

Drainage Study

Project Name: Chick-fil-A Restaurant No. 4003

For:
Chick-fil-A Restaurant No 4003
202 S. Main Street
Orange, California

Prepared for:
Chick-fil-A, Inc.
15635 Alton Parkway, Suite 350
Irvine, CA 92618

Prepared by:
Joseph C. Truxaw & Associates, Inc.
Civil Engineers & Land Surveyors
265 S. Anita Drive, Suite 111
Orange, CA 92868
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June 26, 2018

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Project Description

The subject site is approximately 0.96 acres in size, with a single story building and paved parking area and is bounded on the north by Almond Avenue, on the west by a preschool, on the east by Main Street and south by an office/medical building.

The site slopes westerly towards an opening in the wall at the southwest corner of the property. The existing site is a closed restaurant.

Existing onsite runoff sheet flows across the site to a hole in wall at the southwest corner of the site. The runoff is then collected in a grated inlet on the southerly adjacent property and is conveyed to a underground storm drain system. Runoff is then conveyed to the Orange County storm drain system which discharges runoff to the Santa Ana River and ultimately to the Pacific Ocean.

The redevelopment of the site includes the demolition of the existing building and asphalt pavement, the construction of the new Chick-fil-A Restaurant, trash enclosure, asphalt parking, and landscape planters. The proposed development will not alter the existing drainage patterns. Site runoff will be collected by a private storm drain system and conveyed to an underground infiltration system to be treated. Once the system reaches capacity, the storm water will flow by the proposed catch basin at the southwest corner of the site and discharge through a proposed concrete channel to the existing hole in the wall.

Hydrology Computations

1. Peak Stormwater Runoff Discharge Rates

This project should be designed for 10-year and 100-year rainfall event. As per the Riverside County Hydrology Manual, the peak flow is determined by the equation $Q=0.9(I-Fm)*A$ using the Advanced Engineering Software (AES) program.

Pre-development Condition

Sub-area Node 100 to Node 102

Area = 0.66 acres

L = 281 ft.

$Q_{25} = 2.37$ cfs.

$T_c = 6.88$ min.

$I = 4.03$ in/hr.

$Q_{100} = 3.04$ cfs.

$T_c = 6.88$ min.

$I = 5.16$ in/hr.

Sub-area Node 101 to Node 102

Area = 0.30 acres

L = 228 ft.

$$Q_{25} = 1.12 \text{ cfs.}$$

$$T_c = 6.45 \text{ min.}$$

$$I = 4.18 \text{ in/hr.}$$

$$Q_{100} = 1.44 \text{ cfs.}$$

$$T_c = 6.45 \text{ min.}$$

$$I = 5.35 \text{ in/hr.}$$

Total runoff pre-development condition.

$$Q_{10} = 2.37 + 1.12 = 3.49 \text{ cfs}$$

$$Q_{100} = 3.04 + 1.44 = 4.48 \text{ cfs.}$$

Ultimate disposition of on-site runoff.

The discharge for onsite drainage will be located northwest corner of the property. See Hydrology Map

Burn Factor. The site is paved, no Burn Factor is calculated

Post-development Condition

The following calculations are used to size the required grate inlets and piping.

Sub-area Node 100 to Node 101

Area = 0.53 acres

L = 256ft.

$$Q_{25} = 1.84 \text{ cfs.}$$

$$T_c = 7.32 \text{ min.}$$

$$I = 3.89 \text{ in/hr.}$$

$$Q_{100} = 2.36 \text{ cfs.}$$

$$T_c = 7.32 \text{ min.}$$

$$I = 4.97 \text{ in/hr.}$$

Sub-area Node 200 to Node 201

Area = 0.20 acres

L = 115 ft.

$$Q_{25} = 0.86 \text{ cfs.}$$

$$T_c = 5.00 \text{ min.}$$

$$I = 4.82 \text{ in/hr.}$$

$$Q_{100} = 1.11 \text{ cfs.}$$

$$T_c = 5.00 \text{ min.}$$

$$I = 6.19 \text{ in/hr.}$$

Sub-area Node 300 to Node 301

Area = 0.12 acres

L = 110 ft.

$$Q_{25} = 0.52 \text{ cfs.}$$

$$T_c = 5.00 \text{ min.}$$

$$I = 4.82 \text{ in/hr.}$$

$$Q_{100} = 0.66 \text{ cfs.}$$

$$T_c = 5.00 \text{ min.}$$

$$I = 6.19 \text{ in/hr.}$$

Sub-area Node 400 to Node 401

Area = 0.083 acres

L = 21 ft.

$$Q_{25} = 0.30 \text{ cfs.}$$

$$T_c = 6.12 \text{ min.}$$

$$I = 4.30 \text{ in/hr.}$$

$$Q_{100} = 0.39 \text{ cfs.}$$

$$T_c = 6.12 \text{ min.}$$

$$I = 5.51 \text{ in/hr.}$$

Total runoff post-development condition.

$$Q_{25} = 1.84 + 0.86 + 0.52 + 0.30 = 3.52 \text{ cfs.}$$

$$Q_{100} = 2.36 + 1.11 + 0.66 + 0.39 = 4.52 \text{ cfs.}$$

Volume to Retain

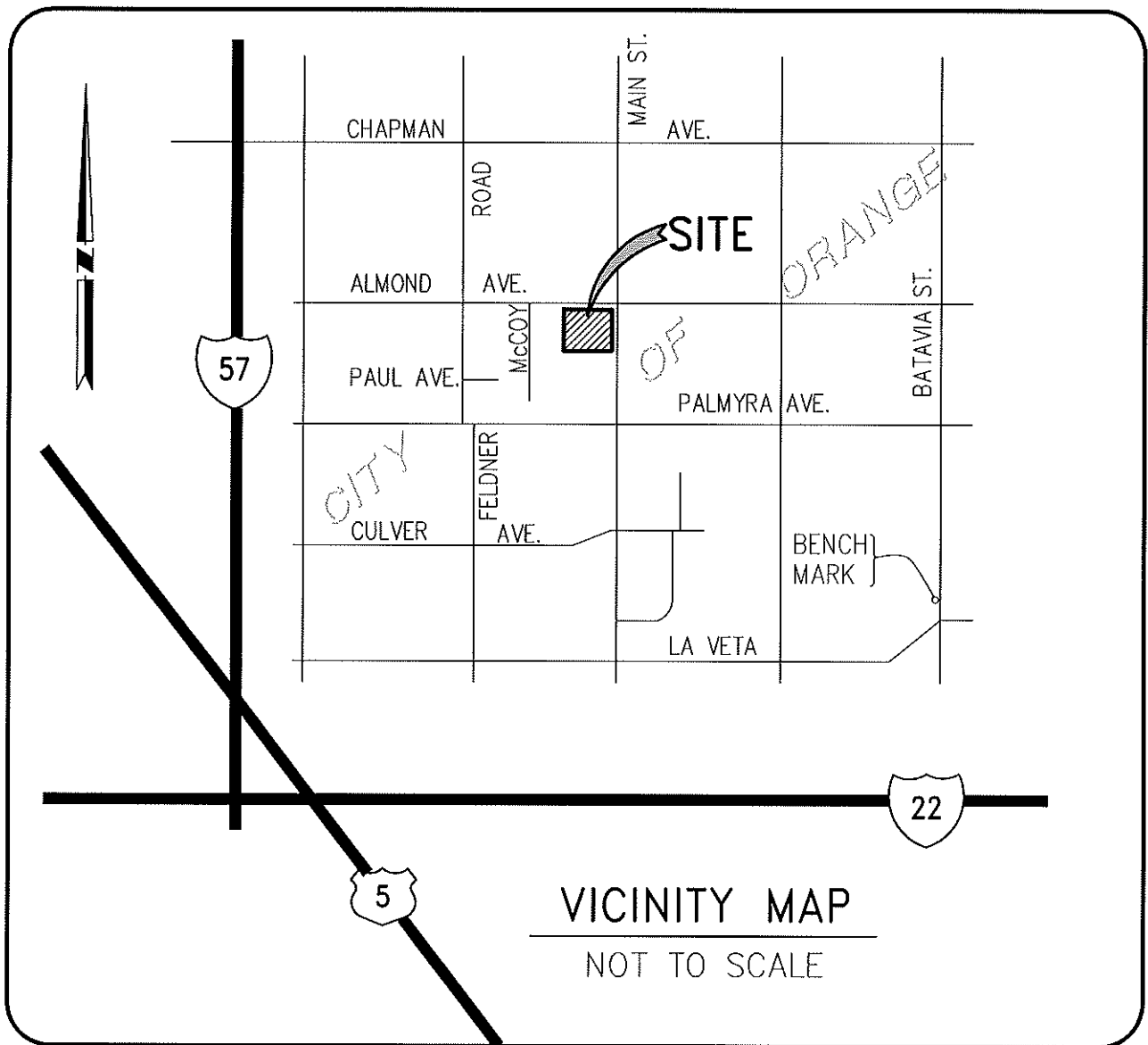
The volume to retain will be the difference in volume between the **Post $Q_{25} = 3.52 \text{ cfs}$ minus the Pre $Q_{25} = 3.49 \text{ cfs}$**

$$\Delta Q = 0.03 \text{ cfs}$$

0.03 cfs is only a 0.9% increase which does not require retention.

Appendix

I. Vicinity Map



II. Site and Project Plans

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
(c) Copyright 1983-2012 Advanced Engineering Software (aes)
Ver. 18.2 Release Date: 05/08/2012 License ID 1537

Analysis prepared by:

Joseph C. Truxaw & Associates, Inc.
265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****

* Chick-fil-A Restaurant No. 4003 *
* Pre-Development Condition *
* 2-Year Storm Frequency *

FILE NAME: CFA46PRE.DAT

TIME/DATE OF STUDY: 10:01 07/18/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00

SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00

SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95

DATA BANK RAINFALL USED

ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET

as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)

2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 281.00

ELEVATION DATA: UPSTREAM(FEET) = 159.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.875

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.885
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.66	0.30	0.100	56	6.88

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 1.10
 TOTAL AREA(ACRES) = 0.66 PEAK FLOW RATE(CFS) = 1.10

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.60 DOWNSTREAM(FEET) = 155.85

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.453
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.955
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.30	0.30	0.100	56	6.45

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.52
 TOTAL AREA(ACRES) = 0.30 PEAK FLOW RATE(CFS) = 0.52

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 0.3 TC(MIN.) = 6.45
 EFFECTIVE AREA(ACRES) = 0.30 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS) = 0.52

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

Joseph C. Truxaw & Associates, Inc.
265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* Chick-fil-A Restaurant No. 4003 *
* Pre-Development Condition *
* 25-Year Storm Frequency *

FILE NAME: CFA46PRE.DAT
TIME/DATE OF STUDY: 10:00 07/18/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

	HALF- WIDTH	CROWN TO CROSSFALL	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
NO.	(FT)	(FT)						
===	=====	=====	=====	=====	=====	=====	=====	=====
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 281.00
ELEVATION DATA: UPSTREAM(FEET) = 159.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.875

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.028
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.66	0.30	0.100	56	6.88

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.37
 TOTAL AREA(ACRES) = 0.66 PEAK FLOW RATE(CFS) = 2.37

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00

ELEVATION DATA: UPSTREAM(FEET) = 158.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.453

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.175

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.30	0.30	0.100	56	6.45

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 1.12

TOTAL AREA(ACRES) = 0.30 PEAK FLOW RATE(CFS) = 1.12

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.3 TC(MIN.) = 6.45

EFFECTIVE AREA(ACRES) = 0.30 AREA-AVERAGED Fm(INCH/HR) = 0.03

AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.100

PEAK FLOW RATE(CFS) = 1.12

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Ver. 18.2 Release Date: 05/08/2012 License ID 1537

Analysis prepared by:

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Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* Chick-fil-A Restaurant No. 4003 *
* Pre-Development Condition *
* 100-Year Storm Frequency *

FILE NAME: CFA46PRE.DAT
TIME/DATE OF STUDY: 09:58 07/18/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 281.00
ELEVATION DATA: UPSTREAM(FEET) = 159.60 DOWNSTREAM(FEET) = 155.85

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.875

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.155
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.66	0.30	0.100	56	6.88

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 3.04
 TOTAL AREA(ACRES) = 0.66 PEAK FLOW RATE(CFS) = 3.04

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00

ELEVATION DATA: UPSTREAM(FEET) = 158.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.453

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.346

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.30	0.30	0.100	56	6.45

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 1.44
 TOTAL AREA(ACRES) = 0.30 PEAK FLOW RATE(CFS) = 1.44

END OF STUDY SUMMARY:

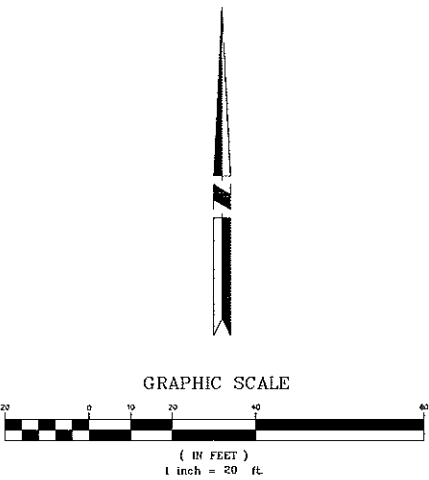
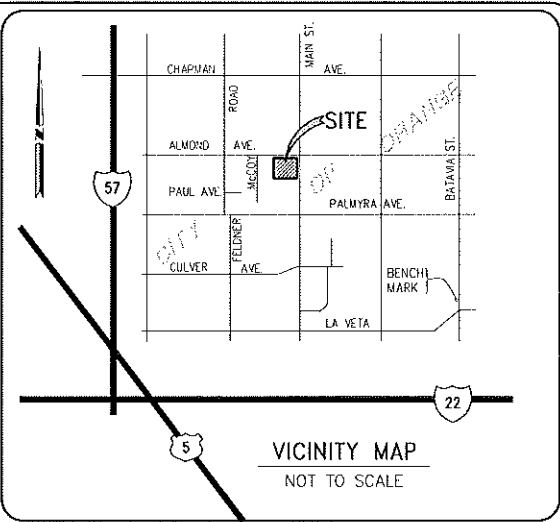
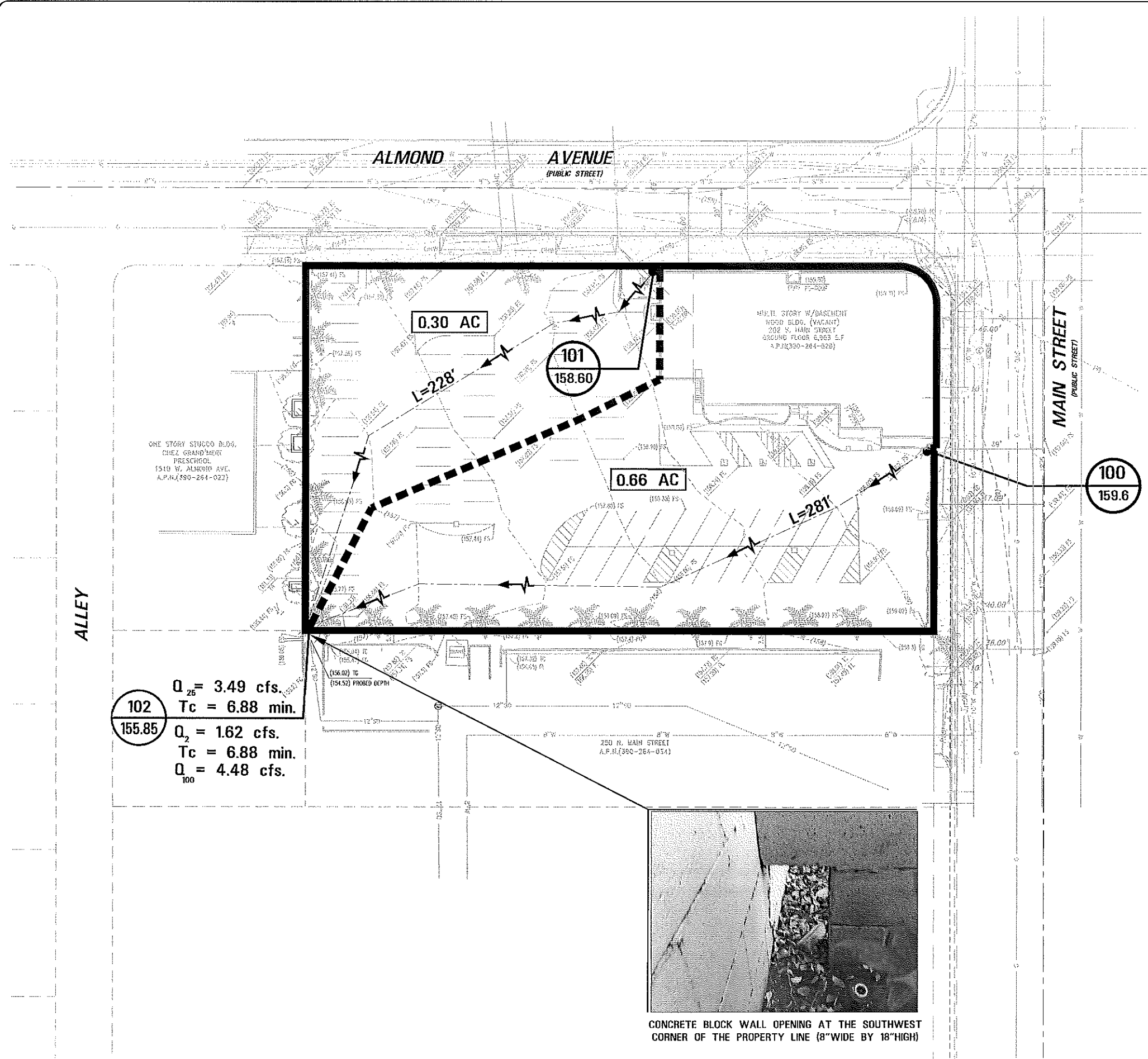
TOTAL AREA(ACRES) = 0.3 TC(MIN.) = 6.45

EFFECTIVE AREA(ACRES) = 0.30 AREA-AVERAGED Fm(INCH/HR) = 0.03

AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.100

PEAK FLOW RATE(CFS) = 1.44

END OF RATIONAL METHOD ANALYSIS

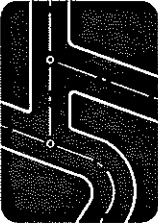


- LEGEND**
- DRAINAGE BOUNDARY
 - - - DRAINAGE SUB-AREA BOUNDARY
 - 101
450
ELEVATION
 - A-1
0.497
SUB-AREA
 - Q₂₅ = 1.17 cfs
Q₂ = 1.17 cfs
DESIGN FLOW
LOW FLOW
 - PATH OF FLOW

SOIL GROUP TYPE "B"

NO.	REVISIONS	DATE

Prepared by:
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Civil Engineers and Land Surveyors
265 S. Anita Dr., Suite 111, Orange, CA 92668 (714) 935-0265 fax: (714) 935-0106



HYDROLOGY MAP
PRE-DEVELOPMENT
202 S. MAIN STREET
IN THE CITY OF ORANGE, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE
06-26-18
DRAWN BY
RD
CHECKED BY
SMH
JOB NO.
CFA16046
SHEET NO.

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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Analysis prepared by:

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265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* Chick-fil-A Restaurant No. 4003 *
* Post-Development Condition *
* 2-Year Storm Frequency *

FILE NAME: CFA46PO.DAT

TIME/DATE OF STUDY: 17:21 06/27/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 256.00
ELEVATION DATA: UPSTREAM(FEET) = 158.30 DOWNSTREAM(FEET) = 156.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 7.322

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.819
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.53	0.30	0.100	56	7.32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.85
 TOTAL AREA(ACRES) = 0.53 PEAK FLOW RATE(CFS) = 0.85

 FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 115.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.50 DOWNSTREAM(FEET) = 157.15

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.20	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.40
 TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.40

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 110.00
 ELEVATION DATA: UPSTREAM(FEET) = 159.04 DOWNSTREAM(FEET) = 157.32

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.12	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.24
 TOTAL AREA(ACRES) = 0.12 PEAK FLOW RATE(CFS) = 0.24

 FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 21.00

ELEVATION DATA: UPSTREAM(FEET) = 159.00 DOWNSTREAM(FEET) = 158.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION\ CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.121

* 2 YEAR RAINFALL INTENSITY (INCH/HR) = 2.015

SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	--------------------	--------------------	-----------	-----------------

NATURAL GOOD COVER

"GRASS"	B	0.08	0.30	1.000	61	6.12
---------	---	------	------	-------	----	------

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 1.000

SUBAREA RUNOFF (CFS) = 0.13

TOTAL AREA (ACRES) = 0.08 PEAK FLOW RATE (CFS) = 0.13

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 0.1 T_c (MIN.) = 6.12

EFFECTIVE AREA (ACRES) = 0.08 AREA-AVERAGED F_m (INCH/HR) = 0.30

AREA-AVERAGED F_p (INCH/HR) = 0.30 AREA-AVERAGED A_p = 1.000

PEAK FLOW RATE (CFS) = 0.13

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
(c) Copyright 1983-2012 Advanced Engineering Software (aes)
Ver. 18.2 Release Date: 05/08/2012 License ID 1537

Analysis prepared by:

Joseph C. Truxaw & Associates, Inc.
265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* Chick-fil-A Restaurant No. 4003 *
* Post-Development Condition *
* 25-Year Storm Frequency *

FILE NAME: CFA46PO.DAT
TIME/DATE OF STUDY: 17:20 06/27/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
- *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 256.00
ELEVATION DATA: UPSTREAM(FEET) = 158.30 DOWNSTREAM(FEET) = 156.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 7.322

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.887
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.53	0.30	0.100	56	7.32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 1.84
 TOTAL AREA(ACRES) = 0.53 PEAK FLOW RATE(CFS) = 1.84

 FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 115.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.50 DOWNSTREAM(FEET) = 157.15

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.20	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.86
 TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.86

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 110.00
 ELEVATION DATA: UPSTREAM(FEET) = 159.04 DOWNSTREAM(FEET) = 157.32

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.12	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.52
 TOTAL AREA(ACRES) = 0.12 PEAK FLOW RATE(CFS) = 0.52

 FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 21.00

ELEVATION DATA: UPSTREAM(FEET) = 159.00 DOWNSTREAM(FEET) = 158.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.121

* 25 YEAR RAINFALL INTENSITY (INCH/HR) = 4.302

SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	--------------------	--------------------	-----------	-----------------

NATURAL GOOD COVER

"GRASS"	B	0.08	0.30	1.000	61	6.12
---------	---	------	------	-------	----	------

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 1.000

SUBAREA RUNOFF (CFS) = 0.30

TOTAL AREA (ACRES) = 0.08 PEAK FLOW RATE (CFS) = 0.30

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 0.1 T_c (MIN.) = 6.12

EFFECTIVE AREA (ACRES) = 0.08 AREA-AVERAGED F_m (INCH/HR) = 0.30

AREA-AVERAGED F_p (INCH/HR) = 0.30 AREA-AVERAGED A_p = 1.000

PEAK FLOW RATE (CFS) = 0.30

=====

END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
(c) Copyright 1983-2012 Advanced Engineering Software (aes)
Ver. 18.2 Release Date: 05/08/2012 License ID 1537

Analysis prepared by:

Joseph C. Truxaw & Associates, Inc.
265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* Chick-fil-A Restaurant No. 4003 *
* Post-Development Condition *
* 100-Year Storm Frequency *

FILE NAME: CFA46PO.DAT
TIME/DATE OF STUDY: 17:17 06/27/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
- *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 256.00
ELEVATION DATA: UPSTREAM(FEET) = 158.30 DOWNSTREAM(FEET) = 156.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 7.322

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.973
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.53	0.30	0.100	56	7.32

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.36
 TOTAL AREA(ACRES) = 0.53 PEAK FLOW RATE(CFS) = 2.36

 FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 115.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.50 DOWNSTREAM(FEET) = 157.15

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.187
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.20	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 1.11
 TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 1.11

 FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 110.00
 ELEVATION DATA: UPSTREAM(FEET) = 159.04 DOWNSTREAM(FEET) = 157.32

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.187
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.12	0.30	0.100	56	5.00

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.66
 TOTAL AREA(ACRES) = 0.12 PEAK FLOW RATE(CFS) = 0.66

 FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 21.00

ELEVATION DATA: UPSTREAM(FEET) = 159.00 DOWNSTREAM(FEET) = 158.23

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.121

* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 5.510

SUBAREA T_c AND LOSS RATE DATA (AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	--------------------	--------------------	-----------	-----------------

NATURAL GOOD COVER

"GRASS"	B	0.08	0.30	1.000	61	6.12
---------	---	------	------	-------	----	------

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 1.000

SUBAREA RUNOFF (CFS) = 0.39

TOTAL AREA (ACRES) = 0.08 PEAK FLOW RATE (CFS) = 0.39

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 0.1 T_c (MIN.) = 6.12

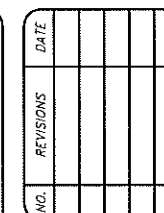
EFFECTIVE AREA (ACRES) = 0.08 AREA-AVERAGED F_m (INCH/HR) = 0.30

AREA-AVERAGED F_p (INCH/HR) = 0.30 AREA-AVERAGED A_p = 1.000

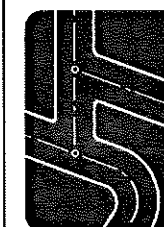
PEAK FLOW RATE (CFS) = 0.39

=====

END OF RATIONAL METHOD ANALYSIS

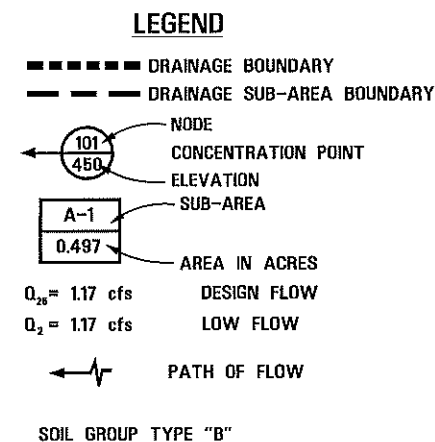


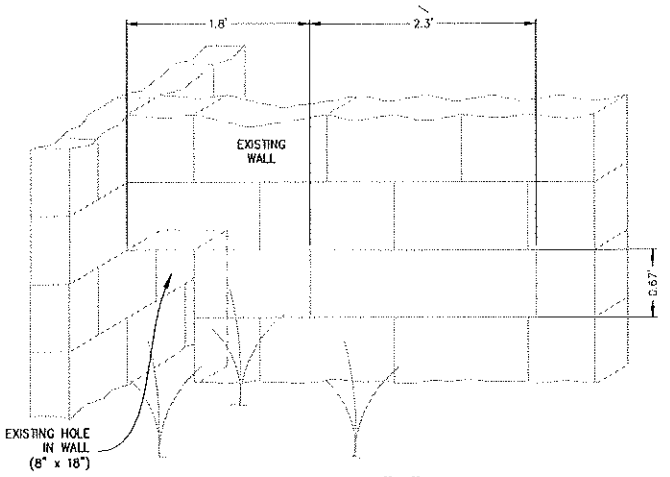
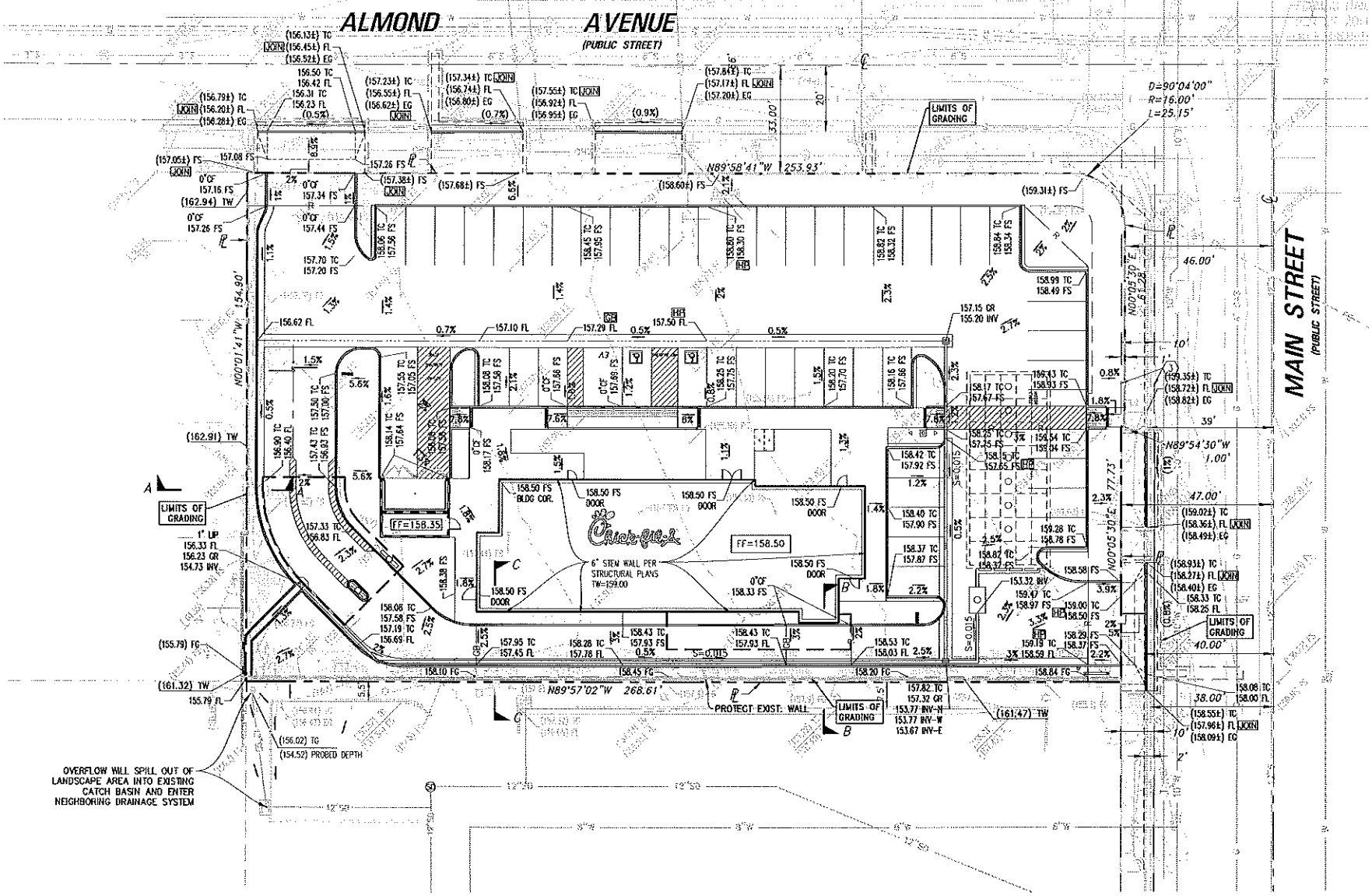
Prepared by:
Joseph C. Truxaw and Associates, Inc.
Civil Engineers and Land Surveyors
285 S. Anita Dr., Suite 111, Orange, Ca. 92668 (714) 935-0265 fax: (714) 935-0106



HYDROLOGY MAP
POST-DEVELOPMENT
202 S. MAIN STREET
IN THE CITY OF ORANGE, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE	06-26-18
DRAWN BY	PJS
CHECKED BY	SMH
JOB NO.	CFA16046
SHEET NO.	





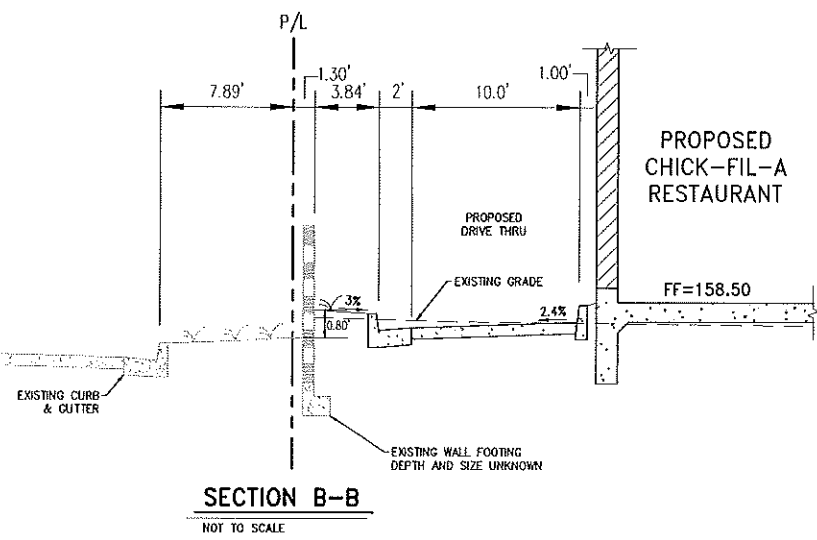
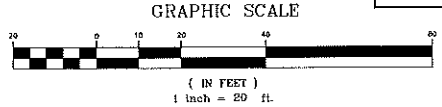
DETAIL "A"
NOT TO SCALE

EASEMENT NOTES
REFER TO A.L.T.A. AND TITLE REPORT FOR ADDITIONAL INFORMATION AND DETAILS:
③ AN EASEMENT FOR PIPELINE AND INCIDENTAL PURPOSES, RECORDED JULY 24, 1929 AS BOOK 293, PAGE 498 AND AUGUST 6, 1929 IN BOOK 301, PAGE 206, BOTH OF OFFICIAL RECORDS.
IN FAVOR OF: SANTA ANA VALLEY IRRIGATION COMPANY
AFFECTS: AS DESCRIBED THEREIN
NOTE: PLOTTED, EASEMENT AFFECTS EASTERLY 1.0 FOOT OF PORTION OF SAID PARCEL AS SHOWN ON THE SURVEY.

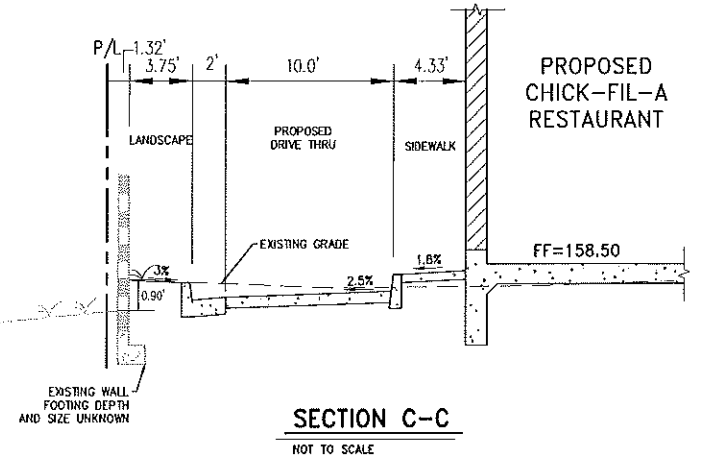
BENCH MARK
ORANGE COUNTY B.M. NO. SA-323-91 ELEVATION = 167.593 FEET
(NAND 88) 1995 ADJUSTMENT, YEAR LEVELED 2010
DESCRIBED BY OCS 2002 - FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "SA-323-91", SET IN THE NORTHEAST CORNER OF A 4 FOOT BY 4.5 FOOT CONCRETE CATCH BASIN, MONUMENT IS LOCATED IN THE NORTHWEST CORNER OF THE INTERSECTION OF LA VETA AVENUE AND BATAVIA STREET, 100 FEET NORTHERLY OF THE CENTERLINE INTERSECTION OF BATAVIA STREET, MONUMENT IS LEVEL WITH THE SIDEWALK.

BASIS OF BEARINGS
THE BEARING NORTH 00°05'30" EAST AS THE CENTERLINE OF MAIN STREET AS SHOWN ON TRACT NO. 3086 BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, COUNTY OF ORANGE, STATE OF CALIFORNIA, ESTABLISHED FROM FOUND MONUMENTS AT THE CENTERLINE INTERSECTIONS OF ALMOND AVENUE & MAIN STREET AND PALMIRA AVENUE & MAIN STREET WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

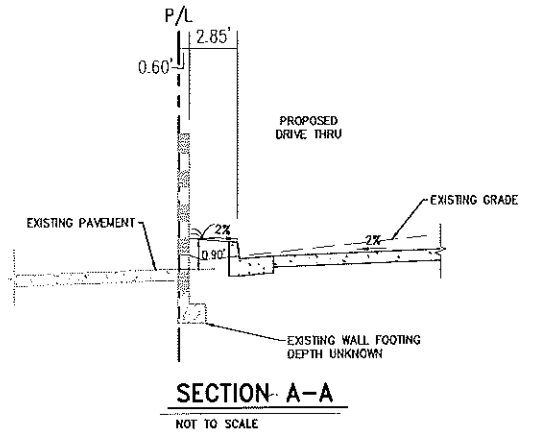
SEE TITLE SHEET FOR LEGEND AND SYMBOLS



SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE



SECTION A-A
NOT TO SCALE

THIS PLAN IS:
PRELIMINARY
(NOT FOR CONSTRUCTION)

NOTICE TO CONTRACTOR
THE CONTRACTOR SHALL ASCERTAIN THE TRUE VERTICAL AND HORIZONTAL LOCATION AND SIZE OF ALL UTILITIES, PIPES, AND/OR STRUCTURES AND SHALL BE RESPONSIBLE FOR DAMAGE TO ANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON.
Two working days before you dig.
For your Dig Alert ID, Number call Underground Service Alert CALL 811

5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:

Mark	Date	By
△		
△		
△		

Seal

Prepared by:

JOSEPH C. TRUXAW & ASSOCIATES, INC.
Civil Engineers and Land Surveyors
265 S. ANTA DRIVE, SUITE 111
ORANGE, CA 92668
(714) 935-0265
(714) 935-0106 (FAX)

STORE
MAIN STREET &
ALMOND AVE.

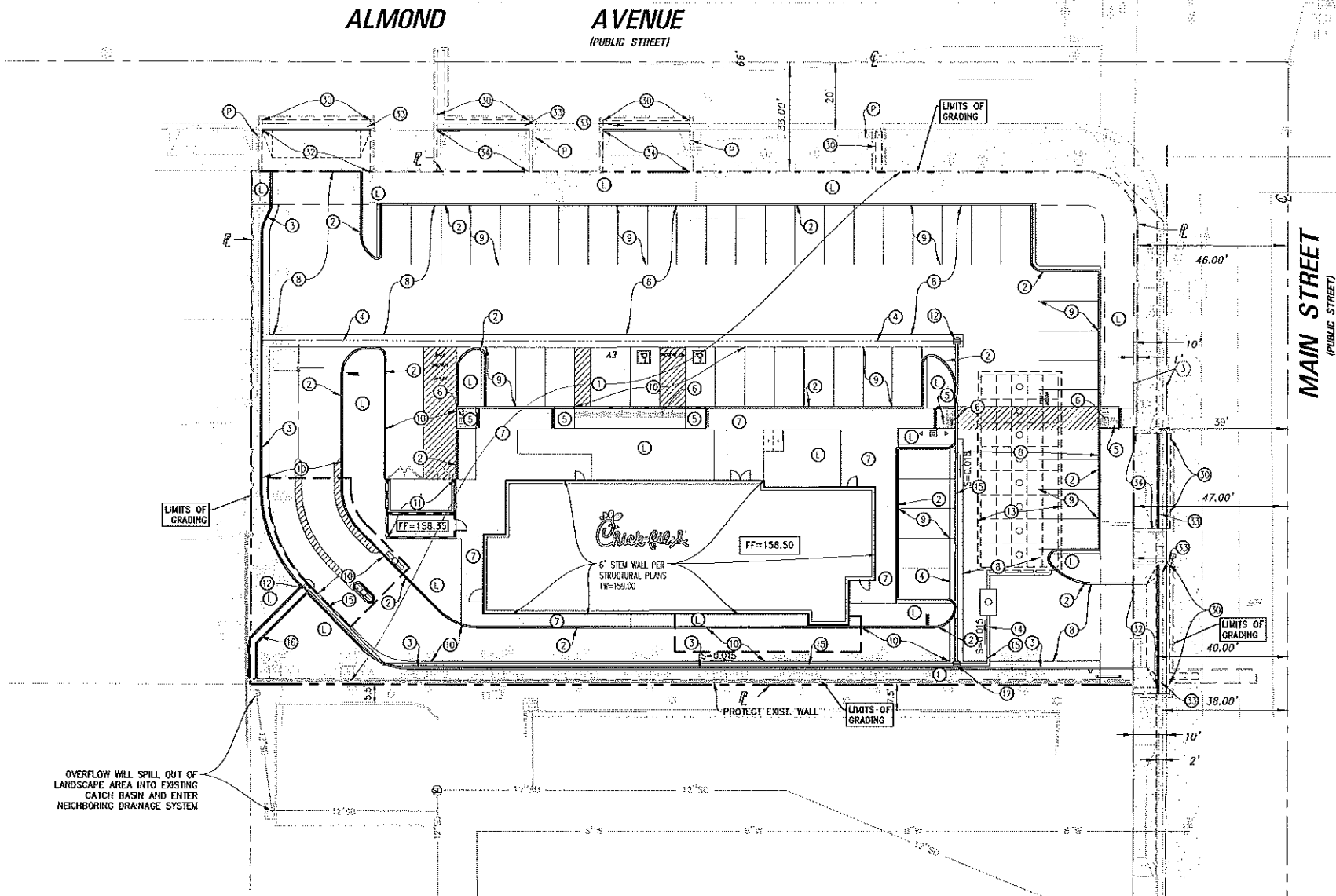
202 S. MAIN ST.
ORANGE, CA

SHEET TITLE
CONCEPTUAL
GRADING &
DRAINAGE PLAN

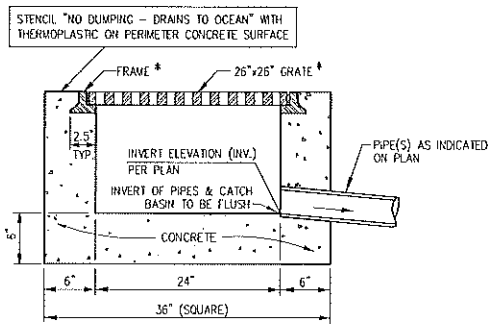
VERSION: H-V6
ISSUE DATE: 12-2015

Job No. : CFA16046
Store : 04003
Date : 3-12-18
Drawn By : GL/PJS
Checked By: SMH

Sheet
2 of 4

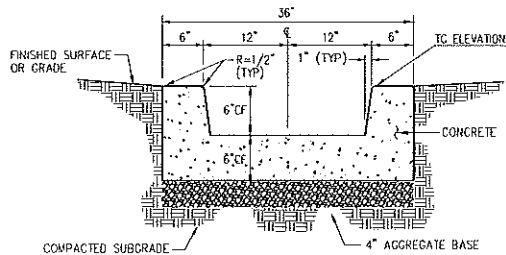


OVERFLOW WILL SPILL OUT OF LANDSCAPE AREA INTO EXISTING CATCH BASIN AND ENTER NEIGHBORING DRAINAGE SYSTEM



24"x24" CONCRETE CATCH BASIN BOX

NOT TO SCALE



DOUBLE 6" CURB & 24" GUTTER DETAIL

NOT TO SCALE

EASEMENT NOTES

REFER TO A.L.T.A. AND TITLE REPORT FOR ADDITIONAL INFORMATION AND DETAILS:

3. AN EASEMENT FOR PIPELINE AND INCIDENTAL PURPOSES, RECORDED JULY 24, 1929 AS BOOK 293, PAGE 498 AND AUGUST 6, 1929 IN BOOK 301, PAGE 206, BOTH OF OFFICIAL RECORDS.

IN FAVOR OF: SANTA ANA VALLEY IRRIGATION COMPANY
AS DESCRIBED THEREIN

NOTE: PLOTTED, EASEMENT AFFECTS EASTERLY 1.0 FOOT OF PORTION OF SAID PARCEL AS SHOWN ON THE SURVEY.

BENCH MARK

ORANGE COUNTY B.M. NO. SA-323-91 ELEVATION = 167.593 FEET
(HARD 88) 1995 ADJUSTMENT, YEAR LEVELED 2010

DESCRIBED BY OCS 2002 - FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "SA-323-91", SET IN THE NORTHEASTERN CORNER OF A 4 FOOT BY 4.5 FOOT CONCRETE CATCH BASIN MONUMENT IS LOCATED IN THE NORTHEASTERN CORNER OF THE INTERSECTION OF LA VETA AVENUE AND BATAVIA STREET, 100 FEET NORTHERLY OF THE CENTERLINE INTERSECTION OF BATAVIA STREET. MONUMENT IS LEVEL WITH THE SIDEWALK.

BASIS OF BEARINGS

THE BEARING NORTH 09°05'30" EAST AS THE CENTERLINE OF MAIN STREET AS SHOWN ON TRACT NO. 3086 BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, COUNTY OF ORANGE, STATE OF CALIFORNIA, ESTABLISHED FROM FOUR MONUMENTS AT THE CENTERLINE INTERSECTIONS OF ALMOND AVENUE & MAIN STREET AND PALMIRA AVENUE & MAIN STREET WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

CONSTRUCTION NOTES - ON-SITE

1. SAWCUT & REMOVE EXIST. AC PAVING, CONCRETE CURBS, ETC.
2. CONSTRUCT CURB, CF=6" UNLESS OTHERWISE SHOWN ON PLANS.
3. CONSTRUCT 6" CURB & 24" GUTTER.
4. CONSTRUCT 48" V-GUTTER.
5. CONSTRUCT CONCRETE HANDICAP ACCESS RAMP IN ACCORDANCE WITH CA TITLE 24 REQUIREMENTS, ADA GUIDELINES, CITY STANDARDS AND ARCHITECTURAL DETAILS.
6. PLACE TRUNCATED DOWNS PER ADA REQUIREMENTS.
7. CONSTRUCT CONCRETE SIDEWALK/HARDSCAPE.
8. PAVE WITH 3-INCHES AC OVER 6-INCHES AB OVER COMPACTED SUBGRADE. (DRIVE LANES).
9. PAVE WITH 3-INCHES AC OVER 4-INCHES AB OVER COMPACTED SUBGRADE. (PARKING STALLS).
10. PAVE WITH 6-INCHES PCC WITH #3 REINFORCING BARS @ 18" O.C. EACH WAY OVER 4-INCHES AB OVER COMPACTED SUBGRADE.
11. COVERED TRASH ENCLOSURE/STORAGE ROOM AND CONCRETE APRON PER ARCHITECTURAL DETAILS.
12. CONSTRUCT 24" X 24" GRATED INLET.
13. INSTALL CULTEC RECHARGERS.
14. INSTALL CULTEC STORMFILTER.
15. INSTALL 10-RICH PVC SDR-35 PIPE WITH FITTINGS.
16. CONSTRUCT 24" WIDE DOUBLE CURB & GUTTER.
17. LANDSCAPE AREA PER SEPARATE LANDSCAPE PLANS.

** PAVEMENT SECTIONS SHALL COMPLY WITH GEOTECHNICAL REPORT RECOMMENDATIONS.

CONSTRUCTION NOTES - OFF-SITE

30. SAWCUT & REMOVE INTERFERING SECTIONS OF AC PAVEMENT, CONCRETE DRIVEWAY, CURB & GUTTER, SIDEWALK, ETC.
31. CONSTRUCT COMMERCIAL DRIVEWAY APRON PER CITY OF ORANGE STD. PLAN 115; W=25', T=0'.
32. CONSTRUCT COMMERCIAL DRIVEWAY APRON WITH DEPRESSED SIDEWALK PER CITY OF ORANGE STD. PLAN 115; W=25', T=5'.
33. CONSTRUCT CURB & GUTTER PER CITY OF ORANGE STD. PLAN 117, TYPE A.
34. CONSTRUCT SIDEWALK PER CITY OF ORANGE STD. PLAN 118.

*** CONTRACTOR SHALL APPLY FOR AND OBTAIN AN ENCROACHMENT PERMIT FOR IMPROVEMENTS WITHIN THE PUBLIC R/W.

THIS PLAN IS:
PRELIMINARY
(NOT FOR CONSTRUCTION)

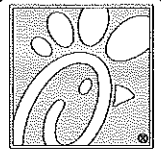
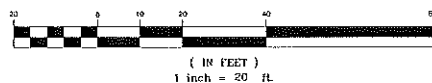
NOTE TO CONTRACTOR

THE CONTRACTOR SHALL ASCERTAIN THE TRUE VERTICAL AND HORIZONTAL LOCATION AND SIZE OF ALL UTILITIES, PIPES, AND/OR STRUCTURES AND SHALL BE RESPONSIBLE FOR DAMAGE TO ANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON.

IMPORTANT NOTICE

Section 4216 of the Government Code requires a Dig Alert Identification Number be issued before a "Permit to Excavate" will be void. For your Dig Alert ID, Number call Underground Service Alert CALL 811 Two working days before you dig.

GRAPHIC SCALE



Chick-fil-A

5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:

Mark	Date	By
△		

Mark	Date	By
△		

Mark	Date	By
△		

Seal



Prepared by:



JOSEPH C. TRUXAW & ASSOCIATES, INC.

Civil Engineers and
Land Surveyors

265 S. ANITA DRIVE, SUITE 111
ORANGE, CA 92668
(714) 935-0265
(714) 935-0106 (FAX)

STORE
MAIN STREET &
ALMOND AVE.

202 S. MAIN ST.
ORANGE, CA

SHEET TITLE
CONSTRUCTION
NOTES

VERSION: H-V6
ISSUE DATE: 12-2015

Job No. : CFA16046

Store : 04003

Date : 3-12-18

Drawn By : GJ/PJS

Checked By: SMH

Sheet

3 of 4



PRELIMINARY

PRIORITY

WATER QUALITY MANAGEMENT PLAN

(WQMP)

For:

CHICK-FIL-A RESTAURANT # 4003
202 S. Main Street
City of Orange, County of Orange, California 92868

Prepared for:
Chick-fil-A, Inc.
15635 Alton Parkway, Suite 350
Irvine, Ca 92618
(404) 305-4834



Prepared by:
Joseph C. Truxaw & Associates, Inc.
Engineer of Record: Randy Decker RCE: 81077
1915 W Orangetown Ave. Suite 101
Orange, CA 92868
(714) 935-0265
Original Date: 11-09-2018
Revised on: 3-18-19

Public Works Director

Date

City Engineer

Date

OWNER'S CERTIFICATION
WATER QUALITY MANAGEMENT PLAN
FOR
CHICK-FIL-A RESTAURANT # 4003

This Water Quality Management Plan (WQMP) for the Chick-fil-A Restaurant # 4003 has been prepared for Chick-fil-A, Inc. This WQMP is intended to comply with the requirements of the City of Orange's GENERAL PLAN AMENDMENT NO. 2018-0002, ZONE CHANGE NO. 1287-18, CONDITIONAL USE PERMIT NO. 3044-17, DESIGN REVIEW NO. 4909 17, MINOR SITE PLAN NO. 0904-17, AND ENVIRONMENTAL REVIEW NO. 1858-18 requiring the preparation of a Water Quality Management Plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the City of Orange Local Implementation Plan (LIP), and the intent of NPDES Permit and Waste Discharge Requirements for the City of Orange, County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. Maintenance requirements within Section V and Appendix D will be adhered to with particular emphasis on maintaining the BMPs described within Sections IV and V. The Owner's Annual Self Certification Statement along with a BMP maintenance implementation table will be submitted by June 30th every year following project completion. At least one copy of the approved WQMP shall be available on the subject property in perpetuity.

Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. The City of Orange will be notified of the change of ownership and the new owner will submit a new certification.

Signature: _____ Date: _____

Name: Jennifer M. Daw

Title: Director of Design and Construction

Company: Chick-fil-A, Inc.

Address: 15635 Alton Parkway, Suite 350

Telephone Number: (404) 305-4834

Notice of Transfer of Responsibility

Water Quality Management Plan (WQMP)

WQMP Number – As assigned by the City of Orange: _____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City that responsibility for the Water Quality Management Plan (WQMP) for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or portion thereof) to the New Owner, as further described below.

I. Owner/ Responsible Party Information

Company: Chick-fil-A, Inc. Contact Person: Jennifer M. Daw
Street Address: 15635 Alton Parkway, Suite 350 Title: Director of Design and Construction

City: Irvine State: California Zip: 92618 Phone: (404)305-4834

II. Information about Site Relevant to WQMP

Name of Project: Chick-fil-A Restaurant # 4003
Title of WQMP applicable to site: Priority/WQMP-Chick-Fil-A Restaurant #4003
Street Address of the site: 202 S. Main Street, City of Orange, California 92868
Date of Transfer of Responsibility: _____

III. New Owner (Upon Transfer)/ Responsible Party Information

Company/ Individual: _____ Contact Person: _____

Street Address: _____ Title: _____

City _____ State _____ Zip _____ Phone: _____

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- C. BMP Details
- D. BMP Maintenance Information
- E. Geotechnical Infiltration Testing (for reference only)
- F. Hydrology Information (Q2 – Two-year frequency storm evaluation)

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I. Discretionary Permit Number(s), Water Quality Condition Number(s) and Conditions of Approval

Tract No. 3086

Lot No. 27

GPS Coordinates: Latitude: 33.78587° N Longitude: -117.86763° W

Water Quality Conditions (WQMP conditions listed below)

A complete copy of the signed Conditions of Approval, Resolution Number (Pending)

Dated (Pending) are included as Appendix A

Conditions of Approval:

1. Prior to issuance of a Grading Permit, Applicant shall submit a Final Water Quality Management Plan to the City of Orange Public Works Department for review and approval.
2. Prior to the issuance of any grading permits the applicant shall submit a Priority Project WQMP for review and approval to the Public Works Department that:
 - a. Prioritizes the use of Low Impact Development principles as follows: preserves natural features; minimizes runoff and reduces impervious surfaces; and utilizes infiltration of runoff as the method of pollutant treatment. Infiltration BMPs to be considered include the use of permeable materials such as concrete and concrete pavers, infiltration trenches, infiltration planters, and other infiltration BMPs as applicable,
 - b. Incorporates the applicable Routine Source and Structural Control BMPs as defined in the Drainage Area Management Plan (DAMP),
 - c. Maintains the hydrologic characteristics of the site by matching time of concentration, runoff velocity, volume and hydrograph for a 2-year storm event,
 - d. Minimizes the potential increase in downstream erosion and avoids downstream impacts to physical structures, aquatic and riparian habitat.
 - e. Generally describes the long-term operation and maintenance requirements for structural and Treatment Control BMPs,
 - f. Identifies the entity or employees that will be responsible for long-term operation, maintenance, repair and or replacement of the structural and Treatment Control BMPs and the training that qualifies them to operate and maintain the BMPs,
 - g. Describes the mechanism for funding the long-term operation and maintenance of all structural and Treatment Control BMPs,
 - h. Includes a copy of the forms to be used in conducting maintenance and inspection activities,
 - i. Meets recordkeeping requirements (forms to be kept for 5 years).
 - j. Includes a copy of the form to be submitted annually by the project owner to the Public Works Department that certifies that the project's structural and treatment BMPs are being inspected and maintained in accordance with the project's WQMP.

3. Prior to the issuance of certificates for use of occupancy, the applicant shall demonstrate the following to the Public Works Department:
 - a. That all structural and treatment control best management practices (BMPs) described in the Project WQMP have been constructed and installed in conformance with the approved plans and specifications,
 - b. That the applicant is prepared to implement all non-structural BMPs described in the Project WQMP,
 - c. That an adequate number of copies of the project's approved final Project WQMP are available for the future occupiers.
4. Prior to the issuance of certificates for use of occupancy or final signoff by the Public Works Department, the applicant shall demonstrate to the satisfaction of Public Works, that the preparer of the WQMP has reviewed the BMP maintenance requirements in Section V of the WQMP with the responsible person and that a copy of the WQMP has been provided to that person. A certification letter from the WQMP preparer may be used to satisfy this condition.
5. Prior to issuance of building permits, the applicant shall review the approved Water Quality Management Plan (WQMP) and grading plan to ensure the structure's downspouts or drainage outlet locations are consistent with those documents. Copies of the building or architectural plans specifically showing the downspouts and drainage outlets shall be submitted to the Public Works Department for review.
6. The project applicant shall maintain all structural, treatment and low impact development BMPs at the frequency specified in the approved WQMP. Upon transfer of ownership or management responsibilities for the project site, the applicant shall notify the City of Orange Public Works Department of the new person(s) or entity responsible for maintenance of the BMPs.
12. For those food service establishments projects installing Grease Interceptors: Prior to issuance of building permits the applicant shall identify the location of the grease interceptor and provide evidence to the Building Official that the design meets and is consistent with the City's latest adopted building codes.

II. Project Description

Planning Area (Location): Southwest corner of Almond Avenue and Main Street

Project Site Area (ac): 0.95

Project Disturbed Area within Property Limits (ac): 0.95

Percent Change in Impermeable Surfaces: 19.5% (Reduction)

SIC Code (if applicable): 5812 (Eating Places)

Project Description:

According to City of Orange Zoning map the project site is in "NMU-24" Zone area (Neighborhood Mixed Use). The existing condition consists of a vacant one to two story restaurant building with a basement (approx. 6,983 square feet perimeter wall) A complete demolition of the existing site improvements is proposed and a new single-story Chick-Fil-A Restaurant will be constructed along with associated parking, landscaping, drainage features such as curb & gutter, v-gutter, concrete channels, grated inlet catch basins, and underground infiltration system. Existing driveways will be re-located in the Public R/W in both Main St. and Almond Ave. Street trees are proposed along Almond Ave. and decorative features are proposed at the corner of Main St. and Almond Ave.

The proposed development is to include a drive-thru and an overhanging canopy structure at the menu order area for weather protection and aesthetics. A trash enclosure is also proposed for this project. The trash enclosure will be covered and will also have a drain inside that is connected to the grease waste line. The trash enclosure surface will be graded so that storm water will not enter the interior drain. The site will be designed so that all surface runoff from the site will be captured by grate inlet catch basins and conveyed to a storm water treatment system.

Project Purpose and Activities

The purpose of the development is for the sale of prepared foods and onsite activities include preparation of foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption. Customers will either dine-in or take food offsite. Outdoor seating will not be provided at this site, customers who dine-in will be inside the store only. Refuse will take place onsite in a covered trash enclosure that drains to the grease waste. A grease interceptor will be installed and implemented onsite to treat grease waste from the kitchen and trash enclosure. A storage area will also be constructed alongside the

trash enclosure to store materials and equipment. The drive-thru is designed to be two lanes two serve customers quickly to avoid any backup and employees typically walk the drive-thru to serve and take orders from the customers. Routine deliveries will take place onsite in the loading zone provided in front of the trash enclosure. Landscape will be planted with drought tolerant species and will be irrigated.

Potential Storm Water Pollutants

The facility mainly generates non-hazardous waste such as:

- Paper and cardboard which are collected and sent to recycling centers,
- Food waste that gets emptied in the trash bin, located outside of the restaurant.

Pollutants of Concern: Suspended Solid/Sediments, Nutrients, Pathogens, Pesticides, Trash & Debris, and Oil & Grease.

Primary Pollutants of Concern: Suspended Solid/Sediments, Nutrients, Pathogens, Pesticides, and Metals.

Hydrologic Conditions of Concern

The resulted Tc (Time of concentration for the 2 year storm event in the proposed condition is greater than the time of concentration in the existing condition,

6.88 min. < 7.32 min. (+6.4%)

Based on 2-year Unit Hydrograph analysis, the volume (ac-ft.) in the proposed condition is less than existing condition,

0.0841 ac-ft. < 0.0950 ac-ft. (-11.5%)

The peak flow in the developed condition is less than a 5% increase from existing.

Q2 developed = 1.69 cfs > Q2 existing = 1.62 cfs. (+4.3%)

Per the analysis, the project does not have HCOC.

See detail calculations in Appendix F.

Post Development Drainage Characteristics

In the proposed condition the site has been divided into one DMA (Drainage Management Area) and one STA (Self treating area). The runoff mostly slopes in the same direction as in existing condition. In DMA-1 (approximately 0.858 ac.) the runoff sheet flows from the northeast to southwest corner of the site.

For the purpose of water quality an underground infiltration system (manufactured by CULTEC) is designed to capture and treat the Design Capture Volume. Once the underground infiltration system reaches its designed capacity, the remaining / excess discharge (High flow, Q25 and Q100) will bypass the underground infiltration system and will sheet flow to the concrete channel. Runoff from High Flow events will then discharge through the existing concrete block wall opening where it will be collected by

the existing storm drain system on the neighboring site. The proposed catch basins will have Oldcastle Flogard Filter Inserts for trash and debris capture. Upstream of the underground infiltration system, one stormfilter (manufactured by CULTEC) is installed to separate and trap trash, debris, sediment and hydrocarbons from stormwater runoff.

The STA-1 (approximately 0.010 ac.) is a self-treating area and it sheet flows into the existing curb and gutter along Almond Avenue and Main Street.

The discharge flow path from this site is into the municipal storm drain system, Reach 2 Santa Ana River and ultimately the Pacific Ocean. See Proposed Hydrology Map in this report.

Commercial Projects

For this project site, the onsite activities include preparation of foods and drinks in the kitchen area. The dining and beverage areas are inside the building only. A large roll-off trash bin is located in a separate covered structure adjacent to the building. This bin is typically removed once a week during normal business hours. Grease waste barrels, recycling bins and organic waste will also be stored within the covered trash enclosure and typically removed once a week. The grease interceptor will be located just north of the trash enclosure and can be easily accessed for routine maintenance when necessary. In addition, kitchen BMPs will be implemented where all kitchen sink drains and floor drains will connect to the grease waste line and pass through the grease interceptor for treatment.

Raw materials are received via trucks. These materials are transferred to and from truck into the buildings. There is not currently, nor will there be in the future, any bulk storage of fertilizers, herbicides, or pesticides; typically, these items are contracted and purchased in just the quantity needed and applied promptly via approved means.

Site Ownership and any Easements

Property Owner:
202 S Main St. LLC

Business Owner/Lessee:
Chick-Fil-A, Inc.

Easement Item No. 3

An Easement for pipeline and incidental purposes, recorded July 24, 1929 as book 293, page 498 and August 6, 1929 in book 301, page 206, both of official records.

In favour of: Santa Ana Valley Irrigation Company

III. Site Description

Reference Location Map: See section VI in this report for Location Map

Site Address: 202 S. Main Street, Orange, California 92868

Zoning: The project site is in "NMU-24" Zone area (Neighborhood Mixed Use)

Predominant Soil type: Type "B" (source: Technical Guidance Document, Appendix XVI-2)

Pre-project percent pervious: 1.1 **Post-project percent pervious:** 20.6

Pre-project percent impervious: 98.9 **Post-project percent impervious:** 79.4

Site Characteristics

The existing 0.95 acre site is occupied by a vacant one to two story Manhattan Steak and Seafood Restaurant building with basement (approximately 6,983 square feet perimeter wall). It is unknown if the existing basement extends beneath the entire building. The site consists of parking area, paved driveway and walkway of approximately 41,107 square feet and a minor landscaped area of approximately 478 square feet. The discharge flow from this property sheet flows from north and east to the southwest corner of the property. An existing block wall opening directs the flow toward an existing grated inlet that is located in the neighboring property.

Precipitation Zone:

The site is located in Precipitation Zone of 0.80 inch Design Capture Storm Depth. (See Figure XVI-1 in appendix "C").

Topography:

The existing site is relatively flat condition and gently slopes from the northeast of the project site toward the southwest.

Drainage Patterns/ Connections:

A public storm drain system is accepting the runoff from the site and delivering to the Santa Ana River and to the Pacific Ocean.

Soil Type, Geology, and Infiltration Properties:

Based on GILES field investigation, the site is underlain by Young Alluvial Fan Deposits that typically consist of unconsolidated, loose to moderately dense sand, sandy silt and silt. The infiltration test procedure outlined in the Orange County Technical Guidance Document (OCTGD) was used as a guide in the infiltration testing. A summary of the results of the percolation test is provided in table 1 below, additionally, the calculated infiltration rates were

also adjusted to reflect a factor of safety (FS) of 2 applied to the rates obtained from the infiltration test results.

TABLE 1 – PERCOLATION TEST RESULTS				
Test Hole	Test Depth ¹ (feet)	Pre-Adjusted Percolation Rate (in/hr)	Infiltration Rate ² (in/hr)	Soil Type
B-6	5.0±	12.24	1.00	Silty Sand
B-7	6.0±	24.48	1.12	Silty Sand
1) Depth is referenced to the existing surface grade at the test location. 2) Reflects FS of 2 per Worksheet H of OCTGD				

Hydrologic (Groundwater) Conditions:

Groundwater was not encountered during the subsurface investigation to the maximum depth explored (16.5 feet). Based on a review of the Seismic Hazard Zone Report for the Orange Quadrangle, the depth to historic high groundwater is reported to be greater than 40 feet below grade. However, fluctuations of the groundwater table, localized zones of perched water, and rise in soil moisture content should be anticipated during and after the rainy season. Irrigation of landscape areas on or adjacent to the site can also cause fluctuations of local or shallow perched groundwater levels.

Watershed Characteristics

Watershed: Lower Santa Ana River

Downstream Receiving Waters:

Santa Ana River-Reach 2, Reach 1, Pacific Ocean

Water Quality Impairments (if applicable):

Identify hydromodification susceptibility:

Downstream channels are not susceptible to hydrologic degradation. Per the regional map (TGD, Fig. 3 Susceptibility Analysis).

TECHNICAL GUIDANCE DOCUMENT APPENDICES

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	2	0.50
		Suitability Assessment Safety Factor, $S_A = \Sigma p$				2.0
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	1	0.25
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$				1
Combined Safety Factor, $S_{Total} = S_A \times S_B$				2 x 1	2
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{observed} / S_{Total}$					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

IV. Best Management Practices

Based on site plan layout and infiltration rate from soil investigation, underground infiltration tanks (chambers manufactured by Cultec) were possible and have been proposed for this site. The infiltration chambers will be pre-treated (via Stormfilter unit and Oldcastle Flogard Catch Basin Inserts) and the DCV will get infiltrated within 48 hours.

IV.1 Site Design and Drainage Characteristics

**Table 1
Site Design BMPs**

Technique	Included?		If no, state justification.
	Yes	No	
Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)	X		
Create Reduced or "Zero Discharge" Areas (Runoff Volume Reduction) ¹		X	No Zero Discharge is proposed onsite
Minimize Impervious Area/Maximize Permeability (C-Factor Reduction) ²	X		Landscape has been added
Conserve Natural Areas (C-Factor Reduction)		X	Developed site with no natural areas

- 1 Detention and retention areas incorporated into landscape design provide areas for retaining and detaining stormwater flows, resulting in lower runoff rates and reductions in volume due to limited infiltration and evaporation. Such Site Design BMPs may reduce the size of Treatment Control BMPs.
- 2 The "C Factor" is a representation of the ability of a surface to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C Factors. By incorporating more pervious, lower C Factor surfaces into a development, lower volumes of runoff will be produced. Lower volumes and rates of runoff translate directly to lowering treatment requirements.

The site has been developed with the goals of minimizing Directly Connected Impervious Areas (DCIAs) via separation of parking from public sidewalk with landscape buffer, various sized landscaped areas around building and between parking, landscape separation between drive-thru and property limits, and a landscape separation of the sidewalk and trash enclosure and maximizing permeability but utilizing planting in landscaped areas to slow down surface runoff and allow infiltration into the native soil. Impervious Areas have been minimized to the allowable level for normal operation, i.e. parking stalls are designed to the minimum size, drive aisles designed to minimum size, minimal sidewalk used around the building utilizing typical access only.

IV.2 Source Control BMPs

IV.2.1 Routine Non-Structural BMPs

**Table 2
Routine Non-Structural BMPs**

BMP No.	Name	Check One		If not applicable, state brief reason.
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restriction	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance		X	This BMP is not applicable. No hazardous waste at this site.
N6	Local Water Quality Permit Compliance		X	This BMP is not applicable. The City of Orange does not issue water quality permits.
N7	Spill Contingency Plan		X	This BMP is not applicable. No spill contingency plan is required for this site.
N8	Underground Storage Tank Compliance		X	No underground storage of hazardous materials
N9	Hazardous Materials Disclosure Compliance		X	This BMP is not applicable. No hazardous waste at this site.
N10	Uniform Fire Code Implementation		X	Property owner is not required to comply with Article 80 of the Uniform Fire Code.
N11	Common Area Litter Control	X		
N12	Employee Training	X		
N13	Housekeeping of Loading Docks		X	This BMP is not applicable. No proposed loading dock at this site.
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		

NON-STRUCTURAL MEASURES:

N1. Education for Property Owners, tenants and occupants – No Property Owners Association. Copies of this manual shall be used by the owner of this site and the Owner shall be responsible for the training of their employees on proper BMP procedures that apply to their portion of the site annually.

N2. Activity Restrictions - Documents shall be prepared by the owner for the purpose of surface water quality protection. Vehicle maintenance, washing, power washing discharges, etc. are prohibited site activities and must remain in compliance with Orange Municipal Code at all times.

N3. Common Area Landscape Management – Ongoing maintenance consistent with County Water Conservation Resolution, with the City of Orange model water efficient landscape ordinance, and fertilizer and pesticide usage consistent with County. Weekly inspection and maintenance of all landscape areas shall occur in compliance with the Orange Municipal Code.

N4. BMP Maintenance – The owner will be responsible for implementing each non-structural BMP and schedule cleaning and maintenance of all BMP structural facilities as shown in Section V.

N11. Common Area Litter Control – The owner will be required to implement trash management and litter control procedures in the areas aimed at reducing pollution of drainage water. Daily inspection of all areas shall occur and any trash and/or debris will be removed. Weekly inspection/maintenance will also occur.

N12. Employee Training – Education program as it would apply to future employees of the restaurant. Business operator shall provide training upon hire and annually thereafter on activities and maintenance on site regarding surface water/storm water protection; to include awareness training of all Post-Construction BMPs and activity restrictions.

N14. Common Area Catch Basin Inspection - The owner shall have all onsite proposed catch basins inspected and, if necessary, cleaned prior to the wet season, no later than October 1st each year. Inspection of all on-site drainage features shall also occur following all storm events.

N15. Street Sweeping Private Streets and Parking Lots – Sweeping of the parking area and drive aisles shall occur weekly.

IV.2.2 Routine Structural BMPs

**Table 3
Routine Structural BMPs**

Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Provide storm drain system stenciling and signage- "No Dumping – Drains to Ocean"	X		
Design and construct outdoor material storage areas to reduce pollution introduction		X	This BMP is not applicable. No Hazardous materials at this site.
Design and construct trash and waste storage areas to reduce pollution introduction	X		
Use efficient irrigation systems & landscape design	X		
Protect slopes and channels and provide energy dissipation		X	This BMP is not applicable. No slope areas at this site.
Incorporate requirements applicable to individual project features			
a. Dock areas		X	This BMP is not applicable. No loading area is proposed at this site
b. Maintenance bays		X	This BMP is not applicable. No maintenance bay area is proposed at this site
c. Vehicle or community wash areas		X	This BMP is not applicable. No community wash areas at this site
d. Outdoor processing areas		X	This BMP is not applicable. No outdoor processing area at this site
e. Equipment wash areas		X	This BMP is not applicable. No outdoor equipment wash areas at this site
f. Fueling areas		X	This BMP is not applicable. No fueling areas at this site
g. Hillside landscaping		X	This BMP is not applicable. Site is not located within hillside landscaping.
h. Wash water control for food preparation areas	X		

Structural Measures

S1- Storm Drain System Stenciling and Signage. Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system.

S3 -Design Trash Enclosures to Reduce Pollutant Introduction. Trash enclosure areas will be paved and have perimeter walls and gates.

S4 - Use Efficient Irrigation Systems and Landscape Design
Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system.

S13 - Wash Water Controls for Food Preparation Areas. All kitchen sinks and floor drains will drain to the grease waste line and pass through the grease interceptor for prior to discharge into the public sewer system.

IV.3 Low Impact Development BMP Selection

IV.3.1 Hydrologic Source Controls

Not Applicable

Table 4
Hydrologic Source Control BMPs

Name	Check If Used
Localized on-lot infiltration	<input type="checkbox"/>
Impervious area dispersion (e.g. roof top disconnection)	<input type="checkbox"/>
Street trees (canopy interception)	<input type="checkbox"/>
Residential rain barrels (not actively managed)	<input type="checkbox"/>
Green roofs/Brown roofs	<input type="checkbox"/>
Blue roofs	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

IV.3.2 Infiltration BMPs

**Table 5
Infiltration BMPs**

Name	Check If Used
Bioretention without underdrains	<input type="checkbox"/>
Rain gardens	<input type="checkbox"/>
Porous landscaping	<input type="checkbox"/>
Infiltration planters	<input type="checkbox"/>
Retention swales	<input type="checkbox"/>
Infiltration trenches	<input type="checkbox"/>
Infiltration basins	<input type="checkbox"/>
Drywells	<input type="checkbox"/>
Subsurface infiltration galleries	<input checked="" type="checkbox"/>
French drains	<input type="checkbox"/>
Permeable asphalt	<input type="checkbox"/>
Permeable concrete	<input type="checkbox"/>
Permeable concrete pavers	<input type="checkbox"/>
Other: Trash Filter Insert	<input checked="" type="checkbox"/>
Other: Pre-Treatment/Separation Device	<input checked="" type="checkbox"/>

In the proposed condition the site has been divided into one DMA (Drainage Management Area) and one STA (Self treating area). The runoff mostly slopes in the same direction as in the existing condition. The Self Treating Area (STA-1) is approximately 4,227 square feet of landscaping area along Main Street and Almond Ave. In DMA-1 (approximately 0.858 ac.) the runoff sheet flows from northeast to southwest of the property site. Flow will get intercepted and treated prior to exiting the site by a debris and sediment separation unit (manufactured by CULTEC), Storm filter 330, and an underground infiltration system (manufactured by CULTEC), Recharger 330XLHD (Heavy Duty Chambers). Roof downspouts will not be connected directly to the onsite storm drain system but rather will spill to landscaped planters or finished surfaces adjacent to the buildings. The overall site in DMA-1, will sheet flow toward three 24" by 24" grated inlets. The proposed grated inlets will have trash filter inserts installed and are sized to capture the 100 year storm event and direct the flow toward the debris and sediment separator unit and finally into the underground storm infiltration system. Once the underground system reaches its designed capacity, the remaining / excess discharge (High flow, Q₂₅ and Q₁₀₀) will bypass through the storm drain system and will outlet from the lowest grated

inlet onsite by sheet flow and will be conveyed into the proposed 2.0' wide concrete channel and through the existing concrete block wall opening and will get collected by the existing storm drain system in the neighboring project site.

The LID Design Storm Capture Volume is fully treated.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Not Applicable

**Table 6
Evapotranspiration, Rainwater Harvesting BMP**

Name	Check If Used
All HSCs; <i>See Section IV.3.1</i>	<input type="checkbox"/>
Surface-based infiltration BMPs	<input type="checkbox"/>
Biotreatment BMPs	<input type="checkbox"/>
Above-ground cisterns and basins	<input type="checkbox"/>
Underground detention	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

IV.3.4 Biotreatment BMPs

Not Applicable

Table 7
Biotreatment BMPs

Bioretention with underdrains	<input type="checkbox"/>
Storm water planter boxes with underdrains	<input type="checkbox"/>
Rain gardens with underdrains	<input type="checkbox"/>
Constructed wetlands	<input type="checkbox"/>
Vegetated swales	<input type="checkbox"/>
Vegetated filter strips	<input type="checkbox"/>
Proprietary vegetated biotreatment systems	<input type="checkbox"/>
Wet extended detention basin	<input type="checkbox"/>
Dry extended detention basins	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

IV.3.5 Hydromodification Control BMPs

Hydromodification is not required .

IV.3.6 Regional/Sub-Regional LID BMPs

Not Applicable.

IV.3.7 Treatment Control BMPs

Not Applicable.

IV. 4 Water Quality Credits

Not Applicable

IV.5 Alternative Compliance Plan

Not Applicable.

IV.6 Vector Control

Based on site grading design all surface water will drain to a grated inlet catch basin so no standing water will occur onsite in paved areas. Landscaped areas will also drain to grated inlets, any standing water behind curbs will be minimal and will infiltrate the native soil. The infiltration surface area of the underground infiltration chambers is large enough to infiltrate the full capacity of the chambers within 48 hours.

IV.7 Drainage Management Area (DMA)

Describe each DMA used in project, the BMPs in each DMA and the area treated.

DMA Number	BMPs	Area Treated
1	Underground infiltration system with pre-treatment debris and sedimentation separation device and trash filter inserts within each catch basin (Cultec Stormfilter and Recharger Chambers, Oldcastle Flogard Inserts)	0.852 Acres
2		
3		
4		
5		
6		
Total Area		0.852 Acres

Total Project Area= 0.95 Acres

Note: The 0.097 Acre of landscaped area facing Almond Avenue and Main Street is categorized as STA (Self Treating Area).

IV.8 Calculations

Required Storm capture volume for (DMA-1).

$$DCV = C \times d \times A \times 43,560 \text{ sf/ac} \times 1/12 \text{ in/ft}$$

Where: C = runoff coefficient = $(0.75 \times \text{imp} + 0.15)$

d = storm depth (inches)

A – Tributary area

The impervious area = 0.81 (post-development)

$$C = (0.75 \times 0.86 + 0.15) = 0.80$$

$$d = 0.8 \text{ inches}$$

$$A = 0.858 \text{ Ac.}$$

$$DCV = 0.80 \times 0.8 \times 0.858 \times 43560 \times 1/12 = 1,993.3 \text{ cubic –feet} \leftarrow$$

Drawdown time calculation for (DMA-1)

Dm = maximum allowable depth (ft.)

$$Dm = [(t) \times (I)] / 12$$

Where:

I = site infiltration rate (in/hr) [Two results from Soils Report: 1.0 and 1.2 in/hr with safety factor of 2 applied] 1.0 used to be conservative

t = maximum drawdown time (48 hours)

$$Dm = [(48) \times (1.0)] / 12$$

$$Dm = 4.0 \text{ feet maximum}$$

Cultec 330XL-HD selected to provide LID treatment has a maximum height of 30.5 inches.
BMP sizing provided by Cultec spreadsheet attached in Appendix C.

Drawdown Time

$$(30.5 \text{ in}) / (1.0 \text{ in/hr}) = 30.5 \text{ hr; } 30.5 \text{ hr.} < 48 \text{ hr}$$

DCV required: 1,993.3 cubic-feet

Volume Provided: 2,122.4 cubic-feet

Treatment is complete.



Founder of Plastic Chamber Technology
Stormwater and Septic Solutions
Since 1986

1-800-4-CULTEC
custservice@cultec.com

Prepared For:

Name			
Company Name			
Street Address			
City		Zip	
State			
Phone			
Fax			
Email			

Project Information:

Chick-fil-A Restaurant #4003	
202 S. Main Street	
Orange	
CA	

Date:

November 09, 2018

Engineer:

Randy Decker	
Truxaw & Associates	
265 S. Anita Drive, Suite 111	
Orange	
CA	92868
714-935-0265	
714-935-0106	
randydecker@truxaw.com	

Calculations Performed By:

Name			
Company Name			
Street Address			
City		Zip	
State			
Phone			
Fax			
Email			

Input Given Parameters

Unit of Measure	English
Select Model	Recharger 330XLHD

Stone Porosity	40.0%
Number of Header Systems	1 Header
Stone Depth Above Chamber	6 inches
Stone Depth Below Chamber	6 inches

Workable Bed Depth	5.00 feet
Max. Bed Width	25.50 feet
Storage Volume Required	1979.40 cu. feet

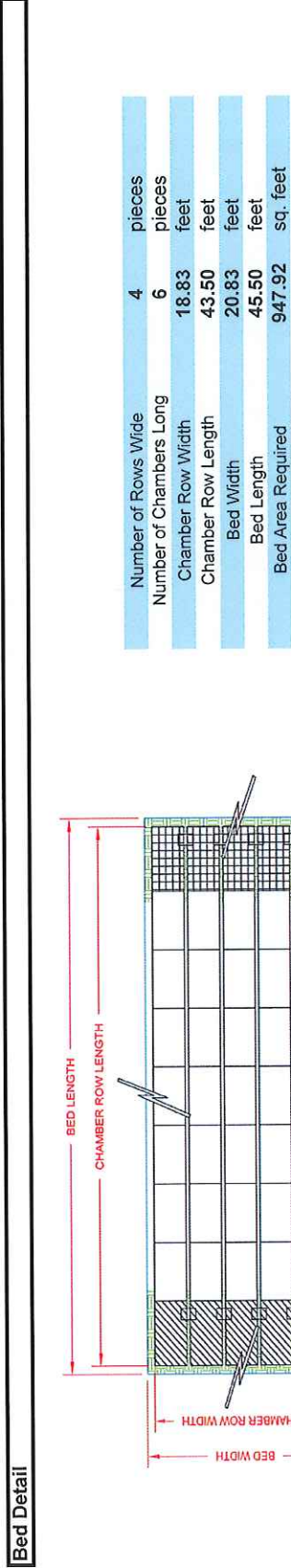


Chamber Specifications

Height	30.5 inches
Width	52.00 inches
Length	8.50 feet
Installed Length	7.00 feet
Bare Chamber Volume	52.21 cu. feet
Installed Chamber Volume	79.26 cu. feet
<i>Image for visual reference only. May not reflect selected model.</i>	
Bed Depth	4.63 feet
Bed Width	20.83 feet
Storage Volume Provided	2122.42 cu. feet

Materials List			
Recharger 330XLHD	Stormwater System by CULTEC, Inc.		
Approx. Unit Count - not for construction	24	pieces	
Actual Number of Chambers Required	24	pieces	
Starter Chambers	4	pieces	
Intermediate Chambers	16	pieces	
End Chambers	4	pieces	

HVLV FC-24 Feed Connector	3	pieces	
CULTEC No. 410™ Filter Fabric	289.14	sq. yards	
CULTEC No. 20L Polyethylene Liner	20.83	feet	
Stone	76.22	cu. yards	



Bed detail for reference only. Not project specific. Not to scale. Use CULTEC StormGenie to output project specific detail.



Founder of Plastic Chamber Technology
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Since 1986

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custservice@cultec.com

Project Name: Chick-fil-A Restaurant #4003

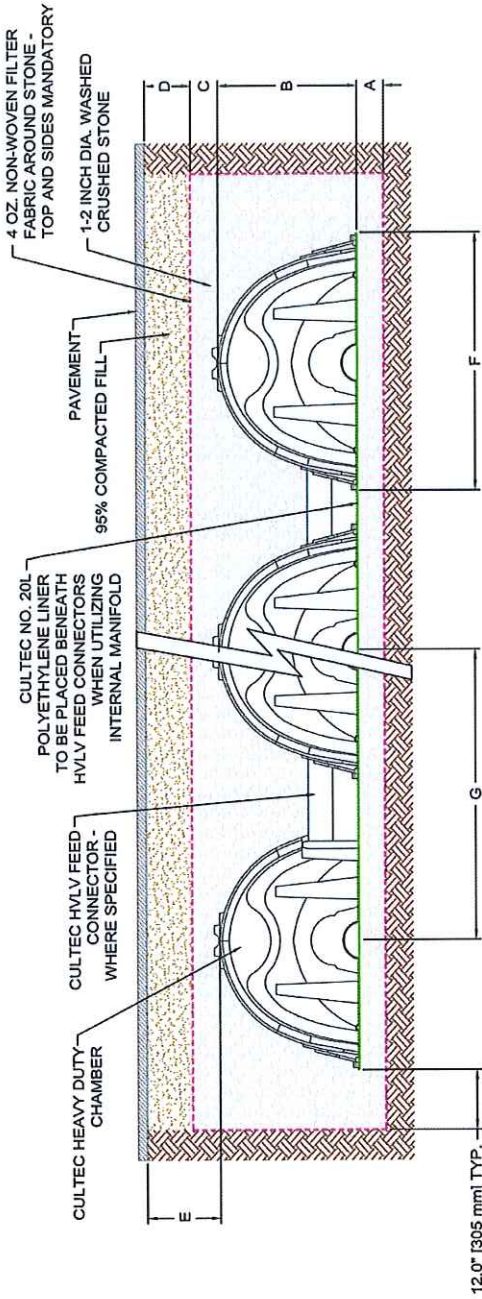
Date: November 09, 2018

Cross Section Detail



Recharger 330XLHD	
Pavement	3 inches
95% Compacted Fill	10 inches
Stone Above	6 inches
Chamber Height	30.5 inches
Stone Below	6 inches
Effective Depth	42.5 inches
Bed Depth	55.5 inches

Conceptual graphic only. Not job specific.



A	Depth of Stone Base	6.0 inches
B	Chamber Height	30.5 inches
C	Depth of Stone Above Units	6.0 inches
D	Depth of 95% Compacted Fill	10.0 inches
E	Max. Depth of Cover Allowed Above Crown of Chamber	12.0 feet
F	Chamber Width	52.0 inches
G	Center to Center Spacing	4.83 feet

Breakdown of Storage Provided by Recharger 330XLHD Stormwater System	
Chambers	1297.87 cu. feet
Feed Connectors	1.37 cu. feet
Stone	823.19 cu. feet
Total Storage Provided	2122.42 cu. feet

V. Implementation, Maintenance and Inspection Responsibility for BMPs (O&M Plan)

Responsible Party Information: Store Operator (pending)

Name: Jennifer M. Daw

Title: Director of Design and Construction

Company: Chick-fil-A, Inc.

Phone Number: (404) 305-4834

Table 8 - Frequency Inspection Matrix

BMP	Responsible Party	*Maintenance Activity	*Inspection/Maintenance Frequency
Source Control BMPs (Structural and Non-structural)			
N1: Education for property Owner(s), Tenants and Occupants	Chick-fil-A (Store Operator)	Site manager shall be responsible for the training of employees on proper BMP procedures that apply to their portion of the site. Information materials on Best Management Practices that contribute to the protection of stormwater quality will be provided by the manager to all employees.	Annually and to all new employees
N2: Activity Restrictions	Chick-fil-A (Store Operator)	<p>These restrictions shall include the following:</p> <ol style="list-style-type: none"> 1. Pesticides and fertilizers shall be applied at the minimum rate recommended by the manufacturer, and shall be consistent with label requirements for use of pesticides and fertilizers in close proximity to storm drains, creeks, etc. 2. Parking lots, walkways, driveways, patios and sidewalks shall be swept instead of washed or hosed down. All debris collected shall be disposed of in approved trash receptacles and shall not be directed into sidewalk, parking lot, streets and storm drains. 3. Vehicle maintenance and 	Daily

**WQMP for
Chick-fil-A Restaurant # 4003**

		vehicle washing shall not be allowed in any outside area of the site.	
N3: Common Area Landscape Management	Chick-fil-A (Store Operator)	Landscape crews shall inspect the irrigation system after each landscape procedure and shall report all broken sprinklers and all drainage problems to the owner. All routine landscaping maintenance shall be done in conformance with BMP factsheet in Appendix B, including proper sweeping and cleanup / removal of landscape mowing/cutting/trimming waste.	Weekly or every two weeks for maintenance and system inspection. Daily visual inspection for trash and debris and/or damage.
N11: Common Area Litter Control	Chick-fil-A (Store Operator)	Trash dumpsters will be emptied a minimum of once a week or more often if they are routinely filled. Landscape maintenance firm to sweep and clean the site during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in, and noting trash disposal violations by customers or employees and reporting the violations to the property owner for investigation.	On-going daily maintenance
N12: Employee Training	Chick-fil-A (Store Operator)	All contractors shall be trained and made aware of this WQMP and operation and maintenance requirements of BMPs. Education programs (seeN1) as it would apply to future employees of individual businesses.	At first hire and annually
N14: Common Area Catch Basin Inspection	Chick-fil-A (Store Operator)	On-site catch basins shall be inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation. The owner shall contract with a qualified contractor to inspect and clean out accumulations of trash, litter and sediment and check for evidence of illegal dumping of waste materials into on-site drains.	Weekly or every two weeks for maintenance and system inspection. Daily visual inspection for trash and debris and/or damage.
N15: Street Sweeping Private	Chick-fil-A (Store Operator)	Parking lots shall be swept weekly to prevent sediment, garden waste, and trash, or other pollutants from	Monthly and prior to October 1st each year.

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Streets and Parking Lots		entering on-site drains and public storm channels. Sweeping will be done by a landscape contractor or other contractor provided by the owner.	
S1: Private storm drain system stencilling and signage	Chick-fil-A (Store Operator)	Check stencilling and labelling of all storm drains and catch basins. The message 'No Dumping-Drains to Ocean' must be visible and legible.	Once a year. Re-stencil as necessary but at minimum once every five years.
S3: Design and Construct trash and waste storage areas to reduce pollution introduction	Chick-fil-A (Store Operator)	Design trash storage areas to reduce pollutant introduction. The contractor will clean out and cover trash receptacles weekly to prevent spillage. Storage area will store supplies only and will be covered.	Once a week with maintenance activities.
S4: Use efficient irrigation system and landscape design, water conservation, smart controllers, and source control	Chick-fil-A (Store Operator)	Verify that the runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, irrigation heads are adjusted properly to eliminate overspray to landscape areas, and that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures.	Once a week with maintenance activities.
S13 Wash Water Controls for Food Preparation Areas	Chick-Fil-A (Store Operator)	Verify that all kitchen drains are clear and draining properly without any backup. Perform drain cleaning as necessary.	Inspect Annually
Low Impact Development and Treatment BMPs			
Trash Filter Insert (Oldcastle Flogard)	Chick-fil-A (Store Operator)	Trash Filter Inserts shall be inspected with the routine catch basin inspection for trash and debris. The owner shall contract with a qualified contractor to inspect and clean out the filters of accumulated trash and debris.	Monthly and prior to October 1 st each year.
Pre-treatment Control (CULTEC Storm Filter 330)	Chick-Fil-A (Store Operator)	Storm Filter Device shall be inspected and cleaned of accumulated debris and sediment through the access cover at surface elevation.	Visually inspect and remove debris and sediment 3 times annually, and prior to the rainy season.

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INF-7 Underground Infiltration Chambers (CULTEC Rechager 330 XLHD)	Chick-Fil-A (Store Operator)	Underground infiltration chambers shall be inspected through the provided inspection ports at surface elevation for accumulation of debris and sedimentation.	Monthly and prior to the rainy season, October 1 st each year.
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*Attach in appendix additional inspection, maintenance and operations information if required.

Regulatory Permits

N/A

Funding

The entity responsible for the long-term inspection and maintenance of all BMPs will be the project's business operator (Chick-fil-A, Inc.). The project's owner will be the responsible entity until such time that a management firm is contracted to perform those inspection and maintenance responsibilities.

OWNER SELF CERTIFICATION STATEMENT

As the owner representative of the Chick-fil-A Restaurant # 4003 for which a Water Quality Management Plan (WQMP) was approved by the City, I hereby certify under penalty of law that all Best Management Practices contained within the approved Project WQMP have been maintained and inspected in accordance with the schedule and frequency outlined in the approved WQMP Maintenance Table.

The maintenance activities and inspections conducted are shown in the attached table and have been performed by qualified and knowledgeable individuals. Structural Treatment BMPs have been inspected and certified by a licensed professional engineer.

To the best of my knowledge, the information submitted is true and accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and citations for violating water quality regulations.

Signed: _____

Name: Jennifer M. Daw

Title: Director of Design and Construction

Company: Chick-fil-A, Inc.

Address: 15635 Alton Parkway, Suite 350

Telephone Number: (404) 305-4834

Date: _____

BMP Implementation Tracking Table

BMP	Activity	Completion Dates or Frequency	Initial
Source Control BMPs (Structural and Nonstructural)			
N1: Education for property Owner(s), Tenants and Occupants	Training of employees on proper BMP procedures that apply to their portion of the site. Information materials on Best Management Practices that contribute to the protection of stormwater quality will be provided by the manager to all employees.		
N2: Activity Restrictions	<p>1. Pesticides and fertilizers applied at the minimum rate recommended by the manufacturer, and shall be consistent with label requirements for use of pesticides and fertilizers in close proximity to storm drains, creeks, etc.</p> <p>2. Parking lots, walkways, driveways, patios and sidewalks have been swept instead of washed or hosed down. All debris collected was disposed of in approved trash receptacles and not directed into sidewalk, parking lot, streets and storm drains.</p> <p>3. Vehicle maintenance and vehicle washing was not allowed in any outside area of the site.</p>		
N3: Common Area Landscape Management	Inspect the irrigation system after each landscape procedure and report all broken sprinklers and all drainage problems to the owner. All routine landscaping maintenance done in conformance with BMP factsheet in Appendix B, including proper sweeping and cleanup / removal of landscape mowing/cutting/trimming waste.		
N11: Common Area Litter Control	Trash dumpsters are emptied a minimum of once a week or more often if they are routinely filled. Sweep and clean		

**WQMP for
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	the site during regularly scheduled maintenance, consisting of litter patrol, emptying of trash receptacles, and noting trash disposal violations by customers or employees and reported the violations to the property owner for investigation.		
N12: Employee Training	Employees and contractors were trained and made aware of this WQMP and operation and maintenance requirements of BMPs.		
N14: Common Area Catch Basin Inspection	On-site catch basins inspected monthly during the rainy season (October-May) and before and after each storm to ensure proper operation. The owner contracted with a qualified contractor to inspect and clean out accumulations of trash, litter and sediment and check for evidence of illegal dumping of waste materials into on-site drains.		
N15: Street Sweeping Private Streets and Parking Lots	Parking lots swept weekly to prevent sediment, garden waste, and trash, or other pollutants from entering on-site drains and public storm channels. Sweeping done by a landscape contractor and/or site maintenance contractor provided by the owner.		
S1: Private storm drain system stencilling and signage	Verified legibility of storm water messaging for all storm drains and catch basins.		
S3: Design and Construct trash and waste storage areas to reduce pollution introduction	Trash storage areas continue to prevent pollutant introduction. The contractor cleans out and covers trash receptacles weekly to prevent spillage.		
S4: Use efficient irrigation system and landscape design, water conservation, smart controllers,	Runoff minimizing landscape design continues to function, water sensors are functioning properly, irrigation heads are adjusted properly to eliminate overspray to landscape areas, and irrigation timing and cycle lengths were		

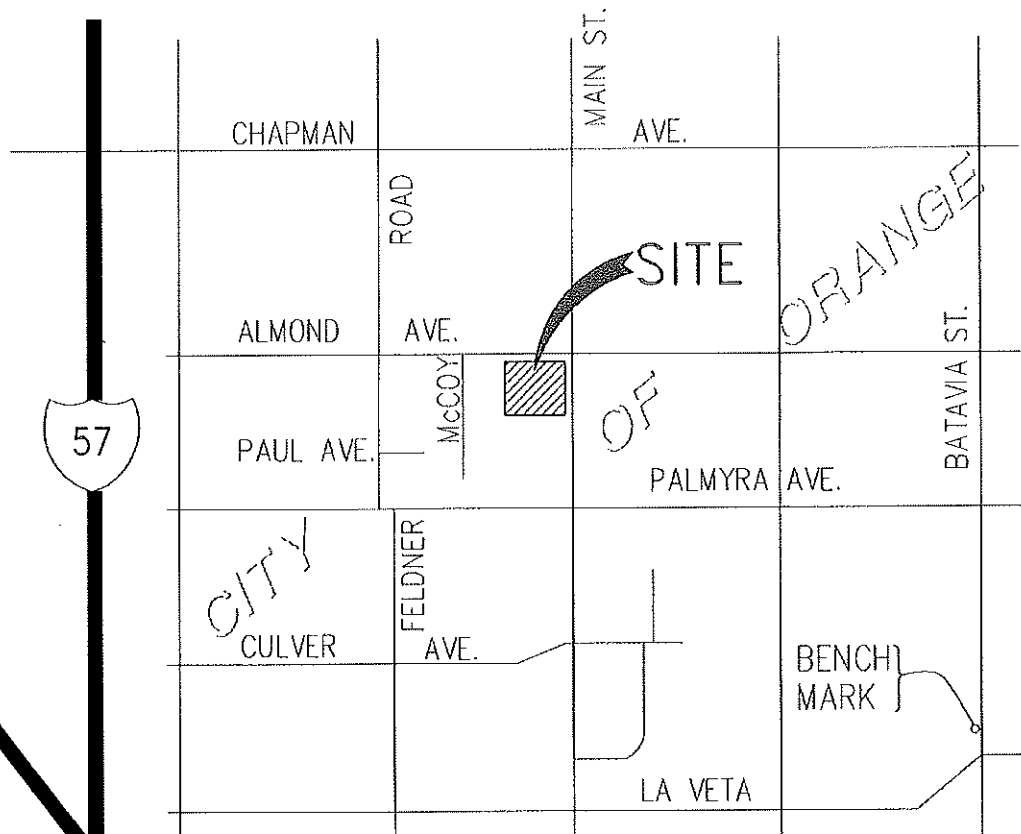
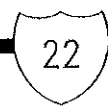
**WQMP for
Chick-fil-A Restaurant # 4003**

and source control	adjusted in accordance with water demands, given time of year, weather and day or night time temperatures.		
S13 Wash Water Controls for Food Preparation Areas	Kitchen BMPs were followed and no discharge of wash water from interiors reached exterior areas		
Low Impact Development and Treatment BMPs			
Trash Filter Insert (Oldcastle Flogard)	Removed and cleaned trash filter insert. Replaced if necessary.		
Pre-Treatment Control (CULTEC Storm Filter 330)	Inspected pre-treatment control device through access hole. Removed debris and sediment buildup as needed.		
Underground Infiltration Chambers (CULTEC Rechargers 330XLHD)	Inspected underground infiltrators through access port. Removed debris and sediment buildup as needed.		

* This sheet is to be submitted annually with the Owner Self Certification Statement.

** Structural Treatment BMPs should be certified by a Licensed Professional Engineer.

VI. Reference Maps

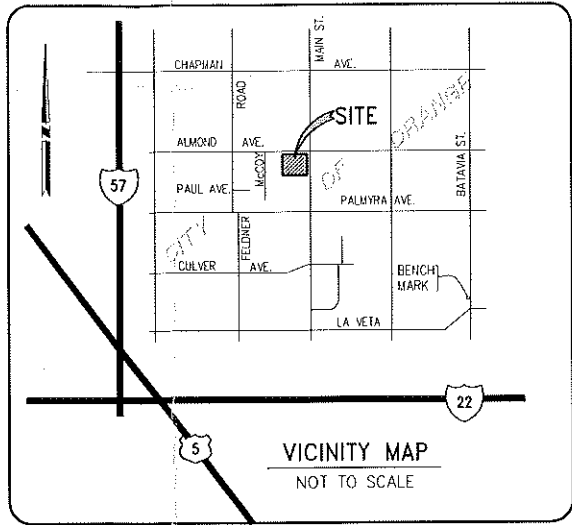


VICINITY MAP

NOT TO SCALE

VII. Reference Plans

CONCEPTUAL GRADING & UTILITY PLAN
CHICK-FIL-A RESTAURANT NO. 04003
202 SOUTH MAIN STREET
ORANGE, CA



GENERAL GRADING NOTES

- A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO BEGINNING ANY GRADING OR CONSTRUCTION. CALL CITY INSPECTOR 714-744-5526 TO ARRANGE MEETING TIME.
- ALL GRADING SHALL BE DONE IN ACCORDANCE WITH THE CITY OF ORANGE MANUAL OF GRADING AND STANDARD PLANS AND SPECIFICATIONS (AVAILABLE ON CITY WEBSITE OR AT THE ENGINEERING OFFICE).
- CITY APPROVAL OF PLANS DOES NOT RELIEVE THE DEVELOPER FROM RESPONSIBILITY FOR THE CORRECTION OF ANY ERROR AND/OR OMISSION DISCOVERED DURING THE CONSTRUCTION. ANY SUBSTANTIAL CHANGES TO THE APPROVED GRADING PLAN OCCASIONED BY FIELD CONDITIONS, SITE PLAN CHANGES, ETC. SHALL BE ACCOMPLISHED PRIOR TO FINAL GRADING, AND SHALL BE REVIEWED AND APPROVED BY THE CITY ENGINEER PRIOR TO IMPLEMENTING CHANGES IN THE FIELD.
- RETAINING WALLS WILL BE REQUIRED WHERE CUTTING OR FILLING ALONG PROPERTY LINES MAY CAUSE DAMAGE, BUT ALWAYS WHERE THE CUT OR FILL EXCEEDS ONE (1) VERTICAL FOOT.
- FREE STANDING AND RETAINING WALLS SHOWN ON THIS PLAN ARE FOR LOCATION AND ELEVATION CONTOURS ONLY. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE STRUCTURAL APPROVAL OF ANY WALLS OR RETAINING DEVICES SHOWN HEREON. A SEPARATE PLAN CHECK AND PERMIT MUST BE OBTAINED FROM THE CITY BUILDING DIVISION BEFORE THE CONSTRUCTION OF ANY WALLS.
- ALL ON-SITE SLOPES SHALL NOT EXCEED A GRADE OF TWO (2) HORIZONTAL TO ONE (1) VERTICAL (2:1), UNLESS STEEPER SLOPES ARE AUTHORIZED BY THE SOILS ENGINEER AND APPROVED BY THE CITY ENGINEER.
- A GRADING PERMIT MUST BE OBTAINED FROM THE CITY ENGINEERING DIVISION BY THE OWNER, DEVELOPER, OR GENERAL CONTRACTOR PRIOR TO CONDUCTING ANY GRADING, CLEARING, BRUSHING, OR GRUBBING ON NATURAL OR EXISTING GRADE THAT IS PREPARATORY TO GRADING.
- ALL ROUGH AND FINAL GRADING SHALL BE CERTIFIED TO BE IN COMPLIANCE WITH THE APPROVED GRADING PLAN AND CITY STANDARDS. THESE CERTIFICATIONS SHALL BE IN WRITING TO THE CITY ENGINEER AND SHALL BE SIGNED AND STAMPED BY A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR, SOILS OR GEOTECHNICAL ENGINEER, AND GRADING CONTRACTOR. THESE CERTIFICATIONS SHALL BE FILED WITH THE CITY PRIOR TO THE RELEASE OF OCCUPANCY.
- LANDSCAPING AND IRRIGATION PLANS, AS REQUIRED, SHALL BE APPROVED BY THE CITY DEPARTMENT OF COMMUNITY DEVELOPMENT 714-744-7220.
- PROVIDE STREET TREES AS REQUIRED BY THE CITY, NORTHERN DEPARTMENT OF PUBLIC WORKS, MAINTENANCE DIVISION, 714-532-6480 FOR STREET TREE LOCATION AND PLANTING STANDARDS.
- ALL FILL ONE (1) FOOT OR GREATER SHALL BE TESTED AND CERTIFIED AS TO RELATIVE COMPACTION.
- FILL SLOPES THREE (3) FEET OR GREATER IN HEIGHT SHALL BE COMPACTED TO THE FACE. THE SOILS ENGINEER SHALL INCLUDE SLOPE COMPACTION TESTS IN THE FINAL REPORT FOR ROUGH GRADING.
- ALL TRENCH BACKFILLS SHALL BE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE SOILS ENGINEER. THE SOILS ENGINEER SHALL PROVIDE WRITTEN APPROVAL OF UTILITY TRENCH BACKFILL PRIOR TO FINAL GRADING RELEASE.
- ALL FILL SHALL BE COMPACTED IN ACCORDANCE WITH THE CURRENT VERSION OF THE CALIFORNIA BUILDING CODE ADOPTED BY THE CITY OR RESPONSIBLE ENGINEERING RECOMMENDATIONS.
- IN THE EVENT THE LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR, SOILS ENGINEER, OR ENGINEERING GEOLOGIST WHO IS RESPONSIBLE FOR THE PROFESSIONAL SUPERVISION OF THAT PORTION OF THE GRADING WHICH IS WITHIN HIS AREA OF TECHNICAL COMPETENCE IS RELIEVED OF OR OTHERWISE TERMINATES HIS DUTIES PRIOR TO COMPLETION OF THE WORK SHOWN ON THESE PLANS HE SHALL REPORT THIS FACT IN WRITING TO THE CITY ENGINEER WITHIN 48 HOURS OF HIS TERMINATION. PERSON ASSUMING HIS DUTIES SHALL PERFORM ALL INVESTIGATIONS HE DEEM NECESSARY TO APPROVE THE ENTIRE WORK INCLUDING CERTIFYING THAT PREVIOUS REPORTS ARE IN CONFORMANCE WITH CITY GRADING ORDINANCE AND THE GRADING PERMIT. ACCEPTANCE OF THE PROJECT BY THE NEW CONSULTANT SHALL BE MADE IN WRITING TO THE CITY, AND SHALL INCLUDE HIS CERTIFICATION OF ALL WORK PREVIOUSLY ACCOMPLISHED AND HIS RESPONSIBILITY FOR THE REMAINDER OF THE PROJECT.
- REPAIR OR REPLACE ANY BROKEN OR DETERIORATED ADJACENT PUBLIC INFRASTRUCTURE INCLUDING DAMAGED PUBLIC SIDEWALK, DAMAGED CURB AND GUTTER, AND DAMAGED DRIVEWAY APRONS.
- ALL UTILITY LINES FROM PUBLIC STREET AND EASEMENT, INCLUDING POWER LINES AND TELECOMMUNICATION LINES SHALL BE CONSTRUCTED UNDERGROUND.
- A SEPARATE ENCROACHMENT PERMIT IS REQUIRED FOR WORK PERFORMED IN PUBLIC RIGHT-OF-WAY.
- A SEPARATE HAUL PERMIT IS REQUIRED FOR IMPORT/EXPORT OF EARTH MATERIAL. CONTACT TRAFFIC DIVISION AT 714-744-5536 FOR MORE DETAILS.

EASEMENT NOTES **

REFER TO A.L.T.A. AND TITLE REPORT FOR ADDITIONAL INFORMATION AND DETAILS:

- ③ AN EASEMENT FOR PIPELINE AND INCIDENTAL PURPOSES, RECORDED JULY 24, 1929 AS BOOK 293, PAGE 498 AND AUGUST 6, 1929 IN BOOK 301, PAGE 206, BOTH OF OFFICIAL RECORDS.

IN FAVOR OF: SANTA ANA VALLEY IRRIGATION COMPANY
AFFECTS: AS DESCRIBED THEREIN

NOTE: PLOTTED, EASEMENT AFFECTS EASTERLY 1.0 FOOT OF PORTION OF SAID PARCEL AS SHOWN ON THE SURVEY.

NOTICE TO CONTRACTOR

THE CONTRACTOR SHALL ASCERTAIN THE TYPE, LOCATION AND SIZE OF ALL UTILITIES, PIPES, AND/OR STRUCTURES AND SHALL BE RESPONSIBLE FOR DAMAGE TO ANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON.

IMPORTANT NOTICE

Section 4216 of the Government Code requires a Big Alert Identification Number be issued before a "Permit to Excavate" will be void. For your Big Alert ID, Number call 800-451-4311. Two working days before you dig.

TITLE REPORT **

THIS SURVEY AND EASEMENTS SHOWN HEREON ARE BASED ON INFORMATION CONTAINED IN THE PRELIMINARY TITLE REPORT PREPARED BY:

FIRST AMERICAN TITLE INSURANCE COMPANY
4380 LA JOLLA VILLAGE DRIVE, SUITE 110
SAN DIEGO, CA 92122
(619) 410-2151

COMMITMENT NUMBER: NCS-807670-SD
COMMITMENT DATE: AUGUST 01, 2016
TITLE OFFICER: TRIXY BROWN / JANICE TREANOR

LEGAL DESCRIPTION **

REAL PROPERTY IN THE CITY OF ORANGE, COUNTY OF ORANGE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

THE NORTH HALF OF LOT 27 OF TRACT 3086, AS SHOWN ON A MAP THEREOF RECORDED IN BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, RECORDS OF ORANGE COUNTY, CALIFORNIA.

EXCEPT THE WESTERLY 82 FEET,

ALSO EXCEPTING THE SOUTHERLY 75 FEET,

ALSO EXCEPTING THE EAST 2 FEET.

ALSO EXCEPTING A 15.00 FOOT BY 15.00 FOOT TRIANGULAR SHAPED SECTION FORMED BY THE INTERSECTION OF THE EAST LINE OF SAID NORTH HALF, ABOVE DESCRIBED, AND THE NORTH LINE OF LOT 27 OF TRACT NO. 3086, AS SHOWN ON A MAP RECORDED IN BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, RECORDS OF SAID ORANGE COUNTY.

FOR THE PURPOSES OF THIS DESCRIPTION, THE SAID EAST LINE IS INTENDED TO BE 40 FEET WESTERLY AS MEASURED AT RIGHT ANGLES FROM THE CENTERLINE OF MAIN STREET AS IT NOW EXISTS.

ALSO EXCEPTING THEREFROM THAT PORTION LYING EAST OF THE WEST LINE OF MAIN STREET AS CONVEYED TO THE CITY OF ORANGE BY DEED RECORDED APRIL 28, 2010 AS INSTRUMENT NO. 2010-200490 OF OFFICIAL RECORDS.

APN: 390-264-28

BENCH MARK **

ORANGE COUNTY B.M. NO. SA-323-91 ELEVATION = 167.593 FEET
(NAD83) 1995 ADJUSTMENT. YEAR LEVELED 2010

DESCRIBED BY OCS 2002 - FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "SA-323-91", SET IN THE NORTHEASTLY CORNER OF A 4 FOOT BY 4.5 FOOT CONCRETE CATCH BASIN. MONUMENT IS LOCATED IN THE NORTHWESTERLY CORNER OF THE INTERSECTION OF LA VETA AVENUE AND BATAVIA STREET, 100 FEET NORTHERLY OF THE CENTERLINE INTERSECTION OF BATAVIA STREET. MONUMENT IS LEVEL WITH THE SIDEWALK.

BASIS OF BEARINGS **

THE BEARING NORTH 00°05'30" EAST AS THE CENTERLINE OF MAIN STREET AS SHOWN ON TRACT NO. 3086 BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, COUNTY OF ORANGE, STATE OF CALIFORNIA, ESTABLISHED FROM FOUND MONUMENTS AT THE CENTERLINE INTERSECTIONS OF ALMOND AVENUE & MAIN STREET AND PALMYRA AVENUE & MAIN STREET WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

LEGEND

AB = AGGREGATE BASE
AC = ASPHALT CONCRETE
BFP = BACKFLOW PREVENTOR
BLK = CONCRETE BLOCK
BS = BACK OF SIDEWALK
CB = CATCH BASIN
CF = CURB FACE
CL = CENTERLINE
CLF = CHAIN LINK FENCE
CO = CLEANOUT
DS = ROOF DOWNSPOUT
EG = EDGE OF GUTTER
EP = EDGE OF PAVEMENT
FD = FOUND
FDC = FIRE DEPT. CONNECTION
FF = FINISHED FLOOR
FG = FINISHED GRADE
FH = FIRE HYDRANT
FL = FLOW LINE
FS = FINISHED SURFACE
GB = GRADE BREAK
GM = GAS METER
GR = TOP OF GRADE
GV = GAS VALVE
HP = HIGH POINT
HI = HEIGHT
ICV = IRRIGATION CONTROL VALVE
IP = IRON PIPE
LS = LIGHT STANDARD
L&T = LEAD & TAG
MH = MANHOLE
NG = NATURAL GROUND
N&T = NAIL & TAG
OHV = OVERHEAD WIRE
PB = PULL BOX
PCC = CONCRETE
P.V. = POST INDICATOR VALVE
PL = PROPERTY LINE
RD = ROOF DRAIN
RWH = REINFORCED CONCRETE
SCB = SIGNAL CONTROL BOX
SMH = SEWER MANHOLE
SPK = SPIKE
SW = SIDEWALK
TC = TOP OF CURB
TE = TRASH ENCLOSURE
TP = TELEPHONE POLE
TRAN = TRANSITION
TRANS = TRANSFORMER
TOW = TOP OF RETAINING WALL
TW = TOP OF WALL
UG = UNDERGROUND
UP = UTILITY POLE
VAR = VARIABLE
W = WASHER
WF = WROUGHT IRON FENCE
WM = WATER METER
WV = WATER VALVE
IL = NORTH
S = SOUTH
E = EAST
W = WEST
NLY = NORTHERLY
SLY = SOUTHERLY
ELY = EASTERLY
WLY = WESTERLY
N/O = NORTH OF
S/O = SOUTH OF
E/O = EAST OF
W/O = WEST OF
P/L = PROPERTY LINE
C = CENTERLINE
R/W = RIGHT OF WAY
Δ = DELTA
R = RADIUS
L = LENGTH
T = TANGENT
M = MEASURED DATA
C = CALCULATED DATA
(RAD) = RADIAL BEARING

SITE PLANNING DATA **

INFORMATION PROVIDED BY JOSEPH C. TRUXAW AND ASSOCIATES, INC. IN THE SITE INVESTIGATION REPORT DATED 08/09/16.

ZONING: NNU-24 (NEIGHBORHOOD MIXED USE)

SETBACKS:

BUILDING: NORTH = 10 FEET, SOUTH = 0 FEET,
EAST = 10 FEET, WEST = 0 FEET.

LANDSCAPE: NORTH = 10 FEET, SOUTH = 0 FEET,
EAST = 10 FEET, WEST = 0 FEET.

MAXIMUM BUILDING HEIGHT: 45 FEET OR THREE STORIES, WHICHEVER IS LESS.

FLOOD ZONE **

COMMUNITY NUMBER: 060228 0161J, EFFECTIVE DATE: DECEMBER 3, 2009

ZONE X (UNSHADED)

PROPERTY NOT IN A SPECIAL FLOOD HAZARD AREA, AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

INFORMATION OBTAINED FROM CERTIFIED FLOOD SYSTEMS, INC. ON 07/19/2016

RECORD DATA **

(R) = RECORD DATA PER TRACT NO. 3086, FILED IN BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS.

EARTHWORK QUANTITY ESTIMATES			
RAW CUT:	1,200	CU. YD.	
RAW FILL:	250	CU. YD.	
EXPORT:	950	CU. YD.	
THE ABOVE QUANTITIES DO NOT REFLECT ANY SHRINKAGE, SWELLING, SUBSIDENCE, STRIPPING LOSS, OVER-EXCAVATION, DEMOLITION LOSSES, FOOTING SPOOLS, OR ANY SPECIAL CONDITIONS THAT MAY BE SPECIFIED IN THE APPLICABLE GEOTECHNICAL REPORT(S) AND ARE FOR REFERENCE AND FEE PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING HIS OWN QUANTITIES FOR CONSTRUCTION AND CONTRACT PURPOSES.			

THESE QUANTITIES ARE APPROXIMATE ONLY AND DO NOT INCLUDE OVEREXCAVATION QUANTITIES, IMPORT OR EXPORT QUANTITIES.

UTILITY PROVIDERS

SEWER.....CITY OF ORANGE, 200 E. CHAPMAN AVENUE, ORANGE 92666, JEN SOLYKJAR (714) 744-5525
WATER.....CITY OF ORANGE-WATER DIV., 199 S. WATER STREET, ORANGE 92668, PUBLIC WORKS (714) 288-2475
STORM DRAIN.....CITY OF ORANGE, 200 E. CHAPMAN AVENUE, ORANGE 92666, JEN SOLYKJAR (714) 744-5525
ELECTRIC.....S.O. CALIF. EDISON, P.O. BOX 11982, SANTA ANA 92711, PLANNING (714) 973-5454
GAS.....S.O. CAL. GAS CO., 1919 S. STATE COLLEGE BLVD., ANAHEIM 92806, ADALBERTO RODRIGUEZ (714) 634-5069
CABLE.....TIME WARNER CABLE, 7142 CHAPMAN AVENUE, GARDEN GROVE 92841, DAVE DOLNEY (714) 591-4869
PHONE.....AT&T, 3939 E. CORONADO ST. 2ND. FLOOR, ANAHEIM 92807, SUSAN BLACKBURN (714) 507-3526

ROADWAY.....CITY OF ORANGE, 300 E. CHAPMAN AVENUE, ORANGE 92666, JACKI SCOTT (714) 744-5535

PRO = PROPORTIONATE MEASUREMENT
(210.00' R) = RECORD DATA
210.00' M. = MEASURED DATA
210.00' PRO. = PROKATED DATA
210.00' C. = CALCULATED DATA
(477.00' R) = EXISTING ELEVATION
427.00' TC = DESIGN ELEVATION

--- CATV --- = CABLE TV LINE
--- E --- = ELECTRICAL LINE
--- G --- = GAS LINE
--- GB --- = GRADE BREAK LINE
--- R --- = EDGE LINE
--- S --- = SEWER LINE
--- SD --- = STORM DRAIN LINE
--- T --- = TELEPHONE LINE
--- W --- = WATER LINE

SYMBOLS

⊠ FIRE HYDRANT
○ STREET LIGHT
⊠ TRAFFIC SIGNAL
⊠ TRAFFIC SIGNAL ARM & POLE
⊠ LIGHT STANDARD
⊠ UTILITY POLE
⊠ GUY WIRE & ANCHOR

WM WATER METER
GM GAS METER
WV WATER VALVE
GV GAS VALVE
PB PULL BOX
IM GRATE INLET
S SIGN
X VENT

PAV. TREE, TRUNK DIAMETER SHOWN
B.P. TREE, SPECIES VARIES, TRUNK DIAMETER SHOWN

SOURCE OF BOUNDARY & EASEMENT INFORMATION.

THE TOPOGRAPHIC INFORMATION SHOWN ON THESE PLANS WERE TAKEN FROM THE PLAN REFERENCED BELOW.

REV. #1, FEBRUARY 8, 2017
TRUXAW AND ASSOCIATES, INC.
1915 W ORANGEWOOD AVE. SUITE 101
ORANGE, CA 92668
(714) 935-0265
JOB # CFA16046

SHEET #	TITLE
1	TITLE SHEET
2	CONCEPTUAL GRADING PLAN & DRAINAGE PLAN
3	CONSTRUCTION NOTES
4	CONCEPTUAL UTILITY PLAN
* 1	ALTA SURVEY (TITLE SHEET)
* 2	ALTA SURVEY (BOUNDARY)
* 3	ALTA SURVEY (TOPO)
* FOR REFERENCE ONLY	

THIS PLAN IS:
PRELIMINARY
(NOT FOR CONSTRUCTION)

DEVELOPER

CHICK-FIL-A

5200 BUFFINGTON ROAD
ATLANTA, GEORGIA 30349

ARCHITECT

CRHO ARCHITECTS

195 SOUTH "C" STREET, SUITE 200
TUSTIN, CA 92780
(714) 832-1834 FAX (714) 832-1910

SOILS ENGINEER

THESE PLANS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE GEOTECHNICAL RECOMMENDATIONS MADE BY:

GILES ENGINEERING ASSOCIATES, INC.

1965 NORTH MAIN STREET
ORANGE, CA 92665

PH (714) 279-0817 FAX (714) 279-9687

PROJECT No. 2G-1610007

REPORT DATE: DECEMBER 14, 2016

CONTRACTOR SHALL OBTAIN A COPY OF THIS REPORT AND ALL ADDENDUM AND FOLLOW THE RECOMMENDATIONS THEREIN. NOTIFY TRUXAW AND ASSOCIATES OF ANY DISCREPANCIES OR FIELD CHANGES PRIOR TO CONSTRUCTION.

SIGNATURE - SOILS ENGINEER

DATE



Chick-fil-A

5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:

Mark Date By

△

Mark Date By

△

Mark Date By

△

Seal



Prepared by:



JOSEPH C. TRUXAW
& ASSOCIATES, INC.

Civil Engineers and
Land Surveyors

1915 W ORANGEWOOD AVE.
SUITE 101
ORANGE, CA 92668
(714) 935-0265
(714) 935-0106 (FAX)

STORE
MAIN STREET &
ALMOND AVE.

202 S. MAIN ST.
ORANGE, CA

SHEET TITLE
TITLE SHEET

VERSION: H-V6
ISSUE DATE: 12-2015

Job No. : CFA16046

Store : 04003

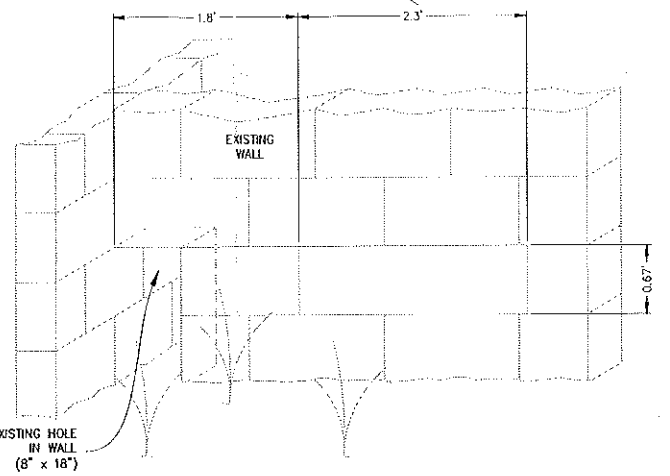
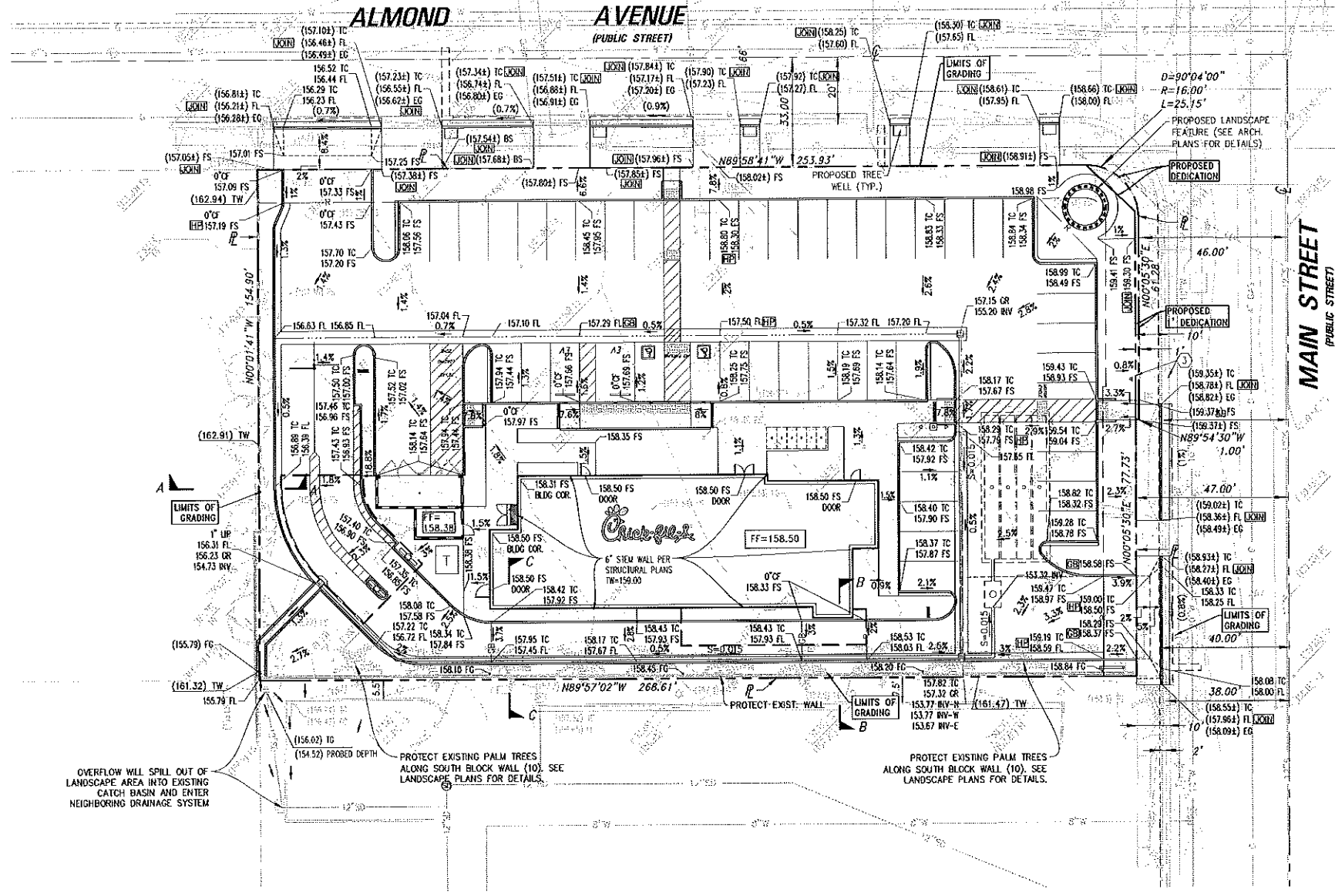
Date : 01-16-19

Drawn By : G/PJS

Checked By: SMH

Sheet

1 of 4



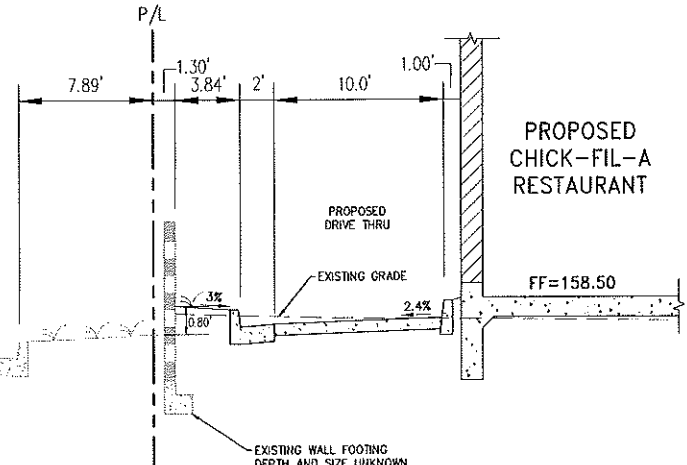
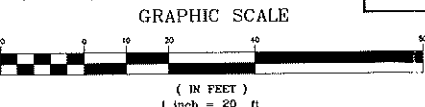
DETAIL "A"
NOT TO SCALE

EASEMENT NOTES.
REFER TO A.L.T.A. AND TITLE REPORT FOR ADDITIONAL INFORMATION AND DETAILS:
③ AN EASEMENT FOR PIPELINE AND INCIDENTAL PURPOSES, RECORDED JULY 24, 1929 AS BOOK 293, PAGE 498 AND AUGUST 8, 1929 IN BOOK 301, PAGE 206, BOTH OF OFFICIAL RECORDS.
IN FAVOR OF: SANTA ANA VALLEY IRRIGATION COMPANY
AFFECTS: AS DESCRIBED THEREIN
NOTE: PLOTTED, EASEMENT AFFECTS EASTERLY 1.0 FOOT OF PORTION OF SAID PARCEL AS SHOWN ON THE SURVEY.

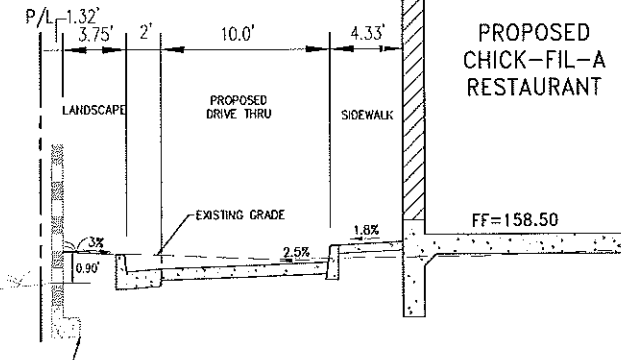
BENCH MARK
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(NAVD 83) 1995 ADJUSTMENT, YEAR LEVELED 2010
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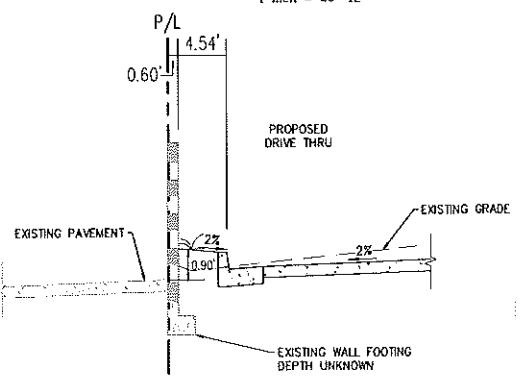
SEE TITLE SHEET FOR LEGEND AND SYMBOLS



SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE

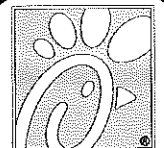


SECTION A-A
NOT TO SCALE

THIS PLAN IS:
PRELIMINARY
(NOT FOR CONSTRUCTION)

NOTICE TO CONTRACTOR
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IMPORTANT NOTICE
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5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:
Mark Date By

Mark Date By

Mark Date By



Prepared by:
JOSEPH C. TRUXAW & ASSOCIATES, INC.
Civil Engineers and
Land Surveyors
1915 W ORANGEMOOD AVE.
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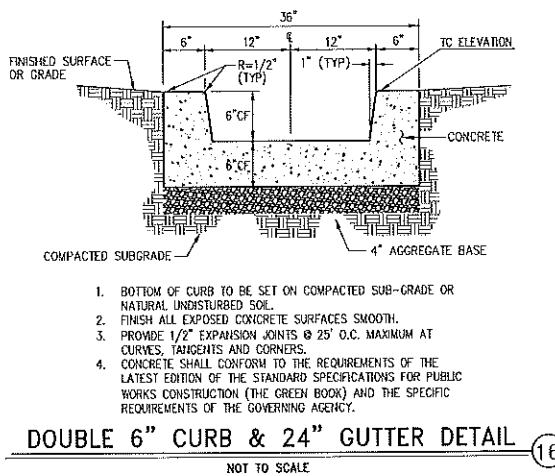
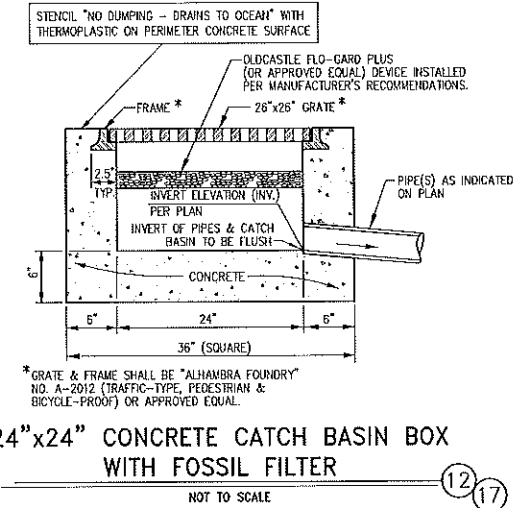
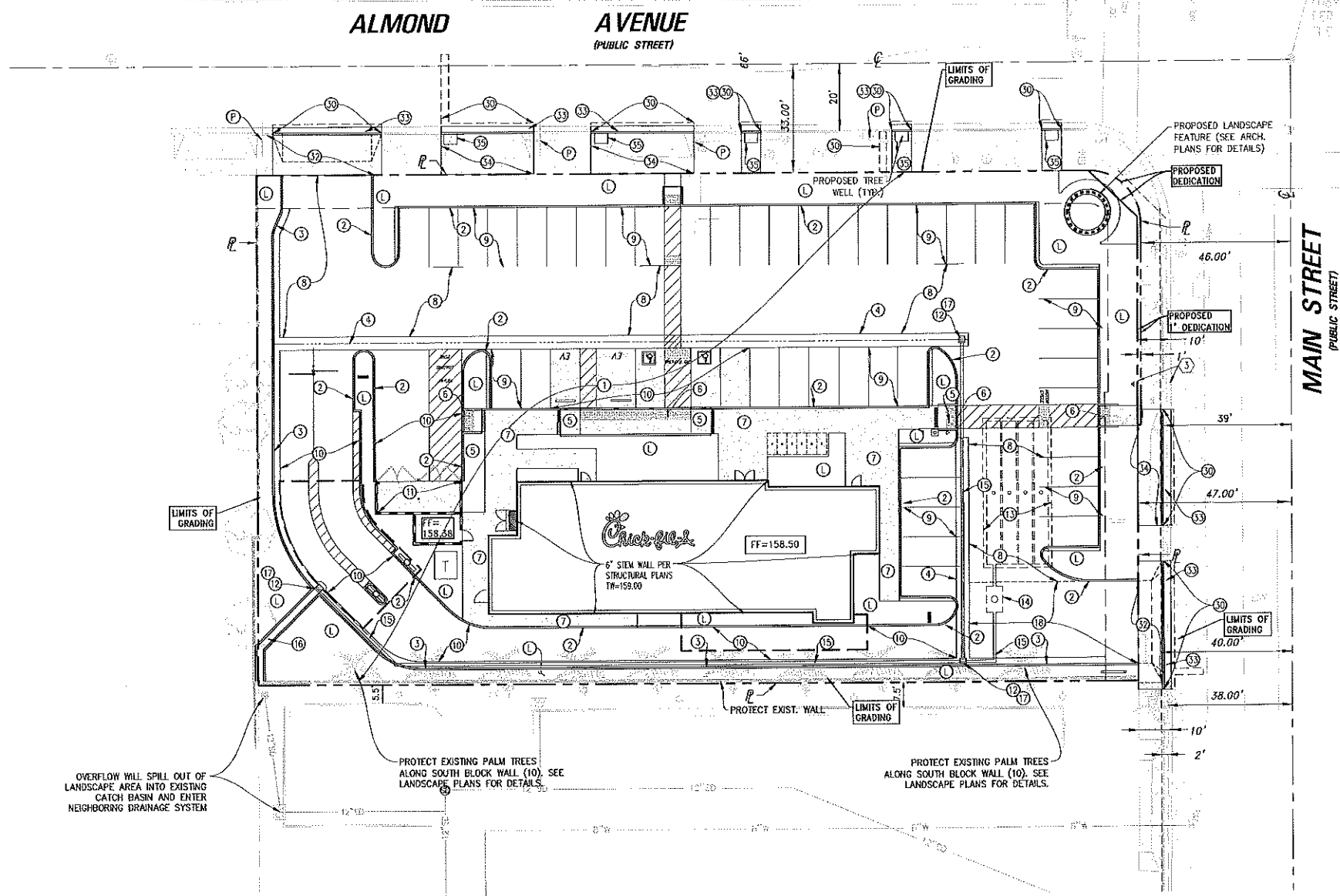
202 S. MAIN ST.
ORANGE, CA
SHEET TITLE
CONCEPTUAL
GRADING &
DRAINAGE PLAN

VERSION: H-V6

ISSUE DATE: 12-2015

Job No. : CFA16046
Store : 04003
Date : 01-16-19
Drawn By : G/PJS
Checked By: SMH

Sheet



CONSTRUCTION NOTES - ON-SITE

- 1 SAWCUT & REMOVE EXIST. AC PAVING, CONCRETE CURBS, ETC.
 - 2 CONSTRUCT CURB; CF=6" UNLESS OTHERWISE SHOWN ON PLANS.
 - 3 CONSTRUCT 6" CURB & 24" GUTTER.
 - 4 CONSTRUCT 48" V-GUTTER
 - 5 CONSTRUCT CONCRETE HANDICAP ACCESS RAMP IN ACCORDANCE WITH CA TITLE 24 REQUIREMENTS, ADA GUIDELINES, CITY STANDARDS AND ARCHITECTURAL DETAILS.
 - 6 PLACE TRUNCATED DOWNS PER ADA REQUIREMENTS.
 - 7 CONSTRUCT CONCRETE SIDEWALK/HARDSCAPE.
 - 8 PAVE WITH 3-INCHES AC OVER 6-INCHES AB OVER COMPACTED SUBGRADE. (DRIVE LANES).
 - 9 PAVE WITH 3-INCHES AC OVER 4-INCHES AB OVER COMPACTED SUBGRADE. (PARKING STALLS).
 - 10 PAVE WITH 6-INCHES PCC WITH #3 REINFORCING BARS @ 18" O.C. EACH WAY OVER 4-INCHES AB OVER COMPACTED SUBGRADE.
 - 11 COVERED TRASH ENCLOSURE/STORAGE ROOM AND CONCRETE APRON PER ARCHITECTURAL DETAILS.
 - 12 CONSTRUCT 24" X 24" GRATED INLET.
 - 13 INSTALL CULTEC RECHARGERS (20.83' X 45.50', 947.77 S.F.)
 - 14 INSTALL CULTEC STORMFILTER (5.00' X 8.00', 40.00 S.F.)
 - 15 INSTALL 10-INCH PVC SDR-35 PIPE WITH FITTINGS.
 - 16 CONSTRUCT 24" WIDE DOUBLE CURB & GUTTER
 - 17 INSTALL OLDCASTLE FLOGARD FOSSIL FILTER INSERT AT ALL CATCH BASINS
 - 18 PAVE WITH 3-INCHES AC OVER 8-INCHES AB OVER COMPACTED SUBGRADE. (FIRE ACCESS LANE) SEE FIRE MASTER PLAN FOR FIRE ACCESS LANE DETAILS.
- L LANDSCAPE AREA PER SEPARATE LANDSCAPE PLANS.
- *** PAVEMENT SECTIONS SHALL COMPLY WITH GEOTECHNICAL RECOMMENDATIONS PROVIDED IN THE GEOTECHNICAL REPORT BY GILES ENGINEERING DATED 5-18-18
- *** PAVEMENT SECTION SHALL COMPLY WITH GEOTECHNICAL RECOMMENDATION PROVIDED IN THE LETTER PROVIDED BY GILES ENGINEERING DATED 1-8-19.

CONSTRUCTION NOTES - OFF-SITE

- 30 SAWCUT & REMOVE INTERFERING SECTIONS OF AC PAVEMENT, CONCRETE DRIVEWAY, CURB & GUTTER, SIDEWALK, ETC.
- 31 CONSTRUCT COMMERCIAL DRIVEWAY APRON PER CITY OF ORANGE STD. PLAN 115; W=25', T=0'.
- 32 CONSTRUCT COMMERCIAL DRIVEWAY APRON WITH DEPRESSED SIDEWALK PER CITY OF ORANGE STD. PLAN 115; W=25', T=3'.
- 33 CONSTRUCT CURB & GUTTER PER CITY OF ORANGE STD. PLAN 117; TYPE A.
- 34 CONSTRUCT SIDEWALK PER CITY OF ORANGE STD. PLAN 118.
- 35 CONSTRUCT TREE WELL PER CITY OF ORANGE STD.

*** CONTRACTOR SHALL APPLY FOR AND OBTAIN AN ENCROACHMENT PERMIT FOR IMPROVEMENTS WITHIN THE PUBLIC R/W.

EASEMENT NOTES

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PRELIMINARY**

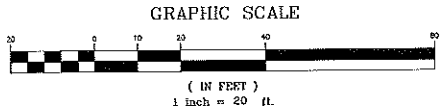
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5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:

Mark	Date	By
△		
△		
△		
△		

Seal

Prepared by:

JOSEPH C. TRUXAW & ASSOCIATES, INC.
Civil Engineers and
Land Surveyors
1915 W ORANGECWOOD AVE.
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STORE
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ALMOND AVE.

202 S. MAIN ST.
ORANGE, CA

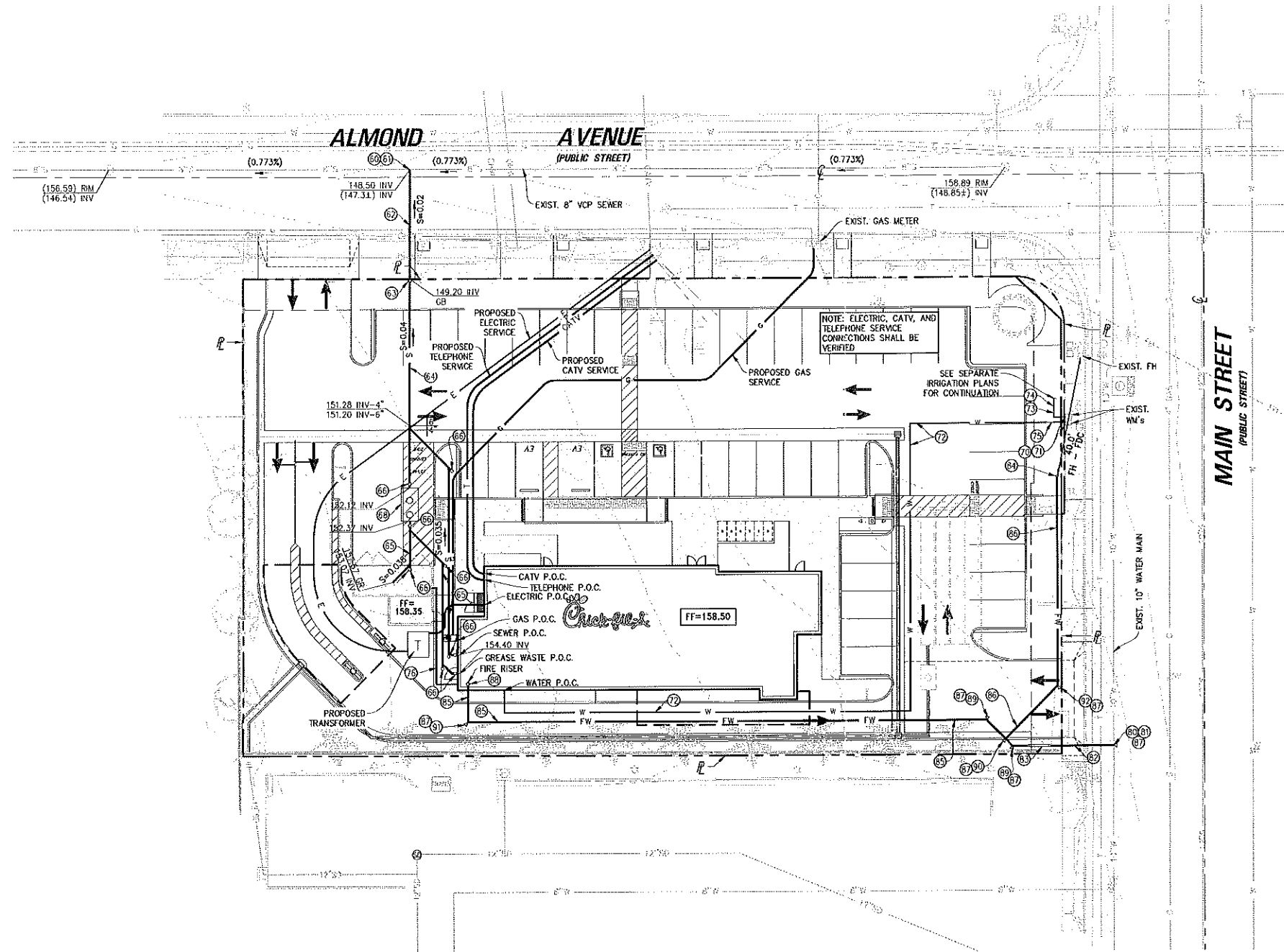
SHEET TITLE
CONSTRUCTION
NOTES

VERSION: H-V6
ISSUE DATE: 12-2015

Job No. : CFA16046
Store : 04003
Date : 08-16-19
Drawn By : GJP/JS
Checked By: SMH

Sheet

3 of 4



THIS PLAN IS:
PRELIMINARY
(NOT FOR CONSTRUCTION)

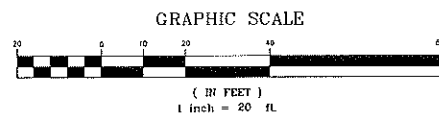
BENCH MARK

ORANGE COUNTY B.M. NO. SA-323-91 ELEVATION = 167.593 FEET
(NAVD 88) 1995 ADJUSTMENT, YEAR LEVELED 2010

DESCRIBED BY OCS 2002 - FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK
STAMPED "SA-323-91", SET IN THE NORTHEASTLY CORNER OF A 4 FOOT BY
4.5 FOOT CONCRETE CATCH BASIN. MONUMENT IS LOCATED IN THE
NORTHEASTLY CORNER OF THE INTERSECTION OF LA VETA AVENUE AND BATAMIA
STREET, 100 FEET NORTHERLY OF THE CENTERLINE INTERSECTION OF BATAMIA
STREET. MONUMENT IS LEVEL WITH THE SIDEWALK.

BASIS OF BEARINGS

THE BEARING NORTH 00°05'30" EAST AS THE CENTERLINE OF MAIN STREET AS
SHOWN ON TRACT NO. 3086 BOOK 94, PAGE 37 OF MISCELLANEOUS MAPS, COUNTY
OF ORANGE, STATE OF CALIFORNIA, ESTABLISHED FROM FOUND MONUMENTS AT THE
CENTERLINE INTERSECTIONS OF ALMOND AVENUE & MAIN STREET AND PALMYRA
AVENUE & MAIN STREET WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.



SEE TITLE SHEET FOR LEGEND AND SYMBOLS

CONSTRUCTION NOTES - SEWER

- 60 POTHOLE AND VERIFY THE EXISTENCE, LOCATION, DEPTH, MATERIAL, SIZE, AND CONDITION OF EXISTING SEWER MAIN. REPORT FINDINGS TO TRUXAW & ASSOCIATES PRIOR TO CONSTRUCTION.
- 61 CONNECT TO EXISTING 8" VCP SEWER MAIN PER CITY OF ORANGE STD. PLAN 207, TYPE A.
- 62 PLACE 6" SEWER LATERAL PER CITY OF ORANGE STD. PLAN 206.
- 63 CONSTRUCT 6" SEWER CLEAN-OUT PER CITY OF ORANGE STD. PLAN 238.
- 64 PLACE 6" PVC SDR-35 SEWER LINE WITH FITTINGS PER CPC REQUIREMENTS.
- 65 CONSTRUCT 4" PVC SDR-35 SEWER LINE WITH FITTINGS PER CPC REQUIREMENTS.
- 66 INSTALL CLEAN-OUT, SIZE TO MATCH DOWNSTREAM PIPE SIZE.
- 67 DRAIN IN COVERED TRASH ENCLOSURE PER PLUMBING PLANS.
- 68 GREASE INTERCEPTOR PER PLUMBING PLANS. (BUILDING)

WATER (DOMESTIC & IRRIGATION)

- 70 VERIFY THE EXISTENCE, LOCATION, SIZE, AND CONDITION OF THE EXISTING WATER METERS. REPORT FINDINGS TO TRUXAW & ASSOCIATES PRIOR TO CONSTRUCTION.
1.5" WATER METER REQUIRED FOR DOMESTIC.
1" WATER METER REQUIRED FOR IRRIGATION.
REPLACE IF NECESSARY.
- 71 CONNECT TO EXISTING WATER METER.
- 72 PLACE 2" PVC SCH-80 WATER LINE WITH FITTINGS (DOMESTIC).
- 73 INSTALL 1" BACKFLOW PREVENTION DEVICE PER CITY OF ORANGE WATER DIV. STD. PLAN OWD-306. (IRRIGATION)
- 74 PLACE 1" PVC SCH-80 WATER LINE WITH FITTINGS (IRRIGATION).
- 75 INSTALL 2" BACKFLOW PREVENTION DEVICE PER CITY OF ORANGE WATER DIV. STD. (DOMESTIC)
- 76 PLACE 0.75" PVC SCH 80 WATER LINE.

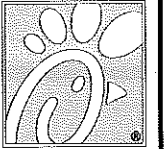
WATER (FIRE SERVICE)

- 80 POTHOLE AND VERIFY THE EXISTENCE, LOCATION, DEPTH, MATERIAL, SIZE, AND CONDITION OF EXISTING 10" WATER MAIN. REPORT FINDINGS TO TRUXAW & ASSOCIATES PRIOR TO CONSTRUCTION.
- 81 HOT-TAP CONNECTION TO EXISTING 10" WATER MAIN PER CITY OF ORANGE WATER DIV. STD. PLAN OWD-107.
- **82 CONSTRUCT 6" DUCTILE IRON PIPE WATER LINE WITH FITTINGS PER CITY OF ORANGE WATER DIVISION STANDARDS.
- **83 INSTALL 6" DOUBLE CHECK DETECTOR ASSEMBLY PER CITY OF ORANGE WATER DIV. STD. PLAN OWD-305.
- 84 INSTALL FIRE DEPARTMENT CONNECTION PER CITY OF ORANGE WATER DIVISION REQUIREMENTS.
- **85 PLACE 6" PVC C-900 WATER LINE WITH FITTINGS. (USE 1-PIECE STAINLESS STEEL RISER WITHIN 5 FEET OF BUILDING FOOTPRINT)
- **86 PLACE 4" PVC C-900 WATER LINE WITH FITTINGS.
- 87 CONSTRUCT CONCRETE THRUST BLOCK PER CITY OF ORANGE WATER DIV. STD. PLAN OWD-109.
- 88 CONNECT TO FIRE RISER.
- 89 INSTALL 6-INCH 45° CAST IRON ELBOW
- 90 INSTALL 6" X 4" X 6" CAST IRON TEE
- 91 INSTALL 6-INCH 90° CAST IRON ELBOW
- 92 INSTALL 4-INCH 45° CAST IRON ELBOW

** FIRE PROTECTION PIPE LINE AND SPRINKLERS IN THE BUILDING TO BE DESIGNED AND PERMITTED BY SEPARATE PLANS. PRIOR TO CONSTRUCTION OF FIRE WATER SYSTEM SHOWN ON THIS PLAN, CONTRACTOR SHALL VERIFY VIA HYDRAULIC CALCULATIONS ACCEPTABLE TO THE FIRE DEPARTMENT THAT SIZE OF FIRE SERVICE & DETECTOR CHECK ARE OF SUFFICIENT SIZE TO SERVE BUILDING. (SIZE SHOWN FOR PLAN CHECK & BID PURPOSES ONLY).

DRY UTILITIES

PROPOSED ELECTRIC, TELEPHONE, CABLE TV, AND GAS LINES ARE SHOWN HEREON FOR COORDINATION PURPOSES. CONTRACTOR TO VERIFY POINTS OF CONNECTION AND CONSTRUCT PROPOSED SERVICE LINES IN ACCORDANCE WITH SERVICE PLANNING DOCUMENTS PREPARED BY EACH RESPECTIVE UTILITY COMPANY.



Chick-fil-A

5200 Buffington Rd.
Atlanta Georgia,
30349-2998

Revisions:

Mark Date By

△

Mark Date By

△

Mark Date By

△

Seal



Prepared by:



**JOSEPH C. TRUXAW
& ASSOCIATES, INC.**

Civil Engineers and
Land Surveyors

1915 W ORANGEWOOD AVE.
SUITE 101
ORANGE, CA 92668
(714) 935-0265
(714) 935-0106 (FAX)

STORE
MAIN STREET &
ALMOND AVE.

202 S. MAIN ST.
ORANGE, CA

SHEET TITLE
CONCEPTUAL
UTILITY PLAN

VERSION: H-V6
ISSUE DATE: 12-2015

Job No. : CFA16046

Store : 04003

Date : 01-16-19

Drawn By : G/PJS

Checked By: SMH

Sheet

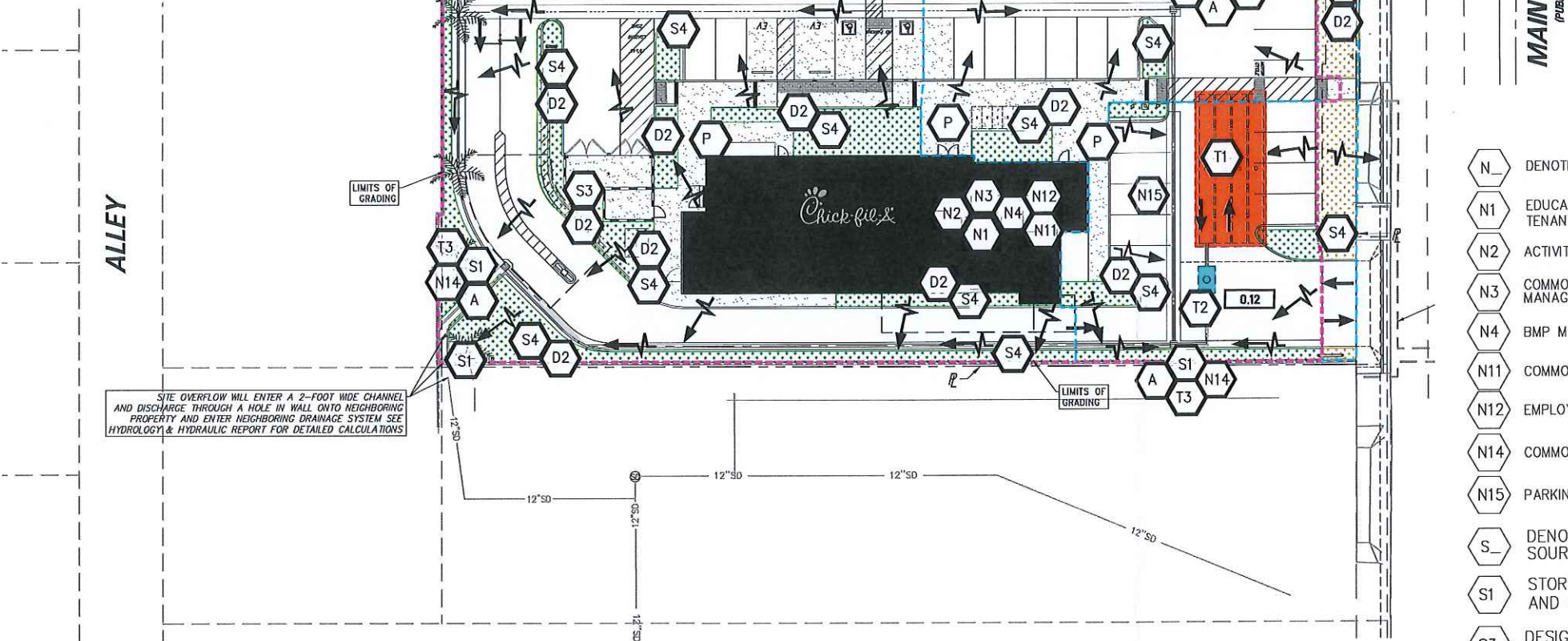
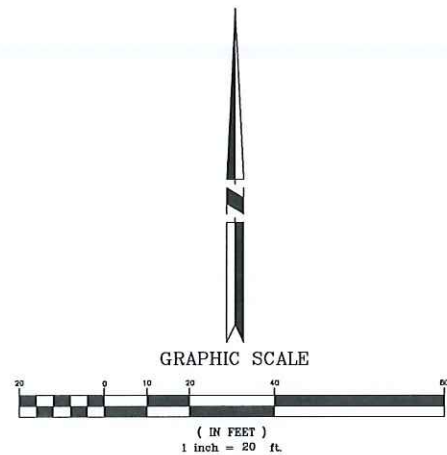
4 of 4

NOTICE TO CONTRACTOR

THE CONTRACTOR SHALL ASCERTAIN THE TRUE VERTICAL AND HORIZONTAL LOCATION AND SIZE OF ALL UTILITIES, PIPES, AND/OR STRUCTURES AND SHALL BE RESPONSIBLE FOR DAMAGE TO ANY PUBLIC OR PRIVATE UTILITIES, SHOWN OR NOT SHOWN HEREON.

IMPORTANT NOTICE

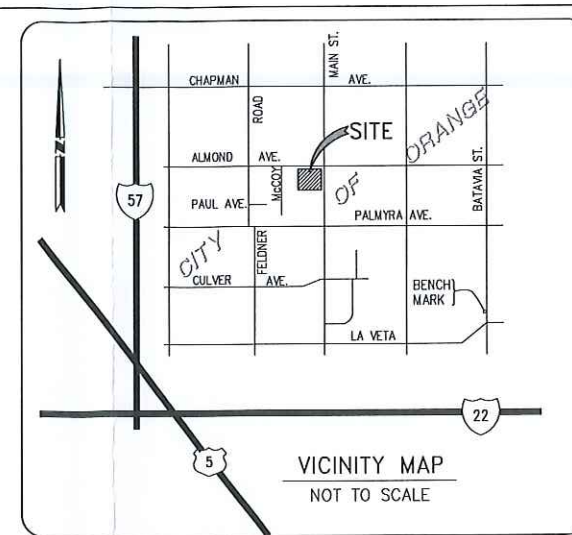
Section 4216 of the Government Code requires a Dig Alert Identification Number be issued before a "Permit to Excavate" will be valid. For your Dig Alert ID, Number call Underground Service Alert CALL 811 Two working days before you dig.



SELF TREATING AREAS (STA)					
	SURFACE TYPE	AREA	PERVIOUS	IMPERVIOUS	PROPOSED LID BMP
STA	LANDSCAPE	4,356 sf= 0.010ac	3,615 sf= 0.083ac	83.0% 741 sf= 0.015ac	17.0% NONE
DRAINAGE MANAGEMENT AREAS (DMA)					
	SURFACE TYPE	AREA	PERVIOUS	IMPERVIOUS	PROPOSED LID BMP
DMA-1	ROOF - PAVEMENT	37,358 sf= 0.86ac	4,942 sf= 0.11ac	13.2% 32,416 sf= 0.75ac	UNDERGROUND INFILTRATION SYSTEM
	LANDSCAPE				

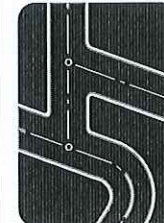
SYSTEM	V _{LID} (cf)		
	TREATED AREA (acres)	V _{LID} (cf)	VOLUME PROVIDED (cf)
CULTEC RECHARGER MODEL # 330XLHD (24 UNITS, 4 X 6)	0.858	1,993	2,122.4
			FOOTPRINT (20.83' X 45.50') 947.77 S.F.

- LEGEND**
- N₁ DENOTES NON-STRUCTURAL MEASURES
- N₁ EDUCATION FOR PROPERTY OWNERS, TENANTS AND OCCUPANTS
- N₂ ACTIVITY RESTRICTIONS
- N₃ COMMON AREA LANDSCAPE MANAGEMENT
- N₄ BMP MAINTENANCE
- N₁₁ COMMON AREA LITTER CONTROL
- N₁₂ EMPLOYEE TRAINING
- N₁₄ COMMON AREA CATCH BASIN INSPECTION
- N₁₅ PARKING AND DRIVE AISLE SWEEPING
- S₁ DENOTES ROUTINE STRUCTURAL SOURCE CONTROL BMPs
- S₁ STORM DRAIN SYSTEM STENCILING AND SIGNAGE
- S₃ DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS
- S₄ EFFICIENT IRRIGATION SYSTEMS AND LANDSCAPE DESIGN
- A ON-SITE STORM DRAIN INLETS
- D₂ LANDSCAPE/ OUTDOOR PESTICIDE USE
- P PLAZAS, SIDEWALKS, AND PARKING LOTS
- T₁ DENOTES TREATMENT BMPs
- T₁ INFILTRATION SYSTEM (INF-7) (CULTEC RECHARGER 330XLHD)
- T₂ PRETREATMENT SYSTEM (CULTEC STORMFILTER 330)
- T₃ CATCH BASIN INSERT (FLOGARD FOSSIL FILTER INSERT)
- PATTERN OF FLOW
- LIMITS OF DISTURBED AREA FOR THIS WQMP
- PRE-TREATMENT SYSTEM
- INFILTRATION SYSTEM
- PERVIOUS AREA
- SELF-TREATING AREA
- PROPOSED BUILDING
- IMPERVIOUS AREA
- LIMITS OF SUBAREA
- DRAINAGE BOUNDARY
- A-1 SUB-AREA
- 0.497 AREA IN ACRES



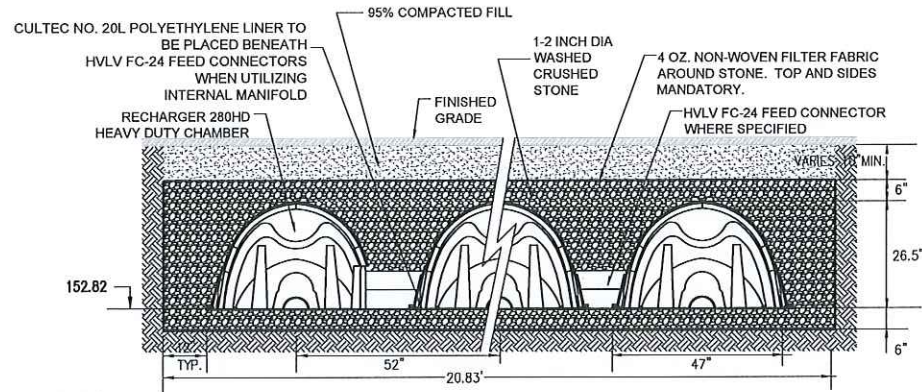
NO.	REVISIONS	DATE

Prepared by:
Joseph C. Truxaw and Associates, Inc.
Civil Engineers and Land Surveyors
1915 W ORANGEWOOD AVE., SUITE 101, ORANGE, CA 92668
(714) 935-0265 (714) 935-0106 (fax)



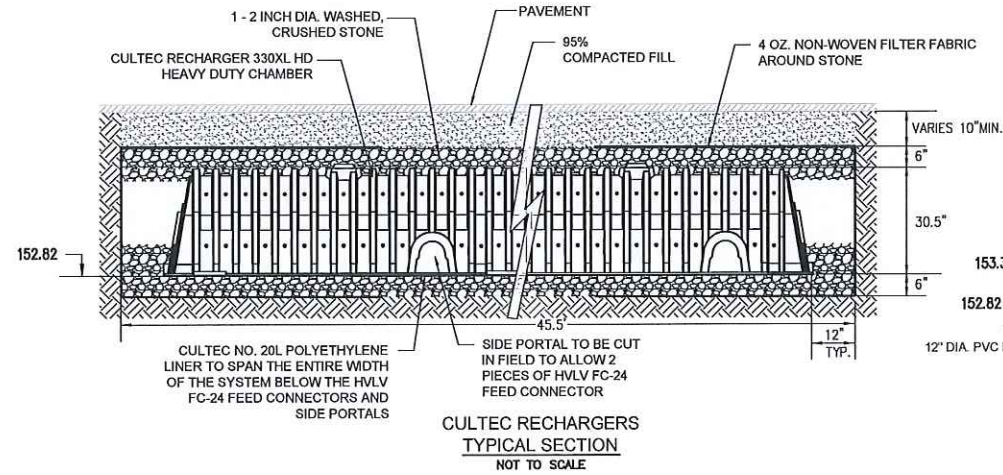
WATER QUALITY MANAGEMENT PLAN
CHICK-FIL-A RESTAURANT No. 4003
202 S. MAIN STREET
ORANGE, STATE OF CALIFORNIA

DATE 3-18-19
DRAWN BY PJS
CHECKED BY SMH
JOB NO. CFA16046
SHEET NO. 1

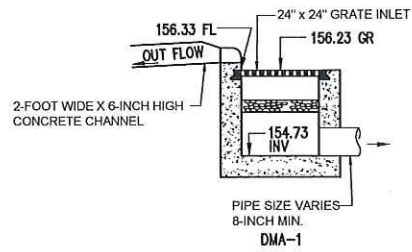


GENERAL NOTES
RECHARGER 280HD BY CULTEC, INC. OF BROOKFIELD, CT. STORAGE PROVIDED = 6.08 CF/FT PER DESIGN UNIT. REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES. USE RECHARGER 280HD HEAVY DUTY FOR TRAFFIC AND/OR H-25 APPLICATIONS.

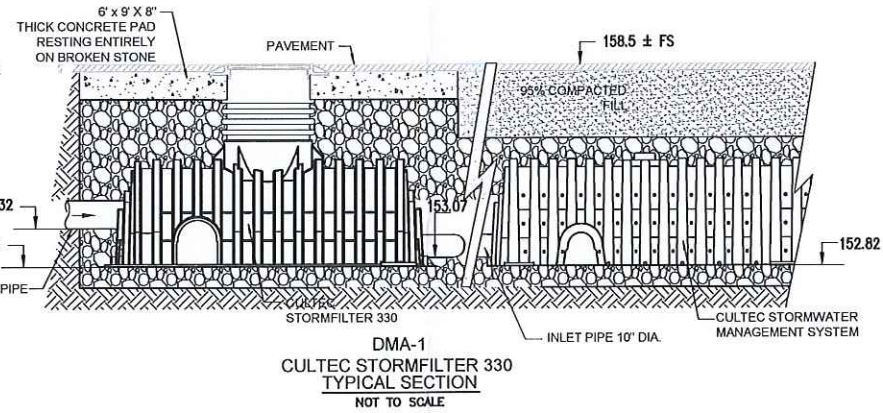
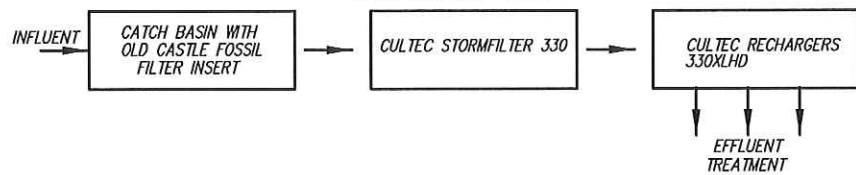
ALL RECHARGER 330XL HD HEAVY DUTY UNITS ARE MARKED WITH A COLOR STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER. ALL RECHARGER 280HD CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.



**CULTEC RECHARGERS
TYPICAL SECTION
NOT TO SCALE**



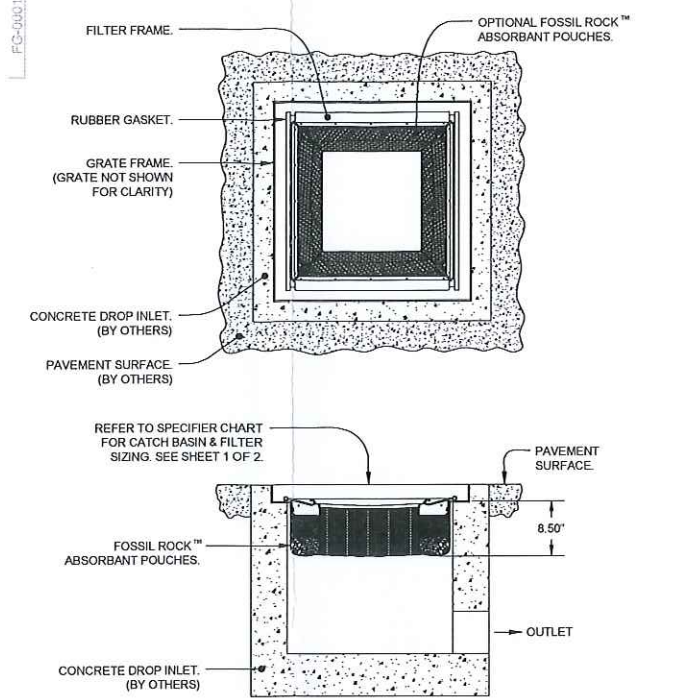
TREATMENT TRAIN



**DMA-1
CULTEC STORMFILTER 330
TYPICAL SECTION
NOT TO SCALE**

**NO DUMPING
DRAINS TO OCEAN**

S2 STORM DRAIN SYSTEM STENCILING AND SIGNAGE



REFER TO SPECIFIER CHART FOR CATCH BASIN & FILTER SIZING. SEE SHEET 1 OF 2.

FloGard®
Catch Basin Insert Filter
Grated Inlet Style

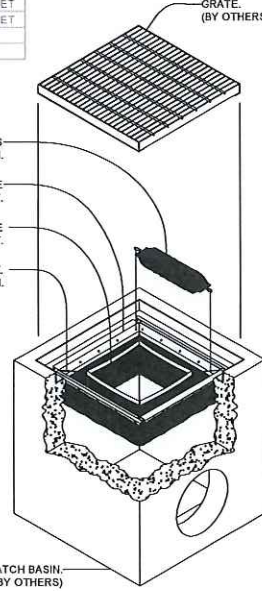
Oldcastle®
Stormwater Solutions
7721 Southpark Plaza, Suite 200 | Littleton, CO 80120 | Ph: 800.579.8819 | oldcastlestormwater.com
THIS DOCUMENT IS THE PROPERTY OF OLDCASTLE STORMWATER SOLUTIONS, INC. IT IS TO BE USED FOR THE PROJECT AND SITE ONLY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. WITHOUT PERMISSION IN WRITING FROM OLDCASTLE STORMWATER SOLUTIONS, INC. ALL RIGHTS ARE RESERVED.

MODEL	INLET ID	GRATE OD	COMMENTS
FF-12D	12" X 12"	15" X 15"	GRATED INLET
FF-16D	16" X 16"	18" X 18"	GRATED INLET
FF-18D	18" X 18"	20" X 20"	GRATED INLET
FF-1836SD	18" X 36"	18" X 36"	GRATED INLET
FF-1836DGO	18" X 36"	18" X 40"	COMBINATION INLET
FF-24D	24" X 24"	24" X 24"	GRATED INLET
FF-2436SD	24" X 36"	24" X 40"	GRATED INLET
FF-24DGO	24" X 24"	18" X 36"	COMBINATION INLET
FF-2436DGO	24" X 36"	24" X 40"	COMBINATION INLET
FF-36D (2 PIECE)	36" X 36"	36" X 40"	GRATED INLET
FF-3648D (2 PIECE)	36" X 48"	40" X 40"	GRATED INLET

- NOTES
1. Filter insert shall have a high flow bypass feature.
 2. Filter support frame shall be constructed from stainless steel Type 304.
 3. Filter medium shall be Fossil Rock™, installed and maintained in accordance with manufacturer specifications.
 4. Storage capacity reflects 60% of maximum solids collection prior to impeding filtering bypass.

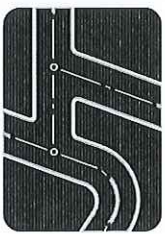
FloGard®
Catch Basin Insert Filter
Grated Inlet Style

Oldcastle®
Stormwater Solutions
7721 Southpark Plaza, Suite 200 | Littleton, CO 80120 | Ph: 800.579.8819 | oldcastlestormwater.com
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NO.	REVISIONS	DATE

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1915 W ORANGEWOOD AVE., SUITE 101, ORANGE, CA 92668
(714) 935-0265 (714) 935-0106 (fax)



**WATER QUALITY MANAGEMENT PLAN
DETAILS**
CHICK-FIL-A RESTAURANT No. 4003
202 S. MAIN STREET
ORANGE, STATE OF CALIFORNIA

DATE 3-18-19
DRAWN BY PJS
CHECKED BY SMH
JOB NO. CFA16046
SHEET NO. 2

VIII. Educational Materials

Refer to the City's website www.cityoforange.org or the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Attach *only* the educational materials specifically applicable to the project.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	<input checked="" type="checkbox"/>	Tips for the Automotive Industry	<input type="checkbox"/>
Tips for Car Wash Fund-raisers	<input type="checkbox"/>	Tips for Using Concrete and Mortar	<input type="checkbox"/>
Tips for the Home Mechanic	<input type="checkbox"/>	Tips for the Food Service Industry	<input checked="" type="checkbox"/>
Homeowners Guide for Sustainable Water Use	<input type="checkbox"/>	Proper Maintenance Practices for Your Business	<input checked="" type="checkbox"/>
Household Tips	<input type="checkbox"/>	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	<input type="checkbox"/>		
Recycle at Your Local Used Oil Collection Center (North County)	<input type="checkbox"/>		<input type="checkbox"/>
Recycle at Your Local Used Oil Collection Center (Central County)	<input checked="" type="checkbox"/>		<input type="checkbox"/>
Recycle at Your Local Used Oil Collection Center (South County)	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Maintaining a Septic Tank System	<input type="checkbox"/>		<input type="checkbox"/>
Responsible Pest Control	<input checked="" type="checkbox"/>		<input type="checkbox"/>
Sewer Spill Response	<input checked="" type="checkbox"/>		<input type="checkbox"/>
Tips for the Home Improvement Projects	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Horse Care	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Landscaping and Gardening	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Pet Care	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Pool Maintenance	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Residential Pool, Landscape and Hardscape Drains	<input type="checkbox"/>		<input type="checkbox"/>
Tips for Projects Using Paint	<input type="checkbox"/>		<input type="checkbox"/>

Appendix A:

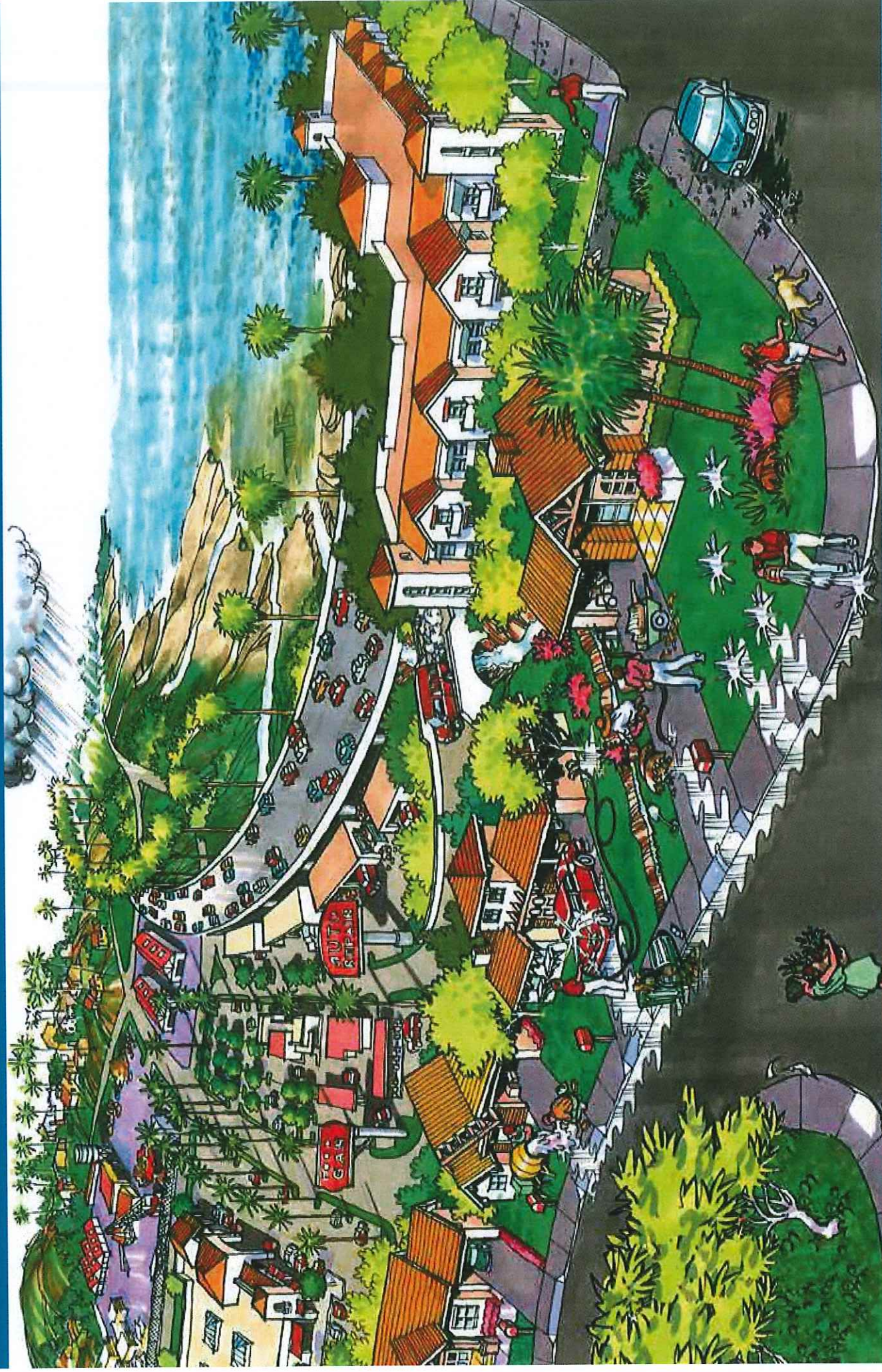
Conditions of Approval

Resolution Number_____ **dated**_____

(Pending)

Appendix B:
Educational Material

The Ocean Begins at Your Front Door



Never allow pollutants to enter the

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate-free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow wastewater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

Lawn and Garden

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



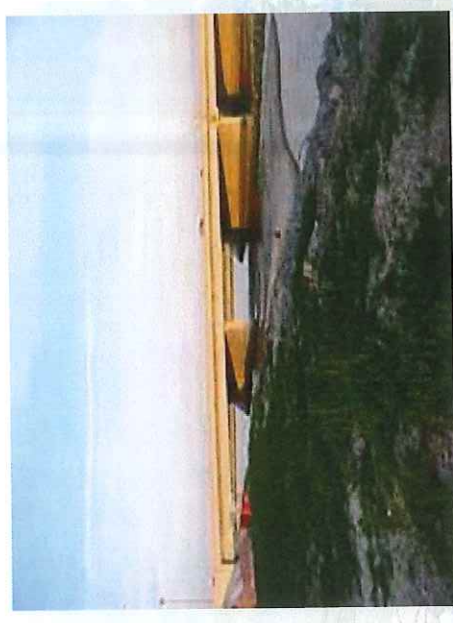
The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.



For More Information

California Environmental Protection Agency

www.calepa.ca.gov

- **Air Resources Board**

www.arb.ca.gov

- **Department of Pesticide Regulation**

www.cdpr.ca.gov

- **Department of Toxic Substances Control**

www.dtsc.ca.gov

- **Integrated Waste Management Board**

www.ciwm.ca.gov

- **Office of Environmental Health Hazard Assessment**

www.oehha.ca.gov

- **State Water Resources Control Board**

www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner

(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook

Visit www.cabmphandbooks.com

UC Master Gardener Hotline

(714) 708-1646 or visit www.ucceng.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Orange County Stormwater Program

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water		
Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455
Orange County 24-Hour		
Water Pollution Problem Reporting Hotline		
1-877-89-SPILL (1-877-897-7455)		

On-line Water Pollution Problem Reporting Form

www.ocwatersheds.com



Printed on Recycled Paper

The Ocean Begins at Your Front Door





Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.



For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

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Help Prevent Ocean Pollution

Recycle at Your Local Used Oil Collection Center

The Ocean Begins at Your Front Door

P R O J E C T
Pollution
P R E V E N T I O N

Balboa Hill's Boat Service 814 E Bay Ave., Balboa, CA 92661 CIWMBH: 30-C-05538	Jiffy Lube #861 375 Bristol St., Costa Mesa, CA 92626 (714)557-5923 CIWMBH: 30-C-05552	Econo Lube N' Tune #26 19961 Beach Blvd., Huntington Beach, CA 92648 (714)536-6519 CIWMBH: 30-C-06117	Expertec Automotive 7680 Teller Ave. Suite A&B, Huntington Beach, CA 92648 (714)948-9222 CIWMBH: 30-C-05914	EZ Lube Inc #16 7681 Edinger Ave., Huntington Beach, CA 92647 (714)969-3600 CIWMBH: 30-C-03289	EZ Lube Inc #79 9862 Adams St., Huntington Beach, CA 92647 (714)556-1312 CIWMBH: 30-C-06547	Firestone Store #71T5 16171 Beach Blvd., Huntington Beach, CA 92647 (714)947-6081 CIWMBH: 30-C-02118	Huntington Beach Car Wash 18971 Beach Blvd., Huntington Beach, CA 92648 (714)947-4924 CIWMBH: 30-C-05303	Kragen Auto Parts #1468 10072 Adams Ave., Huntington Beach, CA 92646 (714)593-6156 CIWMBH: 30-C-04284	Kragen Auto Parts #1511 7171 Warner Ave., Huntington Beach, CA 92647 (714)942-4531 CIWMBH: 30-C-04129	Kragen Auto Parts #1633 18688 Beach Blvd., Huntington Beach, CA 92648 (714)965-2353 CIWMBH: 30-C-02645	Oilmax 10 Minute Lube/Wash 9862 Adams Ave., Huntington Beach, CA 92646 (714)964-7110 CIWMBH: 30-C-03219	Pep Boys #799 19122 Brookhurst St., Huntington Beach, CA 92646 (714)964-0777 CIWMBH: 30-C-03439	Quik Change Lube & Oil 5841 Warner Ave., Huntington Beach, CA 92649 (714)940-2331 CIWMBH: 30-C-03208	R Kids Tire and Service #6 5062 Warner Ave., Huntington Beach, CA 92647 (714)946-1189 CIWMBH: 30-C-05691	Saturn of Huntington Beach 18601 Beach Blvd., Huntington Beach, CA 92646 (714)941-5426 CIWMBH: 30-C-05221	USA Express Tire & Service Inc 7232 Edinger Ave., Huntington Beach, CA 92647 (714)942-0717 CIWMBH: 30-C-04429	Zito's Auto Care 19002 Magnolia St., Huntington Beach, CA 92646 (714)968-8788 CIWMBH: 30-C-03251	Bella Terra Car Wash 16061 Beach Blvd., Huntington Beach, CA 92647 (714)947-4924 CIWMBH: 30-C-06195	Big O Tires #553 19411 Beach Blvd., Huntington Beach, CA 92648 (714)536-7571 CIWMBH: 30-C-00970	Costa Mesa 2500 San Joaquin Hills Rd., Corona Del Mar, CA 92625 CIWMBH: 30-C-03363	AutoZone #5220 744 W. 19th St., Costa Mesa, CA 92627 (907)495-7159 CIWMBH: 30-C-05992	Big O Tires #5571 3161 Harbor Blvd., Costa Mesa, CA 92626 (949)443-1521 CIWMBH: 30-C-04676	Coast General Performance 2855 Harbor Blvd., Costa Mesa, CA 92626 (714)546-1200 CIWMBH: 30-C-05916	Connell Chevrolet 2828 Harbor Blvd., Costa Mesa, CA 92626 (714)546-1200 CIWMBH: 30-C-06286	EZ Lube Inc #15 3599 Harbor Blvd., Costa Mesa, CA 92626 (714)556-1847 CIWMBH: 30-C-03137	EZ Lube Inc #16 400 E 17th St., Costa Mesa, CA 92627 (714)556-1312 CIWMBH: 30-C-05779	EZ Lube Inc #44 2248 Harbor Blvd., Costa Mesa, CA 92627 (714)556-1312 CIWMBH: 30-C-05737	Firestone Store #71T7 475 E 17th St., Costa Mesa, CA 92627 (949)545-2444 CIWMBH: 30-C-02120	Jiffy Lube #1969 300 E 17th St., Costa Mesa, CA 92627 (949)545-2905 CIWMBH: 30-C-05553	Jiffy Lube #1970 2175 Newport Blvd., Costa Mesa, CA 92627 (949)548-4100 CIWMBH: 30-C-05554	Jiffy Lube #607 2255 Fairview Rd., Costa Mesa, CA 92627 (949)550-5823 CIWMBH: 30-C-05551	John's Mobil 1465 S. Katella Ave., Santa Ana, CA 92707 (714)835-3266 CIWMBH: 30-C-00578	Scher Tire #33 1821 E. Katella Ave., Orange, CA 92667 (909)343-0100 CIWMBH: 30-C-06324	Tabassi Shell Service Station 8330 E. Katella Ave., Orange, CA 92667 (714)771-6990 CIWMBH: 30-C-00552	The Tune-up Center 193 S. Main St., Orange, CA 92668 (714)933-1876 CIWMBH: 30-C-02091	Tony's Fuel and Towing 1650 W. La Brea Ave., Orange, CA 92668 (714)953-7676 CIWMBH: 30-C-00868	Truck Lubrication Company 143 S. Pixey Orange, CA 92668 (714)997-0787 CIWMBH: 30-C-06001	Kragen Auto Parts #1516 2337 S. Bristol Ave., Santa Ana, CA 92704 (714)557-0787 CIWMBH: 30-C-04106	Kragen Auto Parts #1648 1015 S. Main St., Santa Ana, CA 92701 (714)568-1570 CIWMBH: 30-C-05664	Pep Boys #609 120 E. 1st St., Santa Ana, CA 92701 (714)547-7477 CIWMBH: 30-C-01738	Pep Boys #802 1107 S. Harbor Blvd., Santa Ana, CA 92704 (714)775-0828 CIWMBH: 30-C-01739	Purified Auto Service 2519 S. Main St., Santa Ana, CA 92707 (714)549-7900 CIWMBH: 30-C-02085	Saturn of Santa Ana 1330 Auto Mall Dr., Santa Ana, CA 92705 (714)948-2444 CIWMBH: 30-C-05222	Scher Tire #28 1805 N. Grand Ave., Santa Ana, CA 92705 (714)558-8644 CIWMBH: 30-C-03225	Tustin Big O Tires #555 131 E. 1st St., Tustin, CA 92780 (714)544-9431 CIWMBH: 30-C-00972	EZ Lube #42 12572 Newport Ave., Tustin, CA 92780 (714)556-1312 CIWMBH: 30-C-06408	Jiffy Lube #1406 3087 Edinger Ave., Tustin, CA 92780 (949)551-8614 CIWMBH: 30-C-03778	Kragen Auto Parts #1533 502 E. 1st St., Tustin, CA 92780 (714)544-9248 CIWMBH: 30-C-04128	Scher Tire Inc #17 dba Goodyear Tire 14511 Redhill Ave., Tustin, CA 92780 (714)934-6011 CIWMBH: 30-C-03035	Villa Park Phil's Villa Park 76 17771 Santiago Blvd., Villa Park, CA 92681 (714)837-0854 CIWMBH: 30-C-06579	Guaranty Chevrolet Motors Inc. 711 E. 17th St., Santa Ana, CA 92701 (714)973-1711 CIWMBH: 30-C-06506	Jiffy Lube #1303 2025 N. Tustin Santa Ana, CA 92701 (714)720-5737 CIWMBH: 30-C-06283	Firestone Store #71W6 3733 S. Bristol Santa Ana, CA 92704 (714)549-4015 CIWMBH: 30-C-01223	Firestone Store #71TA 101 S. Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Firestone Store #71W5 205 N. Tustin Ave., Santa Ana, CA 92705 (714)541-7977 CIWMBH: 30-C-03688	Managed Mobile, Inc. 1030 N. Balboa St., #B, Orange, CA 92667 (714)400-0250 CIWMBH: 30-C-05776	Pep Boys #806 215 E. Katella Ave., Orange, CA 92667 (714)997-1540 CIWMBH: 30-C-01759	Santiago Hills Car Care 8544 East Chapman Ave., Orange, CA 92669 (714)919-1060 CIWMBH: 30-C-05622	AutoZone #5338 1101 S. Bristol Santa Ana, CA 92704 (714)241-0335 CIWMBH: 30-C-00829	Big O Tires 1211 W. Warner Ave., Santa Ana, CA 92707 (714)540-8646 CIWMBH: 30-C-04679	Big O Tires #712 1302 E. 17th St., Santa Ana, CA 92705 (714)541-6811 CIWMBH: 30-C-05813	Firestone Store #7175 3733 S. Bristol Santa Ana, CA 92704 (714)549-4015 CIWMBH: 30-C-01223	Firestone Store #71TA 101 S. Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Kragen Auto Parts #1764 910 Tustin St., Orange, CA 92667 (714)771-3000 CIWMBH: 30-C-06280	Managed Mobile, Inc. 1030 N. Balboa St., #B, Orange, CA 92667 (714)400-0250 CIWMBH: 30-C-05776	Pep Boys #806 215 E. Katella Ave., Orange, CA 92667 (714)997-1540 CIWMBH: 30-C-01759	Santiago Hills Car Care 8544 East Chapman Ave., Orange, CA 92669 (714)919-1060 CIWMBH: 30-C-05622	AutoZone #5338 1101 S. Bristol Santa Ana, CA 92704 (714)241-0335 CIWMBH: 30-C-00829	Big O Tires 1211 W. Warner Ave., Santa Ana, CA 92707 (714)540-8646 CIWMBH: 30-C-04679	Big O Tires #712 1302 E. 17th St., Santa Ana, CA 92705 (714)541-6811 CIWMBH: 30-C-05813	Firestone Store #7175 3733 S. Bristol Santa Ana, CA 92704 (714)549-4015 CIWMBH: 30-C-01223	Firestone Store #71TA 101 S. Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Kragen Auto Parts #1764 910 Tustin St., Orange, CA 92667 (714)771-3000 CIWMBH: 30-C-06280	Managed Mobile, Inc. 1030 N. 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Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Kragen Auto Parts #1764 910 Tustin St., Orange, CA 92667 (714)771-3000 CIWMBH: 30-C-06280	Managed Mobile, Inc. 1030 N. Balboa St., #B, Orange, CA 92667 (714)400-0250 CIWMBH: 30-C-05776	Pep Boys #806 215 E. Katella Ave., Orange, CA 92667 (714)997-1540 CIWMBH: 30-C-01759	Santiago Hills Car Care 8544 East Chapman Ave., Orange, CA 92669 (714)919-1060 CIWMBH: 30-C-05622	AutoZone #5338 1101 S. Bristol Santa Ana, CA 92704 (714)241-0335 CIWMBH: 30-C-00829	Big O Tires 1211 W. Warner Ave., Santa Ana, CA 92707 (714)540-8646 CIWMBH: 30-C-04679	Big O Tires #712 1302 E. 17th St., Santa Ana, CA 92705 (714)541-6811 CIWMBH: 30-C-05813	Firestone Store #7175 3733 S. Bristol Santa Ana, CA 92704 (714)549-4015 CIWMBH: 30-C-01223	Firestone Store #71TA 101 S. Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Kragen Auto Parts #1764 910 Tustin St., Orange, CA 92667 (714)771-3000 CIWMBH: 30-C-06280	Managed Mobile, Inc. 1030 N. 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Katella Ave., Orange, CA 92667 (714)997-1540 CIWMBH: 30-C-01759	Santiago Hills Car Care 8544 East Chapman Ave., Orange, CA 92669 (714)919-1060 CIWMBH: 30-C-05622	AutoZone #5338 1101 S. Bristol Santa Ana, CA 92704 (714)241-0335 CIWMBH: 30-C-00829	Big O Tires 1211 W. Warner Ave., Santa Ana, CA 92707 (714)540-8646 CIWMBH: 30-C-04679	Big O Tires #712 1302 E. 17th St., Santa Ana, CA 92705 (714)541-6811 CIWMBH: 30-C-05813	Firestone Store #7175 3733 S. Bristol Santa Ana, CA 92704 (714)549-4015 CIWMBH: 30-C-01223	Firestone Store #71TA 101 S. Main St., Santa Ana, CA 92701 (714)542-8837 CIWMBH: 30-C-02123	Kragen Auto Parts #1764 910 Tustin St., Orange, CA 92667 (714)771-3000 CIWMBH: 30-C-06280	Managed Mobile, Inc. 1030 N. Balboa St., #B, Orange, CA 92667 (714)400-0250 CIWMBH: 30-C-05776	Pep Boys #806 215 E. Katella Ave., Orange, CA 92667 (714)997-1540 CIWMBH: 30-C-01759	Santiago Hills Car Care 8544 East Chapman Ave., Orange, CA 92669 (714)919-1060 CIWMBH: 30-C-05622	AutoZone #5338 1101 S. 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Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

Help Prevent Ocean Pollution:

Responsible Pest Control

For more information,
please call

University of California Cooperative
Extension Master Gardeners at
(714) 708-1646

or visit these Web sites:

www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen
sample visit the Orange County
Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
**Orange County 24-Hour
Water Pollution Problem
Reporting Hotline**

at 1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

Information From:

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Watershed Management Advisor; Mary
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Horticulture Advisor; Carolyn L. Unruh,
University of California Cooperative
Extension staff writer. Photos courtesy of
the UC Statewide IPM Program and
Darren Haver.

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The Ocean Begins
at Your Front Door

P R O J E C T
Pollution
P R E V E N T I O N

Tips for Pest Control

Key Steps to Follow:

Step 1: Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.



Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: Determine how many pests are present and causing damage.



Small pest populations may be controlled

more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.



Step 3: If a pesticide must be used, choose the least toxic chemical.

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: Wear appropriate protective clothing.

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: Properly store and dispose of unused pesticides.



Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste Collection Center
(714) 834-6752
www.oclandfills.com



Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program 24 Hour Water Pollution Reporting Hotline 1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health (714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
 - must immediately notify the local health agency of the discharge.
 - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
 - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between \$500-\$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board Santa Ana Region San Diego Region (951) 782-4130 (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services (800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

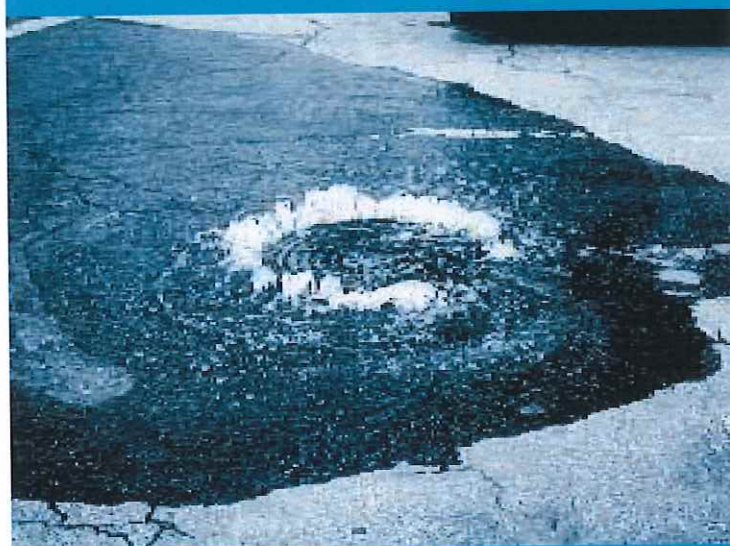
- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters shall immediately notify the Office of Emergency Services.
- Any person who fails to provide the notice required by this section is guilty of a misdemeanor and shall be punished by a fine (less than \$20,000) and/or imprisonment for not more than one year.



Sewage Spill Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities



Orange County
Sanitation District



Health Care Agency
Environmental Health



www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCS).
For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing
cleanout pipe
located on
private property



You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

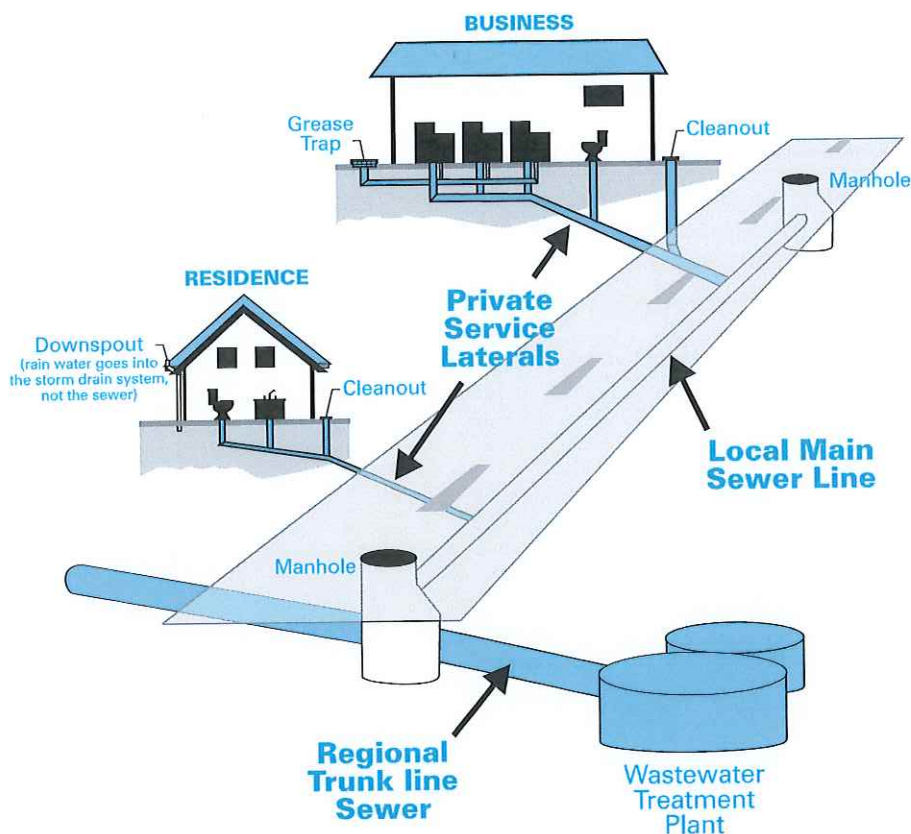
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

**If You See a Sewage Spill Occurring,
Notify Your City Sewer/Public Works
Department or Public Sewer District
IMMEDIATELY!**

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

- 1 Never put grease down garbage disposals, drains or toilets.**
- 2 Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
- 3 Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**



Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

- **City Sewer/Public Works Departments—**
Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—**
Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—**
Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—**
Responsible for protecting State waters.
- **Orange County Stormwater Program—**
Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.



Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District ..	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550



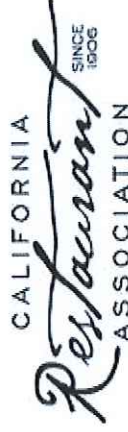
Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. Fats, oils and grease from restaurants and food service facilities can cause sewer line blockages that may result in sewage overflow into your facility and into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways and should never contain wastewater, trash, grease or other materials.

You would never dump oil and trash into the ocean, so don't let it enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

Report sewage spills and
discharges that are not
contained to your site to the
**Orange County 24-Hour
Water Pollution Problem
Reporting Hotline**
at **1-877-89-SPILL** (1-877-897-7455)

For emergencies, dial 911.



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Help Prevent Ocean Pollution:

Tips for the Food Service Industry

DELA

The Ocean Begins
at Your Front Door

P R O J E C T
Pollution
P R E V E N T I O N

Best Kitchen Practices

Food Waste Disposal

- Scrape food waste off of plates, utensils, pots, food preparation and cooking areas and dispose of it in the trash.
- Never put food waste down the drain. Food scraps often contain grease, which can clog sewer pipes and result in sewage backups and overflows.

Grease & Oil Disposal

- Never put oil or grease down the drain. Contain grease and oil by using covered grease storage containers or installing a grease interceptor.
- Never overfill your grease storage container or transport it without a cover.
- Grease control devices must be emptied and cleaned by permitted companies.
- Keep maintenance records on site.



- For a list of oil/grease recycling companies, contact the CIWMB at www.ciwmb.ca.gov/foodwaste/render.htm or contact your local sanitation district.

Minor Spill Cleanup

- Always use dry cleanup methods, such as a rag, damp mop or broom.
- Never hose a spill into the street, gutter or storm drain.



Major Spill Cleanup

- Have spill containment and clean-up kits readily available, and train all employees on how to use them.
- Immediately contain and clean the spill using dry methods.
- If the spill leaves your site, call 1-877-897-7455.

Dumpster Cleanup

- Pick up all debris around the dumpster.
- Always keep the lid on the dumpster closed.
- Never pour liquids into the dumpster or hose it out.



Floor Mat Cleaning

- Sweep the floor mats regularly, discarding the debris into the trash.
- Hose off the mats in a mop sink, at a floor drain, or in an outdoor area that can contain the water.
- Never hose the mats in an area where the wastewater can flow to the street, gutter or storm drain.



Washwater Disposal

- Dispose of washwater in a mop sink or an area with a floor drain.
- Never dispose of washwater in the street, gutter or storm drain.



Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: www.swrcb.ca.gov/stormwater/industrial.html

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
**Orange County 24-Hour
Water Pollution Problem
Reporting Hotline**
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

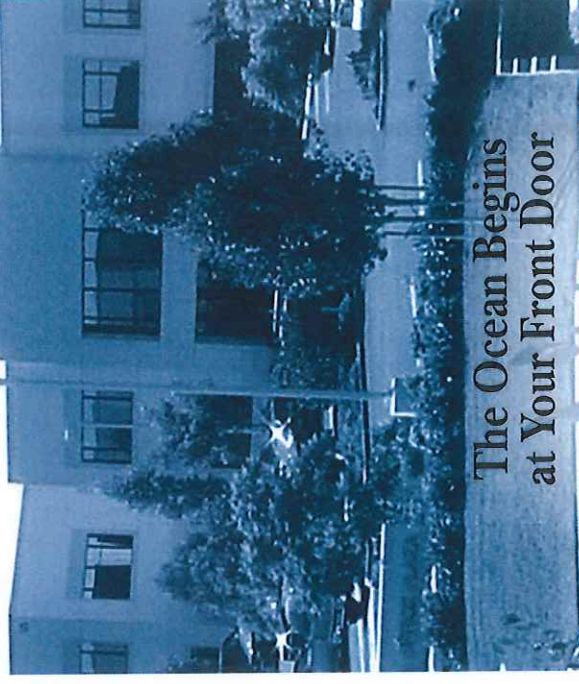


RECYCLE
USED OIL



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Help Prevent Ocean Pollution: Proper Maintenance Practices for Your Business



The Ocean Begins
at Your Front Door

P R O J E C T
Po\$olution
P R E V E N T I O N

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.

- Call your trash hauler to replace leaking dumpsters.

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

NEVER DISPOSE
OF ANYTHING
IN THE STORM
DRAIN.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit www.oclandfills.com.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit www.ciwmmb.ca.gov/recycle.
- Properly label materials. Familiarize employees with Material Safety Data Sheets.



Appendix C:

BMP Details



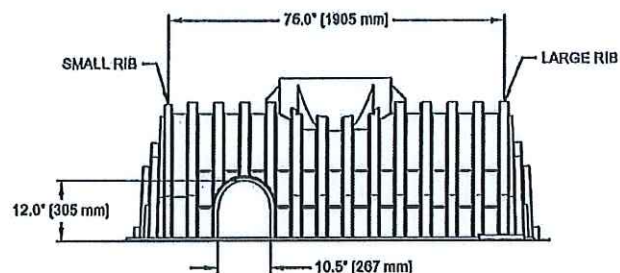
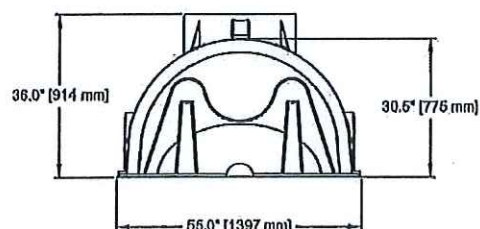
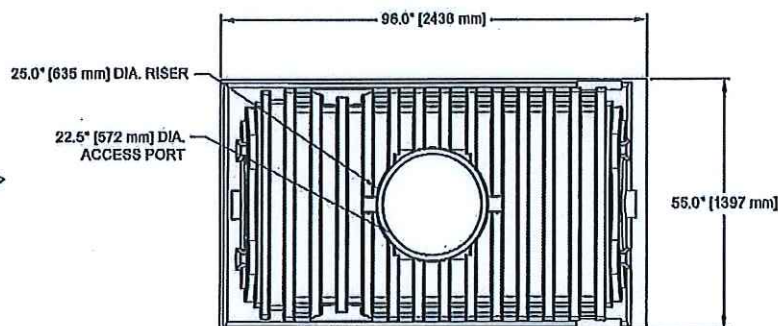
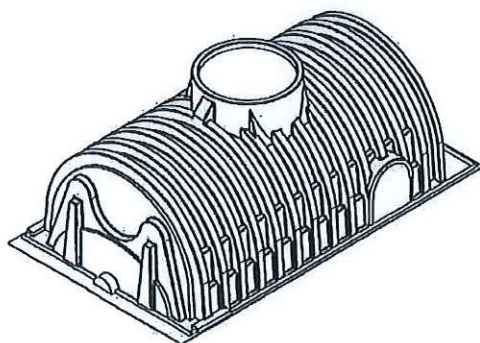
CULTEC StormFilter® 330 Water Quality Unit

The CULTEC StormFilter® 330 is designed to be a secondary in-line filter system that effectively removes many of the smaller particles not eliminated by conventional structures during the pretreatment process.

CULTEC StormFilter® 330 is a pass-through filter system. It has a welded and secured solid bottom.



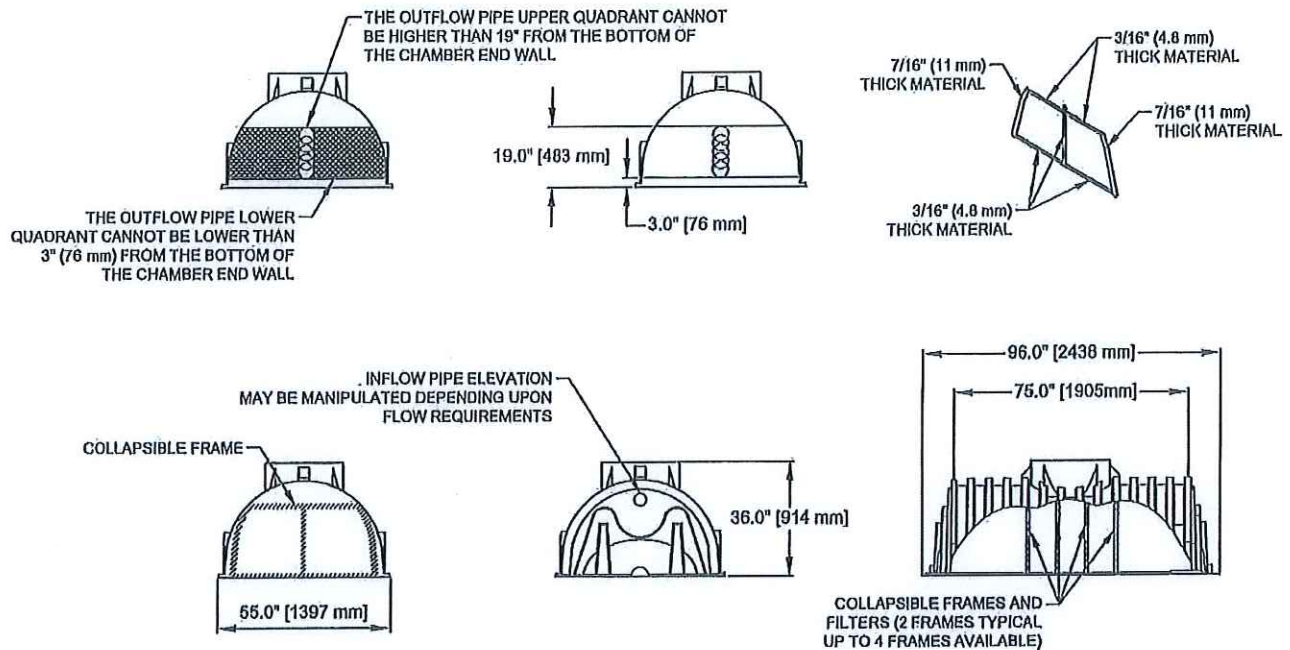
Size (L x W x H)	8' x 55" x 36" 2.44 m x 1397 mm x 914 mm
Access Opening	22.5" 572 mm
Capacity	418.5 gal. 1584 l
Number of Filters	2 Typical (up to 4 available)
Filtration Capability	740.6 gpm 2800 l/min
Apparent Opening Size of Filter	30 US Std. Sieve 0.60 mm
Max. Allowable Cover	4' 1.22 m
Weight	300 lbs. 136.1 kg
Max. Inlet Opening in End Wall	8" (fully filtered) 203 mm (fully filtered) 24" (w/ bypass capability) 600 mm (w/ bypass capability)



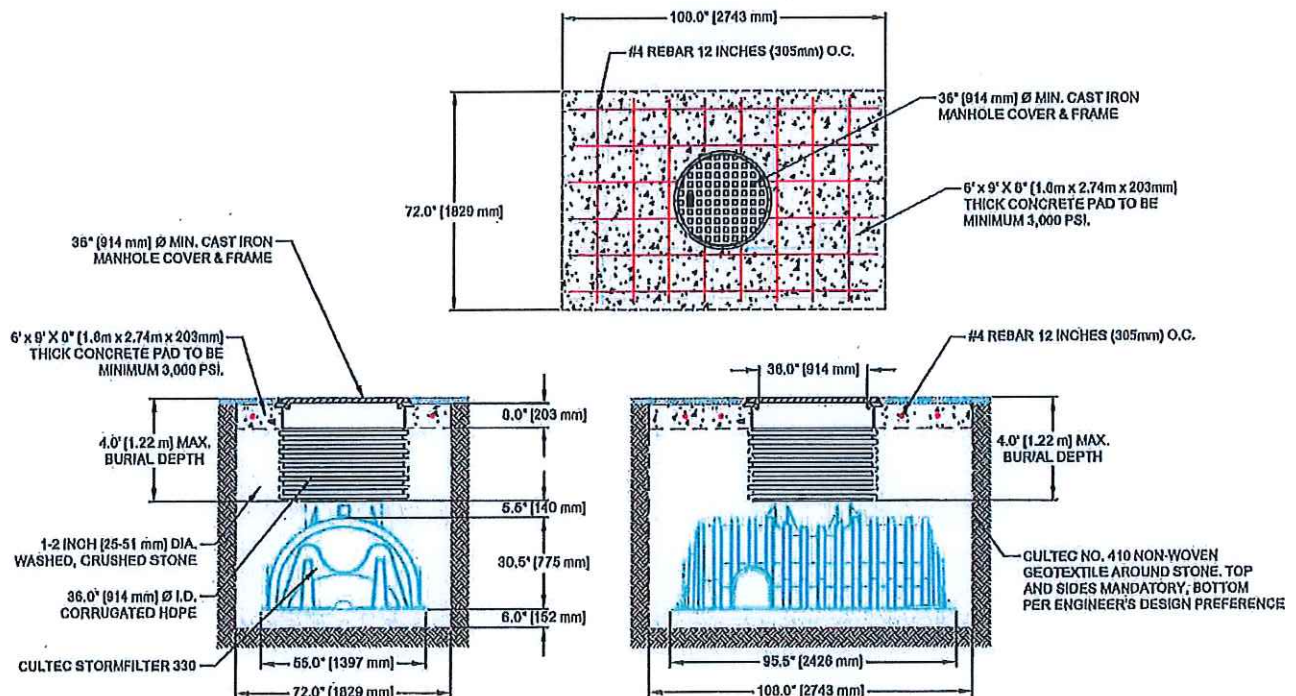
For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

© CULTEC, Inc. July 2016 SUBSE330-07-16

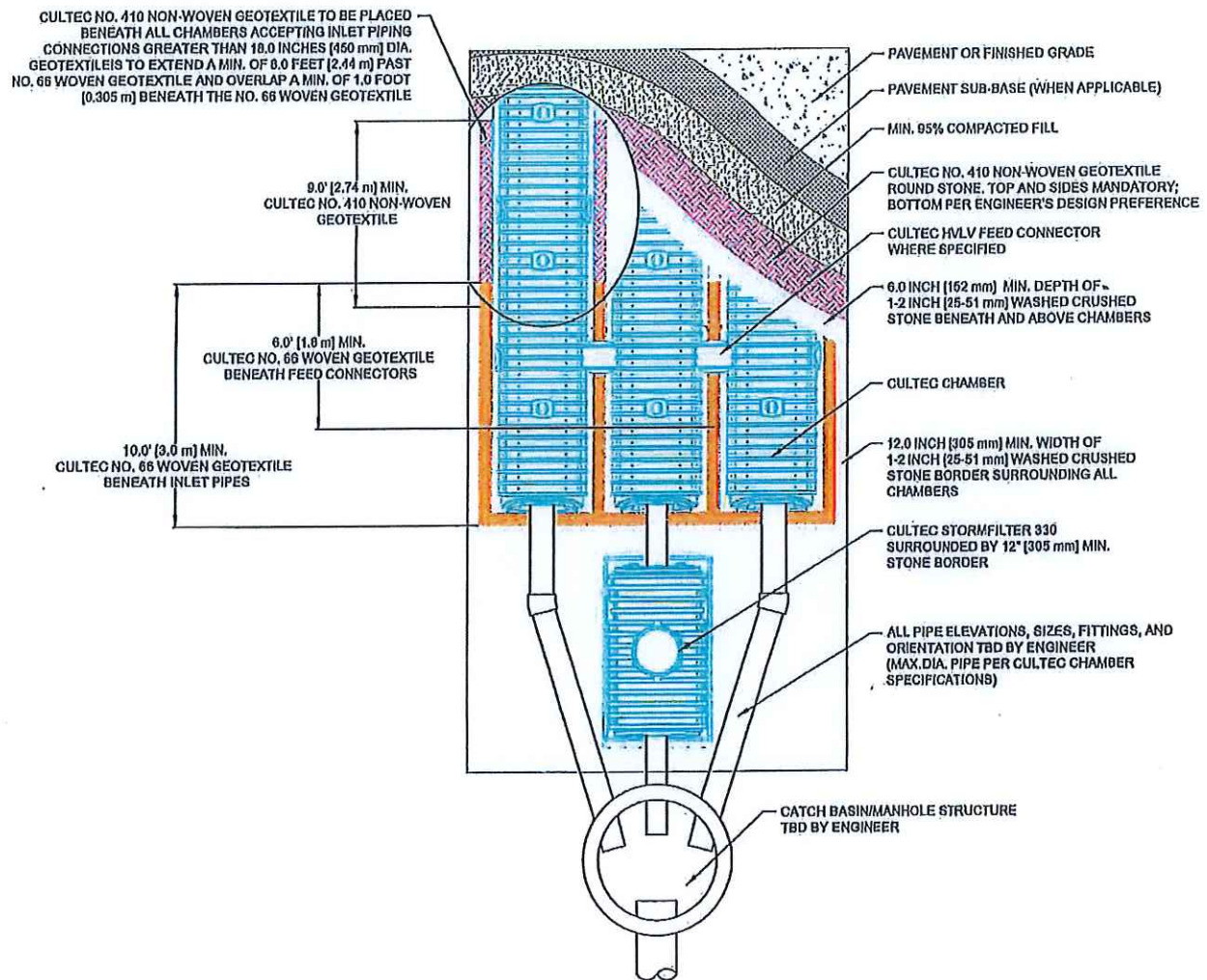
Frame Detail



Typical Cross Section for Paved Traffic Application



Overflow/Bypass Plan View Detail



Visit www.cultec.com/downloads.html for Product Downloads and CAD details.



CULTEC STORMFILTER® 330 Water Quality Unit Specifications

GENERAL

CULTEC StormFilter® 330 designed as a water quality unit. The unit may be used to filter stormwater run-off via pass-thru filtration baffles.

STORMFILTER 330 PARAMETERS

1. The chambers shall be manufactured by CULTEC, Inc. of Brookfield, CT (203-775-4416 or 1-800-428-5832).
2. The chamber shall be vacuum thermoformed of black polyethylene.
3. The chamber shall be arched in shape.
4. The chamber shall have a welded and secured solid bottom plate.
5. The nominal chamber dimensions of the CULTEC StormFilter® 330 shall be 36 inches (914 mm) tall, 55 inches (1397 mm) wide and 8 feet (2.44 m) long.
6. The chamber shall have a 22.5 inch (572 mm) diameter access opening located at the top of the unit.
7. Maximum inlet opening on the chamber end wall is 24 inches (600 mm) when utilizing bypass capability.
8. The recommended inlet pipe diameter is 8 inches (200 mm) for full filtering capacity.
9. The recommended outlet pipe diameter is 15 inches (375 mm) for full filtering capacity.
10. The chamber shall have two side portals to accept CULTEC HVLV™ FC-24 Feed Connectors. The nominal dimensions of each side portal shall be 12 inches (305 mm) high by 10.5 inches (267 mm) wide. Maximum allowable pipe size in the side portal is 10 inches (250 mm). The side portals may only be used when utilizing the StormFilter housing without filter frames/bags.
11. The nominal storage volume of the StormFilter® 330 shall be 418.5 gal / unit (1584 l/unit).
12. The StormFilter® 330 chamber shall have 14 corrugations.
13. The StormFilter 330 shall be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.
14. The StormFilter® 330 has a maximum filtering capacity of 740.6 gpm (2800 l/min).
15. The maximum burial depth shall not exceed 4 feet (1.22 m).
16. The chamber shall be manufactured in an ISO 9001:2008 certified facility.

FILTER FRAME BAG SPECIFICATIONS

GENERAL

CULTEC's filter enclosures, manufactured from a geotextile composed of polypropylene yarns, which are woven into a stable network such that the yarns retain their relative position. The geotextile filters are inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids and are designed to fit collapsible metal frames.

FILTER FRAME BAG PARAMETERS

1. The geotextile shall be provided by CULTEC, Inc. of Brookfield, CT (203-775-4416 or 1-800-428-5832).
2. The filter enclosures are constructed from geotextile composed of polypropylene yarns, which are woven into a stable network such that the yarns retain their relative position.
3. The filter bag shall have a nominal area of 6.44 ft² (0.60 m²).
4. The geotextile shall be black in appearance.
5. The geotextile shall have a Grab Tensile Strength value of 400 lbs MD/335 lbs CD (1780 N MD/1491 N CD) per ASTM D4632 testing method.
6. The geotextile shall have an Grab Tensile Elongation value of 20% MD/15% CD per ASTM D4632 testing method.
7. The geotextile shall have a Trapezoid Tear value of 145 lbs MD/125 lbs CD (645 N MD/556 N CD) per ASTM D4533 testing method.
8. The geotextile shall have a CBR Puncture Strength value of 1250 lbs (5563 N) per ASTM D6241 testing method.
9. The geotextile shall have a Percent Open Area value of 8% per COE-02215 testing method.
10. The geotextile shall have a Flow Rate value of 115 gpm/ft² (4685 lpm/m²) per ASTM D4491 testing method.
11. The geotextile shall have an Apparent Opening Size (AOS) value of 30 U.S. Sieve (0.60 mm) per ASTM D4751 testing method.
12. The geotextile shall have a UV Resistance (at 500 hours) value of 90% strength retained per ASTM D4355 testing method.

FILTERING SPECIFICATIONS

1. The filter removes more than 70% of the total suspended solids typically present in stormwater run off.
2. Continuous filtration capability for clean filters is rated at 1.65 CFS (0.0467 m³/s).
3. Treatment capability is approximately 740.6 gpm (2800 l/min).



CULTEC Recharger® 330XLHD Stormwater Chamber

The Recharger® 330XLHD is a 30.5" (775 mm) tall, high capacity chamber. Typically when using this model, fewer chambers are required resulting in less labor and a smaller installation area. The Recharger® 330XLHD has the side portal internal manifold feature. HVLV® FC-24 Feed Connectors are inserted into the side portals to create the internal manifold.



Size (L x W x H)	8.5' x 52" x 30.5"
	2.59 m x 1321 mm x 775 mm
Installed Length	7'
	2.13 m
Length Adjustment per Run	1.50'
	0.46 m
Chamber Storage	7.46 ft³/ft
	0.69 m³/m
	52.21 ft³/unit
	1.48 m³/unit
Min. Installed Storage	11.32 ft³/ft
	1.05 m³/m
	79.26 ft³/unit
	2.24 m³/unit
Min. Area Required	33.83 ft²
	3.14 m²
Min. Center-to-Center Spacing	4.83'
	1.47 m
Max. Allowable Cover	12'
	3.66 m
Max. Inlet Opening in End Wall	24"
	600 mm
Max. Allowable O.D. in Side Portal	11.75"
	298 mm
Compatible Feed Connector	HVLV FC-24 Feed Connector

	Stone Foundation Depth		
	6"	12"	18"
	152 mm	305 mm	457 mm
Chamber and Stone Storage Per Chamber	79.26 ft³	86.03 ft³	92.79 ft³
	2.24 m³	2.44 m³	2.63 m³
Min. Effective Depth	3.54'	4.04'	4.54'
	1.08 m	1.23 m	1.38 m
Stone Required Per Chamber	2.50 yd³	3.13 yd³	3.76 yd³
	1.91 m³	2.39 m³	2.87 m³

Calculations are based on installed chamber length.
Includes 6" (152 mm) stone above crown of chamber and typical stone surround.
Stone void calculated at 40%.

Recharger® 330XLHD Bare Chamber Storage Volumes

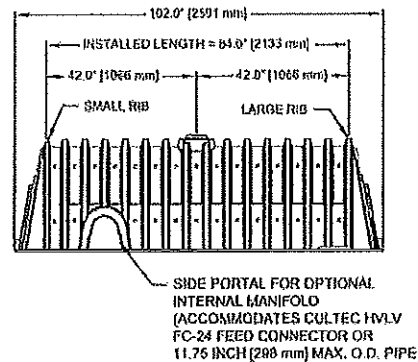
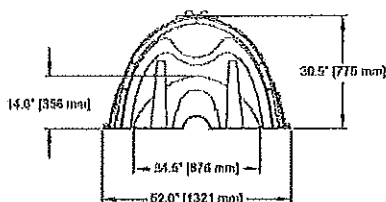
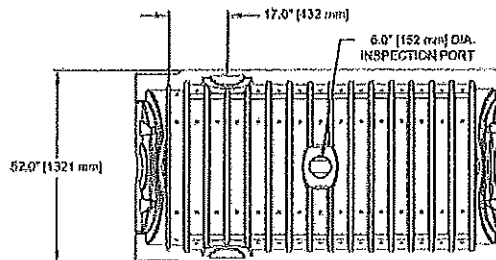
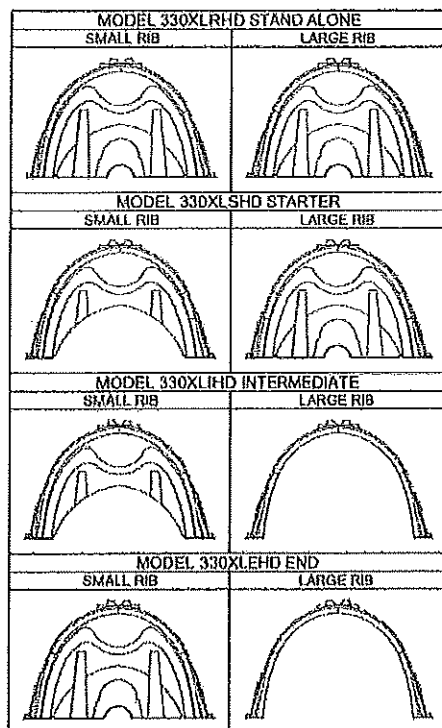
Elevation		Incremental Storage Volume				Cumulative Storage	
in.	mm	ft³/ft	m³/m	ft³	m³	ft³	m³
30.5	775	0.000	0.000	0.000	0.000	52.213	1.479
30	762	0.019	0.002	0.133	0.004	52.213	1.479
29	737	0.051	0.005	0.357	0.010	52.080	1.475
28	711	0.084	0.008	0.588	0.017	51.723	1.465
27	686	0.124	0.012	0.868	0.025	51.135	1.448
26	660	0.150	0.014	1.05	0.030	50.267	1.424
25	635	0.173	0.016	1.211	0.034	49.217	1.394
24	609	0.191	0.018	1.337	0.038	48.006	1.360
23	584	0.207	0.019	1.449	0.041	46.669	1.322
22	559	0.221	0.021	1.547	0.044	45.220	1.281
21	533	0.233	0.022	1.631	0.046	43.673	1.237
20	508	0.244	0.023	1.708	0.048	42.042	1.191
19	483	0.254	0.024	1.778	0.050	40.334	1.142
18	457	0.264	0.025	1.848	0.052	38.556	1.092
17	432	0.271	0.025	1.897	0.054	36.708	1.040
16	406	0.283	0.026	1.981	0.056	34.811	0.986
15	381	0.294	0.027	2.058	0.058	32.830	0.930
14	356	0.296	0.027	2.072	0.059	30.772	0.871
13	330	0.299	0.028	2.093	0.059	28.700	0.813
12	305	0.301	0.028	2.107	0.060	26.607	0.754
11	279	0.303	0.028	2.121	0.060	24.500	0.694
10	254	0.304	0.028	2.128	0.060	22.379	0.634
9	229	0.306	0.028	2.142	0.061	20.251	0.574
8	203	0.313	0.029	2.191	0.062	18.109	0.513
7	178	0.321	0.030	2.247	0.064	15.918	0.451
6	152	0.322	0.030	2.254	0.064	13.671	0.387
5	127	0.323	0.030	2.261	0.064	11.417	0.323
4	102	0.324	0.030	2.268	0.064	9.156	0.259
3	76	0.325	0.030	2.275	0.064	6.888	0.195
2	51	0.327	0.030	2.289	0.065	4.613	0.131
1	25	0.332	0.031	2.324	0.066	2.324	0.066
Total		7.459	0.693	52.213	1.479	52.213	1.479

Calculations are based on installed chamber length.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

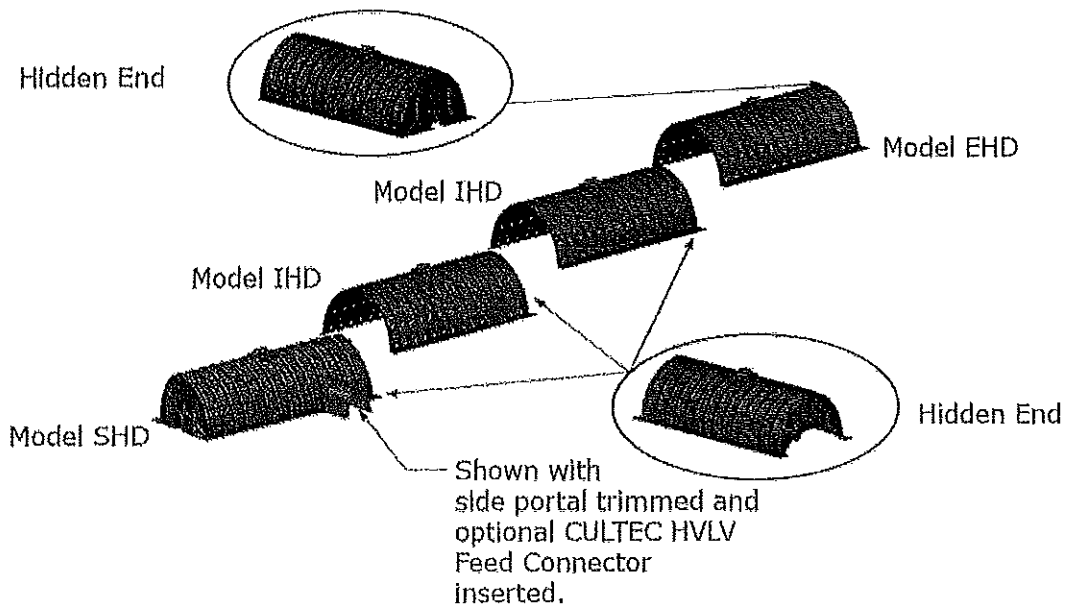
For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

Three View Drawing



CULTEC RECHARGER 330XLHD CHAMBER STORAGE = 7.459 CF/FT [0.693 m³/m]
 INSTALLED LENGTH ADJUSTMENT = 1.5' [0.46 m]
 SIDE PORTAL ACCEPTS CULTEC HVLV FC-24 FEED CONNECTOR

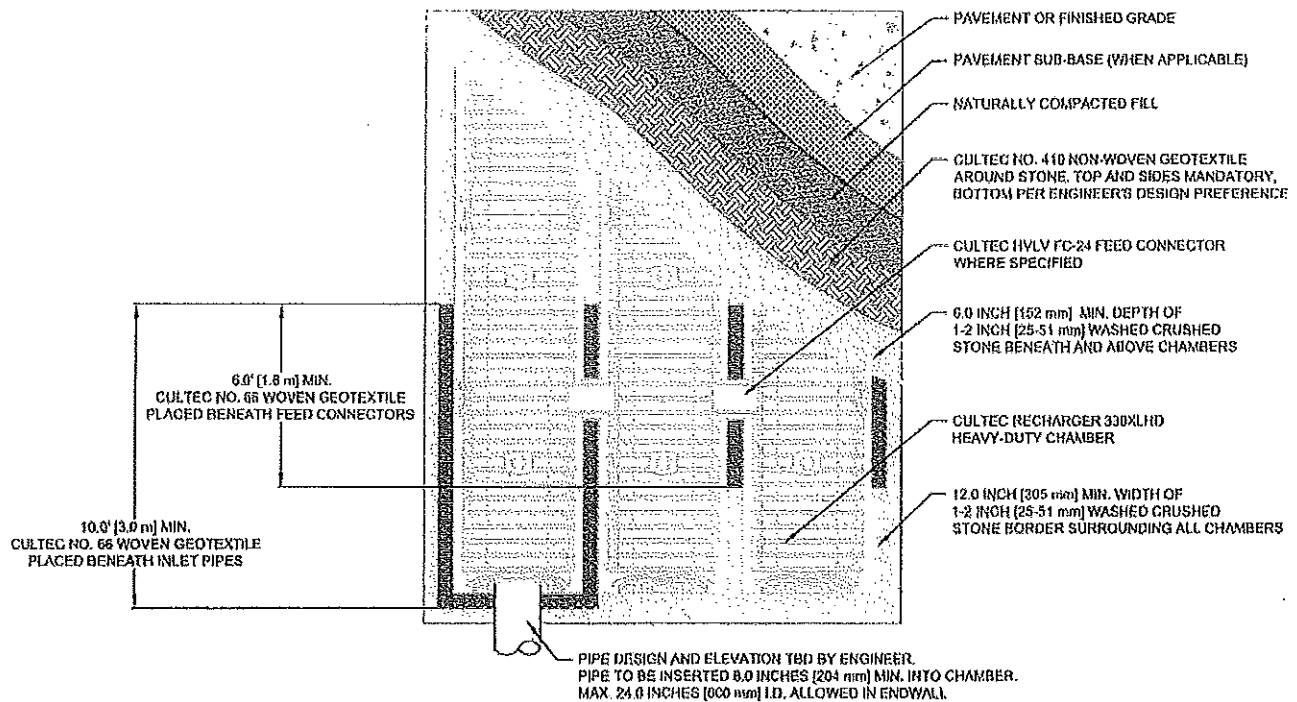
Typical Interlock Installation



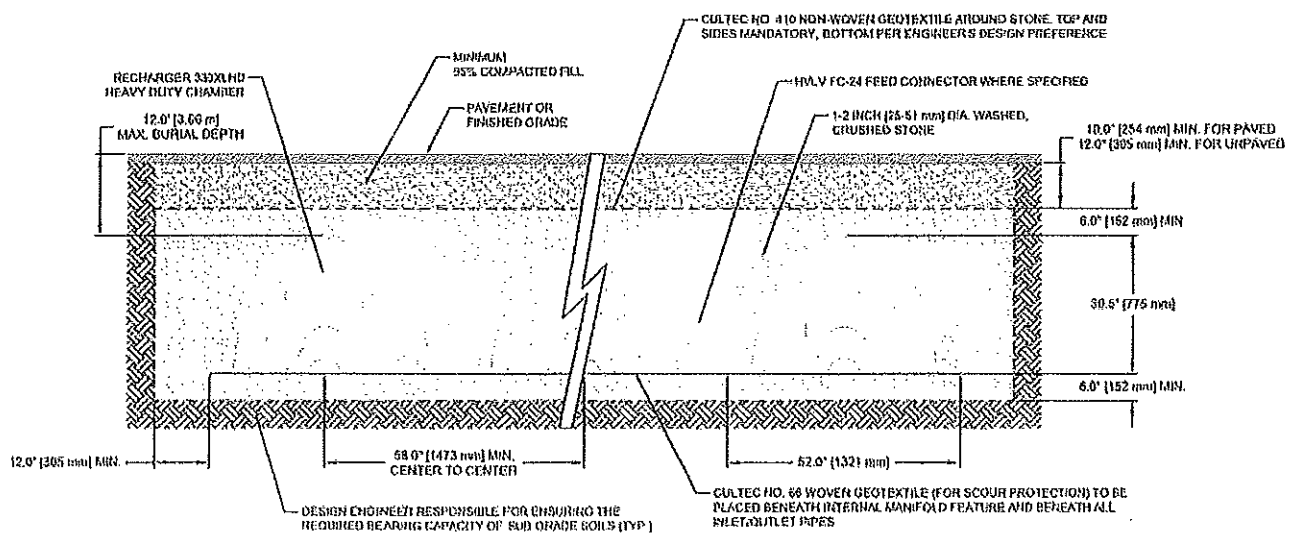


CULTEC Recharger® 330XLHD Stormwater Chamber

Plan View Drawing



Typical Cross Section for Traffic Application



For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.



CULTEC Recharger® 330XLHD Specifications

GENERAL

CULTEC Recharger® 330XLHD chambers are designed for underground stormwater management. The chambers may be used for retention, recharging, detention or controlling the flow of on-site stormwater runoff.

CHAMBER PARAMETERS

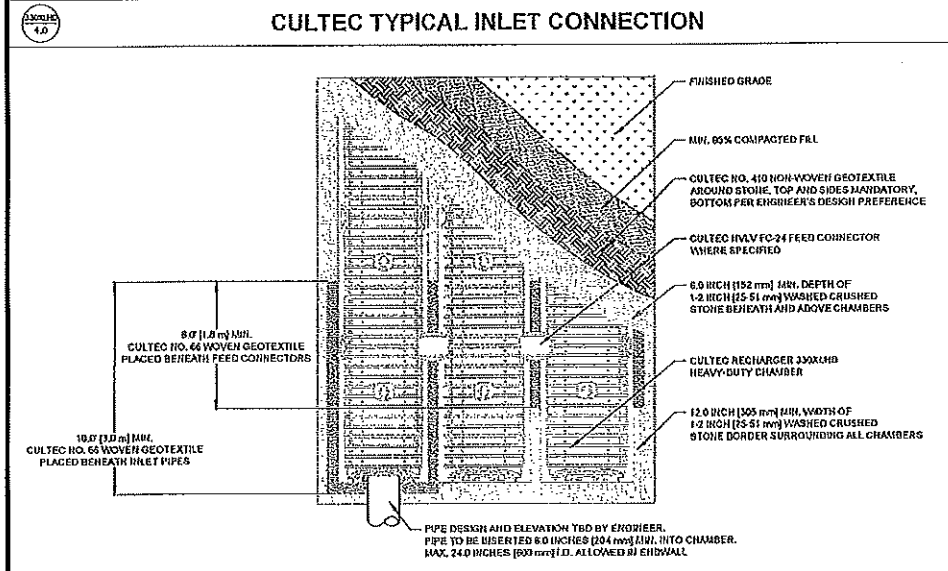
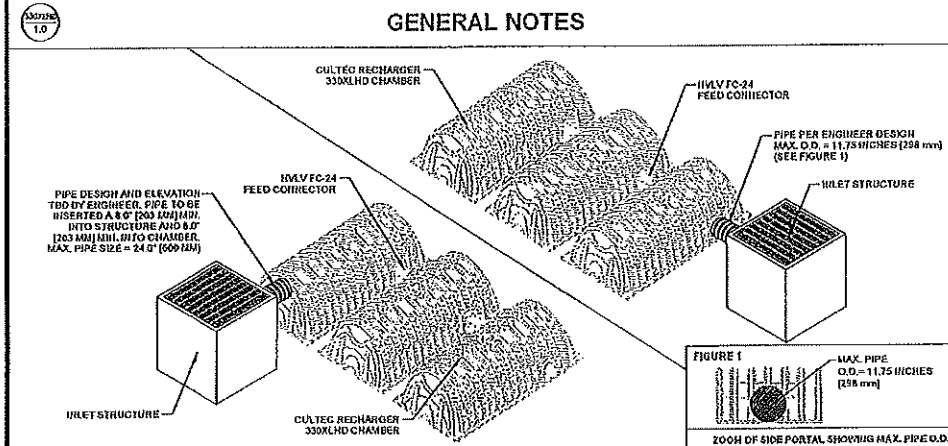
1. The chambers shall be manufactured in the U.S.A. by CULTEC, Inc. of Brookfield, CT (cultec.com, 203-775-4416).
2. The chamber shall be vacuum thermoformed of black polyethylene.
3. The chamber shall be arched in shape.
4. The chamber shall be open-bottomed.
5. The chamber shall be joined using an interlocking overlapping rib method. Connections must be fully shouldered overlapping ribs, having no separate couplings or separate end walls.
6. The nominal chamber dimensions of the CULTEC Recharger® 330XLHD shall be 30.5 inches (775 mm) tall, 52 inches (1321 mm) wide and 8.5 feet (2.59 m) long. The installed length of a joined Recharger® 330XLHD shall be 7 feet (2.13 m).
7. Maximum inlet opening on the chamber end wall is 24 inches (600 mm).
8. The chamber shall have two side portals to accept CULTEC HVLV® FC-24 Feed Connectors to create an internal manifold. Maximum allowable O.D. in the side portal is 11.75 inches (298 mm).
9. The nominal chamber dimensions of the CULTEC HVLV® FC-24 Feed Connector shall be 12 inches (305 mm) tall, 16 inches (406 mm) wide and 24.2 inches (614 mm) long.
10. The nominal storage volume of the Recharger® 330XLHD chamber shall be 7.459 ft³ / ft (0.693 m³ / m) - without stone. The nominal storage volume of a single Recharger® 330XLHD Stand Alone unit shall be 63.40 ft³ (1.80 m³) - without stone. The nominal storage volume of a joined Recharger® 330XLHD Intermediate unit shall be 52.213 ft³ (1.478 m³) - without stone. The nominal storage volume of the length adjustment amount per run shall be 11.19 ft³ (1.04 m³) - without stone.
11. The nominal storage volume of the HVLV® FC-24 Feed Connector shall be 0.913 ft³ / ft (0.026 m³ / m) - without stone.
12. The Recharger® 330XLHD chamber shall have fifty-six discharge holes bored into the sidewalls of the unit's core to promote lateral conveyance of water.
13. The Recharger® 330XLHD chamber shall have 16 corrugations.
14. The end wall of the chamber, when present, shall be an integral part of the continuously formed unit. Separate end plates cannot be used with this unit.
15. The Recharger® 330XLHD Stand Alone unit must be formed as a whole chamber having two fully formed integral end walls and having no separate end plates or separate end walls.
16. The Recharger® 330XLHD Starter unit must be formed as a whole chamber having one fully formed integral end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
17. The Recharger® 330XLHD Intermediate unit must be formed as a whole chamber having one fully open end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
18. The Recharger® 330XLHD End unit must be formed as a whole chamber having one fully formed integral end wall and one fully open end wall and having no separate end plates or end walls.
19. The HVLV® FC-24 Feed Connector must be formed as a whole chamber having two open end walls and having no separate end plates or separate end walls. The unit shall fit into the side portals of the Recharger® 330XLHD and act as cross feed connections.
20. Chambers must have horizontal stiffening flex reduction steps between the ribs.
21. Heavy duty units are designated by a colored stripe formed into the part along the length of the chamber.
22. The chamber shall have a raised integral cap at the top of the arch in the center of each unit to be used as an optional inspection port or clean-out.
23. The units may be trimmed to custom lengths by cutting back to any corrugation on the large rib end.
24. The chamber shall be manufactured in an ISO 9001:2008 certified facility.
25. Maximum allowable cover over the top of the chamber shall be 12' (3.66 m).
26. The chamber shall be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.

CULTEC RECHARGER 330XLHD PRODUCT SPECIFICATIONS

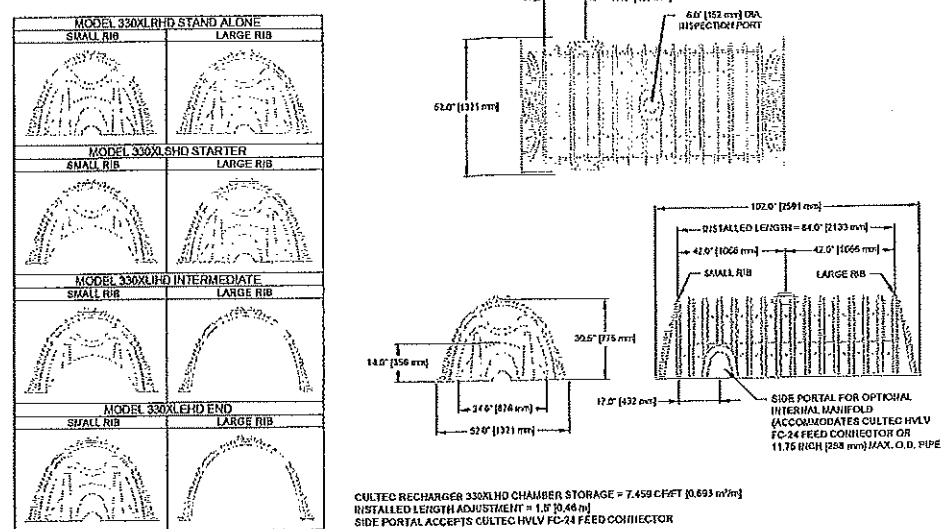
GENERAL
CULTEC RECHARGER 330XLHD IS DESIGNED FOR USE IN STORMWATER MANAGEMENT SYSTEMS. THE RECHARGER MAY BE USED FOR RETENTION, TREATMENT, OR STORAGE OF STORMWATER.

CHAMBER PARAMETERS

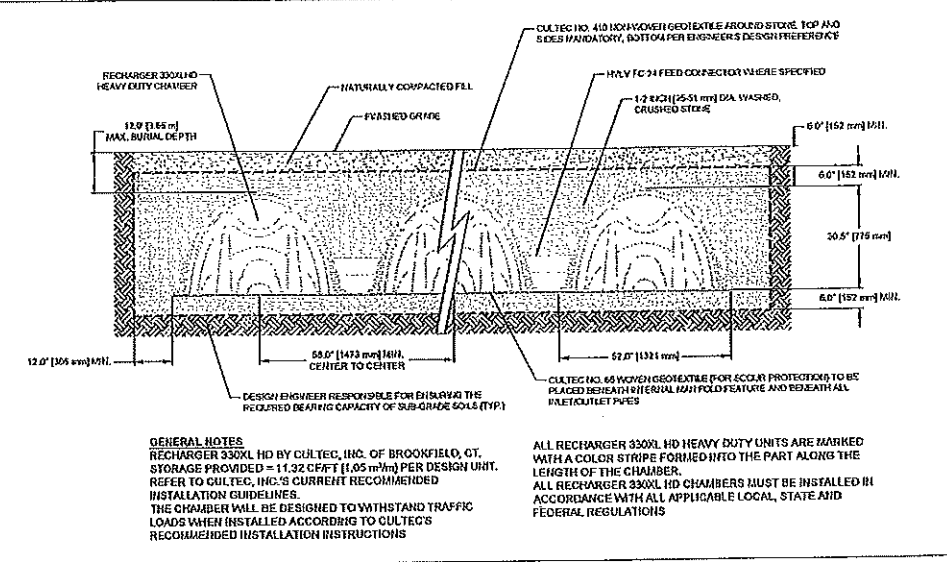
1. THE CHAMBER SHALL BE MANUFACTURED FROM 100% POLYETHYLENE.
2. THE CHAMBER SHALL BE 330 INCHES (8438 mm) LONG.
3. THE CHAMBER SHALL BE 48 INCHES (1219 mm) WIDE.
4. THE CHAMBER SHALL BE 30 INCHES (762 mm) HIGH.
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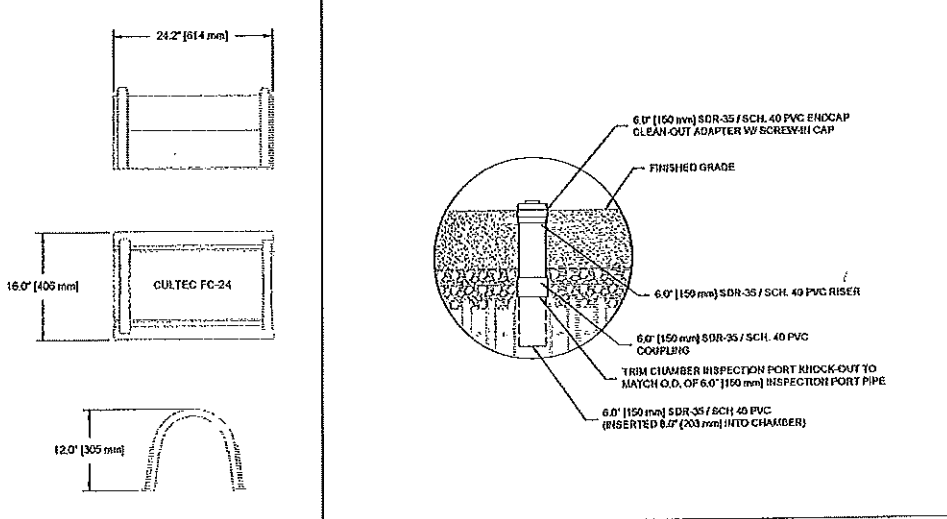
CULTEC RECHARGER 330XLHD HEAVY DUTY PLAN VIEW



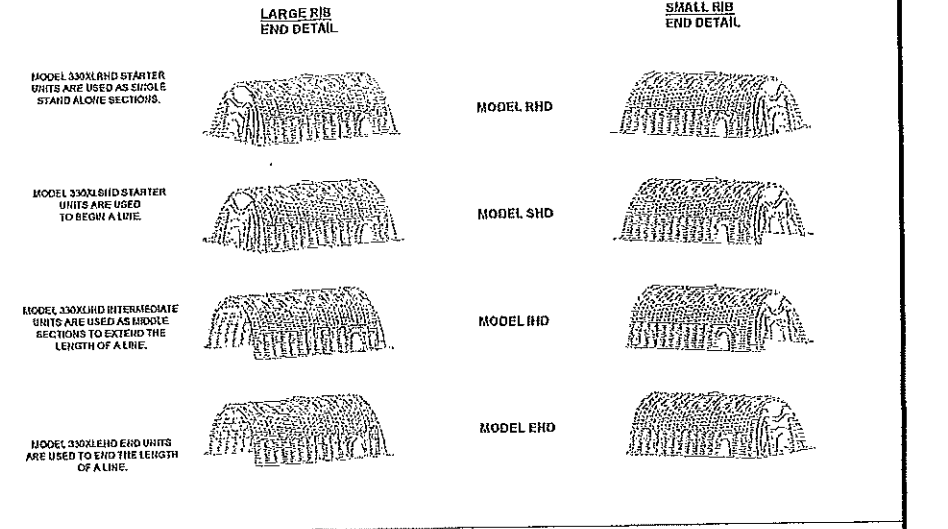
CULTEC RECHARGER 330XLHD HEAVY DUTY THREE VIEW



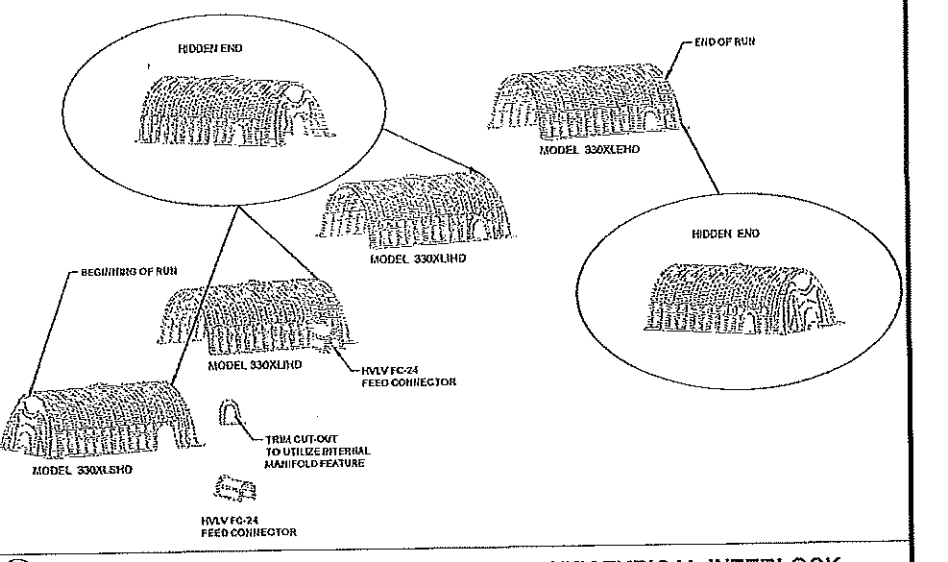
CULTEC RECHARGER 330XLHD HEAVY DUTY TYPICAL CROSS SECTION



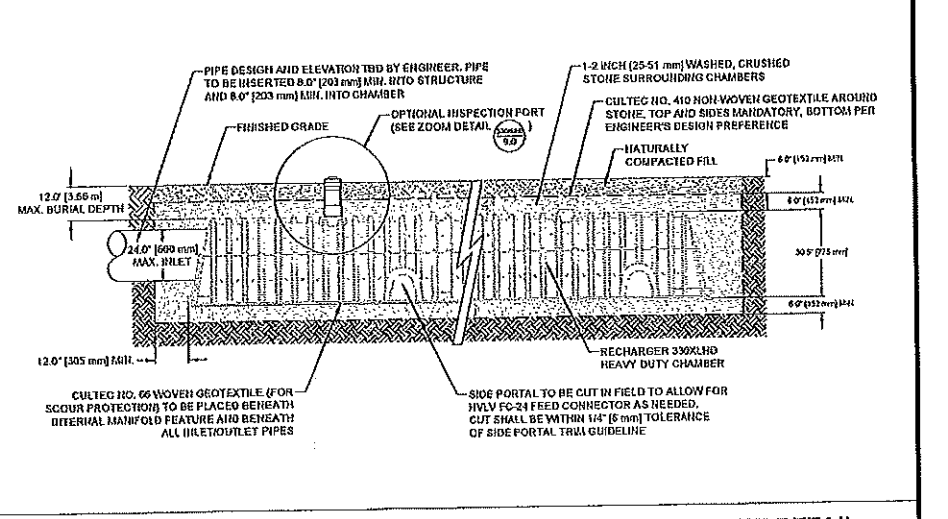
CULTEC RECHARGER 330XLHD HEAVY DUTY PLAN VIEW



CULTEC RECHARGER 330XLHD HEAVY DUTY END DETAIL INFORMATION



CULTEC RECHARGER 330XLHD HEAVY DUTY TYPICAL INTERLOCK



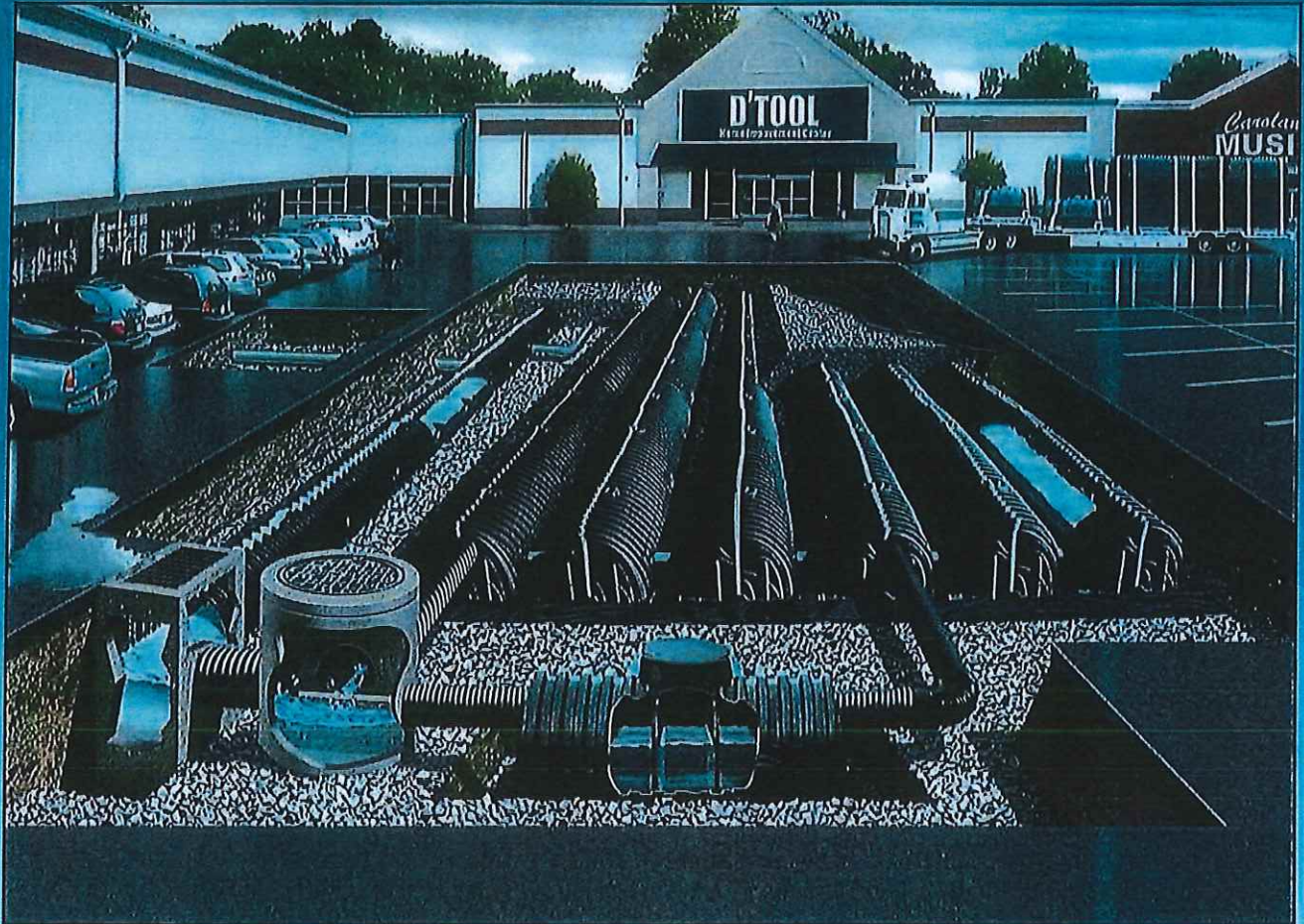
CULTEC RECHARGER 330XLHD HEAVY DUTY PLAN VIEW

Appendix D:
BMP Maintenance Information

Contactor® & Recharger®

Stormwater Chambers

The Chamber With The Stripe®



Operation and Maintenance Guidelines

Operation & Maintenance

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

- A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stand rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pre-treatment device). CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.
- B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.
 1. **Manhole Access**

This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

Operation & Maintenance



2. StormFilter Access

Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the Inspector can enter the StormFilter unit to launch the CCTV camera robot.

- C. The Inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the Inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

- A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.
- B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.
- C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.
- D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance

The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris as required.

B. Major Maintenance

The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

Major Maintenance (continued)

	Frequency	Action
Inlets and Outlets	Every 3 years	<ul style="list-style-type: none"> Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	<ul style="list-style-type: none"> Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	<ul style="list-style-type: none"> Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique.
	45 to 50 years after commissioning	<ul style="list-style-type: none"> Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. Attain the appropriate approvals as required. Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1 st year	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	<ul style="list-style-type: none"> Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.



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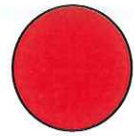
Phone: 203-775-4416 • Toll Free: 800-4-CULTEC • Fax: 203-775-1462

Web: www.cultec.com • E-mail: custservice@cultec.com

Appendix E:

Geotechnical Information

(Storm water infiltration BMP evaluation)



RED

Geotechnical Engineering Exploration and Analysis

**Proposed Chick-fil-A Restaurant #4003
Main & Almond FSU
202 N. Main Street
Orange, California**

Prepared for:

**Chick-fil-A, Inc.
Irvine, California**

Prepared by:

Giles Engineering Associates, Inc.

**May 18, 2018
Project No. 2G-1610007**



GILES
ENGINEERING ASSOCIATES, INC.



GILES

ENGINEERING ASSOCIATES, INC.

GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

- Atlanta, GA
- Baltimore, MD
- Dallas, TX
- Los Angeles, CA
- Manassas, VA
- Milwaukee, WI

May 18, 2018

Chick-fil-A, Inc.
15635 Alton Parkway, Suite 350
Irvine, California 92618

Attention: Ms. Beth Witt
Development Coordinator

Subject: Geotechnical Engineering Exploration and Analysis
Proposed Chick-fil-A Restaurant #4003
Main & Almond FSU
202 N. Main Street
Orange, California
Project No. 2G-1610007

Dear Ms. Witt:

Giles Engineering Associates, Inc. (Giles) is pleased to present our *Geotechnical Engineering Exploration and Analysis* report prepared for the above-referenced project. Conclusions and recommendations developed from the exploration and analysis are discussed in the accompanying report.

We appreciate the opportunity to be of service on this project. If we may be of additional assistance, should geotechnical related problems occur or to provide construction observation and testing services, please do not hesitate to call at any time.

Respectfully submitted,

GILES ENGINEERING ASSOCIATES, INC.


Edgar L. Gatus, P.E.
Assistant Branch Manager



Distribution: Chick-fil-A, Inc.
Attn: Ms. Beth Witt (email: Beth.Witt@cfacorp.com)
Attn: Ms. Jennifer Daw (email: Jennifer.Daw@cfacorp.com)
(1 upload to Buzzsaw)

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PROPOSED CHICK-FIL-A RESTAURANT #4003
MAIN & ALMOND FSU
202 N. MAIN STREET
ORANGE, CALIFORNIA
PROJECT NO. 2G-1610007

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APPENDICES

Appendix A – Figures (4), Boring Logs (8) and Percolation Test Data

Appendix B – Field Procedures

Appendix C – Laboratory Testing and Classification

Appendix D – General Information (*Modified Guideline Specifications*) and *Important Information About Your Geotechnical Report*



GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED CHICK-FIL-A RESTAURANT #4003
MAIN & ALMOND FSU
202 N. MAIN STREET
ORANGE, CALIFORNIA
PROJECT NO. 2G-1610007

1.0 EXECUTIVE SUMMARY OUTLINE

The executive summary is provided solely for purposes of overview. Any party who relies on this report must read the full report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

Subsurface Conditions

- Site Class designation D is recommended for seismic design considerations.
- Based on our review of the Geologic Map for the Orange County California prepared by California Department of Conservation, the site is mapped as being underlain by Young Alluvial Fan Deposits that typically consist of unconsolidated, loose to moderately dense sand, sandy silt and silt.
- Fill materials were encountered within test borings B-1 to B-5 to depths of about 1½ to 2 feet below existing grades. These materials were noted to be generally moist, very loose silty sand with trace to little clay.
- Native soils encountered below the fill materials and beneath the pavement within test borings B-6 to B-8 were generally damp to very moist, very loose to medium dense in relative density silty sand and clayey sand, and soft in comparative consistency sandy clay.

Site Development

- The proposed site development will include the demolition of existing building (with basement) for the construction of a new Chick-fil-A (CFA) single-story building and site improvements that will include new concrete walkways, parking stalls, driveways, drive thru lane, and trash enclosure. The new CFA building will be located to the south of the existing building and along the southerly end of the property.
- New Building: Due to the presence of variable and low strength soils and the likely disturbance of the subgrade soils during clearing operations, we recommend that the subgrade beneath the proposed building area be over-excavated to a depth of at least 2 feet below the bottom of proposed footings and/or slabs and at least 3 feet below existing grade, whichever is deeper. The soil exposed at the bottom of the soil over-excavation should then be examined by the geotechnical engineer to assess the suitability of these soils for building support. The exposed soils should then be scarified to a depth of 12 inches, moisture conditioned and then compacted to at least 90% of the soil's maximum dry density.

Building Foundation

- Shallow spread footing foundation systems or turned-down slabs may be designed for a maximum, net allowable soil pressure of 2,500 psf soil bearing pressure underlain by competent subgrade soils.
- We recommend that all strip footings be reinforced with at least 4 No. 5 bars (2 top and 2 bottom).



Building Floor Slab

- It is recommended that on grade slab be a minimum 4-inch thick slab-on-grade or turned-down slab over properly prepared subgrade.
- A minimum 10-mil vapor retarder is recommended to be directly below the floor slab or base course where required to protect moisture sensitive floor coverings.
- Minimum slab reinforcing recommended consisting of No. 3 rebars spaced at 18 inches on center, each way.

Parking Improvement

- Asphalt Pavements: 3 inches of asphaltic concrete underlain by 4 and 6 inches of base course aggregate in parking stalls and driveways, respectively.
- Portland Cement Concrete: 6 inches in thickness underlain by 4 inches of base course in high stress areas such as entrance/exit aprons, trash enclosure-loading zone, and the drive through area.

RED - This site has been given a red designation due to potential increased costs associated with the removal of the basement and placement of engineered fill, and also the presence of low strength near surface on site soils.



2.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. ("Giles") conducted regarding the proposed development. The *Geotechnical Engineering Exploration and Analysis* included several separate, but related, service areas referenced hereafter as the Geotechnical Subsurface Exploration Program, Geotechnical Laboratory Services, and Geotechnical Engineering Services. The scope of each service area was narrow and limited, as directed by our client and in consideration of the proposed project. The scope of each service area is briefly explained in this report.

Geotechnical-related recommendations for design and construction of the foundation and ground-bearing floor slab for the proposed building are provided in this report. Geotechnical-related recommendations are also provided for the proposed parking lot improvements. Site preparation recommendations are also given; however, those recommendations are only preliminary since the means and methods of site preparation will depend on factors that were unknown when this report was prepared. Those factors include the weather before and during construction, the water table at the time of construction, subsurface conditions that are exposed during construction, and finalized details of the proposed development.

Giles conducted a *Phase 1 Environmental Site Assessment* for the subject site. The results of that assessment were provided under separate cover.

3.0 SITES AND PROJECT DESCRIPTION

3.1 Site Description

A new Chick-fil-A restaurant with drive-thru lane is proposed at 202 N. Main Street in the city of Orange, California. The site is currently occupied by a vacant one to two story Manhattan Steak and Seafood restaurant building with basement. It is unknown if the existing basement extends beneath the entire building. The building is located in the northeast corner of the property with paved parking stalls and driveways to the west and south of the building. The site is bordered on the north by Almond Avenue, on the east by Main Street, on the south by a two story office/medical building and on the east by a single story preschool building. Access to the site is through driveways at Almond Avenue and Main Street.

Other existing site improvements include asphalt pavements, concrete curbs and gutters, concrete walkways, block walls along the southerly and westerly property lines, some planter areas that contain trees and shrubs and underground utilities. The existing site parking lot and parking areas are considered to be in fair condition.

Our review of the ALTA/ACSM survey prepared by Truxaw and Associates Inc. (Truxaw) indicated elevations within the site ranged from Elevation (EL.) 159.8 feet along the northeast corner of the site to El. 156.7 along the southwest corner of the site. Additionally, according to Truxaw site survey, the



existing multi story vacant building has basement. However, whether this is a full or partial basement is not known as of the date of this report. The subject property is situated at approximately latitude 33.7859° North and longitude -117.8677° West.

3.2 Proposed Project Description

The proposed developments include the demolition of existing building and site improvements for the construction of a new, single-story Chick-fil-A restaurant building to be located to the south of the existing building along the southerly end of the property. The new building will be a single-story wood-frame structure, 4,998 square feet, with no basement or underground levels. We were not provided with specific loading information for this project at the time of this report; however, based on previous Chick-fil-A projects, we expect maximum combined dead and live loads supported by the bearing walls and columns of 2 to 3 kips per lineal foot (klf) and 40 to 50 kips, respectively. The live load supported by the floor slab is expected to be a maximum of 100 pounds per square foot (psf).

Other planned improvements include a drive-thru lane to the north, east and south of the new building, new parking stalls, menu board signs, a new trash enclosure, an outdoor patio, new concrete walkways, storm water infiltration system and new planter areas.

According to the Conceptual Grading and Drainage Plan (Sheet 2 of 4), prepared by Joseph C. Truxaw & Associates, dated March 12, 2018, the planned finished floor elevation for the proposed building will be at El. 158.5 feet. Existing ground surface elevations within the new building range from El. 157.4 to El. 158.5. Therefore, site grading will consist of minor fill (up to 1 foot) in order to establish the necessary site grade to accommodate the planned floor elevation exclusive of site preparation or over-excavation requirements necessary to create a stable site suited for the proposed development.

The traffic loading on the proposed parking lot is understood to predominantly consist of automobiles with occasional heavy trucks resulting from deliveries and trash removal. The parking lot pavement sections have been designed on the basis of an assumed Traffic Index of 4.0 for the parking stall areas (light duty) and 5.0 for the drive lanes (medium duty). Pavement designs are based on a 20-year design period.

4.0 SUBSURFACE EXPLORATION

4.1 Subsurface Exploration

Our subsurface exploration consisted of the drilling of eight (8) exploratory test borings to depths of about 5 to 16½ feet below existing ground surfaces. Some of the boring locations were restricted due to the existing building. The approximate test boring locations are shown in the Test Boring Location Plan (Figure 1). The Test Boring Location Plan and Test Boring Logs (Records of Subsurface Exploration) are enclosed in Appendix A. Field and laboratory test procedures and results are enclosed in Appendix B and C, respectively. The terms and symbols used on the Test Boring Logs are defined on the General Notes in Appendix D.



Our subsurface exploration included the collection of relatively undisturbed samples of subsurface soil materials for laboratory testing purposes. Bulk samples consisted of composite soil materials obtained at selected depth intervals from the borings. Relatively undisturbed samples were collected (per ASTM D-3550) using a 3-inch outside-diameter, modified California split-spoon soil sampler (CS) lined with 1-inch high brass rings. The sampler was driven with successive 30-inch drops of a hydraulically operated, 140-pound automatic trip hammer. Blow counts for each 6-inch driving increment were recorded on the field exploration logs. The central portions of the driven core samples were placed in sealed containers and transported to our laboratory for testing.

Where deemed appropriate, standard split-spoon tests (SS), also called Standard Penetration Test (SPT), were also performed at selected depth intervals in accordance with the American Society for Testing Materials (ASTM) Standard Procedure D 1586. This method consists of mechanically driving an unlined standard split-barrel sampler 18 inches into the soil with successive 30-inch drops of the 140-pound automatic trip hammer. Blow counts for each 6-inch driving increment were recorded on the exploration logs. The number of blows required to drive the standard split-spoon sampler for the last 12 of the 18 inches was identified as the uncorrected standard penetration resistance (N). Disturbed soil samples from the unlined standard split-spoon samplers were placed in plastic containers and transported to our laboratory for testing.

4.2 Subsurface Conditions

The subsurface conditions as subsequently described have been simplified somewhat for ease of report interpretation. A more detailed description of the subsurface conditions at the test boring locations is provided by the logs of the test borings enclosed in Appendix A of this report.

Site Geologic Setting

Based on our review of the Geologic Map for the Orange County California prepared by California Department of Conservation, the site is mapped as being underlain by Young Alluvial Fan Deposits that typically consist of unconsolidated, loose to moderately dense sand, sandy silt and silt.

Pavement

Existing pavement encountered consisted of approximately 2½ to 6 inches thick asphaltic concrete with no base noted, except at Test Boring B-5 where about 4 inches of aggregate base was encountered. Based on our visual observation, the existing pavement is in fair condition.

Soil

Fill materials were encountered within our exploratory Test Borings B-1 to B-5 to depths of about 1½ to 2 feet below existing grades. These materials were noted to be generally moist, very loose silty sand with trace to little clay. Additional fill soils may be situated adjacent to the existing basement foundation walls associated with the existing building.

Native soils encountered below the fill materials and beneath the pavement within Test Borings B-6 to B-8 were generally damp to very moist, very loose to medium dense in relative density silty sand and clayey sand, and soft in comparative consistency sandy clay.

Groundwater

Groundwater was not encountered during our subsurface investigation to the maximum depth explored (16.5 feet). Based on a review of the Seismic Hazard Zone Report for the Orange Quadrangle, the depth to historic high groundwater is reported to be greater than 40 feet below grade. However, fluctuations of the groundwater table, localized zones of perched water, and rise in soil moisture content should be anticipated during and after the rainy season. Irrigation of landscape areas on or adjacent to the site can also cause fluctuations of local or shallow perched groundwater levels.

4.3 Infiltration Testing

On-site below grade storm water infiltration system is being planned to the east of the new building and at least 30 feet lateral distance from the building.

Two percolation tests (B-6 @ 5 feet and B-7 @ 6 feet) were conducted at the site (Figure 1) and involved the drilling of a test boring utilizing a hollow-stem auger drill rig with an outside diameter of approximately 8 inches. Within the drilled test hole gravel about 2 inches in thickness was placed at the bottom of the test hole, then a two-inch diameter perforated pvc pipe was installed inside the boring and pea gravel was used as filter pack around the outside diameter of the pipe. Testing involved presoaking the test holes and filling the test holes with water, and recording the drop in the water surface. The approximate locations of the percolation tests are shown on the attached Figure 1.

The infiltration test procedure outlined in the Orange County Technical Guidance Document (OCTGD) was used as a guide in our percolation testing. A summary of the results of the percolation tests is provided in Table 1 below.

The drop in water level over time is the pre-adjusted percolation rate at the test location. The pre-adjusted percolation rates were reduced to account for the discharge of water from both the sides and bottom of the boring. The formula below was used to calculate for the infiltration rate.

$$\text{Infiltration Rate} = \Delta H (60r) / \Delta t (r + 2H_{avg})$$

Where: r is the radius of the test hole (in)

ΔH is the change in height over the time interval (in)

Δt is the time interval (min)

H_{avg} is the average head height over the time interval

Additionally, the calculated infiltration rates were also adjusted to reflect a factor safety (FS) of 2 applied to the rates obtained from the infiltration test results and are summarized below.

TABLE 1 – PERCOLATION TEST RESULTS				
Test Hole	Test Depth ¹ (feet)	Pre-Adjusted Percolation Rate (in/hr)	Infiltration Rate ² (in/hr)	Soil Type
B-6	5.0±	12.24	1.00	Silty Sand
B-7	6.0±	24.48	1.12	Silty Sand
1) Depth is referenced to the existing surface grade at the test location. 2) Reflects FS of 2 per Worksheet H of OCTGD				

It should be noted that the infiltration rate of the on-site soils represents a specific area and depth tested and may fluctuate throughout other areas of the site.

The percolation test field data sheet, percolation rate conversion calculations and Worksheet H are attached in this report.

4.4 Photoionization Detector (PID) Screening

Soil samples taken from our subsurface exploration were screened with a Photoionization Detector (PID) to check for the possible presence of volatile vapors. Volatile vapors were detected within test borings B-1 at 3.5 feet and B-4 at 10 feet and measured about 42.1 and 18.2 ppm, respectively, with the use of a PID instrument. PID field-screening results are included on the soil boring logs and also provided to our environmental department.

5.0 LABORATORY TESTING

Several laboratory tests were performed on selected samples considered representative of those encountered in order to evaluate the engineering properties of on-site soils. The following are brief description of our laboratory test results.

In Situ Moisture and Density

Tests were performed on select samples from the test borings to determine the subsoils dry density and natural moisture contents in accordance with Test Method ASTM 2216-05. The results of these tests are included in the Test Boring Logs enclosed in Appendix A.

Sieve Analysis

Sieve Analyses including Passing No. 200 Sieve were performed on selected samples from Test Borings B-2, B-4, B-6 and B-7 to assist in soil classification. These tests were performed in accordance with Test Method ASTM D 1140-00 (Reapproved 2006) and ASTC C 1369-96. The results of the sieve analyses are graphically presented as Figure 2 and passing no. 200 sieve results are presented on Test Boring Logs, Appendix A.

Expansion

To evaluate the expansive potential of the near surface soils encountered during our subsurface exploration, a composite sample collected from Test Boring B-2 (1 to 5 feet) was subjected to Expansive Index (EI) testing in accordance with Test Method ASTM D 4829-08a. The result of our expansion index (EI) test indicates that the near surface sample has a *very low* expansion potential (EI= 0).

Consolidation Test

The consolidation characteristics of the site soils under anticipated loads were made on the basis of one-dimensional consolidation tests. These tests were performed in general accordance with Test Method ASTM D 2435-11. The test samples were inundated at 2,000 psf pressure in order to evaluate the sudden increase in moisture condition (swell or collapse potential). Results of this tests indicated that the near surface soils exhibited a low collapse potential of 0.04% and 0.63% at a loading of 2000 psf. The Consolidation test curves, Figures 3 and 4 are included in Appendix A.

Soluble Sulfate Analysis and Soil Corrosivity

A representative sample of the near surface soils which may contact shallow buried utilities and structural concrete was performed to determine the corrosion potential for buried ferrous metal conduits and the concentrations present of water soluble sulfate which could result in chemical attack of cement. The following table presents the results of our laboratory testing.

Parameter	B-2 1 to 5 feet
pH	7.88
Chloride	96 ppm
Sulfate	0.0156%
Resistivity	4,000 ohm-cm

The chloride content of the near-surface soils was determined for a selected sample in accordance with California Test Method No. 422. The results of this test indicated that tested on-site soil has a Low exposure to chloride. The results of limited in-house testing of soil pH and resistivity were determined in accordance with California test Method No. 643 and indicated that on-site soil is slightly alkaline with respect to pH.

These test results have been evaluated in accordance with criteria established by the Cast Iron Pipe Research Association, Ductile Iron Pipe Research Association, the American Concrete Institute and the National Association of Corrosion Engineers. The test results on a near surface bulk sample from the site generally indicate that tested site soils has a moderate corrosive potential when in contact with ferrous materials. Therefore, special protection for underground cast iron pipe or ductile pipe may be warranted depending on the actual materials in contact with the pipe. We recommend that a corrosion engineer review these results in order to provide specific recommendations for corrosion protection as well as appropriate recommendations for other types of buried metal structures.

Corrosivity testing also included determination of the concentrations of water-soluble sulfates present in the tested soil sample in accordance with California Test Method No. 417. Our laboratory test data indicated that near surface soils contain approximately 0.0156 percent of water soluble sulfates. Based on the 2016 California Building Code (CBC), concrete that may be exposed to sulfate containing soils shall comply with the provisions of ACI 318-05, Section 4.3. Therefore, according to Table 4.3.1 of the ACI 318-05, a low exposure to sulfate corrosivity can be expected for concrete placed in contact with the tested on-site soils. No special sulfate resistant cement is considered necessary for concrete which will be in contact with the tested on-site soils.

6.0 GEOLOGIC AND SEISMIC HAZARD

6.1 Active Fault Zones

The project site is located in the highly seismic Southern California region within the influence of several fault systems. However, the site is not mapped within the boundaries of an Earthquake Fault Zone as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act.

6.2 Seismic Hazard Zones

Our review of the published Seismic Hazard Evaluation Report for the Orange Quadrangle (within which the subject site is located) indicates that the subject site does not lie within a designated Liquefaction Hazard Zone. Therefore, an assessment of the potential for liquefaction is not considered necessary.

General types of ground failures that might occur as a consequence of severe ground shaking typically include landsliding, ground lurching and shallow ground rupture. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, subsoils and groundwater conditions, in addition to other factors. Based on our subsurface exploration and the seismic designation for this site, all of the above effects of seismic activity are considered unlikely at the site.

6.3 Landslide Hazards

The subject site does not lie within the designated Landslide Hazard Zone based on our review of the published Seismic Hazard Evaluation Report for the Orange Quadrangle. Since the subject site is generally level and not located near unstable slope, mitigation of landslide hazards is not necessary for the site.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our subsurface exploration and laboratory testing, the planned development for the subject site is considered feasible from a geotechnical point of view provided the following conclusions and recommendations are incorporated in the design and project specifications.

Conditions imposed by the proposed improvement have been evaluated on the basis of the engineering characteristics of the subsurface materials encountered during our subsurface investigation and their anticipated behavior both during and after construction. Conclusions and recommendations, along with site preparation recommendations and construction considerations are discussed in the following sections of this report.

We recommend that Giles Engineering Associates, Inc. be involved in the review of the grading and foundation plans for the site to ensure our recommendations are interpreted correctly. Based on the results of our review, modifications to our recommendations or the plans may be warranted.

Effect of Proposed Grading and Construction on Adjacent Property

It is our opinion that the proposed construction and grading will be safe against geotechnical hazards from landslides, settlement, or slippage and the proposed work will not adversely affect the geologic stability of the adjacent property provided grading and construction are performed in compliance with the city code and in accordance with the recommendations presented herein.

7.1 Seismic Design Considerations

Faulting/Seismic Design Parameters

Research of available maps published by the California Geological Survey (CGS) indicates that the site is not located within an Alquist-Priolo Earthquake Fault Zone. The potential for fault rupture through the site is, therefore, considered to be low. The site may however be subject to strong groundshaking during seismic activity. The proposed structure should be designed in accordance with the current version of the 2016 California Building Code (CBC) and applicable local codes. Based on our subsurface exploration, a Site Class D is recommended for design.



According to the 2008 National Seismic Hazard Maps prepared by USGS, the San Joaquin Hills, Puente Hills (Coyote Hills), Elsinore:W+GI+T+J+CM, and Newport Inglewood Connected alt 2 faults are the closest known active faults and are located about 6.51, 6.67, 9.41 and 10.46 miles, respectively, from the site and with an anticipated maximum moment magnitude (M_w) of 7.10, 6.90, 7.85 and 7.50, respectively.

The proposed structure should be designed in accordance with the current version of the 2016 California Building Code (CBC) and applicable local codes. Within the International Code Council's 2015 International Building Code (IBC), the five-percent damped design spectral response accelerations at short periods, S_{DS} , and at 1-second period, S_{D1} , are used to determine the seismic design base shear. These parameters, which are a function of the site's seismicity and soil, are also used as parts of triggers for other code requirements. The following values are determined by using the USGS published U.S. Seismic Design Maps program based upon the 2016 CBC referenced ASCE 7 (with July 2013 errata).

CBC 2016, Earthquake Loads	
Site Class Definition (Table 1613.5.2)	D
Mapped Spectral Response Acceleration Parameter, S_s (Figure 1613.3.1(1) for 0.2 second)	1.488
Mapped Spectral Response Acceleration Parameter, S_1 (Figure 1613.3.1(2) for 1.0 second)	0.543
Site Coefficient, F_a (Table 1613.3.3 (1) short period)	1.000
Site Coefficient, F_v (Table 1613.3.3 (2) 1-second period)	1.500
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{MS} (Eq. 16-37)	1.488
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{M1} (Eq. 16-38)	0.814
Design Spectral Response Acceleration Parameter, S_{DS} (Eq. 16-39)	0.992
Design Spectral Response Acceleration Parameter, S_{D1} (Eq. 16-40)	0.543

7.2 Site Development Recommendations

The following recommendations for site development have been based upon the assumed floor elevation and foundation bearing grades and the conditions encountered at the test boring locations.

Site Clearing & Demolition

Clearing operations should include the demolition and removal of all existing landscape areas and structural features such as building footings and floor slab, basement walls or other below-grade construction, asphaltic concrete pavement, and concrete walkways within the area of the proposed new building and site improvements.



If desired, basement walls may be left in-place (outside the new building location). All basement walls to be left in-place should be cut-off at least 3 feet below finished grade. The locations of any walls to be left in-place should be evaluated to verify that the existing walls will not interfere with future utility line excavation. The basement should be backfilled with a properly placed and compacted fill as recommended in a subsequent section of this report.

All soils disturbed by the demolition and clearing operations should be removed and stockpiled for future use. All debris resulting from the demolition and clearing operations should be legally disposed off-site. Clearing operations should also include the removal of all vegetation within the area of proposed development. Trees and large shrubs to be removed should include their stumps and major roots. Existing pavement within areas of proposed development should be removed or processed to a maximum 3-inch size and stockpiled for use as compacted fill or stabilizing material for the new development. Processed asphalt may be used as fill, sub-base course material, or subgrade stabilization material beyond the building perimeter. Processed concrete or existing base may be used as fill, sub-base course material, or subgrade stabilization material both within and outside of the building perimeter. Due to the moisture sensitivity and variable support characteristics of the on-site soils, the pavement is recommended to remain in-place as long as possible to help protect the subgrade from construction traffic.

Should any unusual soil conditions or subsurface structures be encountered during clearing/demolition operations or during grading, they should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations.

Existing Utilities

All existing utilities should be located. Utilities that are not reused should be capped off and removed or properly abandoned in-place in accordance with local codes and ordinances. The excavations made for removed utilities that are in the influence zone of new construction are recommended to be backfilled with structural compacted fill. Underground utilities, which are to be reused or abandoned in-place, are recommended to be evaluated by the structural engineer and utility backfill is recommended to be evaluated by the geotechnical engineer, to determine their potential effect on the new improvement. If any existing utilities are to be preserved, grading operations must be carefully performed so as not to disturb or damage the existing utility.

Building Area

Due to the presence of variable and low strength soils and the likely disturbance of the subgrade soils during clearing operations, we recommend that the subgrade beneath the proposed building area be over-excavated to a depth of at least 2 feet below the bottom of proposed footings and/or slabs and at least 3 feet below existing grade, whichever is deeper. The soil exposed at the bottom of the soil over-excavation should then be examined by the geotechnical engineer to assess the suitability of these soils for building support. The exposed soils should then be scarified, where possible, to a depth of 12 inches, moisture conditioned and then compacted to at least 90% of the soil's maximum dry density. The lateral extent of this recommendation should include the area at least 5 feet beyond the new building limits.



Positive drainage devices such as sloped concrete flatwork, earth swales, and sheet flow gradients in landscape, setback, and easement areas should be designed for the site. The drainage system should drain to a suitable discharge area. The purpose of this drainage system is to reduce water infiltration into the subgrade soils and to direct water away from buildings and site improvements.

Proofroll and Compact

After site clearing and lowering of site grades where necessary, the subgrades within the proposed pavement areas should be proofrolled in the presence of the geotechnical engineer with appropriate rubber-tire mounted heavy construction equipment or a loaded truck to detect very loose/soft yielding soil which should be removed to a stable subgrade. Following proofrolling and completion of any necessary over-excavation, the subgrade should be scarified to a minimum depth of 12 inches, moisture conditioned and recompacted to at least 90 percent of the Modified Proctor (ASTM D1557-00) maximum density. The upper 1 foot of the pavement subgrade should have minimum in-place density of at least 95% of the maximum dry density. Low areas and excavations may then be backfilled in lifts with suitable very low expansive (EI less than 21) structural compacted fill. The selection, placement and compaction of structural fill should be performed in accordance with the project specifications.

The Guide Specifications included in Appendix D (Modified Proctor) of this report are recommended to be used, at a minimum, as an aid in developing the project specifications. The floor slab subgrade may need to be recompacted prior to slab construction due to weather and equipment traffic effects on the previously compacted soils.

Reuse of On-site Soil

On-site material may be reused as structural compacted fill within the proposed building and pavement improvement area provided they are moisture conditioned and compacted as recommended, and do not contain oversized materials, significant quantities of organic matter, or other deleterious materials. Care should be used in controlling the moisture content of the soils to achieve proper compaction for pavement support. All subgrade soil compaction as well as the selection, placement and compaction of new fill soils should be performed in accordance with the project specifications under engineering controlled conditions.

Import Structural Fill

Any soil imported to the site (if required) for use as structural fill should consist of very low expansive soils (EI less than 21). Material designated for import should be submitted to the project geotechnical engineer no less than three working days prior to placement for evaluation.

In addition to expansion criteria, soils imported to the site should exhibit adequate shear strength characteristics for the recommended allowable soil bearing pressure; soluble sulfate content and corrosivity; and pavement support characteristics.



Subgrade Protection

The near surface soils that are expected to comprise the subgrade are sensitive to water. Unstable soil conditions will develop if these soils are exposed to moisture increases or are disturbed (rutted) by construction traffic. The site should be graded to prevent water from ponding within construction areas and/or flowing into excavations. Accumulated water must be removed immediately along with any unstable soil. Foundation concrete should be placed and excavations backfilled as soon as possible to protect the bearing grade. The degree of subgrade instability and associated remedial construction is dependent, in part, upon precautions taken by the contractor to protect the subgrade during site development.

Silt fences or other appropriate erosion control devices should be installed in accordance with local, state and federal requirements at the perimeter of the development areas to control sediment from erosion. Since silt fences or other erosion control measures are temporary structures, careful and continuous monitoring and periodic maintenance to remove accumulated soil and/or replacement should be anticipated.

Fill Placement

Material for engineered fill should be moisture conditioned and compacted in accordance with the specifications, be free of organic material, debris, and other deleterious substances, and should not contain fragments greater than 3 inches in maximum dimension. On-site excavated soils that meet these requirements may be used to backfill the excavated pavement areas.

All fill should be placed in 8-inch-thick maximum loose lifts, moisture conditioned and then compacted in accordance with recommendation herein and with the enclosed "Guide Structural Fill Specifications". A representative of the geotechnical engineer should be present on-site during grading operations to verify proper placement and compaction of all fill, as well as to verify compliance with the other geotechnical recommendations presented herein.

7.3 Construction Considerations

Construction Dewatering

Groundwater was not encountered during our subsurface investigation. Therefore, groundwater is not expected to impact shallow excavations for footings and utilities. However, the site may be susceptible to shallow perched water conditions. In the event that shallow perched water is encountered, filter sump pumps placed within pits in the bottoms of excavations are expected to be the most feasible method of construction dewatering.

Soil Excavation

Some localized slope stability problems may be encountered in steep, unbraced excavations considering the granular nature of the subsoils. All excavations must be performed in accordance with CAL-OSHA requirements, which is the responsibility of the contractor. Shallow excavations may be adequately sloped for bank stability while deeper excavations or excavations where adequate back sloping cannot be performed may require some form of external support such as shoring or bracing.

7.4 Foundation Recommendations

Vertical Load Capacity

Upon completion of the building pad preparation, the proposed structure may be supported by a shallow foundation system underlain by newly placed engineered fill. The foundation system may consist of either independently constructed spread footings or monolithically constructed foundation and floor slab thereby using a turned-down slab construction technique. Foundations may be designed for a maximum, net, allowable soil-bearing pressure of 2,500 pounds per square foot (psf). Minimum foundation widths for walls and columns should be 16 and 24 inches, respectively, regardless of the calculated soil bearing pressure. The recommended allowable soil bearing pressure may be increased by one-third for short term wind and/or seismic loads.

Reinforcing

The recommended minimum quantity of longitudinal reinforcing for geotechnical considerations within continuous strip footing is four No. 5 bars (2 top and 2 bottom) continuous through column pads within the strip footings. The recommended quantity of longitudinal reinforcing pertains to a minimum 12-inch thick and a maximum 24-inch wide footing pad; additional reinforcing may be necessary if a thinner or wider footing pad is used to develop equivalent rigidity. Conventional reinforcing is considered suitable in isolated column pad footings. The final design of the foundations as well as determination of the actual quantity of steel reinforcing and the footing dimensions should be performed by the project structural engineer.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. Passive pressure and friction may be used in combination, without reduction, in determining the total resistance to lateral loads. A one-third increase in the passive pressure value may be used for short duration wind or seismic loads.

A coefficient of friction of 0.35 may be used with dead load forces for footings placed on newly placed compacted fill soil. An allowable passive earth pressure of 250 psf per foot of footing depth (pcf) below the lowest adjacent grade may be used for the sides of footings placed against newly placed structural fill. The maximum recommended allowable passive pressure is 1,500 psf.

Bearing Material Criteria

Soil suitable to serve as the foundation bearing grade should exhibit at least a loose relative density (average N value of at least 8) for non-cohesive soils for the recommended 2,500 psf allowable soil bearing pressure. For design and construction estimating purposes, suitable bearing soils are expected to be encountered at nominal foundation depths following the recommended site preparation activities. However, field testing by the Geotechnical Engineer within the foundation bearing soils is recommended to document that the foundation support soils possess the minimum strength parameters noted above. If unsuitable bearing soils are encountered, they should be recompacted in-place, if feasible, or excavated to a suitable bearing soil subgrade and to a lateral extent as defined by Item No. 3 of the enclosed Guide Specifications, with the excavation backfilled with structural compacted fill to develop a uniform bearing grade. As an alternate, a lean concrete slurry (minimum 28-day compressive strength of 500 psi) could be used as backfill and would limit the lateral over-excavation as needed with a soil backfill. If the lean concrete slurry option is used, it should extend at least 3 inches beyond to footing element. The effectiveness of the lean concrete option may also be limited due to anticipated caving within the granular soils.

Foundation Embedment

The California Building Code (CBC) requires a minimum 12-inch foundation embedment depth. However, it is recommended that exterior foundations extend at least 18 inches below the adjacent exterior grade for bearing capacity and to provide greater protection of the moisture sensitive bearing soils. Interior footings may be supported at nominal depth below the floor. All footings must be protected against weather and water damage during and after construction, and must be supported within suitable bearing materials.

Estimated Foundation Settlement

Post-construction total and differential static movement (settlement) of a shallow foundation system designed and constructed in accordance with the recommendations provided in this report are estimated to be less than $\frac{3}{4}$ and $\frac{1}{2}$ inch, respectively, for static conditions. The estimated differential movement is anticipated to result in an angular distortion of about 0.002 inches per inch on the basis of a minimum clear span of 20 feet. The maximum estimated total and differential movement is considered within tolerable limits for the proposed structure provided it is considered in the structural design.

7.5 Floor Slab Recommendations

Subgrade

The floor slab subgrade should be prepared in accordance with the appropriate recommendations presented in the Site Development Recommendations section of this report. Foundation, utility trenches and other below-slab excavations should be backfilled with structural compacted fill in accordance with the project specifications.

Design

The floor of the proposed building may be designed and constructed as a conventional slab-on-grade supported on a properly prepared subgrade. If desired, the floor slab may be poured monolithically with perimeter foundations where the foundations consist of thickened sections thereby using a turned-down slab construction technique. The minimum slab reinforcing for geotechnical considerations is recommended to consist of No. 3 rebars at 18 inches on center, each way. Based on the recommended reinforcing and the assumed live loading, the slab is recommended to be a minimum of 4 inches in thickness. A qualified structural engineer should perform the actual design of the slab to ensure proper thickness and reinforcing.

A minimum 10-mil synthetic sheet should be placed below the floor slab to serve as a vapor retarder where required to protect moisture sensitive floor coverings (i.e. tile, or carpet, etc.). The sheets of the vapor retarder material should be evaluated for holes and/or punctures prior to placement and the edges overlapped and taped. If materials underlying the synthetic sheet contain sharp, angular particles, a layer of coarse sand (Sand Equivalent > 30) approximately 2 inches thick or a geotextile should be provided to protect it from puncture. An additional 2-inch thick layer of coarse sand may be needed between the slab and the vapor retarder to promote proper curing. Proper curing techniques are recommended to reduce the potential for shrinkage cracking and slab curling.

Estimated Movements

Post-construction total and differential movements of the floor slab designed and constructed in accordance with the recommendations provided in this report are estimated to be less than 1/2 and 1/8 inch, respectively. Movements on the order of those estimated for foundations should be expected when the foundation and floor slab are structurally connected or constructed monolithically. The estimated differential movement is anticipated to occur across the short dimension of the structure. The maximum total and differential movement is considered within tolerable limits for the proposed structure, provided that the structural design adequately considers this distortion.

7.6 New Pavement

The following recommendations for the new pavement are intended for vehicular traffic associated with the restaurant development within the subject property.

New Pavement Subgrades

Following completion of the recommended subgrade preparation procedures, the subgrade in areas of new pavement construction are expected to consist of existing soil that exhibit a very low expansion potential. The anticipated subgrade soils are classified as a fair subgrade material with estimated R-value of 40 to 50 when properly prepared based on the Unified Soil Classification System designation of SM. An R-value of 40 has been assumed in the preparation of the pavement design. It should



however, be recognized that the City of Orange may require a specific R-value test to verify the use of the following design. It is recommended that this testing, if required, be conducted following completion of rough grading in the proposed pavement areas so that the R-value test results are indicative of the actual pavement subgrade soils. Alternatively, a minimum code pavement section may be required if a specific R-value test is not performed. To use this R-value, all fill added to the pavement subgrade must have pavement support characteristics at least equivalent to the existing soils, and must be placed and compacted in accordance with the project specifications.

Asphalt Pavements

The following table presents recommended thicknesses for a new flexible pavement structure consisting of asphaltic concrete over a granular base, along with the appropriate CALTRANS specifications for proper materials and placement procedures. An alternate pavement section has been provided for use in parking stall areas due to the anticipated lower traffic intensity in these areas. However, care must be used so that truck traffic is excluded from areas where the thinner pavement section is used, since premature pavement distress may occur. In the event that heavy vehicle traffic cannot be excluded from the specific areas, the pavement section recommended for drive lanes should be used throughout the parking lot.

ASPHALT PAVEMENTS			
Materials	Thickness (inches)		CALTRANS Specifications
	Parking Stalls (TI=4.0)	Drive Lanes (TI=5.0)	
Asphaltic Concrete Surface Course (b)	1	1	Section 39, (a)
Asphaltic Concrete Binder Course (b)	2	2	Section 39, (a)
Crushed Aggregate Base Course	4	6	Section 26, Class 2 (R-value at least 78)
NOTES:			
(a) Compaction to density between 95 and 100 percent of the 50-Blow Marshall Density			
(b) The surface and binder course may be combined as a single layer placed in one lift if similar materials are utilized.			

Pavement recommendations are based upon CALTRANS design parameters for a twenty-year design period and assume proper drainage and construction monitoring. It is, therefore, recommended that the geotechnical engineer monitors and tests subgrade preparation, and that the subgrade be evaluated immediately before pavement construction.

Portland Concrete Pavements

Portland Cement Concrete pavements are recommended in areas where traffic is concentrated such as the entrance/exit aprons as well as areas subjected to heavy loads such as the trash enclosure loading zone. The preparation of the subgrade soils within concrete pavement areas should be

performed as previously described in this report. Portland Cement Concrete pavements in high stress areas are recommended to be at least 6 inches thick containing No. 3 bars at 18-inch on-center both ways placed at mid-height. The pavement should be constructed in accordance with Section 40 of the CALTRANS Standard Specifications. A minimum 4-inch thick layer of base course (CALTRANS Class 2) is recommended below the concrete pavement. This base course should be compacted to at least 95% of the material's maximum dry density.

The maximum joint spacing within all of the Portland Cement Concrete pavements is recommended to be 15 feet to control shrinkage cracking. Load transfer reinforcing is recommended at construction joints perpendicular to traffic flow if construction joints are not properly keyed. In this event, $\frac{3}{4}$ -inch diameter smooth dowel bars, 18 inches in length placed at 12 inches on-center are recommended where joints are perpendicular to the anticipated traffic flow. Expansion joints are recommended only where the pavement abuts fixed objects such as light standard foundations. Tie bars are recommended at the first joint within the perimeter of the concrete pavement area. Tie bars are recommended to be No. 4 bars at 42-inch on-center spacings and at least 48 inches in length.

General Considerations

Pavement recommendations assume proper drainage and construction monitoring and are based on traffic loads as indicated previously. Pavement designs are based on either PCA or CALTRANS design parameters for twenty (20) year design period. However, these designs are also based on a routine pavement maintenance program and significant asphalt concrete pavement rehabilitation after about 8 to 10 years, in order to obtain a reasonable pavement service life.

7.7 Recommended Construction Materials Testing Services

The report was prepared assuming that Giles will perform Construction Materials Testing (CMT) services during construction of the proposed development. In general, CMT services are recommended (and expected) to at least include observation and testing of foundation and pavement support soil and other construction materials. It might be necessary for Giles to provide supplemental geotechnical recommendations based on the results of CMT services and specific details of the project not known at this time.

7.8 Basis of Report

This report is based on Giles' proposal, which is dated October 18, 2016 and is referenced by Giles' proposal number 2GEP-1610016. The actual services for the project varied somewhat from those described in the proposal because of the conditions that were encountered while performing the services and in consideration of the proposed project.

This report is strictly based on the project description given earlier in this report. Giles must be notified if any parts of the project description or our assumptions are not accurate so that this report can be amended, if needed. This report is based on the assumption that the facility will be designed and constructed according to the codes that govern construction at the site.

Geotechnical Engineering Exploration and Analysis
Proposed Chick-fil-A Restaurant #4003
Main & Almond FSU
Orange, California
Project No. 2G-1610007
Page 20

The conclusions and recommendations in this report are based on estimated subsurface conditions as shown on the *Records of Subsurface Exploration*. Giles must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Records of Subsurface Exploration* because this report will likely need to be revised. General comments and limitations of this report are given in the appendix.

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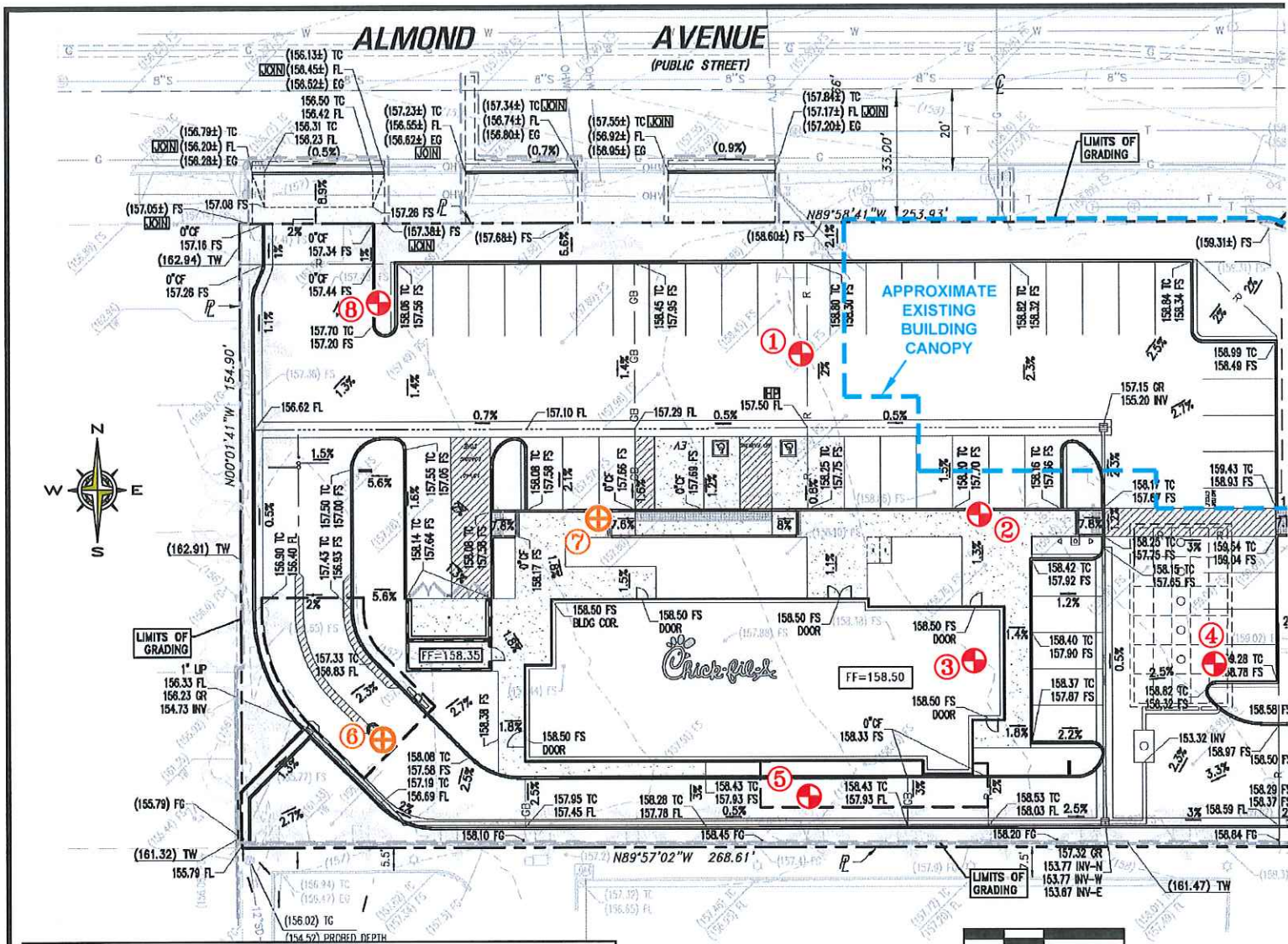


APPENDIX A

FIGURES AND TEST BORING LOGS

The Test Boring Location Plan contained herein was prepared based upon information supplied by *Giles'* client, or others, along with *Giles'* field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.



GILES ENGINEERING ASSOCIATES, INC.
 1965 N. MAIN STREET
 ORANGE, CA 92865 (714)279-0817

FIGURE 1
 TEST BORING LOCATION PLAN
 PROPOSED CHICK-FIL-A RESTAURANT NO. 04003
 MAIN & ALMOND FSU
 202 SOUTH MAIN STREET
 ORANGE, CALIFORNIA

DESIGNED	DRAWN	SCALE	DATE	REVISED
ELG	JSZ	approx. 1"=40'	12-08-16	05-16-18
PROJECT NO.: 2G-1610007			CAD No. 2g1610007-blp2	

LEGEND:



GEOTECHNICAL TEST BORING

GEOTECHNICAL TEST BORING /
 PERCOLATION TEST BORING

NOTES:

- 1.) TEST BORING LOC/
- 2.) BASE MAP DEVELC
 (SHEET PSP-7), REV

0 20' 40'
 APPROXIMATE
 SCALE



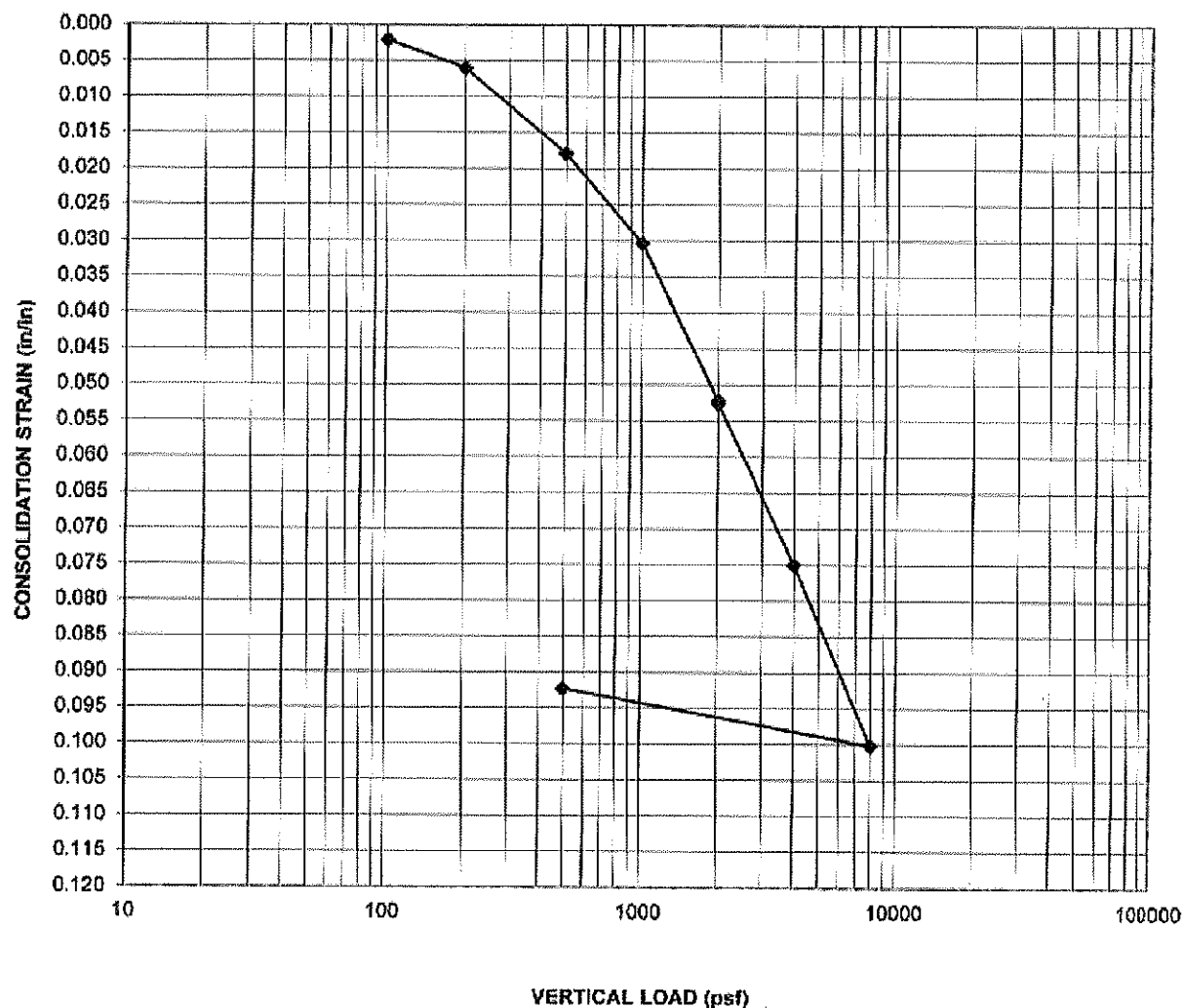
PROJECT Proposed CFA #4003 - Orange, CA
FIGURE 2

JOB NO. 2G-1610007
DATE 12/12/16

GRADATION CURVES

Giles Engineering Associates, Inc

CONSOLIDATION / COLLAPSE TEST ASTM D2435/ASTM D5333



Classification	Silty Sand		
Boring No.	B-1	Initial Moisture Content (%)	11.4
Sample No.	2-CS	Final Moisture Content (%)	14.5
Depth (ft.)	3.5 - 5.0	Natural Density (pcf)	119.9
Elevation		Initial Dry Density (pcf)	107.6
Liquid Limit	NP	Final Dry Density (pcf)	118.6
Plastic Limit	NP	Collapse at 2000 psf	0.04%
Specimen Diameter (in.)	2.42		
Initial Specimen Thickness (in.)	1.00		

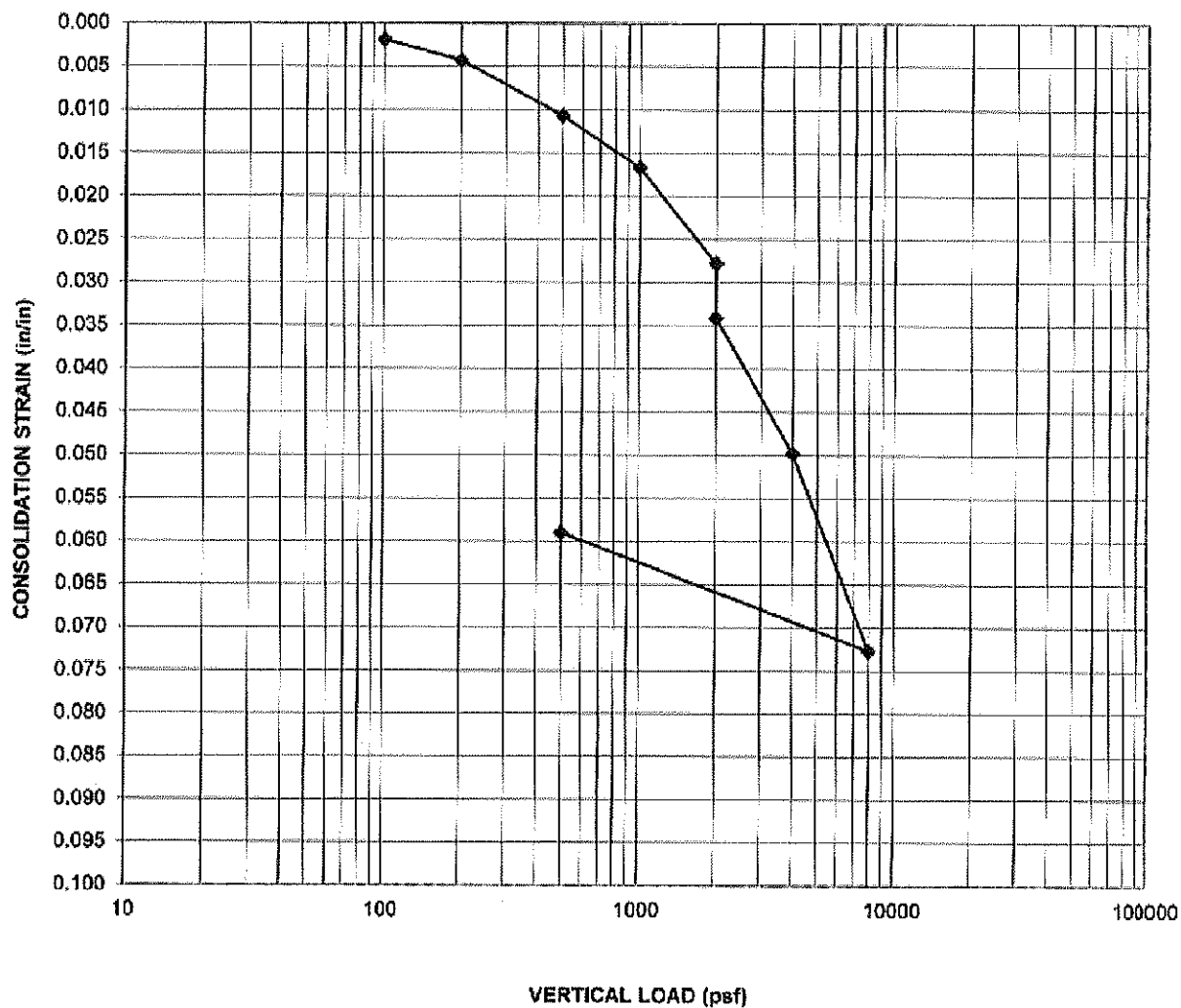
Sample inundated at 2000 psf pressure

Project: CFA#4003
Orange, CA
Client: Chick-fil-A Inc.
Project No.: 2G-1610007
Figure No.: 3

GILES ENGINEERING ASSOCIATES, INC.

-GEOTECHNICAL, ENVIRONMENTAL, AND CONSTRUCTION MATERIALS-
1965 NORTH MAIN STREET, ORANGE, CALIFORNIA
OFFICE: 714-279-0817 FAX: 714-279-8687

CONSOLIDATION / COLLAPSE TEST ASTM D2435/ASTM D5333




Classification	Silty Sand		
Boring No.	B-1	Initial Moisture Content (%)	18.2
Sample No.	4CS	Final Moisture Content (%)	20.1
Depth (ft.)	10.0 - 11.5	Natural Density (pcf)	119.7
Elevation		Initial Dry Density (pcf)	101.3
Liquid Limit	NP	Final Dry Density (pcf)	107.6
Plastic Limit	NP	Collapse at 2000 psf	0.63%
Specimen Diameter (in.)	2.42		
Initial Specimen Thickness (in.)	1.00		

Sample inundated at 2000 psf pressure

Project: CFA#4003
Orange, CA
Client: Chick-fil-A Inc.
Project No.: 2G-1610007
Figure No.: 4

GILES ENGINEERING ASSOCIATES, INC.

-GEOTECHNICAL, ENVIRONMENTAL, AND CONSTRUCTION MATERIALS-
1885 NORTH MAIN STREET, ORANGE, CALIFORNIA
OFFICE: 714-278-0817 FAX: 714-278-9687

BORING NO. & LOCATION: B-1	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 158.6 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 4.5 inches of asphaltic concrete										
Brown Silty fine Sand - Moist (Fill)			1-SS	4				9	BDL	
Light Brown Silty fine Sand, trace of Clay - Moist (Native)		155	2-CS	6				11	42.1	Dd=107.5 pcf
	5		3-CS	9				5	BDL	Dd=110.2 pcf
Brown to Light Brown fine to coarse Sand, trace to little Silt, some Gravel - Damp to Moist		150	4-CS	6				18	BDL	Dd=101.3 pcf
	10		5-SS	2				21	BDL	
Olive Brown Silty fine to coarse Sand, some Clay, trace to little Gravel, some thin layers of Sandy Clay - Moist to Very Moist		145								
	15									

No groundwater encountered
Boring Terminated at about 16.5 feet (EL. 142')

Water Observation Data		Remarks:
<input checked="" type="checkbox"/>	Water Encountered During Drilling: None	CS = California Split Spoon SS = Standard Penetration Test BDL - Below Detection Level
<input checked="" type="checkbox"/>	Water Level At End of Drilling:	
<input checked="" type="checkbox"/>	Cave Depth At End of Drilling:	
<input checked="" type="checkbox"/>	Water Level After Drilling:	
<input checked="" type="checkbox"/>	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.






GILES LOG REPORT: 2G-1610007.GPJ GILES QDT: 12/12/16

BORING NO. & LOCATION: B-2	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 <p>GILES ENGINEERING ASSOCIATES, INC.</p>
SURFACE ELEVATION: 158.9 feet		
COMPLETION DATE: 11/19/18		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 4.5 inches of asphaltic concrete										
Brown Silty fine Sand, trace of Clay - Moist (Fill)			1-SS	4				11	BDL	P ₂₀₀ =28%
Brown to Light Brown Silty fine Sand, trace to little Clay, little Gravel - Damp to Moist (Native)		155	2-SS	2				12	BDL	P ₂₀₀ =35%
	5		3-SS	14				5	BDL	P ₂₀₀ =16%
		150								
Brown fine Sand, trace to little Silt, little Gravel - Damp	10		4-SS	11				3	BDL	P ₂₀₀ =9%
		145								
Olive Brown Sandy Clay, little Silt, trace of Gravel - Very Moist	15		5-SS	3				22	BDL	

No groundwater encountered
Boring Terminated at about 16.5 feet (EL. 142.4')

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/18

Water Observation Data		Remarks:
	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL - Below Detection Level
	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
	Water Level After Drilling:	
	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-3	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 <p>GILES ENGINEERING ASSOCIATES, INC.</p>
SURFACE ELEVATION: 158.4 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 6 inches of asphaltic concrete										
Brown Silty fine Sand - Moist (Fill)										
Light Brown to Brown Silty fine Sand, little Clay - Moist (Native)			1-SS	2				9	BDL	
	155									
			2-CS	6				11	BDL	Dd=104.4 pcf
	5									
			3-CS	17				3	BDL	Dd=103.4 pcf
	150									
	10		4-CS	22				3	18.2	Dd=110.1 pcf
	145									
	15		5-CS	6				11	BDL	
Olive Brown Clayey fine Sand - Moist										

No groundwater encountered
Boring Terminated at about 16.5 feet (EL. 141.9')

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/16

Water Observation Data		Remarks:
<input checked="" type="checkbox"/>	Water Encountered During Drilling: None	CS = California Split Spoon SS = Standard Penetration Test BDL - Below Detection Level
<input checked="" type="checkbox"/>	Water Level At End of Drilling:	
<input checked="" type="checkbox"/>	Cave Depth At End of Drilling:	
<input checked="" type="checkbox"/>	Water Level After Drilling:	
<input checked="" type="checkbox"/>	Cave Depth After Drilling:	






Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-4	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 159.3 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 4 inches of asphaltic concrete										
Brown Silty fine Sand, trace of Gravel - Moist (Fill)			1-SS	3				12	BDL	P ₂₀₀ =37%
Light Brown to Brown fine to coarse Sand, trace to little Silt, little Gravel - Damp (Native)										
	5	155	2-SS	11				3	BDL	P ₂₀₀ =8%
			3-SS	15				3	BDL	P ₂₀₀ =5%
	10	150	4-SS	10				6	BDL	
Olive Brown to Brown Silty fine Sand, some Clay, some layers of Sandy Clay - Very Moist										
	15	145	5-SS	3				19	BDL	

No groundwater encountered
Boring Terminated at about 16.5 feet (EL. 142.8')

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/16






Water Observation Data		Remarks:
	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL = Below Detection Level
	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
	Water Level After Drilling:	
	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-5	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 158 feet		
COMPLETION DATE: 11/19/18		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _t (tsf)	W (%)	PID	NOTES
Approximately 4 inches of asphaltic concrete over 4 inches of aggregate base										
Brown Silty fine Sand, trace to little Clay - Moist (Fill)		157.5								
			1-SS	5				7	BDL	
	2.5									
		155.0								
			2-SS	7				5	BDL	
	5.0									

No groundwater encountered
Boring Terminated at about 5 feet (EL. 153')

Water Observation Data		Remarks:
	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL - Below Detection Level
	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/18

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-6	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 157 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 5 inches of asphaltic concrete										
Brown Silty fine Sand, little Clay - Damp (Native)										
	156.0		1-SS	7				5	BDL	
	152.5		2-SS	17				5	BDL	
	5.0									

Boring Terminated at about 5 feet (EL. 152')

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/16

Water Observation Data		Remarks:
<input checked="" type="checkbox"/>	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL - Below Detection Level
<input checked="" type="checkbox"/>	Water Level At End of Drilling:	
<input checked="" type="checkbox"/>	Cave Depth At End of Drilling:	
<input checked="" type="checkbox"/>	Water Level After Drilling:	
<input checked="" type="checkbox"/>	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-7	<h2 style="text-align: center;">TEST BORING LOG</h2> <p style="text-align: center;">PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p style="text-align: center;">202 SOUTH MAIN STREET ORANGE, CA</p> <p style="text-align: center;">PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 157.6 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		


MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 5.5 inches of asphaltic concrete		157.5								
Brown Silty fine Sand, trace to little Clay - Moist (Native)			1-SS	4				8	BDL	
	2.5	155.0								
			2-SS	2				9	BDL	
	5.0	152.5								

No groundwater encountered
Boring Terminated at about 6 feet (EL. 151.6')

GILES LOG REPORT 2G-1610007.GPJ GILES.GDT 12/12/16





Water Observation Data		Remarks:
<input checked="" type="checkbox"/>	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL - Below Detection Level
<input checked="" type="checkbox"/>	Water Level At End of Drilling:	
<input checked="" type="checkbox"/>	Cave Depth At End of Drilling:	
<input checked="" type="checkbox"/>	Water Level After Drilling:	
<input checked="" type="checkbox"/>	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: B-8	<h1>TEST BORING LOG</h1> <p>PROPOSED CHICK-FIL-A RESTAURANT #4003</p> <p>202 SOUTH MAIN STREET ORANGE, CA</p> <p>PROJECT NO: 2G-1610007</p>	 GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 157.5 feet		
COMPLETION DATE: 11/19/16		
FIELD REP: LARRY BALLARD		

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q _u (tsf)	Q _p (tsf)	Q _s (tsf)	W (%)	PID	NOTES
Approximately 2.5 inches of asphaltic concrete										
Brown Silty fine Sand, trace to little Clay, some pockets of fine Sand - Moist (Native)			1-SS	3				9	BDL	
	2.5	155.0								
			2-SS	7				7	BDL	
	5.0	152.5								

No groundwater encountered
Boring Terminated at about 5 feet (EL. 152.5')

Water Observation Data		Remarks:
	Water Encountered During Drilling: None	SS = Standard Penetration Test BDL - Below Detection Level
	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 2G-1610007.GPJ GILES GDT 12/12/16

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

Percolation Test Data Sheet							
Project: CFA - Orange		Project No: 2G-1610007		Date: 11-19-16			
Test Hole No: B-6		Tested By: LB					
Depth of Test Hole, D _T : 5'		USCS Soil Classification: Silty Sand (SM)					
Test Hole Dimensions (Inches)				Length	Width		
Diameter (If round)= 8"		Sides (If rectangular)=					
Sandy Soil Criteria Test*							
Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (In.)	Final Depth to Water (In.)	Change in Water Level (In.)	Greater than or Equal to 6"? (y/n)
1							
2							
<p>*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".</p>							
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D ₀ Initial Depth to Water (In.)	D _f Final Depth to Water (In.)	ΔD Change in Water Level (In.)	Percolation Rate (min./In.)
1	11:55	12:25	30	3.15	4.11	0.96	
2	12:26	12:56	30	3.45	4.15	0.70	
3	12:57	1:27	30	3.70	4.30	0.60	
4	1:28	1:58	30	3.65	4.18	0.53	
5	1:59	2:29	30	3.45	3.98	0.53	
6	2:30	3:00	30	3.47	4.01	0.54	
7	3:01	3:31	30	3.91	4.42	0.51	
8	3:32	4:02	30	3.91	4.42	0.51	
9							
10							
11							
12							
13							
14							
15							
<p>COMMENTS: Measured in feet Pre Adjusted Percolation Rate = $\frac{0.51 \text{ ft}}{30 \text{ min}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 12.24 \text{ in/hr}$</p>							



TECHNICAL GUIDANCE DOCUMENT APPENDICES

Percolation Test Data Sheet							
Project:	CFA - Orange		Project No:	26-1610067		Date:	11-19-16
Test Hole No:	B-7		Tested By:	LB			
Depth of Test Hole, D ₁ :	6'		USCS Soil Classification:	SM			
Test Hole Dimensions (Inches)				Length	Width		
Diameter (If round)=		8"		Sides (If rectangular)=			
Sandy Soil Criteria Test*							
Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change In Water Level (in.)	Greater than or Equal to 6" (y/n)
1							
2							
*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".							
Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D ₀ Initial Depth to Water (in.)	D ₁ Final Depth to Water (in.)	ΔD Change In Water Level (in.)	Percolation Rate (min./in.)
1	11:00	11:30	30	4.60	5.76	1.16	
2	11:31	12:01	30	4.83	5.73	0.90	
3	12:02	12:32	30	4.83	5.85	1.02	
4	12:40	12:50	10	4.80	5.55	0.75	
5	12:51	1:01	10	4.85	5.47	0.62	
6	1:02	1:12	10	4.90	5.45	0.55	
7	1:13	1:23	10	4.95	5.55	0.45	
8	1:23	1:43	10	5.10	5.47	0.37	
9	1:44	1:54	10	5.19	5.51	0.34	
10							
11							
12							
13							
14							
15							
COMMENTS: Measured in feet Pre Adjusted Percolation Rate = $\frac{0.34 \text{ in}}{10 \text{ min}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{60 \text{ min}}{1 \text{ hr}} = 24.48 \text{ in/hr}$							



Percolation Rate Conversion

Brig B-6

Time Interval = 30 min

Initial Depth to Water, $D_0 = 46.92$ in

Final Depth to Water, $D_f = 53.04$ in

Total Depth of Test Hole $b_T = 5' = 60$ in.

Test of Hole Radius, $r = 4$ inches

$$I_t = \frac{\Delta H (60r)}{\Delta t (r + 2H_{avg})}$$

$$\begin{aligned}\Delta H &= \text{change in height over the time interval} \\ &= 53.04 - 46.92 \\ &= 6.12 \text{ in}\end{aligned}$$

$$\Delta t = 30 \text{ min}$$

$$H_{avg} = 60 - \frac{46.92 + 53.04}{2} = 10.02 \text{ in}$$

$$I_t = \frac{6.12 (60 \times 4)}{30 (4 + 2(10.02))} = 2.04 \text{ in}$$

Apply FS of 2

$$\text{Design Infiltration rate} = \frac{2.04}{2} = \boxed{1.0 \text{ in/hr}}$$

Percolation Rate Conversion

Boring B-7

Time Interval = 10 min

Initial Depth to Water $D_0 = 5.19' = 62.28''$

Final Depth to Water $D_f = 5.51' = 66.12''$

Total Depth of Test Hole $D_T = 83''$ (measured from top of pipe)

Radius = 4.0 inches

$$I_r = \frac{\Delta H (60 \times r)}{\Delta t (r + 2H_{avg})}$$

$$\Delta H = 66.12 - 62.28 = 3.84 \text{ in}$$

$$\Delta t = 10 \text{ min}$$

$$H_{avg} = 83 - \frac{62.28 + 66.12}{2} = 18.8 \text{ in}$$

$$I_r = \frac{3.84 (60 \times r)}{10 (r + 2(18.8))}$$

$$= 2.24 \text{ in}$$

Apply FS of 2

$$\text{Design Infiltration Rate} = \frac{2.24}{2} = \boxed{1.12 \text{ in/hr}}$$

TECHNICAL GUIDANCE DOCUMENT APPENDICES

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	2	0.50
		Suitability Assessment Safety Factor, $S_A = \Sigma p$				2.0
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	1	0.25
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$				1
Combined Safety Factor, $S_{Total} = S_A \times S_B$				2 x 1	2
Observed Infiltration Rate, inch/hr, $K_{Observed}$ (corrected for test-specific bias)					
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{Observed} / S_{Total}$					
Supporting Data					
Briefly describe Infiltration test and provide reference to test forms:					

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

APPENDIX B

FIELD PROCEDURES

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D 420 entitled "Standard Guide for Sampling Rock and Rock" and/or other relevant specifications. Soil samples were preserved and transported to *Giles*' laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled "Standard Practice for Preserving and Transporting Soil Samples." Brief descriptions of the sampling, testing and field procedures commonly performed by *Giles* are provided herein.

GENERAL FIELD PROCEDURES

Test Boring Elevations

The ground surface elevations reported on the Test Boring Logs are referenced to the assumed benchmark shown on the Boring Location Plan (Figure 1). Unless otherwise noted, the elevations were determined with a conventional hand-level and are accurate to within about 1 foot.

Test Boring Locations

The test borings were located on-site based on the existing site features and/or apparent property lines. Dimensions illustrating the approximate boring locations are reported on the Boring Location Plan (Figure 1).

Water Level Measurement

The water levels reported on the Test Boring Logs represent the depth of "free" water encountered during drilling and/or after the drilling tools were removed from the borehole. Water levels measured within a granular (sand and gravel) soil profile are typically indicative of the water table elevation. It is usually not possible to accurately identify the water table elevation with cohesive (clayey) soils, since the rate of seepage is slow. The water table elevation within cohesive soils must therefore be determined over a period of time with groundwater observation wells.

It must be recognized that the water table may fluctuate seasonally and during periods of heavy precipitation. Depending on the subsurface conditions, water may also become perched above the water table, especially during wet periods.

Borehole Backfilling Procedures

Each borehole was backfilled upon completion of the field operations. If potential contamination was encountered, and/or if required by state or local regulations, boreholes were backfilled with an "impervious" material (such as bentonite slurry). Borings that penetrated pavements, sidewalks, etc. were "capped" with Portland Cement concrete, asphaltic concrete, or a similar surface material. It must, however, be recognized that the backfill material may settle, and the surface cap may subside, over a period of time. Further backfilling and/or re-surfacing by *Giles'* client or the property owner may be required.



FIELD SAMPLING AND TESTING PROCEDURES

Auger Sampling (AU)

Soil samples are removed from the auger flights as an auger is withdrawn above the ground surface. Such samples are used to determine general soil types and identify approximate soil stratifications. Auger samples are highly disturbed and are therefore not typically used for geotechnical strength testing.

Split-Barrel Sampling (SS) – (ASTM D-1586)

A split-barrel sampler with a 2-inch outside diameter is driven into the subsoil with a 140-pound hammer free-falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12-inches of an 18-inch sample interval is defined as the "Standard Penetration Resistance" or N-value is an index of the relative density of granular soils and the comparative consistency of cohesive soils. A soil sample is collected from each SPT interval.

Shelby Tube Sampling (ST) – (ASTM D-1587)

A relatively undisturbed soil sample is collected by hydraulically advancing a thin-walled Shelby Tube sampler into a soil mass. Shelby Tubes have a sharp cutting edge and are commonly 2 to 5 inches in diameter.

Bulk Sample (BS)

A relatively large volume of soils is collected with a shovel or other manually-operated tool. The sample is typically transported to *Giles'* materials laboratory in a sealed bag or bucket.

Dynamic Cone Penetration Test (DC) – (ASTM STP 399)

This test is conducted by driving a 1.5-inch-diameter cone into the subsoil using a 15-pound steel ring (hammer), free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density, and is defined as "N". The Dynamic Cone Penetration test is commonly conducted in hand auger borings, test pits and within excavated trenches.

- Continued -



GILES ENGINEERING ASSOCIATES, INC.

Ring-Lined Barrel Sampling – (ASTM D 3550)

In this procedure, a ring-lined barrel sampler is used to collect soil samples for classification and laboratory testing. This method provides samples that fit directly into laboratory test instruments without additional handling/disturbance.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e. N-values) are reported on the Test Boring Logs. Explanations of the terms and symbols shown on the logs are provided on the appendix enclosure entitled "General Notes".



APPENDIX C

LABORATORY TESTING AND CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory tests commonly performed by *Giles* are provided herein.

LABORATORY TESTING AND CLASSIFICATION

Photoionization Detector (PID)

In this procedure, soil samples are “scanned” in *Giles’* analytical laboratory using a Photoionization Detector (PID). The instrument is equipped with an 11.7 eV lamp calibrated to a Benzene Standard and is capable of detecting a minute concentration of **certain** Volatile Organic Compound (VOC) vapors, such as those commonly associated with petroleum products and some solvents. Results of the PID analysis are expressed in HNu (manufacturer’s) units rather than actual concentration.

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Unconfined Compressive Strength (qu) (ASTM D 2166)

An axial load is applied at a uniform rate to a cylindrical soil sample. The unconfined compressive strength is the maximum stress obtained or the stress when 15% axial strain is reached, whichever occurs first.

Calibrated Penetrometer Resistance (qp)

The small, cylindrical tip of a hand-held penetrometer is pressed into a soil sample to a prescribed depth to measure the soils capacity to resist penetration. This test is used to evaluate unconfined compressive strength.

Vane-Shear Strength (qs)

The blades of a vane are inserted into the flat surface of a soil sample and the vane is rotated until failure occurs. The maximum shear resistance measured immediately prior to failure is taken as the vane-shear strength.

Loss-on-Ignition (ASTM D 2974; Method C)

The Loss-on-Ignition (L.O.I.) test is used to determine the organic content of a soil sample. The procedure is conducted by heating a dry soil sample to 440°C in order to burn-off or “ash” organic matter present within the sample. The L.O.I. value is the ratio of the weight loss due to ignition compared to the initial weight of the dry sample. L.O.I. is expressed as a percentage.



Particle Size Distribution (ASTB D 421, D 422, and D 1140)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a "sieve analysis," which is conducted by passing the sample through a series of nested sieves. The distribution of fine-grained soil particles (silt and clay) is determined from a "hydrometer analysis" which is based on the sedimentation of particles suspended in water.

Consolidation Test (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. During each load increment, vertical compression (consolidation) of the sample is measured over a period of time. Results of this test are used to estimate settlement and time rate of settlement.

Classification of Samples

Each soil sample was visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D-2488-75). The classifications are reported on the Test Boring Logs.

Laboratory Testing

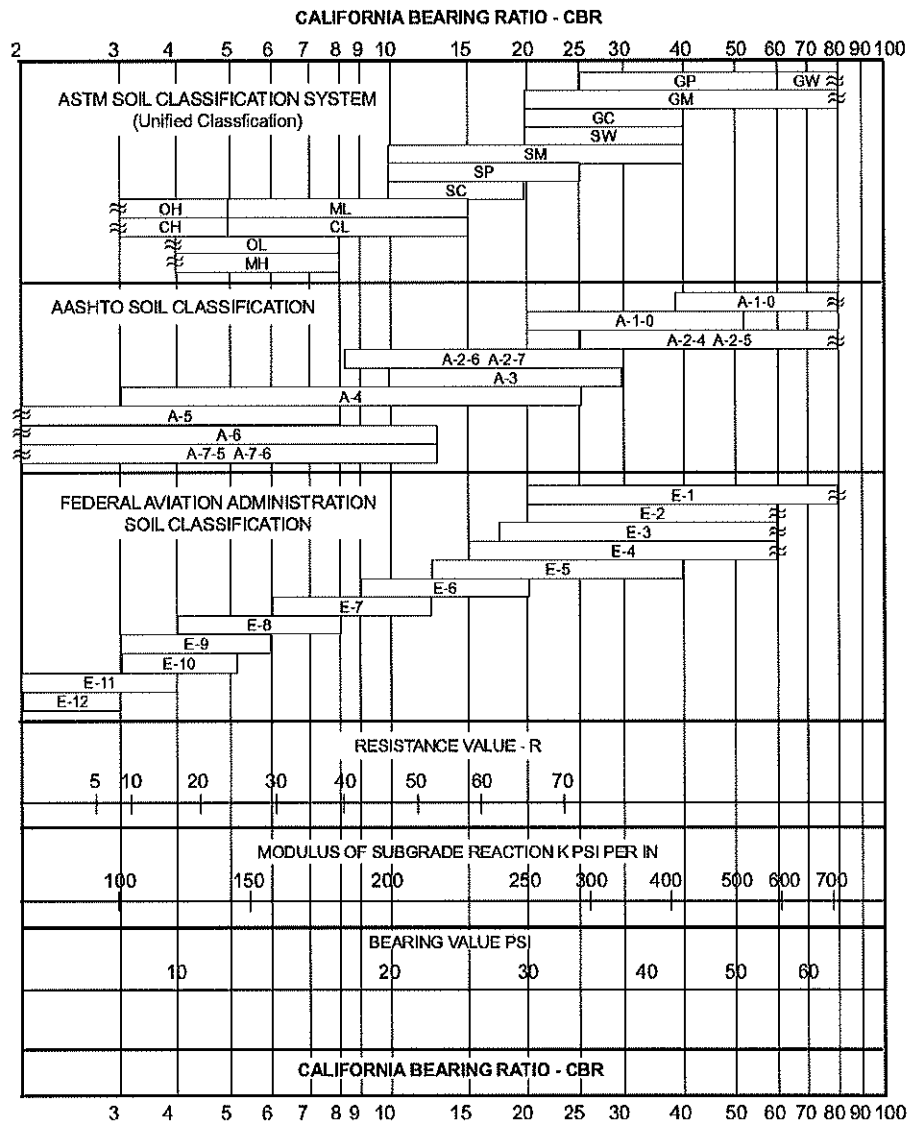
The laboratory testing operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the laboratory tests are provided on the Test Boring Logs or other appendix enclosures. Explanation of the terms and symbols used on the logs is provided on the appendix enclosure entitled "General Notes."



California Bearing Ratio (CBR) Test ASTM D-1833

The CBR test is used for evaluation of a soil subgrade for pavement design. The test consists of measuring the force required for a 3-square-inch cylindrical piston to penetrate 0.1 or 0.2 inch into a compacted soil sample. The result is expressed as a percent of force required to penetrate a standard compacted crushed stone.

Unless a CBR test has been specifically requested by the client, the CBR is estimated from published charts, based on soil classification and strength characteristics. A typical correlation chart is below.



APPENDIX D

GENERAL INFORMATION

**GUIDE SPECIFICATIONS FOR SUBGRADE AND PREPARATION
FOR FILL, FOUNDATION, FLOOR SLAB AND PAVEMENT SUPPORT;
AND SELECTION, PLACEMENT AND COMPACTION OF FILL SOILS
USING MODIFIED PROCTOR PROCEDURES**

1. Construction monitoring and testing of subgrades and grades for fill, foundation, floor slab and pavement; and fill selection, placement and compaction shall be performed by an experienced soils engineer and/or his representatives.
2. All compacted fill, subgrades, and grades shall be (a) underlain by suitable bearing material, (b) free of all organic frozen, or other deleterious material, and (c) observed, tested and approved by qualified engineering personnel representing an experienced soils engineer. Preparation of subgrades after stripping vegetation, organic or other unsuitable materials shall consist of (a) proofrolling to detect soft, wet, yielding soils or other unstable materials that must be undercut, (b) scarifying top 6 to 8 inches, (c) moisture conditioning the soils as required, and (d) recompaction to same minimum in-situ density required for similar material indicated under Item 5. Note: Compaction requirements for pavement subgrade are higher than other areas. Weather and construction equipment may damage compacted fill surface and reworking and retesting may be necessary for proper performance.
3. In overexcavation and fill areas, the compacted fill must extend (a) a minimum 1 foot lateral distance beyond the exterior edge of the foundation at bearing grade or pavement at subgrade and down to compacted fill subgrade on a maximum 0.5(H):1(V) slope, (b) 1 foot above footing grade outside the building, and (c) to floor subgrade inside the building. Fill shall be placed and compacted on a 5(H):1(V) slope or must be stepped or benched as required to flatten if not specifically approved by qualified personnel under the direction of an experienced soils engineer.
4. The compacted fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated", and shall be low-expansive with a maximum Liquid Limit (ASTM D-423) and Plasticity Index (ASTM D-424) of 30 and 15, respectively, unless specifically tested and found to have low expansive properties and approved by an experienced soils engineer. The top 12 inches of compacted fill should have a maximum 3 inch particle diameter and all underlying compacted fill a maximum 6 inch diameter unless specifically approved by an experienced soils engineer. All fill material must be tested and approved under the direction of an experienced soils engineer prior to placement. If the fill is to provide non-frost susceptible characteristics, it must be classified as a clean GW, GP, SW or SP per Unified Soils Classification System (ASTM D-2487).
5. For structural fill depths less than 20 feet, the density of the structural compacted fill and scarified subgrade and grades shall not be less than 90 percent of the maximum dry density as determined by Modified Proctor (ASTM D-1557) with the exception of the top 12 inches of pavement subgrade which shall have a minimum in-situ density of 95 percent of maximum dry density, or 5 percent higher than underlying structural fill materials. Where the structural fill depth is greater than 20 feet, the portion below 20 feet should have a minimum in-place density of 95 percent of its maximum dry density or 5 percent higher than the top 20 feet. Cohesive soils shall not vary by more than -1 to +3 percent moisture content and granular soil ± 3 percent from the optimum when placed and compacted or recompacted, unless specifically recommended/approved by the soils engineer observing the placement and compaction. Cohesive soils with moderate to high expansion potentials ($PI > 15$) should, however, be placed, compacted and maintained prior to construction at a 3 ± 1 percent moisture content above optimum moisture content to limit future heave. Fill shall be placed in layers with a maximum loose thickness of 8 inches for foundations and 10 inches for floor slabs and pavements, unless specifically approved by the soils engineer taking into consideration the type of materials and compaction equipment being used. The compaction equipment should consist of suitable mechanical equipment specifically designed for soil compaction. Bulldozers or similar tracked vehicles are typically not suitable for compaction.
6. Excavation, filling, subgrade grade preparation shall be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working platform. Springs or water seepage encountered during grade/foundation construction must be called to the soils engineer's attention immediately for possible construction procedure revision or inclusion of an underdrain system.
7. Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls (i.e. basement walls and retaining walls) must be properly tested and approved by an experienced soils engineer with consideration for the lateral pressure used in the wall design.
8. Wherever, in the opinion of the soils engineer or the Owner's Representatives, an unstable condition is being created either by cutting or filling, the work should not proceed into that area until an appropriate geotechnical exploration and analysis has been performed and the grading plan revised, if found necessary.



GENERAL COMMENTS

The soil samples obtained during the subsurface exploration will be retained for a period of thirty days. If no instructions are received, they will be disposed of at that time.

This report has been prepared exclusively for the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. Copies of this report may be provided to contractor(s), with contract documents, to disclose information relative to this project. The report, however, has not been prepared to serve as the plans and specifications for actual construction without the appropriate interpretation by the project architect, structural engineer, and/or civil engineer. Reproduction and distribution of this report must be authorized by the client and *Giles*.

This report has been based on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the architect, civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. The project plans and specifications may also be submitted to *Giles* for review to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted.

The analysis of this site was based on a subsoil profile interpolated from a limited subsurface exploration. If the actual conditions encountered during construction vary from those indicated by the borings, *Giles* must be contacted immediately to determine if the conditions alter the recommendations contained herein.

The conclusions and recommendations presented in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.



CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *

Soil Characteristics	Max. Dry Density Standard Proctor (pcf)	Compressibility and Expansion	Drainage and Permeability	Value as an Embankment Material	Value as Subgrade When Not Subject to Frost	Value as Base Course	Value as Temporary Pavement	
							With Dust Palliative	With Bituminous Treatment
Lightly tamped, steel roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to poor	Excellent
Lightly tamped, steel roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
Lightly tamped or	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
Lightly tamped or	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
Lightly tamped or	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
Lightly tamped or	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
Lightly tamped or sheepfoot	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
Lightly tamped or	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
Lightly tamped or	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
Lightly tamped or rubber-tyred	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
Lightly tamped or rubber-tyred	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
Lightly tamped or rubber-tyred	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Not suitable
Lightly tamped roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
Lightly tamped roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

Appendix A - Characteristics of Soil Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments
 Memorandum 357, U.S. Waterways Experiment Station, Vicksburg, 1953.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

Major Divisions			Group Symbols		Typical Names		Laboratory Classification Criteria										
<div>Coarse-grained soils (more than half of material is larger than No. 200 sieve size)</div> <div>Gravels (More than half of coarse fraction is larger than No. 4 sieve size)</div> <div>Clean gravels (little or no fines)</div> <div>GP</div> <div>Poorly graded gravels, gravel-sand mixtures, little or no fines</div> <div>Gravels with fines (appreciable amount of fines)</div> <div>GM^a</div> <div>d</div> <div>u</div> <div>Silty gravels, gravel-sand-silt mixtures</div> <div>GC</div> <div>Clayey gravels, gravel-sand-clay mixtures</div> <div>Sands (More than half of coarse fraction is smaller than No. 4 sieve size)</div> <div>Clean sands (Little or no fines)</div> <div>SW</div> <div>Well-graded sands, gravelly sands, little or no fines</div> <div>SP</div> <div>Poorly graded sands, gravelly sands, little or no fines</div> <div>Sands with fines (Appreciable amount of fines)</div> <div>SM^a</div> <div>d</div> <div>u</div> <div>Silty sands, sand-silt mixtures</div> <div>SC</div> <div>Clayey sands, sand-clay mixtures</div>							<div>Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP More than 12 percent: GM, GC, SM, SC Borderline cases requiring dual symbols^b 5 to 12 percent:</div>		$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3								
									Not meeting all gradation requirements for GW								
									Atterberg limits below "A" line or P.I. less than 4		Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are <i>borderline</i> cases requiring use of dual symbols						
									Atterberg limits above "A" line or P.I. greater than 7								
									$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3								
									Not meeting all gradation requirements for SW								
									Atterberg limits below "A" line or P.I. less than 4		Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are <i>borderline</i> cases requiring use of dual symbols						
									Atterberg limits above "A" line or P.I. greater than 7								
									<div>Fine-grained soils (More than half material is smaller than No. 200 sieve size)</div> <div>Silts and clays (Liquid limit less than 50)</div> <div>ML</div> <div>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity</div> <div>CL</div> <div>Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays</div> <div>OL</div> <div>Organic silts and organic silty clays of low plasticity</div> <div>Silts and clays (Liquid limit greater than 50)</div> <div>MH</div> <div>Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts</div> <div>CH</div> <div>Inorganic clays of high plasticity, fat clays</div> <div>OH</div> <div>Organic clays of medium to high plasticity, organic silts</div> <div>Highly organic soils</div> <div>Pt</div> <div>Peat and other highly organic soils</div>							<div>Plasticity Chart</div>	

^a Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits, suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u is used when L.L. is greater than 28.

^b Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.

GENERAL NOTES

SAMPLE IDENTIFICATION

All samples are visually classified in general accordance with the Unified Soil Classification System (ASTM D-2487-75 or D-2488-75)

DESCRIPTIVE TERM (% BY DRY WEIGHT)

Trace:	1-10%
Little:	11-20%
Some:	21-35%
And/Adjective	36-50%

PARTICLE SIZE (DIAMETER)

Boulders:	8 inch and larger
Cobbles:	3 inch to 8 inch
Gravel:	coarse - ¾ to 3 inch fine - No. 4 (4.76 mm) to ¾ inch
Sand:	coarse - No. 4 (4.76 mm) to No. 10 (2.0 mm) medium - No. 10 (2.0 mm) to No. 40 (0.42 mm) fine - No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt:	No. 200 (0.074 mm) and smaller (non-plastic)
Clay:	No 200 (0.074 mm) and smaller (plastic)

SOIL PROPERTY SYMBOLS

Dd:	Dry Density (pcf)	SS:	Split-Spoon
LL:	Liquid Limit, percent	ST:	Shelby Tube - 3 inch O.D. (except where noted)
PL:	Plastic Limit, percent	CS:	3 inch O.D. California Ring Sampler
PI:	Plasticity Index (LL-PL)	DC:	Dynamic Cone Penetrometer per ASTM Special Technical Publication No. 399
LOI:	Loss on Ignition, percent	AU:	Auger Sample
Gs:	Specific Gravity	DB:	Diamond Bit
K:	Coefficient of Permeability	CB:	Carbide Bit
w:	Moisture content, percent	WS:	Wash Sample
qp:	Calibrated Penetrometer Resistance, tsf	RB:	Rock-Roller Bit
qs:	Vane-Shear Strength, tsf	BS:	Bulk Sample
qu:	Unconfined Compressive Strength, tsf	Note:	Depth intervals for sampling shown on Record of Subsurface Exploration are not indicative of sample recovery, but position where sampling initiated
qc:	Static Cone Penetrometer Resistance (correlated to Unconfined Compressive Strength, tsf)		
PID:	Results of vapor analysis conducted on representative samples utilizing a Photoionization Detector calibrated to a benzene standard. Results expressed in HNU-Units. (BDL=Below Detection Limit)		
N:	Penetration Resistance per 12 inch interval, or fraction thereof, for a standard 2 inch O.D. (1½ inch I.D.) split spoon sampler driven with a 140 pound weight free-falling 30 inches. Performed in general accordance with Standard Penetration Test Specifications (ASTM D- 1586). N in blows per foot equals sum of N-Values where plus sign (+) is shown.		
Nc:	Penetration Resistance per 1¾ inches of Dynamic Cone Penetrometer. Approximately equivalent to Standard Penetration Test N-Value in blows per foot.		
Nr:	Penetration Resistance per 12 inch interval, or fraction thereof, for California Ring Sampler driven with a 140 pound weight free-falling 30 inches per ASTM D-3550. Not equivalent to Standard Penetration Test N-Value.		

SOIL STRENGTH CHARACTERISTICS

COHESIVE (CLAYEY) SOILS

COMPARATIVE CONSISTENCY	BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
Very Soft	0 - 2	0 - 0.25
Soft	3 - 4	0.25 - 0.50
Medium Stiff	5 - 8	0.50 - 1.00
Stiff	9 - 15	1.00 - 2.00
Very Stiff	16 - 30	2.00 - 4.00
Hard	31+	4.00+

NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	BLOWS PER FOOT (N)
Very Loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	51+

DEGREE OF PLASTICITY	PI	DEGREE OF EXPANSIVE POTENTIAL	PI
None to Slight	0 - 4	Low	0 - 15
Slight	5 - 10	Medium	15 - 25
Medium	11 - 30	High	25+
High to Very High	31+		



Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

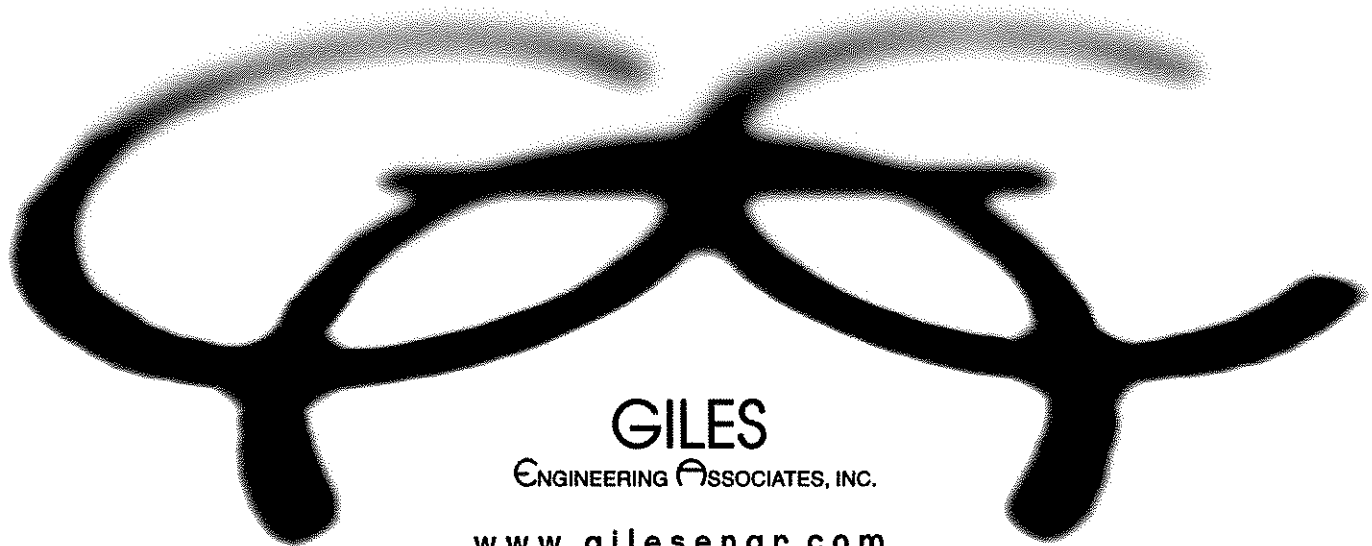


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Appendix F:

Hydrology Information

(Q2 – Two-year frequency storm evaluation)

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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Ver. 18.2 Release Date: 05/08/2012 License ID 1537

Analysis prepared by:

Joseph C. Truxaw & Associates, Inc.
265 S. Anita Drive
Suite 111
Orange CA 92868

***** DESCRIPTION OF STUDY *****
* chick-fil-A Restaurant No. 4003 *
* Pre-Development Condition *
* 2-Year Storm Frequency *

FILE NAME: CFA46PRE.DAT
TIME/DATE OF STUDY: 10:01 07/18/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 102.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 281.00
ELEVATION DATA: UPSTREAM(FEET) = 159.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION CHANGE)]^{**0.20}$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.875

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.885

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------	-----------------

CF46PR2.RES
 COMMERCIAL B 0.66 0.30 0.100 56 6.88
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA RUNOFF(CFS) = 1.10
 TOTAL AREA(ACRES) = 0.66 PEAK FLOW RATE(CFS) = 1.10

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 228.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.60 DOWNSTREAM(FEET) = 155.85

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION CHANGE)]^{**} 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.453

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.955

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	B	0.30	0.30	0.100	56	6.45

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 0.52

TOTAL AREA(ACRES) = 0.30 PEAK FLOW RATE(CFS) = 0.52

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.3 T_c (MIN.) = 6.45

EFFECTIVE AREA(ACRES) = 0.30 AREA-AVERAGED F_m (INCH/HR) = 0.03

AREA-AVERAGED F_p (INCH/HR) = 0.30 AREA-AVERAGED A_p = 0.100

PEAK FLOW RATE(CFS) = 0.52

=====

END OF RATIONAL METHOD ANALYSIS

♀

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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Analysis prepared by:

***** DESCRIPTION OF STUDY *****
 * CHICK-FIL-A #4003 MAIN & ALMOND *
 * 2-YR STORM EVENT *
 * POST DEVELOPMENT *

FILE NAME: CFA46PO.DAT
 TIME/DATE OF STUDY: 11:26 11/01/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
 DATA BANK RAINFALL USED
 ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0312 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 256.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.30 DOWNSTREAM(FEET) = 156.23

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION CHANGE)]^{**0.20}$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 7.322

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.819

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------	-----------------

CFA16046_2-YR POST.RES
 COMMERCIAL B 0.53 0.30 0.100 56 7.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.85
 TOTAL AREA(ACRES) = 0.53 PEAK FLOW RATE(CFS) = 0.85

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 115.00
 ELEVATION DATA: UPSTREAM(FEET) = 158.50 DOWNSTREAM(FEET) = 157.15

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL B 0.20 0.30 0.100 56 5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.40
 TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.40

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 109.00
 ELEVATION DATA: UPSTREAM(FEET) = 159.04 DOWNSTREAM(FEET) = 157.32

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL B 0.12 0.30 0.100 56 5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.24
 TOTAL AREA(ACRES) = 0.12 PEAK FLOW RATE(CFS) = 0.24

FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 21.00
 ELEVATION DATA: UPSTREAM(FEET) = 159.00 DOWNSTREAM(FEET) = 158.23

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC II):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL B 0.12 0.30 0.100 56 5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 0.24
 TOTAL AREA(ACRES) = 0.12 PEAK FLOW RATE(CFS) = 0.24

CFA16046_2-YR POST.RES
 COMMERCIAL B 0.10 0.30 0.100 56 5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
 SUBAREA RUNOFF(CFS) = 0.20
 TOTAL AREA(ACRES) = 0.10 PEAK FLOW RATE(CFS) = 0.20

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.1 TC(MIN.) = 5.00
 EFFECTIVE AREA(ACRES) = 0.10 AREA-AVERAGED F_m (INCH/HR)= 0.03
 AREA-AVERAGED F_p (INCH/HR) = 0.30 AREA-AVERAGED A_p = 0.100
 PEAK FLOW RATE(CFS) = 0.20

=====

END OF RATIONAL METHOD ANALYSIS

‡

SMALL AREA UNIT HYDROGRAPH MODEL

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 Ver. 19.0 Release Date: 06/01/2012 License ID 1537

Analysis prepared by:
 Joseph C. Truxaw & Associates, Inc.
 265 S. Anita Drive, Suite 111
 Orange, CA 92868

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
 TOTAL CATCHMENT AREA(ACRES) = 0.96
 SOIL-LOSS RATE, Fm, (INCH/HR) = 0.030
 LOW LOSS FRACTION = 0.940
 TIME OF CONCENTRATION(MIN.) = 6.88
 SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
 ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
 RETURN FREQUENCY(YEARS) = 2
 5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19
 30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
 1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53
 3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89
 6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22
 24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.09
 TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.07

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.07	0.0000	0.00	Q	.	.	.	.
0.19	0.0000	0.00	Q	.	.	.	.
0.30	0.0000	0.00	Q	.	.	.	.
0.42	0.0001	0.00	Q	.	.	.	.
0.53	0.0001	0.00	Q	.	.	.	.
0.65	0.0001	0.00	Q	.	.	.	.
0.76	0.0001	0.00	Q	.	.	.	.
0.88	0.0001	0.00	Q	.	.	.	.
0.99	0.0002	0.00	Q	.	.	.	.
1.10	0.0002	0.00	Q	.	.	.	.
1.22	0.0002	0.00	Q	.	.	.	.
1.33	0.0003	0.00	Q	.	.	.	.
1.45	0.0003	0.00	Q	.	.	.	.
1.56	0.0003	0.00	Q	.	.	.	.
1.68	0.0003	0.00	Q	.	.	.	.
1.79	0.0004	0.00	Q	.	.	.	.
1.91	0.0004	0.00	Q	.	.	.	.
2.02	0.0005	0.00	Q	.	.	.	.
2.14	0.0005	0.00	Q	.	.	.	.
2.25	0.0005	0.00	Q	.	.	.	.
2.36	0.0006	0.00	Q	.	.	.	.
2.48	0.0006	0.00	Q	.	.	.	.
2.59	0.0007	0.00	Q	.	.	.	.

2-YR HYDROGRAPH_PRE.txt

2.71	0.0007	0.00	Q	.	.	.	.
2.82	0.0008	0.01	Q	.	.	.	.
2.94	0.0008	0.01	Q	.	.	.	.
3.05	0.0009	0.01	Q	.	.	.	.
3.17	0.0009	0.01	Q	.	.	.	.
3.28	0.0010	0.01	Q	.	.	.	.
3.40	0.0010	0.01	Q	.	.	.	.
3.51	0.0011	0.01	Q	.	.	.	.
3.62	0.0011	0.01	Q	.	.	.	.
3.74	0.0012	0.01	Q	.	.	.	.
3.85	0.0013	0.01	Q	.	.	.	.
3.97	0.0013	0.01	Q	.	.	.	.
4.08	0.0014	0.01	Q	.	.	.	.
4.20	0.0015	0.01	Q	.	.	.	.
4.31	0.0015	0.01	Q	.	.	.	.
4.43	0.0016	0.01	Q	.	.	.	.
4.54	0.0017	0.01	Q	.	.	.	.
4.66	0.0018	0.01	Q	.	.	.	.
4.77	0.0018	0.01	Q	.	.	.	.
4.89	0.0019	0.01	Q	.	.	.	.
5.00	0.0020	0.01	Q	.	.	.	.
5.11	0.0021	0.01	Q	.	.	.	.
5.23	0.0022	0.01	Q	.	.	.	.
5.34	0.0023	0.01	Q	.	.	.	.
5.46	0.0024	0.01	Q	.	.	.	.
5.57	0.0024	0.01	Q	.	.	.	.
5.69	0.0025	0.01	Q	.	.	.	.
5.80	0.0026	0.01	Q	.	.	.	.
5.92	0.0027	0.01	Q	.	.	.	.
6.03	0.0028	0.01	Q	.	.	.	.
6.15	0.0029	0.01	Q	.	.	.	.
6.26	0.0031	0.01	Q	.	.	.	.
6.38	0.0032	0.01	Q	.	.	.	.
6.49	0.0033	0.01	Q	.	.	.	.
6.60	0.0034	0.01	Q	.	.	.	.
6.72	0.0035	0.01	Q	.	.	.	.
6.83	0.0036	0.01	Q	.	.	.	.
6.95	0.0038	0.01	Q	.	.	.	.
7.06	0.0039	0.01	Q	.	.	.	.
7.18	0.0040	0.01	Q	.	.	.	.
7.29	0.0042	0.01	Q	.	.	.	.
7.41	0.0043	0.01	Q	.	.	.	.
7.52	0.0044	0.01	Q	.	.	.	.
7.64	0.0046	0.02	Q	.	.	.	.
7.75	0.0047	0.02	Q	.	.	.	.
7.86	0.0049	0.02	Q	.	.	.	.
7.98	0.0050	0.02	Q	.	.	.	.
8.09	0.0052	0.02	Q	.	.	.	.
8.21	0.0053	0.02	Q	.	.	.	.
8.32	0.0055	0.02	Q	.	.	.	.
8.44	0.0057	0.02	Q	.	.	.	.
8.55	0.0058	0.02	Q	.	.	.	.
8.67	0.0060	0.02	Q	.	.	.	.
8.78	0.0062	0.02	Q	.	.	.	.
8.90	0.0064	0.02	Q	.	.	.	.
9.01	0.0066	0.02	Q	.	.	.	.
9.12	0.0068	0.02	Q	.	.	.	.
9.24	0.0070	0.02	Q	.	.	.	.
9.35	0.0072	0.02	Q	.	.	.	.
9.47	0.0074	0.02	Q	.	.	.	.
9.58	0.0076	0.02	Q	.	.	.	.
9.70	0.0078	0.02	Q	.	.	.	.
9.81	0.0080	0.02	Q	.	.	.	.

			2-YR HYDROGRAPH_PRE.txt				
9.93	0.0082	0.02	Q	.	.	.	.
10.04	0.0085	0.02	Q	.	.	.	.
10.16	0.0087	0.03	Q	.	.	.	.
10.27	0.0089	0.03	Q	.	.	.	.
10.39	0.0092	0.03	Q	.	.	.	.
10.50	0.0095	0.03	Q	.	.	.	.
10.61	0.0097	0.03	Q	.	.	.	.
10.73	0.0100	0.03	Q	.	.	.	.
10.84	0.0103	0.03	Q	.	.	.	.
10.96	0.0105	0.03	Q	.	.	.	.
11.07	0.0108	0.03	Q	.	.	.	.
11.19	0.0111	0.03	Q	.	.	.	.
11.30	0.0114	0.03	Q	.	.	.	.
11.42	0.0118	0.03	Q	.	.	.	.
11.53	0.0121	0.03	Q	.	.	.	.
11.65	0.0124	0.04	Q	.	.	.	.
11.76	0.0128	0.04	Q	.	.	.	.
11.88	0.0131	0.04	Q	.	.	.	.
11.99	0.0135	0.04	Q	.	.	.	.
12.10	0.0139	0.04	Q	.	.	.	.
12.22	0.0143	0.06	Q	.	.	.	.
12.33	0.0149	0.06	Q	.	.	.	.
12.45	0.0154	0.06	Q	.	.	.	.
12.56	0.0160	0.06	Q	.	.	.	.
12.68	0.0165	0.06	Q	.	.	.	.
12.79	0.0171	0.06	Q	.	.	.	.
12.91	0.0177	0.06	Q	.	.	.	.
13.02	0.0184	0.07	Q	.	.	.	.
13.14	0.0190	0.07	Q	.	.	.	.
13.25	0.0197	0.07	Q	.	.	.	.
13.36	0.0203	0.07	Q	.	.	.	.
13.48	0.0210	0.07	Q	.	.	.	.
13.59	0.0217	0.08	Q	.	.	.	.
13.71	0.0225	0.08	Q	.	.	.	.
13.82	0.0233	0.08	Q	.	.	.	.
13.94	0.0241	0.09	Q	.	.	.	.
14.05	0.0249	0.09	Q	.	.	.	.
14.17	0.0258	0.10	Q	.	.	.	.
14.28	0.0267	0.10	Q	.	.	.	.
14.40	0.0277	0.11	Q	.	.	.	.
14.51	0.0287	0.11	Q	.	.	.	.
14.62	0.0298	0.12	Q	.	.	.	.
14.74	0.0309	0.12	Q	.	.	.	.
14.85	0.0321	0.13	Q	.	.	.	.
14.97	0.0334	0.14	Q	.	.	.	.
15.08	0.0348	0.15	Q	.	.	.	.
15.20	0.0362	0.16	Q	.	.	.	.
15.31	0.0378	0.17	Q	.	.	.	.
15.43	0.0394	0.17	Q	.	.	.	.
15.54	0.0410	0.18	Q	.	.	.	.
15.66	0.0429	0.22	Q	.	.	.	.
15.77	0.0451	0.25	.Q	.	.	.	.
15.89	0.0481	0.37	.Q	.	.	.	.
16.00	0.0523	0.52	. Q	.	.	.	.
16.11	0.0624	1.61	. Q	Q	.	.	.
16.23	0.0715	0.30	.Q	.	.	.	.
16.34	0.0738	0.20	Q	.	.	.	.
16.46	0.0756	0.18	Q	.	.	.	.
16.57	0.0772	0.15	Q	.	.	.	.
16.69	0.0786	0.13	Q	.	.	.	.
16.80	0.0798	0.12	Q	.	.	.	.
16.92	0.0808	0.11	Q	.	.	.	.
17.03	0.0818	0.10	Q	.	.	.	.

2-YR HYDROGRAPH_PRE.txt

17.15	0.0827	0.09	Q	.	.	.	.
17.26	0.0835	0.08	Q	.	.	.	.
17.38	0.0842	0.08	Q	.	.	.	.
17.49	0.0849	0.07	Q	.	.	.	.
17.60	0.0856	0.07	Q	.	.	.	.
17.72	0.0862	0.06	Q	.	.	.	.
17.83	0.0868	0.06	Q	.	.	.	.
17.95	0.0874	0.06	Q	.	.	.	.
18.06	0.0879	0.05	Q	.	.	.	.
18.18	0.0883	0.04	Q	.	.	.	.
18.29	0.0887	0.04	Q	.	.	.	.
18.41	0.0890	0.03	Q	.	.	.	.
18.52	0.0893	0.03	Q	.	.	.	.
18.64	0.0896	0.03	Q	.	.	.	.
18.75	0.0899	0.03	Q	.	.	.	.
18.86	0.0902	0.03	Q	.	.	.	.
18.98	0.0904	0.03	Q	.	.	.	.
19.09	0.0907	0.03	Q	.	.	.	.
19.21	0.0909	0.02	Q	.	.	.	.
19.32	0.0911	0.02	Q	.	.	.	.
19.44	0.0914	0.02	Q	.	.	.	.
19.55	0.0916	0.02	Q	.	.	.	.
19.67	0.0917	0.02	Q	.	.	.	.
19.78	0.0919	0.02	Q	.	.	.	.
19.90	0.0921	0.02	Q	.	.	.	.
20.01	0.0923	0.02	Q	.	.	.	.
20.12	0.0924	0.02	Q	.	.	.	.
20.24	0.0926	0.02	Q	.	.	.	.
20.35	0.0927	0.02	Q	.	.	.	.
20.47	0.0929	0.01	Q	.	.	.	.
20.58	0.0930	0.01	Q	.	.	.	.
20.70	0.0931	0.01	Q	.	.	.	.
20.81	0.0933	0.01	Q	.	.	.	.
20.93	0.0934	0.01	Q	.	.	.	.
21.04	0.0935	0.01	Q	.	.	.	.
21.16	0.0936	0.01	Q	.	.	.	.
21.27	0.0937	0.01	Q	.	.	.	.
21.39	0.0938	0.01	Q	.	.	.	.
21.50	0.0939	0.01	Q	.	.	.	.
21.61	0.0940	0.01	Q	.	.	.	.
21.73	0.0940	0.01	Q	.	.	.	.
21.84	0.0941	0.01	Q	.	.	.	.
21.96	0.0942	0.01	Q	.	.	.	.
22.07	0.0943	0.01	Q	.	.	.	.
22.19	0.0943	0.01	Q	.	.	.	.
22.30	0.0944	0.01	Q	.	.	.	.
22.42	0.0945	0.01	Q	.	.	.	.
22.53	0.0945	0.01	Q	.	.	.	.
22.65	0.0946	0.01	Q	.	.	.	.
22.76	0.0946	0.01	Q	.	.	.	.
22.88	0.0947	0.00	Q	.	.	.	.
22.99	0.0947	0.00	Q	.	.	.	.
23.10	0.0947	0.00	Q	.	.	.	.
23.22	0.0948	0.00	Q	.	.	.	.
23.33	0.0948	0.00	Q	.	.	.	.
23.45	0.0948	0.00	Q	.	.	.	.
23.56	0.0949	0.00	Q	.	.	.	.
23.68	0.0949	0.00	Q	.	.	.	.
23.79	0.0949	0.00	Q	.	.	.	.
23.91	0.0949	0.00	Q	.	.	.	.
24.02	0.0950	0.00	Q	.	.	.	.
24.14	0.0950	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1443.8
10%	75.6
20%	20.6
30%	13.8
40%	6.9
50%	6.9
60%	6.9
70%	6.9
80%	6.9
90%	6.9

SMALL AREA UNIT HYDROGRAPH MODEL

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Analysis prepared by:
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RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
 TOTAL CATCHMENT AREA(ACRES) = 0.85
 SOIL-LOSS RATE, Fm, (INCH/HR) = 0.030
 LOW LOSS FRACTION = 0.940
 TIME OF CONCENTRATION(MIN.) = 7.32
 SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
 ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
 RETURN FREQUENCY(YEARS) = 2
 5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.19
 30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
 1-HOUR POINT RAINFALL VALUE(INCHES) = 0.53
 3-HOUR POINT RAINFALL VALUE(INCHES) = 0.89
 6-HOUR POINT RAINFALL VALUE(INCHES) = 1.22
 24-HOUR POINT RAINFALL VALUE(INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.08
 TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.06

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.01	0.0000	0.00	Q	.	.	.	.
0.14	0.0000	0.00	Q	.	.	.	.
0.26	0.0000	0.00	Q	.	.	.	.
0.38	0.0000	0.00	Q	.	.	.	.
0.50	0.0001	0.00	Q	.	.	.	.
0.62	0.0001	0.00	Q	.	.	.	.
0.75	0.0001	0.00	Q	.	.	.	.
0.87	0.0001	0.00	Q	.	.	.	.
0.99	0.0001	0.00	Q	.	.	.	.
1.11	0.0002	0.00	Q	.	.	.	.
1.23	0.0002	0.00	Q	.	.	.	.
1.36	0.0002	0.00	Q	.	.	.	.
1.48	0.0003	0.00	Q	.	.	.	.
1.60	0.0003	0.00	Q	.	.	.	.
1.72	0.0003	0.00	Q	.	.	.	.
1.84	0.0003	0.00	Q	.	.	.	.
1.97	0.0004	0.00	Q	.	.	.	.
2.09	0.0004	0.00	Q	.	.	.	.
2.21	0.0005	0.00	Q	.	.	.	.
2.33	0.0005	0.00	Q	.	.	.	.
2.45	0.0005	0.00	Q	.	.	.	.
2.58	0.0006	0.00	Q	.	.	.	.
2.70	0.0006	0.00	Q	.	.	.	.
2.82	0.0007	0.00	Q	.	.	.	.

2-YR HYDROGRAPH_POST.txt

2.94	0.0007	0.00	Q	.	.	.	.
3.06	0.0008	0.00	Q	.	.	.	.
3.19	0.0008	0.01	Q	.	.	.	.
3.31	0.0009	0.01	Q	.	.	.	.
3.43	0.0009	0.01	Q	.	.	.	.
3.55	0.0010	0.01	Q	.	.	.	.
3.67	0.0010	0.01	Q	.	.	.	.
3.80	0.0011	0.01	Q	.	.	.	.
3.92	0.0011	0.01	Q	.	.	.	.
4.04	0.0012	0.01	Q	.	.	.	.
4.16	0.0013	0.01	Q	.	.	.	.
4.28	0.0013	0.01	Q	.	.	.	.
4.41	0.0014	0.01	Q	.	.	.	.
4.53	0.0015	0.01	Q	.	.	.	.
4.65	0.0015	0.01	Q	.	.	.	.
4.77	0.0016	0.01	Q	.	.	.	.
4.89	0.0017	0.01	Q	.	.	.	.
5.02	0.0018	0.01	Q	.	.	.	.
5.14	0.0019	0.01	Q	.	.	.	.
5.26	0.0019	0.01	Q	.	.	.	.
5.38	0.0020	0.01	Q	.	.	.	.
5.51	0.0021	0.01	Q	.	.	.	.
5.63	0.0022	0.01	Q	.	.	.	.
5.75	0.0023	0.01	Q	.	.	.	.
5.87	0.0024	0.01	Q	.	.	.	.
5.99	0.0025	0.01	Q	.	.	.	.
6.12	0.0026	0.01	Q	.	.	.	.
6.24	0.0027	0.01	Q	.	.	.	.
6.36	0.0028	0.01	Q	.	.	.	.
6.48	0.0029	0.01	Q	.	.	.	.
6.60	0.0030	0.01	Q	.	.	.	.
6.73	0.0031	0.01	Q	.	.	.	.
6.85	0.0032	0.01	Q	.	.	.	.
6.97	0.0033	0.01	Q	.	.	.	.
7.09	0.0035	0.01	Q	.	.	.	.
7.21	0.0036	0.01	Q	.	.	.	.
7.34	0.0037	0.01	Q	.	.	.	.
7.46	0.0038	0.01	Q	.	.	.	.
7.58	0.0040	0.01	Q	.	.	.	.
7.70	0.0041	0.01	Q	.	.	.	.
7.82	0.0042	0.01	Q	.	.	.	.
7.95	0.0044	0.01	Q	.	.	.	.
8.07	0.0045	0.01	Q	.	.	.	.
8.19	0.0047	0.01	Q	.	.	.	.
8.31	0.0048	0.02	Q	.	.	.	.
8.43	0.0050	0.02	Q	.	.	.	.
8.56	0.0052	0.02	Q	.	.	.	.
8.68	0.0053	0.02	Q	.	.	.	.
8.80	0.0055	0.02	Q	.	.	.	.
8.92	0.0057	0.02	Q	.	.	.	.
9.04	0.0058	0.02	Q	.	.	.	.
9.17	0.0060	0.02	Q	.	.	.	.
9.29	0.0062	0.02	Q	.	.	.	.
9.41	0.0064	0.02	Q	.	.	.	.
9.53	0.0066	0.02	Q	.	.	.	.
9.65	0.0068	0.02	Q	.	.	.	.
9.78	0.0070	0.02	Q	.	.	.	.
9.90	0.0072	0.02	Q	.	.	.	.
10.02	0.0074	0.02	Q	.	.	.	.
10.14	0.0077	0.02	Q	.	.	.	.
10.26	0.0079	0.02	Q	.	.	.	.
10.39	0.0081	0.02	Q	.	.	.	.
10.51	0.0084	0.02	Q	.	.	.	.

2-YR HYDROGRAPH_POST.txt

10.63	0.0086	0.02	Q	.	.	.	.
10.75	0.0089	0.03	Q	.	.	.	.
10.87	0.0091	0.03	Q	.	.	.	.
11.00	0.0094	0.03	Q	.	.	.	.
11.12	0.0097	0.03	Q	.	.	.	.
11.24	0.0100	0.03	Q	.	.	.	.
11.36	0.0103	0.03	Q	.	.	.	.
11.48	0.0106	0.03	Q	.	.	.	.
11.61	0.0109	0.03	Q	.	.	.	.
11.73	0.0112	0.03	Q	.	.	.	.
11.85	0.0115	0.03	Q	.	.	.	.
11.97	0.0119	0.03	Q	.	.	.	.
12.09	0.0122	0.04	Q	.	.	.	.
12.22	0.0127	0.05	Q	.	.	.	.
12.34	0.0132	0.05	Q	.	.	.	.
12.46	0.0137	0.05	Q	.	.	.	.
12.58	0.0142	0.05	Q	.	.	.	.
12.71	0.0147	0.05	Q	.	.	.	.
12.83	0.0153	0.06	Q	.	.	.	.
12.95	0.0159	0.06	Q	.	.	.	.
13.07	0.0165	0.06	Q	.	.	.	.
13.19	0.0171	0.06	Q	.	.	.	.
13.32	0.0177	0.06	Q	.	.	.	.
13.44	0.0183	0.07	Q	.	.	.	.
13.56	0.0190	0.07	Q	.	.	.	.
13.68	0.0197	0.07	Q	.	.	.	.
13.80	0.0204	0.07	Q	.	.	.	.
13.93	0.0212	0.08	Q	.	.	.	.
14.05	0.0220	0.08	Q	.	.	.	.
14.17	0.0228	0.09	Q	.	.	.	.
14.29	0.0237	0.09	Q	.	.	.	.
14.41	0.0246	0.09	Q	.	.	.	.
14.54	0.0256	0.10	Q	.	.	.	.
14.66	0.0266	0.11	Q	.	.	.	.
14.78	0.0277	0.11	Q	.	.	.	.
14.90	0.0288	0.12	Q	.	.	.	.
15.02	0.0301	0.12	Q	.	.	.	.
15.15	0.0314	0.14	Q	.	.	.	.
15.27	0.0328	0.14	Q	.	.	.	.
15.39	0.0343	0.16	Q	.	.	.	.
15.51	0.0359	0.15	Q	.	.	.	.
15.63	0.0376	0.19	Q	.	.	.	.
15.76	0.0396	0.21	Q	.	.	.	.
15.88	0.0423	0.32	.Q	.	.	.	.
16.00	0.0461	0.44	.Q	.	.	.	.
16.12	0.0553	1.37	. Q	.	.	.	.
16.24	0.0635	0.26	.Q	.	.	.	.
16.37	0.0656	0.17	Q	.	.	.	.
16.49	0.0672	0.15	Q	.	.	.	.
16.61	0.0687	0.13	Q	.	.	.	.
16.73	0.0699	0.11	Q	.	.	.	.
16.85	0.0710	0.10	Q	.	.	.	.
16.98	0.0720	0.09	Q	.	.	.	.
17.10	0.0728	0.08	Q	.	.	.	.
17.22	0.0736	0.07	Q	.	.	.	.
17.34	0.0744	0.07	Q	.	.	.	.
17.46	0.0750	0.06	Q	.	.	.	.
17.59	0.0757	0.06	Q	.	.	.	.
17.71	0.0762	0.06	Q
17.83	0.0768	0.05	Q
17.95	0.0773	0.05	Q
18.07	0.0778	0.05	Q
18.20	0.0782	0.03	Q

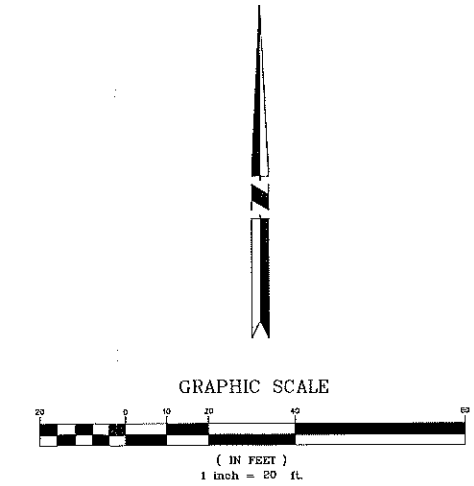
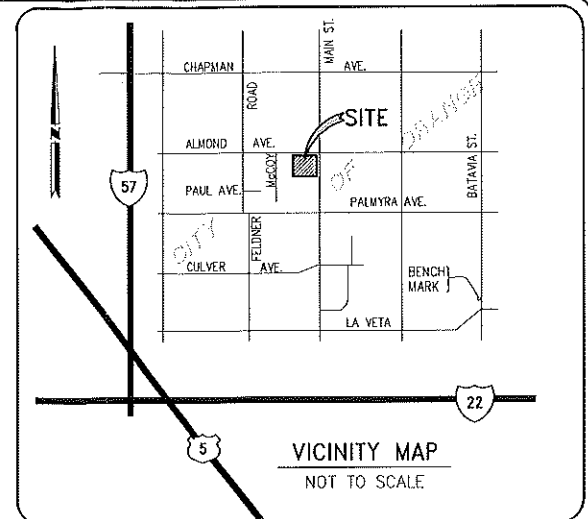
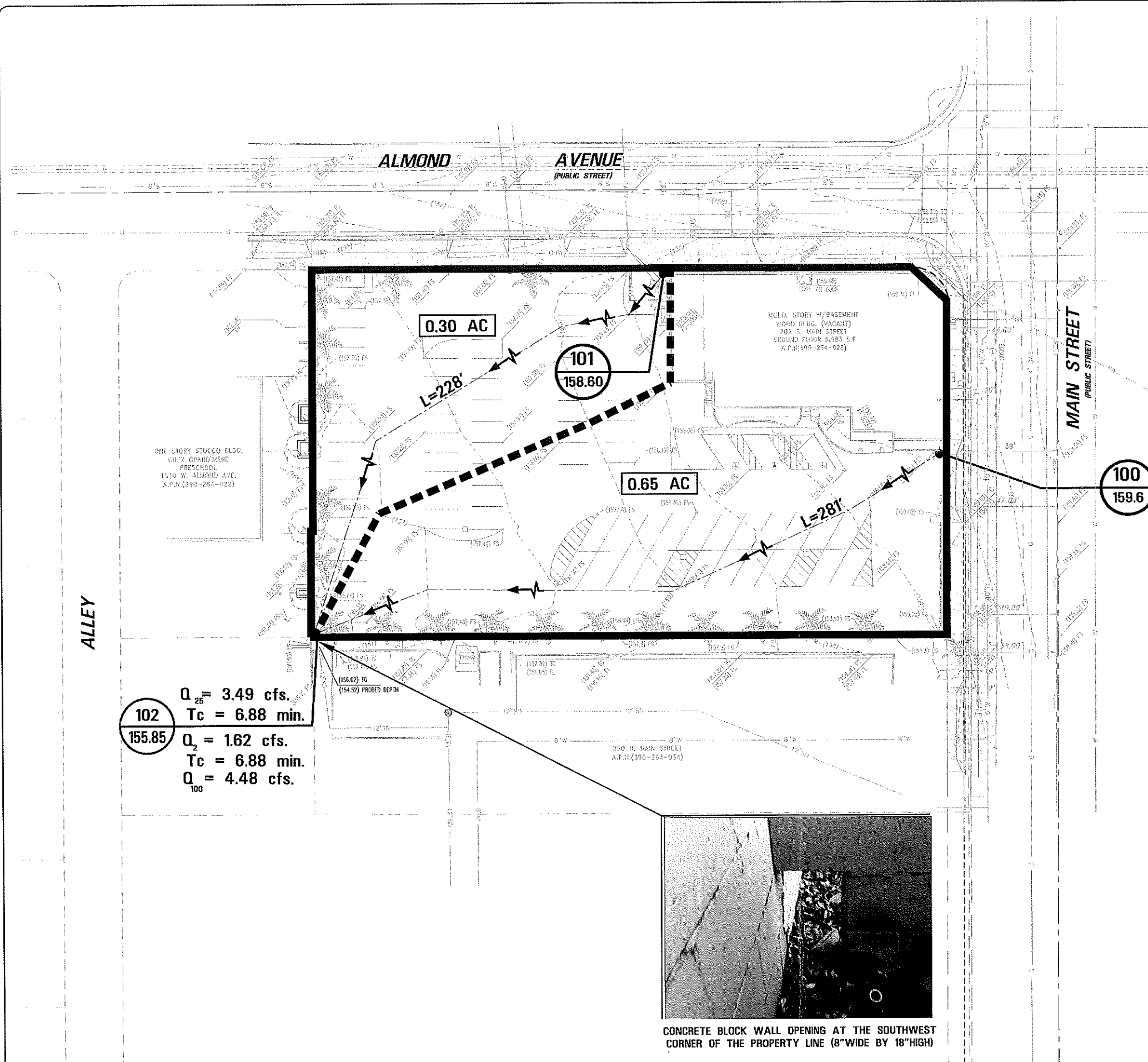
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18.32	0.0786	0.03	Q
18.44	0.0789	0.03	Q
18.56	0.0792	0.03	Q
18.68	0.0795	0.03	Q
18.81	0.0797	0.03	Q
18.93	0.0800	0.02	Q	.	.	.	.
19.05	0.0802	0.02	Q	.	.	.	.
19.17	0.0804	0.02	Q	.	.	.	.
19.29	0.0806	0.02	Q	.	.	.	.
19.42	0.0808	0.02	Q	.	.	.	.
19.54	0.0810	0.02	Q	.	.	.	.
19.66	0.0812	0.02	Q	.	.	.	.
19.78	0.0814	0.02	Q	.	.	.	.
19.91	0.0816	0.02	Q	.	.	.	.
20.03	0.0817	0.02	Q	.	.	.	.
20.15	0.0819	0.01	Q	.	.	.	.
20.27	0.0820	0.01	Q	.	.	.	.
20.39	0.0821	0.01	Q	.	.	.	.
20.52	0.0823	0.01	Q	.	.	.	.
20.64	0.0824	0.01	Q	.	.	.	.
20.76	0.0825	0.01	Q	.	.	.	.
20.88	0.0826	0.01	Q	.	.	.	.
21.00	0.0827	0.01	Q	.	.	.	.
21.13	0.0828	0.01	Q	.	.	.	.
21.25	0.0829	0.01	Q	.	.	.	.
21.37	0.0830	0.01	Q	.	.	.	.
21.49	0.0831	0.01	Q	.	.	.	.
21.61	0.0832	0.01	Q	.	.	.	.
21.74	0.0833	0.01	Q	.	.	.	.
21.86	0.0833	0.01	Q	.	.	.	.
21.98	0.0834	0.01	Q	.	.	.	.
22.10	0.0835	0.01	Q	.	.	.	.
22.22	0.0835	0.01	Q	.	.	.	.
22.35	0.0836	0.01	Q	.	.	.	.
22.47	0.0836	0.01	Q	.	.	.	.
22.59	0.0837	0.00	Q	.	.	.	.
22.71	0.0837	0.00	Q	.	.	.	.
22.83	0.0838	0.00	Q	.	.	.	.
22.96	0.0838	0.00	Q	.	.	.	.
23.08	0.0839	0.00	Q	.	.	.	.
23.20	0.0839	0.00	Q	.	.	.	.
23.32	0.0839	0.00	Q	.	.	.	.
23.44	0.0840	0.00	Q	.	.	.	.
23.57	0.0840	0.00	Q	.	.	.	.
23.69	0.0840	0.00	Q	.	.	.	.
23.81	0.0840	0.00	Q	.	.	.	.
23.93	0.0841	0.00	Q	.	.	.	.
24.05	0.0841	0.00	Q	.	.	.	.
24.18	0.0841	0.00	Q	.	.	.	.

 TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1442.4
10%	80.5
20%	22.0
30%	14.6
40%	7.3

	2-YR HYDROGRAPH_POST.txt
50%	7.3
60%	7.3
70%	7.3
80%	7.3
90%	7.3

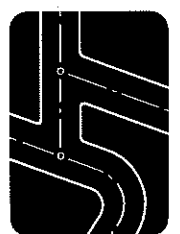


- LEGEND**
- DRAINAGE BOUNDARY
 - - - DRAINAGE SUB-AREA BOUNDARY
 - 101 450 NODE CONCENTRATION POINT ELEVATION
 - A-1 0.497 SUB-AREA AREA IN ACRES
 - $Q_{26} = 1.17$ cfs DESIGN FLOW
 - $Q_2 = 1.17$ cfs LOW FLOW
 - PATH OF FLOW

SOIL GROUP TYPE "B"

NO.	REVISIONS	DATE

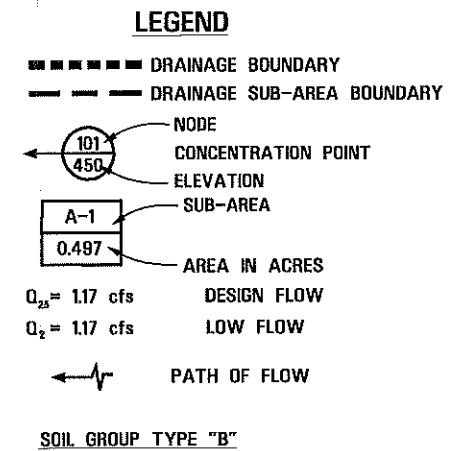
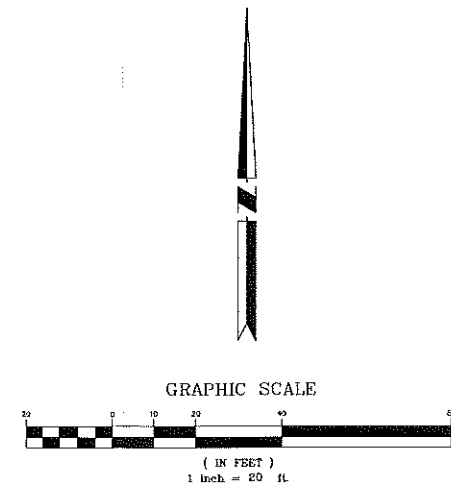
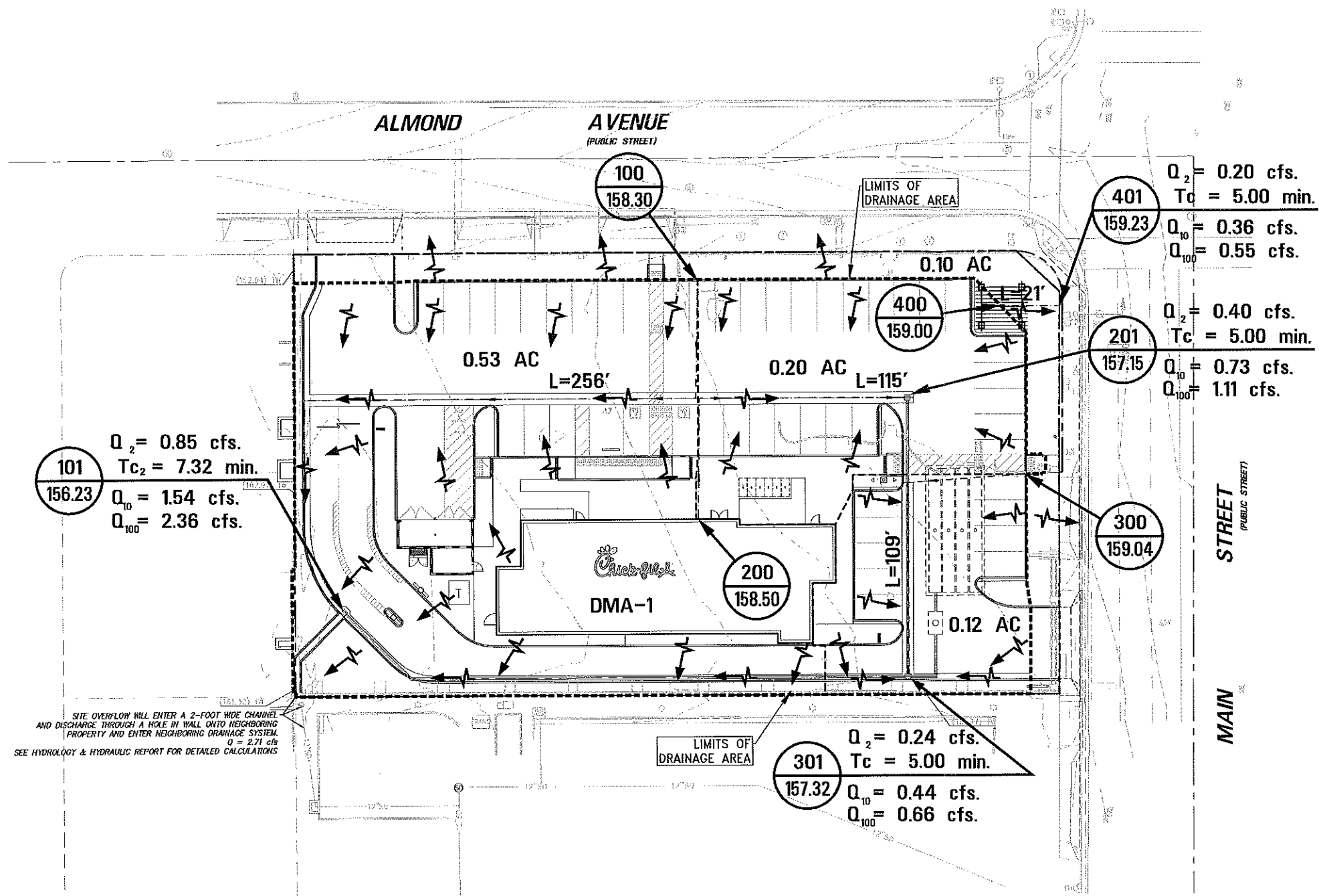
Prepared by:
Joseph C. Truxaw and Associates, Inc.
Civil Engineers and Land Surveyors
265 S. Anita Dr., Suite 111, Orange, CA 92668 (714) 935-0265 fax (714) 935-0106



HYDROLOGY MAP
PRE-DEVELOPMENT
202 S. MAIN STREET
IN THE CITY OF ORANGE, COUNTY OF ORANGE,
STATE OF CALIFORNIA

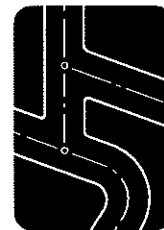
DATE	06-26-18
DRAWN BY	RD
CHECKED BY	SMH
JOB NO.	CFA16046
SHEET NO.	1

OF 2 SHEETS



NO.	REVISIONS	DATE

Prepared by:
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265 S. Anita Dr., Suite 111, Orange, CA 92668 (714) 935-0265 Fax: (714) 935-0106



HYDROLOGY MAP
POST-DEVELOPMENT
202 S. MAIN STREET
IN THE CITY OF ORANGE, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE	11-09-18
DRAWN BY	PJS
CHECKED BY	SMH
JOB NO.	CFA16046
SHEET NO.	2