LODI UNIFIED SCHOOL DISTRICT
Traffic Circulation Project

Project Number: 0925-8225
DSA #: 02-116195
San Joaquin Encroachment Permit
No. PS-1702619

Lockeford Elementary School

ADDENDUM NO. 1

March 4, 2019

Owner:	Lodi Unified School District 1305 E. Vine Street Lodi, CA 95240
Engineer:	A R Sanguinetti & Associates Civil Engineering, Land Planning & Surveying 1150 W. Robinhood Drive, Suite 1C Stockton, CA 95207
Project Manager:	Capital Program Management, Inc. 1851 Heritage Lane, Suite 210 Sacramento, CA 95815

This Addendum has been prepared to clarify, modify, delete, or add to the drawings and/or specifications for the above referenced project, and revisions to items listed here shall supersede description thereof prior to the above stated date. All conditions not specifically referenced here shall remain the same. It is the obligation of the Prime Contractor to make subcontractors aware of any items herein that may affect submitted bids.

Acknowledge receipt of this addendum by inserting its number and date in the bidding documents. Failure to do so may subject bidder to disqualification.

All addenda items refer to the plans and specifications unless specifically noted otherwise.

TOTAL PAGES IN THIS ADDENDUM (including attachments): 137

LODI UNIFIED SCHOOL DISTRICT
Traffic Circulation Project

PROJECT NUMBER: 0925-82225
DSA #: 02-116195
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Lockeford Elementary School

ADDENDUM NO. 1

PART A - BIDDING AND CONTRACT REQUIREMENTS

1.1 The bid date has not changed. Bids are due Thursday, March 7, 2019 by 2:30:00 p.m. at the District Facilities Office, 1305 E. Vine Street Lodi California 95240.

1.2 Refer to Document 00 21 13 – Instructions to Bidders.
- 1.2.1 See 00 21 13-2, in paragraph 10, add the following: “g. DVBE Certification form.”

1.3 Refer to Document 00 21 13 – Instructions to Bidders.
- 1.3.1 See 00 21 13-4, in paragraph 20, last sentence; delete the following: “Submit forms within four (4) days after Notice of Award.”
- 1.3.2 And in its place add the following: “Submit this form with your bid.”

1.4 Refer to Document 00 21 13 – Instructions to Bidders.
- 1.4.1 See 00 21 13-9, in paragraph 32; delete the following: “h. Disabled Veteran Business Enterprise Participation Certification.”
- 1.4.2 And in its place add the following: “h. Not used.”

1.5 Refer to Document 00 31 19 – Existing Conditions.
- 1.5.1 See 00 31 19-1, in paragraph 2, Reports and Information on Existing Conditions, item f; delete the following: “(1) TBD”
- 1.5.2 And in its place add the following: “(1) Geotechnical Engineering Report, Lockeford Elementary School Additions, dated February 13, 2008 (See Exhibit A).”
- 1.5.3 And in its place add the following: “(2) Miscellaneous Soil Testing, Lockeford Elementary School Additions, dated April 28, 2008 (See Exhibit B).”
- 1.5.4 And in its place add the following: “(3) Supplemental Miscellaneous Soil Testing, Lockeford Elementary School Additions, dated May 22, 2008 (See Exhibit C).”
- 1.5.5 And in its place add the following: “(4) Review of Storm Drainage Analysis, Lockeford Elementary School, dated November 28, 2017 (See Exhibit D).”

1.6 Refer to Document 00 41 13 – Bid Form and Proposal.
- 1.6.1 Add entire new Bid Form and Proposal.

1.7 Refer to Document 00 45 46.02 Disabled Veteran Business Enterprise Participation Certification.
- 1.7.1 See 00 45 46.02-1, in paragraph 1, last sentence; delete the following: “This form must be provided to the District no later than four (4) calendar days after the bid opening.”
- 1.7.2 And in its place add the following: “This form must be provided to the District at the time of bid.”

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ADDENDUM NO. 1

1.8 Refer to Document 00 51 00 – Notice of Award.

1.8.1 See 00 51 00-1, in the fifth paragraph delete the following: "h. Disabled Veteran Business Enterprise Participation Certificate."

1.8.2 And in its place add the following: "h. Not used."

1.9 Refer to Document 00 73 13 Special Conditions.

1.9.1 See 00 73 13-6, in paragraph 7 Disabled Veterans Business Enterprises, last sentence; delete the following: "The Contractor must submit the Disabled Veteran Business Enterprise Participation Certification to the District with its executed Agreement, identifying the steps Contractor took to solicit DVBE participation in conjunction with this Contract."

1.9.2 And in its place add the following: "The Contractor must submit the Disabled Veteran Business Enterprise Participation Certification to the District at time of bid, identifying the steps Contractor took to solicit DVBE participation in conjunction with this Contract."

1.10 Refer to Document 01 21 00 Allowance.

1.12.1 See 01 21 00-1 in paragraph 1.3 Allowances, Item A. delete content

1.12.2 And in its place insert the following: "Included in the Contract, a stipulated sum/price of Seventy-five Thousand Dollars ($75,000) as allowances for Unforeseen Conditions plus a stipulated sum/price of Sixty Thousand Dollars ($60,000) as allowances for bioswale area landscaping and irrigation within the limits set forth in the Bridging Documents. This Allowance shall not be utilized without written approval by the District."

LODI UNIFIED SCHOOL DISTRICT
Traffic Circulation Project

PROJECT NUMBER: 0925-82225
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No. PS-1702619

Lockeford Elementary School

ADDENDUM NO. 1

PART B - TECHNICAL REQUIREMENTS

1.11 See attached product data for “Checkmate” inline check valve by Red Valve Company.
1.12 See attached inline check valve installation, operations and maintenance manual.

PART C - DRAWINGS

1.13 See attached Drawing and Details for Jack Tone Road added inline check valve scope item.

PART D – RESPONSES TO CONTRACTOR QUESTIONS

1. Q. Is builders risk insurance required?
   A. Yes, see General Conditions Document 00 72.13.13.1.5 for Builder's Risk “All Risk” Insurance, and 00 72.13.13 Insurance and Bonds, for all insurance and bond requirements.

2. Q. Is there a geotechnical report available?
   A. Yes, See Addendum 1, item 1.5 above.

3. Q. Will the contractor be required to obtain any permits (grading, encroachment, etc.)?
   A. No. The County has already issued the Encroachment Permit, which was paid for by the District (see attached). However, the contractor is required to have the proper excavation permit(s) with OSHA. Additionally, see response to Question 5 below.

4. Q. Is the contractor required to place a temporary fence around the work area?
   A. Yes.

5. Q. Is there a SWPPP Plan? If not will the contractor be required to prepare one?
   A. No. This project size is less than 1 acre (0.92ac) and therefore is not required. However, if the contractor requires more area pending project staging and that area exceeds a total project area of 1 acre (project area + staging area = greater than 1 acre) then a NOI and SWPPP is required by law, and the SWPPP Plan is prepared or NOI (Notice of Intent) is to be filed by the Contractor with the State Water Resources Control Board. NOTE: BMP's as shown on the erosion control plan and in the plan notes are required regardless and are minimum. Therefore, additional BMP's may be necessary pending construction method, staging and time of year.

LODI UNIFIED SCHOOL DISTRICT
Traffic Circulation Project

PROJECT NUMBER: 0925-82225
DSA #: 02-116195
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Lockeford Elementary School

ADDENDUM NO. 1

6. Q. Is the contractor required to install & remove SWPPP Protection?
   A. See question 5, and yes in our opinion if a NOI is required per above comment, then a NOT (Notice of Termination) should be the contractor's responsibility.

7. Q. Can you confirm that the SJWD approved plans shall govern for storm drain work only?
   A. The storm drainage is governed by the approved plans from San Joaquin County Public Works Department, and the Civil Engineer of record. All work in the County Right-of-Way is governed by San Joaquin County, and work in the District Property is delineated and governed by the plans & Civil Engineer of Record.

8. Q. Can we use recycled Class 2 aggregate base or does it need to be virgin?
   A. Yes. However, it needs to meet gradation requirements and other Caltrans requirements. The recycled material cannot contain any foreign debris such a brick, plastics, etc. All recycled material must be submitted to the project geotechnical engineer and certified that it meets Caltrans Specifications for recycled Class 2 AB (Cal Trans Standard, Section 26). Certification must be provided to the Civil Engineer of Record prior to placement.

9. Q. See section 39-1.43, D on sheet 2 of the plans regarding Prime coat. Can Prime coat be omitted? I don't think SC250 or MC250 oils are available in California and prime coat has no value on a project like this. It would be very difficult to keep the prime oil from being tracked from the paving trucks onto the fresh concrete during the paving operation.
   A. No, prime coat cannot be omitted. A Prime Coat is required for the following reasons:
      a) We want the moisture to be sealed in and not knowing how long between AB placement and AC placement, especially during the warm months the moisture content will be lost.
      b) Again not knowing how long between AB placement & AC placement we do not want the AB to unravel.

   As for availability the contractor shall provide acceptable evidence from the supplier that SC250 or MC250 is not any longer permitted or available in California and shall provide an acceptable substitute that is used in this region of the State for approval by the Engineer and County.

10. Q. See section 39-1.43, G on sheet 2. Is a pneumatic roller required on this project? These rollers are very difficult to find and I see no reason to use one on a small paving project like this one.
    A. Yes, a pneumatic roller is required by the County of San Joaquin Public Works Department.

11. Q. Can excess dirt or grass stripping be stockpiled or spread onsite or will it need to be exported?
    A. No, any excess dirt/spoils must be exported.

LODI UNIFIED SCHOOL DISTRICT
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ADDENDUM NO. 1

12. Q. Will any hydroseeding be required?
    A. No unless a SWPPP is required, see questions 5 and 6 above. Note that there is an Allowance being added to the Bid Form for "Landscaping and Irrigation" that will be designed by the Architect, which will be installed by the Contractor in the bioswale areas.

List of Attachments

1. Pre-Bid Conference and Site Visit Agenda dated February 20, 2019 (1 page).
2. Pre-Bid Conference and Site Visit Sign-in Sheet dated February 20, 2019 (3 pages).
3. Bid Form and Proposal (4 pages).
4. Exhibit A - Geotechnical Engineering Report, Lockeford Elementary School Additions, dated February 13, 2008 (84 pages).
5. Exhibit B - Miscellaneous Soil Testing, Lockeford Elementary School Additions, dated April 28, 2008 (7 pages).
6. Exhibit C - Supplemental Miscellaneous Soil Testing, Lockeford Elementary School Additions, dated May 22, 2008 (8 pages).
7. Exhibit D - Review of Storm Drainage Analysis, Lockeford Elementary School, dated November 28, 2017 (3 pages).
8. Checkmate Inline check valve product data (7 pages).
9. Checkmate inline check valve installation, operations and maintenance manual (7 pages).
10. Drawing and Details for Jack Tone Road inline check valve addition (2 pages).
11. County of San Joaquin Public Works Department Encroachment Permit (5 pages)

End of Addendum

Lodi Unified School District
Project No. 0925-8225
Lockeford Traffic Circulation Project
Lockeford Elementary School

PRE-BID CONFERENCE & SITE VISIT AGENDA

Date: Wednesday, February 20, 2019 **Time:** 3:30 p.m.
Schools: **0925-8225:** Lockeford Elementary School
Bid Date: **Thursday, March 7, 2019 by 2:30:00 p.m.**

I. Meeting Called to Order
II. Introduction of Project Team
- A. District Representative, Vicki Brum, Planning & Facilities
- B. Capital Program Management, Craig Dooling and Mark Rosson
- C. Jeff Sanguinetti, AR Sanguinetti & Associates, Civil Engineer

III. Bidding Documents: Available from District https://www.lodiud.net/district/departments/business-services/facilities-and-planning
IV. Contracting Format: (1) Prime Contract
V. Scope of Work Descriptions: Document 01 11 00 Part 1.02 A Summary of Work and Drawings
VI. Engineer's Estimated Construction Budget: 0910-8225: $ 695,000.
VII. Bidding and Contract Award Requirements:
- A. License requirement(s): A
- B. Bid Bond or Certified Check, 10% of bid
- C. Prevailing Wages - certified payrolls, payroll records and other documents shall be required along with your progress billings: **www.dir.ca.gov/dlsr/DPreWageDetermination.htm**
- D. DIR Registration of Contractor & Subcontractors (See General Conditions, Section 0072 13)
- E. Disabled Veterans Business Enterprise (DVBE – Section 00 45 46.02)
- F. Bond and Insurance Requirements (See General Conditions, Section 00 72 13)
- G. Bid Form (See Bid Form, Section 00 41 13):
  1. Completed Forms
  2. No exclusions
  3. No faxes, phone or email bids
  4. Bids good for 90 days

VIII. Inspection Procedures: DSA Project Inspector: TBD
IX. Project Schedule: See Special Conditions, Article 8 – Time, Page 90
X. Department of Justice (DOJ) Clearance, Badges and Security: District Protocols
XI. Site Information:
- A. Contact: Vicki Brum, 209-331-7223
- B. Site access, temporary facilities, staging areas and parking
- C. Conduct on school premises
- D. Contractor's working hours
- E. Contractor's supervision

XII. Site Visits:
- A. Lockeford Elementary School, 19456 N.Tully Road, Lockeford, CA. 95237

XIII. Questions
XIV. Adjournment

Important note: Responses to inquiries and discussions occurring at this pre-bid walk-through shall in no way change or modify the bid documents. The bid documents will be affected only by addenda issued prior to the bid date.

Send written inquiries by March 12, 2019 to: Mark Rosson, mrosson@capitalpm.com

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Lodi Unified School District
PRE-BID CONFERENCE AND SITE VISIT SIGN-IN SHEET FOR
PROJECT NO. 0925-8225
Traffic Circulation Project at Lockeford Elementary School
Lockeford Elementary
Wednesday, February 20, 2019
3:30 PM

Company Name & Representative	Company Street Address	Phone #	E-Mail	INITIAL Lockeford Elementay Check In
Bsco Constructors Tyler Seavey	3650 Cincinati Ave, Rocklin Ca	(916)-233-9393	TSeavey@gcbrco.com	TS
Machado and Sons Francisco Llamas	1000 S Kilroy Turlock CA	(559)589-5016	estimating@machadoandsons	FL
AM Stephens	1717 S. Stockton St. Lodi CA	209-333-0136	jr@amstephens.net	DE
Tom May Const	4735 E. Fremont St. Stockton CA 95215	943-6248	MARK@TOMMAY@.NET	
AI ADVANTAGE ASPHALT	10508 PLACER LN SACRAMENTO CA 95827	916 388-2020	MATT@advantageasphalt.com	
BOBO CONSTRUCTION	9722 Kent St. Elk Grove, CA 95624	916 383 7777	bestimating@bobo const ruction inc.com	BO
Steve Kubat George Reed, Inc	140 Empire Ave Modesto, CA	(209)352-2351	gmo contracting@georgereed.com	SK
TBS WEST	6540 S. AUSTIN ROAD STOCKTON CA 95215	209/942-1360	ESTIMATING@TANDSINC.US	
ROBT BURNS CONST	2501 N WIGWAM DRIVE	209/943/6969	MBURNS@ROBERT BURNS CONSTRUCTION.COM	MB
GRAYSON ENGINEERING	221 W. OAK St., LODI	209 368-5448	BOB@GRAYSONENG.COM	

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Lodi Unified School District
PRE-BID CONFERENCE AND SITE VISIT SIGN-IN SHEET FOR
PROJECT NO. 0925-8225
Traffic Circulation Project at Lockeford Elementary School
Lockeford Elementary
Wednesday, February 20, 2019
3:30 PM

Company Name & Representative	Company Street Address	Phone #	E-Mail	INITIAL Lockeford Elementay Check In
Martin General Engineering Brandon Martin	12485 Quicksilver Dr. Rancho Cordova, CA	(916) 355-6101	bmartin@martingeneral.net	BM
Western Engineering Contractors Casey McKenzie	3171 Rippey Rd. Loomis, CA 95650	(916) 316-0229	cmckenzie@westeng.com	CM
McFadden Dustin Ketterling	~~707~~ 707 Murray Dr. Stockton CA 95210	2094787707	Dustin k@mcfaddenconstruction.com	DK
R&R Pacific Construction Gabriel Melendez	433 2nd St STE 103 Woodland, CA 95695	530-383-7655	gabriel@rrpaccon.com	GM.

Lodi Unified School District

PRE-BID CONFERENCE AND SITE VISIT SIGN-IN SHEET FOR

PROJECT NO. 0925-8225

Traffic Circulation Project at Lockeford Elementary School

Lockeford Elementary

Wednesday, February 20, 2019

3:30 PM

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Company Name & Representative	Company Street Address	Phone #	E-Mail	INITIAL Lockeford Elementay Check In
PROBUILDERS ROBERT LEWIS	7030 DRYWOOD WY 95662	916 2250373	SEBASTIAN @ SACPROBUILDERS.COM	RLL
CALIFORNIA HIGHWAY CONSTRUCTION GROUP INC - Alex Cabrera	1647 Willow Pass Rd. #150 Concord, CA 94523	(925) 766-7014	CHC_GROUP @ AOL.COM	AC

DOCUMENT 00 41 13

BID FORM AND PROPOSAL

To: Governing Board of the Lodi Unified School District ("District" or "Owner")

From: _____
(Proper Name of Bidder)

The undersigned declares that Bidder has read and understands the Contract Documents, including, without limitation, the Notice to Bidders and the Instructions to Bidders, and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Project No. 0910-8210 & 0931-8231 for the following project known as:

Lockeford Elementary School Traffic Circulation Project, Project No. 0925-8225

1. ("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included in words and numbers:

Lockeford Elementary School Traffic Circulation Project, Project No. 0925-8225

_____ Dollars $ _____ Base Bid

2. Alternates: Not Used

3. Allowances: The Bidder's Base Bid shall NOT include the following potential Allowance(s). The District will add some or all of the following Allowance(s) amount(s) to the successful bidder's Contract, at the District's discretion. Contractor shall be permitted to invoice for Work under an Allowance in the identical structure as a Change Order.

Lockeford Elementary School (0925-8225), Allowance #1: Allowance for unforeseen conditions at Lockeford Elementary School.	$75,000.00

Lockeford Elementary School (0925-8225), Allowance #2: Allowance for bioswale area landscaping and irrigation.	$60,000.00

Additional Detail Regarding Calculation of Base Bid

1. Allowance. The Bidder's Base Bid shall include allowances for unforeseen items, see Bid Form. The above allowances shall only be allocated for unforeseen items relating to the Work. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared an Allowance Expenditure Directive incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated.

2. OCIP. Not used.

3. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.

4. The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.

5. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.

6. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.

7. It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.

8. The following documents are attached hereto:

   - Bid Bond on the District's form or other security
   - Designated Subcontractors List
   - Site Visit Certification
   - Non-Collusion Declaration
   - Iran Contracting Act Certification
   - Disabled Veteran Business Enterprise Participation Certification

9. Receipt and acceptance of the following Addenda is hereby acknowledged:

No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____

10. Bidder acknowledges that the license required for performance of the Work is a Class A license.

11. Bidder hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.

12. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with all requirements of the Department of Industrial Relations.

13. Bidder hereby certifies that its bid includes sufficient funds to permit Bidder to comply with all local, state or federal labor laws or regulations during the Project, including payment of prevailing wage, and that Bidder will comply with the provisions of Labor Code section 2810(d) if awarded the Contract.

14. Not used.

15. Not used.

16. Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.

17. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.

18. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Gov. Code, § 12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.

19. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the Contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents and registered as a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this _____ day of _____ 20 ____

Name of Bidder: _____

Type of Organization: _____

Signed by: _____

Title of Signer: _____

Address of Bidder: _____

Taxpayer Identification No. of Bidder: _____

Telephone Number: _____

Fax Number: _____

E-mail: _____ Web Page: _____

Contractor's License No(s): No.: _____ Class: _____ Expiration Date: _____

No.: _____ Class:_____ Expiration Date: _____

No.: _____ Class:_____ Expiration Date: _____

Public Works Contractor Registration No.: _____

END OF DOCUMENT

Engineering Geologic and
Geotechnical Engineering Report

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California
February 13, 2008
WKA No. 7954.01

Prepared For:
Lodi Unified School District
1305 East Vine Street
Lodi, California 95240

Geologic Hazard and Geotechnical Engineering Report

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

WKA No. 7954.01

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Wallace Kuhl & Associates Inc

Corporate Office
3251 Beacon Boulevard, Suite 300
West Sacramento, CA 95691
916.372.1434 phone
916.372.2565 fax

Rocklin Office
500 Menlo Drive, Suite 100
Rocklin, CA 95765
916.435.9722 phone
916.435.9822 fax

Stockton Office
3410 West Hammer Lane, Suite F
Stockton, CA 95219
209.234.7722 phone
209.234.7727 fax

Geologic Hazard and Geotechnical Engineering Report

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

19456 North Tully Road

Lockeford, California

WKA No. 7954.01

February 13, 2008

INTRODUCTION

We have completed a geotechnical engineering and geologic hazard investigation for the site of the proposed construction of additions within the Lockeford Elementary School campus in Lockeford, California (see Figure 1). The purposes of our work have been to investigate the site, soil, and groundwater conditions of the property, and to prepare geologic and geotechnical engineering conclusions and recommendations for use by the other members of the design team in preparing project plans and specifications.

Work Scope

Our scope of work included the following:

1. Site reconnaissance.
2. Review of historic aerial photographs, topographic maps and groundwater maps of the area, and previous reports prepared for the site.
3. Review of geologic maps and fault maps.
4. Review of seismic activity within 100 miles of the site.
5. Subsurface exploration, including the drilling and sampling of six test borings to the maximum depth of approximately 16 feet below the existing site grades and conducting three cone penetrometer test (CPT) soundings to the maximum depth of 37½ feet below the existing site grades.
6. Collection of bulk samples of near-surface soils for pavement design, expansion potential and preliminary corrosion characteristics.
7. Laboratory testing of selected soil samples.
8. Engineering and geologic analyses.
9. Preparation of this report.

Figures and Attachments

The following Figures are included with this report:

Figure	Title	Figure	Title
No. 1	Vicinity Map	No. 14	Unified Soil Classification System
No. 2	Site Plan	No. 15	Geologic Map
No. 3-11	Logs of Borings and CPT Logs	No. 16	Fault Map
No. 12-13	Geologic Cross-sections	No. 17	Epicenter Map

Appended to this report are:

- General information regarding project concepts, exploratory methods used during our field investigation, and laboratory test results not included on the logs of borings.
- Guide Earthwork Specifications that may be used in the preparation of contract documents.
- A list of cited references.
- Results of the liquefaction analysis of the soils beneath the site.

Proposed Development

An Overall *Site Plan*, dated December 17, 2007, provided by Stafford King Wiese Architects (Project Architect), indicates the proposed project will include the construction of three- and four-classroom buildings, approximately 2,100 square foot each, and an approximately 4,700 square foot multi-purpose building. The proposed buildings will be single-story, modular structures with concrete slab-on-grade floors, supported on a conventional foundation system. Associated developments will include an asphalt-concrete paved parking lot, entry drives, underground utilities, exterior flatwork and landscaping.

Grading plans were not available at the time this report was prepared, however, considering the relatively flat site topography we anticipate excavations and fills on the order of one to three feet across the major portion of the site will achieve level building pad and provide positive site drainage.

FINDINGS

Site Description

The project site is located within the Lockeford Elementary School campus. The Lockeford Elementary School is located at 19456 North Tully Road in Lockeford, California (see Figure 1). The site is bounded to the south by grass sports fields; to the east by classroom and office buildings; to the north by North Tully Road, beyond which is a vineyard; and, to the west by vacant land, a barn and residential structures.

At the time of our site reconnaissance and our site investigation on January 23, 2008, the major portion of the proposed location of the four-classroom building was a landscaped area. A mature tree, asphalt concrete pavements and a modular classroom building were also observed within the proposed location of the four-classroom building. The proposed location of the three-classroom building, the multi-purpose building and a major portion of the parking lot was vacant land. Several mature trees, asphalt concrete pavements, standing water, scattered debris and gravel were observed within the proposed location of the three-classroom building, the multi-purpose building and the major portion of the parking lot. The proposed location of the most southern portion of the parking lot supported an existing asphalt paved parking lot. Overhead power lines were observed along North Tully Road. Several trees were noted in the areas proposed for the improvements.

Based upon review of an undated topographic map transmitted to our office on January 18, 2008, by Stafford King Wiese Architects the site elevation ranges between approximately +100 to +102 feet relative to mean sea level (msl).

The project site history was compiled based on the review of the historical aerial photographs (dated 1963, 1975, 1993, and 1999), and a USGS historical topographic map (dated 1968, photorevised 1979). A warehouse was present within the northern portion of the site since at least 1963 until at least 1999. Also, a grain warehouse was located on-site between 1992 and 1930. An underground storage tank (UST) was located within the southern portion of the site. The UST was removed in 1996.

According to the USGS *Topographic Map of the Lockeford, California Quadrangle* (photorevised 1979), the site is located at approximately 38.1618 degrees north latitude and 121.1490 degrees west longitude.

Previous Investigations

Review of the report entitled *Over-Excavation and Soil Disposal for the Lockeford Elementary School Expansion Site* (referred to, hereinafter, as the Aperio Report), prepared by Aperio, Inc. and dated November 5, 2007, indicates that at least three excavations, up to six feet deep were performed on-site to remove contaminated soils. The report does not indicate that the excavations were backfilled with engineered fill or compaction tests were performed during the backfill. Specifically the report states:

> *Sides of excavation were broken down, the gate was closed, and demobilization took place at 3:30 pm.*

The Aperio Report indicates that foundation fragments associated with former structure on-site, UST excavation backfill and household debris were encountered during excavations.

Subsurface Soil Conditions

Undocumented fill soils were encountered in every boring and CPT sounding. Fill soils consist of sandy and silty clays and fine gravels to depths ranging from approximately one to 1½ feet below existing site grades.

The exploratory borings and CPT soundings indicate the native subsurface soils below the fill soils consist of brown to reddish-brown clayey, silty sands and sandy, silty clays to depths ranging from 2½ to 15½ feet below existing site grades, underlain by interbedded layers of silty clays, clayey silts, clayey sands and silty sands to a maximum depth explored of 37½ feet below existing site grades. Partially cemented soils were encountered at various depths. Cone refusal occurred for each of the CPT soundings at depths ranging from seven to 37½ feet below existing site grades.

For soil conditions encountered at a specific location, please refer to the Logs of Soil Borings, Figures 3 through 8 and Logs of CPT Soundings, Figures 9 through 11.

Groundwater

At the time of the drilling operations, free groundwater was initially encountered in Borings D1 and D4 at depths of approximately 7½ and 9½ feet below existing site grades, respectively. At the time of completion of our field investigation, the groundwater level in the borings had remained at 7½ and 9½ feet below existing site grades, respectively.

Review of the Spring 2003 San Joaquin County Flood Control and Water Conservation District Map *Lines of Equal Depth to Groundwater* indicates that current depth-to-groundwater is estimated to be between -10 feet and -20 msl, or about 110 to 120 feet below the lowest site elevation. Based on review of historical ground water data compiled by the San Joaquin County Flood Control and Water Conservation District, groundwater elevations have fluctuated from a maximum between +10 to 0 feet msl in 1971, or about 90 to 100 feet below the lowest site elevation, to a minimum between -30 to -40 feet msl in 1997, or about 130 to 140 feet below the lowest site elevation.

Regional Geology

The project site is located within the Great Valley geomorphic province of California. The geology in the Great Valley is characterized by thick sequences of alluvial and flood plain deposits consisting of sedimentary material derived from the Coast Ranges to the west and the Sierra Nevada mountain range to the east. According to the California Division of Mines and Geology (Wagner, D.L., et all, 1981), the project site is underlain by arkosic alluvium of Modesto-Riverbank Formations (see Figure 15). According to the United States Geological Survey (Marchand, D.E., Bartow, J.A., 1979), the project site is underlain by Pleistocene upper member of River Bank Formation, consisting of arkosic alluvium forming Mokelumne River terraces and alluvial fan; chiefly sand with minor gravel and silt; probably glacial outwash.

Geologic Structure

The Great Valley of California is generally considered to be an elongated sedimentary trough, approximately 450 miles long and 50 miles wide, which has been filled by a thick sequence of Jurassic to Holocene continental and marine sediments. The sediments have been folded into an asymmetric syncline, the axis of which lies immediately east of the interior Coast Ranges (Bailey, 1966).

Surface elevations within the Great Valley generally range from several feet below msl to more than 1000 feet msl. The major topographical feature in the Sacramento Valley is the Sutter Buttes (a volcanic remnant), which rise approximately 1980 feet above the surrounding valley floor.

Faults and Seismicity

Using the *Revised 2002 California Probabilistic Seismic Maps* (Cao, et al, 2003), we have prepared Table 1 containing faults and fault systems within about 100 miles of the site that are considered capable of producing earthquakes with greater than a 6.5 moment magnitude (M_W). A fault location map is presented on Figure 16.

According to the *Fault Activity Map of California and Adjacent Areas*, prepared by the DMG (Jennings, 1996), the closest fault to the site is indicated to be the Pre-Quaternary Stockton Fault, located approximately 10¾ miles south of the site. The nearest fault exhibiting activity in Holocene is Youngs Creek Fault of the Bear Mountains Fault Zone located approximately 20½ miles east of the site. This fault is not zoned as an Alquist-Priolo Earthquake Fault Zone.

The project site is not located across a mapped trace of any fault, nor was there any indication of surface rupture or fault-related surface disturbance at the site during our site reconnaissance or review of aerial photographs. The site is *not* located within an Alquist-Priolo Earthquake Fault Zone (DMG Special Publication No. 42, 1997). The nearest Alquist-Priolo Earthquake Fault Zone is Greenville Fault, located approximately 67 kilometers west of the site.

Table 1
Faults Influential to the School Site

Fault Name	Maximum Magnitude (M_W)	Distance To Site Miles (Kilometers)
Foothills Fault System (Segment 1)	6.5	16.0 (25.8)
Foothills Fault System (Segment 2)	6.5	24.5 (39.5)
Foothills Fault System (Segment 3)	6.5	29.0 (46.7
Great Valley Fault System (Segment 5) *	6.5	33.3 (53.6)
Great Valley Fault System (Segment 7) *	6.7	36.2 (58.2)
Great Valley Fault System (Segment 4) *	6.6	41.7 (67.1)
Greenville Fault (Northern Segment)	6.7	41.8 (67.2)
Mount Diablo Thrust Fault	6.7	42.1 (67.8)
Greenville Fault (Northern and Southern Segments)	6.9	43.2 (69.5)
Concord - Green Valley Faults (Concord & Green Valley Northern and Southern Segments)	6.7	49.1 (79.0)
Great Valley Fault System (Segment 8) *	6.6	50.5 (81.2)
Concord - Green Valley Faults (Green Valley Northern and Southern Segments)	6.5	51.1 (82.2)
Calaveras Fault (Northern, Central, and Southern Segments)	6.9	52.4 (84.4)
Great Valley Fault System (Segment 3) *	6.9	58.5 (94.1)
West Napa Fault	6.5	59.5 (95.8)
Hunting Creek – Berryessa Fault	7.1	60.4 (97.2)
Hayward Fault (Northern and Southern Segments & Rodger Creek)	7.3	60.5 (97.3)
Ortigalita Fault	7.1	62.0 (99.8)
Hayward Fault (Northern Segment & Rodgers Creek Fault)	7.1	62.3 (100.2)
Hayward Fault (Rodgers Creek)	7.0	70.0 (112.7)
Great Valley Fault System (Segment 9) *	6.6	73.8 (118.8)
Monte Vista – Shannon Fault	6.7	75.7 (121.8)
San Andreas Fault (Santa Cruz, Peninsula, North Coast, and Offshore Segments)	7.9	79.0 (127.1)
Western Nevada Fault (Zone 1)	7.3	80.3 (129.3)
Genoa (Carson Range Fault Zone)	6.9	80.8 (130.1)

Fault Name	Maximum Magnitude (M_W)	Distance To Site Miles (Kilometers)
Foothills Fault System (Segment 4)	6.5	81.5 (131.1)
San Andreas Fault (North Coast and Offshore Segments)	7.7	81.6 (131.4)
San Andreas Fault (Santa Cruz Segment)	7.0	82.4 (132.6)
San Gregorio Fault (Northern and Southern Segments)	7.4	84.2 (135.5)
Zayante – Vergeles Fault	7.0	86.6 (139.4)
Maacama – Gerberville Fault	7.5	88.6 (142.6)
Bartlett Springs Fault System	7.6	90.9 (146.3)
Point Reyes Fault	7.0	91.2 (146.7)
Antelope Valley Fault	6.7	92.9 (149.5)
Collayomi Fault	6.5	93.5 (150.5)
Western Nevada Fault (Zone 2)	7.3	94.4 (152.0)
Mohawk – Honey Lake (Zone 5)	7.3	99.0 (159.3)
Great Valley Fault System (Segment 1) *	6.7	99.2 (159.6)

*Nine segments of the Great Valley Fault, as modeled by Cao, et al (2003) are located within 33.3 to 99.2 miles (53.6 to 159.6 km) of the site and have maximum magnitudes of 6.4 to 6.9.

The term "Foothills Fault System" has been used for the major fault zones in the western Sierra Nevada. The Melones and Bear Mountain Fault Zones are the most important components of this system, south of the Cosumnes River. Generally, the faults of this system consist of vertical to steeply east-dipping zones of sheared rock with linear mapped traces. Many of the faults are delineated wholly or in part by lenses of sheared serpentine or shist.

Prior to the Oroville Earthquake (Magnitude 5.7) on August 1, 1975, the Foothills Fault System was regarded as seismically inactive. This earthquake occurred within the northern extension of the Bear Mountain Fault zone and suggested the possibility of reservoir-induced (Oroville Dam) seismicity. Microearthquake data and geodetic surveys show that the two main branches of the Foothills Fault System (Bear Mountain and Melones Fault Zones) display active movement, at least in the area between Oroville and Folsom.

The Great Valley Fault System is the boundary between the Coast Range and the Great Valley geomorphic provinces of California. The Great Valley Fault System consists a low-angle fault system or blind thrust, the fault surfaces of which do not break the ground surface during sizeable earthquakes (Namson and Davis, 1988; Unruh and Moores, 1992; Wakabayashi and Smith, 1994). The 1892 M_R6.4 and 6.2 Winters-Vacaville, 1983 M_W6.5 Coalinga, and the 1985 M_W6.1 Kettleman Hills earthquakes occurred along segments of the Great Valley Fault System.

In addition to the faults indicated above, the *Public Health and Safety Element of the San Joaquin County General Plan* (1992) recognizes the potential impacts of the Midland Fault Zone, Midway Fault, Black Butte Fault, Patterson Pass Fault and Tesla Fault.

Historic Seismicity

Data pertinent to the greatest historical earthquakes affecting the site are contained within the database of the EQSEARCH computer program (Blake, 2000; database updated to June 2007). The EQSEARCH database was developed by extracting records of events greater than magnitude 4.0 from the DMG *Comprehensive Computerized Earthquake Catalog*, and supplemented by records from the USGS; University of California, Berkeley; the California Institute of Technology; and, the University of Nevada at Reno. A historic earthquake epicenter map is presented as Figure 17.

An examination of the tabulated data suggests that the site has experienced ground shaking equivalent to Modified Mercalli Intensity VIII[1]. Historically, the largest magnitude earthquake to influence the site was the 1906 San Francisco earthquake. Based upon the attenuation relationships of Boore (1997) for strike slip faults, the 1906 San Francisco earthquake has produced a peak horizontal site acceleration of approximately 0.10g.

The closest earthquake to the site is indicated to be an M_R4.3 earthquake that occurred on August 4, 1850, with an epicenter located approximately 11.1 miles northwest of the site. Based upon

[1] Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving automobiles disturbed.

the attenuation relationships of Boore (1997) for strike slip faults, this event is estimated to have produced a peak horizontal site acceleration of approximately 0.06g at the school site.

CONCLUSIONS

Bearing Capacity and Anticipate Settlements

Removal of any surface and subsurface items associated with previous development, including, but not limited to foundations, concrete slabs, pavements, any utilities to be relocated or abandoned, trees and debris will disturb on-site soils to depths on the order of two to three feet below existing grades. In addition, undocumented fill soils encountered within the project site as well as backfill of the exploration test pits and UST excavation will not provide adequate support for the proposed improvements or fills. Our representative should be on-site during site preparation to determine the depth of disturbance of soils, depth of undocumented fill soils and identify areas, which will require removal, processing and recompaction. Specific recommendations for overexcavation, moisture conditioning and recompaction of the surface soils are provided in the Site Preparation section of this report.

Our work indicates that recompacted surface soils and engineered fill, when placed and compacted in accordance with the recommendations of this report, will be capable of supporting the proposed improvements. Field and laboratory test results indicate the undisturbed native soils encountered in our test borings are capable of supporting the proposed improvements.

Foundations constructed in accordance with the recommendations of this report are expected to experience maximum total and differential settlements (seismic and static) of 1-inch and ½-inch in 40 linear feet, respectively.

Expansive Soils

Laboratory test results on the near-surface soils indicate these materials possess a "low" expansion potential (See Figure A2) when tested in accordance with ASTM D4829 (UBC 18-2).

Therefore, expansive soils should not be a factor in the design and construction of the proposed improvements on-site.

Suitability of On-site Soils for Use as Fill

In our opinion, the on-site soils encountered in our test borings are considered suitable for use as engineered fill materials if they are free of debris, organics and are at a workable moisture content.

Excavation Conditions

Based on our field investigation, the native soils on the site should be readily excavatable with conventional earthmoving and trenching equipment typically used in the area.

Excavations likely will stand at a near-vertical inclination for short periods of time, unless zones or pockets of clean cohesionless sands are encountered or the construction is performed during the rainy season. Excavations encountering perched water, saturated soils, or excavations exposing granular, silty sand soils may slough or cave if left open for an extended period of time. Excavations entered by workers must conform to current OSHA requirements (i.e., sloped or braced shoring). Temporarily sloped excavations in near surface clay soils should be constructed no steeper than one horizontal to one vertical (1:1). Temporarily sloped excavations which expose granular silty sand soils or saturated soils should be constructed no steeper than one and a half horizontal to one vertical (1½:1).

Pavement Subgrade Quality

Based upon our testing of representative samples of the anticipated pavement subgrade soils (see Figure A3), the clay soils are indicated to be poor quality materials for support of asphalt concrete and Portland cement concrete pavements (R-value of 13). Relatively thick pavement sections will be required to compensate for the low quality of the native clay soils. Our experience with similar soils indicates that the subgrade soils can be amended to near-subbase (R-value > 50) quality with the addition of a combination of high calcium or dolomitic quick

lime and Type C or Type F fly ash. Amending the pavement subgrade soils will reduce the aggregate base thickness required to support the anticipated traffic.

Chemical-Treatment of Soil

Based upon our experience with similar soil types, it is our opinion that treatment of the on-site soils with a combination of high calcium or dolomitic quick lime and Type C or Type F fly ash will: increase the shear strength of the soils; improve the pavement support characteristics of the soils; and, reduce the moisture content of saturated soils to a level at which the specified degree of compaction can be achieved.

The performance of chemically-stabilized soils is critically dependent on uniform mixing of the lime and fly ash into the subgrade soil, and providing for a proper curing period following amendment chemically. An experienced stabilization contractor coupled with a comprehensive quality control program are generally required to achieve the best possible stabilized subgrade.

Ground Water and Seasonal Water

Considering groundwater was encountered only in two borings and the variable depth to groundwater, it is our opinion that the groundwater encountered in our borings is perched groundwater.

Based upon anticipated groundwater depths, we conclude that the permanent or perched groundwater levels should not be a factor in design or construction of the structure at the site. However, moisture vapor penetration resistance should be a significant consideration in design and construction of interior floor slabs.

Excavations extending deeper than five feet below the existing ground surface could encounter saturated soils and ground water. We anticipate that utility trenches deeper than five feet could require dewatering to allow construction to proceed. It is recommended to consult an earthwork contractor with experience in dewatering operations for similar type projects and similar type ground water conditions prior to finalizing construction bid documents.

During the wet season, infiltrating surface water will create a saturated surface condition. Grading operations attempted following the on-set of winter rains and prior to prolonged drying periods will be hampered by high soil moisture contents. In addition, soils excavated during utility trench construction and soils at the bottom of the utility trenches are anticipated to have moisture content significantly above optimum moisture content. Such soils, intended for use as engineered fill, will require considerable aeration to reach a moisture content that will permit the specified degree of compaction to be achieved.

Preliminary Soil Corrosion Potential

Two soil samples were submitted to Sunland Analytical for testing to determine pH, resistivity, and sulfate and chloride concentrations to help evaluate the potential for corrosive attack upon reinforced concrete and buried metal. The test results for the samples revealed chloride levels of 19.5 and 19.9 parts per million (ppm) and sulfate levels of 46.1 and 56.7 ppm. The minimum resistivity values were recorded at 2,600 and 2,790 ohm-centimeters (Ω-cm) and soil pH values were 7.55 and 7.59. Results of the corrosion testing are summarized in Appendix A, Figures A4 and A5.

Published literature[2] indicates soils with minimum resistivity values less than 1000 Ω-cm, chloride concentration greater than or equal to 500 ppm, a sulfate concentration greater than or equal to 2000 ppm, or with a pH of 5.5 or less, may significantly increase corrosion of reinforced concrete structures. Based on this criterion the on-site soils may be corrosive to buried metal but not unusually corrosive to reinforcement steel properly embedded in Portland cement concrete. Table 4.3.1 – *Requirement for Concrete Exposed to Sulfate-Containing Solutions,* ACI 318, Section 4.3, as referenced in section 1904A.3 of the 2007 CBC, indicates the sulfate exposure for the samples tested is *Negligible*. Ordinary Type I-II Portland cement is indicated to be suitable for use on this project, assuming a minimum cover is maintained over the reinforcement.

Wallace-Kuhl & Associates are not corrosion engineers. Therefore, to further define the soil corrosion potential at the site, a corrosion engineer could be consulted to determine the need for cathodic protection or grounding systems.

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[2] California Department of Transportation Division of Engineering Services Materials Engineering and Testing Services Corrosion Technology Branch, Corrosion Guidelines Version 1.0, September 2003.

Landscape Soil Quality

Two soil samples were submitted to Sunland Analytical to determine the quality of the soils with respect to landscaping. The results of the testing and recommendations provided by Sunland are presented in Appendix A, Figures A6 and A7.

Seismic Hazards

No active or potentially active faults are shown to pass through the project site as indicated by the published geologic maps or aerial photographs that we reviewed. The project site is not located within an Alquist-Priolo Earthquake Fault Zone. The school site is located within an area of moderate seismic activity; however, design of the structures in conformance with the 2007 edition of the California Building Code (Title 24 of the California Code of Regulations, Chapter 16A), should be sufficient to prevent significant damage from ground shaking during seismic events resulting from movement on any of the faults or fault systems discussed in this report.

Seismic Code Design

Section 1613 of the 2007 CBC uses the Maximum Considered Earthquake (MCE) ground motion for most design not requiring site-specific response analysis. A site specific ground response analysis study is beyond the scope of services of this investigation. Section 1613.5.1 requires the determination of parameters S_S and S_1, the 0.2 second and 1.0 second spectral response accelerations from the maps prepared by the United States Geological Survey (USGS) presented in CBC Figures 1613.5(1) through 1613.5(14). Alternatively, the site parameters may be determined based on the site latitude and longitude using the public domain computer program developed by the USGS. The following parameters may be used for seismic design of the proposed improvements using the 2007 CBC.

Latitude: 38.1618° W Longitude: 121.1490° N	ASCE 7-05 Table/Figure	Factor/Coefficient	Value
Short-Period MCE at 0.2s	Figure 22-3	S_S	0.572 g
1.0s Period MCE	Figure 22-4	S_1	0.230 g
Site Class	Table 20.3-1	D	--
Site Coefficient	Table 11.4-1	F_a	1.342
Site Coefficient	Table 11.4-2	F_v	1.941
Adjusted MCE Spectral Response Parameters	Equation 11.4-1	S_{MS}	0.768
	Equation 11.4-2	S_{M1}	0.446
Design Spectral Acceleration Parameters	Equation 11.4-3	S_{DS}	0.512
	Equation 11.4-4	S_{D1}	0.297
Seismic Design Category	Table 11.6-1	Occupancy I to IV	D
Seismic Design Category	Table 11.6-2	Occupancy I to IV	D

Volcanic Hazards

The school site is located more than 60 miles from the nearest areas subject to potential hazards from future eruptions in California (Clear Lake Area and Mono Lake – Long Valley Area); therefore, the risk to the site associated with volcanic hazards is very low (Miller, 1989).

Naturally Occurring Asbestos (NOA)

The project site is underlain by Holocene and (or) Pleistocene alluvial-fan deposits. There are no geologic formations in the area of the school which are likely to contain naturally occurring asbestos.

Subsidence

According to the *Public Health and Safety Element of the San Joaquin County General Plan* (1992), there is no mapped history of ground subsidence in the Lockeford area.

Landslides

Due to relatively flat relief at the site, the potential for landslides on this site is considered to be low.

Flood Hazards and Dam Inundation

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for San Joaquin County, California (Community-Panel Number 060299 0170 C, April 2, 2002), the project site is located within ZONE C defined as "Areas of minimal flooding".

According to the *Dam Failure Plan* (December 2003) prepared by the San Joaquin County Office of Emergency Services the project site is located within areas subject to inundation due to Camanche Dam and Camanche South Dikes failure or overspill.

There are no significant bodies of standing water near the site; therefore, the potential for seiches or tsunamis influencing the site is very low.

Liquefaction Potential and Seismically Induced Settlement

The site is not located in a Seismic Hazard Special Studies Zone for liquefaction which delineates areas of historical occurrence of liquefaction or local geological, geotechnical and ground water conditions indicating a potential for permanent ground displacement such that a mitigation as defined in Public Resources Code Section 2693 will be required.

Our liquefaction and seismic settlement analyses were performed using the commercially available software program *LiqIT v. 4.7 – Soil Liquefaction Assessment Software*, written by GeoLogismiki in conjunction with Dr. Peter Robertson. The input parameters and the printout of the liquefaction analysis is attached to this report.

For the purpose of the liquefaction analysis a ground water depth of seven feet below site grade was utilized. The value of horizontal peak ground acceleration for the liquefaction analysis of 0.2g (or value of S_{DS} divided by 2.5) was selected in accordance with *CGS Note 48 Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings*, dated October 2007. Results of the hazard deaggregation conducted using the program *FRISKSP* ver. 4.00 indicate that the mode magnitude earthquake for the site is 6.8. This earthquake magnitude was utilized in our liquefaction analyses.

Results of liquefaction analyses indicate the potential for soil liquefaction beneath the site is considered low (factor of safety against liquefaction of 1.5 or higher).

There are no slopes or free faces near the site, therefore the potential for lateral spreading is considered to be low at this site.

The results of seismic settlement analysis indicate seismic settlement equal to zero. However, we understand that the earthquake producing horizontal peak ground acceleration of 0.2g on-site will generate some seismic settlement. Therefore, total and differential seismic settlements of ¼-inch and ⅛-inch in 40 linear feet, respectively, should be anticipated. These settlements should be considered in addition to the static settlements for the design of the foundations and underground utilities.

RECOMMENDATIONS

General

The recommendations presented below are appropriate for typical construction in the late spring through fall months. The on-site soils likely will be saturated by rainfall in the winter and early spring months, and will not be compactable without drying by aeration or the addition of lime (or a similar product) to dry the soils. Should the construction schedule require work during wet conditions, additional recommendations can be provided, as conditions warrant.

In addition, subgrade soils below existing pavement sections and landscape areas will have moisture contents significantly above optimum moisture content regardless of the time year. Therefore, regardless when construction begins, drying of subgrade soils by aeration or by chemical treatment should be anticipated.

Excavations extending deeper than five feet below the existing ground surface may encounter saturated soils and perched groundwater. We anticipate that utility trenches or demolition excavations deeper than five feet may require dewatering to allow construction to proceed. It is

Original grade preparation and fill construction should extend at least five feet beyond the perimeter columns of the buildings and two feet beyond pavements and exterior flatwork.

Compaction of the ground surface should be performed using a heavy, self-propelled sheepsfoot compactor and must be performed in the presence of our representative who will evaluate the performance of the subgrade under compactive load, and identify any loose or unstable soil conditions that could require additional excavation. All excavations should be restored to grade with engineered fill compacted in accordance with the recommendations of this report.

On-site soils (native or undocumented fill) are considered suitable for use in engineered fill construction, if free of rubble, rubbish, or concentrations of organics. Imported, non-expansive fill materials should be granular materials with a Plasticity Index of 15 or less, an Expansion Index of 20 or less, an R-value of 10 or higher (if used in the pavement areas), be free of particles greater than three inches in largest dimension, be free of contamination, and have corrosion characteristics within acceptable limits. *Proposed import soils must be approved by our office prior to being transported to the project site.* All imported soils should meet the requirements set forth by the appropriate regulatory Agency.

Excavated poorly graded gravel should be thoroughly mixed with on-site, native soils prior to be placed as engineered fill.

Engineered fill composed of native, on-site soils, existing fills, or imported materials should be placed in horizontal lifts not exceeding six inches in compacted thickness. Untreated soils should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 90 percent of the ASTM D1557 maximum dry density. Chemically-treated soils should be uniformly moisture conditioned to at least the optimum moisture content and compacted to at least 92 percent of the ASTM D1557 maximum dry density. Engineered fill soil placed deeper than five feet below the proposed site grades should be compacted to a minimum of 95 percent of the ASTM D1557 maximum dry density.

The upper six inches of untreated pavement subgrades should be uniformly compacted to at least 95 percent of the maximum dry density at a moisture content of at least the optimum moisture, and must be stable under construction traffic prior to placement of aggregate base. Alternatively,

the upper 12 inches may consist of chemically-treated soils compacted to at least 92 percent relative compaction, at a moisture content of at least the optimum moisture content.

A combination of lime and Type C or F fly ash should be added to the soil material to be treated. Lime should be added at a rate of at least three percent by dry unit weight (not less than 3½ pounds of lime per square foot based on a 12-inch mixing depth). Fly ash should be added at a rate of at least three percent by dry unit weight (not less than 3½ pounds of lime per square foot based on a 12-inch mixing depth). These spread rates are provided for estimation purposes only as the actual amount of product can only be determined at the time of construction based upon the prevailing site conditions. Contractors should provide an add/deduct unit price for the chemicals on a per pound basis to allow for additional adjustments if necessary.

Permanent excavation and fill slopes should be constructed no steeper than two horizontal to one vertical (2:1). Revegetation of the slopes as soon as possible following grading will help reduce erosion.

Site preparation should be accomplished in accordance with the recommendations of this section and the *Guide Earthwork Specifications* contained in Appendix B. A representative from our office should be present during site preparation and all grading operations to observe and test the fill to verify compliance with our recommendations and the job specifications.

Foundations

The proposed structures may be constructed upon a continuous perimeter foundation with isolated or continuous spread foundations bearing upon undisturbed native soils or engineered fill constructed in accordance with these recommendations. Foundations for the structure should be embedded at least 12 inches below lowest adjacent soil grade. Isolated foundations should be at least 15 inches in plan dimensions; continuous foundations should be at least 12 inches wide. Foundations so established may be sized for a maximum allowable soil bearing pressures of 2500 pounds per square foot (psf) for dead plus live load, with a 1/3 increase to include wind or seismic forces.

Foundations should be designed to resist total settlements (static and seismic) of 1-inch and maximum differential settlements (static and seismic) of ½-inch in 40 linear feet.

The weight of foundation concrete extending below adjacent soil grade may be disregarded in sizing computations. The project structural engineer should design foundation reinforcement; however the reinforcement should consist of no less than two No. 4 bars placed one each near the top and bottom of the foundation. The structural engineer should evaluate the need for additional reinforcement, given the potential for total and differential settlements presented above.

Lateral resistance of foundations may be computed using an allowable friction factor of 0.30, which may be multiplied by the vertical load on the foundation. Additional lateral resistance may be assumed to develop against the vertical face of the foundations and may be computed using a "passive" equivalent fluid pressure of 350 psf per foot of depth. These two modes of resistance should not be added unless the frictional component is reduced by 50 percent, since full mobilization of the passive resistance requires some horizontal movement, which significantly diminishes the frictional resistance.

Interior Floor Slab Support

Interior concrete slab-on-grade floors should be a minimum of four inches thick and can be supported upon a capillary break, consisting of layer of crushed rock, over at least 12 inches of compacted soils as recommended in this report.

Additional moisture protection may be provided by placing a minimum 15-mil vapor retarder membrane directly beneath the slab. If used, the membrane should generally conform to ASTM E1745 requirements. The membrane should be installed so that there are no holes or uncovered areas. All seams should be overlapped and sealed with the manufacturer-approved tape, continuous at the laps so they are vapor tight. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc., should be sealed or caulked per manufacturer's recommendations.

Floor slab construction practice over the past 20 years or more has included placement of a thin layer of sand over the vapor retarder membrane. The intent of the sand is to aid in the proper

curing of the slab concrete. However, recent debate over excessive moisture vapor emissions from floor slabs includes concern of water trapped within the sand. As a consequence, we consider use of the sand layer as optional. The concrete curing benefits should be weighed against efforts to reduce slab moisture vapor transmission.

From a crack-control standpoint, No. 3 reinforcing bars placed at 24-inch center-to-center spacing both directions in the slab would be suitable for slab reinforcement. This slab reinforcement is suggested as a guide "minimum" only for crack control; final slab thickness, reinforcement and joint spacing should be determined by the structural engineer.

The loaded track pressure of cranes and/or heavy construction equipment that will operate on slabs or pavements should be assessed by the contractor prior to placing equipment on the slab. Construction loads should be considered in the design of concrete slabs-on-grade.

The recommendations presented above should mitigate significant soils-related cracking of the slab-on-grade floors. Also important to the performance and appearance of a Portland cement concrete slab is the quality of the concrete, the workmanship of the concrete contractor, the curing techniques utilized and spacing of control joints.

Floor Slab Moisture Penetration Resistance

It is emphasized that the use of sub-slab gravel and sheet plastic membrane will not "moisture proof" the slab, nor does it assure that slab moisture transmission levels will be low enough to prevent damage to other building components and floor coverings. They simply offer a first line of defense against soil related moisture.

Recommendations contained in this report concerning foundation and floor slab design are presented as *minimum* requirements, only from the geotechnical engineering standpoint.

It is emphasized that we are not slab moisture-proofing or moisture protection experts. We are expressly stating that we make no guarantee nor provide any assurance that use of the sub-slab gravel and vapor retarder will reduce slab moisture penetration to any specific amount or level, particularly those required by floor covering manufacturers or to prevent damage to other

building materials. The builder and designers should consider all available measures for slab moisture protection. If moisture sensitive floor covering are anticipated, or if moisture penetration through the slab is considered an issue by the school district or designer, a moist protection expert should be contacted. It is commonly accepted that the quality and thickness of the concrete slab are of primary importance to reducing moisture and moisture vapor penetration.

Exterior Flatwork Construction

Exterior slab-on-grade concrete should be at least four inches thick and should be supported on at least 12 inches of compacted soils as recommended in this report. The proper moisture content of subgrade should be maintained until placement of aggregate base section or concrete.

Exterior flatwork should be constructed independent of perimeter building foundations and isolated column foundations by the placement of a layer of felt material between the flatwork and the foundation.

The architect or civil engineer should determine the thickness, strength, reinforcement, and joint spacing of exterior slab-on-grade concrete. Exterior flatwork next to landscaped areas should be thickened to twice the slab thickness for a width of at least 12 inches to help support lawn mowing equipment and other maintenance equipment. Exterior flatwork to support traffic loads should be designed as a pavement in accordance with the following recommendations.

Surface Drainage

The control of surface water is critical to the performance of the buildings and pavements. The ground adjacent to the planned buildings should be sloped away from the structures at a gradient no less than two percent for a distance of at least 10 feet. All roof drainage downspouts should be connected to solid PVC piping directed to an appropriate drainage point away from the facility. Ponding of surface water should not be allowed within 10 feet of the buildings or pavements. Landscape berms, if planned, should not be constructed in such a manner as to promote drainage toward the buildings.

Trench Backfill

We recommend only native soils (in lieu of select gravel or sand backfill) be used as backfill for utility trenches located within the building footprint and extending at least five feet beyond the perimeter foundations to minimize water transmission beneath the structure. All utility trench backfill should be thoroughly moisture conditioned to at least the optimum moisture content and mechanically compacted to at least 90 percent of the ASTM D1557 maximum dry density.

We recommend that underground utility trenches that are aligned nearly parallel with foundations be at least three feet from the outer edge of foundations, wherever possible. As a general rule, trenches should not encroach into the zone extending outward at a 1:1 inclination below the bottom of the foundations. Additionally, trenches near foundations should not remain open longer than 72 hours to prevent drying and formation of desiccation and shrinkage cracks. The intent of these recommendations is to prevent loss of both lateral and vertical support of foundations, resulting in possible settlement.

We anticipate that utility trenches deeper than five feet would require dewatering to allow construction to proceed. It is recommended to consult an earthwork contractor with significant experience in dewatering operations for similar type projects prior to finalizing construction bid documents.

Excavated soils will likely be at an elevated moisture content, especially soils excavated from the deeper portions of the excavation. These soils may require aeration to achieve a compactable moisture content.

Pavement Design

The procedures used to design the pavement sections present below are in general conformance with the "Flexible Pavement Structural Design Guide for California Cities and Counties" dated January 1979, and the California Highway Design Manual dated September 1, 2006. An R-value of 10 was used for design of the following pavement thicknesses for untreated subgrade soils. A minimum R-value of 50 was assumed for chemically-treated subgrade soils.

Pavement Design Alternatives

Untreated Subgrade (R-value = 5)? 10 per pg 24

Traffic Condition	Traffic Traffic Index (TI)	Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
Parking Stalls and Traffic Lanes for Automobiles	4.5	2½	9 4	-- 4
Light Trucks and Automobiles	6.0	2½ 3½* --	14 12* 4	-- -- 5
Truck Traffic (Delivery Vehicles /Busses)	7.0	3 4* --	16 14 6	-- -- 6

* = Asphalt thickness includes Caltrans Factor of Safety.

Pavement Design Alternatives

Chemically-treated Subgrade (a)

Traffic Condition	Traffic Traffic Index (TI)	Type B Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Portland Cement Concrete (inches)
Parking Stalls and Traffic Lanes for Automobiles	4.5	2½	4 4	-- 4
Light Trucks And Automobiles	6.0	2½ 3½* --	5 4 4	-- -- 4
Truck Traffic (Delivery Vehicles /Busses)	7.0	3 4 ---	7 5 6	-- -- 4

* = Asphalt thickness includes Caltrans Factor of Safety.

(a) = Chemically-treated subgrade should possess a minimum R-value of 50 when tested in accordance with California Test 301.

In the summer heat, high axle loads coupled with shear stresses induced by sharply turning tire movements can lead to failure in asphalt concrete pavements. Therefore, we recommend the use of Portland cement concrete (PCC) sections in areas subjected to concentrated heavy wheel loading, such as entry driveways, in front of trash enclosures and in turning areas.

Upper six inches of pavement subgrade should be compacted to at least 95 percent relative compaction at a moisture content of at least the optimum moisture content. Alternatively, the upper 12 inches of pavement subgrade can consist of chemically-treated soils compacted to at least 92 percent relative compaction at a moisture content of at least the optimum moisture content.

All underground utility trenches should be backfilled prior to final preparation of pavement subgrades. Scarification, moisture conditioning and final compaction of pavement subgrades should be accomplished within 48 hours of aggregate base placement, to prevent degradation of the subgrade. The aggregate base should be compacted to at least 95 percent relative compaction.

We emphasize that the performance of the pavement is critically dependent upon uniform and adequate compaction of the soil subgrade as well as all engineered fill and utility trench backfill within the limits of the pavement. Earthwork construction within the limits of the pavement should be performed in accordance with the recommendations contained within this report.

Materials, quality and construction of the structural section of the pavement should conform to the applicable provisions of the Caltrans Standard Specifications, latest edition. Construction of Portland cement concrete pavements should be performed in accordance with applicable ACI or PCA standards. Control joints should be at least ¼ the thickness of the slab. We do not recommend saw cut control joints, as drying shrinkage cracks often form before the joints are cut. Tooled joints or use of proprietary joint inserts are preferable. Joint spacing should be determined by the civil engineer, but should be no greater than 30 times the slab thickness (10 feet maximum spacing for four inch thick slabs), but no greater than 15 feet. Portland cement concrete utilized in pavements should attain a compressive strength of at least 3500 psi at 28 days.

Consideration should be given to using full-depth curbs between landscaped areas and pavements to serve as a cut-off for water that could migrate into the pavement base materials. Weep holes are recommended in parking lot drop inlets to allow accumulating water moving through the aggregate base to drain from beneath the pavements.

Construction Testing and Observation

Geotechnical testing and observation during construction is considered a continuation of our geotechnical engineering investigation. Wallace-Kuhl & Associates, Inc. should be retained to provide testing and observation services during earthwork and foundation construction at the project to verify compliance with this geotechnical report and the project plans and specifications, and to provide consultation as required during construction. These services are beyond the scope of work authorized for this investigation.

In the event that Wallace-Kuhl & Associates, Inc., is not retained to provide geotechnical engineering observation and testing services during construction, the Geotechnical Engineer retained to provide these services in conformance with Sections 1704*A*7, 1704*A*8 and 1704*A*9 of the 2007 edition of the *California Building Code*, should indicate in writing that they agree with the recommendations of this report, or prepare supplemental recommendations as necessary. A final report by the "Soils Engineer" should be prepared upon completion of the project as required by the CBC Section *1704A7*.1. The title Soils Engineer is restricted in the State of California to a Civil Engineer authorized by the State of California to use the title "Geotechnical Engineer."

LIMITATIONS

Our recommendations are based upon the information provided regarding the proposed construction, combined with our analysis of site conditions revealed by the field exploration and laboratory testing programs. We have used our best engineering judgment based upon the information provided and the data generated from our investigation. If the proposed construction is modified or resited; or, if it is found during construction that subsurface conditions differ from those we encountered at the boring locations, we should be afforded the opportunity to review the

new information or changed conditions to determine if our conclusions and recommendations must be modified.

We would appreciate the opportunity to review the final plans and specifications to determine if the intent of our recommendations has been implemented in those documents.

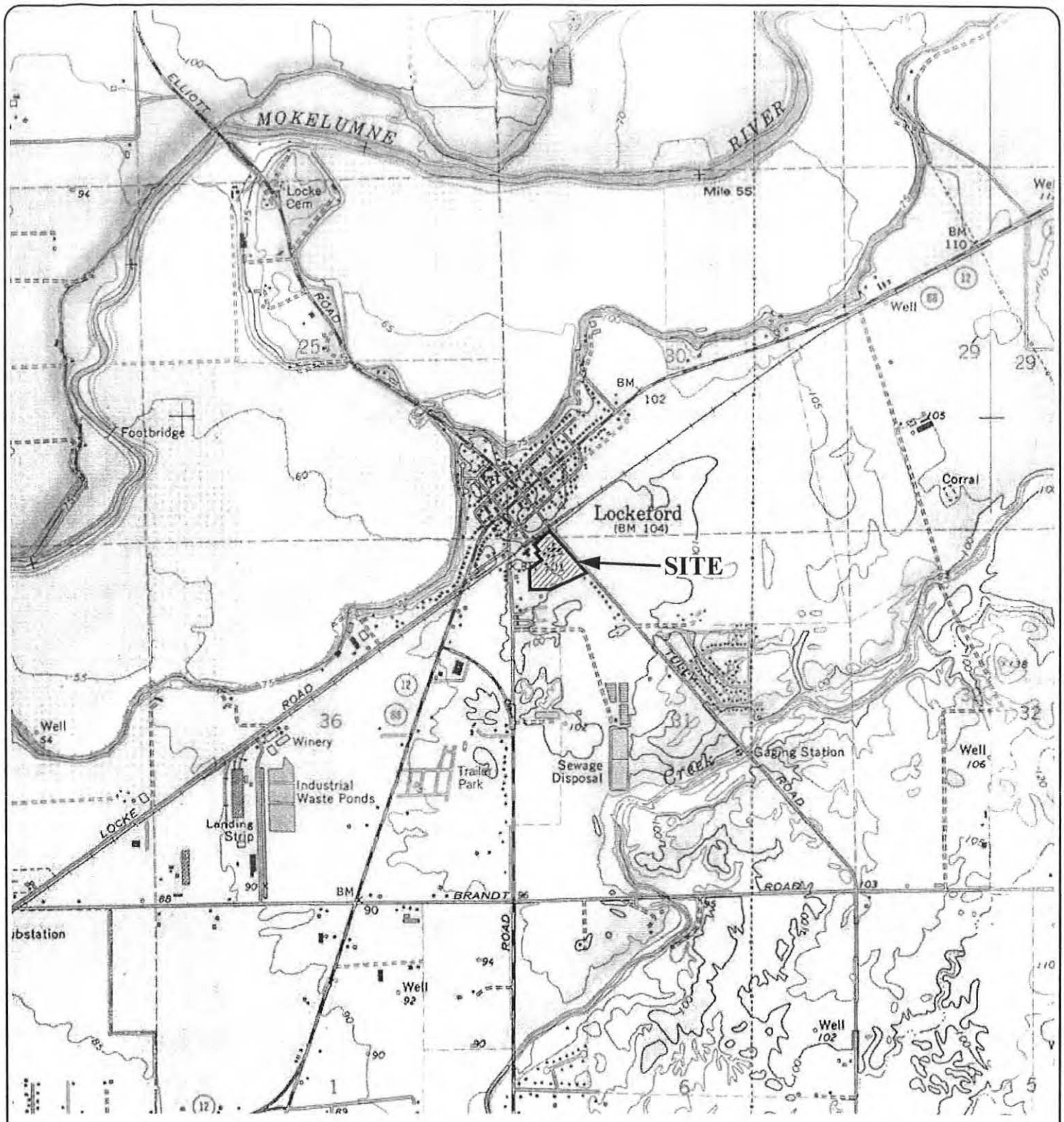
We emphasize that this report is applicable only to the proposed construction and the investigated site. This report should not be utilized for construction on any other site.

Wallace - Kuhl & Associates, Inc.

Vasiliy V. Parfenov
Project Engineering Geologist

Todd G. Kamisky
Senior Engineer

VVP:TGK



Adapted from the U.S. Geological Survey 7.5 minute topographic map of the Lockeford quadrangle, California.

Map created with TOPO! ©2003 National Geographic (www.nationalgeographic.com/topo).

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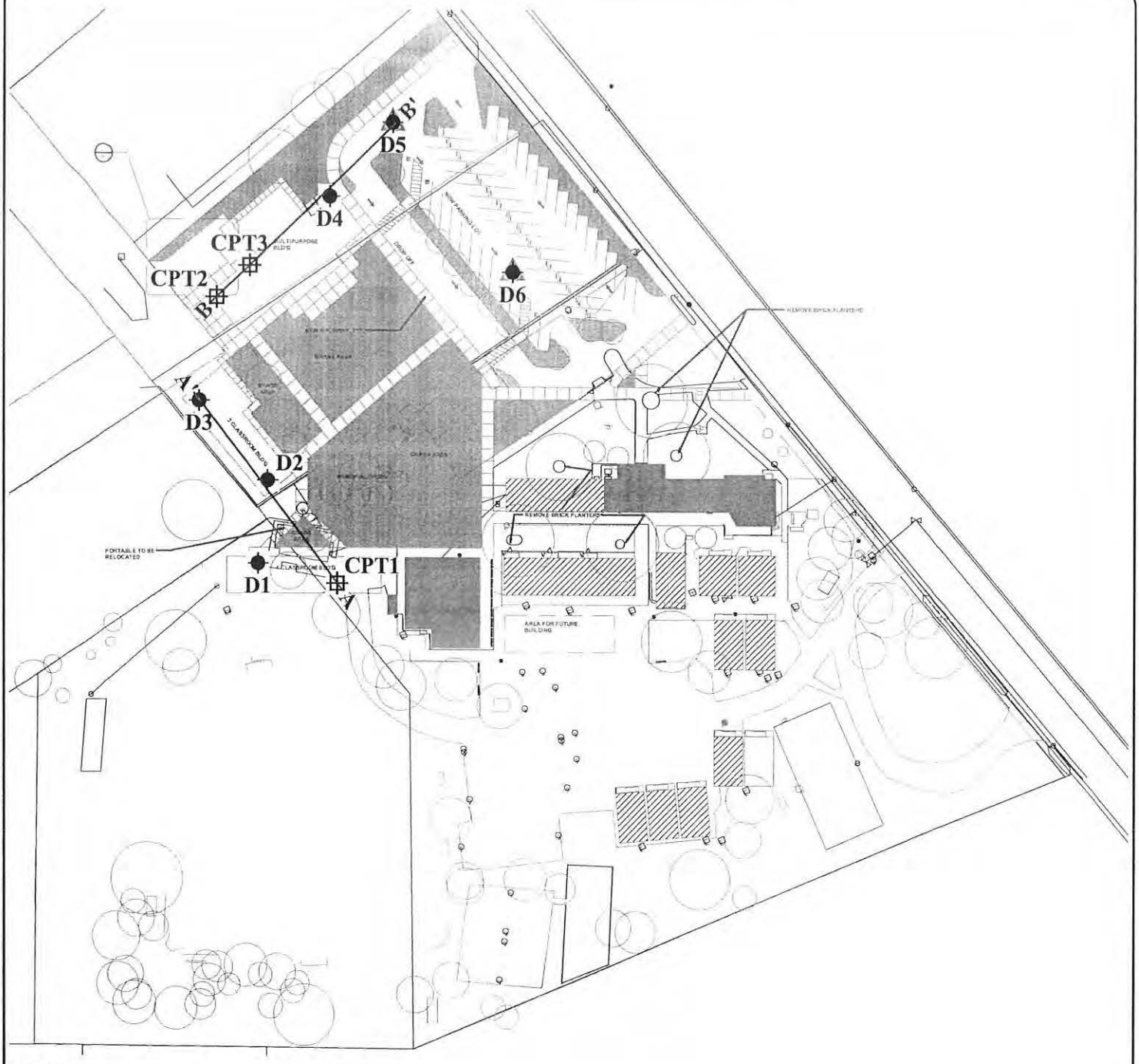
VICINITY MAP

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 1	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	



Note:

Adapted from a CAD drawing prepared by Stafford King Wiese Architects, dated December 17, 2007.

Legend:

- Approximate soil boring location
- Approximate soil boring and bulk sample location
- Approximate CPT sounding location
- A——A' Approximate geologic cross-section location

N

0 60 120

SCALE IN FEET

WallaceKuhl & ASSOCIATES INC

SITE PLAN

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 2	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

Project: Lockeford Elementary School Additions Project Location: Lockeford, California WKA Number: 7954.01	LOG OF SOIL BORING D1 Sheet 1 of 1

Date(s) Drilled: 1/23/08	Logged By: ML	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: West Coast Exploration	Total Depth of Drill Hole: 10.0 feet
Drill Rig Type: B - 24	Diameter(s) of Hole, inches: 4-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: 7.0	Sampling Method(s): California Modified Sampler with 6-inch sleeves	Drill Hole Backfill: Bentonite chips and Soil Cutting
Remarks:		Driving Method and Drop: 140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown to dark brown, silty clay, (CL), fill		D1 - 1I	7	13	116	
			Brown to reddish brown, moist, clayey, silty fine sand (SM)						
			fine to medium sand		D1 - 2I	26	11	119	
	5								
			fine to coarse sand, partially cemented		D1 - 3I	63	15	110	
	10								

BORING LOG 7954.01P - LOCKEFORD ELEMENTARY SCHOOL.GPJ WKA.GDT 2/13/08 9:38 AM

Wallace Kuhl & Associates Inc

FIGURE 3

Project: Lockeford Elementary School Additions Project Location: Lockeford, California WKA Number: 7954.01	LOG OF SOIL BORING D2 Sheet 1 of 1

Date(s) Drilled: 1/23/08	Logged By: ML	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: West Coast Exploration	Total Depth of Drill Hole: 16.0 feet
Drill Rig Type: B - 24	Diameter(s) of Hole, inches: 4-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet:	Sampling Method(s): California Modified Sampler with 6-inch sleeves	Drill Hole Backfill: Soil cuttings
Remarks:		Driving Method and Drop: 140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Poorly graded, fine sub-angular gravel, (GP), fill						
			Brown to reddish brown, moist, clayey, silty fine to medium sand (SM)		D2 - 1I	7	15	118	TX
	5		partially cemented		D2 - 2I	50/4"	12	99	
	10				D2 - 3I	64	7	106	
			brown to olive brown						
	15				D2 - 4I	78	15	108	
			Olive brown, silty clay (CL)						

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FIGURE 4

Project: Lockeford Elementary School Additions Project Location: Lockeford, California WKA Number: 7954.01	LOG OF SOIL BORING D3 Sheet 1 of 1

Date(s) Drilled	1/23/08	Logged By	ML	Checked By	VVP
Drilling Method	Solid Flight Auger	Drilling Contractor	West Coast Exploration	Total Depth of Drill Hole	11.5 feet
Drill Rig Type	B - 24	Diameter(s) of Hole, inches	4-inches	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	California Modified Sampler with 6-inch sleeves	Drill Hole Backfill	Soil cuttings
Remarks				Driving Method and Drop	140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Reddish brown to dark brown, sandy, silty clay, (CL), fill						
			Brown to reddish brown, silty fine to medium sand (SM)		D3 - 1I	14	11	109	
	5		partially cemented		D3 - 2I	80/10"	10	125	
	10				D3 - 3I	63	23	99	

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FIGURE 5

Project: Lockeford Elementary School Additions Project Location: Lockeford, California WKA Number: 7954.01	LOG OF SOIL BORING D4 Sheet 1 of 1

Date(s) Drilled: 1/23/08	Logged By: ML	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: West Coast Exploration	Total Depth of Drill Hole: 11.5 feet
Drill Rig Type: B - 24	Diameter(s) of Hole, inches: 4-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet: 9.5	Sampling Method(s): California Modified Sampler with 6-inch sleeves	Drill Hole Backfill: Bentonite chips and Soil Cutting
Remarks:		Driving Method and Drop: 140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Poorly graded, fine sub-angular gravel, (GP), fill						
			Dark brown, moist, sandy, silty clay, (CL), fill						
			Brown to reddish brown, moist, fine sandy, silty clay (CL)		D4 - 1I	18	13	115	
			Brown to reddish brown, moist, silty fine sand (SM)						
	5		fine to meidum sand, partially cemented		D4 - 2I	50/5"	7	100	
	10		reddish brown		D4 - 3I	92	11	123	

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FIGURE 6

Project: Lockeford Elementary School Additions
Project Location: Lockeford, California
WKA Number: 7954.01

LOG OF SOIL BORING D5

Sheet 1 of 1

Date(s) Drilled: 1/23/08	Logged By: ML	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: West Coast Exploration	Total Depth of Drill Hole: 5.0 feet
Drill Rig Type: B - 24	Diameter(s) of Hole, inches: 4-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet:	Sampling Method(s):	Drill Hole Backfill: Soil cuttings
Remarks: Bulk sample D5 (1.5' - 3.5').		Driving Method and Drop:

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Poorly graded, fine sub-angular gravel, (GP), fill						
			Dark brown, silty clay, (CL), fill						
			Brown to reddish brown, fine sandy, silty clay (CL)						
	5								

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FIGURE 7

Project: Lockeford Elementary School Additions
Project Location: Lockeford, California
WKA Number: 7954.01

LOG OF SOIL BORING D6

Sheet 1 of 1

Date(s) Drilled: 1/23/08	Logged By: ML	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: West Coast Exploration	Total Depth of Drill Hole: 5.0 feet
Drill Rig Type: B - 24	Diameter(s) of Hole, inches: 4-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet:	Sampling Method(s):	Drill Hole Backfill: Soil cuttings
Remarks: Bulk sample D6 (1' - 3').		Driving Method and Drop:

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Poorly graded, fine sub-angular gravel, (GP), fill						
			Dark brown, silty clay, (CL), fill						
			Brown to reddish brown, fine sandy, silty clay (CL)						EI RV
	5								

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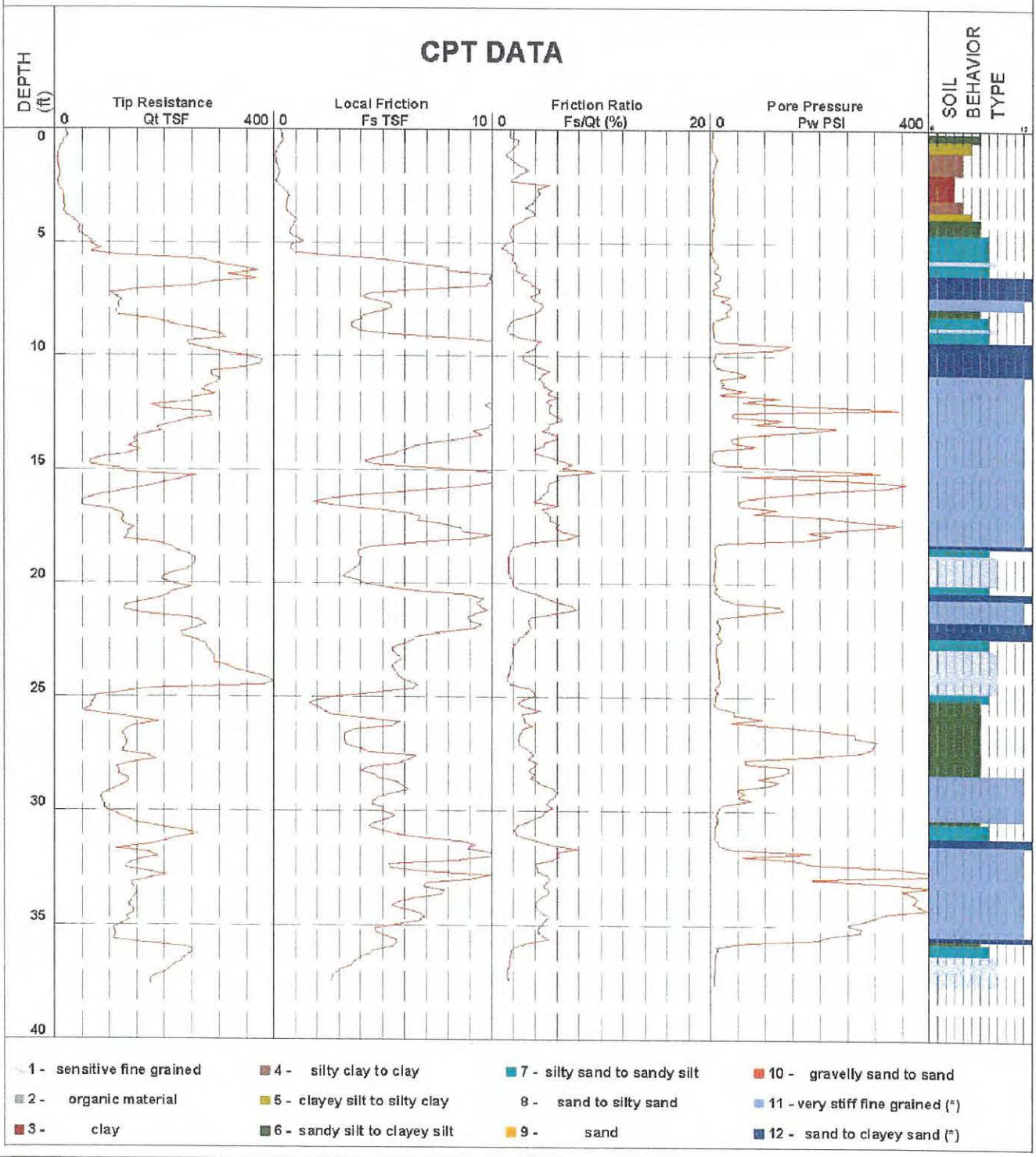
FIGURE 8

Wallace Kuhl & Associates

Operator Doug | Job Number 315 | Cone ID DSG0777

Date 1/23/2008 9:31:08 AM | Location Lockeford Elementary School | Sounding CPT-01



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LOGS OF CPT SOUNDINGS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

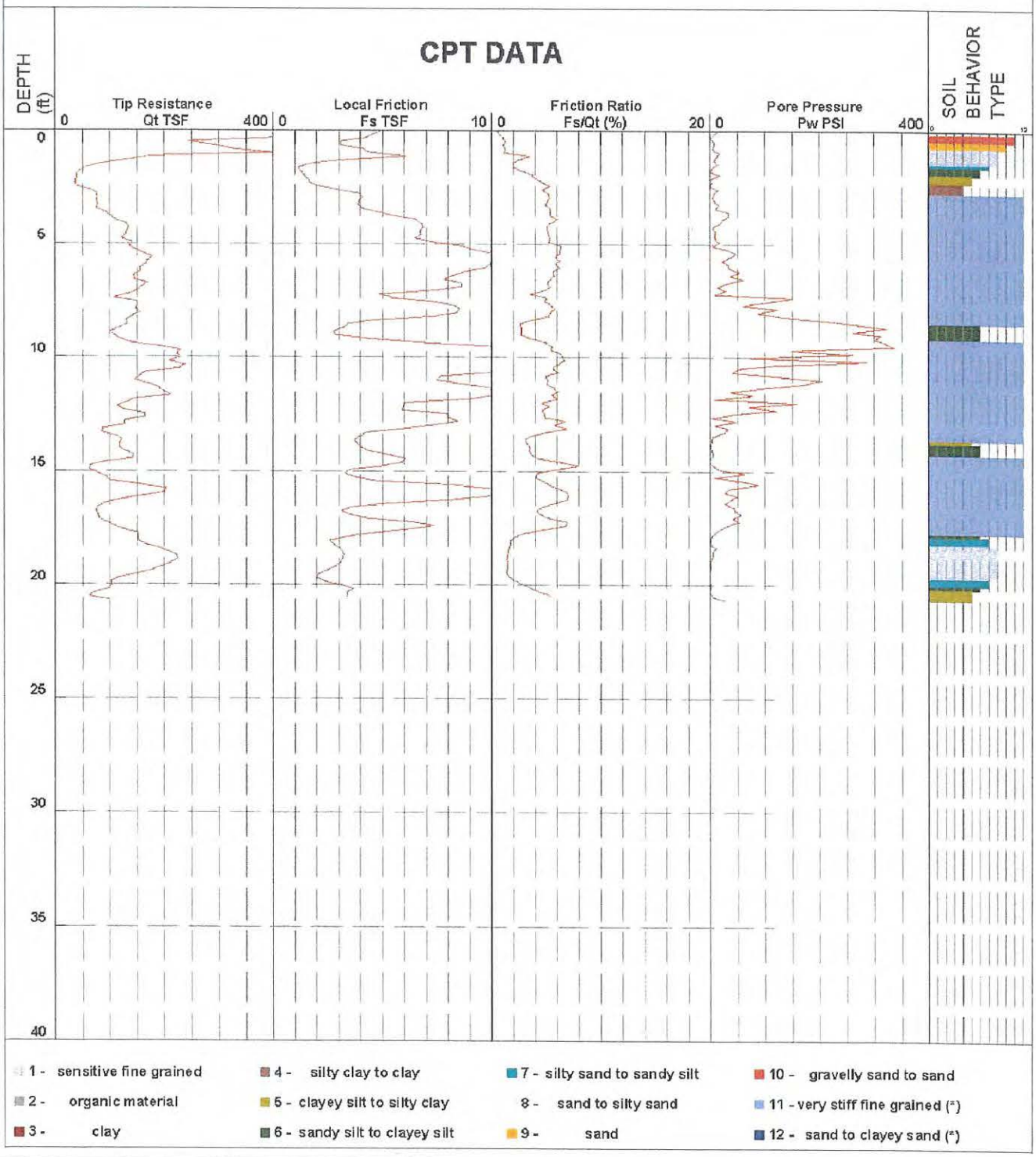
Lockeford, California

FIGURE 9	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	

Wallace Kuhl & Associates

Operator Doug Job Number 315 Cone ID DSG0369

Date 1/23/2008 10:22:54 AM Location Lockeford Elementary School Sounding CPT-02



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LOGS OF CPT SOUNDINGS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

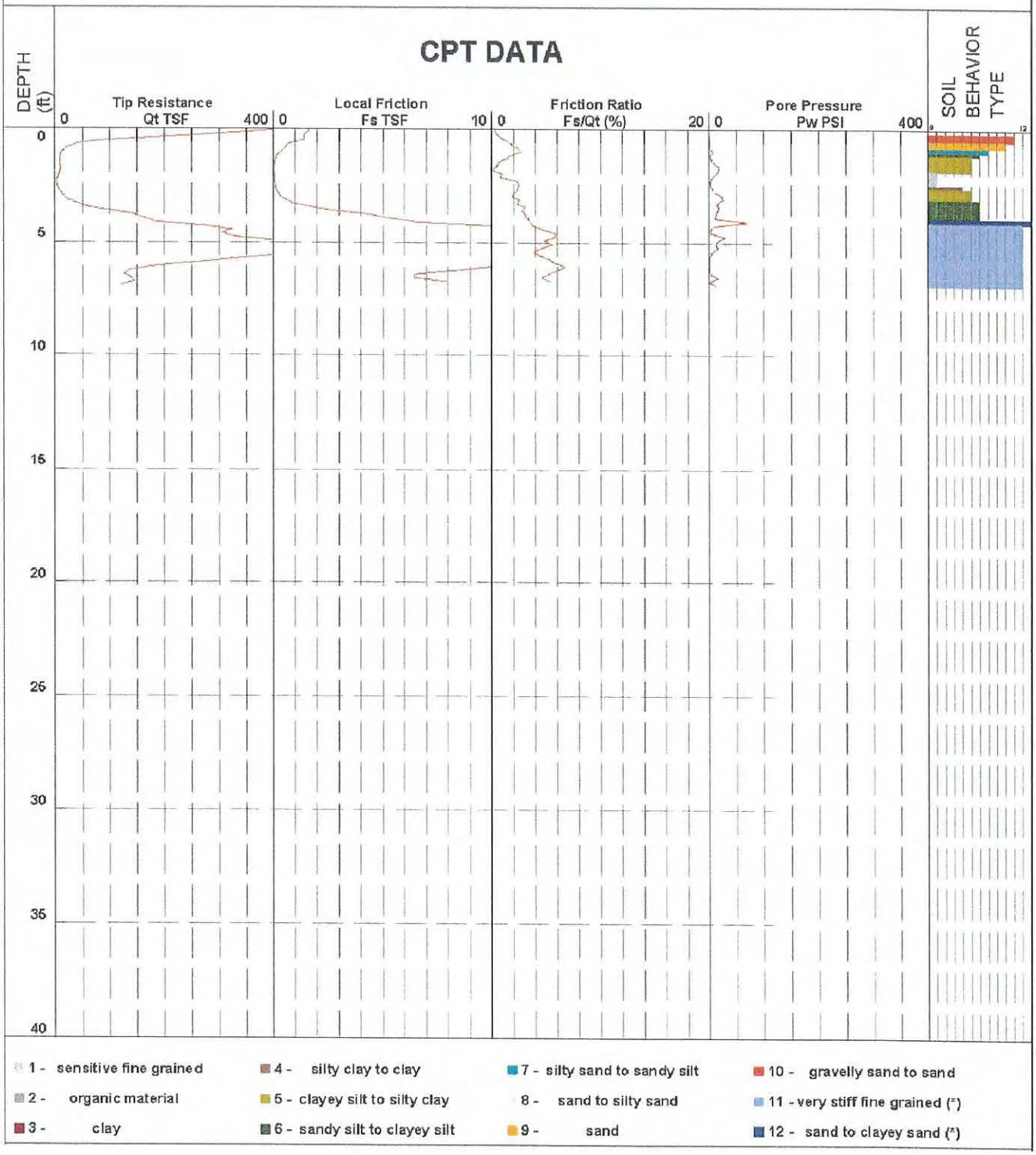
FIGURE 10	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

Wallace Kuhl & Associates

Operator: Doug | Job Number: 315 | Cone ID: DSG0369

Date: 1/23/2008 10:49:08 AM | Location: Lockeford Elementary School | Sounding: CPT-03



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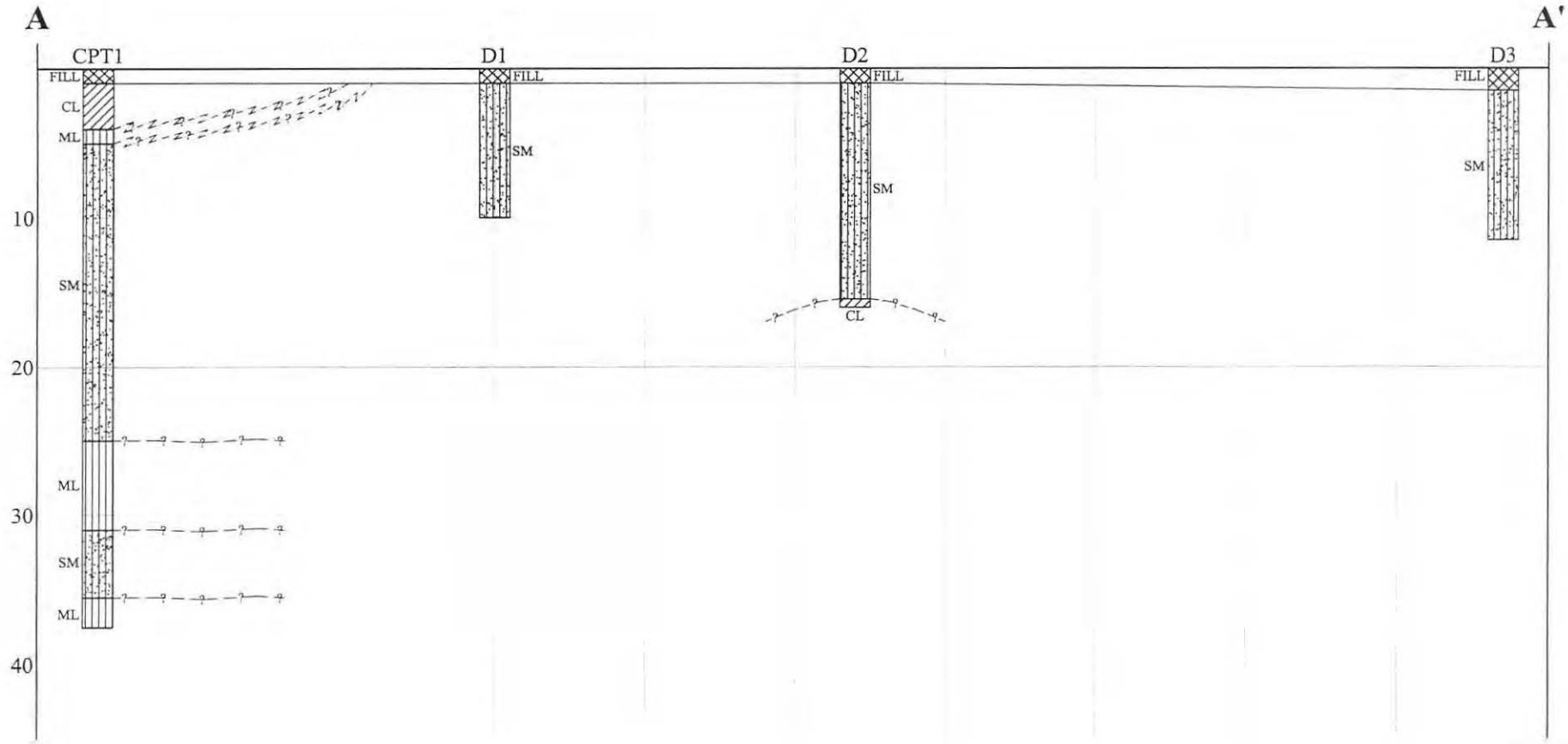
LOGS OF CPT SOUNDINGS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 11	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	



Scale: Horizontal 1" = 22'
Vertical 1" = 11'

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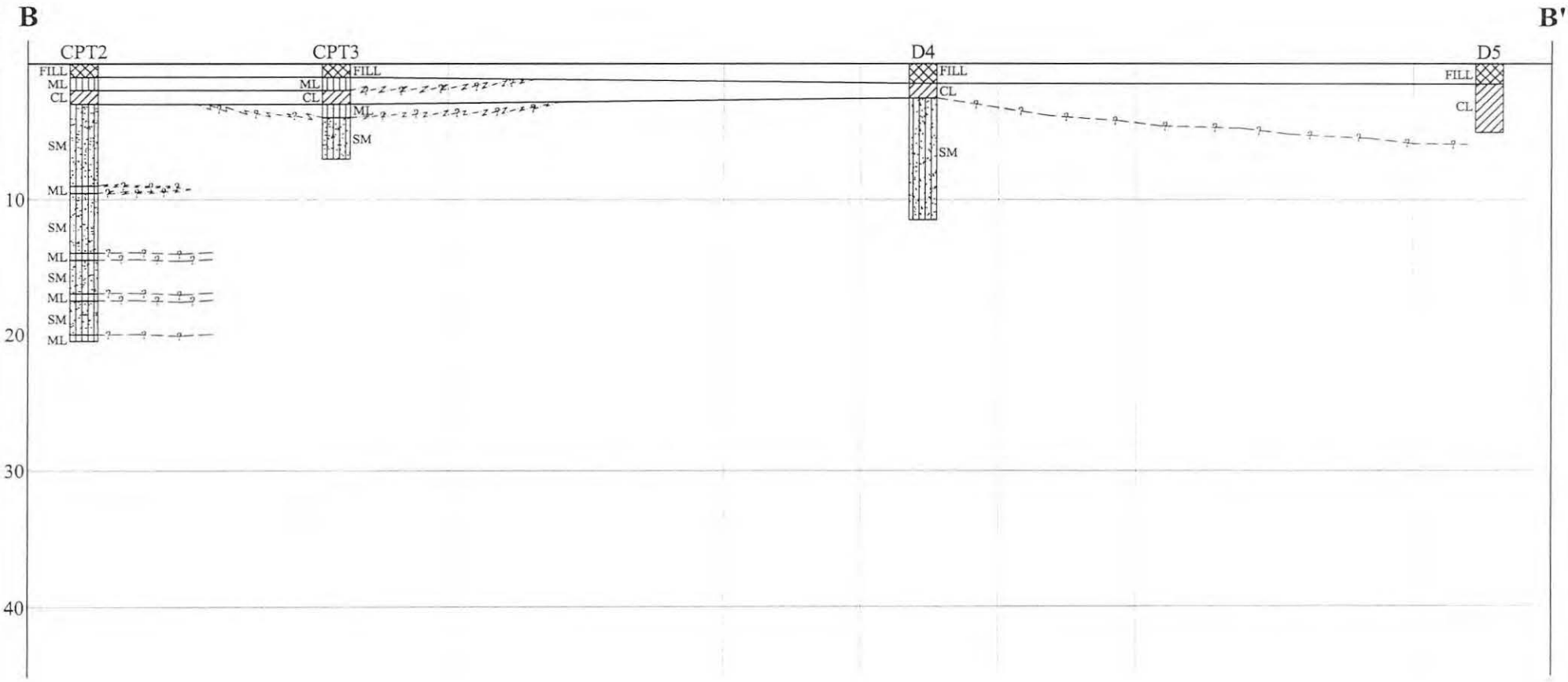
GEOLOGIC CROSS-SECTIONS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	12
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01



Scale: Horizontal 1" = 22'
Vertical 1" = 11'

WallaceKuhl & ASSOCIATES INC

GEOLOGIC CROSS-SECTIONS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	13
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sample: no recovery

= SPT Sample

= Initial Water Level

= Final Water Level

— — — = Estimated or gradational material change line

——— = Observed material change line

Laboratory Tests

PI = Plasticity Index
EI = Expansion Index
UCC = Unconfined Compression Test
TR = Triaxial Compression Test
GR = Gradational Analysis (Sieve)
K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

WallaceKuhl & ASSOCIATES INC

UNIFIED SOIL CLASSIFICATION SYSTEM

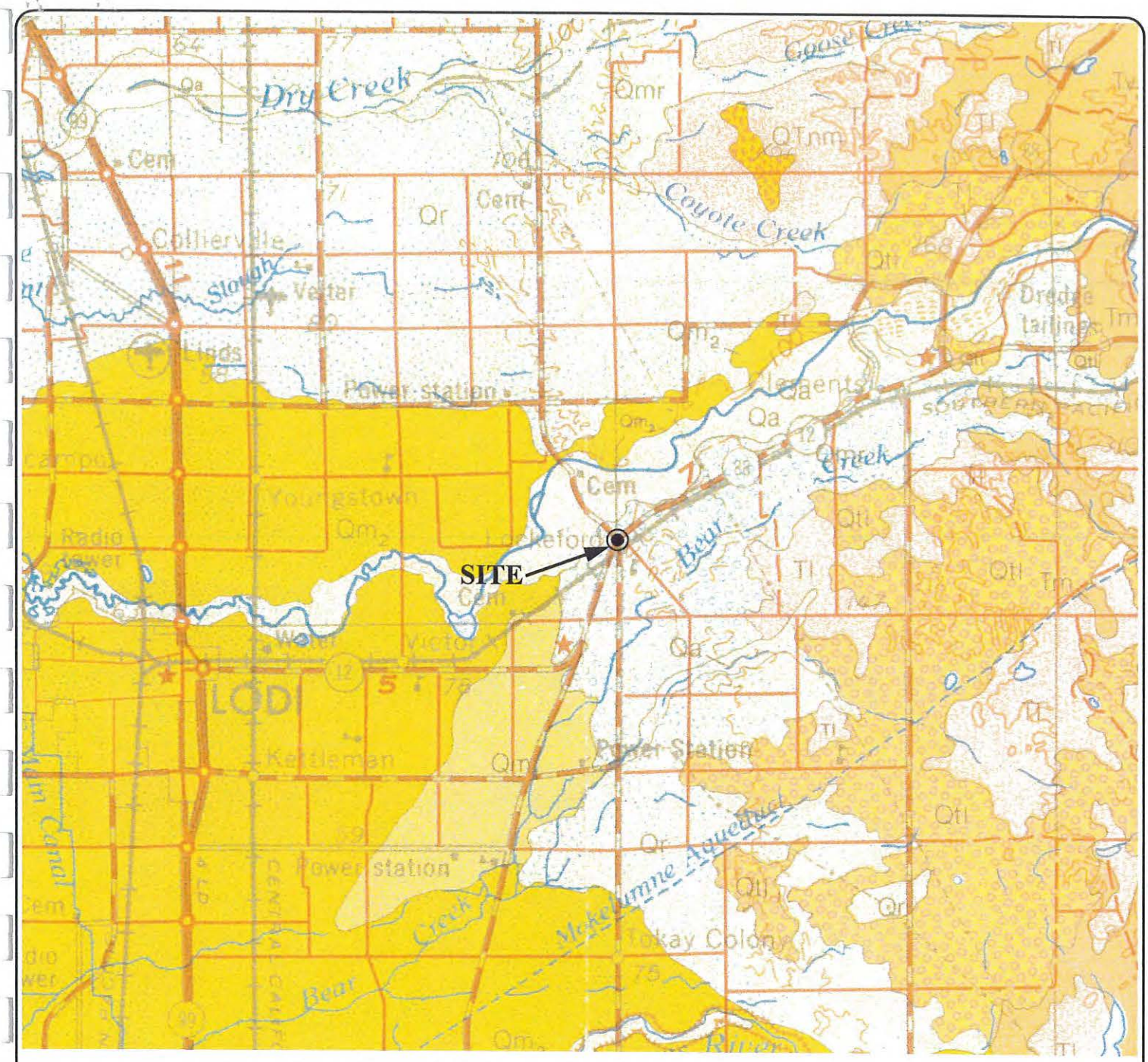
LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 14

DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01



Adapted from D.L. Wagner, C.W. Jennings, T.L. Bedrossian, and E.J. Bortugno, 1981.

N

0 1 2

SCALE IN MILES

Legend:

- Qa - Levee and channel deposits
- Qm_1 - Modesto Formation, Upper Member
- Qm_2 - Modesto Formation, Lower Member
- Qr - Riverbank Formation
- Qmr - Modesto-Riverbank Formations
- Qtl - Turlock Lake Formation
- QTnm - North Merced Gravel
- Tl - Tehama Formation
- Tm - Mehrten Formation
- Tvs - Valley Springs Formation

WallaceKuhl & ASSOCIATES INC

GEOLOGIC MAP

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	15
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

Adapted from Jennings, 1994

N

0 5 10

SCALE IN MILES (APPROX.)

WallaceKuhl
& ASSOCIATES INC

FAULT MAP

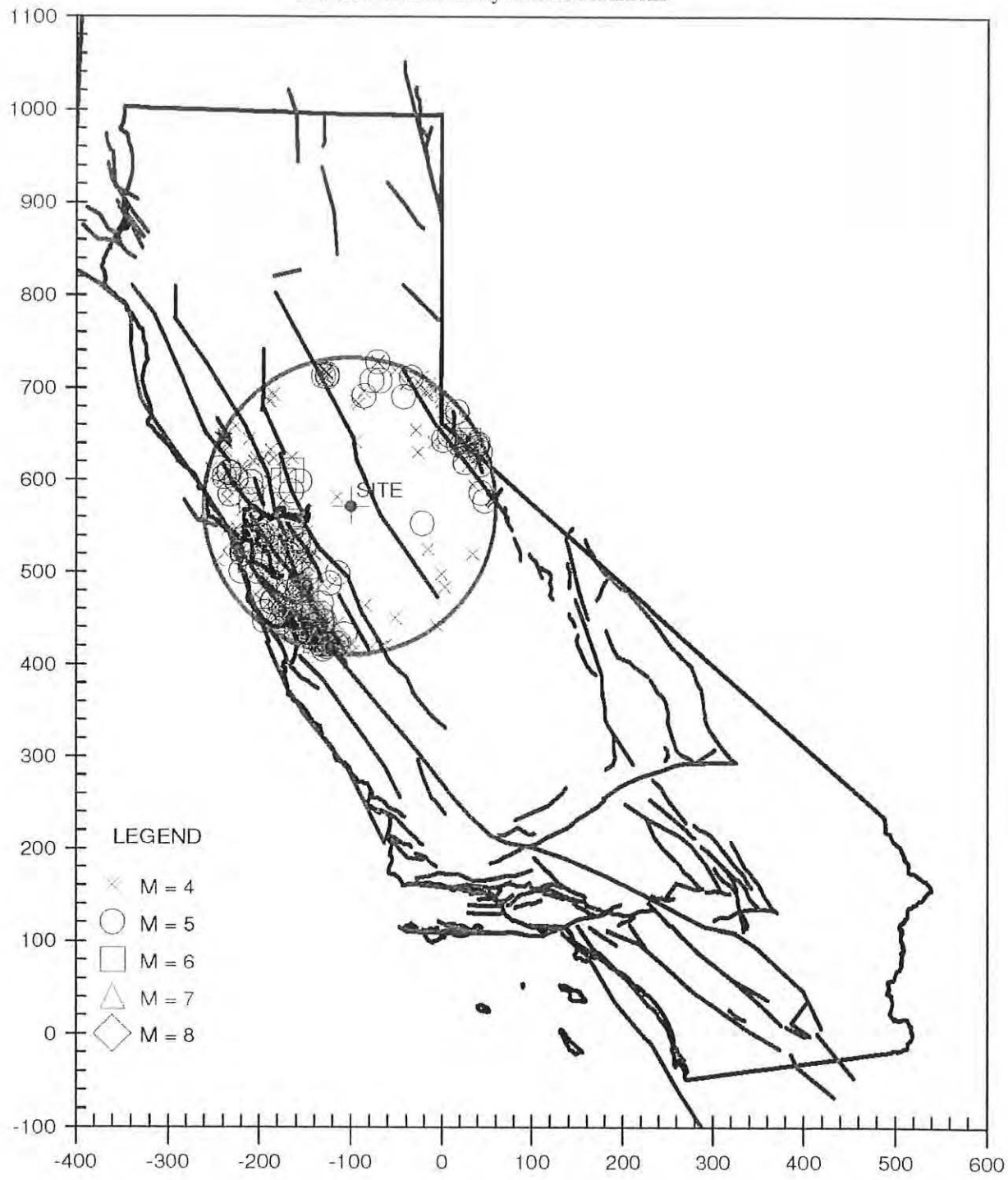
LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	16
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO.	7954.01

EARTHQUAKE EPICENTER MAP

Lockeford Elementary School Additions



WallaceKuhl & ASSOCIATES INC

EPICENTER MAP

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 17	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

APPENDICES

APPENDIX A

APPENDIX A

A. GENERAL INFORMATION

The performance of a geologic hazard investigation, a geotechnical engineering investigation and pavement design analysis at the site for the proposed additions to be constructed within the existing Lockeford Elementary School campus, located at 19456 North Tully Road, in Lockeford, California, was authorized on January 15, 2008 by Mr. Gary Yocum. Authorization was for an investigation as described in our proposal letter of January 10, 2008, sent to our client, Lodi Unified School District, whose mailing address is 1305 East Vine Street, Lodi, California 95240; telephone (209) 331-7213; facsimile (209) 331-7229.

The Project Architect is Stafford King Wise whose mailing address is 622 20th Street, Sacramento, California 95814; telephone (916) 930-5900; facsimile (916) 930-5800.

B. FIELD EXPLORATION

Test borings were accomplished on January 23, 2008, utilizing a B-24 truck-mounted drill rig. At the approximate locations indicated on Figure 2, six exploratory borings were drilled to a maximum depth of about 16 feet utilizing 4-inch O.D. diameter solid flight augers. At various intervals, relatively undisturbed soil samples were recovered with a 2½-inch O.D., 2-inch I.D. California sampler, driven by a 140-pound hammer freely falling 30 inches. The number of blows of the hammer required to drive the 18-inch long sampler each 6-inch interval was recorded with the sum of the blows required to drive the sampler the lower 12-inch interval, or portion thereof, being designated the penetration resistance or "blow count" for that particular drive.

The samples were retained in 2-inch diameter by 6-inch long thin-walled brass tubes contained within the sampler. Immediately after recovery, the soils in the tubes were visually classified by the field engineer, and the ends of the tubes were sealed to preserve the natural moisture contents.

All samples were taken to our laboratory for additional soil classification and selection of samples for testing. The Logs of Soil Borings, Figures 3 through 8, contain descriptions

of the soils encountered in each boring. An explanation of the Unified Soil Classification System symbols used in the descriptions is contained on Figure 14.

Cone penetrometer test (CPT) soundings were accomplished on January 23, 2008. At the approximate locations indicated on Figure 2, three CPT soundings were advanced to a maximum depth of approximately 37½ feet utilizing a 10-ton capacity cone with a tip area of 10 cm^2 and a friction sleeve area of 225 cm^2. Measurements of cone bearing, sleeve friction and dynamic pore water pressure were taken at 5-cm intervals during penetration to provide a nearly continuous geologic log. CPT soundings were performed in accordance with ASTM standard D5778. The Logs of CPT Sounding, Figures 9 through 11, contain descriptions of soils encountered, measured cone bearing, sleeve friction and friction ratio.

C. LABORATORY TESTING

Selected undisturbed soil samples were tested to determine dry unit weight (ASTM D2937), natural moisture content (ASTM D4643) and triaxial compressive strength (ASTM D4767). The results of the unit weight and moisture content tests are included on the boring logs at the depth each sample was obtained. The results of triaxial compressive strength tests are presented on Figure A1.

One representative bulk sample was subjected to Expansion Index testing (ASTM D4829). The results of the test are presented on Figure A2.

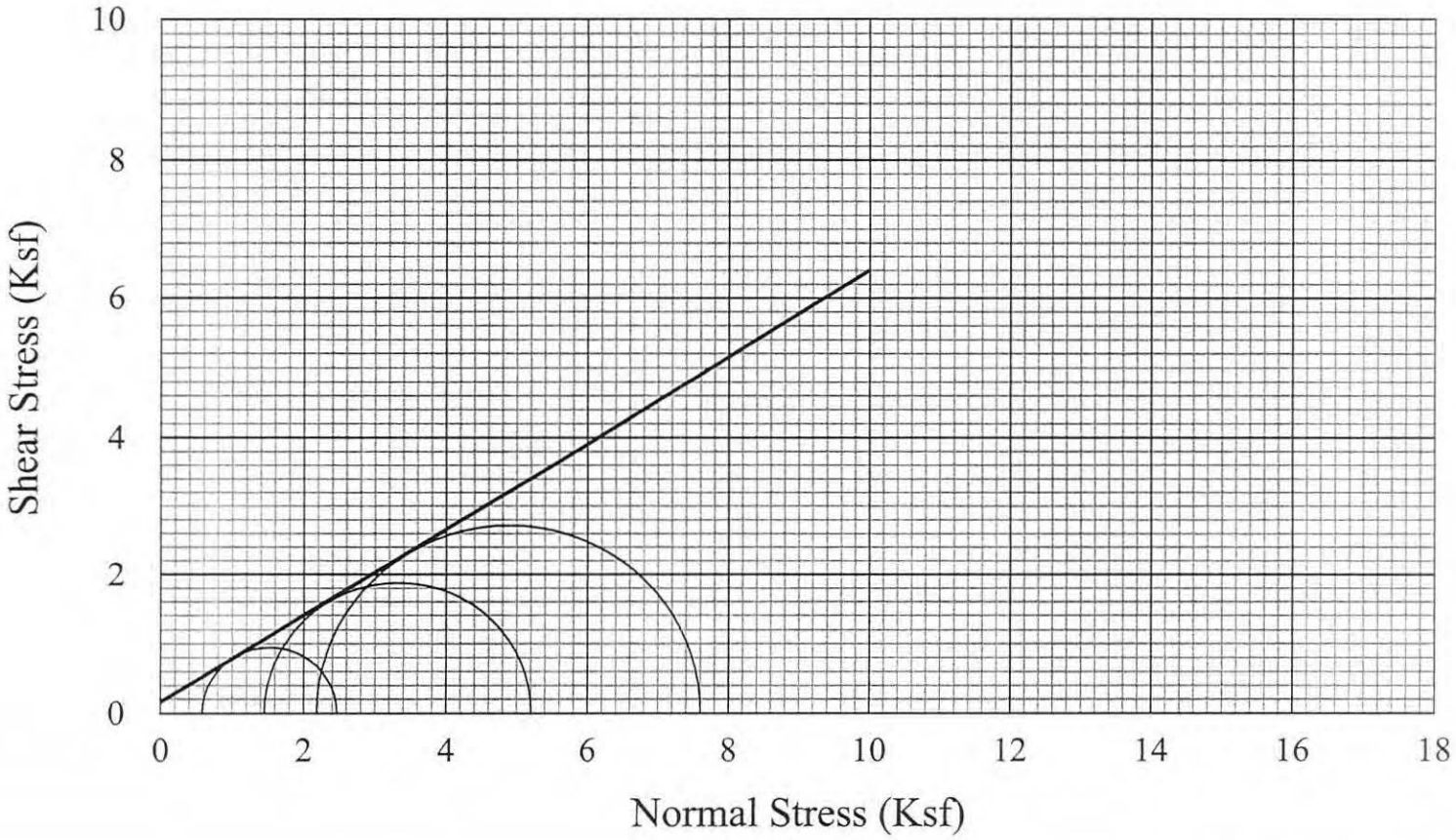
One representative bulk sample was subjected to Resistance value testing (CT 301). The results of the test are presented on Figure A3.

Two soil samples were submitted to Sunland Analytical to determine the soil pH and minimum resistivity (CT 643), sulfate concentration (CT 417) and chloride concentration (CT 422). Results from these tests are included as Figures A4 and A5.

One soil sample was submitted to Sunland Analytical Laboratories for landscape fertility testing. The results of the tests are presented on Figures A6 and A7.

TRIAXIAL COMPRESSION TEST

ASTM D4767-04



SAMPLE NO. :	D2-1I
SAMPLE CONDITION :	Undisturbed
SAMPLE DESCRIPTION :	Brown to reddish-brown, clayey, silty fine to medium sand

DRY DENSITY (PCF) :	118
INITIAL MOISTURE (%) :	15.2
FINAL MOISTURE (%) :	15.3
ANGLE OF INTERNAL FRICTION (ø) :	32°
COHESION (PSF) :	155

Wallace Kuhl & Associates Inc

TRIAXIAL COMPRESSION TEST

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE A1

DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

EXPANSION INDEX TEST RESULTS

UBC Standard No. 18-2

ASTM D4829-03

MATERIAL DESCRIPTION: Brown to reddish-brown, sandy, silty clay

LOCATION: D6

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index *
1'-3'	9.6	22.0	102	**27**

CLASSIFICATION OF EXPANSIVE SOIL **

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	**Low**
51 - 90	Medium
91 - 130	High
Above 130	Very High

* Corrected to 50% Saturation

** From UBC Table 18-I-B

WallaceKuhl & ASSOCIATES INC

EXPANSION INDEX TEST RESULTS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	A2
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

RESISTANCE VALUE TEST RESULTS
(California Test 301)

MATERIAL DESCRIPTION: Brown to reddish-brown, sandy, silty clay

LOCATION: D6 (1'-3')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial)	Expansion Pressure (psf)	R Value
1	117.1	12.6	402	18	79	34
2	115.8	14.7	275	2	9	10
3	110.2	16.9	199	0	0	2

R-Value at 300 psi exudation pressure = 13

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RESISTANCE VALUE TEST RESULTS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	A3
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/25/2008

To: Mauricio Luna
Wallace-Kuhl & Assoc.
P.O. Box 1137
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 7954.01P LOCKEFORD Site ID : D3-1III.
Your purchase order number is 1747.
Thank you for your business.

* For future reference to this analysis please use SUN # 52479-104945.

EVALUATION FOR SOIL CORROSION

Soil pH	7.55	
Minimum Resistivity	2.79 ohm-cm (x1000)	
Chloride	19.9 ppm	00.00199 %
Sulfate	56.7 ppm	00.00567 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

WallaceKuhl & ASSOCIATES INC

CORROSION TEST RESULTS
LOCKEFORD ELEMENTARY SCHOOL ADDITIONS
Lockeford, California

FIGURE A4	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	

Sunland Analytical
11353 Pyrites Way, Suite 1
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/25/2008

To: Mauricio Luna
Wallace-Kuhl & Assoc.
P.O. Box 1137
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 7954.01P LOCKEFORD Site ID : B1/1.5-3'.
Your purchase order number is 1747.
Thank you for your business.

* For future reference to this analysis please use SUN # 52479-104944.

EVALUATION FOR SOIL CORROSION

Soil pH	7.59	
Minimum Resistivity	2.60 ohm-cm (x1000)	
Chloride	19.5 ppm	00.00195 %
Sulfate	46.1 ppm	00.00461 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

WallaceKuhl & ASSOCIATES INC

CORROSION TEST RESULTS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE A5	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	

Sunland Analytical
11353 Pyrites Way, Suite G
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/25/2008

To: Mauricio Luna
Wallace-Kuhl & Assoc.
P.O. Box 1137
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : 7954.01P LOCKEFORD Site ID : D4-1III.
Your purchase order number is 1747. Thank you for your business.

* For future reference to this analysis please use SUN # 52479-104947.

SOIL ANALYSIS

Saturation Percent (SP)	37		Soil Texture Loam
pH	6.41		
E.C.	0.24	mmho/cm	
Tot.Dissolved Salts	153.6	ppm	
Infiltration Rate (0% Slope)	0.54	in/hr	
% Organic Matter	3.1		
C.E.C.	6.3	meq/100g	
Sodium Absorption Ratio (SAR)	2.2		
Exchangable Sodium Percent (ESP)	1.9		
Gypsum Req. (CaSO4*2H2O)	None Required		
est. Nitrogen Release	2.4	#/1000 sq.ft.	

Nitrate	4.88	ppm	**
Phosphorus	11.48	ppm	**********
Potassium	161.32	ppm	************************
Sulfur	51.84	ppm	****************************
Chloride	35.70	ppm	************
Carbonates	No Test		
Sodium	27.73	ppm	
Calcium	945.10	ppm	***************
Magnesium	132.05	ppm	*******
Boron	0.17	ppm	*****
Copper	5.63	ppm	**********************
Iron	29.55	ppm	***************
Manganese	34.30	ppm	**********************
Zinc	6.90	ppm	*********************************

Very Low | Low | Adequate | Excessive

WallaceKuhl & ASSOCIATES INC

LANDSCAPE SOIL QUALITY TEST RESULTS
LOCKEFORD ELEMENTARY SCHOOL ADDITIONS
Lockeford, California

FIGURE A6	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	

Sunland Analytical
11353 Pyrites Way, Suite 1
Rancho Cordova, CA 95670
(916) 852-8557

DATE 01/30/2008
SUN NUMBER 104947

Information requested by:
Mauricio Luna
Wallace-Kuhl & Assoc.

Information for:
7954.01P LOCKEFORD
Sample ID: D4-1III

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL pH (Acidity and Alkalinity)

The pH of this sample indicates the soil is moderately acid and should be modified for non acid-tolerant plants. Apply 10 pounds of Dolomite Lime per 1000 sq.ft. and work into ground before planting.

DISSOLVED SALTS (Indicated by E.C. & TDS)

These conditions are in the normal range for plant growth.

SOIL TEXTURE AND RATE OF WATER INFILTRATION

The infiltration rate for all soil textures decreases with increasing ground slope. At 0 to 4%, 5 to 8%, 9 to 12%, 13 to 16% and above 16% the infiltration rate of this sample decreases from 0.54 to 0.43, 0.32, 0.22, 0.14, respectively. Infiltration rate also decreases with percent of ground cover and by compaction.

WATER PENETRATION OF SOIL DUE TO CHEMICAL CHARACTERISTICS

When exchangable Sodium increases in the soil, water penetration decreases. Based on SAR and ESP values this sample has no penetration problem due to soil Sodium. No Gypsum required.

ORGANIC MATTER

Organic matter provides a slow nitrogen release and aids water retention. This sample has a moderate Organic Matter content.
To maintain moisture and provide sustained nitrogen release a level of 10% organic matter is recommended. Use amending material that is approximately 75% organic matter (i.e. many ground fir barks). Based on the analysis of this soil sample apply 3 yards per 1000 sq.ft. Spread evenly and blend into the top six inches of soil. It is a reasonable practice to apply a top dressing of 3 inches of organic mulches to aid water penetration and retention.

SOIL BORON

Boron concenrations are in a range allowing normal plant growth.

SOIL MICRONUTRIENTS

Micronutrients, Copper, Iron, Manganese and Zinc, in soil are present in small amounts. However, they play a necessary role in plant metabolism. Without appropriate amounts plants will not thrive. Soil has adequate amounts - no application needed.

Wallace Kuhl & Associates Inc

LANDSCAPE SOIL QUALITY TEST RESULTS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE	A6
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08

WKA NO. 7954.01

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

DATE 01/30/2008
SUN NUMBER 104947

Information requested by:
Mauricio Luna
Wallace-Kuhl & Assoc.

Information for:
7954.01P LOCKEFORD
Sample ID: D4-1III

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL MACRONUTRIENTS : NITROGEN-PHOSPHORUS-POTASSIUM (N-P-K)
GENERAL N-P-K RECOMMENDATION

Use ONE of these NPK preparations for the first fertilizer application.

Standard NPK Fertilizer Preparations	6-20-20	5-20-10	16-16-16	0-10-10	28-3-4	21-0-0	Customer Choice None
#/1000 sq.ft.	17	21	N/A	N/A	N/A	N/A	**

GRASS OR SOD PREPARATION

Till in organic matter, N,P,K and micro nutrients in addition to any lime gypsum or sulfur as directed above. Smooth soil surface and follow seed or sod producers direction for moisture and product application.

TREES AND SHRUBS

Excavate holes for planting shrubs and trees to at least twice the volume of the container. Prepare backfill for tree and shrub planting holes by mixing three parts of native soil (or imported top soil) with one part organic amendment (preferably nitrogen and iron fortified) and 2.5 pounds of 6-20-20 per yard of mix. For extended fertilization, place slow release fertilizer tablets in each hole per manufacturer's instructions. If 6-20-20 was not directly added to backfill mix, during backfill apply uniformly 1/2 oz of 6-20-20 per gallon containers, 2.5 oz per 5 gallons, 6 oz per 24 inch boxes.

Summary and Suggested Sequence of Soil Improvements (#/1000 Sq.Ft.)

Dolimite Lime	10	#
Organic Amendment	3	Yd./1000 Sq.Ft. Bulk organic amendment (nitrofied).
N-P-K Fertilizer	See above chart	
Magnesium	Low Magnesium compensated for by Dolimite Lime	

Maintenance Fertilization

Apply 5 pounds of Ammonium sulfate (21-0-0) per 1000 sq.ft.every month until plants become established. After established, apply 28-3-4 (or similar preparation) to provide desired growth rate and color.

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 01/30/2008
Date Submitted 01/25/2008

To: Mauricio Luna
Wallace-Kuhl & Assoc.
P.O. Box 1137
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : 7954.01P LOCKEFORD Site ID : B1/1.5-3'.
Your purchase order number is 1747. Thank you for your business.

* For future reference to this analysis please use SUN # 52479-104946.

SOIL ANALYSIS

Saturation Percent (SP)	40	Soil Texture Loam
pH	7.74	
E.C.	0.30	mmho/cm
Tot.Dissolved Salts	192	ppm
Infiltration Rate (0% Slope)	0.54	in/hr
% Organic Matter	3.0	
C.E.C.	13.5	meq/100g
Sodium Absorption Ratio (SAR)	6.3	
Exchangable Sodium Percent (ESP)	7.4	
Gypsum Req. ($CaSO_4*2H_2O$)	26.8	#/1000 sq.ft.
est. Nitrogen Release	2.3	#/1000 sq.ft.

Nitrate	10.86	ppm	*****
Phosphorus	11.55	ppm	**********
Potassium	83.47	ppm	********************
Sulfur	49.92	ppm	******************************
Chloride	42.84	ppm	**************
Carbonates	No Test		
Sodium	229.66	ppm	
Calcium	1774.65	ppm	********************
Magnesium	419.53	ppm	**************
Boron	0.16	ppm	****
Copper	6.78	ppm	************************
Iron	44.66	ppm	********************
Manganese	18.77	ppm	********************
Zinc	2.73	ppm	**********

Very Low	Low	Adequate	Excessive

WallaceKuhl & ASSOCIATES INC

LANDSCAPE SOIL QUALITY TEST RESULTS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE A7	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	2/08
WKA NO. 7954.01	

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

DATE 01/30/2008
SUN NUMBER 104946

Information requested by:
Mauricio Luna
Wallace-Kuhl & Assoc.

Information for:
7954.01P LOCKEFORD
Sample ID: B1/1.5-3'

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL pH (Acidity and Alkalinity)

The pH of this sample indicates the soil is moderately alkaline, a condition negatively affecting some plants. Apply 9 pounds of soil sulfur per 1000 sq.ft. Spread evenly and work into the top six inches. Recall that sulfur alteration of pH is a slow process. For more rapid effect Sulfuric Acid may be used.

DISSOLVED SALTS (Indicated by E.C. & TDS)

These conditions are in the normal range for plant growth.

SOIL TEXTURE AND RATE OF WATER INFILTRATION

The infiltration rate for all soil textures decreases with increasing ground slope. At 0 to 4%, 5 to 8%, 9 to 12%, 13 to 16% and above 16% the infiltration rate of this sample decreases from 0.54 to 0.43, 0.32, 0.22, 0.14, respectively. Infiltration rate also decreases with percent of ground cover and by compaction.

WATER PENETRATION OF SOIL DUE TO CHEMICAL CHARACTERISTICS

When exchangable Sodium increases in the soil, water penetration decreases. Based on SAR and ESP values this sample will have increasing problems with water penetration. Apply 27 pounds of Gypsum per 1000 sq.ft., work into soil, and leach with good quality water. Have the water analyzed before use to insure that the water is not the cause of the high Sodium in the soil. Leaching requires good quality water and adequate drainage through the root zone.

ORGANIC MATTER

Organic matter provides a slow nitrogen release and aids water retention. This sample has a moderate Organic Matter content.
To maintain moisture and provide sustained nitrogen release a level of 10% organic matter is recommended. Use amending material that is approximately 75% organic matter (i.e. many ground fir barks). Based on the analysis of this soil sample apply 3 yards per 1000 sq.ft. Spread evenly and blend into the top six inches of soil. It is a reasonable practice to apply a top dressing of 3 inches of organic mulches to aid water penetration and retention.

SOIL BORON

Boron concenrations are in a range allowing normal plant growth.

SOIL MICRONUTRIENTS

Micronutrients, Copper, Iron, Manganese and Zinc, in soil are present in small amounts. However, they play a necessary role in plant metabolism. Without appropriate amounts plants will not thrive. Soil has adequate amounts - no application needed.

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

DATE 01/30/2008
SUN NUMBER 104946

Information requested by:
Mauricio Luna
Wallace-Kuhl & Assoc.

Information for:
7954.01P LOCKEFORD
Sample ID: B1/1.5-3'

SOIL RECOMMENDATIONS FOR LANDSCAPE GARDENING

SOIL MACRONUTRIENTS : NITROGEN-PHOSPHORUS-POTASSIUM (N-P-K)
GENERAL N-P-K RECOMMENDATION

Use ONE of these NPK preparations for the first fertilizer application.

Standard NPK Fertilizer Preparations	6-20-20	5-20-10	16-16-16	0-10-10	28-3-4	21-0-0	Customer Choice None
#/1000 sq.ft.	13	15	N/A	N/A	N/A	N/A	**

GRASS OR SOD PREPARATION

Till in organic matter, N,P,K and micro nutrients in addition to any lime gypsum or sulfur as directed above. Smooth soil surface and follow seed or sod producers direction for moisture and product application.

TREES AND SHRUBS

Excavate holes for planting shrubs and trees to at least twice the volume of the container. Prepare backfill for tree and shrub planting holes by mixing three parts of native soil (or imported top soil) with one part organic amendment (preferably nitrogen and iron fortified) and 2.5 pounds of 6-20-20 per yard of mix. For extended fertilization, place slow release fertilizer tablets in each hole per manufacturer's instructions. If 6-20-20 was not directly added to backfill mix, during backfill apply uniformly 1/2 oz of 6-20-20 per gallon containers, 2.5 oz per 5 gallons, 6 oz per 24 inch boxes.

Summary and Suggested Sequence of Soil Improvements (#/1000 Sq.Ft.)

Gypsum	27	# - leach soil
Soil Sulfur	9.0	# for pH modification, repeat as above
Organic Amendment	3	Yd./1000 Sq.Ft. Bulk organic amendment (nitrofied).
N-P-K Fertilizer	See above chart	

Maintenance Fertilization

Apply 5 pounds of Ammonium sulfate (21-0-0) per 1000 sq.ft.every month until plants become established. After established, apply 28-3-4 (or similar preparation) to provide desired growth rate and color.

APPENDIX B

APPENDIX B

GUIDE EARTHWORK SPECIFICATIONS

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

19456 North Tully Road

Lockeford, California

WKA No. 7954.01

PART I: GENERAL

1.1 SCOPE

a. General Description

This item shall include all clearing and grubbing, preparation of land to be filled, filling, soil treatment, spreading, compaction, observation and testing of the fill, and all subsidiary work necessary to complete the grading of the building and pavement areas to conform with the lines, grades and slopes as shown on the accepted Drawings.

b. Related Work Specified Elsewhere

(1) Trenching and backfilling for sanitary sewer system: Section ____.

(2) Trenching and backfilling for storm sewer system: Section ____.

(3) Trenching and backfilling for underground water, natural gas, and electrical supplies: Section ____.

c. Geotechnical Engineer

Where specific reference is made to "Geotechnical Engineer," this designation shall be understood to include both him and his representative.

1.2 PROTECTION

a. Adequate protection measures shall be provided to protect workmen and passers-by the site. Streets, adjacent property, and underground and overhead utilities shall be fully protected throughout the operations.

b. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

c. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

d. Adjacent streets, sidewalks, and properties shall be kept free of mud, dirt or similar nuisances resulting from earthwork.

e. Surface drainage provisions shall be made during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

f. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.

1.3 GEOTECHNICAL REPORT

a. A Geologic Hazard and Geotechnical Engineering Report (WKA No. 7954.01, dated February 13, 2008) has been prepared for this site by Wallace - Kuhl & Associates, Geotechnical Engineers of Stockton, California [(209) 234-7722].

b. The information contained in this report was obtained for design purposes only. The contractor is responsible for any conclusions he may draw from this report; should he prefer not to assume such risk, he should employ his own experts to analyze available information and/or to make additional borings upon which to base his conclusions, all at no cost to the Owner.

1.4 EXISTING SITE CONDITIONS

The Contractor shall acquaint himself with all site conditions. If unshown active utilities are encountered during the work, the Architect shall be promptly notified for instructions. Failure to notify will make the Contractor liable for damage to these utilities arising from Contractor's operations subsequent to his discovery of such unshown utilities.

1.5 SEASONAL LIMITS

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until field tests indicated that the moisture contents of the subgrade and fill materials are satisfactory.

PART II: PRODUCTS

2.1 MATERIALS

a. Imported Fill Materials

Imported fill materials shall be approved by the Geotechnical Engineer; shall be granular compactable soils having a Plasticity Index not exceeding fifteen (15); shall have an Expansion Index less than twenty (20); shall be of three-inch (3") maximum particle size; shall have a minimum R-value of ten (10) if used in the pavement areas; shall be free of contamination; and, shall have corrosion characteristics within acceptable limits.

b. Treated Soils

Materials to be chemically-stabilized shall be on-site soils free from significant quantities of rubble, rubbish and vegetation and shall have been tested and approved by the Geotechnical Engineer.

c. Capillary Barrier Material

Capillary barrier material under floor slabs shall be provided to the thickness shown on the Drawings. This material shall be clean gravel or crushed rock of one-inch (1") maximum size, with no material passing a number four (#4) sieve.

d. Lime

1) Lime shall be high-calcium or dolomitic quicklime conforming to the definitions in ASTM Designation C 51. When sampled by the Geotechnical Engineer from the lime spreader or during the spreading operations, the sample of lime shall conform to the following requirements:

1a) High-calcium quicklime shall contain not less than 113 percent (113%) calcium hydroxide Ca(OH), as determined by California Test Method 414.

1b) Dolomitic quicklime shall contain not less than fifty-seven percent (57%) calcium oxide, Ca0, and not less than ninety-five percent (95%) combined calcium oxide, Ca0, and magnesium oxide, Mg0, as determined by California Test 404.

1c) When dry sieved in a mechanical sieve shaker for 10 minutes $\pm$30 seconds, a 250 gram test sample of quicklime shall conform to the following grading requirements:

Sieve Size	Percentage Passing
3/8"	98 - 100
No. 100	0 - 25
No. 200	0 – 15

2) Lime from more than one source or of more than one type may be used on the same project but the different limes shall not be mixed.

3) The lime shall be protected from moisture until used and shall be sufficiently dry to flow freely when handled.

4) A Certificate of Compliance in accordance with Caltrans Specification 6-1.07 shall be furnished with each delivery of lime and shall be submitted to the Engineer with a certified copy of the weight of each delivery.

e. Fly Ash

Fly ash should be Type C or Type F conforming to the definitions in ASTM Designation C C618.

f. Water

Water for use in subgrade stabilization shall be clean and potable and shall be added during mixing, remixing and compaction operations, and during the curing period to keep the cured material moist until covered.

g. Other Products

Aggregate base, asphaltic emulsion curing seal, asphalt concrete, related asphaltic seal coats, tack coat, etc., and permeable material shall comply with the appropriate provisions of the State of California (Caltrans) Standard Specifications, latest edition.

PART III: EXECUTION

3.1 LAYOUT AND PREPARATION

Lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protection of utilities--all prior to beginning actual earthwork operations.

3.2 CLEARING, GRUBBING, AND PREPARING BUILDING PAD AND PAVEMENT AREAS

a. All rubble and rubbish; concrete slabs, foundations; fence posts, pavements, irrigation pipes, underground utilities, and associated trench backfill; vegetation; trees; and, any other items encountered during site work and deemed unacceptable by the Geotechnical Engineer, shall be removed and disposed of so as to leave the disturbed areas with a neat and finished appearance, free from unsightly debris. Tree removal should include the rootball and all roots larger than one half of an inch (½") in diameter. Excavations and depressions resulting from the removal of such items, as well as existing excavations and loose soil deposits, as determined by the Geotechnical Engineer, shall be cleaned out to firm, undisturbed soil and backfilled with suitable materials in accordance with these specifications.

b. Undocumented fill soils, backfill of exploration test pits and UST backfill shall be excavated to expose native, undisturbed soils.

c. The surfaces shall be stripped of vegetation.

d. All fill to be constructed shall be constructed in accordance with Section 3.3 of these specifications and the surfaces receiving fill shall be prepared in accordance with the following paragraphs in this section: Section 3.2.

e. Following stripping operations, the entire building pad shall be over-excavated to a depth of twelve inches (12") below existing site grades.

f. The exposed subgrade and all other areas to receive fill, pavements, exterior flatwork, or to remain at-grade shall be plowed or scarified to a depth of at least twelve inches (12"), until the surface is free from ruts, hummocks or other uneven features, which would tend to prevent uniform compaction by the selected equipment.

g. When the moisture content of the subgrade is less than the optimum moisture content, as defined by the ASTM D1557 Compaction Test, water shall be added until the proper moisture content is achieved.

h. When the moisture content of the subgrade is too high to permit the specified compaction to be achieved, the subgrade shall be aerated by blading or other methods until the moisture content is satisfactory for compaction.

i. After the foundations for fill have been cleared, moisture conditioned, and plowed or scarified, they shall be recompacted in place to a depth of at least twelve inches

(12") to a minimum of ninety percent (90%) of the ASTM D1557 maximum dry density.

j. In building areas, the zone of over-excavation, scarification, and compaction shall extend at least ten feet (10') beyond the perimeter building lines, including adjacent flatwork, exterior columns, etc.

k. In the pavement areas, the zone of over-excavation, scarification, and compaction shall extend at least two feet (2') beyond the perimeter curbs.

l. All saturated materials shall be over-excavated to firm soil, as determined by the Geotechnical Engineer, and the resulting excavations shall be backfilled with suitable materials in accordance with these specifications; or, where saturated surface soils are located over native undisturbed soils, the subgrades may be stabilized with high-calcium or dolomitic quicklime to depths and with compactive effort meeting the satisfaction of the Geotechnical Engineer.

m. The contractor shall provide a unit cost per cubic yard of material to allow for variations in overexcavation depth, as determined by the Geotechnical Engineer.

3.3 CONSTRUCTION OF UNTREATED SUBGRADES

a. The selected soil fill material shall be placed in layers which, when compacted, do not exceed six inches (6") in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer.

b. When the moisture content of fill material is less than the optimum moisture content, as defined by the ASTM D1557 Compaction Test, water shall be added until the proper moisture content is achieved.

c. When the moisture content of the fill material is too high to permit the specified degree of compaction to be achieved, the fill material shall be aerated by blading or other methods until the moisture content is satisfactory.

d. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than ninety percent (90%) of maximum dry density as determined by the ASTM D1557 Compaction Test. Fills placed deeper than five feet (5') below finished grade shall be compacted to not less than ninety-five percent (95%) of maximum dry density as determined by the ASTM D1557 Compaction Test. Compaction shall be undertaken with equipment capable of

achieving the specified density and shall be accomplished while the fill material is at the required moisture content. Each layer shall be compacted over its entire area until the desired density has been obtained.

e. The fill operations shall be continued until the fills have been brought to the slopes and grades shown on the accepted Drawings.

3.4 CHEMICALLY-STABILIZED SUBGRADE CONSTRUCTION

a. Placing Material

The material to be treated shall be placed at a moisture content at least the optimum moisture as defined by the ASTM D1557 Compaction Test.

b. Preparing Material

Material to be treated shall be scarified and thoroughly broken up to the full depth and width to be stabilized. The material to be treated shall contain no rocks or solids larger than one and one-half inches (1½") in maximum dimension.

c. Mixing

1) A combination of lime and Type C or F fly ash shall be added to the soil material to be treated. Lime should be added at a rate of three percent (3%), measured as a percentage of the weight of **dry** soil being treated. No less than three and one-half pounds (3½ lb.) of lime per cubic foot of soil treated shall be provided. Fly ash should be added at a rate of three percent (3%), measured as a percentage of the weight of **dry** soil being treated. No less than three and one-half pounds (3½ lb.) of fly ash per cubic foot of soil treated shall be provided.

2) Lime and fly ash shall be spread by equipment that will uniformly distribute the required amount of lime for the full width of the prepared material. The rate of spread per linear foot of blanket shall not vary more than five percent (5%) from the designated rate.

3) The spread lime and fly ash shall be prevented from blowing by suitable means selected by the Contractor. Quicklime shall not be used to make lime slurry. The spreading operations shall be conducted in such a manner that a hazard is not present to construction personnel or the public. All lime and/or fly ash spread shall be thoroughly ripped in, or mixed into, the soil the same day lime spreading operations are performed.

4) The distance which lime and fly ash may be spread upon the prepared material ahead of the mixing operation will be determined by the Geotechnical Engineer.
5) No traffic other than the mixing equipment will be allowed to pass over the spread lime and fly ash until after the completion of mixing.
6) Mixing equipment shall be equipped with a visual depth indicator showing mixing depth, an odometer or footmeter to indicate travel speed and a controllable water additive system for regulating water added to the mixture.
7) Mixing equipment shall be of the type that can mix the full depth of the treatment specified and leave a relatively smooth bottom of the treated section. Mixing and re-mixing, regardless of equipment used, will continue until the material is uniformly mixed (free of streaks or pockets of lime), moisture is at approximately the optimum and the mixture complies with the following requirements:

Minimum Sieve Size	Percent Passing
1-1/2"	100
1"	95
No. 4	60

8) Non-uniformity of color reaction when the treated material, exclusive of one inch or larger clods, is tested with the standard phenolphthalein alcohol indicator, will be considered evidence of inadequate mixing.
9) Treated material shall not be mixed or spread while the atmospheric temperature is below 35°F. The entire mixing operation shall be completed within seventy-two (72) hours of the initial spreading of lime, unless otherwise permitted by the Geotechnical Engineer.
10) The lime-treated mixed soil should be allowed to cure for 24-hours period prior to compaction.
11) It is acceptable for the fly ash to be spread and mixed the day after the initial lime mixing.
12) Fly ash handling shall be consistent with the specifications for lime.

d. Spreading and Compacting

1) The treated mixture shall be spread to the required width, grade and cross-section. The maximum compacted thickness of a single layer may be determined by the Contractor provided he can demonstrate to the Geotechnical Engineer that his equipment and method of operation will provide uniform distribution of the lime and the required compacted density throughout the layer. If the Contractor is unable to achieve uniformity and density throughout the thickness selected, he shall rework the affected area using thinner lifts until a satisfactory treated subgrade meeting the distribution and density requirements is attained, as determined by the Geotechnical Engineer, at no additional cost to the Owner.

2) The finished thickness of the treated material shall not vary more than one-tenth foot (0.1') from the planned thickness at any point.

3) The treated soils shall be compacted to a relative compaction of not less than ninety-two percent (92%) as determined by the ASTM D1557 Compaction Test.

4) Initial compaction shall be performed by means of a sheepsfoot or segmented wheel roller. Final rolling shall be by means of steel-tired or pneumatic-tired rollers.

5) Areas inaccessible to rollers shall be compacted to meet the minimum compaction requirement by other means satisfactory to the Geotechnical Engineer.

6) Final compaction shall be completed within twelve (12) hours of final mixing. The surface of the finished treated material shall be the grading plane and at any point shall not vary more than eight one hundredths of a foot (0.08') foot above or below the grade established by the Civil Engineer except that when the treated material is to be covered by material which is paid for by the cubic yard the surface of the finished treated material shall not extend above the grade established by the Civil Engineer.

7) Before final compaction, if the treated material is above the grade tolerance specified in this section, uncompacted excess material may be removed and used is areas inaccessible to mixing equipment. After final compaction and trimming, excess material shall be removed and disposed of. The trimmed and completed surface shall be rolled with steel or pneumatic-tired rollers. Minor indentations may remain in the surface of the finished material so long as no loose material remains in the indentations.

8) At the end of each day's work, a construction joint shall be made in thoroughly compacted material and with a vertical face. After a part-width section has been completed, the longitudinal joint against which additional material is to be placed shall be trimmed approximately three inches (3") into treated material, to the neat line of the section, with a vertical edge. The material so trimmed shall be incorporated into the adjacent material to be treated.

9) An acceptable alternate to the above construction joints, if the treatment is performed with cross shaft rotary mixers, is to actually mix three inches (3") into the previous day's work to assure a good bond to the adjacent work.

10) A moisture content of chemically-treated material shall be maintained at least the optimum moisture content, as defined by the ASTM D1557 Compaction Test, until aggregate base section is placed. Contractor shall prevent migration or washing-out of the chemically-treated material off-site or into the untreated areas, subsurface drainage systems, creeks, canals, etc and .

3.5 FINAL SUBGRADE PREPARATION USING UNTREATED SOILS

a. Building pad shall be constructed in accordance with Section 3.2 and Section 3.3 of these specifications.

b. The upper six inches (6") of any untreated final pavement subgrades shall be uniformly compacted to at least ninety-five (95%) percent of the ASTM D1557 maximum dry density, at a moisture content at least the optimum moisture content.

3.6 TESTING AND OBSERVATION

a. All grading operations, including lime-treatment of the subgrades, shall be tested and observed by the Geotechnical Engineer, serving as the representative of the Owner.

b. Field density tests shall be made by the Geotechnical Engineer after compaction of each layer of fill. Additional layers of fill shall not be spread until the field density tests indicate that the minimum specified density has been obtained.

c. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at

least two (2) working days prior to commencement of any aspect of the site earthwork.

d. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer and the Architect/Engineer. No deviations from the specifications shall be made except upon written approval of the Geotechnical Engineer or Architect/Engineer.

APPENDIX C

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REFERENCES

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APPENDIX D

Results of Liquefaction Analyses

GeoLogismiki
Geotechnical Engineering Software
Merarhias 56, 621 25 - Serrai, Greece
url: http://www.geologismiki.gr - email: info@geologismiki.gr

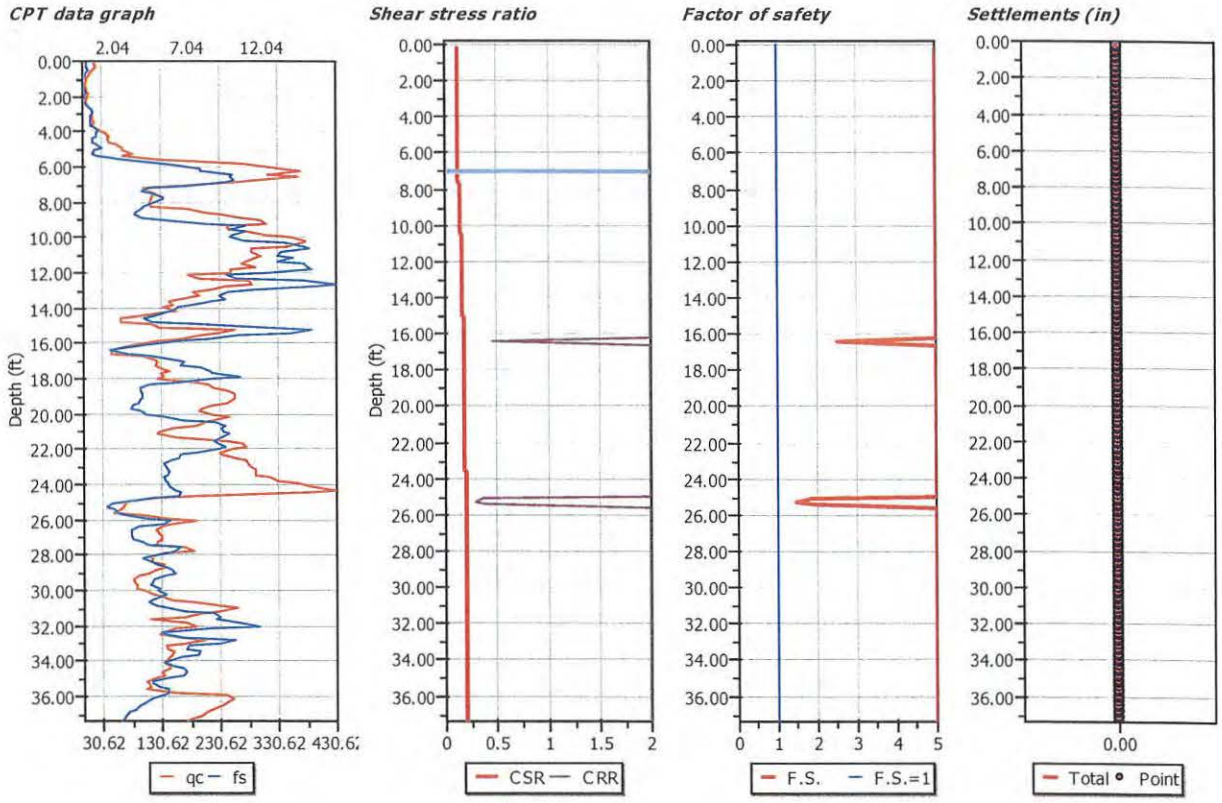
LIQUEFACTION ANALYSIS REPORT

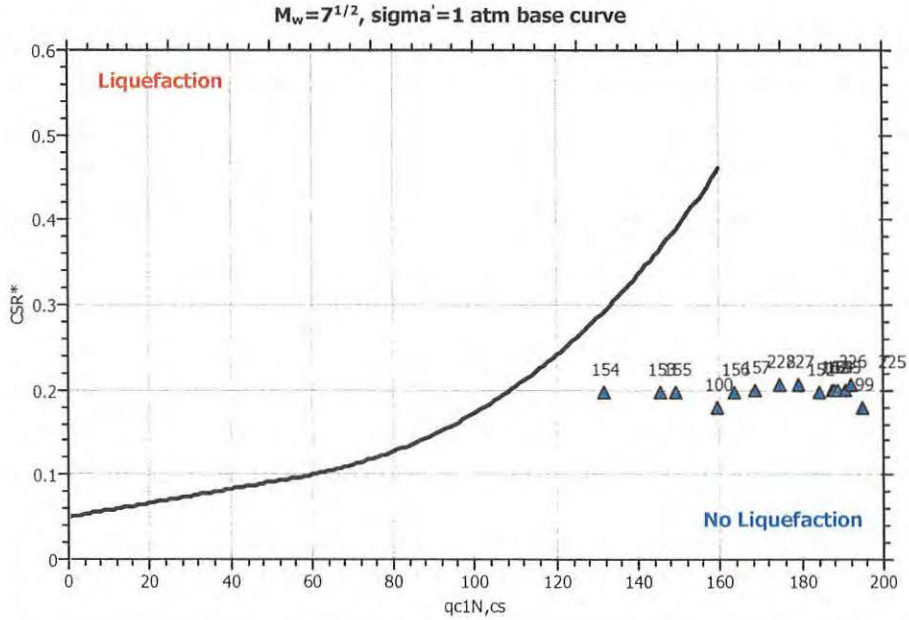
Project title : Lockeford Elementary School

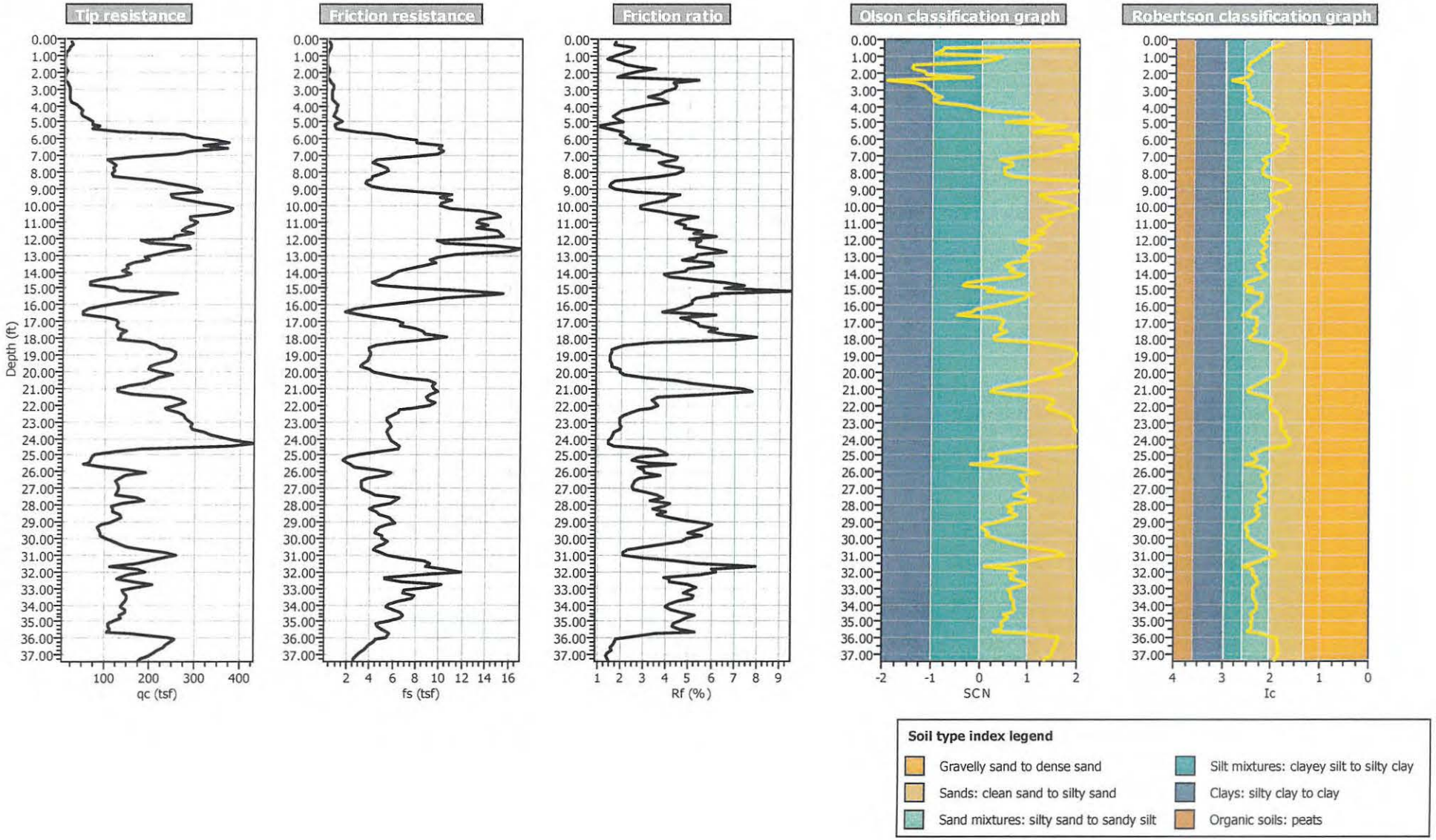
Project subtitle : CPT-1

Input parameters and analysis data

In-situ data type:	Cone Penetration Test	Depth to water table:	7.00 ft
Analysis type:	Deterministic	Earthquake magnitude M_w:	6.80
Analysis method:	Robertson (1998)	Peak ground accelaration:	0.20 g
Fines correction method:	Robertson (1998)	User defined F.S.:	1.30



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Friction resistance
Friction ratio
Olson classifcation graph
Robertson classifcation graph
Depth (ft)
qc (tsf)
fs (tsf)
Rf (%)
SCN
Ic
Soil type index legend
Gravelly sand to dense sand
Sands: clean sand to silty sand
Sand mixtures: silty sand to sandy silt
Silt mixtures: clayey silt to silty clay
Clays: silty clay to clay
Organic soils: peats

GeoLogismiki
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LIQUEFACTION ANALYSIS REPORT

Project title : Lockeford Elementary School

Project subtitle : CPT-2

Input parameters and analysis data

In-situ data type:	Cone Penetration Test	Depth to water table:	7.00 ft
Analysis type:	Deterministic	Earthquake magnitude M_w:	6.80
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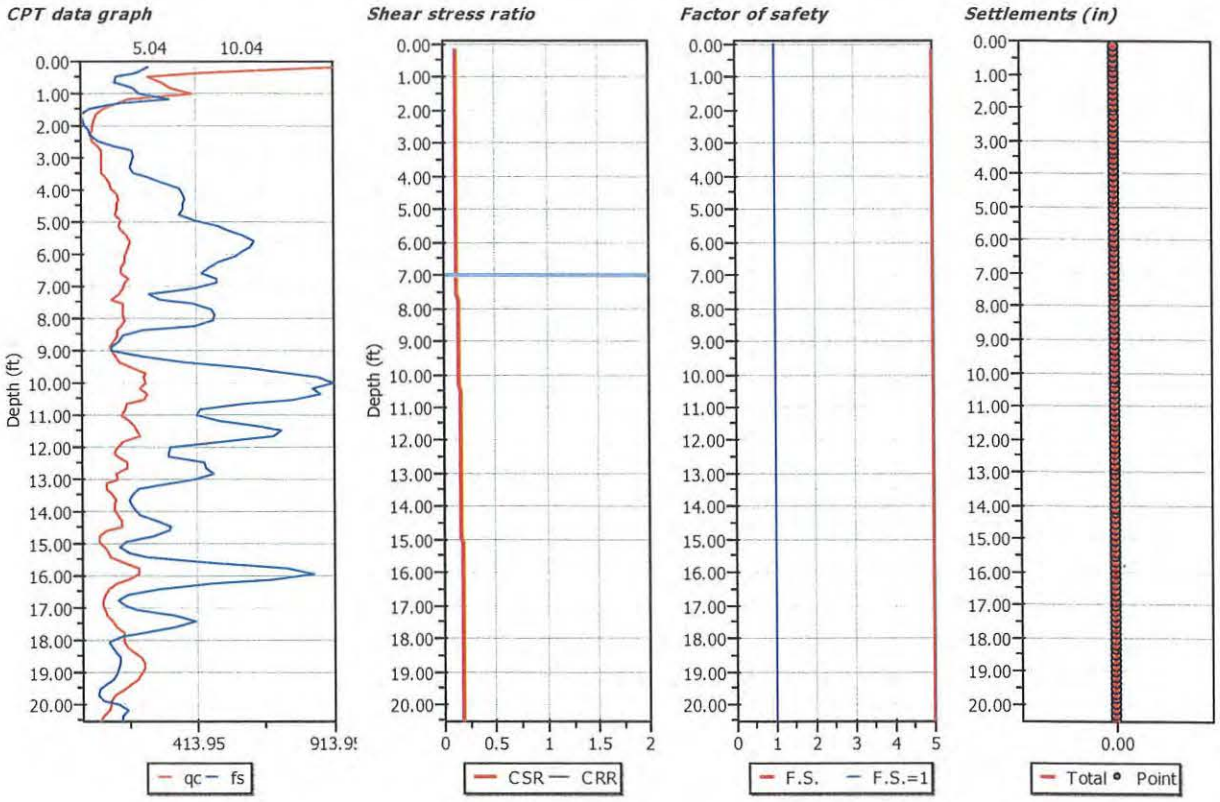
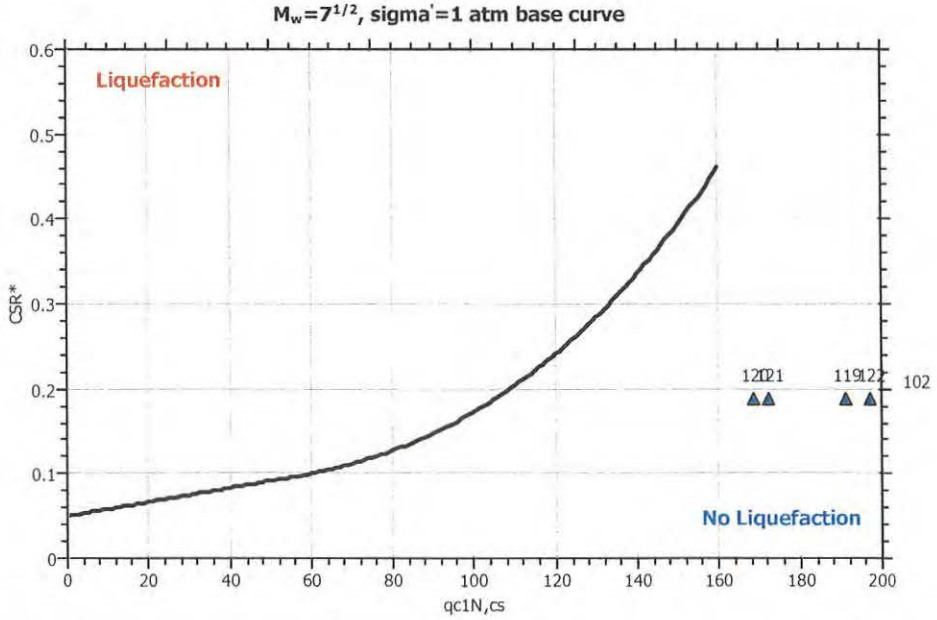
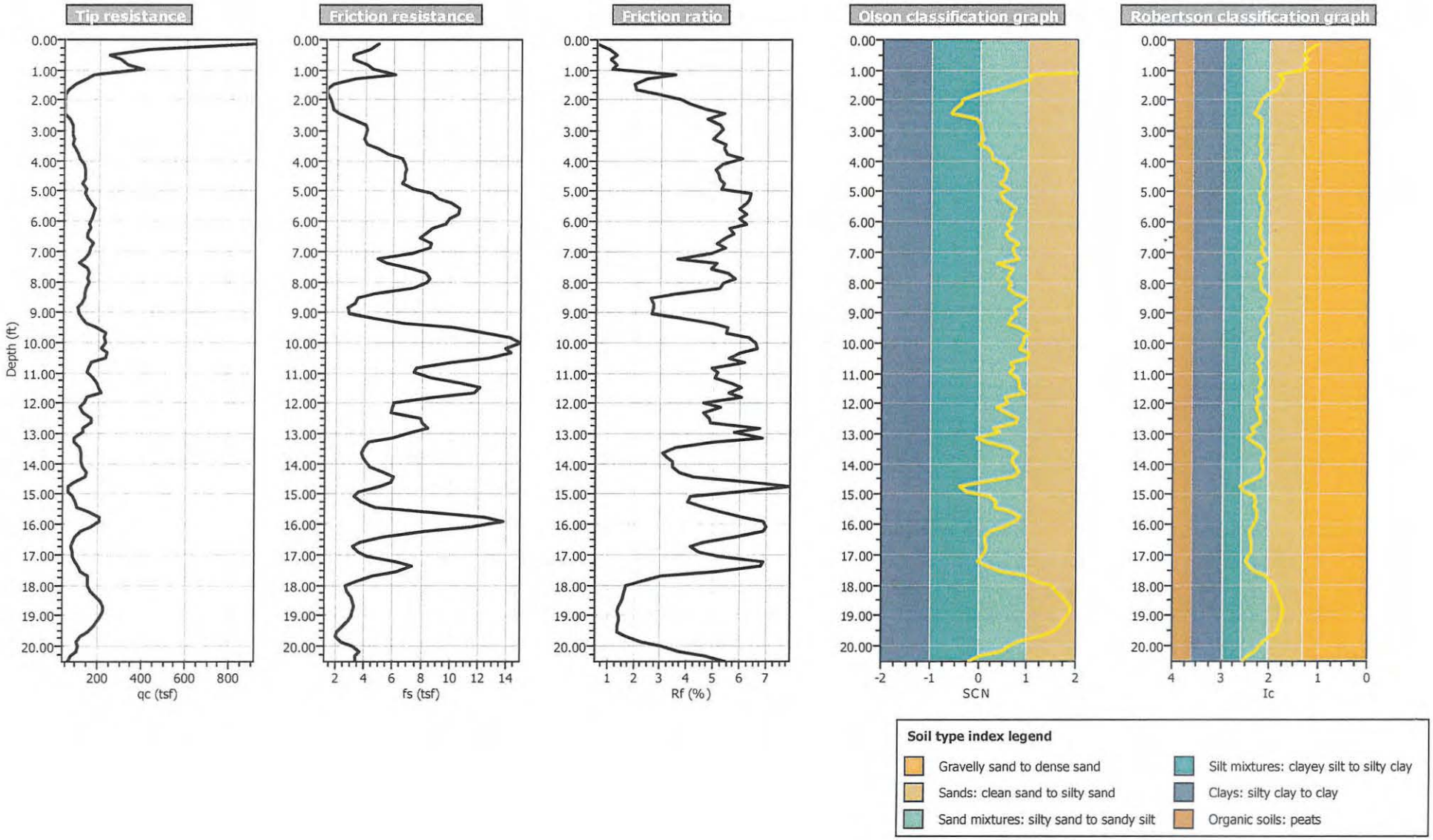
Fines correction method:	Robertson (1998)	User defined F.S.:	1.30



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Friction resistance
Friction ratio
Olson classification graph
Robertson classification graph
Depth (ft)
qc (tsf)
fs (tsf)
Rf (%)
SCN
Ic
Soil type index legend
Gravelly sand to dense sand
Sands: clean sand to silty sand
Sand mixtures: silty sand to sandy silt
Silt mixtures: clayey silt to silty clay
Clays: silty clay to clay
Organic soils: peats

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April 24, 2008

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Miscellaneous Soil Testing Services
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WKA No. 7954.01

As authorized, we have performed in-situ soil permeability testing services referred to, hereinafter, as percolation testing, in the two areas of the proposed stormwater discharge system, within the existing Lockeford Elementary School campus, in Lockeford, California. The two areas that are being considered for the construction of the stormwater system are: 1) the proposed parking lot located in the northern portion of the campus; and, 2) the existing parking lot located in the northeastern portion of the campus. The stormwater discharge system will consist of StormTech chambers and may be constructed at depths of four to approximately 12 feet below existing site grades. The purposes of our work have been to perform percolation testing and provide test results that can be utilized to evaluate the feasibility of the surface run-off discharge through soil percolation.

We previously prepared a *Geologic Hazard and Geotechnical Engineering Report* (WKA No. 7954.01, dated February 13, 2008) for the proposed Lockeford Elementary School additions. This report is referred to, hereinafter, as the Original Report.

Our scope of work has included drilling one soil boring to the maximum depth of approximately 16 feet below existing site grade, performance of five percolation tests and preparation of this report.

Test Site Description

At the time of our field investigation on March 27 through April 1, 2008, the areas that are being considered for the construction of the stormwater system supported an asphalt paved parking lot located in the northeastern portion of campus and an overflow gravel paved parking lot located in the northern portion of campus.

Subsurface Conditions

Our test boring indicates the soils in the area of the proposed stormwater system generally consist of undocumented fills that consist of fine gravels and silty sands to a depth of approximately 3½ feet. The native subsurface soils below the fill soils consist of partially cemented sandy silts to a depth of approximately 9½ feet below existing site grades, underlain by partially cemented silty sands (commonly referred to as "hard pan") to a depth of approximately 16 feet below existing site grades. These soil conditions are consistent with those encountered during our field investigation for the Original Report. However, non-cemented silty sands were encountered to a depth 5¾ feet at the location P-1.

Percolation Testing

Percolation test holes were constructed on March 27 and 31, 2008, utilizing a BK-81 drill rig. Five, 6½-inch diameter, cylindrical percolation test holes were installed to depths ranging from approximately five to 14¾ feet below existing site grades. The sidewalls of the holes were scraped to remove soil smearing (if any), and the slough was removed from the bottom of the holes by hand-augers. Gravel packing was used to protect the bottom and sidewalls of the holes from wash-out during the testing. A 3-inch diameter PVC pipe was placed in each hole and used to transmit water to the bottom of the holes. The percolation holes were presoaked overnight prior to commencement of the percolation tests.

Percolation tests were conducted on March 28 and April 1, 2008 by our field engineer. Percolation testing included adding water to the test holes periodically and measuring the drop in water level over time. Measurements of water levels and the rate of the water levels were

recorded on the percolation test logs. The rates of water level decline near the end of the test period (generally stabilized) were used to calculate the percolation rate of the soils tested.

Soil Percolation Rates

The following are the percolation rates calculated for each test hole, which include a correction factor accounting for the effect of gravel packing on measured perk rates.

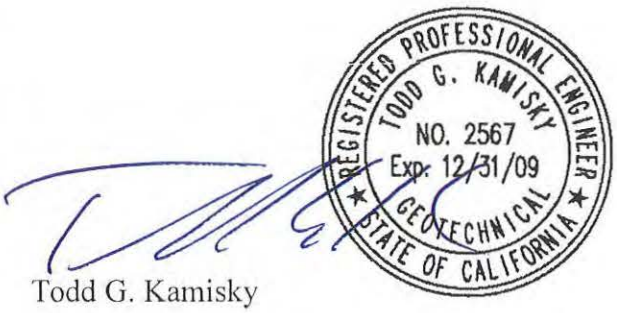
Percolation Test	Percolation Rate (mpi)	Depth of Hole (ft.)
P-1	9	5¾
P-2	781	9
P-3	943	14¾
P-4	132	5
P-5	902	5¼

It should be noted that, in our opinion, the percolation rate for Test P-1 is not considered representative of the soil conditions encountered at similar depths during our current investigation and field investigation for our Original Report.

Therefore, depending of the proposed depth of chambers, design for the stormwater discharge system can be conducted utilizing the aforementioned percolation rates (with the exception of the results of P-1).

The infiltration velocities are valid for the location tested only. This report should be utilized only for the design of the stormwater discharge system. This letter is considered an addendum to our original Geotechnical Engineering Report and is subject to the same limitations contained therein.

Wallace - Kuhl & Associates, Inc.

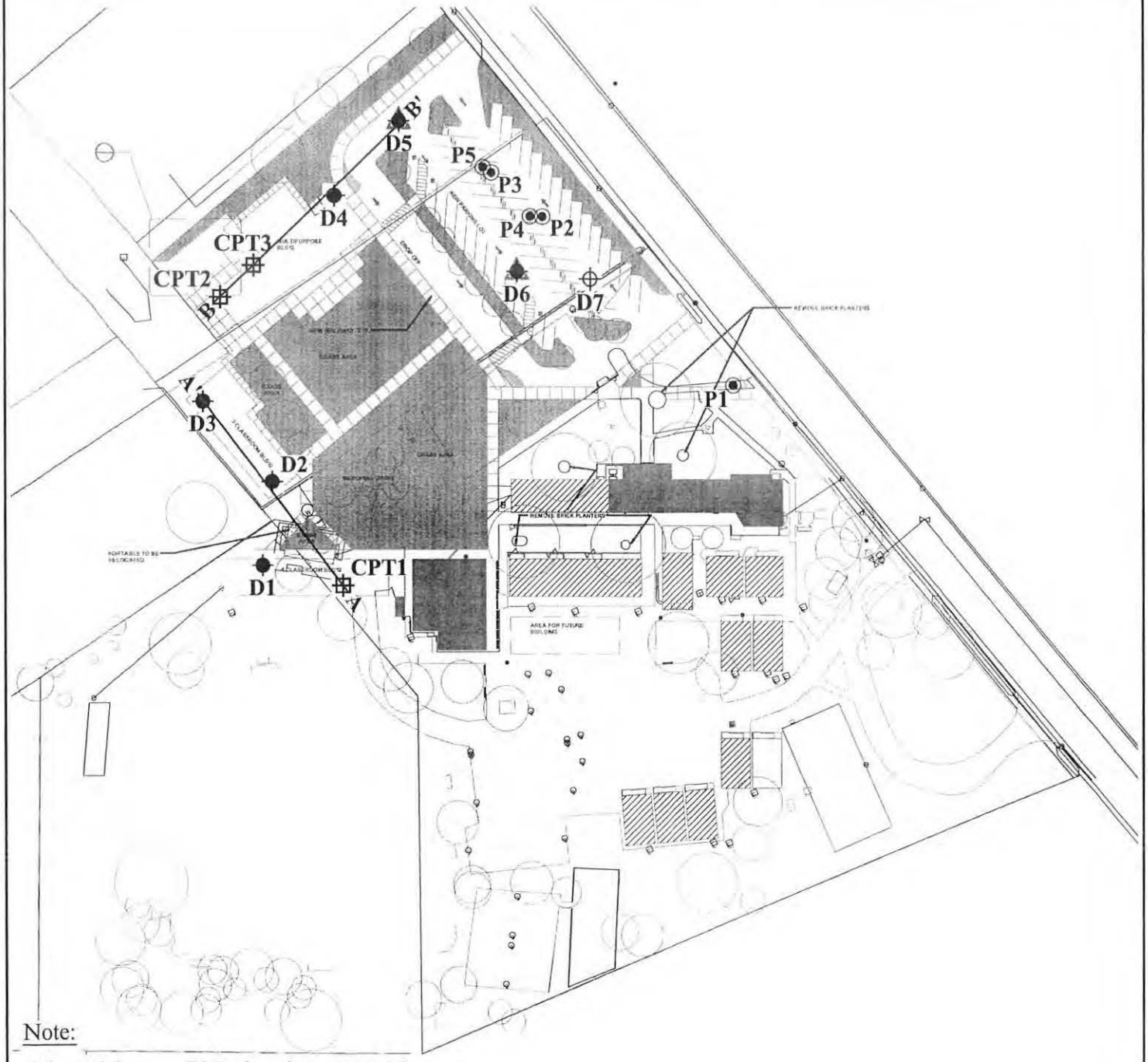


Vasiliy V. Parfenov
Project Engineering Geologist

Todd G. Kamisky
Senior Engineer

Attachments: Figure 1, Site Plan
Figure 2, Log of Soil Boring
Figure 3, Unified Soil Classification System

ML:VVP:TGK



Note:

Adapted from a CAD drawing prepared by Stafford King Wiese Architects, dated December 17, 2007.

Legend:

- Approximate soil boring location, drilled on January 23, 2008
- Approximate soil boring and bulk sample location
- Approximate soil boring location, drilled on March 27, 2008
- Approximate CPT sounding location
- Approximate percolation test location

A——A' Approximate geologic cross-section location

N

0 60 120

SCALE IN FEET

WallaceKuhl & ASSOCIATES INC

SITE PLAN

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 1	
DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	4/08

WKA NO. 7954.01

Project: Lockeford Elementary School Additions
Project Location: Lockeford, California
WKA Number: 7954.01

LOG OF SOIL BORING D7

Sheet 1 of 1

Date(s) Drilled	3/27/08	Logged By	ML	Checked By	VVP
Drilling Method	Hollow Stem Auger	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	16.0 feet
Drill Rig Type	BK-81	Diameter(s) of Hole, inches	6.5-inches	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet		Sampling Method(s)	SPT Sampler	Drill Hole Backfill	Soil cuttings
Remarks				Driving Method and Drop	140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Poorly graded, fine sub-angular gravel, (GP-Fill)						
			Reddish-brown, silty fine sand (SM-Fill)						
			with decomposed metal pipe						
			Brown to reddish-brown, fine sandy silt (ML)						
						31			
	5		dense soil						
			light brown						
			weakly cemented			86			
			Light brown to reddish-brown, silty fine sand (SM)			70			
	10								
			reddish-brown, fine to medium sand			47			
	15								

BORING LOG 7954.01P - LOCKEFORD ELEMENTARY SCHOOL.GPJ WKA.GDT 4/23/08 8:11 AM

Wallace Kuhl & Associates Inc

FIGURE 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sample: no recovery

= SPT Sample

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

PI = Plasticity Index
EI = Expansion Index
UCC = Unconfined Compression Test
TR = Triaxial Compression Test
GR = Gradational Analysis (Sieve)
K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

WallaceKuhl & ASSOCIATES INC

UNIFIED SOIL CLASSIFICATION SYSTEM

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 3

DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	4/08

WKA NO. 7954.01

Wallace Kuhl
& ASSOCIATES INC

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West Sacramento, CA 95691
916.372.1434 phone
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916.435.9722 phone
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Stockton, CA 95219
209.234.7722 phone
209.234.7727 fax

May 22, 2008

Mr. Gary Yokum
Facility Planning Manager
Lodi Unified School District
1305 East Vine Street
Lodi, California 95240

Supplemental Miscellaneous Soil Testing Services
LOCKEFORD ELEMENTARY SCHOOL ADDITIONS
19456 North Tully Road
Lockeford, California
WKA No. 7954.01

As authorized, we have performed supplemental, in-situ soil permeability testing services referred to hereinafter as percolation testing, in the area of the proposed stormwater discharge system, within the existing Lockeford Elementary School campus, in Lockeford, California.

We previously prepared a percolation testing report (WKA No. 7954.01, dated April 24, 2008) for the proposed stormwater discharge system. This report is referred to hereinafter as the Original Percolation Report.

At the time of our percolation testing for the Original Percolation Report, the stormwater discharge system was proposed to consist of StormTech chambers constructed at depths of four to approximately 12 feet below existing site grades. Therefore, our percolation testing was limited to the upper 15 feet below existing site grade. Based on the results of the percolation testing presented in the Original Percolation Report, Warren Consulting Engineers (Project Civil Engineer) concluded that the soil tested do not posses sufficient permeability to discharge stormwater runoff utilizing StormTech chambers only. Therefore, it was proposed to supplement the StormTech chambers with dry wells.

The purposes of our work have been to perform additional percolation testing and provide test results that can be utilized to evaluate the feasibility of the surface run-off discharge through dry wells and to confirm that the soils within the upper four feet below existing site grades posses low permeability characteristics.

Our scope of work for the current investigation has included drilling one soil boring to the maximum depth of approximately 40 feet below existing site grade, performance of four percolation tests and preparation of this report.

Subsurface Conditions

Our test borings indicate the soils in the area of the proposed stormwater system generally consist of undocumented fills that consist of fine gravels and silty sands to depths of approximately two to 3½ feet. The native subsurface soils below the fill soils consist of partially cemented sandy silts and silty sands (commonly referred to as "hard pan") to a depth of approximately 20 feet below existing site grades. These strata were underlain by non-cemented sandy silts and silty sands to the maximum depth explored.

Percolation Testing

Percolation test holes were constructed on May 16, 2008, utilizing a CME-75 drill rig. Four, 6-inch or 7-inch diameter, cylindrical percolation test holes were installed to depths ranging from approximately four to 38½ feet below existing site grades. The sidewalls of the holes were scraped to remove soil smearing (if any), and the slough was removed from the bottom of the holes by hand-augers. Gravel packing was used to protect the bottom and sidewalls of the holes from wash-out during the testing. A 3-inch diameter PVC pipe was placed in each hole and used to transmit water to the bottom of the holes. The percolation holes were presoaked overnight prior to commencement of the percolation tests.

Percolation tests were conducted on May 19 and 20, 2008 by our field engineer. Percolation testing included adding water to the test holes periodically and measuring the drop in water level over time. Measurements of water levels and the rate of the water levels were recorded on the

percolation test logs. The rates of water level decline near the end of the test period (generally stabilized) were used to calculate the percolation rate of the soils tested.

Soil Percolation Rates

The following are the percolation rates calculated for each test hole, which include a correction factor accounting for the effect of gravel packing on measured perk rates.

Percolation Test	Percolation Rate (mpi)	Depth of Hole (ft.)
P-6	15	38½
P-7	45	24½
P-8	203	4¼
P-9	175	4

It should be noted that, based on our observations soil in borings, the soils with relatively high permeability are anticipated to be present at a depth interval between 20 and 40 feet below existing site grades.

Recommendations

Wallace-Kuhl and Associates should be afforded to review the proposed storm-water discharge system design prior to finalization of the project plans and specifications. If bottom of the proposed dry wells to be constructed below depth of 40 feet below existing site grades, supplemental investigation (including drilling of the borings and conducting percolation testing) is recommended to verify that the soils below depth of 40 feet below existing site grades poses permeability properties similar to those utilized for the design.

In addition, independent of the depth of the proposed dry wells, in-situ permeability testing is recommended after the first dry well is constructed.

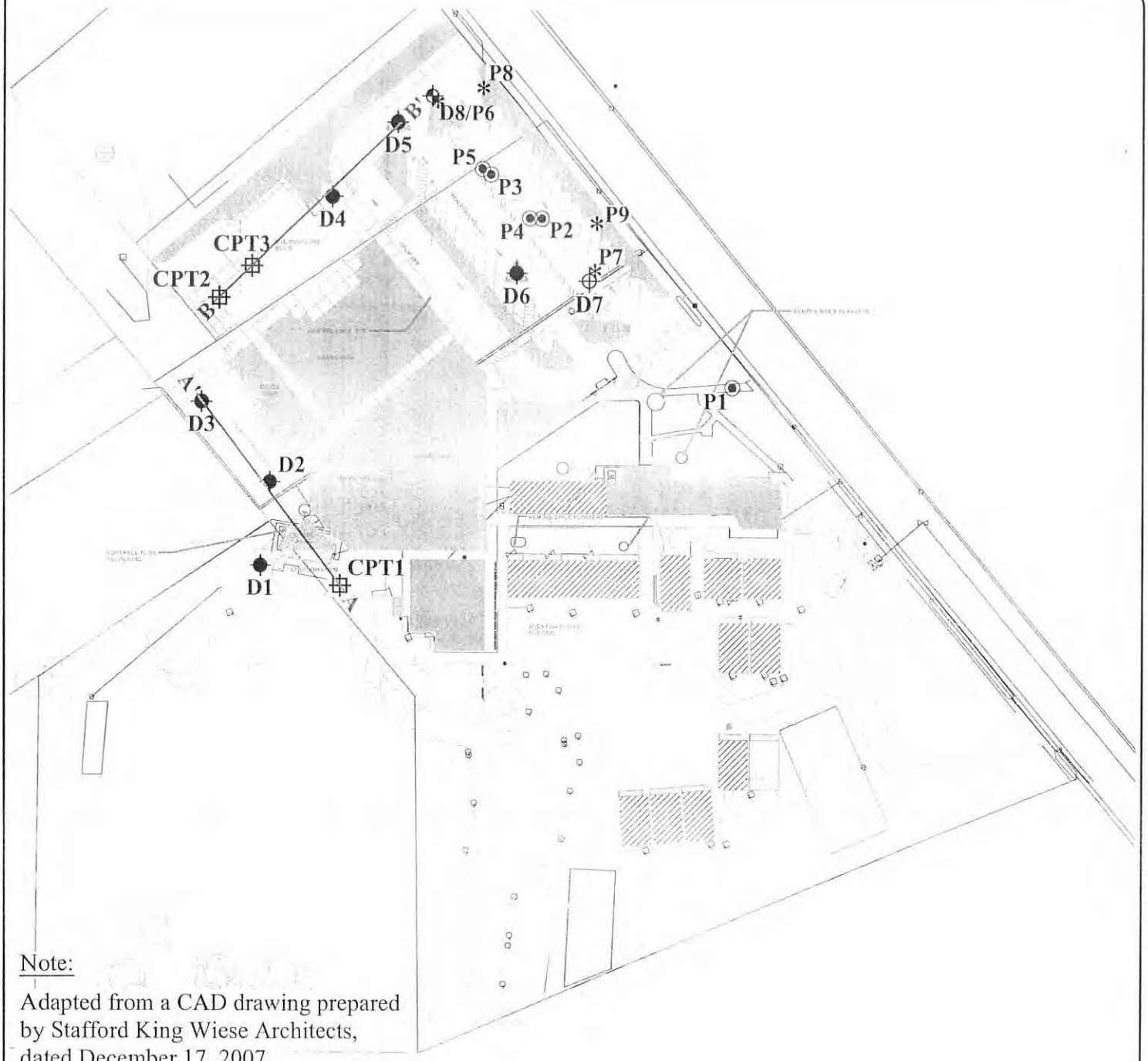
The infiltration velocities are valid for the location tested only. This report should be utilized only for the design of the stormwater discharge system. This letter is considered an addendum to our original Geotechnical Engineering Report and is subject to the same limitations contained therein.

Wallace - Kuhl & Associates, Inc.

Vasiliy V. Parfenov
Project Engineering Geologist

Attachments: Figure 1, Site Plan
Figure 2, Log of Soil Boring
Figure 3, Unified Soil Classification System

VVP:TGK



Note:

Adapted from a CAD drawing prepared by Stafford King Wiese Architects, dated December 17, 2007.

Legend:

- Approximate soil boring location, drilled on January 23, 2008
- Approximate soil boring and bulk sample location
- Approximate soil boring location, drilled on March 27, 2008
- Approximate CPT sounding location
- Approximate percolation test location, March 27, 2008 - April 1, 2008
- Approximate soil boring location, drilled on May 16, 2008
- * Approximate percolation test location, May 16, 2008 - May 20, 2008
- A——A' Approximate geologic cross-section location

N

0 60 120

SCALE IN FEET

WallaceKuhl & ASSOCIATES INC

SITE PLAN

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 1

DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	5/08

WKA NO. 7954.01

Project: Lockeford Elementary School Additions Project Location: Lockeford, California WKA Number: 7954.01	LOG OF SOIL BORING D8 Sheet 1 of 2

Date(s) Drilled: 5/16/08	Logged By: VVP	Checked By: VVP
Drilling Method: Solid Flight Auger	Drilling Contractor: V&W Drilling	Total Depth of Drill Hole: 40.0 feet
Drill Rig Type: CME 55	Diameter(s) of Hole, inches: 7-inches	Approx. Surface Elevation, ft MSL:
Groundwater Depth [Elevation], feet:	Sampling Method(s): California Modified Sampler with 6-inch sleeves	Drill Hole Backfill: Soil cuttings
Remarks:		Driving Method and Drop: 140 lb hammer, 30-inches drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown to dark brown, silty fine to medium sand (Fill-SM)						
			Reddish-brown to brown, fine sandy clay (CL)						
			Yellow-brown, silty fine to medium sand (SM)						
	5		Yellow-brown to light brown, partially cemented, fine sandy silt (ML)						
	10		light brown						
			reddish-brown, clayey silt						
	15				D8 - 1I	45			
	20		yellow-brown, without cementation, fine sandy silt		D8 - 2I	60			

BORING LOG - 7954.01P - LOCKEFORD ELEMENTARY SCHOOL.GPJ WKA.GDT 5/21/08 3:06 PM

Wallace Kuhl

FIGURE 2

Project: Lockeford Elementary School Additions
Project Location: Lockeford, California
WKA Number: 7954.01

LOG OF SOIL BORING D8

Sheet 2 of 2

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Yellow-brown to brown, silty fine to medium sand (SM)		D8 - 3I	30/6"			
			interbedded with seams of sandy silt						
	30		increased silt content		D8 - 4I	35			
	35								
	40				D8 - 5I	48			

BORING LOG 7954.01P - LOCKEFORD ELEMENTARY SCHOOL.GPJ WKA.GDT 5/21/08 3:06 PM

WallaceKuhl

FIGURE 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
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		SC		Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sample: no recovery

= SPT Sample

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

PI = Plasticity Index

EI = Expansion Index

UCC = Unconfined Compression Test

TR = Triaxial Compression Test

GR = Gradational Analysis (Sieve)

K = Permeability Test

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

WallaceKuhl & ASSOCIATES INC

UNIFIED SOIL CLASSIFICATION SYSTEM

LOCKEFORD ELEMENTARY SCHOOL ADDITIONS

Lockeford, California

FIGURE 3

DRAWN BY	TJC
CHECKED BY	VVP
PROJECT MGR	VVP
DATE	5/08

WKA NO. 7954.01

KLEINFELDER
Bright People. Right Solutions.

November 28, 2017
Kleinfelder Project No. 20182851.001A

Mr. Jeff Sanguinetti
A.R Sanguinetti & Associates
Civil Engineering, Land Planning & Surveying
1150 W. Robinhood Drive, Suite C
Stockton, CA 95207
jmsang@aol.com

Subject: **Review of Storm Drainage Analysis Dated June 2017**
Lockeford Elementary School
Lockeford, California

Dear Mr. Sanguinetti:

At your request, we have reviewed your storm drainage analysis prepared for the Lockeford Elementary School located at 19456 North Tully Road in Lockeford, California. We understand that the basis for your design were geotechnical reports prepared by Wallace Kuhl dated April 24, and May 22, 2008, for additions to the Lockeford Elementary School. The first report included the results of five relatively shallow percolation tests. The results of these tests were very slow to essentially zero percolation. The tests, except for P-1, extended into very dense/hard sandy silt soils known locally as "hardpan". The subsequent report in May included the results of four more percolation tests performed in deeper test holes. Wallace Kuhl concluded that more favorable soils for percolation were encountered between the depths of approximately 20 to 40 feet.

As discussed with you, our firm has also performed numerous percolation tests in the Lockeford area and we concur with the Wallace Kuhl report that percolation is very limited due to the partially cemented native soils. We understand that traffic circulation around the school has been an issue for some time. To improve circulation we understand that a new paved road will be constructed to connect Jack Tone Road to Colton Street. Occasional flooding has also been an issue at the school due to the poor percolation characteristics of the near surface soils. During the proposed street improvements we understand that measures to improve on site drainage are also being planned. According to your Storm Drainage Analysis submitted for our review, we understand that the 72 inch diameter CMP, perforated to allow infiltration out of the chamber, will be situated approximately 24 inches below the swale located between the new pavement and sidewalk. Both the pavement and sidewalk will have a deepened curb. The perforated CMP will be bedded on at least 12 inches of drain rock. Although not shown on your sketch we assume that some drain rock will also be placed along the side of the CMP, simply because the excavation of the trench must exceed the diameter of the CMP. The upper portion of the CMP will be covered by an impermeable membrane to reduce infiltration into the CMP chamber. Storm water entering the swale will be directed to the buried CMP by 18 inch diameter drop inlets.

You have asked for our comments on the detention cell detail described above, in particular the proximity of potentially a saturated drain system immediately next to pavements and sidewalks. Normally, water and pavements are sometimes referred to as "dynamite and fire", since saturated soils near pavements generally lead to pavement failures. However, the boring logs included in the Wallace Kuhl reports and our own experience indicate that the near surface native soils are partially cemented and very hard. In fact, the native soils are much stronger than the same soils recompacted as Engineered Fill even to a high degree of compaction such as 95 percent. According to your detail of the detention cell, there is little horizontal distance, about 24 inches, between the side of the CMP and the outside edge of the curbs. We do not recommend that the curbs be supported on fill, even if compacted to 95 percent. Based on our experience, once the CMP and drain rock have been installed, and a major storm event causes the detention cells to fill, there will likely be some shifting of the drain rock and possibly even the compacted fill. One reason for the shifting is the very difficult task of forcing drain rock under the haunch of the CMP. Shaping the bedding layer prior to the installation of the CMP will be critical. It may even be necessary to attach a vibrator to the CMP to "encourage" the drain rock to completely fill the underside of the CMP. Another option is to use a vibrating "stinger" used to consolidate concrete on the drain rock. We suggest that you use the perforations in the CMP to evaluate whether the drain rock is in contact with the entire underside of the pipe.

Because of the above mentioned difficulty and the resulting settlement of the ground surface above the CMP, we recommend that the curbs be supported on the partially cemented native soils and that these hard soils extend at least 12 inches beyond the outside edge of the curb. This will require, according to your detail, that the excavation to install the 72 inch diameter CMP be made with vertical slopes. We recommend that your detail be revised to show the membrane extending over the top of the CMP and also draping laterally over the drain rock placed up to the side of the CMP. The purpose of this is to minimize the amount of backfill soil that migrates into the drain rock when the whole system is saturated. We also agree with your detail that shows the inlet extending above grade which should minimize the amount of solids that enters the detention cell. Fines entering the detention cell could have an adverse impact on the already minimal percolation rate. If the swale area is to be irrigated during the summer, it is important that the landscape contractor be informed that trenches, if situated next to the curb, cannot extend below the level of the curb. If the trenches extended below the bottom elevation of the curb, the lateral support for the curb could be compromised.

LIMITATIONS

This review was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions and recommendations are based on review of a limited number of observations and data provided in geotechnical reports prepared by Wallace Kuhl, dated April 24, and May 22, 2008. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This letter may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than 2 years from the date of the report.

The work performed was based on project information provided by Client. If Client does not retain Kleinfelder to review any plans and specifications, including any revisions or modifications to the plans and specifications, Kleinfelder assumes no responsibility for the suitability of our recommendations. In addition, if there are any changes in the field to the plans and specifications, Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations.

CLOSING

We trust this letter documents our recent discussions. Please note that our scope of work has been limited to the geotechnical aspects of the detention cell detail. Please contact us if you have any additional questions.

Respectfully submitted,

KLEINFELDER, INC.

Ron Heinzen, G.E., No. 388
Senior Program Manager

Carl Henderson, Ph.D., G.E., No. 2886
Principal Geotechnical Engineer

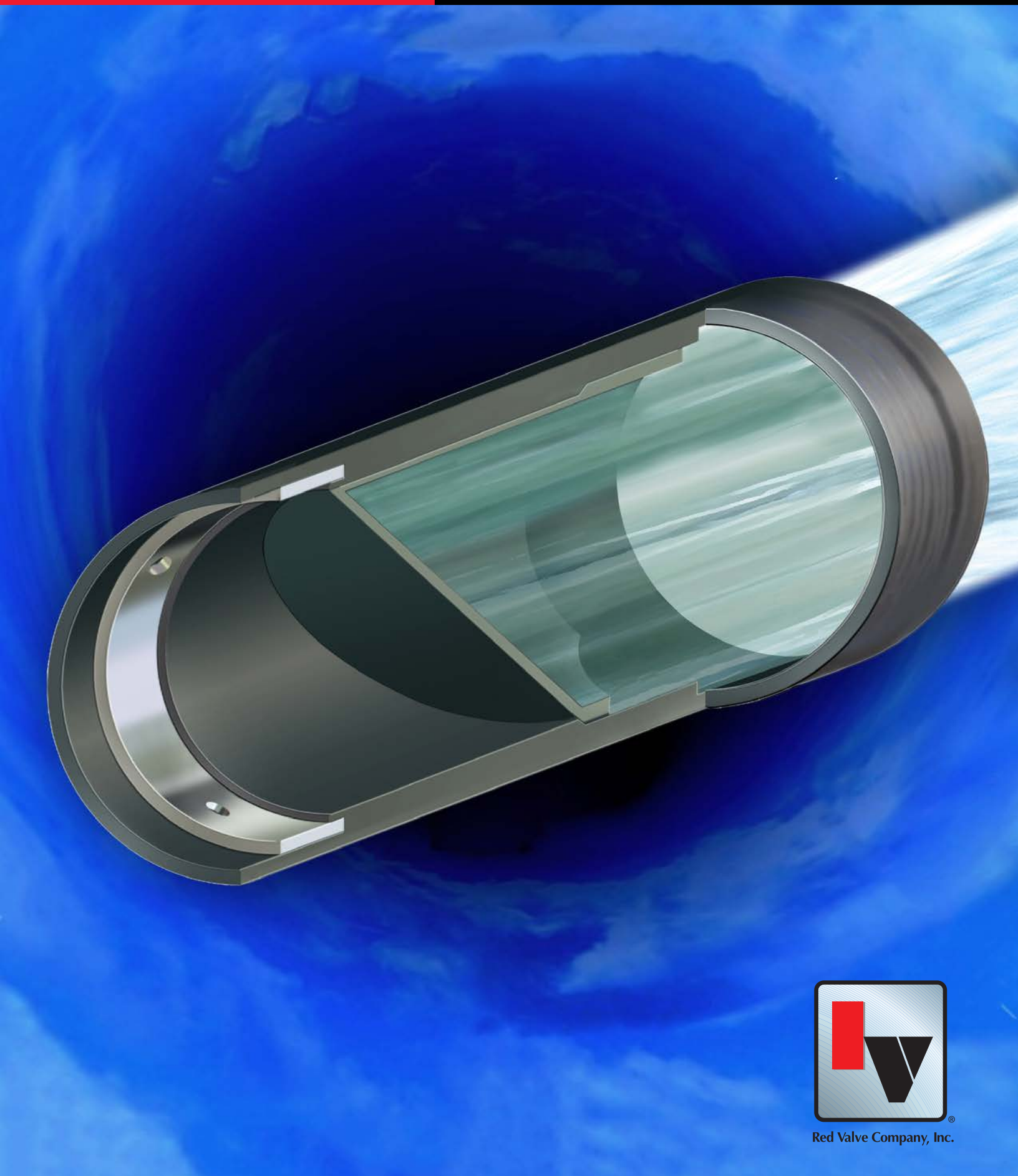
RH:bn

Red Valve®

THE CHECKMATE® ADVANTAGE

The World's Most Reliable Check Valve

Engineering Guide



Red Valve Company, Inc.

Continuing a Legacy of Innovation, Leadership and Customer Service

More than 60 years ago, Red Valve Company was founded on a simple promise: provide the highest quality engineered valves backed by an unsurpassed level of technical innovation and customer service. With that promise began a legacy of leadership—and a never-ending quest to solve the world's toughest flow control challenges while exceeding our customers' expectations.

As the world leader in Pinch Valve and Check Valve technology, that legacy lives on every day at Red Valve Company, and the innovative CheckMate® Inline Check Valve is proof. The CheckMate® Inline Check Valve is rooted in the same superior understanding of elastomer technology as the legendary Tideflex® Check Valve, one of the most well-known valves proven for providing reliable long-lasting backflow prevention, across the globe.

Being a world leader in valve technology is more than a slogan—it's a promise, carried forward by the hundreds of dedicated Red Valve employees and sales representatives around the world. Call us any time. We are ready to speak with you personally—right now.

The patented CheckMate® Inline Check Valve is rooted in the same superior understanding of elastomer technology as the legendary Tideflex® Check Valve, one of the most well-known valves in the world.

A Pioneer in the Check Valve Industry

In 1984, the United States Environmental Protection Agency (EPA) commissioned Red Valve Company to develop and test an alternative to tide gate valves. In their report, Development and Evaluation of a Rubber "Duck Bill" Tide Gate, the EPA states, "Increasing the reliability and performance of tide gates has a beneficial impact on the general pollution abatement program for the nation's waterways."

Development and Evaluation of a Rubber "Duck Bill" Tide Gate

Peter A. Freeman, Angelika B. Forndran, and Richard Field

A unique 54 in. diameter "duckbill rubber tide gate (RTG) was designed, fabricated, and installed in a typical New York City tide gate chamber. The operation of the RTG was observed over two years. The RTG was very effective in preventing the inflow of tidal waters and generally showed equal or improved performance compared to a typical flap gate. Hydraulically, the RTG was supposed to open to release storm flows at a positive difference in upstream head of six in. and to remain closed preventing inflow at a downstream positive head up to eight ft during high tide. Minor inflow was observed when debris was introduced into the RTG, and capability of self-cleaning was exhibited. Inflow would be significantly greater if similar size debris was lodged in the conventional flap-type gate. The maintenance crews observed no incident where the manual removal of debris was required. The existing chamber required minor modifications for the installation of the RTG. The method of adapting the RTG to an existing tide gate frame is critical to ensuring the reliability of the installation. The RTG was exposed on occasions to gale force winds and heavy rainfall during the two years of operation in New York City.

This Project Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Tide gates are a necessary component of municipal combined sewer systems, which discharge overflows into receiving waters whose surface elevations vary due to tidal or seasonal effects. In principle, these perform a check valve function, allowing excess flow mainly from storm events to discharge into receiving waters, while preventing back flow or leakage into the combined sewer system. Leakage can cause significant problems to the treatment process and associated hardware, due both to the presence of dissolved salts or other substances, as well as a waste of treatment plant capacity.

The conventional flap tide gate operates by swinging outward (toward the receiving body of water) when the upstream flow exceeds the capacity of the regulator controlling flows to the interceptor (normally during storm conditions). The water level upstream of the tide gate rises to whatever level is necessary to offset the weight of the tide gate and the water level downstream of the gate. When there is no upstream flow, the gate sits firmly against the frame and does not permit backflow. Properly operating tide gates do not permit tidal inflow (backflow).

In New York City there are three types of such tide gates: (1) Pontoon gates which consist of hollow wrought iron flaps mounted on cast iron frames; (2) Timber gates predominantly made of three in. thick Greenheart timbers, and (3) Cast iron gates which are generally less than 48 in. high. A recently completed regulator improvement program study re-

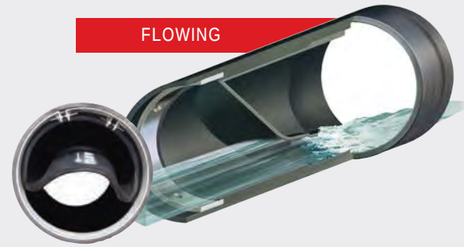
Since the creation of the Tideflex® Check Valve in 1984, years of research and development, testing and proven performance has led to the globalization of the TF-2 Tideflex® Check Valve and the next generation Tideflex® TF-1. With improved flow efficiency characteristics and the latest technology in elastomers, Red Valve continues to deliver on its promise of staying on the forefront of technology and new product development. The Tideflex® name is respected and recognized around the world as the most reliable valve for backflow prevention. It is also worth noting that the first Tideflex® Check Valve sold in 1984 is still in service today, with more than 700,000 Tideflex® Check Valves in service around the world, reliably solving inflow and intrusion problems.

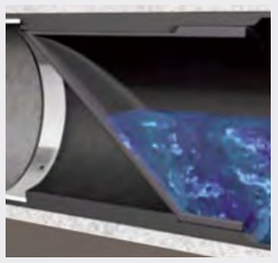
CheckMate® Valve Solves City's Odor Problem

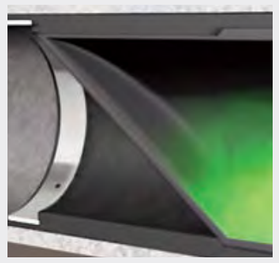
When foul odors were plaguing a soybean producing town in Illinois, officials turned to Red Valve for the most reliable, cost-effective solution.

A chemical deodorizing system and a pump station were also evaluated, but far exceeded budget constraints. The CheckMate® Inline Check Valve proved to be the perfect solution.

The CheckMate® Inline Valve was installed in 2012 and has worked flawlessly ever since, completely blocking the backdraft of the odor. Best of all, there has been zero maintenance expense. According to a public works official, *"This is one of the most cost-effective solutions to a nagging quality of life problem the City has ever implemented. We are now looking at other parts of the combined sewer system that has a few small odor problems due to escaping sewer gas."*

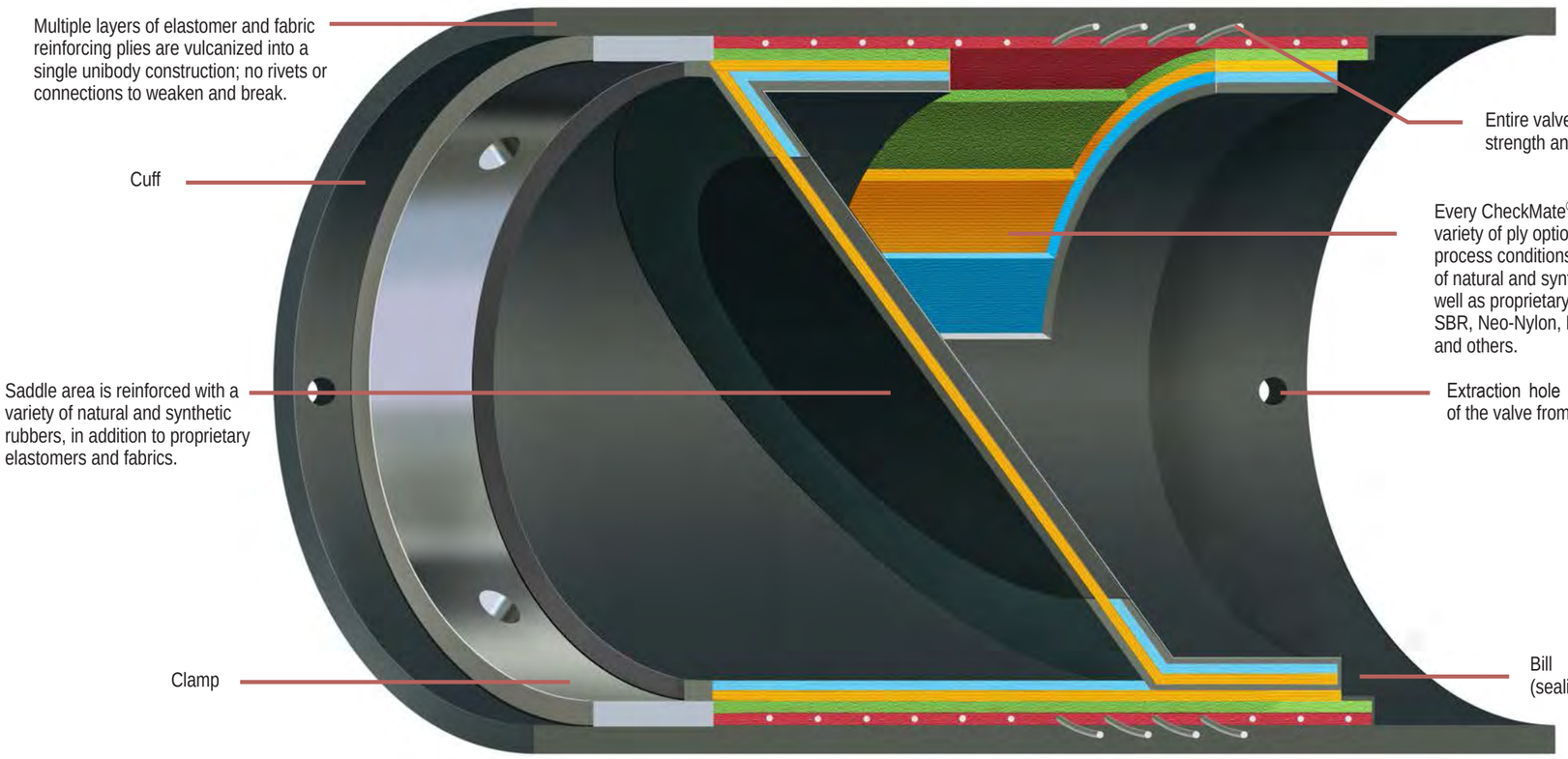






For an animated demonstration of the CheckMate® in operation, please visit: http://www.tideflex.com/checkmate

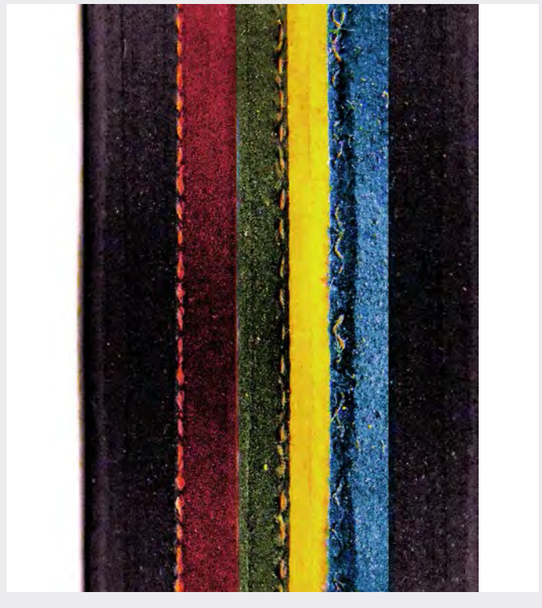
There Is Only One CheckMate® Inline Valve!



The CheckMate® Inline Check Valve: Accept No Substitutes!

The innovative CheckMate® Inline Check Valve has quickly become the specified choice for inline residential, municipal and commercial areas where complete, dependable backflow prevention is critical. It has also become the valve of choice for municipal and industrial applications such as storm water, wastewater, highway runoff, CSO, SSO and flood control by preventing unwanted backflow that can cause surges and flooding. The CheckMate® Inline Check Valve minimizes damage to wetlands, beaches and residential areas and eliminates hydraulic surges to wastewater treatment plants, saving municipalities millions of dollars in maintenance and treatment costs.

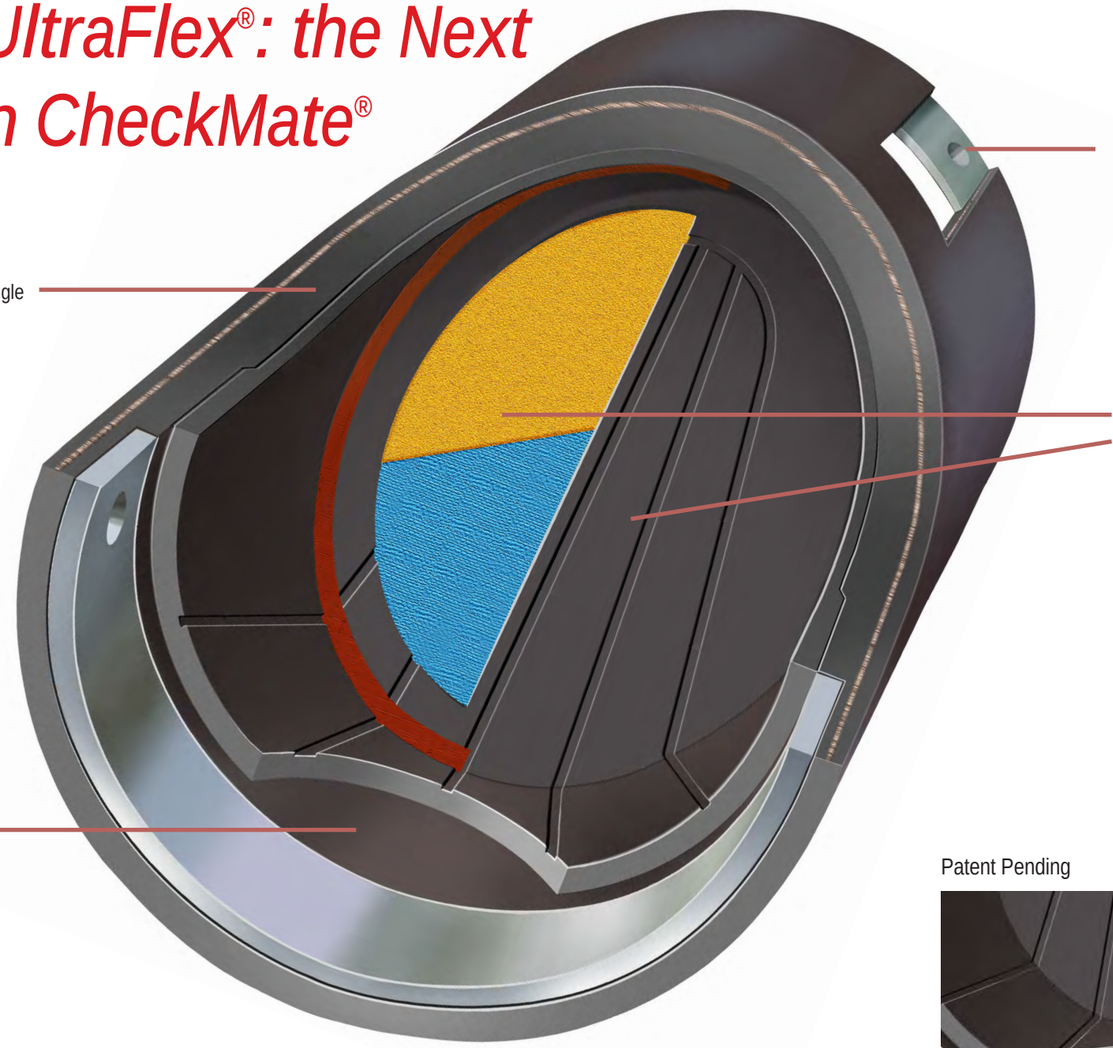
One of the keys to the CheckMate® Valve's exceptional dependability and longevity is Red Valve's unmatched elastomer experience—experience, application knowledge and engineering know-how. Every CheckMate® Inline Check Valve is hand-fabricated, made of multiple layers of varying natural and synthetic elastomers, wire and fabric-reinforced plies, all of which are vulcanized into a robust unibody valve. Unlike competing designs, there are no molded parts or mechanical fasteners and rivets that will loosen, act as catch points, break or corrode—ever. The key to CheckMate® Valve's longevity, performance and low headloss characteristics is the design and construction.



Red Valve's legendary elastomer technology and knowledge is the real story behind the CheckMate® Valve's unrivaled performance. Every CheckMate® Valve is reinforced with various natural and synthetic plies, specifically engineered for your specific application.

CheckMate® Inline Check Valves use state-of-the-art elastomers and fabric technology with no metal hinges, rivets, fasteners or moving parts. The valve's unibody construction is ideally suited for CSO and diversion chamber applications and installed inside the pipeline on either the upstream or downstream side of a diversion chamber.

Introducing UltraFlex®: the Next Generation in CheckMate® Technology!

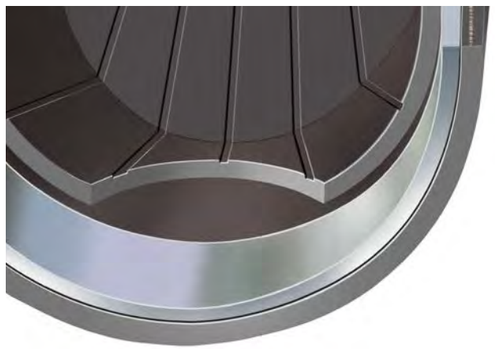


Unmatched Elastomer Research, Innovation and Knowledge

The patented CheckMate UltraFlex® Inline Check Valve features drastically improved hydraulic and performance characteristics to its predecessor, the original CheckMate® Check Valve. Strategically placed reinforcing ribs, segmented pads and the "Arc Notch" bill combine to significantly improve flow efficiency with significantly reduced headloss, while providing absolute backflow protection.

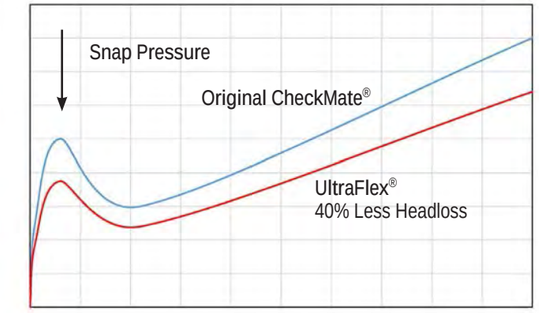
Once upstream head pressure reaches a specific level, CheckMate® Inline Check Valves are designed to "snap" or "pop" open, allowing the rapid discharge of flow. The new UltraFlex®, with its patented "Arc Notch" and optimized construction, allows the next generation CheckMate® Valve to open 40% sooner. As a result, the pipeline and entire collection system drains up to 40% faster. Because the UltraFlex® Valve "snaps" or "pops" open with less head pressure, pipeline capacity is significantly increased while the chance for standing water to collect upstream of the valve is totally eliminated.

Patent Pending



Strategically placed reinforcing ribs, segmented pads and the bill's unique "Arc Notch" combine to significantly improve flow efficiency with significantly reduced headloss while providing absolute backflow protection.

UltraFlex® Boasts 40% Lower "Snap Pressure"



The new CheckMate UltraFlex® Valve boasts a 40% lower snap pressure requirement to open or unseat the valve, without compromising the valve's ability to seal. This greatly improves capacity in pipelines and the rapid drainage of upstream flow through the valve. With its patented "Arc Notch" design, the CheckMate UltraFlex® Inline Check Valve boasts a significantly improved flow efficiency, due to reduced head pressure levels required to "snap" open the valve.

When upstream head reaches 50-75% of pipe diameter (for example, 9" head in a 12" valve), the UltraFlex® bill "snaps" open into a concave shape, allowing substantially more flow with the same amount of head. The valve will progressively open with increased head and flow. Picture shows moment when the valve "snaps" open.

The CheckMate® Valve will crack open and flow with as little as 1" of head pressure.

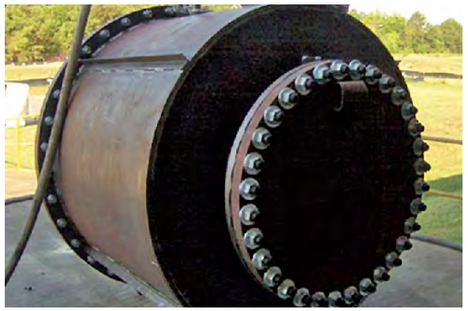
Once the CheckMate® Valve "snaps" open, it achieves rapid discharge of flow.

Independently Tested, Field Validated

Independent Hydraulic Testing

CheckMate® Inline Check Valves are independently tested to determine their hydraulic characteristics in both free and submerged discharge applications. Published hydraulic data is validated through this independent testing, and Finite Element Analysis data is also provided to ensure the CheckMate® Valve meets your exact specifications. CheckMate® Valves are ideally suited for interceptor, manhole and outfall pipelines because they allow flow to discharge with very little headloss and prevent backflow. The CheckMate® Valve's innovative inline design allows it to be easily installed without modifications to existing structures, making it the perfect choice for both municipalities and commercial property owners.

To supplement independent hydraulic testing, Red Valve continually conducts research and development and additional in-house testing to improve existing products and develop new products.



Thousands of CheckMate® Inline Check Valves are currently in service around the globe.

Features and Benefits of CheckMate®

- Extremely Low Headloss
- No Moving Mechanical Parts to Corrode, Catch Debris or Fail
- Heavy Duty Elastomer Unibody Construction
- Quick and Easy Installation
- Seals Around Debris
- Operates on Differential Pressure, Totally Passive
- Virtually No Maintenance
- Self-draining, 1" of Cracking Pressure
- Silent, Non-slamming
- Available in Sizes 3" (75 mm) to 84" (2100 mm)
- Extensive Independent Hydraulic Testing

CheckMate® Valves are ideally suited for interceptor, manhole and outfall pipelines, because they maximize pipeline storage and capacity while preventing backflow into upstream pipelines, collection systems and sewage treatment plants.

Simple Design for Simple Installation

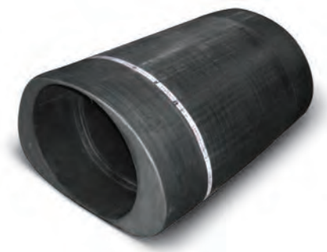
The CheckMate® Inline Check Valve is extremely easy to install, regardless of the existing environment or piping. Its inherent design makes it the most user-friendly inline check valve on the market today. From the upstream or downstream end of the pipe, simply insert the valve into position and clamp it into place. Typically, no modification to the pipe or structure is required to install the CheckMate®. Because the CheckMate® is recessed inside of the pipe, additional permitting is not required. The results are construction cost savings, reduced installation time, and reduced operational costs.

CheckMate® Valves are easily installed regardless of difficult pipe end geometry or pipes in poor end condition. There is no need to rebuild headwalls.

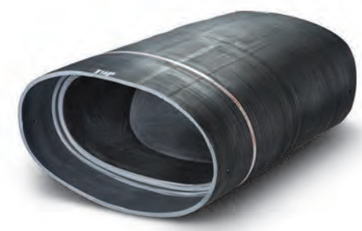
A Wide Range of Shapes and Sizes

Elliptical, Arch and Rectangular Pipes

Elliptical, Arch and Rectangular Pipes for drainage and flood prevention projects have become popular, particularly in high water table areas with shallow surface gradients. CheckMate® Inline Check Valves are the perfect solution as they can be customized to meet your specifications.



Arch Pipe CheckMate®



Elliptical Pipe CheckMate®

Rectangular Pipe CheckMate®

Rubber Flanged

Rubber Flanged CheckMate® Valves can be manufactured with an integral rubber upstream or downstream flange. The flanged CheckMate® gets inserted into the host pipe, then can be bolted to a mating flange or anchored to a concrete headwall. The flange can be circular with standard drilling, or circular, square or rectangular with custom flange drilling. The valve is supplied with retaining rings for mounting.

Thimble Inserts

A CheckMate® Thimble Insert is simply a CheckMate® Valve that is factory installed, clamped and pinned into flanged or plain-end pipe. The thimble insert assembly can either be inserted into the I.D. of the host pipe, or can be mounted to a mating flange or concrete headwall and extend beyond the pipe. Plain end thimble inserts are inserted into the host pipe and non-shrink grout is placed between the thimble insert O.D. and host pipe I.D. to form the seal.

Upstream Flanged CheckMate®

CheckMate® Thimble Insert

"Rely on Red" for a Total System Solution to Your Water and Wastewater Treatment Challenges

No other company can match Red Valve's "Total System Solution" for water and wastewater treatment plants and municipal collection and distribution systems.

Since 1953, Red Valve has provided products for each phase of collection, distribution, separation, aeration, treatment and final discharge. Our complete product line provides customers with one source for on/off and control valves, check valves, pressure measurement, expansion compensation, air diffusers and effluent diffusers. All Red Valve products are designed to handle the rigors of handling raw sewage, sludge, scum and grit with abrasion-resistant, non-clogging designs.

Contact us today for a free copy of our new "Total System Solution" brochure for Municipal Collection and Distribution, or our comprehensive Valve Selection Guide for Wastewater Treatment.

Red Valve Company, Inc.

Tideflex® Technologies

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Carnegie, PA 15106

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412/279-7878

www.redvalve.com

Tideflex® Technologies
A Division of Red Valve, Inc.

CHECKMATE®
INLINE CHECK VALVES

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

The revolutionary design of the CheckMate® Inline Check Valve provides superior backflow prevention and odor mitigation in stormwater, CSO and SSO outfalls. The CheckMate's® custom-engineered, all-rubber unibody design eliminates costly backflow from oceans, rivers and interceptors. The valve's unique elastomer fabric and wire reinforced design provides a proven record of maintenance-free performance, cost savings and results that no other inline check valve can match. The CheckMate® is built to suit all your site-specific and flow needs.

The CheckMate® has a 100% fabric and elastomer construction that eliminates corrosion problems. Because the CheckMate® is made with a unibody construction, there are no mechanical components that trap debris, corrode or fail.

The CheckMate® Valve's inherent flexibility virtually eliminates seating problems. The CheckMate® remains in the closed position until forward differential pressure opens it. The fabric-reinforced elastomer CheckMate® Valve seals around silt and small debris, preventing unwanted backflow.

The major advantage of the CheckMate® Valve is its extremely low headloss. The CheckMate® can open to a near full pipe diameter. This maximizes flow capacity of the outfall, which is particularly beneficial in low-lying areas where limited driving head is available.

Tideflex® Technologies recommends pinning all CheckMate® Valves for added security and stability. CheckMate's® effectively have a zero face-to-face dimension because they fit completely inside of the pipe. No modification of piping is required provided adequate pipe length exists.

IMPORTANT

Please take a moment to **review this manual.** The improper installation or use of this product may result in personal injury, product failure, or reduced product life. Tideflex® Technologies can accept NO liability resulting from the improper use or installation of this product. If you have any questions or problems, please call the customer service department at (412) 279-0044. We appreciate your comments. Thank you for choosing Tideflex® Technologies.

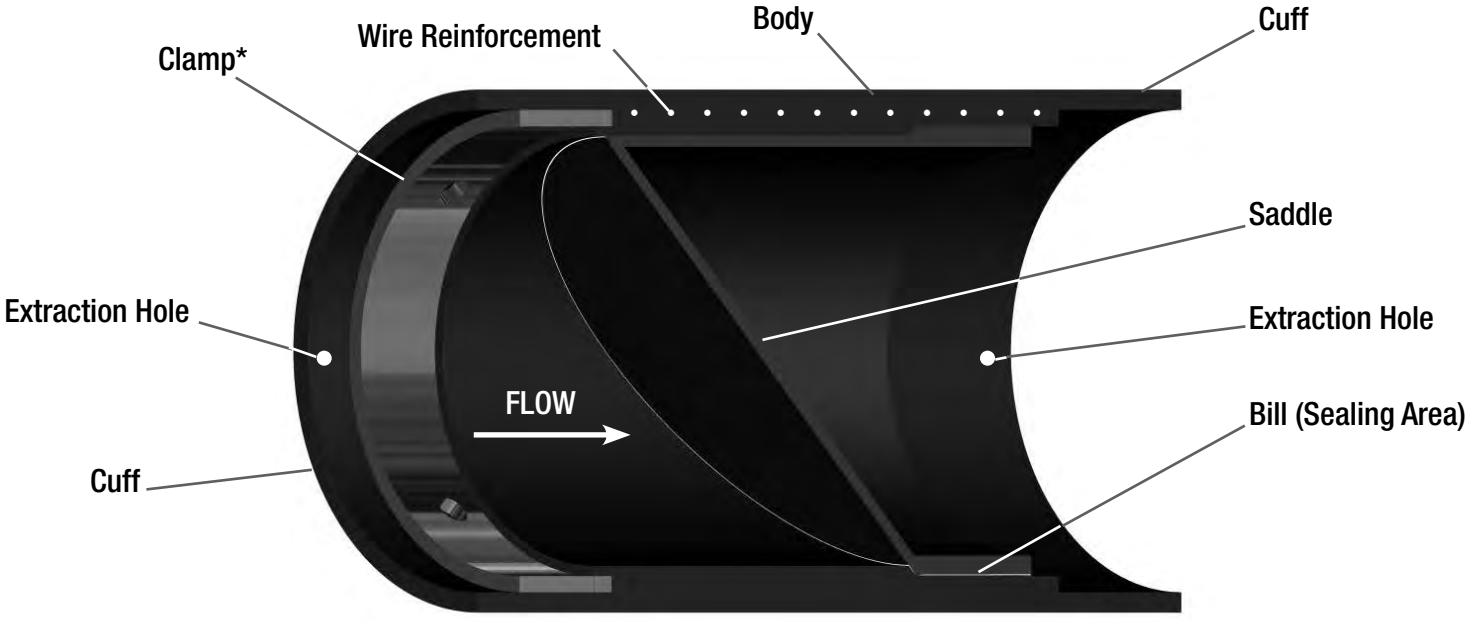
CheckMate® Installation Procedure

NEVER...
Install the valve at an angle

NEVER...
Use Sharp Tools on Rubber

NEVER...
Exceed Design Back Pressure

NEVER...
Install the Valve Backwards



*Clamps are installed in the upstream or downstream cuff, depending upon the application.
The illustration above is shown clamped upstream.

CHECKMATE® INSTALLATION

1. Product Shipping

Valve sizes 2" - 18" are furnished with one clamp. Valves 20" - 60" ship with two clamps. 72" valves ship with three clamps.

NOTE: A clamp is installed on each end of the valve to keep the valve's shape during transit and storage. Once the installation orientation is determined the CheckMate® valve will be clamped from either the upstream or downstream side. **For valves with two or three clamps, they can be installed onto the same side of the valve and offset from each other, as illustrated in Figure 1.**

2. Unpacking & Lifting

Do not use sharp tools when unpacking this product as it may damage the valve.

For larger CheckMate® valves, the valve should be lifted with either a sling or with supports around the O.D. at each side of the valve to ease the installation procedure. Do not place an object through the valve in order to lift.

CAUTION: Do not try to bend, collapse or fold the valve in order to facilitate the installation as this will cause permanent damage and will not allow the valve to return to a fully round shape.

3. Inspection of Pipe I.D.

Check the inside diameter (I.D.) of the pipe section for rough or damaged areas. The inside surface should be uniform and relatively smooth. Long gouges or cracks in the pipe may allow water to pass and should be filled prior to installation. Do not attempt to install a CheckMate® in a smaller pipe I.D.

4. Pipe I.D. Measurements

The pipe I.D. is to be checked in the field. It should be a consistent diameter for the length of valve and should not be out of round. When there is a +/- tolerance on the pipe I.D., the CheckMate® Valve should be ordered to the smallest pipe I.D.. Then, rubber adhesive strip can be applied to both CheckMate® cuffs to build the cuff O.D. up to the actual pipe I.D. See procudure in #5.

Figure 1 – Clamps shown installed on the same side of valve

CheckMate® Rubber Adhesive Strip Build Up Procedure

5. Rubber Adhesive Strip Build up

When valve O.D. is smaller than the pipe I.D., one-sided rubber adhesive strip is used to build up the O.D. of both CheckMate® cuffs to the actual pipe I.D.

NOTICE: Clean and dry the exterior of the valve prior to beginning rubber adhesive strip build up procedure.

STEP A: Place the valve on a solid, flat surface with the clamped end hanging slightly over the edge of the surface.

STEP B: Slowly rotate the valve while firmly pressing the rubber adhesive strip onto itself in concentric layers until valve O.D. is equal to or a fraction smaller than pipe I.D.

STEP C: Repeat steps A and B on the opposite side of the valve to ensure uniformity of the CheckMate's® O.D. is consistent and matches the pipe I.D.

STEP D: Lubricate the valve and rubber adhesive strip surface. Slide valve into pipe. Ensure the area marked TOP is in the 12:00 position.

STEP E: Check O.D. of the valve to ensure it fits snugly into the I.D. of pipe. If loose, add another layer(s) of the rubber adhesive strip.

STEP F: Once in place, tighten the clamp to secure it against the pipe and compress the rubber ahesive strip.

CheckMate® Installation Procedure

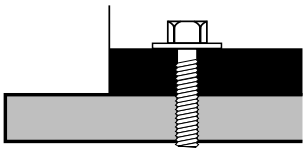
6. Preparation

The CheckMate® Valve uses expanding clamp(s) to exert pressure outwards on the walls of the valve to wedge it in place within the pipe. The walls of the pipe should be clean and free of debris prior to installation.

The valve should be inserted fully into the pipe so that no part of the cuff or bill extends outside the pipe. Ensure that the valve is not slanted at an angle with the bill pointing upwards or downwards. The valve centerline should be parallel to the pipe centerline.

Tideflex® Technologies recommends pinning the CheckMate® Valve on all installations. See below.

Four pre-drilled holes are provided in each expansion clamp. At least one clamp should be pinned. On exposed pipe, holes can be drilled through the valve and pipe, and a bolt run through secured with a nut. For buried pipe, silicon or similar sealant should be used to seal bolts.



7. Lubrication

The outside of the valve can be lubricated with a water-based lubricant prior to inserting the valve into the pipe. If the taping procedure has been used, the surface of the tape can be lubricate to aid insertion.

CAUTION: <u>Do not use petroleum-based lubricants</u> on this product or on the vulcanized rubber tape.

8. Plumb Lines and Arrows

The CheckMate® Valve arrives with a “top” arrow, “flow” arrow and plumb lines, marked in white, at the 12:00 and 6:00 position of the valve. Utilize this marking to orient the valve in the pipe, as well as to ensure the valve is oriented correctly in pipe section.

9. Valve Orientation

The CheckMate® Valve must be installed in a horizontal pipe. Valves 4" – 18" (nominal) are supplied with a single clamp. The clamp turnbuckle should be oriented at top dead center as delinated by the plumb line.

Valves 20” – 60” (nominal) are supplied with two clamps. The turnbuckles should be oriented 45° from the top center plumb line.

The 72” is supplied with three clamps. The turnbuckle for one clamp to be at top center. The other clamps to be 45° to each side of top center.

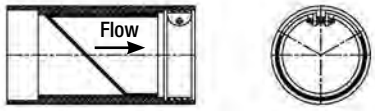
10. Insertion Into Pipe

Clamp to support the shape of the cuff should be hand tight and should be extended outward, but only tight enough to loosely keep the shape of the cuff during installation.

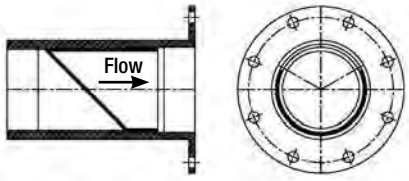
CAUTION: If you expand the clamp excessively at this step it will hinder or prevent the CheckMate® valve being fully inserted into the pipe.

CheckMate® Clamping Diagrams

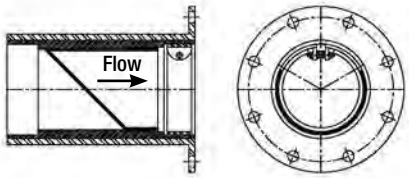
Downstream Clamp



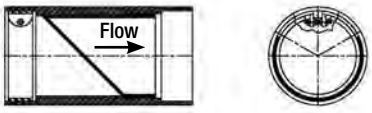
Downstream Flanged



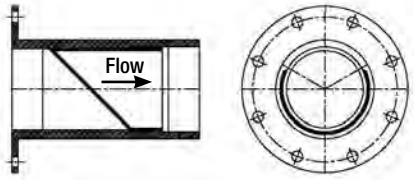
Downstream Flanged Thimble Insert



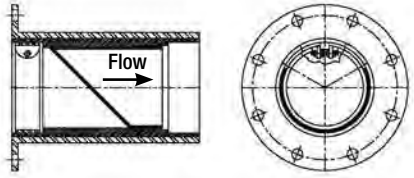
Upstream Clamp



Upstream Flanged



Upstream Flanged Thimble Insert



11. Pallet Push for Larger CheckMate® Valves

Larger CheckMate® valves can be pushed into the pipe utilizing the shipping pallet. The pallet should be placed perpendicular to the valve being inserted into the pipe. Then, with assistance from an excavator, push with consistent even force against the shipping pallet to insert the CheckMate® valve into the pipe.

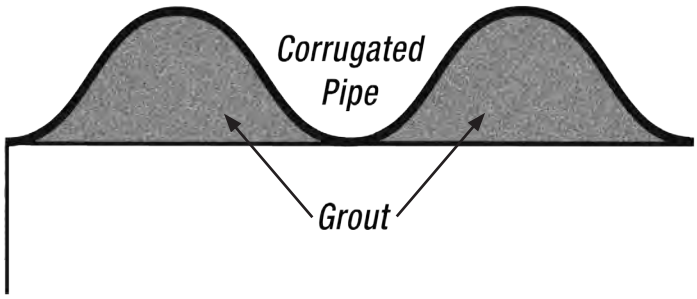
See the image to the right for the suggested positioning and usage of the excavator's shovel assistance for larger-sized CheckMate® valves. Clamps must be installed to prevent damage to cuff.

Pallet Push method for installing CheckMate® Valve

12. Corrugated Pipe and Smooth Wall (PVC, HDPE) Pipe Installation

For installation on corrugated pipe, it is recommended that the corrugations be filled with hydraulic cement (or similar material) that will provide a smooth I.D.

For smooth wall pipe, it is recommended that the valve be pinned.



CheckMates® can be made for any pipe I.D.
Built to fit in sizes from 3" to 78".

Flange shape and bolt pattern can be customized.
Flangeless thimble inserts are available.

	CHECKMATE® VALVE											
	NOMINAL PIPE SIZE I.D.		OVERALL LENGTH*		NUMBER OF CLAMPS	CUFF DEPTH		BACK PRESSURE RATING**		WEIGHT	
	Inches	Millimeters	Inches	Millimeters		Inches	Millimeters	Feet	Meters	lbs	Kg
Low Pressure	3	75	5.1	130	1	1.5	38	5	1.5	1.5	0.7
	4	100	7.9	201	1	1.5	38	5	1.5	1.5	0.7
Standard Pressure	3	75	5.1	130	1	1.5	38	85	26.0	3	1.4
	4	100	7.9	201	1	1.5	38	85	26.0	3	1.5
	5	125	9.5	241	1	1.5	38	83	25.3	4	2
	6	150	11.0	279	1	2.0	51	83	25.3	9	4
	7	175	12.8	325	1	2.0	51	79	24.1	11	5
	8	200	15.2	386	1	2.0	51	79	24.1	13	6
	9	225	15.4	391	1	2.0	51	75	22.9	17	8
	10	250	16.1	409	1	2.0	51	71	21.6	20	10
	12	300	19.8	503	1	2.0	51	68	20.1	37	17
	14	350	25.8	655	1	4.0	102	64	20.0	110	50
	16	400	28.6	726	1	4.0	102	60	18.3	133	52
	18	450	31.0	787	1	4.0	102	56	17.1	143	65
	20	500	42.1	1069	2	8.0	203	53	16.2	223	102
	24	600	47.5	1207	2	8.0	203	45	13.7	304	137
	30	750	54.9	1395	2	8.0	203	38	11.6	500	227
	36	900	62.3	1582	2	8.0	203	30	9.1	828	376
	42	1050	70.6	1793	2	8.0	203	26	7.9	1423	646
	48	1200	79.0	2007	2	8.0	203	23	7.0	1801	817
	54	1350	86.4	2195	2	8.0	203	17	5.2	2700	1225
	60	1500	96.8	2459	2	9.0	229	15	4.6	3315	1504
	72	1800	119.0	3023	3	12.0	305	13	4.0	6100	2767
	78	1950	119.0	3023	3	12.0	305	13	4.0	7000	3176

*Shorter lengths available.

**Back pressure measured from pipe invert.
Higher back pressure ratings available. Consult factory.

13. Flanged Valve Bolt Torques

The valve end with the rubber flange shall be installed using the backup rings provided. The sleeve split should be installed facing downstream, with the split in the vertical position.

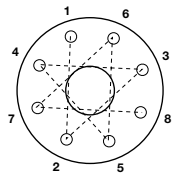
The installation bolt torque on the end flange bolts are listed in the table below.

RECOMMENDED MINIMUM BOLT TORQUE

Valve Size	Bolt Size	Torque (ft*lb.)
1”	1/2” - 13NC	20
1-1/2”	1/2” - 13NC	20
2”	5/8” - 11NC	30
2-1/2”	5/8” - 11NC	40
3”	5/8” - 11NC	40
4”	5/8” - 11NC	30
5”	3/4” - 10NC	40
6”	3/4” - 10NC	30
8”	3/4” - 10NC	40
10”	7/8” - 9NC	40
12”	7/8” - 9NC	50
14”	1” - 8NC	50
16”	1” - 8NC	50
18”	1-1/8” - 7NC	30
20”	1-1/8” - 7NC	30
24”	1-1/4” - 7NC	40
30”	1-1/4” – 7NC	30
36”	1-1/2” – 6NC	40
42”	1-1/2” – 6NC	50
48”	1-1/2” – 6NC	55
54”	1-3/4”– 5NC	60
60”	1-3/4”– 5NC	80
72”	1-3/4”– 5NC	100

Torque values are suggested minimum values.

Torque all flange bolts in a star pattern, first to 50% of tabulated values, then retorque to 100% of tabulated values. If greater torque is required, continue retorquing in increments of 50% of tabulated values. Use of a high quality anti–seize compound on all bolt threads is recommended.



Always use a “star” pattern when bolting a check valve.

Variables such as the surface finish on bolt threads, type of anti–seize compound used, and surface finish of the mating flanges all have an effect on the minimum torque required to obtain a leak–tight flange seal.

During installation you may need to retorque the flange bolts several times for a proper seal. This will overcome any leaks due to the cold flow of the rubber sleeve flange.

CheckMate® Installation Notes

1. It is important that the CheckMate® is installed level within the pipe. The CheckMate® may "gap open" if installed improperly.

2. The sealing area of the CheckMate® must have room to expand outwards, while bottom of the sealing area rises. The area around the sealing area must be kept free of debris to allow the bill to close in order for the valve to seal properly.

3. The CheckMate® effectively reduces the inside diameter of the pipe in which it is installed, creating a restriction. It may also create a "ledge" inside the pipe, causing standing water.

4. Back pressure in excess of the back pressure rating may cause valve failure.

5. Should the conditions that the CheckMate® was designed for change, (line pressure, back pressure, chemical compatibility) the performance of the valve may suffer.

6. CheckMate® Valves must be installed in true round pipe which is concentric across the entire length. Out of round pipe may cause the sealing area of the valve to distort and gap, which will cause the valve to leak.

MAINTENANCE

Inspection

Valves should occasionally be inspected for damage, wear, and buildup of debris. The frequency of the inspections should be determined by the severity of the service and the environment in which it operates.

The clamps should be checked for proper tension, and be sure that the inside of the valve is free of debris. Soft marine growth is normal on valves in submerged applications. Because hard marine growth such as barnacles will not bond well to the CheckMate®, they can be easily removed. Also insert pins to ensure they are tight.

STORAGE

If your CheckMate®, is to be stored for a period of time prior to installation, the following storage guidelines will help to preserve the valve and assure a trouble-free installation:

1. Store in a clean, cool, dry location. Avoid exposure to light, electric motors, dirt, or chemicals.
2. Store valve vertically on floor or pallet.
3. Store valve to prevent other items from contacting check sleeve to prevent possible damage.
4. Store this manual with the valve, so that it is readily available at time of installation.

TROUBLESHOOTING GUIDE

Sleeve Inverted or Distorted

1. Excessive back pressure, water surge, or water hammer.

Leaking Around Perimeter of Valve

1. Tighten clamp.
2. Check for cracks and holes in surface of pipe.
3. If taped, check tape to ensure the pipe I.D. has been fully sealed

Backflow

1. Debris lodged inside bill.

TIDEFLEX® TECHNOLOGIES WARRANTY

WARRANTIES - REMEDIES - DISCLAIMERS - LIMITATION OF LIABILITY

Unless otherwise agreed to in writing signed by Tideflex® Technologies, all Products supplied by Tideflex® Technologies will be described in the specifications set forth on the face hereof.

THE WARRANTIES SET FORTH IN THIS PROVISION ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESS OR IMPLIED (INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OR TRADE).

Tideflex® Technologies Products are guaranteed for a period of one year from date of shipment, against defective workmanship and material only, when properly installed, operated and serviced in accordance with Tideflex® Technologies' recommendations. Replacement for items of Tideflex® Technologies manufacture will be made free of charge if proved to be defective within such year; but not claim for transportation, labor or consequential damages shall be allowed. We shall have the option of requiring the return of the defective product to our factory, with transportation charges prepaid, to establish the claim and our liability shall be limited to the repair or replacement of the defective product, F.O.B. our factory. Tideflex® Technologies will not assume costs incurred to remove or install defective products nor shall we incur back charges or liquidated damages as a result of warranty work. Tideflex® Technologies does not guarantee resistance to corrosion erosion, abrasion or other sources of failure, nor does Tideflex® Technologies guarantee a minimum length of service, or that the product shall be fit for any particular service. Failure of purchaser to give prompt written notice of any alleged defect under this guarantee forthwith upon its discovery, or use, and possession thereof after an attempt has been made and completed to remedy defects therein, or failure to return product or part for replacement as herein provided, or failure to install and operate said products and parts according to instructions furnished by Tideflex® Technologies, or failure to pay entire contract price when due, shall be a waiver by purchaser of all rights under these representations. All orders accepted shall be deemed accepted subject to this warranty which shall be exclusive of any other or previous warranty, and shall be the only effective guarantee or warranty binding on Tideflex® Technologies, anything on the contrary contained in purchaser's order, or represented by any agent or employee of Tideflex® Technologies in writing or otherwise, not withstanding implied warranties. TIDEFLEX® TECHNOLOGIES MAKES NO WARRANTY THAT THE PRODUCTS, AUXILIARIES AND PARTS ARE MERCHANTABLE OR FIT FOR ANY PARTICULAR PURPOSE.

Tideflex Technologies
600 North Bell Avenue
Carnegie, PA 15106
Phone: 412 279-0044
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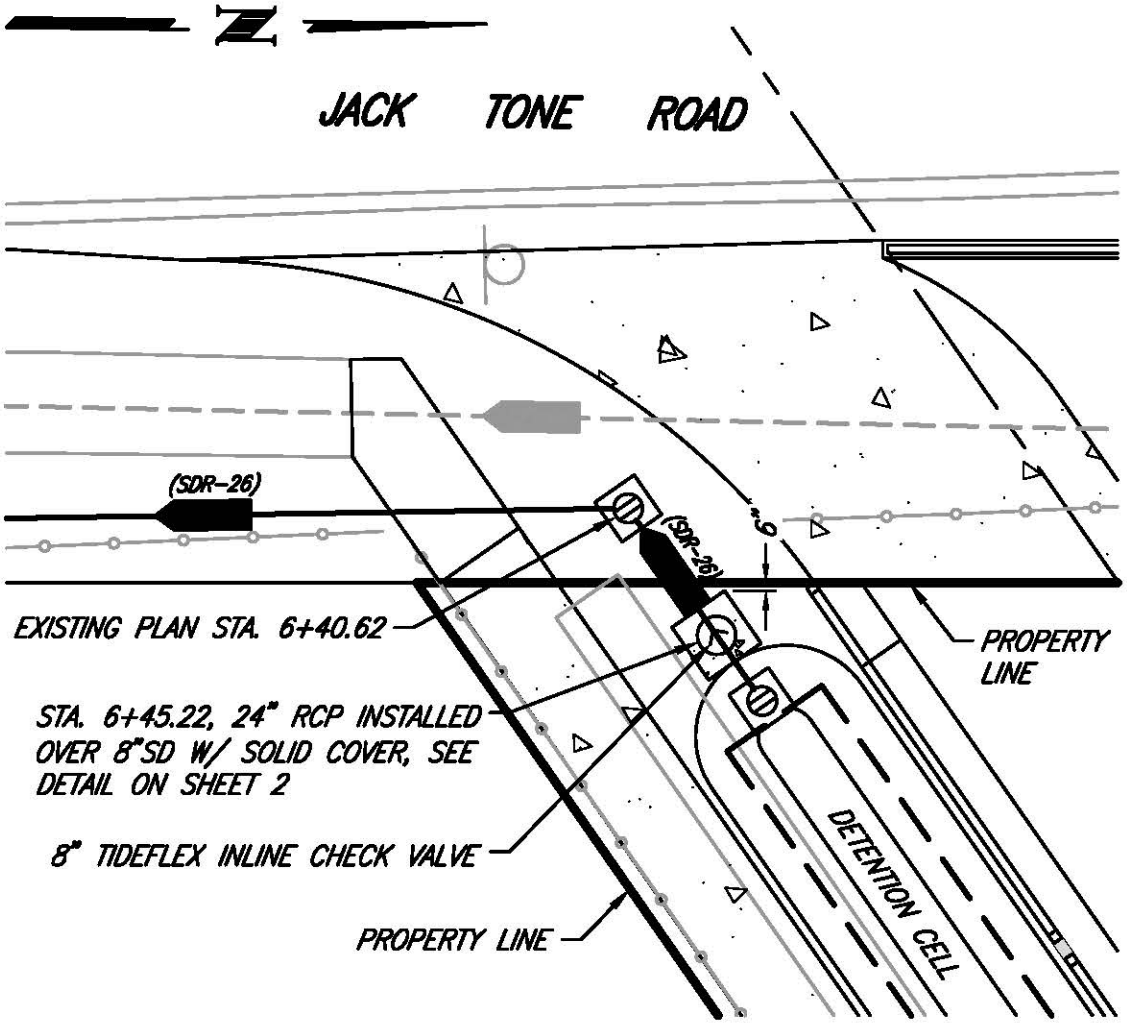
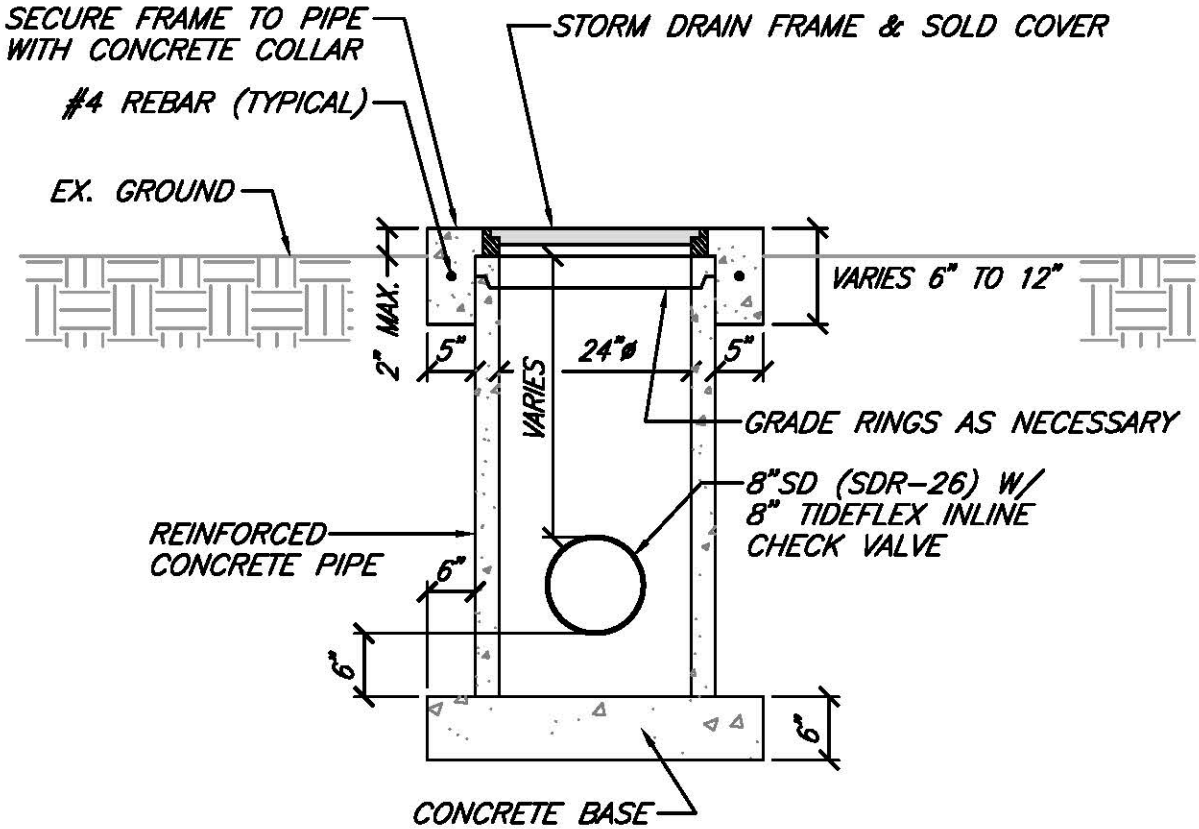
Web: www.tideflex.com



NOTES:

1. THE INLINE CHECK VALVE SHALL BE AN 8-INCH TIDEFLEX CHECKMATE INLINE CHECK VALVE, SLIP IN STYLE FROM UPSTREAM END OF PIPE. CONTRACTOR SHALL SUBMIT PRODUCT DETAILS TO ENGINEER FOR APPROVAL PRIOR TO ORDERING OR INSTALLATION.
2. CONTRACTOR TO CONFIRM WITH MANUFACTURE PROPER SIZE TO FIT 8" PVC-SDR 26 PIPE.

NO.	REV.DATE	BY	APRVD.	LOCKEFORD ELEMENTARY SCHOOL IMPROVEMENT PLANS (JACK TONE ROAD)	ADDENDUM EXHIBIT	
DWG. BY: A.R. SANGUINETTI						
CHECKED BY: JMS				INLINE CHECK VALVE	DATE	DRAWING NO. 1 OF 2
SCALE : 1"=10'						



24" DI W/ CONCRETE COLLAR

NO SCALE

NOTE:
1) PRECAST DRAIN INLET MAY BE USED, CONTRACTOR SHALL SUBMIT SUBSTITUTE TO THE ENGINEER FOR REVIEW & APPROVAL PRIOR TO INSTALLATION

NO.	REV.DATE	BY	APRVD.	LOCKEFORD ELEMENTARY SCHOOL IMPROVEMENT PLANS (JACK TONE ROAD)	ADDENDUM EXHIBIT	
DWG. BY: A.R. SANGUINETTI						
CHECKED BY: JMS				INLINE CHECK VALVE	DATE	DRAWING NO. 2 OF 2
SCALE : NO SCALE						

COUNTY OF SAN JOAQUIN

DEPARTMENT OF PUBLIC WORKS
P.0. BOX 1810-1810 E. HAZELTON AVENUE
STOCKTON, CALIFORNIA 95201
(209) 468-3000
FAX # (209) 468-9324

Permit No: **PS-1702619**
Date Issued: 08/22/2017
Start Date: 02/01/2019
Exp. Date: 09/30/2019
Project No: PWP791710
Quad: NE

ENCROACHMENT PERMIT

To: LODI UNIFIED SCHOOL DISTRICT
1305 E VINE ST
LODI, CA 95240

Encroachment Type:

Road Improvements			

Location:
JACK TONE RD S/O HAMMOND ST

In compliance with your request of **08/23/2017** , permission is hereby granted to do work in County right-of-way as shown on attached application and subject to all the terms, conditions and restrictions written below or printed as general or special provisions on any part of this form. See reverse side and attached sheet, if any.

Trench excavations for service connections will not be permitted within ten feet (10') of pavement centerline unless otherwise approved by the Director. Surface of trench patches shall match in kind and be smooth and even with that of abutting surface. Special attention shall be given to depth of utilities through roadside area in anticipation of future drainage facilities, road profile and/or frontage development. All underground utility facilities are to be established and accurately dimensioned on sketches from surveyed centerline of road right of way, or from right of way (border) lines.

Permittee shall call the Department of Public Works, Field Engineering Division (Permit Inspections) at (209)953-7421 at least forty-eight hours prior to beginning any work within the County right of way. All work performed under this permit shall conform to the rules and regulations pertaining to safety established by the California Division of Industrial Safety and Cal-OSHA.

The jobsite shall be kept in a safe condition at all times by the daily removal of any excess dirt or debris which might be a hazard to either pedestrian or automobile traffic. All necessary traffic convenience and warning devices and personnel shall be provided, placed and maintained by and at the sole expense of the Permittee in accordance with the latest edition of the CALTRANS Manual of Traffic Control.

After completion of the work permitted herein, all debris, lumber, barricades, or any excess material shall be removed and the jobsite left in a neat workmanlike manner. Immediately following completion of construction permitted herein, Permittee shall fill out and mail notice of completion (see attached post card) provided by Grantor.

Special Comments:

Cotton Street Improvements **Traffic Control per MUTCD**

FORMS:

SS/WW, R-29		

Est. Permit Fee: $17,567.00

KRIS BALAJI, Director
Department of Public Works

By: _____
Permit Section

WHITE	-Permittee
GOLDENROD	-PWD Central File
YELLOW	-Field Inspection
PINK	-Permit Section

ENCROACHMENT PERMIT GENERAL PROVISIONS

13-1

1. This permit is issued under and subject to all laws and ordinances of agencies governing the encroachment herein permitted. See the following references:
   STREETS AND HIGHWAYS CODE
   1. Division 1, Chapter 3
   2. Division 2, Chapter 2, Section 942
   3. Division 2, Chapter 4, Section 1126
   4. Division 2, Chapter 5.5 and Chapter 6

   SAN JOAQUIN COUNTY ORDINANCES NUMBERED: 324, 441, 648, 662, 672, 695, 700, 860, 892, 3359, and 3675.

2. It is understood and agreed by the Permittee that the performance of any work under this permit shall constitute an acceptance of all the provisions contained herein and failure on the Permittee's part to comply with any provision will be cause for revocation of this permit. Except as otherwise provided for public agencies and franchise holders, this permit is revocable on five days notice.

3. All work shall be done subject to the supervision of and the satisfaction of the grantor. The Permittee shall at all times during the progress of the work keep the County Highway in as neat and clean condition as is possible and upon completion of the work authorized herein, shall leave the County Highway in a thoroughly neat, clean and usable condition.

4. The Permittee also agrees by the acceptance of this permit to properly maintain any encroachment structure placed by the Permittee on any part of the County Highway and to immediately repair any damage to any portion of the highway, which occurs as a result of the maintenance of the said encroachment structure, until such time as the Permittee may be relieved of the responsibility for such maintenance by the County of San Joaquin.

5. The Permittee also agrees by the acceptance of this permit to make, at its own expense, such repairs as may be deemed necessary by the County Department of Public Works.

6. It is further agreed by the Permittee that whenever construction, reconstruction or maintenance work upon the highway is necessary, the installation provided for herein shall, upon request of the County Department of Public Works, be immediately moved or removed by and at the sole expense of the Permittee.

7. No material used for fill or backfill in the construction of the encroachment shall be borrowed or taken from within the County right of way.

8. All work shall be planned and carried out with as little inconvenience as possible to the traveling public. No material shall be stacked within eight feet (8') of the edge of the pavement or traveled way unless otherwise provided herein. Adequate provision shall be made for the protection of the traveling public. Traffic control standards shall be utilized including barricades; approved signs and lights; and flagmen, as required by the particular work in progress.

9. The Permittee, by the acceptance of this permit, shall assume full responsibility for all liability for personal injury or damage to property which may arise out of the work herein permitted or which may arise out of the failure of the part of the Permittee to properly perform the work provided under this permit. In the event any claim of such liability is made against the County of San Joaquin or any department, official or employee thereof, the Permittee shall defend, indemnify, and hold each of them harmless for such claim.

10. All backfill material is to be moistened as necessary and thoroughly compacted with mechanical means. If required by the County Director of Public Works, such backfill shall consist of gravel or crushed rock. The Permittee shall maintain the surface over structures placed hereunder as may be necessary to insure the return of the roadway to a completely stable condition and until relieved of such responsibility by the County Department of Public Works. Wherever a gravel, crushed rock or asphalt surface is removed or damaged in the course of work related to the permitted encroachment, such material shall either be separately stored and replaced in the roadway as nearly as possible in its original state or shall be replaced in kind, and the roadway shall be left in at least as good a condition as it was before the commencement of operations of placing the encroachment structure.

11. Whenever it becomes necessary to secure permission from abutting property owners for the proposed work, such authority must be secured by the Permittee prior to starting work.

12. The current and future safety and convenience of the traveling public shall be given every consideration in the location and methods of construction utilized.

13. The Permittee is responsible for the preservation of survey monuments located within the area of work herein permitted. Prior to the start of construction, survey monuments that potentially may be disturbed shall be located and referenced by a Licensed Land Surveyor, and a Corner Record filed with the County Surveyor. Any Survey Monuments disturbed during the course of construction shall be reestablished by a Licensed Land Surveyor and another Corner Record filed with the County Surveyor. (Land Surveyors' Act Section 8771)

14. Prior to any excavation, the Permittee shall notify USA North (Underground Service Alert of Northern California and Nevada) at 811 or 800-227-2600 forty-eight (48) hours in advance.

SPECIAL CONDITIONS FOR COTTON STREET IMPROVEMENTS ENCROACHMENT PERMIT

1. Maintain traffic controls for all roads. Traffic control delays shall not exceed 15 minutes. Two-way traffic shall be maintained during non-working hours with excavated areas backfilled or plated. During working hours, two-way traffic control shall be maintained with one lane open and appropriate flaggers. The contractor shall submit traffic control plans for all signing, detours, and any lane closure impacting County right-of-way. Traffic control plans shall be submitted two weeks prior to the closure date.

2. Access to the school property shall be maintained at all times except when work is occurring at the access point. Minimal delays will be allowed to provide access within the work zone area. Driveway access shall be fully restored at the end of each workday. Driveways disturbed by the contractor shall be replaced with in-kind or better materials.

3. Lockeford Elementary School shall be notified in writing, as approved by the County, 48 hours in advance of any impacts to their access.

4. Any areas where parking is to be restricted shall have signs noting the restrictions in place at least 48 hours in advance.

5. School Buses shall be passed through the work zone with minimal delays.

6. All destroyed or obliterated pavement markings must be replaced in kind by the permittee. Typical pavement markings include but not limited to lane lines, centerlines, stop and stop ahead legends, limit lines, raised pavement markers and miscellaneous delineators.

7. The Permittee is responsible for the preservation of survey monuments located within the area of work herein permitted. Prior to the start of construction, survey monuments that potentially may be disturbed shall be located and referenced by a Licensed Land Surveyor, and a Corner Record filed with the County Surveyor. Any Survey Monuments disturbed during the course of construction shall be reestablished by a Licensed Land Surveyor and another Corner Record filed with the County Surveyor. (Land Surveyors' Act Section 8771)

8. All future maintenance of the pipeline and related facilities within the County right-of-way will require a San Joaquin County Encroachment Permit.

9. Trenches shall be maintained in a smooth and even condition to the satisfaction of the County throughout the project limits at all times.

10. All trenches shall be completely backfilled or shored and plated at the end of each workday, and the roadway restored to two-way traffic. If plating is to be used, a trench shoring and plating plan suitable for traffic loadings shall be prepared by a registered civil engineer and submitted for prior approval by the County.

11. The contractor shall use San Joaquin County Improvement Standard R-29 when backfilling trenches within the County right-of-way. Where the existing road structural section is below

standard, a minimum section of 3 inches of asphalt concrete over 8 inches of aggregate base shall be required.

12. Hammond Street & Jack Tone Road subject to pavement cuts shall receive a Type II slurry seal for half of the roadway that will have pavement cuts as per San Joaquin County Department of Public Works Improvement Standards Section 2-5.0 Trench Cut Policy. Shoulder areas shall be brought up to the finish grade as directed by the County.

13. No paving joints are allowed within paved shoulder; contractor shall pave all the way to outer edge of paved shoulder.

14. Class II Aggregate Base shoulder backing is required from the edge of pavement, a minimum of 4-inches thick by 4-feet wide.

15. Contractor shall establish existing roadway and drainage grades within the construction area. Any repair to roadways and adjacent areas shall match existing grades. Any proposed grade changes shall receive prior approval from County.

16. Above ground vaults, panels and/or other similar facilities will be allowed within the right-of-way if located as far to the outside edge as possible. Utility vaults shall be located a minimum of 4'-0" from edge of pavement.

17. County roads shall be kept clean from mud and debris at all times along the access points and work zone areas during entire project. All standard roadway striping and signage shall be clearly visible, maintained and restored throughout the construction zone during and after the project.

18. In addition to standard dust control measures, streets shall be maintained in a clean condition, free of dirt, mud and debris during construction activities. The contractor shall provide daily, and as determined to be necessary by County inspectors, street sweeping using a modern mechanical or vacuum-assisted street sweeper.

19. The contractor shall not conduct construction operations in rain or heavy fog conditions.

APPLICATION FOR ENCROACHMENT PERMIT

PLEASE PRINT:

Date August 11, 2017

To: San Joaquin County
Department of Public Works

Lodi Unified School District-Warren Sun
(Applicant Name)

1305 E Vine St
(Mailing Address)

Lodi, CA 95240
(City, State, Zip Code)

(209) 331-7218
(Area Code - Telephone Number)

wsun@lodilusd.net
(Email Address)

OFFICE USE ONLY

JOB #	791710	REF #	
APN	019-020-60	CR #	
EXP. DATE	10/01/2019		
VALID	03/01/2019 TO 09/30/2019	DRIVEWAYS:	
STREET	Cotton Street	*	
AREA	Lockeford QUAD NE	*	
TYPE	Trenching, Driveways	*	
FORMS	SS/WW, R-29, Trench Cut Policy		
NOTES	Special Conditions		

Sketch (Detailed plans may be submitted)

Plans & Drainage Study are attached hereto.

Any comments need to be addressed to Jeff Sanguinetti of AR Sanguinetti & Assoc. at 1150 W Robinhood Dr., Ste 1-C, Stockton, CA 95207
(209) 477-0899 or (209) 482-6599.
jmsang@aol.com

The undersigned hereby applies for permission to excavate, construct and/or otherwise encroach on County Highway Right-of-Way on the _____ side of Jack Tone Rd approximately 250ft feet/mile south of Hammond Street, _____, by performing the following work (description of work): construction of a 2ft wide conc median, approx. 60 ft together with some shoulder widening on both sides of median just south of Lock Rd at the abandoned RR crossing.

Work will commence on or after October 2017 for approximately 60 days days.

I, the undersigned, certify that I am the owner of the respective property, or am qualified to represent the owner and agree to do the work described above in accordance with the rules and regulations of San Joaquin County and subject to inspection and approval.

Signature of Applicant - Title

8/22/17
Date

Y:\FORMS & TEMPLATES\ENCROACHMENT PERMIT APPLICATION.doc (08/08)