Appendix E

Soil and Foundation Investigation

SOIL AND FOUNDATION INVESTIGATION
NEW ELEMENTARY SCHOOL
NORTHWEST CORNER OF 19TH AND
CINNAMON AVENUES
LEMOORE, CALIFORNIA

BSK JOB 03230063

Submitted to:

LEMOORE ELEMENTARY SCHOOL DISTRICT

October 2, 2002

BSK

BSK

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Bakersfield, CA 93304
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October 2, 2002

BSK JOB 03230063

Mr. Ron Meade, Superintendent
Lemoore Elementary School District
100 Vine Street
Lemoore, California 93245

SUBJECT: Soil and Foundation Investigation
New Elementary School
Northwest Corner of 19th and Cinnamon Avenues
Lemoore, California

Gentlemen:

In accordance with our Proposal 03230063, dated August 19, 2002, we have performed a Soil and Foundation Investigation for the proposed New Elementary School to be located at northwest corner of 19th and Cinnamon Avenues in Lemoore, California.

We appreciate the opportunity to be of service. If you have questions regarding the information contained in this report, please call.

Respectfully submitted,
BSK Associates

On Man Lau, PE
Project Engineer

John Minney, PE, GE
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN M. MINNEY
No. 602
Exp. 06/30/05
GEOTECHNICAL
STATE OF CALIFORNIA

JMM/OML

Distribution: Addressee (4 copies)
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SOIL AND FOUNDATION INVESTIGATION
NEW ELEMENTARY SCHOOL
NORTHWEST CORNER OF 19TH AND CINNAMON AVENUES
LEMOORE, CALIFORNIA

1. INTRODUCTION

This report presents the results of a Soil and Foundation Investigation for the proposed New Elementary School to be located at the northwest corner of 19th and Cinnamon Avenues in Lemoore, California.

The purpose of our investigation was to evaluate the proposed project with respect to known geotechnical features at the site, and to provide geotechnical recommendations concerning project development.

The scope of services outlined in our Proposal 03230063, dated August 19, 2002, included review of an existing report, field exploration, laboratory testing, engineering evaluation, and report preparation. A Geologic and Seismic Hazards Report will be submitted separately.

2. CHANGED CONDITIONS AND LIMITATIONS

The analyses and recommendations submitted in this report are based upon the data obtained from exploratory borings performed at the locations shown on the Boring Location Map, Figure A2 (Appendix A), the results of laboratory testing performed on selected soil samples as presented in Appendix B, and other salient data as described herein.

Soil samples obtained and tested, and observations made, are assumed to be representative of the site. This report does not reflect variations that may occur between borings. Care should be taken in extrapolating subsurface conditions between boring locations.

BSK Associates (BSK) does not practice or consult in the field of safety engineering. We do not, in any way, advise or direct contractors' operations and are not responsible for anyone other than BSK personnel at the site. Therefore, the safety of others is not the responsibility of BSK.

The validity of recommendations contained in this report is dependent upon the recommended testing and observation program to be carried-out during the site preparation and construction phases. Our firm assumes no responsibility for construction compliance with these design concepts and recommendations unless we have been retained to perform continuous on-site testing and review during all phases of site preparation, grading, and foundation construction.

The findings of this report are valid as of the present. However, changes in site conditions can occur with the passage of time, whether caused by natural process or the work of man, on this or adjacent property. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation, governmental policy or the broadening of knowledge. Therefore, this report should be reviewed by BSK to assess the applicability of conclusions and recommendations, before considering changed conditions or after a substantial lapse of time between the preparation of our report and the start of work at the site (one year or more).

BSK has prepared this report for the exclusive use of the Lemoore Elementary School District and their Project Design Team. BSK has endeavored to prepare this report in accordance with generally accepted practices using the degree of care ordinarily exercised under similar circumstances, by reputable geotechnical engineers and geologists practicing at this time in a similar locality. No other warranties, either express or implied, are made as to the professional advice provided under the terms of the agreement and included in this report.

3. SITE DESCRIPTION

The proposed New Elementary School will be located at the northwest corner of 19th and Cinnamon Avenues in Lemoore, California. Currently the relatively flat site is a vacant disced field. The site is bound by a vacant field to the north, farm land to the east , existing Lemoore Elementary School District Office to the south and residential homes to the west.

A Vicinity Map is included as Figure A1, in Appendix A.

4. PROJECT DESCRIPTION

The proposed structures will be one-story, slab-on-grade, wood frame construction, with wood trusses and built-up roofing. We understand that there will be parking areas. A minor amount of grading is anticipated to provide a relatively level pad and proper drainage.

5. FIELD DATA

Fourteen (14) borings were drilled during our field investigation conducted on September 5,6,9 and 10, 2002 using a truck-mounted drill rig equipped with an 8-inch diameter hollow-stem auger and a 5-inch mud rotary rig. Maximum explored boring depth was 51.5 feet. Three bulk samples were obtained for R-Value Tests.

Details of the field exploration program and the Logs of Borings from this investigation are presented in Appendix A. Locations of the exploratory borings and R-Value samples are indicated on the Boring Location Map, Figure A2, Appendix A.

6. LABORATORY DATA

Selected soil samples from this investigation were tested to evaluate in-place moisture and density, shear strength, Expansion Index, consolidation characteristics, Resistance "R"-Value and corrosion potential. Laboratory test results and descriptions of testing procedures are presented in Appendix B.

7. SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

Based on the soil boring data, generally, the upper 5 feet of the on-site soils consist of fine to coarse grained silty sand with trace of clay. The upper one (1) foot is considered to be loose. Below 5 feet generally, layers of sand, silty sand, clayey sand and sandy clay were encountered to maximum explored depth of 50 feet.

Groundwater was encountered at depth of approximately 10 to 16 below ground surface in our borings conducted in September 2002.

Based on the results of the consolidation tests (Figures B2 and B3, Appendix B), the upper 5 feet of the on-site soils are considered to have a very low potential for hydrocompaction.

The upper 5 feet of the on-site soils are considered to have a low expansion potential with Expansion Index of 4.

The soil profile described above is generalized; therefore, the reader is advised to consult the Logs of Borings (Figures A4 through A17, Appendix A) for soil conditions at specific locations and depths. Care should be exercised in interpolating or extrapolating subsurface conditions beyond the boring locations and depths.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

Based on data collected during this investigation, it is our conclusion that the project, as described, is feasible from a geotechnical standpoint provided the recommendations contained in this report are implemented during planning, design and construction.

Findings and recommendations presented herein are subject to review by BSK during grading and foundation construction when subsurface conditions become more fully exposed.

8.2 Grading and Earthwork

8.2.1 Site Preparation

Prior to commencement of site grading, debris and organic material should be removed from the site. Debris and organic material should not be used as engineered fill. Excavations resulting from the removal of buried obstruction should be backfilled with properly compacted fill as described below.

8.2.2 Site Excavation

Because of the relatively loose soils encountered at the upper one (1) foot, the proposed building area should be overexcavated to a depth of one (1) foot below existing-grade or one foot below bottom of footing elevation, whichever is greater. The overexcavation should extend a minimum of 5 feet outside exterior footing lines.

After site excavation, the exposed soils should be scarified to a depth of 8 inches, brought to optimum-moisture content and uniformly compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.2.3 Fill Material and Compaction - Engineered Fill

Existing on-site soils are considered suitable for use as engineered fill provided they are free of vegetation and other organic matter, debris, and oversized fragments greater than 3 inches in greatest-dimension.

Imported soils, if required, should be reviewed by BSK prior to use. At least three working days' notice should be allowed for review. Import material should consist of non-corrosive, non-hazardous, non-expansive, inorganic granular soils conforming to the recommendations presented in Table 8.2.1.

TABLE 8.2.1
IMPORTED FILL RECOMMENDATIONS

Maximum Expansion Index	21
Maximum Particle Size (inches)	3
Maximum Water Soluble Sulfate (SO_4) in Soil (percent by weight)	0.20
Range of Percent Passing #200 Screen	15-50
Minimum Sand Equivalent for Pipe Bedding Envelope	30
Minimum R-Value	55

Fill soils should be placed in maximum 8-inch thick loose lifts, brought to optimum-moisture content and uniformly compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557.

Fill should be tested for conformance to recommended compaction and moisture conditions. Field moisture and density testing should conform to ASTM Test Methods D1556, D2922 and/or D3017. Field moisture and density tests should be performed in the utility trench backfill for every lift, at an approximate longitudinal spacing of 250 feet. Actual test intervals may vary as field conditions dictate. Fill that does not conform to the criteria specified in this section should be removed or otherwise reworked to conform to BSK's recommendations. Continuous observation by BSK's staff should be maintained

during structural fill placement and compaction. Periodic compaction tests should be performed by BSK to supplement field observations.

8.2.4 Drainage Considerations

Proper drainage is vital to the performance of the building foundations. At no time should water be allowed to pond next to, or on, structural improvements. Drainage devices designed to carry surface water from building and structural improvements should not be blocked or destroyed, and should be regularly maintained.

Roof eaves should be connected to downspouts and drainage lines that will carry roof runoff away from the structures and discharge to proper collection devices. At no time should roof drains be allowed to drain directly on adjacent soil subgrade.

8.2.5 Utility Trench Backfill

Underground utility lines should be installed according to the manufacturer's recommendations. However, where manufacturers' recommendations are not available, small-diameter utility lines should have no less than 12 inches of cover. A minimum of 6 inches of compacted sand bedding (Sand Equivalent greater than 30), and a pipe envelope extending 6 inches above the pipe should be provided. The remaining backfill material may consist of native soil, or import material. Utility trench backfill should be placed and compacted to a minimum of 90 percent of maximum dry density as determined by ASTM Test Method D1557. Where space limitations exist, a hand compactor may be used.

8.3 Foundation and Slab Recommendations

8.3.1 General

Provided recommendations contained in this report are implemented during design and construction, it is our opinion that the proposed structure can be supported on shallow spread footings.

A Structural Engineer should evaluate footing configurations and reinforcement requirements for structural loadings, and temperature stresses.

8.3.2 Foundations

Continuous spread footings for the proposed project should be a minimum of 12 inches wide, and embedded a minimum of 12 inches below the lowest adjacent soil subgrade. Isolated spread footings should be a minimum of 24 inches wide and embedded a minimum of 12 inches below the lowest adjacent soil subgrade.

Footing excavations should be neat and trim, devoid of slough. The bottom of the footing excavations should be in a firm, stable condition prior to the placement of steel and/or concrete.

Provided that our grading recommendations are implemented, we recommend a net allowable soil bearing pressure of 3,500 pounds per square foot for continuous and isolated spread footings. This value may be increased by 1/3 for transient loads, such as wind or seismic forces.

For preliminary design purposes, total and differential immediate settlement under static loads of 2-foot square footings supported on compacted soil and sized for the recommended bearing pressure may be assumed to be 1 inch and ½ inch, respectively.

8.3.3 Concrete Slabs-On-Grade

In building areas, we recommend that nonstructural interior concrete slabs-on-grade be underlain by a vapor retarder membrane. The membrane should be made of high density polyethylene (HDPE) and have a 20 mil total thickness. The membrane should be carefully sealed at penetrations and joints. HDPE embedment strips should be used to tie the membrane to perimeter and interior footings and walls. Waterproofing of all joints and connections should be tested following installation.

A layer of washed concrete sand (ASTM C33) 1-1/2 inches in thickness may be placed over the membrane for protection and for absorbing excess water in freshly placed concrete.

The excess moisture entrapped in the sand layer will generate moisture vapor transmission through the concrete floor slab. Sufficient time should be allowed for moisture vapor transmission in floor areas destined to receive moisture-sensitive flooring. The flooring manufacturer's recommendations should be followed for the permissible residual moisture at the time of flooring installation.

The control of the deleterious effects of moisture vapor transmission on floor materials can be substantially improved by the use of low porosity concrete. This can be achieved by specifying a low water/cement ratio (0.45 to 0.49 by weight), 4,000 psi compressive strength at 28 days, a minimum of 7 days wet-curing, and the substitution of flyash for approximately 40 percent of the Portland Cement used in the concrete mix.

8.4 Lateral Pressures and Frictional Resistance

For structures subjected to lateral pressures, the values presented in Table 8.4.1 are recommended (design values assume level backfill, drained conditions and on-site materials).

TABLE 8.4.1
LATERAL EARTH PRESSURES

Pressure Type	Earth Pressure lb/ft^2/ft
Active (drained)	33
At-Rest (drained)	44
Passive (drained)	365

The upper 12 inches of soil of the adjacent grade should not be used for calculating passive resistance.

A coefficient of friction of 0.40 may be used for concrete structures against earth.

The recommended Lateral Earth Pressures presented above are ultimate values. Safety Factors consistent with design considerations should be applied. A minimum Factor of Safety of 1.5 against lateral sliding is recommended if the sliding is resisted only by frictional resistance.

When combined passive and frictional resistance is used, we recommend a minimum Safety Factor of 2.0. For lateral stability against seismic loading, we recommend a minimum Safety Factor of 1.1.

Vertical soil loads should be calculated on the basis of a bulk density of 125 pounds per square foot.

8.5 Soil-Borne Salt Protection

Surficial soil sample obtained from the site were tested to provide a preliminary determination if the potential exists for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts. The test results indicated that the upper 5 feet of the on-site soils have a pH of 7.3, a chloride concentration of 63 ppm, a resistivity of 1,890 ohm-cm, and soluble sulfate of 0.03 percent.

A sulfate content of this magnitude would have a negligible effect on normally formulated concrete. No special concrete formulation will be necessary.

A resistivity of this magnitude is considered corrosive to buried metal conduit. Therefore, buried steel pipe and ferrous metal objects should be provided with a protective coating.

8.6 Recommended Asphaltic Concrete Pavement

R-Value tests indicated values ranging from 54 to 70. Site soils may vary, therefore, a R-Value of 54 is recommended as reasonable and conservative. Accordingly, a range of recommended pavement sections, based on a R-Value of 54, is presented in Table 8.6.1.

TABLE 8.6.1
PAVEMENT SECTIONS - ASPHALTIC CONCRETE

Resistance Value of 54	Traffic Index	
	4.5	7.0
Asphalt Concrete (inches)	2	3
Class 2 Aggregate Base (inches)	4	6

The upper 8 inches of pavement area, finished, soil subgrade should be compacted to a minimum of 95 percent relative compaction (based on the maximum dry density determined by ASTM Test Method D1557).

Aggregate base should meet the specification of Class 2 Aggregate Base, or equivalent (*State of California Standard Specifications, Section 26*). Aggregate base should be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM Test Method D1557.

Asphaltic concrete should conform to Section 39 (Type B) of the above referenced specifications. The asphaltic concrete should be compacted to a minimum of 95 percent of the maximum laboratory density, as determined by *California Test Method 366.*

8.7 Review of Plans and Specifications

We recommend that a review of Plans and Specifications, with regard to foundations and earthwork, be performed by our office staff prior to the start of construction.

8.8 Construction Observations

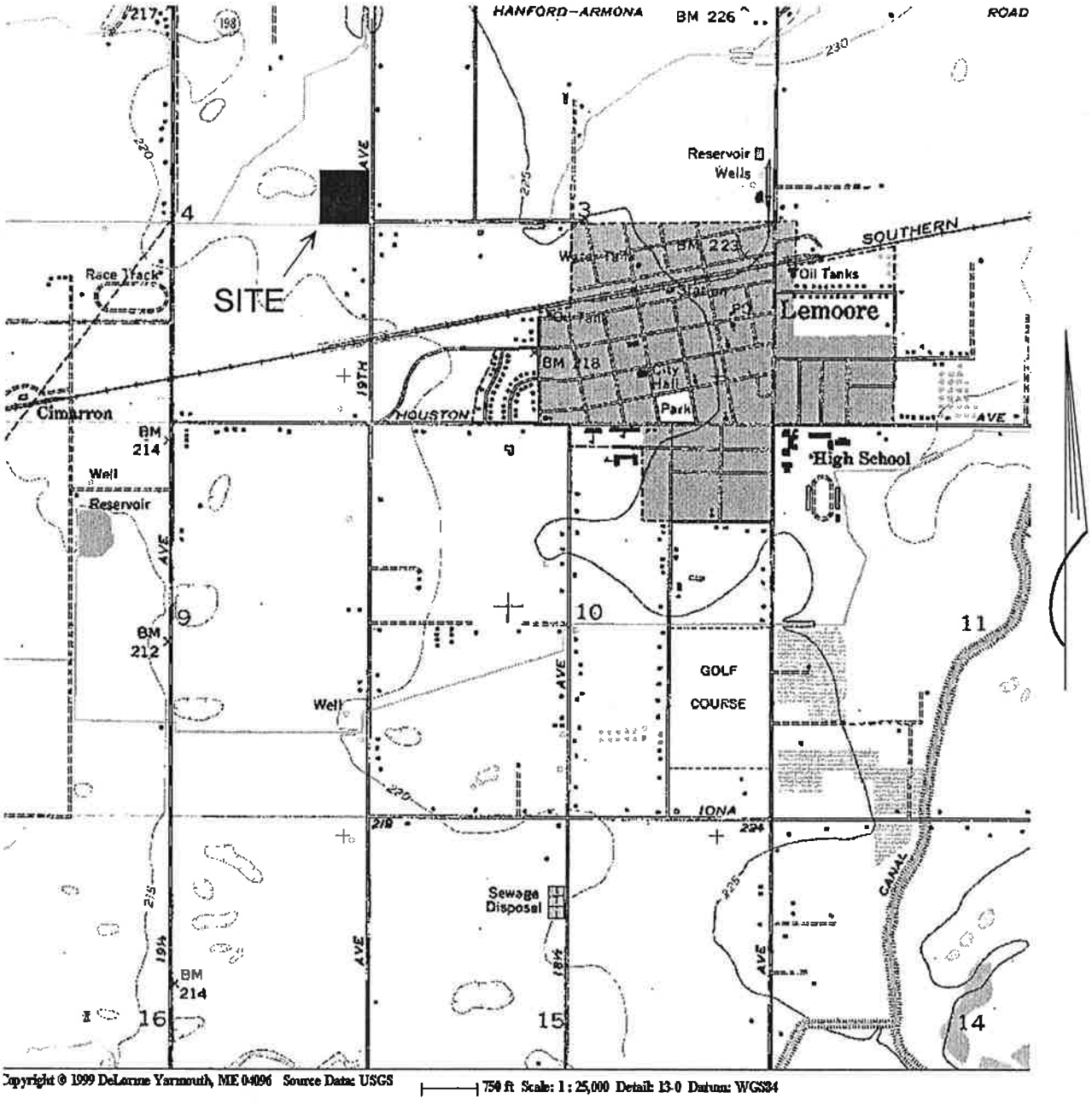
We recommend that BSK be retained to provide testing and observation services during site preparation and grading and during foundation construction phases of the project. This would include observations during site excavation, continuous observations and testing of earthwork, and review of structure and foundation excavations immediately prior to concrete and steel placement.

Geotechnical observations and testing during construction are an important extension of the geotechnical investigation. Field review during site excavation allows for evaluation of the exposed soil conditions and confirmation of revision of the assumptions and extrapolations made in formulating our conclusions and recommendations. If an engineering firm other than BSK is retained to provide geotechnical engineering services during construction, the company should notify the owner, designers, the appropriate governmental agencies and this office that it has assumed responsibility for all phases (design and construction) of the project within the purview of the geotechnical engineer.

BSK ASSOCIATES

APPENDIX A
FIELD INVESTIGATION

BSK Job No. 03230063
September 2002
Figure A1



VICINITY MAP

SOIL AND FOUNDATION INVESTIGATION
NEW ELEMENTARY SCHOOL
NWC OF 19th AND CINNAMON AVENUES
LEMOORE, CALIFORNIA

BSK

FIELD INVESTIGATION

A.1 Test Hole Drilling

The field investigation was conducted on September 5,6, 9 and 10, 2002. Fourteen (14) borings were drilled with a truck-mounted drill rig using an 8-inch diameter hollow-stem auger and a 5-inch mud rotary rig. The approximate test boring locations are indicated on the Boring Location Plan, Figure A2.

The borings were located in the field by measuring from existing landmarks. Hence, boring location accuracy can be implied only to the degree that this method warrants.

Relatively undisturbed and bulk samples were obtained at various depths during test boring drilling. The undisturbed samples were generally obtained by driving a 2.4-inch inside diameter sampler into soils. The sampler was driven with a 140-pound hammer falling from a height of 30 inches. Field blow counts are recorded on the Logs of Borings.

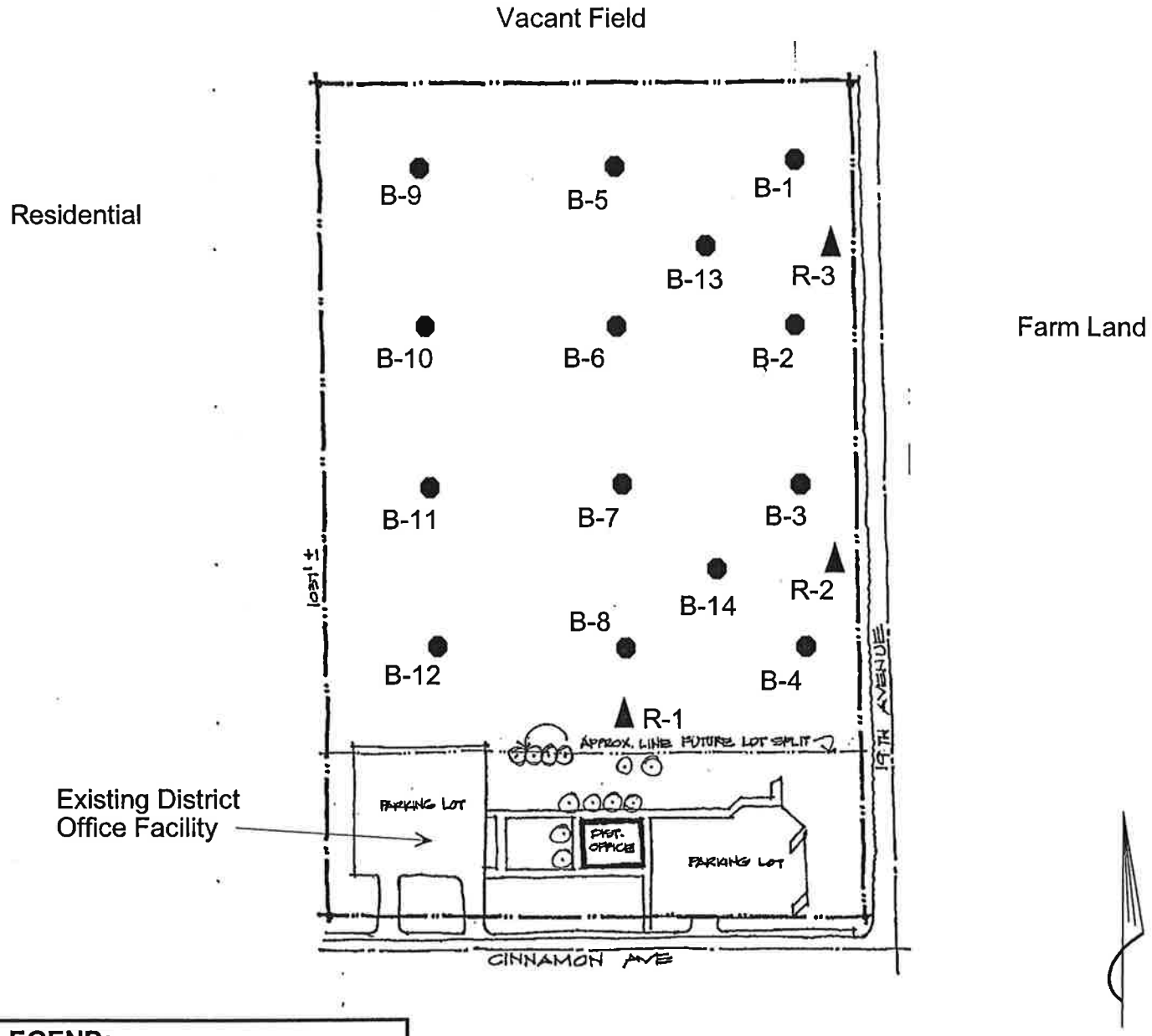
The borings were loosely backfilled with drilled soil cuttings.

A.2 Logs of Borings

A continuous log of soils encountered in the test borings was recorded at the time of the field investigation by our Engineer. The soils were classified based on field observations and laboratory test results. The classifications are in general accordance with the Unified Soil Classification System (see Soil Log Legend, Figure A3). Locations and depths of sampling, soil classifications, and in-place soil dry densities and moisture contents are indicated on the Logs of Borings shown on Figures A4 through A17.

Stratification lines on the logs represent approximate boundaries between predominant soil types. Layers of differing material may be contained within the strata. Transitions between strata may be either gradual or distinct.

BSK Job: 03230063
September 2002
Figure A2



Adapted From: Undated Site Plan prepared by Mangini & Associaties

BORING LOCATION MAP

SOIL AND FOUNDATION INVESTIGATION
NEW ELEMENTARY SCHOOL
NWC OF 19TH AND CINNAMON AVENUE
LEMOORE, CALIFORNIA

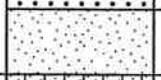
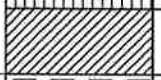
BSK

BSK JOB NO: 03230063
FIGURE NO: A3

SOIL LOG LEGEND

UNIFIED SOIL CLASSIFICATION SYSTEM

(Standard ASTM Test Method D2487 For Classification Of Soils For Engineering Purposes)

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVEL AND GRAVELLY SOILS More than 50% of coarse fraction retained on No.4 sieve	CLEAN GRAVELS (Less than 5% fines)		GW	Well-graded gravel, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravel, gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (More than 12% fines)		GM	Silty gravel, gravel-sand-silt mixtures
				GC	Clayey gravel, gravel-sand-clay mixtures
	SAND AND SANDY SOILS 50% or more of coarse fraction passes No.4 sieve	CLEAN SANDS (Less than 5% fines)		SW	Well-graded sand, gravelly sand, little or no fines
				SP	Poorly graded sand, gravelly sand, little or no fines
		SANDS WITH FINES (More than 12% fines)		SM	Silty sand, sand-silt mixtures
				SC	Clayey sand, sand-clay mixtures
FINE GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit Less Than 50	INORGANIC		ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or clayey silt with slight plasticity
				CL	Lean clay-low to medium plasticity, gravelly clay, sandy clay, silty clay
		ORGANIC		OL	Organic silt and organic silty clay of low plasticity
	SILTS AND CLAYS Liquid Limit 50 or More	INORGANIC		MH	Elastic silt, micaceous or diatomaceous fine sand or silty soil
				CH	Fat clay-high plasticity
		ORGANIC		OH	Organic clay-medium to high plasticity; organic silt
HIGHLY ORGANIC SOILS				PT	Peat, humus, swamp soil with high organic content

NOTE: Dual symbols are used to indicate borderline soil classifications

SAMPLER SYMBOLS

 Auger Cuttings

 Disturbed Sample

 Rock Core

 California Sampler

 No Recovery

 Shelby Tube

 Hand Auger/Sampler

 Standard Penetration Test

 Cone Penetration Test

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LOG OF BORING B-1

BSK JOB NO: 03230063
FIGURE NO: A4
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 16 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						ML		SANDY SILT: light olive brown; fine grained; moist.	Bulk Soil Sample at 0 to 5 Feet
	104	10		21		SM		SILTY SAND: light brown; fine grained; moist.	Expansion Index Test and Corrosion Tests
5	103	7		20					
	105	16		28		SC		CLAYEY SAND: light olive brown; very fine; moist.	
10									
				18		SP		SAND: olive brown; fine grained; very moist.	▽ Groundwater
15									
				17					Boring Terminated at 20.5 Feet
20									

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-2

BSK JOB NO: 03230063
FIGURE NO: A5
SHEET 1 of 1

DATE: 9/6/02
LOGGED BY: Justin Weibe
WATER LEVEL: 14 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						SM		**SILTY SAND: light brown; fine grained; dry.**	**Bulk Soil Sample at 0 to 5 Feet**
	92	2		18				**Slightly moist.**	
5	92	2		18		SP		**SAND: greyish brown; fine to medium grained; slightly moist.**	
						ML		**CLAYEY SILT: dark brown; fine to medium grained; trace of sand.**	
10				16					
						SP		**SAND: greyish brown; fine grained; very moist.**	▽ **Groundwater**
15				18					
20				19					**Boring Terminated at 21.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-3

BSK JOB NO: 03230063
FIGURE NO: A6
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 11 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						ML		SANDY SILT: light greyish brown; dry.	Bulk Soil Sample at 0 to 5 Feet.
						SM		SILTY SAND: brown; fine to medium grained; moist.	
	104	9		28					Direct Shear Test
	105	8		24					
5								Orangish brown.	
				10		SP		SAND: brown; fine to medium grained; moist.	▽ Groundwater
10									
				18					
15									
						SM		SILTY SAND: brown; fine grained; very moist.	
				11					Boring Terminated at 20.5 Feet
20									

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-4

BSK JOB NO: 03230063
FIGURE NO: A7
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 11 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
				26		SM		**SILTY SAND: brown; fine to medium grained; moist.**	
5				20				**Grades to SAND**	
						SP		**SAND: brown; fine to medium grained; moist.**	
10				16				**Very moist; medium dense.**	▽ Groundwater
15				19		ML		**SANDY SILT: grayish olive; very fine grained.**	
						SM-SP		**SILTY SAND/SANDY SILT: grayish olive; very fine grained.**	
20				4				**Heaving sand.**	**Boring Terminated at 20.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-5

BSK JOB NO: 03230063
FIGURE NO: A8
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 15 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						ML		SANDY SILT: light gray; fine grained; dry.	
						SP-SM		SAND/SILTY SAND: brown; fine to medium grained; moist.	
	97	18		17					Consolidation Test
5	108	13		16				Trace of CLAY; grades to SILTY SAND.	
						SC-CL		CLAYEY SAND/SANDY CLAY: olive brown; fine grained; moist.	
10	103	19		26					
						ML		CLAYEY SILT: yellowish brown; trace of very fine grained sand.	
				15		SM		SILTY SAND: light gray; very fine grained; very moist.	▽ Groundwater
15									
				19				Grades to SAND.	Boring Terminated at 20.5 Feet
20									

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-6

BSK JOB NO: 03230063
FIGURE NO: A9
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 13 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
				27		SM		**SILTY SAND: brown; fine to medium grained; trace of clay.**	
5				20				**Interbedded SAND and SANDY SILT lens.**	
10				22		SC		**CLAYEY SAND: brown; fine to medium grained; moist.**	
						SM		**SILTY SAND: brown; very fine grained; very moist.**	▽ Groundwater
15				20					
						SP		**SAND: brown; fine grained, trace of silt.**	
20				26					**Boring Terminated at 20.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-7

BSK JOB NO: 03230063
FIGURE NO: A10
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 10 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						ML		SANDY SILT: brown; fine grained; moist.	Bulk Soil Sample at 0 to 5 Feet
				32		SM		SILTY SAND: brown; fine to medium grained; moist.	
5				18		SP		SAND: light brown; fine to medium grained; slightly moist.	
10				10					▽ Groundwater
15				9					
20				48					Boring Terminated at 20.5 Feet
						SC		CLAYEY SAND: olive brown; very fine grained.	

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-8

BSK JOB NO: 03230063
FIGURE NO: A11
SHEET 1 of 1

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 11 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	110	11		27		SM		**SILTY SAND: brown; fine to medium grained; moist.**	**Bulk Soil Sample at 0 to 5 Feet**
5				22		SC		**CLAYEY SAND: olive brown; fine grained; moist.**	
10				13		SP		**SAND: brown; fine to medium grained; moist; some fines.**	▽ Groundwater
15				19		SP-SM		**SAND/SILTY SAND: brown; fine grained.**	
20				26				**Grades to SAND.**	**Boring Terminated at 20.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-9

BSK JOB NO: 03230063
FIGURE NO: A12
SHEET 1 of 1

DATE: 9/6/02
LOGGED BY: Justin Weibe
WATER LEVEL: 11 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						SM		**SILTY SAND: light brown; fine grained; dry.**	
	101	9		17				**Dark brown; trace of clay, moist.**	
5	112	13		21					
10				14				**Sandier.**	▽ Groundwater
						SP		**SAND: grayish light brown; fine to medium grained.**	
15				16					
20				27					**Boring Terminated at 21.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-10

BSK JOB NO: 03230063
FIGURE NO: A13
SHEET 1 of 1

DATE: 9/6/02
LOGGED BY: Justin Weibe
WATER LEVEL: 14 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						SM		**SILTY SAND: light brown; fine grained; dry.**	**Bulk Soil Sample at 0 to 5 Feet**
	115	11		21				**Moist, trace of clay.**	
5	113	9		17					
						ML		**CLAYEY SILT: dark brown; very moist; trace of sand.**	
10				13					
						SP		**SAND: grayish brn; fine grained; very moist.**	▽ **Groundwater**
15				18					
						SC		**CLAYEY SAND/SANDY CLAY: olive brown; fine grained; moist.**	
20				34					**Boring Terminated at 21.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-11

BSK JOB NO: 03230063
FIGURE NO: A14
SHEET 1 of 1

DATE: 9/6/02
LOGGED BY: Justin Weibe
WATER LEVEL: 13 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						SM		**SILTY SAND: light brown; fine grained; slightly moist.**	**Bulk Sample at 0-5 Feet**
	110	9		18				**Dark brown; moist.**	
5	101	3		17		SP		**SAND: grayish brown; fine grained, trace of medium; moist; trace of silt.**	
10				18					▽ Groundwater
15				14				**Brown; fine grained; very moist.**	
20				28		CL		**CLAY: gray; moist.**	**Boring Terminated at 21.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-12

BSK JOB NO: 03230063
FIGURE NO: A15
SHEET 1 of 1

DATE: 9/6/02
LOGGED BY: Justin Weibe
WATER LEVEL: 11 Feet
GROUND ELEVATION:
EQUIPMENT: CME 75, 8" HSA

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	97	4		14		SM		**SILTY SAND: light brown; fine grained; dry.**	
5	98	8		25				**More SILT.**	
10				13		SP		**SAND: grayish brown; fine to medium grained; very moist.**	▽ Groundwater
15				12				**Fine grained.**	
20				26		CL		**CLAY: gray; moist; trace of sand.**	**Boring Terminated at 21.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-13

BSK JOB NO: 03230063
FIGURE NO: A16
SHEET 1 of 3

DATE: 9/10/02
LOGGED BY: L. Suehiro
WATER LEVEL: 15 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
						SM		**SILTY SAND: laminated orangish brown and olive brown; fine to medium grained; moist.**	
	87	17		24					
5									
	104	17		31					
10								**Olive brown.**	
15	94	30		29				**Laminated orangish brown and grayish brown; very moist.**	▽ Groundwater
						ML		**SANDY SILT: laminated grayish brown and orangish brown; fine grained; stiff.**	
20	93	30		37					
								Olive brown; medium stiff.	
25									

Continued Next Page

BSK

LOG OF BORING B-13

BSK JOB NO: 03230063
FIGURE NO: A16
SHEET 2 of 3

DATE: 9/10/02
LOGGED BY: L. Suehiro
WATER LEVEL: 15 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	90	31		13		ML		**SANDY SILT: brown.**	
						SP		**SAND: light gray; fine to medium grained.**	
30	81	29		39					
35	103	25		40					
40	86	35		35					
45	91	56		56					
						CL		**SILTY CLAY: bluish gray.**	
50									

Continued Next Page

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-13

BSK JOB NO: 03230063
FIGURE NO: A16
SHEET 3 of 3

DATE: 9/10/02
LOGGED BY: L. Suehiro
WATER LEVEL: 15 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	90	34		17		CL		**SILTY CLAY: bluish gray.**	**Boring Terminated at 51.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-14

BSK JOB NO: 03230063
FIGURE NO: A17
SHEET 1 of 3

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 10 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
5	88	20		23		SM		**SILTY SAND: brown; fine to medium grained.**	
10	108	8		26		SP		**SAND: Laminated light brownish gray and brown; fine to medium grained.**	▽ Groundwater
15	105	23		21					
20	100	26		21					
25									

Continued Next Page

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-14

BSK JOB NO: 03230063
FIGURE NO: A17
SHEET 2 of 3

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 10 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	97	25		22		SP		**SAND: brown; fine to medium grained.**	
30	97	25		32					
35	93	23		55				**Fine grained.**	
40	97	27		60					
45	108	22		57					
						CL		**CLAY: bluish gray.**	
50									

Continued Next Page

The described soil conditions may not be representative of those at different locations and times.

BSK

LOG OF BORING B-14

BSK JOB NO: 03230063
FIGURE NO: A17
SHEET 3 of 3

DATE: 9/9/02
LOGGED BY: L. Suehiro
WATER LEVEL: 10 Feet
GROUND ELEVATION:
EQUIPMENT: BK-81, 5" Mud Rotary

DEPTH, FT.	DRY DENSITY, PCF	MOISTURE, %	OVM READING PPM	BLOWS/FOOT	TYPE OF SAMPLER	U.S.C.S.	SYMBOLS	DESCRIPTION	REMARKS
	81	40		17		CL		**CLAY: bluish gray.**	**Boring Terminated at 51.5 Feet**

The described soil conditions may not be representative of those at different locations and times.

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APPENDIX B

LABORATORY TESTING PROCEDURES

BSK

LABORATORY TESTING PROCEDURES

B.1 Moisture-Density Tests

The field moisture content, as a percentage of the dry weight of the soil, was determined by weighing samples before and after oven drying. Dry densities, in pounds per cubic foot, were also determined for the undisturbed samples. Results of these determinations are shown on the Logs of Borings, Figures A4 through A17, included in Appendix A.

B.2 Direct Shear Test

Direct shear test was performed on intact sample to determine strength characteristics of the soil. Test specimens were soaked with water prior to testing. Results of the shear strength test are shown on Figure B1.

B.3 Consolidation Tests

Consolidation characteristics of the site soils were determined by using intact soil samples subjected to dead weight loading increments in a consolidometer. The samples were soaked when loading reached the approximate overburden pressure. Test results are illustrated by curves indicating the percent volume change of the soil under various loads. Results of the Consolidation Tests are shown on Figures B2 and B3.

B.4 Soil Corrosivity Potential

Soil Corrosivity Potential was performed on a bulk soil sample obtained from Borings B-1 at 0 to 5 feet. Testing procedures were Caltrans 422 for chloride content, Caltrans 643 for pH, Caltrans 643 for resistivity and Caltrans 417 for sulfate. Test results are presented in the text in Section 8.5.

B.5 Expansion Test

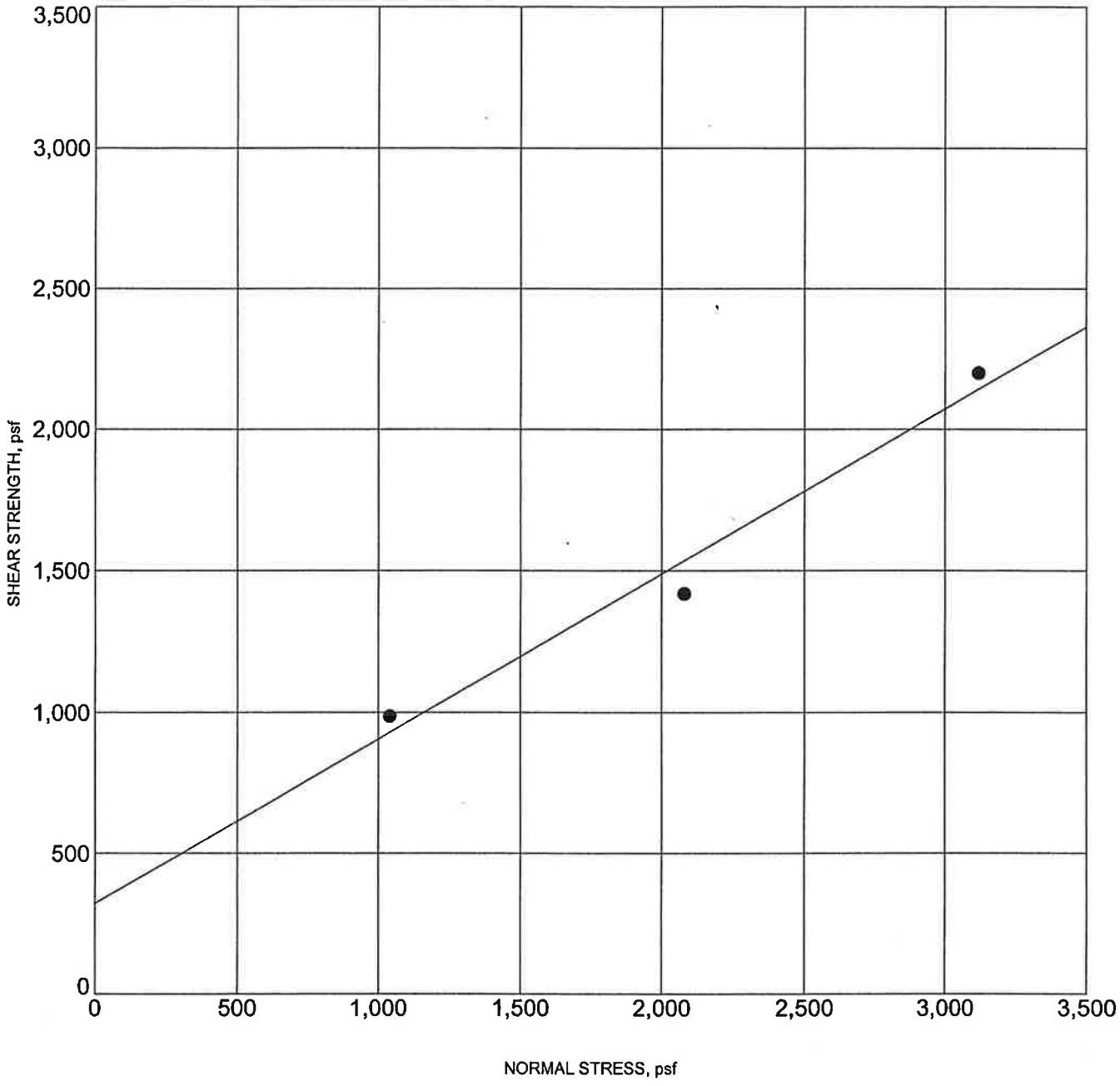
The expansion potential of a near-surface sample of the on-site soils was tested in accordance with Uniform Building Code criteria. Test results are presented in Table B.1.

B.6 Resistance-Value Tests

The Resistance-Value results of the samples of the surficial soils were obtained in accordance with California Department of Transportation's Test Method CA 301. Test results are presented in Table B.2.

BSK JOB: 03230063
Date: 9/10/02
Figure: B1

DIRECT SHEAR DIAGRAM



Boring No.: B-3

Sample Depth: 3.0 ft.

Friction Angle: 30 degrees

Cohesion: 322 psf

Dry Density: 104 pcf

Intact

PROJECT: New Elementary School
NWC of 19th AND Cinnamon Avenues, Lemoore, California

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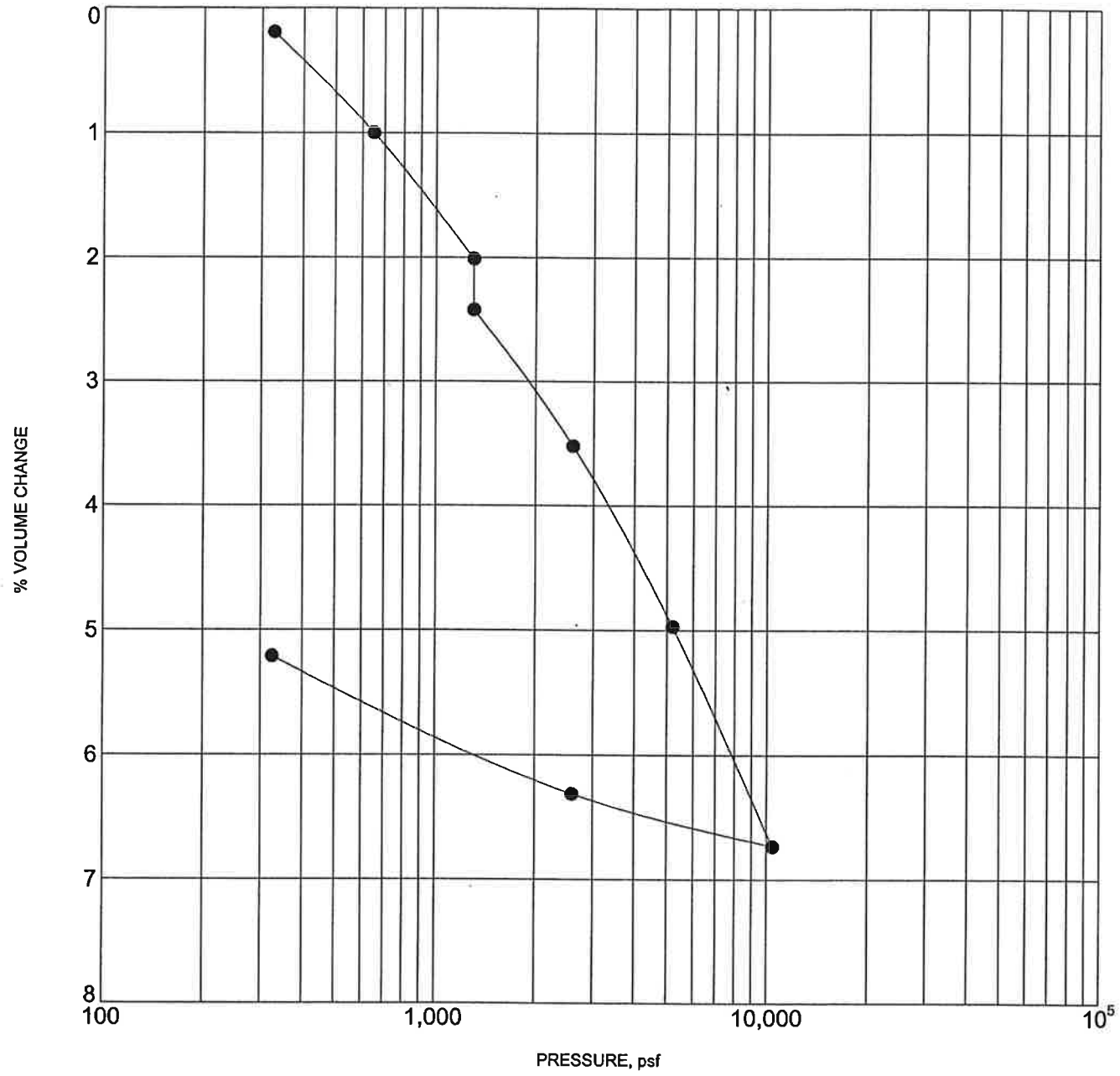
BSK JOB: 03230063
Date: 9/10/02
Figure: B2

CONSOLIDATION TEST

% Volume Change vs. Pressure Curve



Specimen Identification		Classification	Soaked psf	DD pcf	MC%
● B-5 3.0 ft.		**SILTY SAND: brown; fine to medium grained.**	**1300**	**97**	**18**

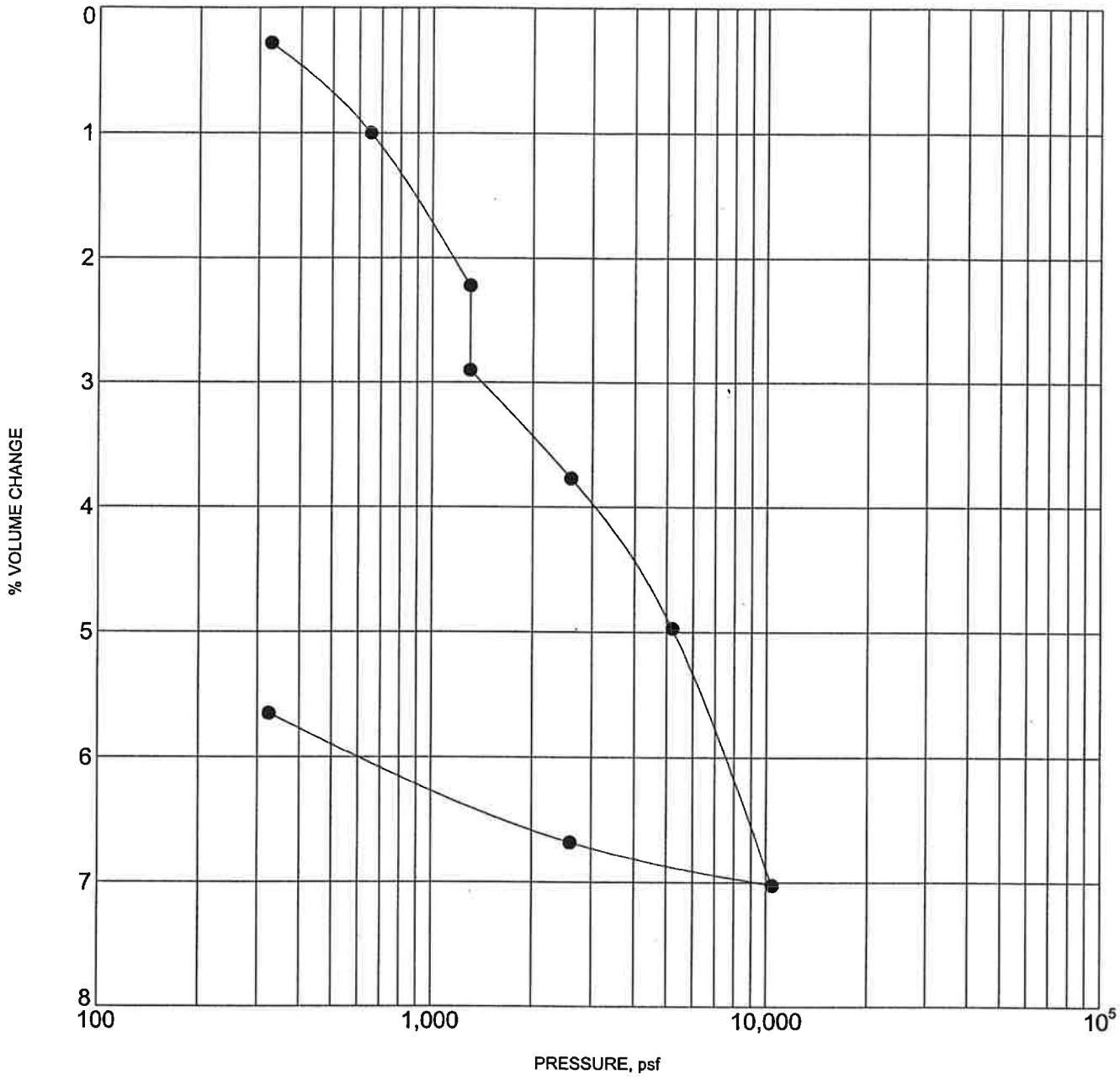
PROJECT: New Elementary School
NWC of 19th AND Cinnamon Avenues, Lemoore, California

BSK

BSK JOB: 03230063
Date: 9/10/02
Figure: B3

CONSOLIDATION TEST

% Volume Change vs. Pressure Curve



Specimen Identification		Classification	Soaked psf	DD pcf	MC%
● B-5 5.0 ft.		**SILTY SAND: brown; fine to medium**	**1300**	**108**	**13**
		grained.			

PROJECT: New Elementary School
NWC of 19th AND Cinnamon Avenues, Lemoore, California

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TABLE B.1
Expansion Index Test Results
(1997 UBC Standard - 18-2)

Test Location	Moisture After Saturation, %	Expansion Index/ Potential
Boring B-1 Bulk Sample at 0 to 5 Feet	16	4/very low

TABLE B.2
Resistance Value Test Results
(CA301)

Test Location	R-Value
R-1 at 0 to 1 Foot	59
R-2 at 0 to 1 Foot	73
R-3 at 0 to 1 foot	54