



Sladden Engineering

45090 Golf Center Parkway, Suite F, Indio, CA (760) 863-0713 Fax (760) 863-0847
6782 Stanton Avenue, Suite A, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863
800 East Florida Avenue, Hemet, CA 92543 (951) 766-8777 Fax (951) 766-8778

May 6, 2011

Project No. 622-11008
11-05-006

City of Beaumont
c/o Urban Logic Consultants, Inc.
43517 Ridge Park Drive, Suite 200
Temecula, CA 92590

Project: Proposed Culvert Crossing
Brookside Avenue at Noble Creek
Beaumont, California

Subject: Culvert Design Information

In order to assist in the design of the Contec Culvert system proposed for the Noble Creek crossing at Brookside Avenue, we have sampled the near surface soil within the existing storm channel and performed laboratory testing necessary to establish appropriate engineering properties to assist in culvert design. The site is located at the Noble Creek crossing of Brookside Avenue just west of Beaumont Avenue in the City of Beaumont, California.

Bulk disturbed samples of the native soil within the channel were obtained on April 14, 2011. The samples were returned to our laboratory for testing to determine soil strength parameters for use in foundation design and lateral analyses. Laboratory testing included grain size analysis were performed in accordance with ASTM Test Method C 117. Maximum Density/Optimum Moisture Content determination was performed in accordance with ASTM Test Method D-1557 and Direct Shear testing was performed in accordance with ASTM D-3080-04. Graphic representations of the laboratory test results are attached to this memo.

The surface soil encountered within the channel area consists primarily of native silty fine to coarse-grained alluvial sand. The native soil appeared compact where undisturbed. Loose and undisturbed sediment was observed within the channel bottom. It appears that significant cuts will be required to attain the design culvert foundation levels and the foundation bearing soil throughout the culvert area appears to be comprised primarily of native alluvial soil.

Based upon our recent site observations and laboratory testing, it appears that the proposed culvert may be supported upon conventional shallow spread footings. The following allowable foundation bearing pressures and lateral pressures are provided to assist in the design of the culvert foundation system and wing walls. Conventional shallow spread footings should be bottomed into competent native soil or compact engineered fill material a minimum of 24 inches below lowest adjacent grade. Additional depth may be required to mitigate potential scour. Continuous footings should be at least 2 feet wide. Continuous footings founded upon competent native soil or compact engineered fill soil may be designed utilizing an allowable bearing pressure of 2500 psf. The recommended allowable bearing pressure may be increased by one-third when considering wind and seismic loading.

Resistance to lateral loads can be provided by a combination of friction acting at the base of the foundations and passive earth pressure along the sides of the foundations. A coefficient of friction of 0.45 between soil and concrete may be used with consideration to dead load forces only. A passive earth pressure of 300 pounds per square foot, per foot of depth, may be used for the sides of footings that are placed against competent native soil or properly compacted engineered fill material. The bearing soil is generally non-expansive and falls within the "very low" expansion category in accordance with 2010 California Building Code (CBC) classification criteria.

Retaining walls (wing walls) will be required to accomplish the culvert crossing construction. Wing walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 35 pcf for native backfill soil with level free-draining backfill conditions. At rest pressures should be utilized when considering restrained conditions. An equivalent fluid weight of 55 pcf is recommended for restrained walls with level backfill conditions.

Sladden has reviewed the 2010 California Building Code (CBC) and summarized the current seismic design parameters for the proposed structure. The seismic design category for a structure may be determined in accordance with Section 1613 of the 2010 CBC or ASCE7. According to the 2010 CBC, Site Class D may be used to estimate design seismic loading for the proposed structures. The period of the structures should be less than ½ second. This assumption should be verified by the project structural engineer. The 2010 CBC Seismic Design Parameters are summarized below.

Occupancy Category (Table 1604.5): II

Site Class (Table 1613.5.2): D

S_s (Figure 1613.5.1): 1.500g

S₁ (Figure 1613.5.1): 0.600g

F_a (Table 1613.5.3(1)): 1.0

F_v (Table 1613.5.3(2)): 1.5

S_{ms} (Equation 16-37 {F_a X S_s}): 1.500g

S_{m1} (Equation 16-38 {F_v X S₁}): 0.900g

S_{D5} (Equation 16-39 {2/3 X S_{ms}}): 1.000g

S_{D1} (Equation 16-40 {2/3 X S_{m1}}): 0.600g

Seismic Design Category: D

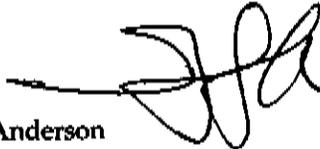
In order to achieve a firm and unyielding bearing surface, we recommend overexcavation and recompaction throughout the culvert and wing wall foundation areas. All native low density near surface soil should be removed to a depth of at least 2 feet below the bottom of the footings. Remedial grading should extend laterally, a minimum of three (3) feet beyond the footing limits. The exposed surface should then be scarified, moisture conditioned to within two percent of optimum moisture content, and compacted to at least 90 percent relative compaction. Testing of the native soil within the excavation bottoms should be performed during grading to verify adequacy.

Soil to be used as engineered fill and backfill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in loose condition. Import soil should be equivalent to or better than the on-site soil.

All fill and backfill soil should be compacted with acceptable compaction equipment, to at least 90 or 95 percent relative compaction dependent upon culvert manufacturer's specifications. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Testing should be performed on all lifts in order to ensure proper compaction of the fill and backfill materials.

If you have questions regarding this memo, please contact the undersigned.

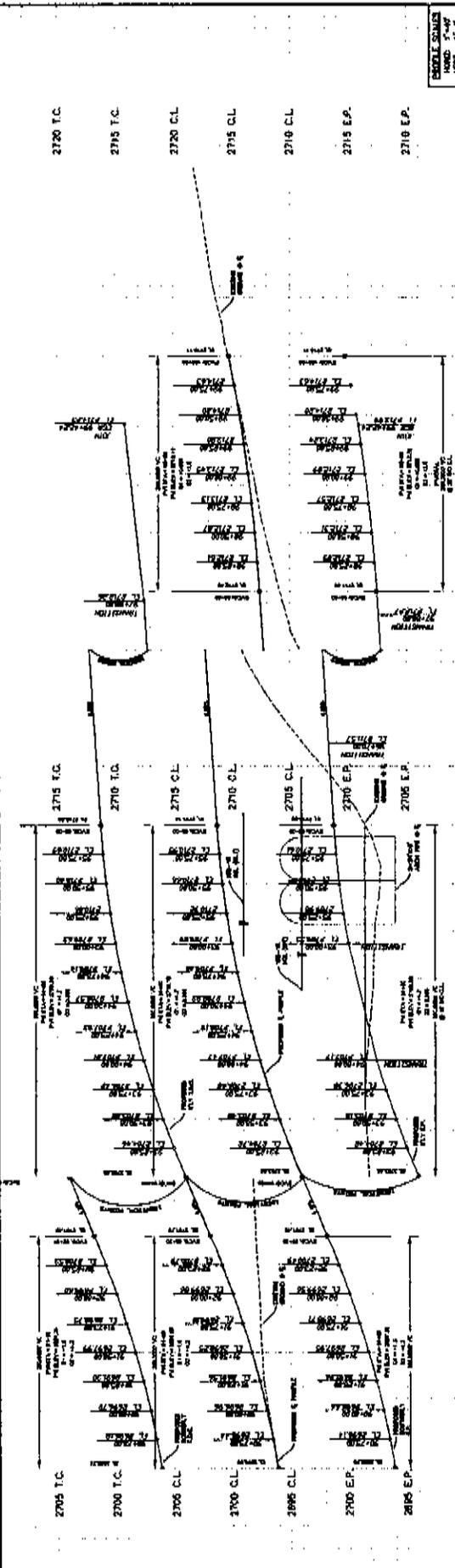
Respectfully submitted,
SLADDEN ENGINEERING



Brett L. Anderson
Principal Engineer

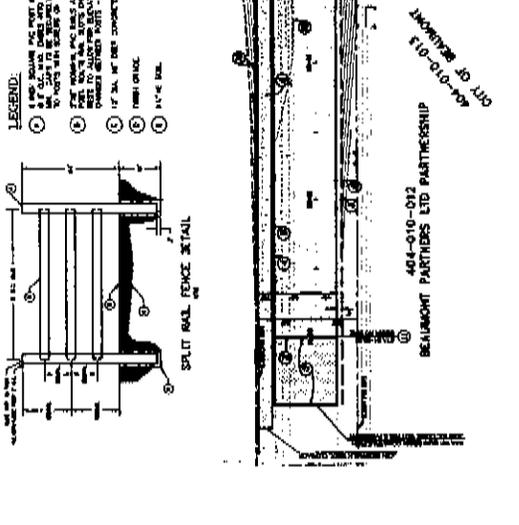
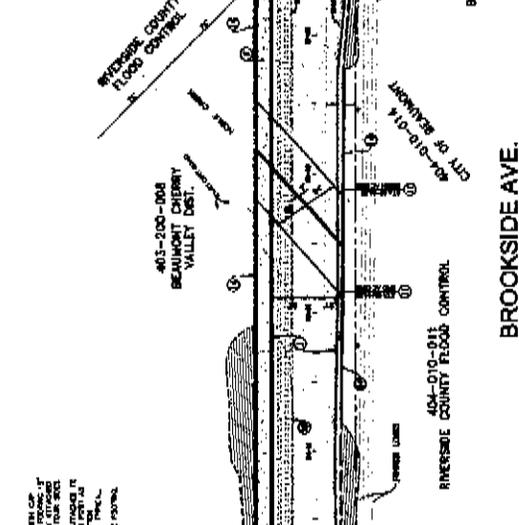
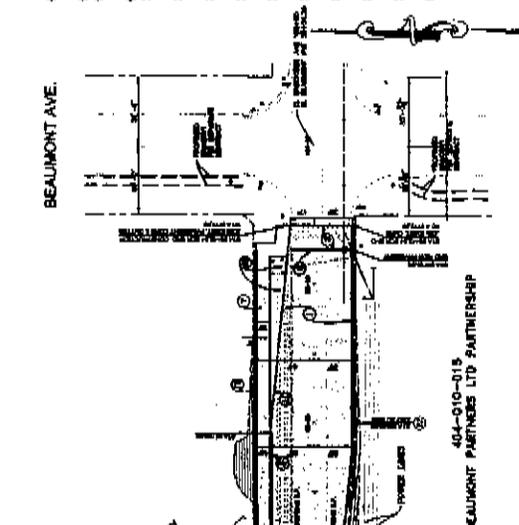


Copies: 4/City of Beaumont



DATE SCALE
 1" = 40'
 1" = 80'

- CONSTRUCTION NOTES**
1. EXISTING 4" A.C. PAVEMENT OVER 6" UNGRAVELLED SUB GRADE IS TO BE REPAVED.
 2. NEW 4" A.C. PAVEMENT TO BE PLACED OVER EXISTING 4" A.C. PAVEMENT.
 3. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 4. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 5. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 6. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 7. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 8. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 9. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
 10. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.



LEGEND:

1. 4" A.C. PAVEMENT OVER 6" UNGRAVELLED SUB GRADE IS TO BE REPAVED.
2. NEW 4" A.C. PAVEMENT TO BE PLACED OVER EXISTING 4" A.C. PAVEMENT.
3. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
4. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
5. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
6. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
7. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
8. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
9. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.
10. EXISTING 4" A.C. PAVEMENT TO BE REPAVED AND REPAVED WITH 4" A.C. PAVEMENT.

APPROVED BY: [Signature]
 [Title]
 [Company]



Sladden Engineering

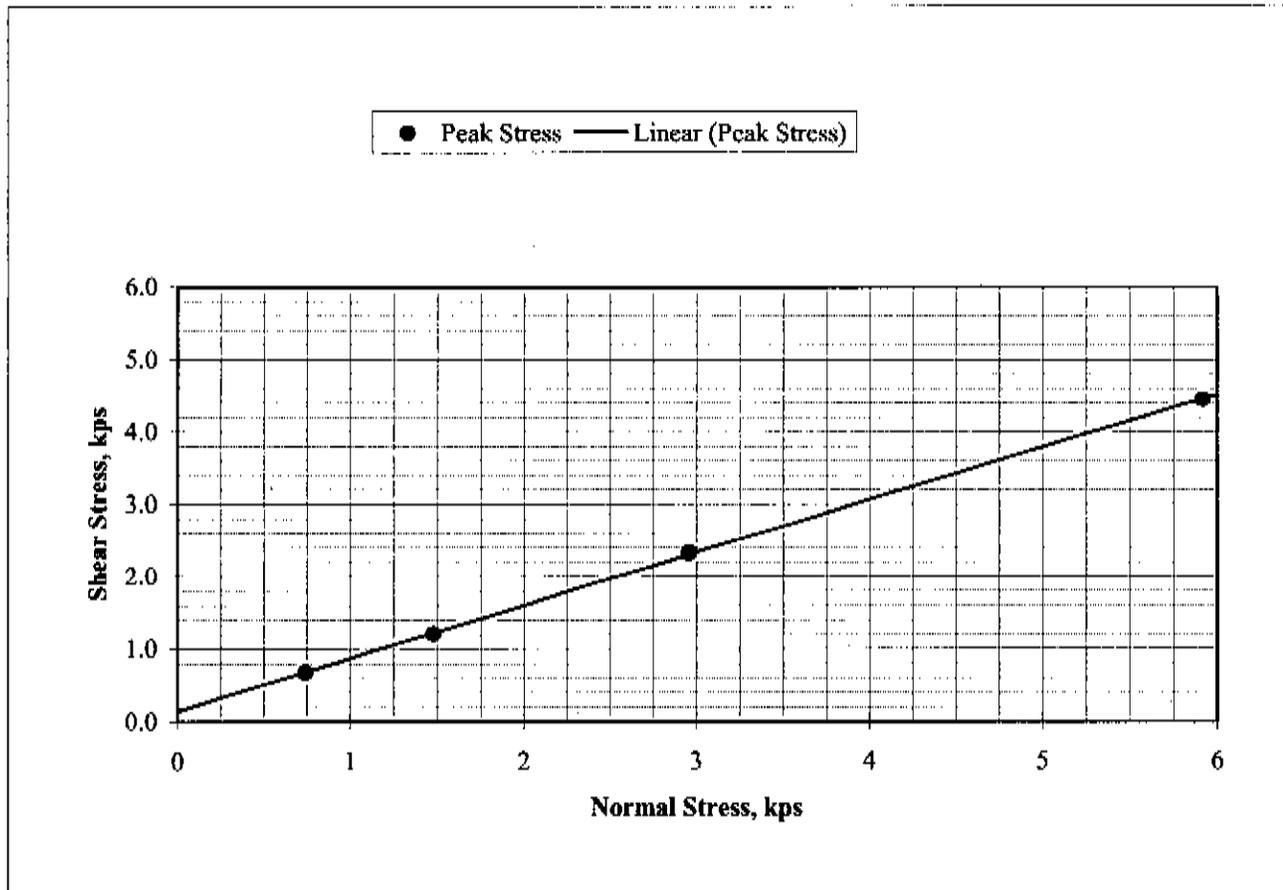
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Direct Shear ASTM D 3080-04 (modified for unconsolidated condition)

Job Number: 622-07044
Job Name City of Beaumont
Lab ID No. LN6-11144
Sample ID Bulk
Classification Brown Sand w/Gravel (SP)
Sample Type Remolded @ 90% of Maximum Density

April 15, 2011
Initial Dry Density: 108.6 pcf
Initial Moisture Content: 11.8 %
Peak Friction Angle (ϕ): 36°
Cohesion (c): 140 psf

Test Results	1	2	3	4	Average
Moisture Content, %	14.6	14.6	14.6	14.6	14.6
Saturation, %	71.7	71.7	71.7	71.7	71.7
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.680	1.206	2.325	4.452	





Sladden Engineering

450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Gradation

ASTM C117 & C136

Project Number: 622-07044

April 15, 2011

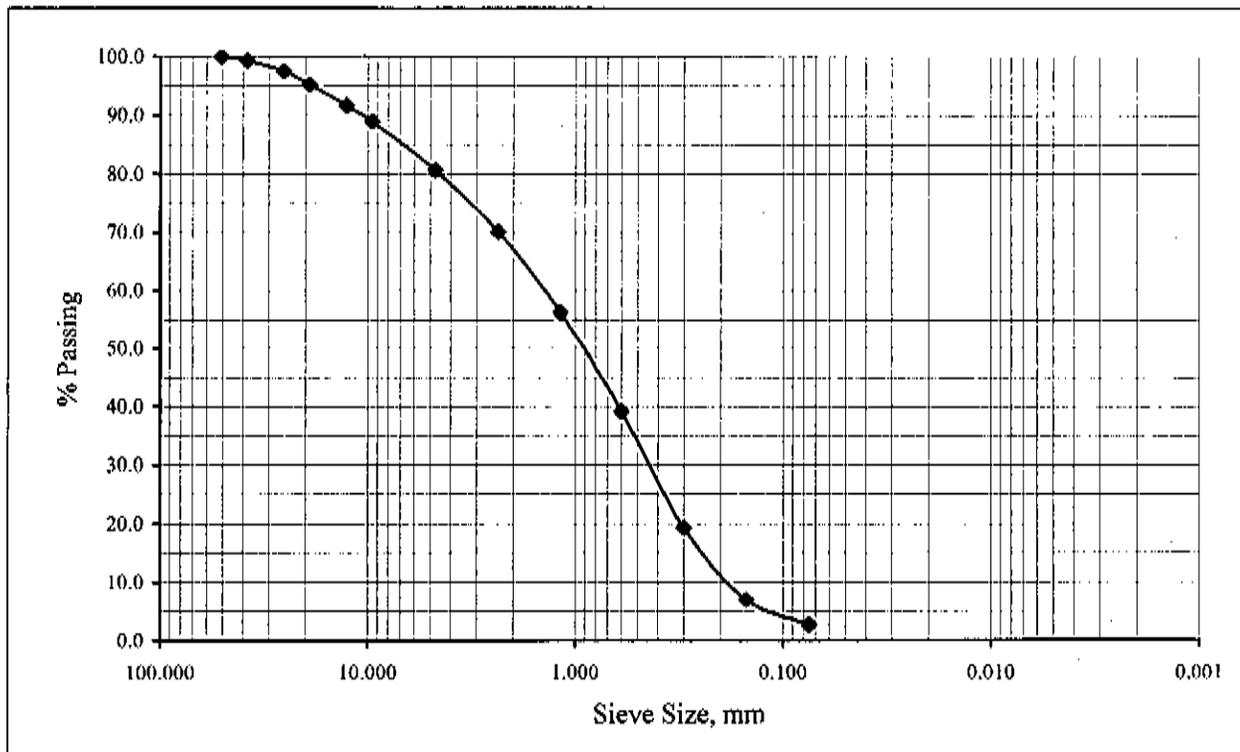
Project Name: City of Beaumont

Lab ID Number: LN6-11144

Sample ID: Bulk

Soil Classification: SP

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	99.4
1"	25.4	97.5
3/4"	19.1	95.3
1/2"	12.7	91.6
3/8"	9.53	88.9
#4	4.75	80.6
#8	2.36	70.1
#16	1.18	56.2
#30	0.60	39.1
#50	0.30	19.2
#100	0.15	6.9
#200	0.075	2.7





Sladden Engineering

450 Egan Avenue, Beaumont CA 92223 (951) 845-7743 Fax (951) 845-8863

Maximum Density/Optimum Moisture

ASTM D698/D1557

Project Number: 622-07044
 Project Name: City of Beaumont
 Lab ID Number: LN6-11144
 Sample Location: Brookside w/o Noble Creek
 Description: Brown Sand w/Gravel (SP)

April 15, 2011

ASTM D-1557 A
 Rammer Type: Machine

Maximum Density: 127.5 pcf
 Optimum Moisture: 9.5%

Corrected for Oversize (ASTM D4718)

Sieve Size	% Retained
3/4"	
3/8"	
#4	19.4

