interval at a depth of about 40 feet. Groundwater was similarly encountered at depths of 44 and 48 feet in 2 borings performed by Soils International in 1979. However, it should be recognized that groundwater levels may fluctuate due to seasonal variations, rainfall, irrigation, or other factors.

Mapping by the State of California for the Seal Beach Quadrangle indicates that the historically high groundwater level at the site is estimated to have been approximately 50 feet below the ground surface (California Department of Conservation, Division of Mines and Geology, 1998). It is our opinion that the groundwater encountered in the boring was likely perched on a localized clayey zone.

6. ENGINEERING SEISMOLOGY

6.1. General Seismic Setting

The Southern California region is known to be seismically active. Earthquakes occurring within approximately 60 miles of the site are generally capable of generating ground shaking of engineering significance to the proposed construction. The project area is located in the general proximity of several active and potentially active faults. Active faults are defined as those that have experienced surface displacement within Holocene time (approximately the last 11,000 years).

The closest active faults to the site are the Newport-Inglewood Fault, located approximately 1 km to the north, the Palos Verdes Fault, located approximately 17 km to the southwest, and the Whittier Fault, located approximately 31 km northeast of the site. The San Andreas Fault is mapped about 84 km to the northeast of the site.

Notable damaging earthquakes in the project region include: the 1994 magnitude M6.7 Northridge earthquake and the 1987 magnitude M5.9 Whittier Narrows earthquake, both on blind thrust faults (low angle faults that are not expressed at the ground surface); the 1971 magnitude M6.4 San Fernando earthquake which occurred on the San Fernando fault (the easternmost fault of the Sierra Madre system); the 1933 magnitude M6.3 Long Beach earthquake on the Newport Inglewood fault; and the 1857 magnitude M7.9 Fort Tejon earthquake on the south central segment of the San Andreas fault.

6.2. Seismic Hazards

The engineering seismology study for the subject site included reviewing local and regional faulting maps and the review of historical earthquake data. Specifically, the following engineering seismology issues were addressed:

6.3. Potential for Surface Fault Rupture

Official Maps of Earthquake Fault Zones were reviewed to evaluate the location of the project site relative to active fault zones. Earthquake Fault Zones (known as Special Studies Zones prior to 1994) have been established in accordance with the Alquist-Priolo Special Studies Zones Act enacted in 1972. The Act directs the State Geologist to delineate the regulatory zones that encompass surface traces of active faults that have a potential for future surface fault rupture. The purpose of the Alquist-Priolo Act is to regulate development near active faults in order to mitigate the hazard of surface fault rupture.

Based on the review of the Seal Beach Quadrangle maps, the site is not located within a designated Alquist-Priolo Earthquake Fault Zone for fault surface rupture hazard. The surface traces of any active or potentially active faults are not known to pass directly through or project towards the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

6.4. Seismic Hazard Zones

Maps of seismic hazard zones are issued by the California Geological Survey (formerly California Department of Conservation, Division of Mines and Geology) in accordance with the Seismic Hazards Mapping Act enacted in April 1997. The intent of the Seismic Hazards Mapping Act is to provide for a statewide seismic hazard mapping and technical advisory program to assist cities and counties in developing compliance requirements to protect the public health and safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure and other seismic hazards caused by earthquakes.

Based on the Seismic Hazard Zone Report 011 – Seismic Hazard Zone Report for the Seal Beach 7.5-minute Quadrangle, Los Angeles and Orange Counties, California (1998), the proposed development is not located within an area identified by the State of California as subject to the hazard of liquefaction or earthquake-induced landslides.

An evaluation of the liquefaction potential and dynamic settlement potential is discussed in following section of this report.

6.5. Liquefaction and Dynamic Settlement Potential

Liquefaction is a phenomenon wherein a saturated or near-saturated mass of soil looses a large percentage of its shear resistance when subject to monotonic, cyclic, or shock loading, and flows in a manner resembling a liquid until the shear stresses acting on the mass are as low as the reduced shear strength. Liquefaction of soils can be caused by ground shaking during earthquakes. Research and historical data indicate that loose, relatively clean granular soils are susceptible to liquefaction and dynamic settlement, whereas the stability of the majority of clayey silts, silty clays and clays is not adversely affected by ground shaking.

Due to the lack of groundwater and the dense to very dense state of the on site granular materials within the depth of liquefaction significance, the potential for liquefaction and its adverse effects impacting the site is considered negligible.

Dynamic settlement occurs due to soil densification during cyclic or shock loading, typically due to earthquake shaking, and can occur in dry sands or, as a consequence of liquefaction, in saturated sands.

Due to the absence of propensity to liquefaction, liquefaction-induced settlement is not expected at the site. However, localized loose to medium dense on-site granular soils encountered in borings B-1 and B-4 may be subject to earthquake-induced settlement. The potential for earthquake-induced settlement of dry soils was calculated according to the procedures outlined in Pradel (1998a, and 1998b). Based on the SPT blowcount data and the thickness of the layers, the earthquake-induced settlement of localized on-site dry materials was calculated to be less than 0.25 inch.

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Based on the above analyses, no special design considerations for mitigation of liquefaction, liquefaction effects, or earthquake induced settlements are deemed necessary.

6.6. Seismic Accelerations

In order to evaluate the potential ground accelerations probabilistic analyses were performed for the design basis earthquake (DBE) which is defined by the 2001 California Building Code as a seismic event having ground acceleration with a 10 percent probability of exceedance in 50 years, which corresponds to an average return period of approximately 475 years. The DBE ground motion is estimated to be 0.42g and the associated de-aggregated predominant earthquake magnitude is Mw6.9 at a distance of 2 kilometers.

7. DESIGN RECOMMENDATIONS

7.1. General

Based on the results of the field explorations and engineering analyses, it is KFMg's opinion that the proposed construction is feasible from a geotechnical standpoint, provided that the recommendations contained in this report are incorporated into the design plans and implemented during construction. The foundations of the proposed expansion structure may be supported on shallow footings established in engineered fill or competent native terrace deposits.

Observations and laboratory tests indicate that the near-surface on-site soils have a very low expansion potential, negligible levels of water-soluble sulfates, and a moderate corrosion potential to ferrous metals.

The design recommendations presented below are based on KFMg's current understanding of the project. Once the project configuration is finalized and the design is complete, KFMg should review the plans and specifications to evaluate if the geotechnical design recommendations have been incorporated as intended.

7.2. Clearing

The surface should be cleared of any existing structures, pavement, flatwork, vegetation, trash and debris prior to commencement of the earth work. Any encountered subterranean installations such as pipes, utility collectors, tanks, etc. should be abandoned in accordance with applicable regulations.

7.3. Site Preparation

In order to create a uniform bearing condition for the proposed construction, the following site subgrade preparation is recommended:

- Building/floor slab areas located on the native terrace deposits should be overexcavated to a depth of 2.5 feet below the bottom of the floor slab or 1.5 foot below the bottom of the footings or to competent native soils, whichever is deeper. Deeper excavation to a depth of at least approximately 5 feet below the existing grade will be required to remove undocumented fill soils encountered in the boring B-4 in the general area of the proposed multi-purpose building. The excavations should extend a horizontal distance of at least 5 feet beyond the outside perimeter of the structure. It is likely that deeper overexcavation will be locally required due to ground disturbance due to removal of existing structures and localized unsuitable subgrade conditions.

- Lightly loaded ancillary structures areas (e.g., site walls, trash enclosures, small retaining walls) should be overexcavated to a depth of at least 1 foot below the bottom of the proposed footing or to competent soils, whichever is deeper. The excavation should extend a horizontal distance of at least 2 feet beyond the outside perimeter of the structure.

- Pavement and flatwork areas should be overexcavated to a depth of at least 1 foot below the proposed pavement subgrade elevation.

- Disturbance of native soils at structural areas will likely occur after clearing the site. Disturbed native soils should be excavated and replaced as compacted fill to the total depth of the disturbed material.

The subgrade soils exposed during excavation should be scarified to a depth of 6 inches, moisture-conditioned to at least optimum moisture contents, and compacted to at least 90 percent of the maximum dry density, as evaluated by the latest version of ASTM D1557. Although not anticipated, if localized zones of loose and/or unstable soils are encountered during the grading operations at the subgrade level that are not practical to be excavated and processed, Table 1 provides options for stabilizing the subgrade. The specific type of remediation and associated area limits will need to be evaluated in the field by a representative of KFMg.

Table 2
Options for Handling Unstable Materials at the Excavated Subgrade

Areas where the soils are soft and/or unstable at the excavation subgrade	• Place non-woven geotextile, Mirafi 180N or equivalent, over the exposed soil. • Place and compact fill over the geotextile.
Areas where the soils are excessively soft and/or unstable	• Place at least 6 inches of aggregate base or crushed rock or similar over the exposed soil; only reasonably achievable compaction is required. • Place non-woven geotextile, Mirafi 180N or equivalent, over the aggregate base. • Place and compact fill over the geotextile.
Larger areas where the soils are excessively soft and/or unstable	• Place non-woven geotextile, Mirafi 180N or equivalent, over the exposed soil. • Place at least an 18-inch-thick layer of 1-inch or ¾-inch crushed rock or gravel; only reasonably achievable compaction is required. • Place non-woven geotextile, Mirafi 180N or equivalent, over the aggregate layer. • Place and compact fill over the geotextile.

All fill placement associated with the replacement of the overexcavated soils, fill placed to achieve finish grade or subgrade, or utility trench backfill should be moisture-conditioned to at least optimum moisture content and compacted to at least 90 percent of the maximum dry density, as evaluated by the latest version of ASTM D1557. The upper 1 foot of soils below pavements and any flatwork should be processed and compacted to at least 95 percent of the maximum dry density.

The on-site soils may be re-used as compacted fill provided they are free of organics, deleterious materials, debris and particles over 3 inches in largest dimension. Particles up to 6 inches in largest dimension may be incorporated in the fill soils based on specific approval and placement recommendations provided by the KFMg during grading.

In the event that any soil materials (including backfill or base course materials) are imported to the site, such soils should be sampled, tested, and approved by KFMg prior to arrival on-site. In general, any soils imported to the site for use as fill should be predominantly granular and have an Expansion Index less than 20. Additional recommendations for site grading are provided in the "General Grading Recommendations" section of this report.

7.4. Temporary and Trench Excavations

The on-site soils are not expected to pose unusual excavation difficulties, and therefore, conventional earth-moving equipment may be used. However, sloughing/raveling of exposed soil intervals in new vertical cuts should be anticipated.

All trench excavations should be performed in accordance with CalOSHA regulations. The on-site soils may be considered a Type C soil, as defined the current CalOSHA soil classification. All applicable excavation safety requirements and regulations, including CalOSHA requirements, should be met.

Unsurcharged excavations: Temporary short-term (generally less than 5 days) unsurcharged excavations shallower than 4 feet may be excavated with vertical sides. Sides of temporary, unsurcharged, excavation deeper than 4 feet should be sloped back at an inclination of 1.5(H):1(V) or flatter. Where space for sloped sides is not available, shoring will be necessary. This office can provide appropriate shoring recommendations, once the excavation layout is known.

Surcharge setback recommendations: Stockpiled (excavated) materials should be placed no closer to the edge of a trench excavation than a distance defined by a line drawn upward from the bottom of the trench at an inclination of 1(H):1.5(V), but no closer than 4 feet. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. KFMg should be advised of such heavy vehicle loadings so that specific setback requirements can be established for the used equipment. Alternatively, a shoring system may be designed to allow reduction in the setback distance.

Personnel from KFMg should observe the excavation progress so that appropriate modifications to the excavation design may be recommended, if necessary due to encountered conditions differing from the design assumptions.

7.5. Foundations

The foundations for the proposed development may be supported on shallow footings established in compacted fill or competent native terrace deposits. Recommendations for the design and construction of shallow foundations are presented below.

7.5.1. Design Parameters

Shallow foundations should be designed using the geotechnical design parameters presented in Table 3. Footings should be designed and reinforced in accordance with the recommendations of the structural engineer and should conform to the 2001 California Building Code.

Table 3
Geotechnical Design Parameters
Continuous and Isolated Spread Footing Foundations

Foundation Dimensions	• At least 18 inches in width • At least 24 inches below the lowest adjacent grade
Net Allowable Bearing Capacity	• 3,000 pounds per square foot (psf) • The allowable bearing value may be increased by one-third for transient live loads from wind or seismicity.
Estimated Settlement	• Approximately 1-inch total settlement • Approximately 0.5-inch differential settlement over 20 feet • Approximately 0.75-inch differential settlement over the building length
Allowable Coefficient of Friction	• 0.40
Allowable Lateral Passive Resistance	• 180 pounds per cubic foot equivalent fluid pressure (pcf EFP)

The total allowable lateral resistance can be taken as the sum of the friction resistance and passive resistance. The passive resistance values may be increased by one-third when considering wind or seismic loading.

Footings should be designed and reinforced in accordance with the recommendations of the Structural Engineer and should conform to the requirements of the 2001 California Building Code.

7.5.2. Footing Observations

To evaluate the presence of satisfactory materials at design elevations, footing excavations should be observed to be clean of loosened soil and debris before placing steel or concrete and probed for soft areas. If soft or loose soils or other unsatisfactory materials are encountered, such materials should be removed and replaced with compacted fill prior to pouring the footing.

7.6. California Building Code Seismic Design Parameters

The seismic design of the project may be performed using criteria presented in the 2001 California Building Code, Volume 2, Chapter 16A, Divisions IV and V, using seismic design parameters described in Table 4.

Table 4
2001 California Building Code Seismic Design Parameters

2001 CBC Seismic Design Factor	Value
Seismic Zone	4
Soil Profile Type	S_D
Seismic Source / Type*	Newport-Inglewood Fault / Type B
Distance to Source	< 2 km

*Faults are designated as Type A, B or C, depending on maximum moment magnitude and slip rates (Table 16A-U of 2001 California Building Code).

7.7. Concrete Slabs-On-Grade

The recommendations provided in the "Site Preparation" section of this report and in this section are intended to help reduce the occurrence of cracks and fissures in concrete and to limit their horizontal separation and vertical offset. However, it should be understood that the concrete slabs may still crack due to structural design or detailing, curing, or construction execution even when these recommendations are implemented. If cracking of the concrete is desired to be minimized, the reinforcement, concrete mix, and curing specifications should be designed by the Structural Engineer and Concrete Specialist.

7.7.1. Floor Slabs

For design of concrete slabs, a modulus of subgrade reaction (k) of 200 pounds per cubic inch may be used. Floor slabs should be designed and reinforced in accordance with the Structural Engineer's recommendations. The minimum reinforcement to reduce separation and offset of potential concrete cracks should consist of No. 4 reinforcing bars spaced at 16 inches on-center, each way, placed in the middle one-third of the section. Reinforcement should be properly placed and supported on "chairs." Welded wire mesh reinforcement is not recommended. To reduce potential for vapor transmission through the slabs, it is recommended that the concrete have a thickness of at least 4 inches, water cement ratio of 0.50 or less, and a slump of 4 inches or less. Table 5 provides alternatives for control of vapor transmission through concrete floor slab support placed on a properly prepared subgrade. The appropriate level of protection should be selected by the Owner and/or the Architect based on the sensitivity of the floor covering and the intended use of the building.

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Table 5
Geotechnical Recommendation
Alternatives for Control of Vapor Migration through Concrete Slab

Objective	Recommendation
"Best" protection against vapor intrusion	• Concrete floor slab-on-grade placed directly on a plastic membrane 10 mils in thickness[1] (ACI 302.1R-96). • The membrane should be placed on at least 2 inches of dry silty sand[2]. • The dry silty sand should be separated from the underlying capillary break layer by non-woven geotextile, Mirafi 140N or equivalent. • The geotextile should be placed on at least 4 inches of ¾-inch crushed rock[3] or clean gravel[4] to act as a capillary break.
"Better" protection against vapor intrusion	• Concrete floor slab-on-grade placed directly on a plastic membrane 10 mils in thickness[1] (ACI 302.1R-96). • The membrane should be placed on at least 2 inches of silty sand[2].
Standard protection against vapor intrusion	• 2 inches of dry silty sand[2]; • placed over plastic membrane 8 mils in thickness. • The membrane should be placed on place at least 2 inches of silty sand[4].

[1] If additional protection is desired, the plastic membrane may be replaced with a 10-mil thick moisture vapor retarder that meets the requirements of ASTM E 1745 Class C (for example, Stego Wrap or similar).
[2] The silty sand should have a gradation between approximately 15 and 35 percent passing the No. 200 sieve and a plasticity index (PI) of less than 4.
[3] The ¾-inch crushed rock should conform to Section 200-1.2 of the latest edition of the Standard Specifications for Public Works Construction (Greenbook).
[4] The gravel should contain less than 10 percent of material passing the No. 4 sieve and less than 3 percent passing the No. 200 sieve.

All underslab materials should be adequately compacted prior to the placement of concrete. The materials should be dry/moist and not be wetted or saturated prior to the placement of concrete. Care should be taken during placement of the concrete to prevent displacement of the underslab materials. The concrete slab should be allowed to cure properly prior to placing vinyl or other moisture-sensitive floor covering.

7.7.2. Exterior Slabs

Exterior slabs should be placed on subgrade prepared in accordance with the recommendations provided in the "Site Preparation" section of this report. As indicated above, Structural Engineer and Engineer specialized in concrete design should be consulted if cracking of the exterior slabs should be minimized. As a minimum for exterior walkways, it is recommended that narrow strip concrete slabs, such as sidewalks, be reinforced with at least No. 3 reinforcing bars placed longitudinally at 36 inches on center. Wide exterior slabs should be reinforced with at least No. 3 reinforcing bars placed 36 inches on center, each way. The reinforcement should be extended through the control joints to reduce the potential for differential movement. Control joints should be constructed in accordance with recommendations from the Structural Engineer and Architect.

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7.8. Retaining Walls

7.8.1. Retaining Wall Design

No specific configurations or locations of retaining walls were provided for the preparation of this report. Consequently, the following recommendations are provided for a general retaining wall less than 6 feet in height. Such a retaining wall may be supported on spread footings constructed in accordance with the "Site Preparation" and "Foundations" sections of this report. The lateral retaining wall loading and soil resistance should be calculated based on the recommendations presented in Table 6. Design values are provided for both the active and at-rest conditions for level backslope and assume that a drainage system will be installed behind the wall, so that external water pressure will not develop. If a drainage system is not installed, the wall should be designed to resist also the hydrostatic pressure.

Table 6
Geotechnical Design Parameters
Geotechnical Design Parameters for Retaining Walls

Level Backslope Condition	
Lateral ***at-rest*** pressure (psf)	60 z + 0.50 Q
Lateral ***active*** pressure (psf)	40 z + 0.34 Q
Allowable lateral ***passive*** resistance	180 pcf EFP

where: z.... Depth below the grade behind the wall (ft)
Q.... Uniform surcharge load (psf) within a 1(H):1(V) plane drawn upward from the heel of the wall footing

Determination of whether the active or at-rest condition is appropriate for design will depend on the flexibility of the walls. Walls that are free to rotate at least 0.001 radians (deflection at the top of the wall of at least 0.001 x H) may be designed for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition. The effect of any surcharge (dead or live load) located within a 1(H):1(V) plane drawn upward from the heel of the wall footing should be added to the lateral earth pressures.

7.8.2. Retaining Wall Backfill and Drainage

It is expected that approved select on-site material may be suitable as the backfill behind the retaining wall. Alternatively, an approved import material may be used for the backfill. Suitable material should have a Sand Equivalent of about 30, an Expansion Index of less than 20, and fines content (passing #200 sieve) of less than 15 percent. However, the suitability of the on-site and/or import material for retaining wall backfill must be verified at the time of construction.

If the surrounding native materials are granular and relatively permeable, the granular backfill may densified by water jetting. Otherwise the backfill should be moisture-conditioned to at least optimum moisture content and compacted in loose horizontal lifts not more than 8 inches in uncompacted thickness to at least 90 percent of the maximum dry density as evaluated by the latest version of ASTM D1557. The backfill should be capped with a concrete swale/slab or with at least 12 inches of relatively impervious clayey material and sloped to prevent ponding of water.

Retaining walls should be constructed to limit potential for hydrostatic pressure built-up behind the wall. If irrigation or precipitation infiltration is expected, adequate drainage is essential to provide a free-drained backfill condition to limit hydrostatic buildup behind the wall. If control of efflorescence on the air side of the wall is desired, the wall should be appropriately waterproofed. Adequate drainage and waterproofing behind the wall may be provided by a backdrain consisting of geosynthetic drainage composite such as TerraDrain, MiraDrain, or approved equivalent, placed against the entire backside of the wall. The drainage composite should be connected to a 4-inch-diameter perforated ABS or PVC Schedule 40 drain pipe, or approved equivalent. The drain pipe should be sloped at least 2 percent and surrounded by 1 cubic foot per foot of the Class II Permeable Material (Caltrans Standard Specifications - Section 68), or by of ¾-inch crushed rock (Standard Specification for Public Works Construction ("Greenbook") - Section 200-1.2) wrapped in suitable non-woven filter fabric, e.g., Mirafi 140NL or approved equivalent. Perforations in the drain pipe should have a maximum diameter of 0.25 inches or ⅜ inches for Class 2 Permeable or ¾-inch crushed rock drain material, respectively, spaced 3 inches on center, and be arranged in 2 rows at a radial spacing of approximately 120 degrees. The axis of the included angle between the perforation rows should be positioned downward to form a flowline. The drain pipe should discharge through a solid pipe to appropriate outlets, such as the storm drain system or through the wall. The maximum length of the drain pipe between discharge outlets should not exceed 200 feet. Alternatively, weep holes through the wall, at least 3-inchches in diameter, spaced no more than 10 feet apart may be considered.

7.9. Asphalt Concrete Pavement

7.9.1. Subgrade Preparation

The pavement subgrade should be prepared, scarified and compacted just prior to placement of the base course. Positive drainage of the pavement and pavement subgrade areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Curbing located adjacent to paved areas should be founded in the compacted subgrade soils, not the aggregate base, in order to provide a cutoff, which reduces water infiltration from adjacent irrigated parkways into the base course.

7.9.2. Pavement Design

The required pavement surface and base thicknesses will depend on the expected wheel loads and volume of traffic (TI, Traffic Index). Assuming that the pavement subgrade will consist of the on-site or comparable soils compacted as recommended, pavement structural sections provided in Table 7 may be used for design.

Table 7
Geotechnical Recommendation
Asphalt Concrete Pavement Structural Sections

Typical Traffic Use	Design Traffic Index	Asphalt Concrete (inches)	Base Course (inches)
Parking / driveways	3	3.0	4.2
Light duty	4.5	3.0	4.2
Fire lanes	6	3.5	7.5

The pavement structural sections were established using the design criteria of the State of California, Department of Transportation, an estimated design, R-value of 30, and the assumed Traffic Indices as indicated. Confirmatory R-value tests on the exposed subgrade soils during grading will be required to verify the recommended design sections.

The base course should meet the specifications for Class II Aggregate Base as defined in Section 26 of the State of California, Department of Transportation, Standard Specifications, current edition. Alternatively, the base course could meet the specifications for untreated base materials as defined in Section 200-2 of the current edition of the Standard Specifications for Public Works Construction ("Greenbook"). The base course should be compacted to at least 95 percent of the maximum dry density (ASTM D1557).

7.9.3. Pavement Construction Observation

The preparation of the pavement subgrade and the placement of the pavement section should be observed by KFMg personnel. Careful observation is recommended to evaluate that the pavement subgrade is uniformly compacted and the recommended pavement and base course thicknesses are achieved, and that good construction procedures are used.

7.10. Drainage Control

The intent of this section is to provide general information regarding the control of surface water. The control of surface water is essential to the satisfactory performance of any building construction and site improvements. Surface water should be controlled so that conditions of uniform moisture are maintained beneath the structure, even during periods of heavy rainfall. The following recommendations are considered minimal.

- Ponding and areas of low flow gradients should be avoided.
- Paved surfaces should be provided with a gradient of at least 1 percent sloping away from improvements.

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- Unpaved areas, e.g., lawn, should be provided with a drainage gradient of at least 2 percent away from structures.
- Bare soil, e.g., planters, within 5 feet of the structure should be sloped away from the improvement at a gradient of 5 percent.
- Positive drainage devices, such as graded swales, paved ditches, and/or catch basins should be employed to accumulate and to convey water to appropriate discharge points.
- Concrete walks and flatwork should not obstruct the free flow of surface water.
- Brick flatwork should be sealed by mortar or be placed over an impermeable membrane.
- Area drains should be recessed below grade to allow free flow of water into the basin.
- Enclosed raised planters should be sealed at the bottom and provided with an ample flow gradient to a drainage device. Recessed planters and landscaped areas should be provided with area inlet and subsurface drain pipes.
- Planters should not be located adjacent to the structure. If planters are to be located adjacent to the structure, the planters should be positively sealed, should incorporate a subdrain, and should be provided with free discharge capacity to a drainage device.
- Planting areas at grade should be provided with positive drainage. Wherever possible, the grade of exposed soil areas should be established above adjacent paved grades. Drainage devices and curbing should be provided to prevent runoff from adjacent pavement or walks into planted areas.
- Gutter and downspout systems should be provided to capture discharge from roof areas. The accumulated roof water should be conveyed to off-site disposal areas by a pipe or concrete swale system.
- Landscape watering should be performed judiciously to preclude either soaking or desiccation of soils. The watering should be such that it just sustains plant growth without excessive infiltration. Sprinkler systems should be checked periodically to detect leakage and they should be turned off during the rainy season.

7.11. Soil Corrosion

The corrosion potential of the on-site materials to buried steel and concrete was evaluated. Laboratory testing was performed on representative soil samples to evaluate pH, minimum resistivity, and soluble sulfate content. Table 8 presents the results of the corrosivity testing. General recommendations to address the corrosion potential of the on-site soils are provided below. If additional recommendations are desired, it is recommended that a corrosion specialist be consulted.

Table 8
Corrosivity Test Results

Boring	B-1 / SK-1	B-5 / SK-1
Depth	3 – 5 feet	3 – 5 feet
pH	8.9	
Minimum Resistivity	7,100 ohm-cm	
Soluble Sulfate Content	0.0058%	0.0049%
Chloride Content	0.0297%	

The corrosion potential of the on-site soils should be verified during construction for each encountered soil type. Imported fill materials should be tested to confirm that their corrosion potential is not more severe than those assumed.

7.11.1. Reinforced Concrete

Laboratory tests indicate that the potential of sulfate attack on concrete in contact with the on-site soils is "negligible" based on 2001 California Building Code Table 19-A-4. Accordingly, concrete mix with Type II cement may be used.

7.11.2. Metallic

Laboratory tests indicate that the on-site soils have a "moderate" corrosion potential to buried ferrous metals. As a consequence of these conditions, we recommend that consideration be given to using plastic piping instead of metal. Alternatively, a corrosion specialist should be consulted regarding suitable types of piping and necessary protection for underground metal conduits.

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8. GENERAL SITE GRADING RECOMMENDATIONS

The intent of this section is to provide general information regarding the site grading. Site grading operations should conform with applicable local building and safety codes and to the rules and regulations of those governmental agencies having jurisdiction over the subject construction.

The grading contractor is responsible for notifying governmental agencies, as required, and a representative of KFMg at the start of site cleanup, at the initiation of grading, and any time that grading operations are resumed after an interruption. Each step of the grading should be accepted in a specific area by a representative of KFMg, and where required, should be approved by the applicable governmental agencies prior to proceeding with subsequent work.

The following site grading recommendations should be regarded as minimal. The site grading recommendations should be incorporated into the project plans and specifications.

1. Prior to grading, existing vegetation, trash, surface structures and debris should be removed and disposed off-site at a legal dumpsite. Any existing utility lines, or other subsurface structures, which are not to be utilized should be removed, destroyed, or abandoned in compliance with current governmental regulations.

2. Subsequent to cleanup operations, and prior to initial grading, a reasonable search should be made for subsurface obstructions and/or possible loose fill or detrimental soil types. This search should be conducted by the contractor, with advice from and under the observation of a representative of KFMg.

3. Prior to the placement of fill or foundations within the building area, the site should be prepared in accordance with the recommendations presented in the Site Preparation section of this report. All undocumented fill or disturbed soils and colluvium within the building areas should be removed and processed as recommended by the representative of KFMg.

4. The exposed subgrade and/or excavation bottom should be observed and approved by a representative of KFMg for conformance with the intent of the recommendations presented in this report and prior to any further processing or fill placement. It should be understood that the actual encountered conditions may warrant excavation and/or subgrade preparation beyond the extent recommended and/or anticipated in this report.

5. On-site inorganic granular soils that are free of debris or contamination are considered suitable for placement as compacted fill. Any rock or other soil fragments greater than 3 inches in size should not be used within 5 feet of the foundation subgrade.

6. Observation and field tests should be performed during grading by a representative of KFMg in order to assist the contractor in obtaining the proper moisture content and required degree of compaction. Wherever, in the opinion of a representative of KFMg, an unsatisfactory

condition is being created in any area, whether by cutting or filling, then the work should not proceed in that area until the condition has been corrected.

9. DESIGN REVIEW AND CONSTRUCTION MONITORING

Geotechnical review of plans and specifications is of paramount importance in engineering practice. The poor performance of many structures has been attributed to inadequate geotechnical review of construction documents. Additionally, observation and testing of the subgrade will be important to the performance of the proposed development. The following sections present our recommendations relative to the review of construction documents and the monitoring of construction activities.

9.1. Plans and Specifications

The design plans and specifications should be reviewed and approved by KFMg prior to bidding and construction, as the geotechnical recommendations may need to be re-evaluated in the light of the actual design configuration and loads. This review is necessary to evaluate whether the recommendations contained in this report have been incorporated into the project plans and specifications as intended.

9.2. Construction Monitoring

Site preparation, removal of unsuitable soils, assessment of imported fill materials, fill placement, foundation installation, and other site grading operations should be observed and tested. The soils exposed during the construction may differ from that encountered in the test borings. Continuous observation by a representative of KFMg during construction allows for evaluation of the soil conditions as they are encountered, and allows the opportunity to recommend appropriate revisions where appropriate.

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10. LIMITATIONS

KFMg has endeavored to perform its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

The recommendations and opinions expressed in this report are based on KFMg's review of background documents and on the limited information obtained from field explorations and the associated laboratory testing. It should be noted that this study did not evaluate the possible presence of hazardous materials on any portion of the site. Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations, for example, the extent of removal of unsuitable soil and the associated additional effort required to mitigate them.

Site conditions, including groundwater level, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which KFMg has no control.

KFMg's recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the recommendations are made contingent upon the opportunity for KFMg to observe grading operations and foundation excavations for the proposed construction. If parties other than KFMg are engaged to provide such services, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. KFMg should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. Reliance by others on the data presented herein or for purposes other than those stated in the text is authorized only if so permitted in writing by KFMg. It should be understood that such an authorization may incur additional expenses and charges.

11. SELECTED REFERENCES

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ATTACHMENT NO. 9-28

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0 2000 4000 (Feet)

Approximate Scale

N

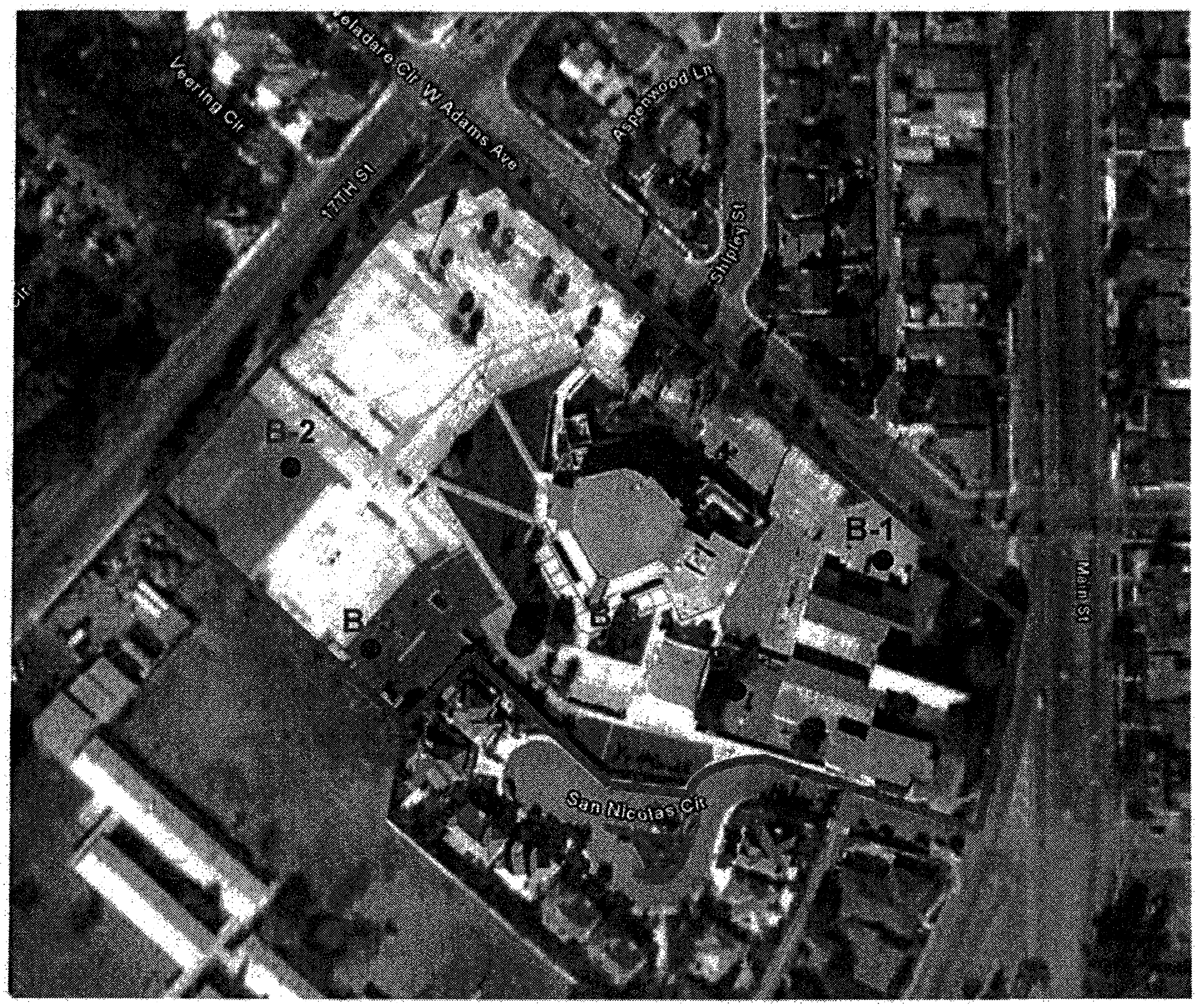
KFM GEOSCIENCE
1360 Valley Vista Drive
Diamond Bar, CA 91765
909.860.5096 phone
909.860.5094 fax

Site Location Map

First Christian Church Additions and Improvements
1207 Main St, Huntington Beach, California

BUN 06-02E **Figure 1**

ATTACHMENT NO. 9.30



N

(Boring locations are approximate)

0 50 100 feet

APPROXIMATE SCALE

KFM GEOSCIENCE

1360 Valley Vista Drive
Diamond Bar, CA 91765
909.860.5096 phone
909.860.5094 fax

Borehole Locations

First Christian Church Additions and Improvements
1207 Main St, Huntington Beach, California

BUN 06-02E

Figure 2

ATTACHMENT NO. 9.31

Appendix A
Logs of Exploratory Borings

Bulk and relatively undisturbed drive samples were obtained in the field during KFMg's subsurface evaluation. The samples were tagged in the field and transported to KFMg's laboratory for observation and testing. The drive samples were obtained using the California Modified Split Barrel Drive sampler as described below.

California Modified Split Barrel Drive Sampler
The split barrel drive sampler was driven with a 140-pound hammer allowed to drop freely 30 inches. The number of blows per foot recorded during sampling is presented in the logs of exploratory borings. The sampler has external and internal diameters of approximately 3.0 and 2.4 inches, respectively, and the inside of the sampler is lined with 1-inch-long brass rings. The relatively undisturbed soil sample within the rings is removed, sealed, and transported to the laboratory for observation and testing.

Standard Penetration Test Sampler
The standard penetration test sampler is driven with a 140-pound hammer allowed to drop freely 30 inches in general accordance with ASTM D1586. The number of blows (N-value) required to drive the SPT sampler 12 inches is shown on the borings logs. The sampler has external and internal diameters of approximately 2.0 and 1.4 inches respectively. The sampling tube consists of an unlined split-tube barrel. The disturbed soil sample is removed, sealed, and transported to the laboratory for testing.

Project: First Christian Church **Project Location: Huntington Beach** **Project Number: BUN 06-02E**	# Log of Boring B-1 Sheet 1 of 1

Date(s) Drilled **December 20, 2006**	Logged By **SRB**	Checked By **EHS**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type	Total Depth of Borehole **31.5 feet bgs**
Drill Rig Type **CME 75**	Drilling Contractor **JET Drilling**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT, Modified California, Bulk**	Hammer Data **140 lb, 30 in drop, auto trip**
Borehole Backfill **Cuttings with Concrete Patch**	Location **Southeast Parking Lot; Proposed Admin Building**	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Blow Count	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density	REMARKS AND OTHER TESTS
	0				SM		3" Concrete Pavement			
							[TERRACE DEPOSITS] SILTY SAND, light to medium brown, slightly moist, medium dense, fine to medium-grained sand			
			SK-1							Grain Size Analysis #200 = 34% pH = 8.9 Resistivity = 7100 (ohm-cm)
	5		R-2	49			becomes dark reddish-brown, sand predominantly fine-grained	9.5	128	
			R-3	41				7.8	114	
	10		SPT-4	20			becomes dark brown			
	15		SK-5 R-6	48	CL		SANDY CLAY, light grayish-brown, moist, hard, fine grained sand	13.8	121	
	20		SPT-7	23	ML		SANDY SILT, dark grayish-brown, moist, very stiff, fine grained sand			
	25		R-8	34	CL		SILTY CLAY, medium to dark grayish-brown with mottling of orangish-brown streaks and dark gray to black organic fragments, moist, very stiff, low plasticity	33	91	
	30		SPT-9	39	SM		SILTY SAND, light to medium brown with orangish-brown streaks, moist, medium dense to dense, fine to medium grained sand			
							Bottom of Boring at 31.5 feet bgs			
	35									
	40									
	45									
	50									

Figure

Project: First Christian Church **Project Location: Huntington Beach** **Project Number: BUN 06-02E**	**Log of Boring B-2** Sheet 1 of 1

Date(s) Drilled: **December 20, 2006**	Logged By: **SRB**	Checked By: **EHS**
Drilling Method: **Hollow Stem Auger**	Drill Bit Size/Type: **8 inch soil bit**	Total Depth of Borehole: **31.5 feet bgs**
Drill Rig Type: **CME 75**	Drilling Contractor: **JET Drilling**	Approximate Surface Elevation
Groundwater Level and Date Measured: **Not Encountered ATD**	Sampling Method(s): **SPT, Modified California, Bulk**	Hammer Data: **140 lb, 30 in drop, auto trip**
Borehole Backfill: **Cuttings and Asphalt Patch**	Location: **Northwest Parking Lot; Proposed Parking Structure**	

Elevation, feet	Depth, feet	Sample Number	Blow Count	USCS Symbol	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density	REMARKS AND OTHER TESTS
	0			Asphalt	3" ASPHALT			
				SP-SM	[TERRACE DEPOSITS] SAND to SILTY SAND, medium reddish-brown, moist, medium dense, fine to very fine grained sand			
	5	R-1	40			7.3	108	
		SK-2						
		R-3	71		becomes medium grayish-brown and dense	3.2	114	
	10	SPT-4	33	SM	SILTY SAND, medium grayish-brown, slightly moist, dense			
					becomes light brown			
	15	R-5	80	SP-SM	SAND to SILTY SAND, light to medium brown with medium reddish-brown mottled streaks, slightly moist, dense, slight calcium carbonate cementation	2.5	103	
	20	SPT-6	37	SM	SILTY SAND, light to medium brown, slightly moist, medium dense to dense, fine-grained sand, absence of cementation			
					becomes fine to medium-sand			
	25	R-7	86			3.1	104	
	30	SPT-8	16	CL	SILTY CLAY, light to medium brown, slightly moist, very stiff			
					Bottom of Boring at 31.5 feet bgs			
	35							
	40							
	45							
	50							

Figure

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ATTACHMENT NO. 9.34

Project: First Christian Church Project Location: Huntington Beach Project Number: BUN 06-02E	**Log of Boring B-3** Sheet 1 of 1

Date(s) Drilled: December 20, 2006	Logged By: SRB	Checked By: EHS
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type: 8 inch soil bit	Total Depth of Borehole: 31.5 feet bgs
Drill Rig Type: CME 75	Drilling Contractor: JET Drilling	Approximate Surface Elevation
Groundwater Level and Date Measured: Not Encountered ATD	Sampling Method(s): SPT, Modified California, Bulk	Hammer Data: 140 lb, 30 in drop, auto trip
Borehole Backfill: Cuttings with Concrete Patch	Location: LAwn in front of main auditorium; Proposed preschool classrooms	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Blow Count	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density	REMARKS AND OTHER TESTS
	0				SM		Topsoil			
							[TERRACE DEPOSITS] SILTY SAND, medium to dark reddish-brown, slightly moist, loose, fine grained sand			
	5		R-1	12				4.6	105	
			SK-2				becomes medium yellowish-brown			
			R-3	19				8.7	111	
	10		SPT-4	8			becomes medium to dark reddish-brown and moist			
							becomes medium reddish-brown			
	15		R-5	40	SM		becomes medium dense	9.9	106	
							becomes light to medium brown			
	20		SPT-6	32			becomes dense and light grayish-brown			
	25		R-7	28			becomes medium dense and light brown/ tan	33.3	91	
					ML		SANDY SILT, medium yellowish-brown with medium reddish-brown mottled streaks, moist, medium dense, fine-grained sand, micaceous			
	30		SPT-8	24	CL		SILTY CLAY, medium grayish-brown with orangish-brown mottled streaks, slightly moist to moist, very stiff			
							Bottom of Boring at 31.5 feet bgs			
	35									
	40									
	45									
	50									

Figure

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ATTACHMENT NO. 9.35

Project: First Christian Church Project Location: Huntington Beach Project Number: BUN 06-02E	**Log of Boring B-4** Sheet 1 of 1

Date(s) Drilled: December 20, 2006	Logged By: SRB	Checked By: EHS
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type: 8 inch soil bit	Total Depth of Borehole: 46 feet bgs
Drill Rig Type: CME 75	Drilling Contractor: JET Drilling	Approximate Surface Elevation:
Groundwater Level and Date Measured: Groundwater Encountered at 40 feet	Sampling Method(s): SPT, Modified California, Bulk	Hammer Data: 140 lb, 30 in drop, auto trip
Borehole Backfill: Cuttings with Concrete Patch	Location: Existing Preschool Playground; Proposed Multi-purpose Building	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Blow Count	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density	REMARKS AND OTHER TESTS
	0				ML		Topsoil			
							[FILL?] SANDY SILT to SILTY CLAY, medium brown, slightly moist, medium dense to very stiff, contains white to light gray nodules and streaks, brown topsoil and siltstone fragments			
	5		R-1	39				8.6	111	Consolidation Test LL = 32%, PL = 17% PI = 15%, EI = 0
			SK-2		SM		[TERRACE SURFACE] SILTY SAND, brown to dark brown, slightly moist, medium dense, contains rootlets			
			R-3	13	SM			5.3	106	Consolidation Test
							[TERRACE DEPOSITS] SILTY SAND, dark reddish-brown, moist, loose, fine-grained sand			
	10		SPT-4	6						
							becomes light to medium yellowish-brown			
	15		R-5	28			becomes slightly moist, medium dense	5.5	97	Consolidation Test
							becomes medium reddish-brown			
	20		SPT-6	19						
					CL		SILTY CLAY, medium grayish-brown, moist, stiff to very stiff			
	25		R-7	32			becomes medium grayish-brown with localized oxidation and contains trace of dark gray to black organic debris	34.4	87	
					SM		SILTY SAND, light to medium yellowish-brown, slightly moist, medium dense, fine-grained sand			
	30		SPT-8	35			becomes fine to medium-grained sand			
	35		R-9	54			becomes light to medium brown, locally oxidized	16.3	109	
	40		SPT-10	58			becomes wet and dense to very dense (ATD) ∇			Grain Size Analysis #200 = 11%
	45		R-11	50/4"						NO RECOVERY
							Bottom of Boring at 46 feet bgs DRILLING STOPPED DUE TO HEAVING WATER AND SAND-LOCK OF AUGER			
	50									

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Figure

ATTACHMENT NO. 9.36

Project: First Christian Church Project Location: Huntington Beach Project Number: BUN 06-02E	**Log of Boring B-5** Sheet 1 of 1

Date(s) Drilled: December 20, 2006	Logged By: SRB	Checked By: EHS
Drilling Method: Hollow Stem Auger	Drill Bit Size/Type: 8 inch soil bit	Total Depth of Borehole: 31.5 feet bgs
Drill Rig Type: CME 75	Drilling Contractor: JET Drilling	Approximate Surface Elevation
Groundwater Level and Date Measured: Not Encountered ATD	Sampling Method(s): SPT, Modified California, Bulk	Hammer Data: 140 lb, 30 in drop, auto trip
Borehole Backfill: Cuttings with Concrete Patch	Location: Northwest Pearking Lot; Proposed Parking Structure	

Elevation, feet	Depth, feet	Sample Type	Sample Number	Blow Count	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density	REMARKS AND OTHER TESTS
	0				Asphalt		3" ASPHALT			
					SM		[TERRACE DEPOSITS] SILTY SAND ,light reddish-brown, moist, loose to medium dense, fine-grained sand			
			SK-1							SO4 = 0.0049%
	5		R-2	21				10.5	103	Consolidation Test
	10		R-3	47			becomes dark reddish-brown and medium dense	9.6	101	Consolidation Test
							becomes light to medium yellowish-brown			
	15		SPT-4	30						
	20		R-5	68			becomes dense	10.4	123	
	25		SPT-6	36						
	30		R-7	53				4.7	106	
							Bottom of Boring at 31.5 feet bgs			
	35									
	40									
	45									
	50									

Figure

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ATTACHMENT NO. 9.37

Appendix B
Laboratory Testing

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Dry Density Tests
The moisture contents and dry densities of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D2937. The test results are presented on the borehole logs in Appendix A.

Particle Size Analysis
An evaluation of the particle size analyses in selected soil samples was performed in general accordance with ASTM D422. The results of the analyses are presented in this Appendix B.

Atterberg Limits Tests
Liquid Limit, Plastic Limit, and Plasticity Index of selected and representative on-site materials were performed in general accordance with ASTM D4318. The results are presented on the borehole logs and in the table below.

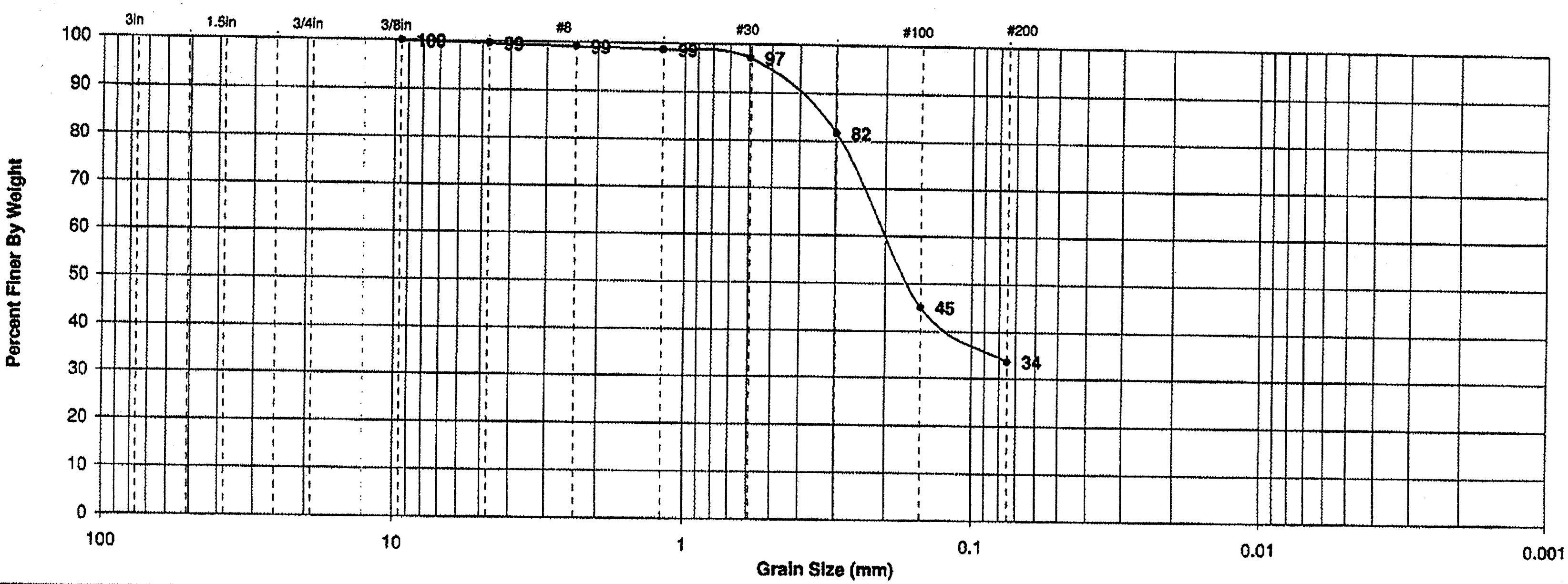
Sample Location	Sample Depth (ft)	Soil Type USCS	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
B-4 / R-1	5 - 5.5	SM	32	17	15

Consolidation Tests
Consolidation tests were performed on selected relatively undisturbed soil samples in general accordance with the latest version of ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the tests are presented in this Appendix B.

Expansion Index Tests
The expansion indices of selected samples were evaluated in general accordance with Uniform Building Code Standard No. 18-2. The results of this test are presented on the borehole logs in Appendix A.

Soil Corrosivity Tests
Soil pH and resistivity tests were performed on representative soil samples in general accordance with the latest version of California Test Method 643. The sulfate content of selected samples was evaluated in general accordance with the latest version of California Test Method 417. The results of the tests are presented in Table 8 in the text of this report.

GRAIN SIZE ANALYSIS - ASTM D 422



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
B-1 / SK-1									SM	

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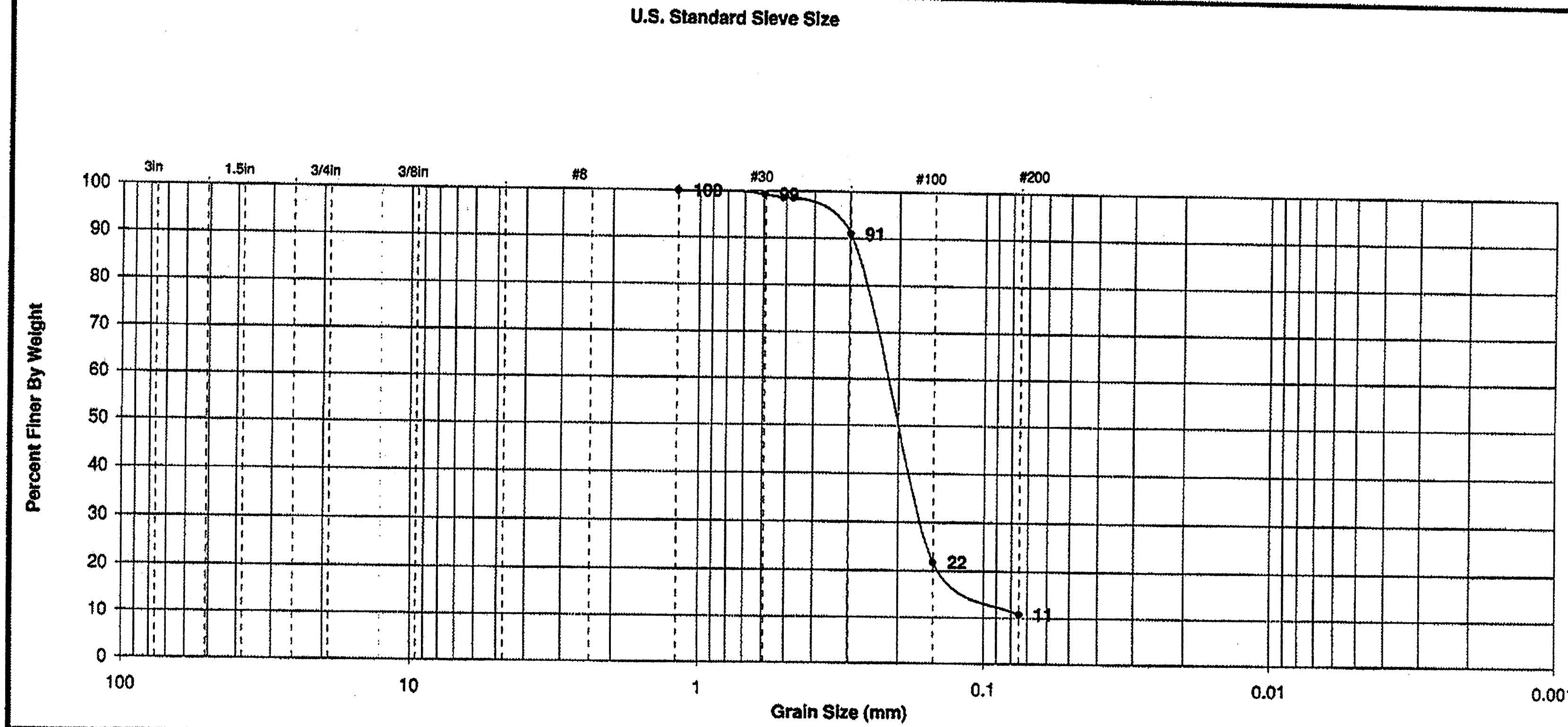
ATTACHMENT NO. 9.39

GRAIN SIZE ANALYSIS - ASTM D 422

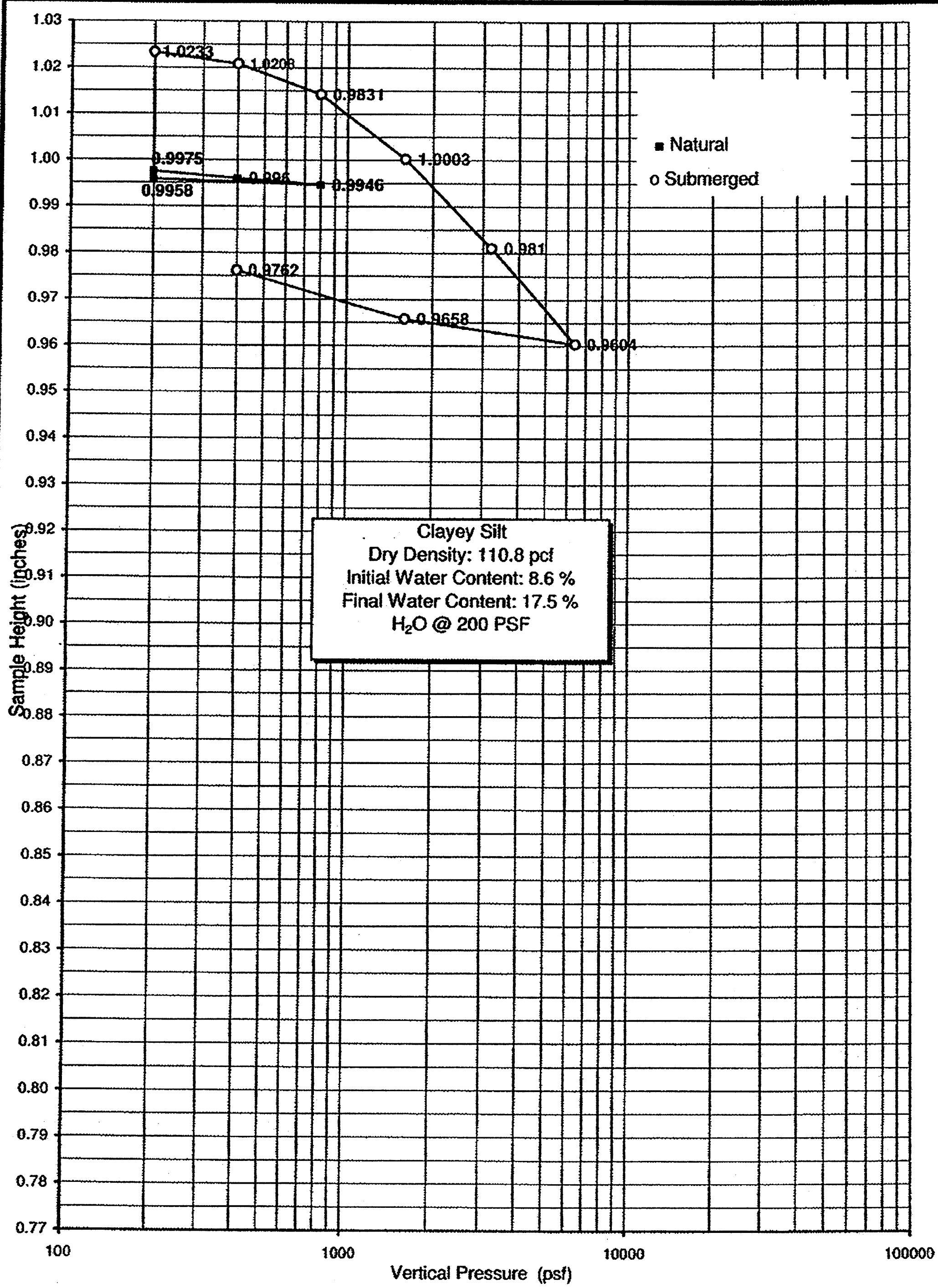


Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeability, K (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
B-4 / SPT-10									SM	

ATTACHMENT NO. 9.40

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	Depth:	Date
B-4 / R-1	5.0' - 5.5'	01-10-07



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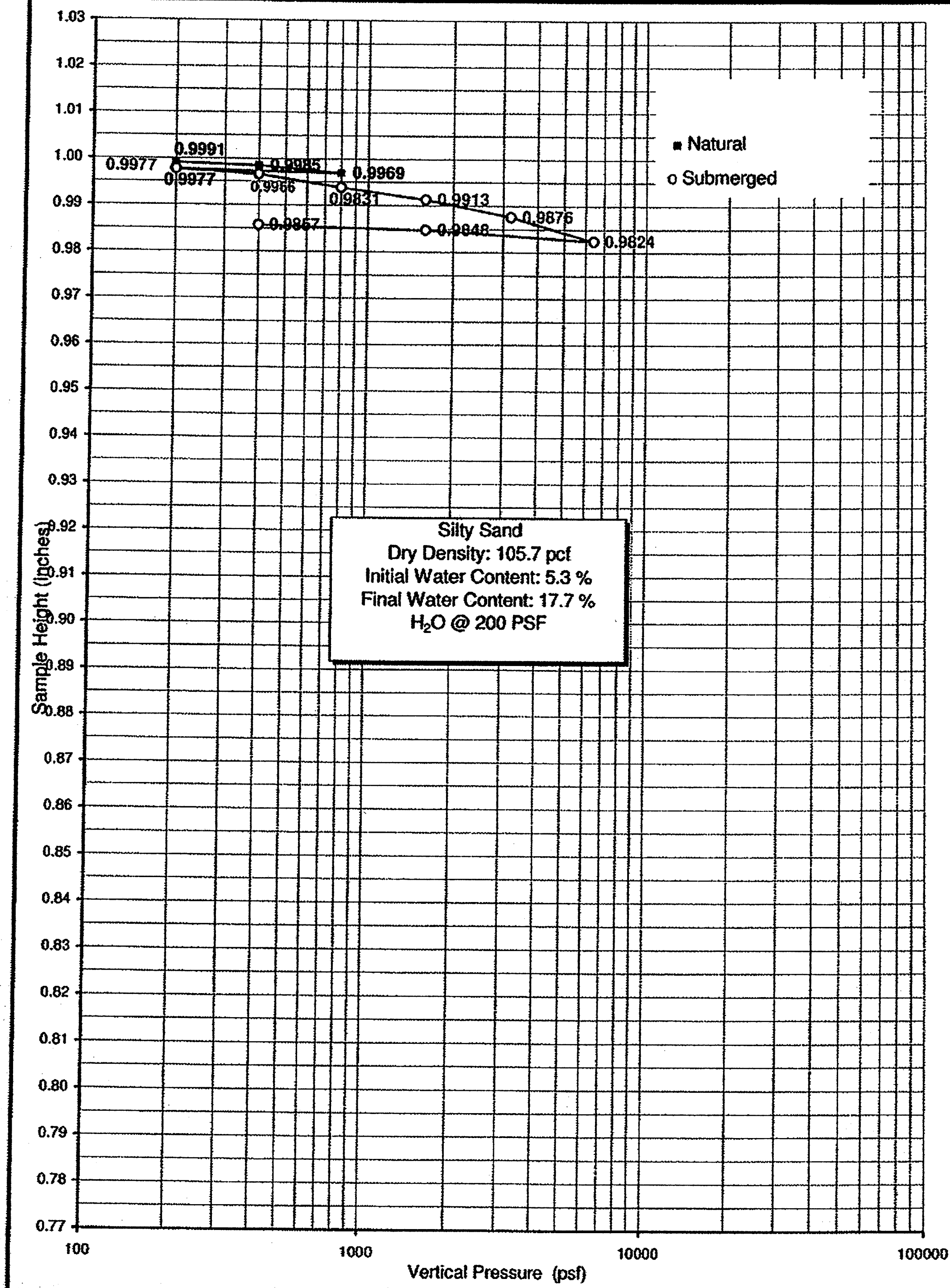
CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-4 / R-3	Depth:	8.0' - 8.5'	Date	01-10-07



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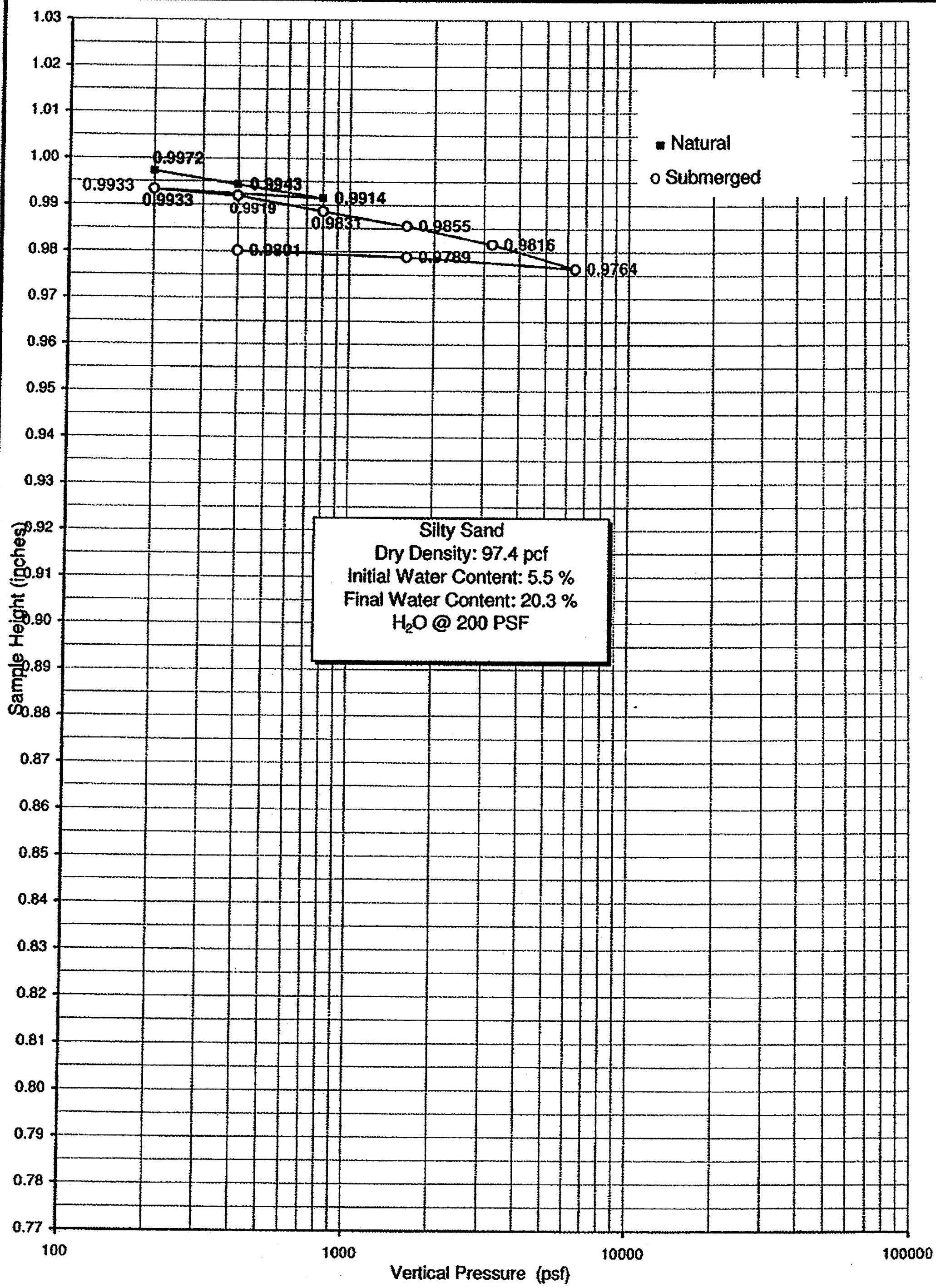
ATTACHMENT NO. 9.42

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No. B-4 / R-5	Depth: 16.0' - 16.5'	Date 01-10-07



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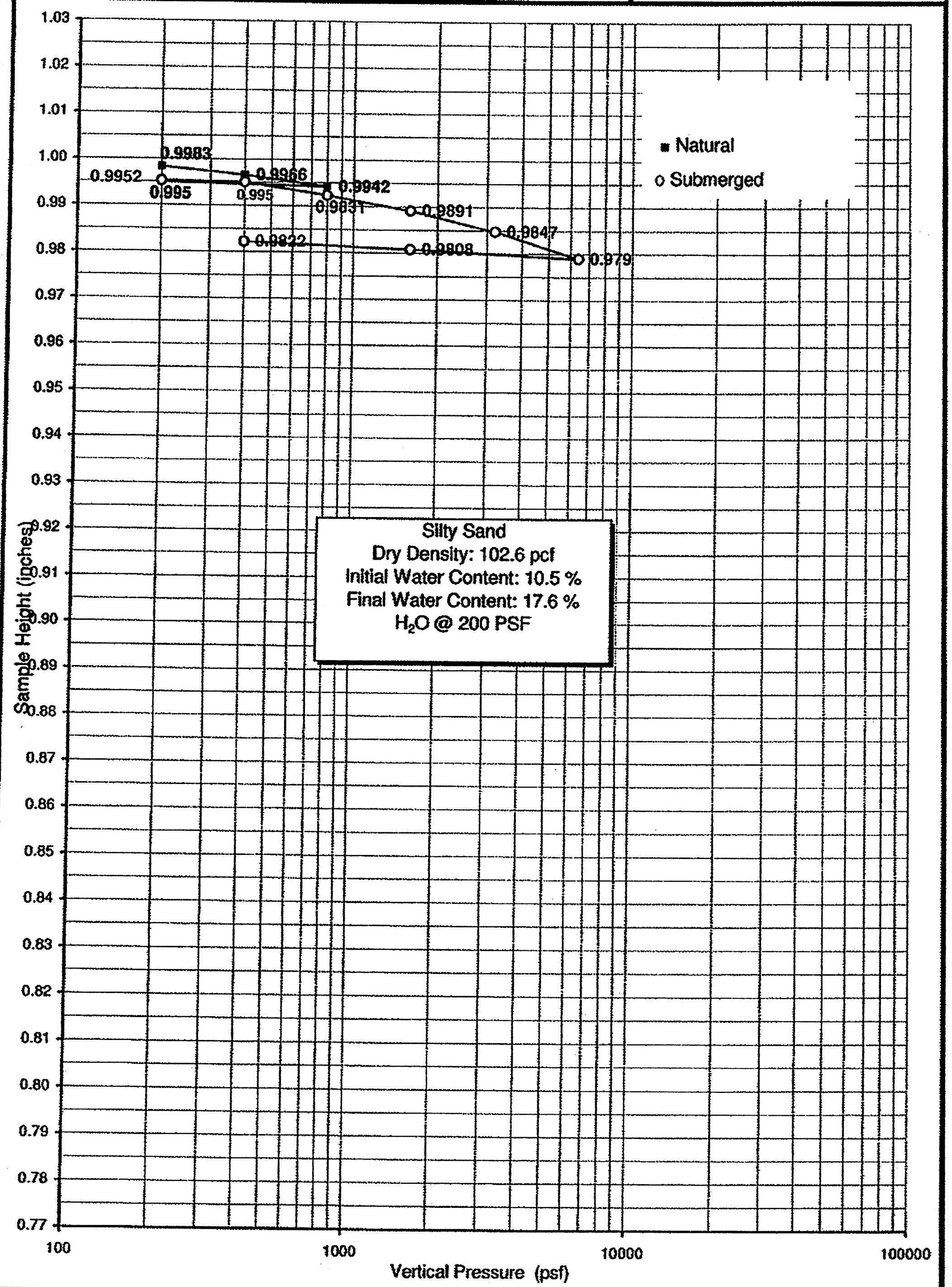
ATTACHMENT NO. 9.43

KFM # BUN 06-02E

CONSOLIDATION TEST - ASTM D2435

Job No. 2005-033

Boring / Sample No. B-5 / R-2	Depth: 6.0' - 6.5'	Date 01-10-07



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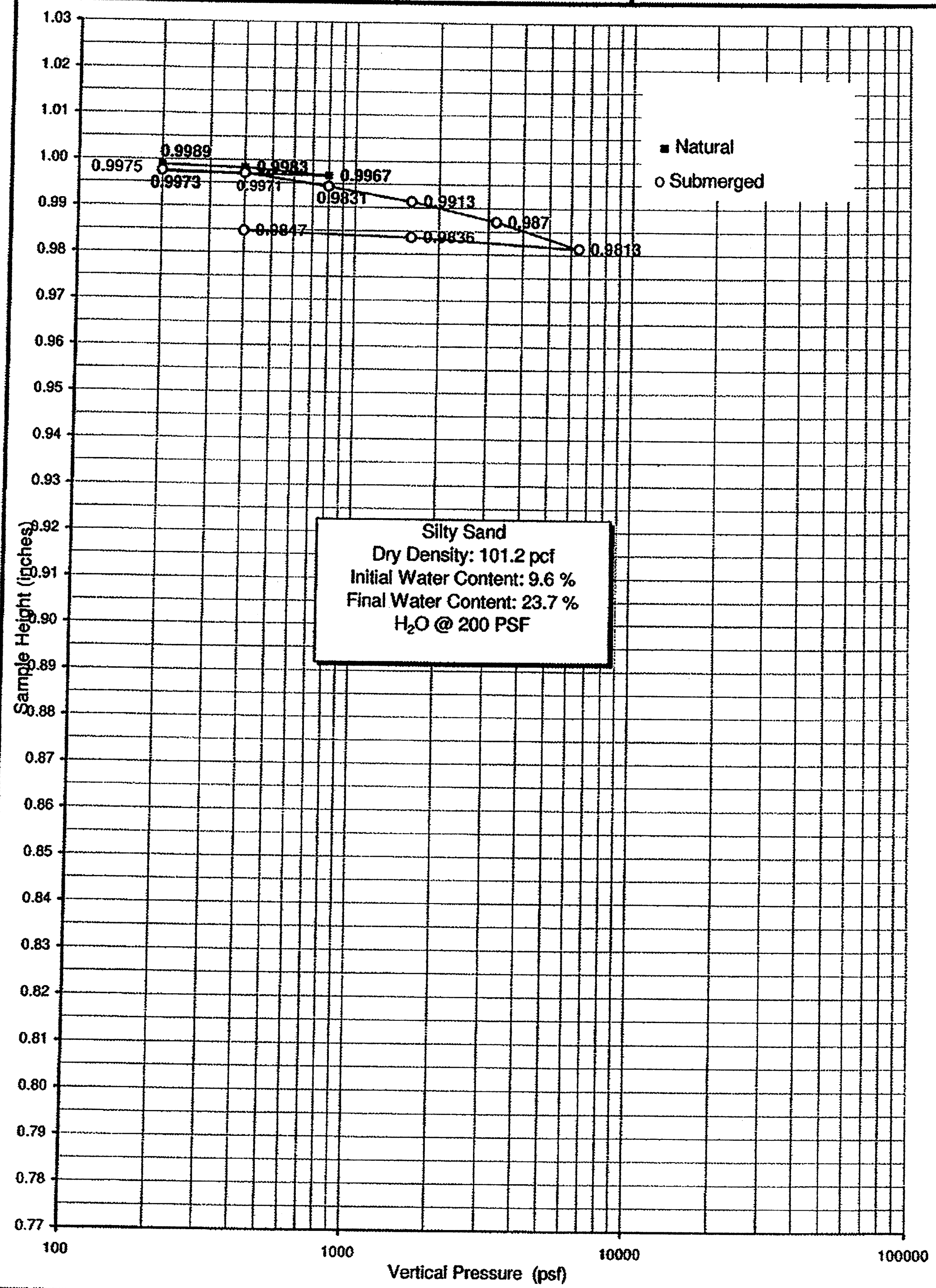
ATTACHMENT NO. 9.44

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	B-5 / R-3	Depth:	10.0' - 10.5'	Date	01-10-07



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ATTACHMENT NO. 9.45

ATTACHMENT NO. 9.46