Preliminary Water Quality Management Plan
Vesting Tentative Tract Map 17845
Rancho La Habra

Prepared for

CalAtlantic Homes

February 2018

Hunsaker & Associates

Preliminary Water Quality Management Plan
Vesting Tentative Tract Map 17845
Rancho La Habra

January 2018

Hunsaker & Associates

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

"Rancho La Habra"

Vesting Tentative Tract Map 17845

Portion of APN 019-481-04

Location: 1400 S. La Habra Hills Drive

La Habra, CA

Prepared for:

15360 Barranca Parkway

Irvine, CA 92618

(949) 789-1600

Contact: Michael Battaglia

Prepared by:

Hunsaker & Associates, Irvine, Inc.

3 Hughes

Irvine, CA 92618

(951) 352-7200

Contact: Brian Lowell, PE

Prepared: February 2015

Revised: February 2018

Project Owner's Certification			
Permit/Application No.	TBD	Grading Permit No.	TBD
Tract/Parcel Map No.	TBD	Building Permit No.	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			Lot 231 Tr 15030

This Preliminary Water Quality Management Plan (P.W.Q.M.P.) has been prepared for **CalAtlantic Homes** by **Hunsaker and Associates Irvine, Inc.** The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the 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 current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: CalAtlantic Homes			
Name/Title	Michael Battaglia, Vice President Project Development		
Company	CalAtlantic Homes		
Address	15360 Barranca Parkway Irvine, CA 92618		
Email	michael.battaglia@calatl.com		
Telephone #	(949) 789-1600		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Signature		Date	14 Jun 18

ENGINEER'S CERTIFICATION
WATER QUALITY MANAGEMENT PLAN

Preparer (Engineer) Certification			
Preparer (Engineer): DOUGLAS STALEY			
Title	CIVIL ENGINEER	PE Registration #	38796
Company	HUNSAKER & ASSOCIATES IRVINE		
Address	3 HUGHES IRVINE CA 92618		
Email	DOUGSTALEY@HUNSAKER.COM		
Telephone #	949 583 1010		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.			
Preparer Signature	[signature]	Date	2-14-18
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER ★ DOUGLAS L. STALEY No. 38796 Exp. 03/31/19 CIVIL ★ STATE OF CALIFORNIA		

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Section I Discretionary Permit(s) and Water Quality Conditions

The project's discretionary permit and water quality information are provided in the following:

Project Information			
Permit/Application No.	TBD	Tract/Parcel Map No.	VTTM No. 17845
Water Quality Conditions			
Water Quality Conditions (list verbatim)	This is the 'Conceptual/Preliminary W.Q.M.P.'. The water quality conditions will be included in the 'Final W.Q.M.P.' after discretionary review and approval.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	WIHMPs: There are currently no approved WIHMPs for the San Gabriel River – Coyote Creek Watershed. TMDLS: Heavy Metals (Technical TMDL[1]) Adoption Date: July 13, 2006 Completion Date: Ongoing		

[1] This TMDL has been approved for Coyote Creek / San Gabriel River by Los Angeles Regional Water Quality Control Board (Region 4); however, it applies to the area of Orange County that drain to Coyote Creek and San Gabriel River.

Section II Project Description

II.1 Project Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Development Category (Verbatim from WQMP):</td><td colspan="4">Priority Project, Category 1 – New development projects that create 10,000 ft^2 or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.

Priority Project, Category 7 – Streets, roads, highways, freeways of 5,000 ft^2 or more of paved surface (excluding routine maintenance activities).</td></tr>
<tr><td>Disturbed Project Area:
6,568,848 ft^2
(150.8 ac.)</td><td colspan="3">Number of Dwelling Units:
277 Single Family Units and
145 Multi-Family units
20,000 sf of commercial space (or 49 additional multi-family units)</td><td>SIC Code:
8811 Private Households</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area
(acres or sq ft)</td><td>Percentage</td><td>Area
(acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>135.8 acres</td><td>90.0 %</td><td>15.0 acres</td><td>10.0 %</td></tr>
<tr><td>Post-Project Conditions</td><td>100.4 acres</td><td>66.6 %</td><td>50.4 acres</td><td>33.4 %</td></tr>
<tr><td>Narrative Project Description:</td><td colspan="4">The proposed project known as "Rancho La Habra" consists of 150.8 acres, and proposes the construction of 277 single family homes, 145 multi-family units, a 2.7 acre commercial site (an additional 49 multi-family units may be constructed as an option to the proposed commercial site), approximately 38.9 acres of open space, paved streets, un-paved trails and access roads, and general improvements related to a residential development. The site is part of the 'La Habra Hills Specific Plan'. The proposed project site is located within the San Gabriel sub-watershed portion of the Santa Ana River Basin, in the City of La Habra, County of Orange, California. The project site is bounded by Beach Boulevard to the west, La Habra Hills Drive to the north, Idaho Street to the east, Tracts 15030 and 15031 to the south and Hillsboro Drive to the south (see included vicinity map).
The existing conditions consist of 0.74 acres of building and out structures (5 buildings), 5.17 acres of concrete cart path, 4.82 acres of ac pavement, 2.00 acres of concrete lined v-ditches and 2.20 acres of water features. The combined existing impervious area equals 14.93 acres, equating to 9.9% impervious of the total 150.8-acre site.</td></tr>
</table>

Description of Proposed Project

The study area breakdown is as follows:

- On-site proposed development area = 115.4 acres
- On-site undeveloped area = 35.4 acres
- Overall site acreage = 150.8 acres

In the existing condition, 47.0 acres located off-site, southerly and upstream of the proposed development, have potential to generate run-on tributary to DMA 'C'. The limits of the hydrology study were expanded to include this offsite area. However, the proposed condition will route the potential run-on from the off-site tributary area around the site and directly connect to the existing municipal storm drain system within Beach Boulevard. By bypassing the site, these 47 acres are not within the scope of the WQMP and are not included the DCV calculations for DMA 'C'. For clarity in comparing the supporting hydrology analysis study area to the study area of this P.W.Q.M.P., the area breakdown is as follows:

- On-site proposed development area = 115.4 acres
- On-site undeveloped area = 35.4 acres

  Total WQMP Study Area (omitting offsite area) = **150.8 acres**

- Offsite area tributary to drainage area 'C' = 47.0 acres

  Total Hydrology Study Area = **197.8 acres**

Proposed entrances into the site will be provided via Beach Boulevard to the west, La Habra Hills Drive to the north, and Idaho Street to the east.

The proposed project will include 277 single family homes, 145 multi-family units and 2.7 acre site for either a maximum of 20,000 square foot retail space or an additional 49 multi-family units.

Associated *impervious* improvements are to include 13.6 acres of private streets 1.9 acres of public streets that will be maintained by the City, 4.5 acres of private concrete sidewalks, 0.9 acres of public concrete sidewalks that will be maintained by the City, 2.9 acres of concrete residential driveways, 12.7 acres of residential buildings (277 units), 6.9 acres of multifamily buildings (145 units), 2.7 acre commercial site, 3.9 acres of D.G. trails, and a 0.4 acre existing clubhouse. All proposed street improvements will be privately owned and maintained (HOA) with exception to La Habra Hills Drive which will be publicly owned and maintained (City). Total impervious acreage equals 50.4 acres.

Associated *pervious* improvements are to include 35.0 acres of slope landscaping, 26.9 acres of landscaping, 18.7 acres of fallow residential backyards, 3.2 acres of park turf, 2.6 acres of water quality basins and 14.0 acres of natural un-developed land. Total pervious acreage equals 100.4 acres.

Walkways, curb and gutter, storm drain improvements, sewer and water

Description of Proposed Project	
	improvements and other related infrastructure improvements, will connect to the existing utilities and improvements surrounding the site. Parking will be provided via garage and uncovered surface parking. Each single family unit will have a 2 car garage, with 2 additional uncovered parking spaces provided in front of the garage on the driveway. Each multi family unit will have 2 car garage, along with additional guest parking located adjacent to the buildings on a paved parking lot. Proposed open space/landscaping will consist of 56.2 acres located throughout the site with 21.9 acres of the existing golf course in the center of the site that will be converted into a park. Additionally, landscaping will be designated throughout the project in the form of open space and common areas located between proposed multifamily units. Paved and other impervious areas of the site include the project's private drives, walkways, D.G. trails, curb and gutter improvements, driveways and the residential building footprint for each residential lot. Total impervious area is anticipated to consist of approximately 32.9% of the 150.8 acre project site. No delivery or storage areas are proposed for the project. Activities typical of residential developments can be anticipated for the project. These are anticipated to include day to day activities such as recreation, commuting and other activities typical of residential developments. Typical household wastes are anticipated to be generated. Each residential unit will have trash bins located/stored within the private residence of each unit (for the SFR, community trash bins for the MFR), to be picked up for disposal on a weekly basis by the contracting waste hauler. All improvements are shown in the WQMP Site Plan in Section VI of this WQMP.
Drainage Patterns/Connections	In the pre-development condition, runoff from the project site is conveyed as sheet flow northerly and westerly where it is collected by an underground storm drain system that outlet into the various water features throughout the golf course, prior to discharging to the existing City of La Habra's 48-inch storm drain system within Imperial Highway and the City of La Habra's 60-inch storm drain system within Beach Boulevard. Runoff is then conveyed southwesterly and discharged into Coyote Creek prior to discharging to San Gabriel River, Alamitos Bay, San Pedro Bay and the Pacific Ocean.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (December 2013) lists the following Pollutants of Concern (POC's) associated with the project:

Pollutants of Concern		
Pollutant	E=Expected to be of concern N=Not Expected to be of concern	Additional Information and Comments
Suspended-Solid/ Sediment	Expected	Potential sources of sediment include existing landscaping areas and disturbed earth surfaces.
Nutrients	Expected	Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals	Expected	Generated by uncovered parking areas and public and private streets.
Pathogens (Bacteria/Virus)	Expected	Potential sources of pathogens include pets, food wastes and landscaping/sediment areas.
Pesticides	Expected	Potential sources of pesticides include landscaping and open space areas.
Oil and Grease	Expected (1)	Potential source of oil and grease is parked vehicles, public and private streets.
Toxic Organic Compounds	Expected	Generated by uncovered parking areas and public and private streets.
Trash and Debris	Expected	Potential sources include common litter and trash cans from residential homes.

(1) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2013 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent.

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event is less than the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ Yes ☐ No – Show map

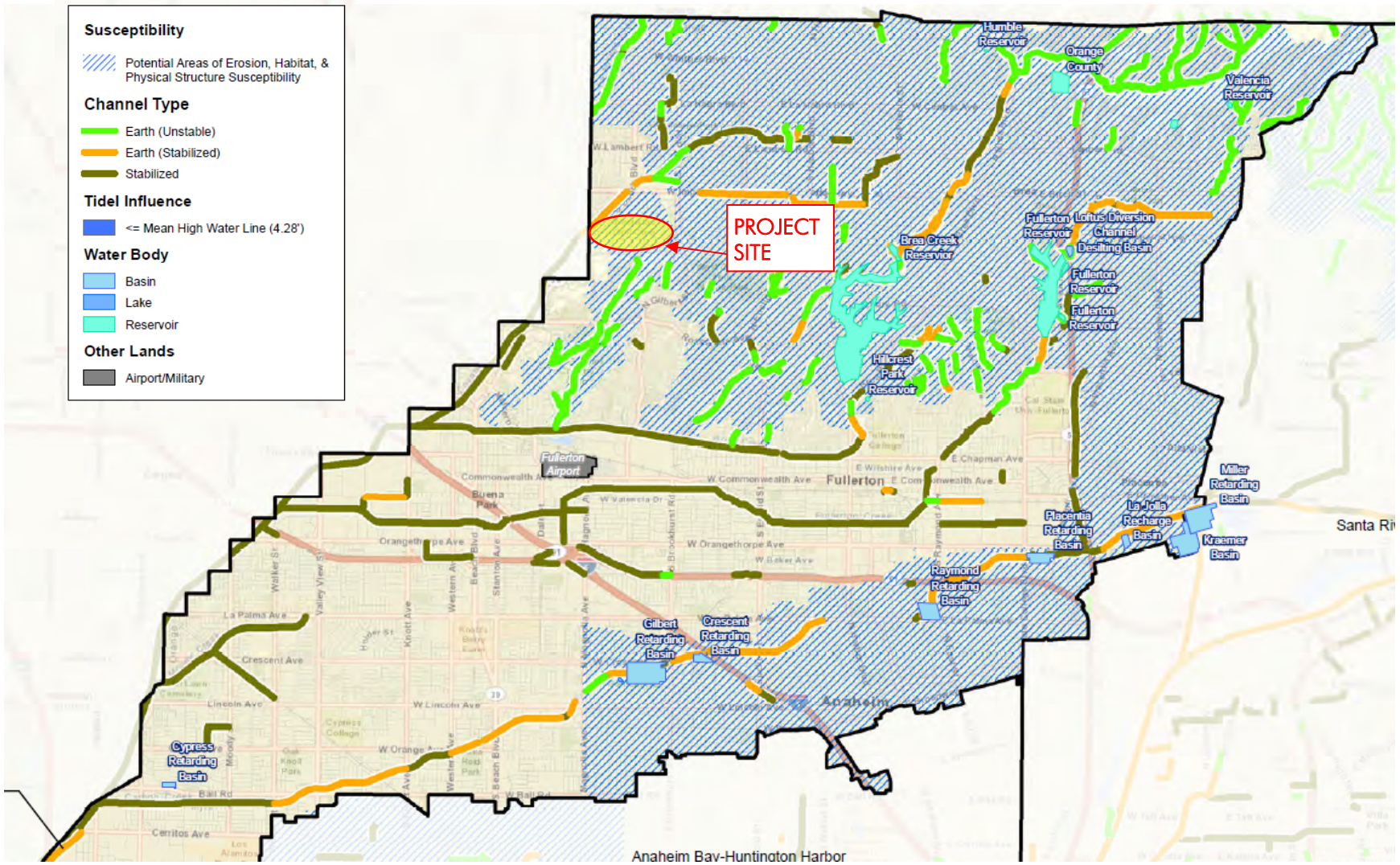
Based on County's current hydromodification susceptibility map (provided in the following page), the project resides in an area that is subject to the specific 2-year criteria noted above (shown in blue hatching) and has the potential to impact downstream receiving waters. A summary of the project's hydromodification analysis is provided in the follow table. Blue values indicate an insignificant change between the project's existing condition and the developed condition. Red values indicate a change where the developed condition is greater than 5% of the pre-project condition, thus requiring detention of the 2-year event to address the increase in developed condition runoff.

Drainage Area	Condition	Acres	Q_2 (cfs)	Tc (min)	V_{2YR} (ac-ft)	Hydromodification Control
A	Existing	27.4	19.5	21.84	0.81	Detention Basin
	Developed	27.4	27.0	14.78	2.18	
	Change	0	+7.5	-7.06	+1.37	
B	Existing	19.6	18.3	13.95	0.63	Subsurface Detention
	Developed	19.7	20.9	13.73	1.77	
	Change	+0.1	+2.6	-0.22	+1.14	

Drainage Area	Condition	Acres	Q_2 (cfs)	Tc (min)	V_{2YR} (ac-ft)	Hydromodification Control
C	Existing	121.0	86.5	17.88	3.47	Detention Basin
	Developed	117.3	104.1	11.37	7.05	
	Change	-3.7	+17.6	-6.51	+3.58	
D	Existing	20.31	15.97	16.73	0.7485	None
	Developed	20.54	16.24	16.67	0.7531	
	Change	+0.23	+0.27	-0.06	+0.0046	
E	Existing	5.81	6.8	9.87	0.81	None
	Developed	5.79	8.4	9.64	0.81	
	Change	-0.02	+1.6	-0.23	0	
F	Existing	1.68	2.6	5.44	0.25	None
	Developed	1.68	2.6	5.44	0.25	
	Change	0	0	0	0	

Based on the results of the analysis, detention of development condition runoff is required for Areas A, B and C. Onsite detention basins (flow-through design) will be employed to detain the increase in runoff volume (2-year event) between the existing and developed conditions.

.



Source: OCTGD Figure XVI.3-1 HCOC Susceptiblity Map for San Gabriel River – Coyote Creek

SUBJECT TO FURTHER REVISION

PROJECT SITE
0.95 INCHES

0.9
0.9
0.95
0.7
0.7
0.75
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
1.05

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

TITLE
RAINFALL ZONES

ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

JOB
ORANGE CO.
CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-1

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics.

The term '*Modular Wetlands',* as used in the following narrative, is described and defined as follows: *Modular* Wetlands' are a self-contained stormwater biofiltration system designed to be installed inline and achieve high water quality treatment. The effluent from the '*Modular* Wetlands' system can either discharge directly into an underground municipal storm drain system, or in some instances where existing improvements are being retrofitted, the modular wetlands can be installed immediately upstream of and discharge/connect directly to an existing catch basin. Direct connection to catch basins will require municipal approval and will be obtained in writing on a case by case basis and included in the Final WQMP. Please refer to Attachment 'C' for more information on the '*Modular Wetland'* System.

The topography of the site divides the project into seven distinct drainage management areas, 'A', 'B', 'C', 'D', 'E', 'F' and 'G'. (150.8 on-site acres and 47.0 off-site acres not tributary to site BMP's)

D.M.A. 'A' totals 27.3 acres, comprised of:

- 0.5 acre water quality detention basin
- 3.2 acres of landscaped slopes
- 6.9 ac residential landscaping
- 6.8 ac fallow residential rear yards
- 3.8 ac private streets
- 1.2 ac private sidewalks
- 0.7 ac residential driveways
- 0.4 ac D.G. trails
- 3.8 ac residential buildings

In general, runoff from DMA 'A' in the developed condition will be conveyed as surface flow, gutter flow and via an underground storm drain system towards and into a proposed water quality basin (BIO-6: modified dry detention basin) located in the north easterly most corner of the project site. Effluent from Basin 'A' will be pass through a *'Modular* Wetlands' system (BIO-7: Proprietary Biotreatment) which has been designed to achieve the water quality objectives for this proposed project. Storm water is then conveyed via underground storm drain pipes towards and into the existing 48-inch City of La Habra storm drain line that lies within Imperial Highway, approximately 800 feet north of the site.

D.M.A. 'B' totals 19.7 acres, comprised of:

- 4.7 acres of landscaped slopes
- 2.8 ac residential landscaping
- 2.8 ac fallow residential rear yards
- 2.5 ac private streets
- 0.7 ac private sidewalks
- 0.7 ac private streets
- 0.4 ac private sidewalks
- 0.7 ac residential driveways
- 0.9 ac D.G. trails
- 3.5 ac residential buildings

In general, runoff from DMA 'B' in the developed condition will be conveyed as surface flow, gutter flow and via an underground storm drain system towards and into a proposed underground storm water

vault (BIO-6: modified underground dry detention basin) located along the properties northerly most property line. Effluent from underground vault 'B' will pass through a *'Modular* Wetlands' system (BIO-7: Proprietary Biotreatment) which has been designed to achieve the water quality objectives for this proposed project. Storm water is then conveyed via underground storm drain pipes towards and into the existing 30-inch City of La Habra storm drain line that lies within La Habra Hills Drive, which outlets into the existing 60-inch City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

D.M.A. 'C' totals 74.6 acres, comprised of:

- 1.4 acre water quality detention basin
- 15.7 acres of landscaped slopes
- 9.1 ac residential landscaping
- 9.1 ac fallow residential rear yards
- 5.3 ac private streets
- 1.6 ac private sidewalks
- 1.5 ac residential driveways
- 1.9 ac D.G. trails
- 5.4 ac residential buildings
- 6.9 ac multifamily buildings
- 2.7 ac commercial site
- 14.0 ac. natural un-developed land

In general, runoff from DMA 'C' in the developed condition will be conveyed as surface flow, gutter flow and via an underground storm drain system towards and into a proposed water quality basin (BIO-6: modified dry detention basin) in the north westerly most corner of the site. Effluent from Basin 'C' will be pass through a *'Modular* Wetlands' system (BIO-7: Proprietary Biotreatment) which has been designed to achieve the water quality objectives for this proposed project. Storm water is then conveyed via a new parallel 48-inch underground storm drain pipe towards and into the existing 60-inch City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

D.M.A. 'D' totals 20.2 acres, comprised of:

- 0.7 acre water quality detention basin
- 7.7 acres of landscaped slopes
- 7.6 ac landscaping
- 3.0 ac turf
- 0.5 ac private sidewalks (remove and replace)
- 0.7 ac D.G. trails

In general, runoff from DMA 'D' in the developed condition will remain the same as in the undeveloped condition, and will be conveyed as surface flow and via an underground storm drain system towards and into an existing pond that functions as a water quality basin (BIO 4: modified wet detention basin) in the northern most portion of the DMA. Aside from remedial grading and the addition of approximately 0.5 acres of walkway improvements, this drainage area will remain un-developed and mimic the existing condition and is self-retaining. Hydrologic Source Control BMP (HSC-2 Impervious Area Dispersion) will be employed address runoff from the sidewalk improvement areas. Runoff from the sidewalk areas will be dispersed over existing golf course fairway landscaping. Discharge from this drainage will be conveyed via underground storm drain pipes towards and into the existing City of La

Habra storm drain line that lies within Beach Boulevard along the project's northwesterly boundary, which then outlets into Coyote Creek.

Effluent from Basin 'D' will be conveyed via underground storm drain pipes towards and into the existing City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

D.M.A. 'E' totals 5.2 acres, comprised of:

- 1.5 acres of landscaped slopes
- 2.0 ac private streets
- 1.2 ac public streets
- 0.5 ac public sidewalks

In general, runoff from DMA 'E' in the developed condition will be conveyed as surface flow towards and into two existing catch basins located on La Habra Hills Drive behind proposed lot 113. Two modular wetlands (BIO-7: Proprietary Biotreatment) will be installed immediately upstream of the existing catch basins and will be sized to meet water quality objectives for the proposed project. Storm water is then conveyed via existing underground 18-inch storm drain pipes towards and into the existing City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

D.M.A. 'F' totals 1.6 acres, comprised of:

- 0.2 ac turf
- 0.5 ac landscaping
- 0.5 ac private sidewalks
- 1,200 s.f. pool
- 0.4 ac clubhouse building

In general, runoff from DMA 'F' in the developed condition will remain the same as in the undeveloped condition, and will be conveyed as surface flow and via an underground storm drain system towards and into a proposed bioretention basin (BIO-7: Proprietary Biotreatment) behind the existing clubhouse. Effluent from the bioretention basin will be conveyed via underground storm drain pipes towards and join the proposed realigned outlet pipe from Basin 'D', which flows towards and into the existing City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

D.M.A. 'G' totals 2.2 acres, comprised of:

- 2.2 acres of landscaped slopes

In general, runoff from DMA 'G' consists of existing landscaped slopes that are not tributary to any of the proposed improvements. The existing residential development to the north of DMA 'G' was designed to collect run-on from this DMA and incorporate it into their storm drain system. The existing storm drain system flows northerly and connects to the existing City of La Habra storm drain line that lies within Beach Boulevard along the projects northwesterly boundary, which then outlets into Coyote Creek as in existing conditions.

Runoff from all seven DMA's will ultimately be conveyed westerly towards and into Coyote Creek as in existing conditions. Along the projects frontage, Coyote Creek is both earthen stabilized and engineered hardened, and therefore exempt from Hydrologic Conditions of Concern (H.C.O.C.).

Low Impact Development

To satisfy the project requirements for Low Impact Development (LID), Hydrologic Source Control measures are being implemented. Specifically, HSC-2 Impervious Area Dispersion and through the planting of HSC-3 Street Trees. HSC-2 dictates that run-off from impervious areas such as roof-tops, walk ways and patios be directed, where feasible, to an adjacent pervious area to increase the potential for on lot retention and infiltration. HSC-3 'street trees' will reduce the design capture volume by intercepting rain with the trees canopy as well as increasing the soils infiltration capacity. Furthermore, water quality objectives will be met through the use of modular wetlands connected to the outlet of each basin, as well as through the infiltration capacity of each basin.

II.5 Property Ownership/Management

The property owner, CalAtlantic Homes shall assume all BMP maintenance and inspection responsibilities for the project site until the establishment of a Homeowners Association. Inspection and maintenance activities are provided in Section 'V' of this WQMP.

Section III Site Description

III.1 Physical Setting

General descriptions of the project area are provided below:

Planning Area/ Community Name	Rancho La Habra
Location/Address	1400 South La Habra Hills Drive La Habra, CA 90631
Project Area Description	The proposed project is located just south of the intersection of Beach Boulevard and Imperial Highway, and east of Beach Boulevard, in the City of La Habra. Specifically, the project consists of Lot 231 of Tract 15030 and is bound to the north by Imperial Highway; to the west by Beach Boulevard; to the south by Tracts 15030 and 15031; and to the east by Idaho Street.
Land Use	Existing: Golf Course (open space) Proposed: Residential
Zoning	Existing: La Habra Hills Specific Plan Proposed: Rancho La Habra Specific Plan
Acreage	Overall site acreage = 150.8 acres
Predominant Soil Type	Based on the County's most recent TGD GIS data, subsurface soils consist of 80% HSG Type C and 20% HSG Type B soils. However, this information is inconsistent with data from the NRCS Web Soil Survey, which indicate that onsite soils consist primarily of 75% HSG Type C (Anaheim clay loam) and 25% HSG Type D soils (Alo clay). Soil classifications were further analyzed in section 2.11 of the attached "Geotechnical Report" dated 8/19/2015. The subject site is located partially on alluvium deposits and partially within the uplifted bedrock that forms the low hills of the Coyote Hills geologic complex south of the site (Morton, 2004). The comparatively young alluvium locally incised a broad, very old alluvial fan that spans the La Habra area to the north. The local alluvium consists of interfingered deposits derived from upstream to the northeast and from the low hills ascending to the south of the site. The bedrock unit underlying the site consists of Quaternary San Pedro Formation, and two existing landslides derived from this material have been identified within the limits of the site. Also, both structural and non-structural artificial fills mantle portions of the site.

III.2 Site Characteristics

The following table summarizes general characteristics of the project site:

Precipitation Zone	0.95 in.
Topography	The pre-project site is moderately hilly, with the site generally sloping to the northwest.
Drainage Patterns/Connections	The pre-developed condition consists of a fully developed and functioning golf course, 'Westridge Golf Course'. The topography of the site divides the project into seven distinct drainage management areas, 'A', 'B', 'C', 'D', 'E', 'F' and 'G'. DMA 'A', 'B', 'D', 'E', 'F' and 'G' generally flow northerly, and DMA 'C' generally flows northwesterly. Runoff from the four larger drainage areas 'A', 'B', 'C' and 'D' generally follow the same drainage pattern described as follows: Run-off is allowed to sheet flow towards and into a network of area drains scattered throughout the fairways. The area drains are directly connected to the existing water features within the golf course. The water features then outlet into a privately owned and maintained on-site storm drain system that outlets into the existing publically owned and maintained City of La Habra storm drain system within Beach Boulevard and Imperial Highway. Runoff is then conveyed westerly towards and into Coyote Creek prior to discharging to San Gabriel River and the Pacific Ocean. Run-off from DMA 'E' and 'F' flows northerly onto La Habra Hills Drive, towards and into two existing catch basins that outlet into the existing publically owned and maintained City of La Habra storm drain system within Beach Boulevard and Imperial Highway. Runoff is then conveyed westerly towards and into Coyote Creek prior to discharging to San Gabriel River and the Pacific Ocean. Similarly, run-off from DMA 'G' flows onto existing landscape catch basins that are also connected to the existing publically owned and maintained City of La Habra storm drain system within Beach Boulevard and Imperial Highway. Runoff is then conveyed westerly towards and into Coyote Creek prior to discharging to San Gabriel River and the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	A soils report has been prepared and is included in 'Attachment E' of this report for reference, excerpts are as follows:

Hydrogeologic (Groundwater) Conditions	Based on the project's previous geotechnical investigation in 1995, no groundwater was encountered to the maximum explored depth of 101.5 feet. Historical high groundwater level in the vicinity of the project site is estimated at greater than 100' deep. This fact was reinstated with the August 2015 Soils Investigation prepared by LGC Geotechnical Inc., their findings are as follows: During our subsurface evaluation, groundwater was encountered at a depth of approximately 29 feet in HS-17 and as seepage at depth within the large-diameter borings LGC-B-4 and LGC-B-5. Groundwater was not encountered in the remaining hollow-stem borings to the maximum explored depth of approximately 76.5 feet below existing grade. Groundwater was encountered at 46 to 49 feet below existing grade within the alluvium to the north of the site as investigated and reported by Eberhart (2001) as part of construction of the commercial development to the north of the site. The referenced grading plan review report by GMU, 1996, stated that "subsurface flow was encountered at depths of about 20 feet within the older alluvium underlying the major valley bottom area." Seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Local perched groundwater conditions or surface seepage may develop once site development is completed and landscape irrigation commences.
Geotechnical Conditions (relevant to infiltration)	Based on '2015 LGC Soils Report', site evaluation and subsurface investigation, the majority of site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays that are known to have a very low permeability and therefore have very low infiltration rates. Within the majority of small and large diameter borings excavated during our subsurface field work, no groundwater was encountered. Isolated seepage was observed at depth in several borings; however, no signs of surface infiltration were observed. Although we understand that the City of La Habra considers the geologic formation underlying the golf course to be a source of recharge to the City's groundwater basin (Malcolm Pirnie, 2010), it is our opinion that infiltration of surface water is not currently occurring through the surface of the golf course. Purposeful infiltration of water to the subsurface at the subject site is neither feasible nor acceptable from a geotechnical standpoint given the onsite materials and the hillside nature of the site.
Off-Site Drainage	The project does receive offsite run-on from two separate sources, Tract 15031 to the south and from an undeveloped area south of Nicklaus Avenue (south of the site). The run-on from both sources is collected and transported via separate underground storm drain pipes to the existing water feature along Beach Boulevard. This water feature acts as a detention basin reducing the peak 25 year flow from an estimated 140 cfs to approximately 48 cfs.
Utility and Infrastructure Info.	Wet and dry utilities are proposed for this tract and will connect to existing facilities located within Beach Boulevard, La Habra Hills Dr and S. Idaho St

III.3 Watershed Description

The following table includes descriptions of the project's receiving waters:

Receiving Waters	Coyote Creek Channel, Coyote Creek, San Gabriel River (Reach 1 & Estuary), Alamitos Bay, San Pedro Bay and Pacific Ocean.
303(d) Listed Impairments	Coyote Creek Channel – Ammonia, Copper (dissolved), Diazinon, Indicator Bacteria, Lead, pH and Toxicity. Coyote Creek – Diazinon, Indicator Bacterial, pH, Toxicity San Gabriel River (Reach 1) – Coliform Bacteria, pH San Gabriel River (Estuary) – Copper, Dioxin, Nickel, Dissolved Oxygen Alamitos Bay – Indicator Bacteria San Pedro Bay – Chlordane, DDT, PCBs, Sediment Toxicity
Applicable TMDLs	Heavy Metals (Technical TMDL[2])
Pollutants of Concern for the Project	Pollutants of Concern: Suspended Solids/Sediment, Nutrients, Heavy Metals, Pathogens, Pesticides, Oil and Grease, Toxic Organic Compounds, Trash and Debris. Primary Pollutants of Concern: Heavy Metals, Pathogens, Toxic Organic Compounds.
Environmentally Sensitive and Special Biological Significant Areas	Coyote Creek and San Gabriel River (Estuary) are listed as impaired under Section 303(d) of the Clean Water Act; however, the project is not located adjacent to (within 200 feet) or directly discharging to these waterbodies. Therefore, this project is not located within any known environmentally sensitive areas.

[2] This TMDL has been approved for Coyote Creek / San Gabriel River by Los Angeles Regional Water Quality Control Board (Region 4); however, it applies to the area of Orange County that drain to Coyote Creek and San Gabriel River.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Project Performance Criteria			
(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?		YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	A WIHMP has not been approved for the watershed.		
If HCOC exists, list applicable hydromodification control performance criteria	H.C.O.C. does not exist for this project, therefore Hydromodification Control BMPs are not required, See Section II.3 of this WQMP.		
List applicable LID performance criteria	The applicable LID performance criteria are as follows: • Retain, onsite (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the Design Capture Volume, and • Recover (i.e.) drawdown the storage volume as soon as possible after a storm event, and, if necessary • **Biotreat, onsite, additional runoff, as feasible, up to 80 percent average annual capture efficiency, and, if necessary** • Retain or biotreat, in a regional facility, the remaining runoff up to 80 percent average annual capture efficiency, and, if necessary • Fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency using treatment controls or other alternative approaches.		
List applicable treatment control BMP performance criteria	N/A. Project proposes the use of LID BMPs to address the project's design capture volume.		

Project Performance Criteria	
Calculate LID design storm capture volume for Project.	Design Capture Volumes are summarized below, followed by their supporting calculations. Attachment 'C' contains additional calculations for determining 'I', 'C', 'I design' & 'Q design'. Time of concentration was determined by the WinTR-55 program calculations (included in attachment C). Impervious percentage was based on the area break down provided in section II.4. DCV summary is as follows: DCV for DMA 'A' = 39,727 cf DCV for DMA 'B' = 34,502 cf DCV for DMA 'C' = 104,024 cf DCV for DMA 'D' = 1,552 cf (for walkway improvements only) DCV for DMA 'E' = 12,259 cf DCV for DMA 'F' = 3,155 cf DCV for DMA 'G' = Not required – no improvements proposed Project's LID DCV has been determined using the following equation: DCV = C x D x A x 43560 sf/ac x 1ft/12in DCV 'A' = (0.422*0.95*27.3*43560)/12 = 39,727 cf DCV 'B' = (0.508*0.95*19.6*43560)/12 = 34,502 cf DCV 'C' = (0.404*0.95*74.6*43560)/12 = 104,024 cf DCV 'D' = (0.90*0.95*0.5*43560)/12 = 1,552 cf DCV 'E' = (0.684*0.95*5.2*43560)/12 = 12,259 cf DCV 'F' = (0.572*0.95*1.6*43560)/12 = 3,155 cf Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 x imp + 0.15) DMA 'A' = (0.75*.363+.15) = C_A = 0.422 DMA 'B' = (0.75*.477+.15) = C_B = 0.508 DMA 'C' = (0.75*.339+.15) = C_C = 0.404 DMA 'D = (0.75*1.0+.15) = C_D = 0.900 DMA 'E' = (0.75*.712+.15) = C_E = 0.684 DMA 'F' = (0.75*.563+.15) = C_F = 0.572 Imp = impervious fraction of drainage area (ranges from 0 to 1) DMA 'A' = Imp = 36.3 % DMA 'B' = Imp = 47.7 % DMA 'C' = Imp = 33.9 % DMA 'D' = Imp = 100% DMA 'E' = Imp = 71.2 % DMA 'F' = Imp = 56.3 % D = storm depth (inches) = 0.95" DMA 'A' = tributary area = 27.3 acres DMA 'B' = tributary area = 19.7 acres DMA 'C' = tributary area = 74.6 acres DMA 'D' = tributary area = 0.5 acres DMA 'E' = tributary area = 5.2 acres DMA 'F' = tributary area = 1.6 acres

IV.2 Site Design and Drainage Plan

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

- The project's permeable area has been maximized by limiting the impermeable areas primarily to the roadways, driveways and building footprints.
- Open jointed paving materials will not be utilized within the project.
- All roadways have been designed to the minimum City requirements.
- The proposed project will incorporate native and drought tolerant plant materials into the landscape design.

Maximize Natural Infiltration Capacity

The project will consist of approximately 69.3% landscaped or open area which will reduce the projects run-off and maximize the potential for natural infiltration.

Preserve Existing Drainage Patterns and Time of Concentration

- Where feasible, the proposed development will conserve natural areas.
- Although the project proposes to increase the percentage of impervious area, the time of concentration is anticipated to increase due to longer flow lengths and routed conditions, as compared to the pre-developed condition.

Disconnect Impervious Areas

- Landscaping will be provided adjacent to walkways, within common areas and private homeowner areas in an effort to disconnect impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

- The original condition consisted of dry brush in a chaparral climate. The existing condition is that of a developed and irrigated golf course. Where feasible, the existing landscaping will be preserved, as the original vegetation was eliminated when the site was originally developed. 6 acres of the project site are being set aside as a natural habitat preservation area. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

- Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.2.2 Drainage Management Areas

Per the TGD, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas tributary to the project's BMPs. DMA limits have been delineated based on the tributary drainage area for each BMP.

The design capture volume (DCV) and design flow rate utilizing the "Simple Method" and the "Capture Efficiency Method" described in the TGD Section III.3.1 and III.3.3 are provided below. Locations of DMAs and associated treatment BMPs are provided on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Attachment C of this WQMP.

DMA	Tributary Drainage Area (Ac.)	% Imp.	C-value	Design Storm Depth (in.)	Simple Method DCV (cu-ft)	Design Intensity (in/hr)	Design Flowrate (cfs)
A	27.3	36.3 %	0.422	0.95	39,727 cf	0.205	2.36
B	19.7	47.7 %	0.508	0.95	34,502 cf	0.205	2.05
C	74.6	33.9 %	0.404	0.95	104,024 cf	0.200	6.03
D	0.5	100 %	0.90	0.95	1,552 cf	0.26	0.12
E	5.2	71.2 %	0.684	0.95	12,259 cf	0.225	0.800
F	1.6	56.3 %	0.572	0.95	3,155 cf	0.235	0.215

IV.3 LID BMP Selection and Project Conformance Analysis

Per the 4th Term MS4 Storm Water Permit (Order No. R8-2009-0030, as amended by Order No. R8-2010-0062), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures in the following treatment hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of flow-thru LID BMPs to address pollutants from the project's runoff.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?	
	Yes	No
HSC-1 Localized on-lot infiltration	☐	☒
HSC-2 Impervious area dispersion (e.g. roof top disconnection)	☒	☐
HSC-3 Street trees (canopy interception)	☒	☐
HSC-4 Residential rain barrels (not actively managed)	☐	☒
HSC-5 Green roofs/Brown roofs	☐	☒
HSC-6 Blue roofs	☐	☒
HSC-7 Impervious area reduction (e.g. permeable pavers, site design)	☐	☒

Although HSC BMPs will be employed to reduce project-related runoff, volume reduction credit from HSC BMPs will not be taken for the project's major improvement areas (DMAs A, B, C, E and F), as the project's proposed LID BMPs have been sized to account for the full DCV for those areas.

To address runoff from the 0.5 acres (cumulative) of paved walkway improvements throughout DMA D, the project proposes the use of HSC-2 BMP (Impervious Area Dispersion). Runoff from the paved improvements will be directed to adjacent landscaping areas (golf course landscaping) to allow for retention of runoff (via soil uptake and evapotranspiration).

Summary of the project's HSC BMP credits for the proposed project is provided in the following table:

DMA	BMP System	DCV (ft^3)	HSC System	Ratio	D_{HSC}	Lat/Long
D	Landscape dispersal over existing golf course vegetation and soil layer (approx.. 3' media over sand layer)	1,552	4.25 acres (minimum) golf course landscaping to 0.50 acres of cumulative impervious	8.1:1	1.0"	33.910394°; -117.965561°

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

Excerpt from the August 2015 Soils Report prepared by LGC, Geotechnical, Inc. reads as follows:

"Based on our site evaluation and subsurface investigation, the majority of site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays that are known to have a very low permeability and therefore have very low infiltration rates. Within the majority of small and large diameter borings excavated during our subsurface field work, no groundwater was encountered. Isolated seepage was observed at depth in several borings; however, no signs of surface infiltration were observed. Although we understand that the City of La Habra considers the geologic formation underlying the golf course to be a source of recharge to the City's groundwater basin (Malcolm Pirnie, 2010), it is our opinion that infiltration of surface water is not currently occurring through the surface of the golf course.

At the completion of grading, the proposed development will consist of either a thick cap of compacted fill (approximately 30 to 60 feet thick) over alluvium at the western half of the site or a thinner cap of compacted fill over bedrock at the eastern half of the site. Engineered fill is considered unacceptable for infiltration in accordance with the Orange County Technical Guidance Document "Section VII.1.6, Fill Condition," that states infiltration must extend to native soils below the fill (County of Orange, 2013). However, siltstone bedrock (native soils) below the engineered fill is also unacceptable for infiltration from a geotechnical standpoint. By definition, bedrock materials do not readily transmit water. The onsite bedrock materials are generally more than 50 percent fine-grained (i.e., clays and silts corresponding to hydrologic soil groups C and D) and bedrock structure includes numerous clayey siltstone interbeds that consist entirely of fine-grained material. The limited amount of water that does enter the bedrock may be transmitted laterally along bedding and through fractures to unknown locations. Deeply buried alluvium at the western portion of the site is also not a geotechnically acceptable medium for infiltration due to that portion of the site being located in a mapped State of California Seismic Hazard Zone for liquefaction as depicted on Figure 2, Seismic Induced Hazard Map
(Rear of Text) (CDMG, 1998).

Purposeful infiltration of water to the subsurface at the subject site is neither feasible nor acceptable from a geotechnical standpoint given the onsite materials and the hillside nature of the site."

Based to the project's predominant soil type (Type "C") and recommendations against infiltration from the soils engineer, infiltration BMPs have not been proposed for the project. Supporting documentation is provided in Attachment C and E of this document.

Name	Included	
	Yes	No
Bioretention without underdrains	☐	☒
Rain gardens	☐	☒
Porous landscaping	☐	☒
Infiltration planters	☐	☒
Retention swales	☐	☒
Infiltration trenches	☐	☒
Infiltration basins	☐	☒
Drywells	☐	☒
Subsurface infiltration galleries	☐	☒
French drains	☐	☒
Permeable asphalt	☐	☒
Permeable concrete	☐	☒
Permeable concrete pavers	☐	☒
Other:	☐	☒
Other:	☐	☒

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included	
	Yes	No
EVAPOTRANSPIRATION		
All HSCs; *See Section IV.3.1*	☐	☒
Surface-based infiltration BMPs	☐	☒
Biotreatment BMPs	☒	☐
HARVEST & REUSE/ RAINWATER HARVESTING		
Above-ground cisterns and basins	☐	☒
Underground detention	☐	☒
Other:	☐	☒

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

Since the project's total toilet flush and irrigated area demand are less than the minimum demand based on Tables X.7 and X.8 of the TBD, the project does not have the demand necessary to consider harvest and use feasible (See Worksheet J in Attachment C).

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

Biotreatment BMPs have been selected for the project to address pollutants in project runoff prior to discharging to the storm drain system.

BIOTREATMENT			
ID	Name	Included?	
		Yes	No
BIO-1	Bioretention with underdrains	☐	☒
	Stormwater planter boxes with underdrains	☐	☒
	Rain gardens with underdrains	☐	☒
BIO-5	Constructed wetlands	☐	☒
BIO-2	Vegetated swales	☐	☒
BIO-3	Vegetated filter strips	☐	☒
BIO-7	Proprietary vegetated biotreatment systems	☒	☐
BIO-4	Wet extended detention basin	☐	☒
BIO-6	Dry extended detention basins	☐	☒

Runoff from the project's development areas will be conveyed as surface flow towards and onto the public right of way. Run-off is then concentrated in the gutter and directed into one of the proposed aboveground detention basins or underground vaults via a network of underground storm drain pipes. Although the storm water detention facilities are similar in characteristics to BIO-4 & 6 and HU-2, water quality objectives are met through the use of BIO-7. Modular Wetland Systems (MWS) by Bioclean (BIO-7: Proprietary Biotreatment) will be installed on the effluent pipe for each of the storm water detention basin / vault for treatment prior to discharging into municipal storm drain system.

These proprietary biotreatment BMPs have been selected for use based on the system's proven pollutant removal efficiencies, small footprint and the ease of incorporating into the project's site design.

BMP Sizing

The proposed units will be sized to treat a design volume on the effluent side of the water quality basins. The design flow rate for the project is provided in the following table:

BIOTREATMENT BMP SUMMARY						
Drainage Area Name	% Impervious	Rainfall Intensity (in/hr)	Drainage Area (ac)	Runoff Coefficient (C)	Treatment V (cf) Q (cfs)	Unit Model and Capacity (cfs)
A (BIO-7)	36.3%	0.205	27.3	0.422	39,727 cf Volume based	2 x MWS-L-8-16 (0.462 cfs per unit) At DCV elevation, peak Q is 0.92 cfs with 16.5 hour drawdown
GPS Coordinates 'A'			LAT.	33.913583 °	LONG.	117.959739 °
B (BIO-7)	47.7%	0.205	19.7	0.508	34,502 cf Volume based	2 x MWS-L-8-16 (0.462 cfs per unit) At DCV elevation, peak Q is 0.92 cfs with 17.0 hour drawdown.
GPS Coordinates 'B'			LAT.	33.914925 °	LONG.	117.964583 °
C (BIO-7)	33.9%	0.200	74.6	0.404	104,024 cf Volume based	6 x MWS-L-8-16 (0.462 cfs per unit) At DCV elevation, peak Q is 2.5 cfs with 16.1 hour drawdown
GPS Coordinates 'C'			LAT.	33.910028 °	LONG.	117.975553 °
E-1 (BIO-7)	80.6%	0.225	2.2	0.754	0.367 cfs Flow based	1 x MWS-L-8-16 0.462 cfs total
GPS Coordinates 'E-1'			LAT.	33.913097 °	LONG.	117.966997 °
E-2 (BIO-7)	69.7%	0.225	3.0	0.673	0.460 cfs Flow based	1 x MWS-L-8-16 0.462 cfs total
GPS Coordinates 'E-2'			LAT.	33.913011 °	LONG.	117.966953 °
F (BIO-7)	56.3%	0.235	1.6	0.572	0.215 cfs Flow based	1 x MWS-L-4-19 0.237 cfs total
GPS Coordinates 'F'			LAT.	33.912378 °	LONG.	117.966606 °

Basin 'A' Volume = 49,348 cf.

Underground Vault 'B' Volume = #2 - 30'x114'x8' vaults = 54,720 cf.

Basin 'C' Volume = 834,838 cf.

IV.3.5 Hydromodification Control BMPs

Per discussion in Section II.3 of this WQMP, three areas of the project site (Drainage A, B and C) have hydrologic conditions of concern. To address the increase in runoff in the project's developed condition, detention facilities will be employed to reduce peak flows to less than pre-project conditions. The following table provides a summary of the project's hydromodification controls and the resulting change in runoff in the developed condition.

Hydromodification Control Summary					
Drainage Area	Existing Q_{2YR} (cfs)	Developed Q_{2YR} (cfs)	Hydromodification Control	Volume (ac-ft) Detained to meet 2-year criteria	Developed (Mitigated) Q_{2YR} (cfs)
A	19.5	27.0	Detention Basin	0.947	4.37
B	18.3	20.9	Subsurface Detention Vault	0.792	0.92
C	86.5	104.1	Detention Basin	4.77	6.91

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.7 Treatment Control BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.8 Non-structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR compliance.
N6	Local Industrial Permit Compliance	☐	☒	Not applicable to residential developments or parks.
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☒	☐	Compliance with article 80 of the Uniform Fire Code, enforced by fire protection agency
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Project is for residential community development only.

A discussion of each selected Non-Structural Source Control BMP is provided in the following section. The implementation of each BMP is described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

N1 Education for Property Owners, Tenants and Occupants – Educational materials will be provided to homeowners at close of escrow by owner and periodically thereafter by the HOA to inform them of their potential impacts to downstream water quality. Materials include those described in Section VII of this WQMP and provided in Attachment A of this WQMP.

N2 Activity Restrictions – Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 Common Area Landscape Management – Maintenance activities for landscape areas shall be consistent with County and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 BMP Maintenance – Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in Section V of this WQMP, with documented records of inspections and maintenance activities completed.

N11 Common Area Litter Control – Litter control onsite will include the use of HOA litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 Employee Training – All employees, contractors and subcontractors of the HOA shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin – As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period.

N15 Street Sweeping Private Streets and Parking Lots – The project's private streets shall be swept, at minimum, on a weekly basis and as needed.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SARWQCB NPDES Permit)	☐	☒	Not applicable. Project resides in SARWQCB.
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.
S11	Fueling areas	☐	☒	None proposed.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S12	Hillside landscaping	☒	☐	
S13	Wash water control for food preparation areas	☐	☒	None proposed.
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected Structural Source Control BMP is provided in the following section. The implementation of each BMP and the responsible party are described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

S1 Storm Drain Stenciling – Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.

S3 Trash Storage Areas – Trash container areas will be designed in such a way so that drainage from adjoining roofs and pavement will be diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater. Trash enclosures shall be designed with either a roof or awning to minimize direct precipitation and prevent rain from entering containers.

S4 Use Efficient Irrigation Systems and Landscape Design – In conjunction with routine landscaping maintenance activities, inspect irrigation for signs of leaks, overspray and repair or adjust accordingly. Adjust system cycle to accommodate seasonal fluctuations in water demand and temperatures. Ensure use of native or drought tolerant/non-invasive plant species to minimize water consumption.

S5 Protect Slopes and Channels – To prevent storm and/or irrigation runoff from causing erosion, all manufactured slopes will be stabilized with vegetation and/or mulch in accordance with the "Efficient Irrigation and Landscape Design" source control BMP. Slope landscaping will consist of drought-tolerant plantings that will require little or no irrigation to minimize run-off and infiltration. The Property Owner and/or the Home Owners Association will be responsible for maintaining the vegetative cover and/or mulch on the project area slopes to eliminate exposed soils, and will inspect the slopes to check for signs of erosion, gullies and sloughing at least twice a year, at the beginning and end of the rainy season, and after all major storm events.

S12 Hillside Landscaping – To prevent storm and/or irrigation runoff from causing erosion, all manufactured slopes will be stabilized with vegetation and/or mulch in accordance with the "Efficient Irrigation and Landscape Design" source control BMP. Slope landscaping will consist of drought-tolerant plantings that will require little or no irrigation to minimize run-off and infiltration. The Property Owner and/or the Home Owners Association will be responsible for maintaining the vegetative cover and/or mulch on the project area slopes to eliminate exposed soils, and will inspect the slopes to check for signs of erosion, gullies and sloughing at least twice a year, at the beginning and end of the rainy season, and after all major storm events.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

The proposed project is able to meet LID compliance via the employment of onsite LID practices. Therefore, water quality credits do not apply to this project.

Description of Proposed Project				
Project Types that Qualify for Water Quality Credits (Select all that apply):				
☐ Redevelopment projects that reduce the overall impervious footprint of the project site.	☐ Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.	☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).		
☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).		☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned		☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).
☐ Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐ Developments in a city center area.	☐ Developments in historic districts or historic preservation areas.	☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.
Calculation of Water Quality Credits (if applicable)	Not applicable to project.			

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below.

A Homeowners' association (HOA) shall be established for this project. The HOA shall be responsible the long-term funding, inspection and maintenance of all BMPs prescribed in this WQMP.

Until the project's HOA has been established, all responsibilities pertaining to this WQMP shall be that of the project developer, CalAtlantic Homes. Contact for the interim responsible party is as follows:

Responsible Party: CalAtlantic Homes
Contact Name: Michael Battaglia
Address: 15360 Barranca Parkway, Irvine, CA 92618
Phone: (949) 789-1600
Email: michael.battaglia@calatl.com

Inspection and maintenance activities, frequencies and responsibilities for the project's selected BMPs are provided in the following BMP matrix.

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
HYDROLOGIC SOURCE CONTROL BMPs				
HSC-2	Impervious Area Dispersion	Inspect for standing water and that water infiltrates into underlying soil or evaporates completely.	After significant storm events and weekly with landscaping	Owner/HOA
BIO-TREATMENT BMPs				
BIO-7	Proprietary Biotreatment (Modular Wetland System)	Inspect unit for accumulated debris and sediment and plant health; remove trash from screening device and separation chamber; trim vegetation.	6 to 12 months	Owner/HOA
		Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media.	1 to 2 years	
		Replace wetland media.	20 years	

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Close of escrow and annually	Owner/HOA
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/HOA
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Weekly	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N4	BMP Maintenance	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing	Owner/HOA
N11	Common Area Litter control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Litter collection and removal shall be performed on a weekly basis.	Ongoing patrols. Weekly (minimum) pick up and removal	Owner/HOA
N12	Employee Training	All employees, contractors and subcontractors of the HOA shall receive training regarding the potential impacts of their actions on downstream water quality, proper material use and staging (for landscaping and other materials) and proper clean up material	Annually and as needed	HOA
N14	Common Area Catch Basin Inspection	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Owner/HOA
N15	Street Sweeping Private Streets	Streets must be swept at minimum, on a weekly basis and as needed.	Weekly and as needed.	Owner/HOA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/HOA
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Weekly	Owner/HOA

Section VI Site Plan and Drainage Plan

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

Exhibits

- Vicinity Map
- Preliminary WQMP Site Plan

Vicinity Map, Preliminary WQMP Site Plan

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2900 ADAMS STREET, SUITE A-15
RIVERSIDE CA 92504 (951)352-7200
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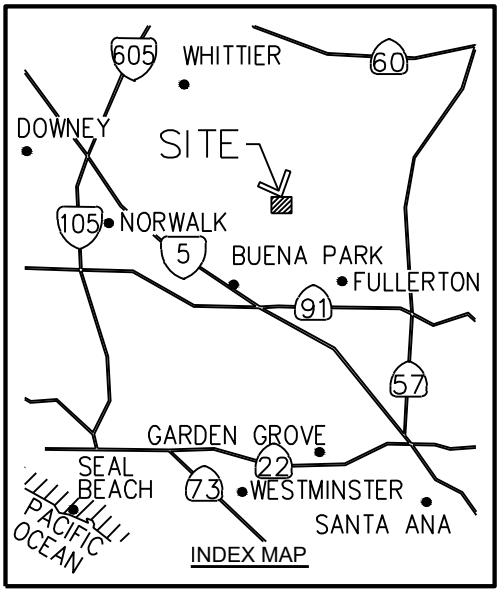
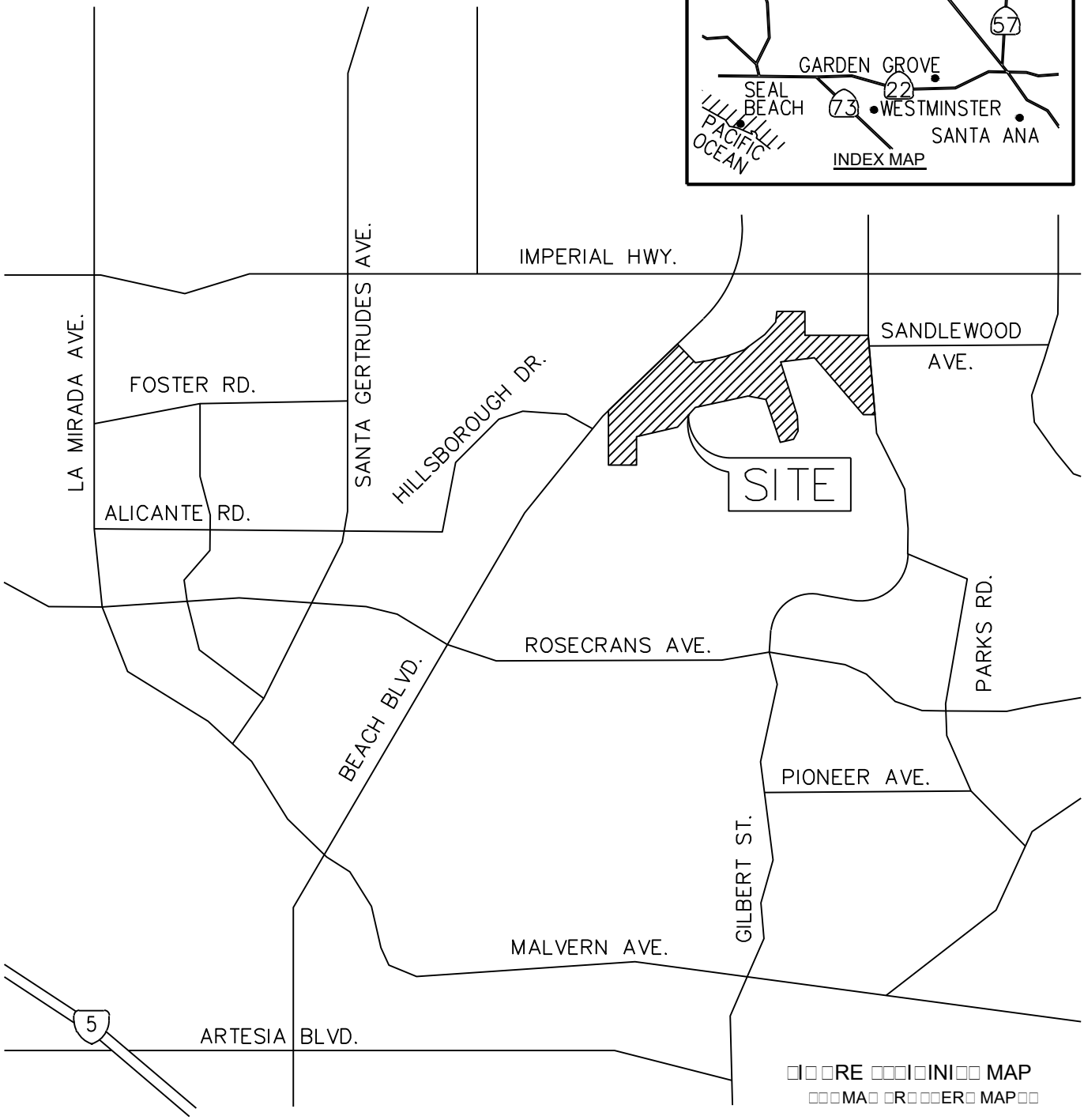


INDEX MAP



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IRVINE, INC
INLAND EMPIRE REGION
2900 ADAMS STREET, SUITE A-15
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FIGURE 2: AERIAL PHOTOGRAPH

PARCEL MAP NO. 2000-140
PMB 325/7-19

TRACT NO
MM 408/

BEACH BOULEVARD

PRODUCT 2

PRODUCT 3

DMA 'A'

DMA 'B'

DMA 'C'

DMA 'D'

DMA 'E-1'

DMA 'E-2'

DMA 'F'

DMA 'G'

BASIN 'A'

BASIN 'B'

BASIN 'C'
BASIN BOTTOM=200

BASIN 'D'

TRACT NO. 15031
MM 766/35-46

TRACT NO. 15030
MM 766/20-34

VICINITY MAP
NOT TO SCALE

INDEX MAP

ACREAGE SUMMARY:

DRAINAGE MANAGEMENT AREA 'A'	=	27.3 AC.
DRAINAGE MANAGEMENT AREA 'B'	=	19.7 AC.
DRAINAGE MANAGEMENT AREA 'C'	=	74.6 AC.
DRAINAGE MANAGEMENT AREA 'D'	=	20.2 AC.
DRAINAGE MANAGEMENT AREA 'E-1'	=	2.2 AC.
DRAINAGE MANAGEMENT AREA 'E-2'	=	3.0 AC.
DRAINAGE MANAGEMENT AREA 'F'	=	1.6 AC
DRAINAGE MANAGEMENT AREA 'G'	=	2.2 AC
TOTAL	=	150.8 AC.

1" = 160'
0 80 160 320 480 640

COUNTY OF ORANGE FLOOD DIVISION
DRAINAGE MANAGEMENT AREA MAP
RANCHO LA HABRA
VESTING TENTATIVE TRACT MAP 17845

PREPARED FOR:
CALATLANTIC GROUP INC.

OWNER:
O2 SKY, INC.
1400 S. LA HABRA HILLS DRIVE
LA HABRA, CA 90631

SCALE: 1"=160'
DATE: 01/31/2018
DESIGNED: BRL
CHECKED: BRL
PLN CK REF:
F.B.

HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
2900 ADAMS STREET, SUITE A-15
RIVERSIDE CA 92504 (951)352-7200
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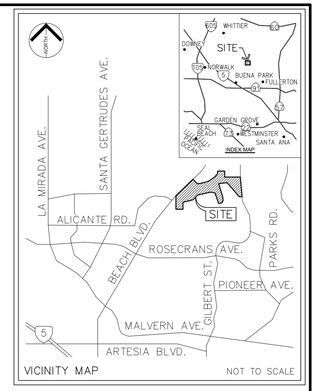

MATCHLINE – SEE SHEET 2

ACREAGE SUMMARY:

IMPERVIOUS AREAS		
– RESIDENTIAL BUILDINGS	=	12.7 AC
– MULTIFAMILY BUILDINGS	=	6.9 AC
– COMMERCIAL BUILDINGS	=	2.7 AC
– EXISTING CLUBHOUSE	=	0.4 AC
– RESIDENTIAL DRIVEWAYS	=	2.9 AC
– STREETS (PUBLIC & PRIVATE)	=	15.5 AC
– SIDEWALK (PUBLIC & PRIVATE)	=	5.4 AC
– D.G. TRAIL	=	3.9 AC
SUB–TOTAL	=	50.4 AC
PERVIOUS AREAS		
– LANDSCAPE SLOPES	=	35.0 AC
– RESIDENTIAL/COMMERCIAL LANDSCAPING	=	26.9 AC
– FALLOW RESIDENTIAL BACKYARDS	=	18.7 AC
– PARK TURF	=	3.2 AC
– DETENTION / WATER QUALITY BASIN	=	2.6 AC
– NATURAL / UNDEVELOPED	=	14.0 AC
SUB–TOTAL	=	100.4 AC
TOTAL AREA	=	150.8 AC

LID PRACTICES TO BE IMPLEMENTED FOR THIS PROJECT INCLUDE:

- IMPERVIOUS AREA DISPERSION (HSC–2)
- BIORETENTION WITH NO UNDER DRAIN (INF–3)
- STREET TREES (HSC–3)

SITE DESIGN AND SOURCE CONTROL BMP'S INCLUDE:

- INTEGRATED PEST MANAGEMENT (IPM) MEASURES
- SD–10 SITE DESIGN/LANDSCAPE PLANNING
- SD–11 ROOF RUNOFF CONTROLS
- SD–12 EFFICIENT IRRIGATION
- SD–13 STORM DRAIN SIGNAGE
- FIRE SPRINKLERS DRAIN TO PRIMED P–TRAP SANITARY SEWER
- SECONDARY CONTAINMENT FOR ANY ROOF AIR CONDITIONING UNITS

ADDITIONAL STRUCTURAL AND NONSTRUCTURAL SOURCE CONTROL BMP'S (SEE PROJECT WQMP OPERATIONS AND MAINTENANCE PLAN FOR DETAILS):

- EDUCATION FOR TENANTS AND EMPLOYEES
- ACTIVITY RESTRICTIONS
- LANDSCAPE MANAGEMENT
- BMP MAINTENANCE
- TITLE 22 COMPLIANCE
- SPILL CONTINGENCY PLAN
- HAZARDOUS MATERIALS DISCLOSURE COMPLIANCE
- UNIFORM FIRE CODE IMPLEMENTATION
- PEAK STORM FLOW MITIGATION
- PRIVATE STREETS AND PARKING LOTS STREET SWEEPING
- DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS
- EFFICIENT IRRIGATION SYSTEM AND LANDSCAPE DESIGN
- PROTECTION OF SLOPES AND CHANNELS
- AT GRADE LOADING DOCKS/DELIVERY AREAS
- LITTER CONTROL

LEGEND

- PROJECT BOUNDARY
- PROPOSED DRAINAGE BOUNDARY LINE
- 100 YEAR FLOOD PLAIN LIMITS
- NAP — NOT A PART
- PROPOSED STORM DRAIN & FLOW DIRECTION (ONSITE)
- EXISTING STORM DRAIN & FLOW DIRECTION (PUBLIC)
- DIRECTION OF SURFACE FLOW (ONSITE)
- DIRECTION OF SURFACE FLOW (OFFSITE)
- BUILDINGS
- LANDSCAPED SLOPES WITH BMPS SITE DESIGN/LANDSCAPE PLANNING SD–10 EFFICIENT IRRIGATION SD–12
- TURF
- UNDERGROUND DETENTION BASIN (VAULT)
- PAVED AREA WITH STREET SWEEPING BMP
- DETENTION / WATER QUALITY BASIN
- CHANNEL AND BASIN ACCESS ROADS
- DEBRIS BASIN BOTTOM
- CATCH BASIN WITH WATER QUALITY INSERT
- PROPRIETARY MODULAR WETLAND BIOTREATMENT SYSTEM

N / W / E / S — HUNSAKER

1" = 100'
0 50 100 200 300 400

COUNTY OF ORANGE FLOOD DIVISION
BEST MANAGEMENT PRACTICES (B.M.P.) MAP
RANCHO LA HABRA
VESTING TENTATIVE TRACT MAP 17845

PREPARED FOR:
CALATLANTIC GROUP INC.

OWNER:
O2 SKY, INC.
1400 S. LA HABRA HILLS DRIVE
LA HABRA, CA 90631

SCALE: 1"=100'
DATE: 01/18/2018
DESIGNED: BRL
CHECKED: BRL
PLN CK REF:
F.B.

HUNSAKER & ASSOCIATES IRVINE, INC
INLAND EMPIRE REGION
2900 ADAMS STREET, SUITE A–15
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COUNTY OF ORANGE FLOOD DIVISION
BEST MANAGEMENT PRACTICES (B.M.P.) MAP
RANCHO LA HABRA
VESTING TENTATIVE TRACT MAP 17845

PREPARED FOR:	OWNER:
CALATLANTIC GROUP INC.	O2 SKY, INC. 1400 S. LA HABRA HILLS DRIVE LA HABRA, CA 90631

SCALE: 1"=100'	HUNSAKER & ASSOCIATES IRVINE, INC INLAND EMPIRE REGION 2900 ADAMS STREET, SUITE A-15 RIVERSIDE CA 92504 (951)352-7200 PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS	W.O. 0252-93X
DATE: 01/18/2018		SHEET 2
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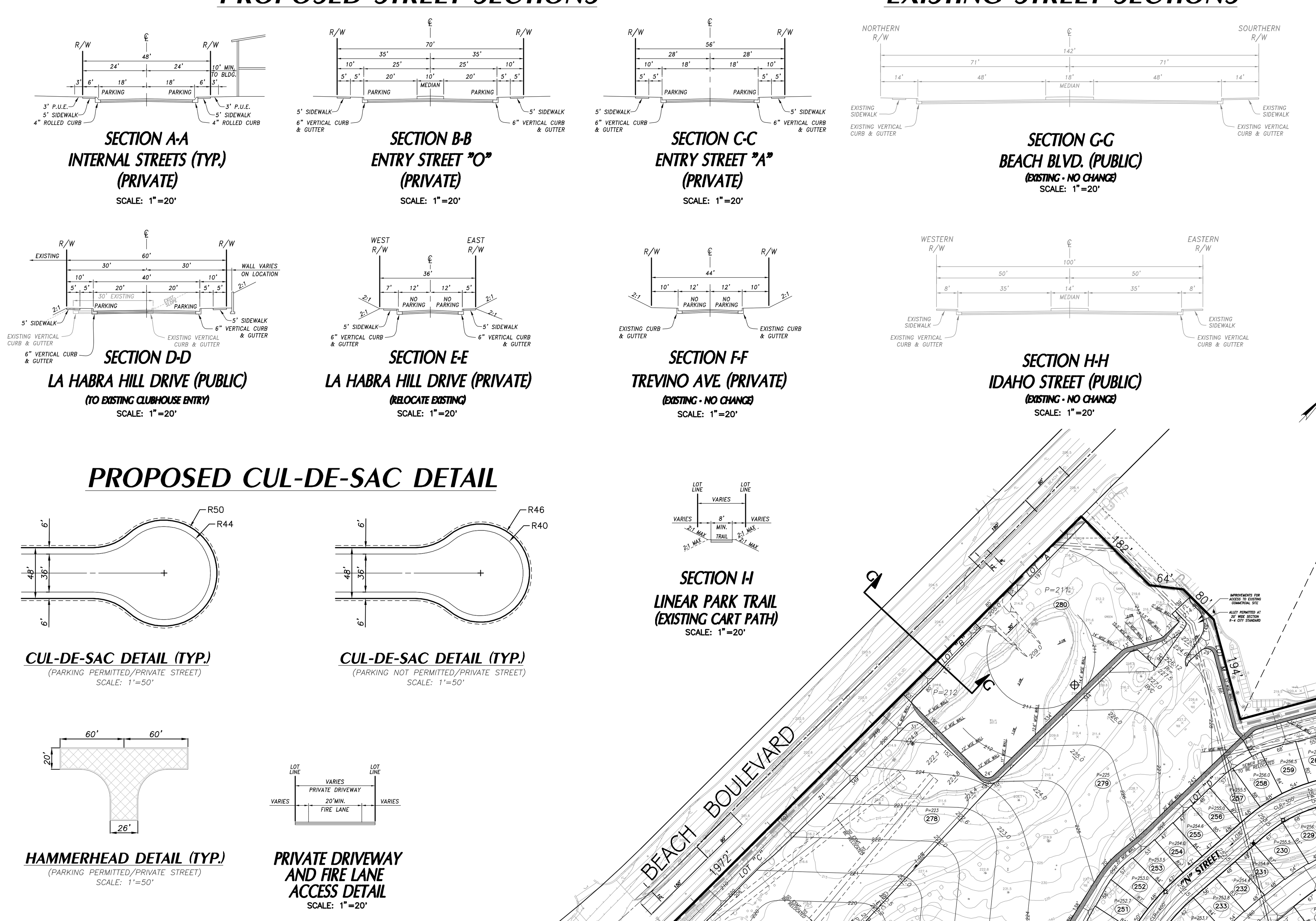
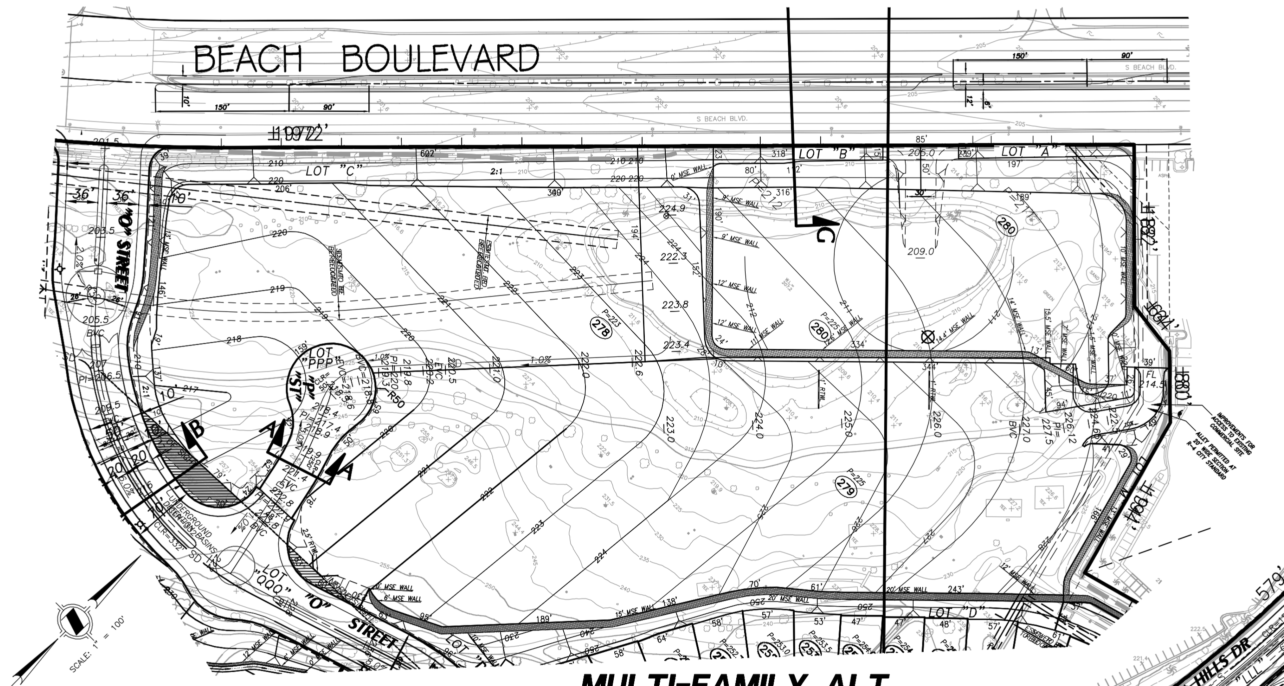




MULTI-FAMILY ALT.

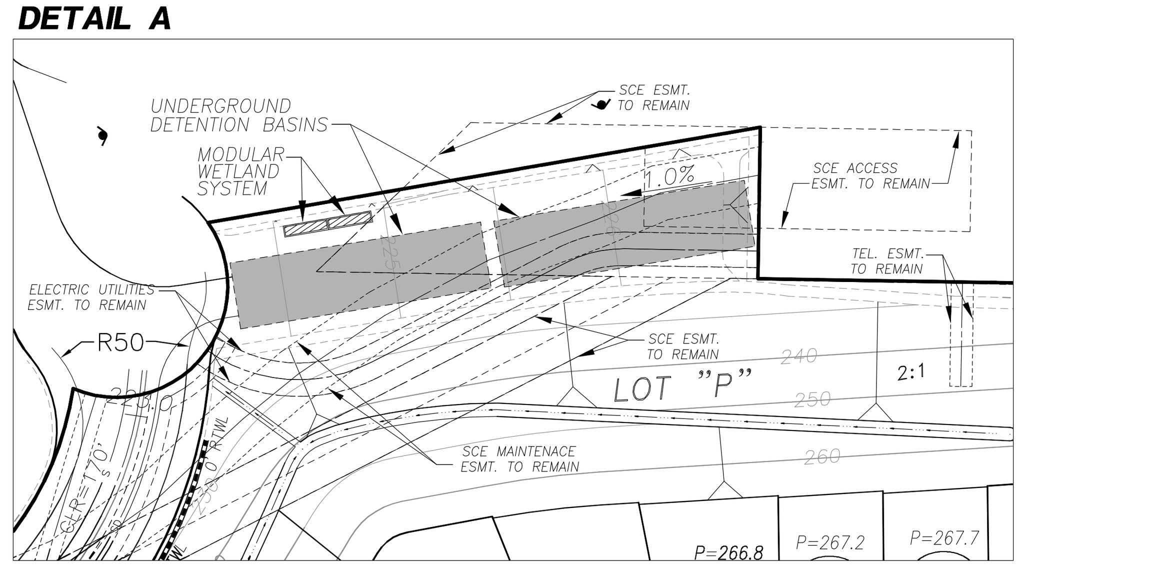
Lot No.	S.F	Acres
278	124,822	2.9
279	236,405	5.4
280	103,192	2.3

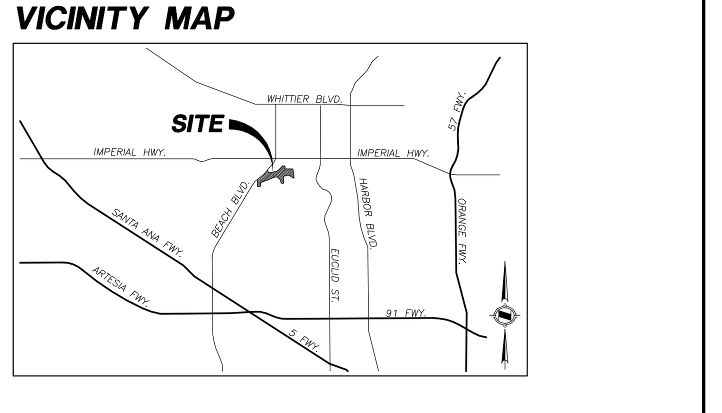
TOTAL: 464,419 S.F.
10.6 AC.

MULTI-FAMILY ALT. OPEN SPACE

Lot No.	S.F	Acres
A	19,843	0.4
B	15,063	0.3
C	33,685	0.8

TOTAL: 68,591 S.F.
1.5 AC.





NOTES

1. EXISTING LAND USE: LA HABRA HILLS S.P. (GOLF COURSE)
2. PROPOSED LAND USE: LA HABRA HILLS S.P. (RESIDENTIAL)
3. EXISTING ZONING: LA HABRA HILLS S.P. (GOLF COURSE)
4. PROPOSED ZONING: LA HABRA HILLS S.P. (RESIDENTIAL)
5. SANITARY SEWER SERVICE BY CITY OF LA HABRA.
6. DOMESTIC WATER SERVICE BY CITY OF LA HABRA.
7. PROPOSED DEVELOPMENT IS WITHIN THE LA HABRA SCHOOL DISTRICT.
8. ALL UTILITIES SHALL BE UNDERGROUND.
   DOMESTIC WATER – CITY OF LA HABRA
   SANITARY SEWER – CITY OF LA HABRA
   GAS – THE GAS COMPANY
   ELECTRICAL – SOUTHERN CALIFORNIA EDISON
9. GRADED SLOPES SHALL BE 2:1 UNLESS OTHERWISE SHOWN.
10. CONTOURS FROM AERIAL TOPO, FLOWN AND COMPILED BY RT. LUNG.
11. SOILS ENGINEER: LGC GEOTECHNICAL, INC.
    131 CALLE IGLESIA, SUITE 200
    SAN CLEMENTE, CA 92672

LEGEND

- PROJECT BOUNDARY
- PROPOSED WATER LINE
- PROPOSED SEWER LINE
- PROPOSED STORM DRAIN
- PROPOSED RIGHT OF WAY
- PROPOSED CENTERLINE
- PROPOSED CONTOUR LINE (600)
- TOP OF SLOPE
- TOE OF SLOPE
- DAYLIGHT LINE
- PROPOSED EASEMENT
- RETAINING WALL
- MSE WALL
- EXISTING CONTOUR (580)
- LOT NUMBER (1)
- PAD ELEVATION (P=XXX.X)
- EXISTING FIRE HYDRANT
- PROPOSED FIRE HYDRANT
- STREET LIGHT
- ABANDONED OIL WELL
- 20' PRIVATE DRIVEWAY (FIRE LANE)
- FIRE APPROVED GATE
- UNDERGROUND DETENTION BASIN

LAND USE SUMMARY:

LOT	ACREAGE	LAND USE
1–277	34.6	SINGLE FAMILY RESIDENTIAL
278–279	8.5	MULTI–FAMILY
280	2.5	COMMERCIAL
281	3.2	CLUBHOUSE
A–CCC	82.3	OPEN SPACE LOTS
DDD–PPP	14.4	STREETS
QQQ–TTT	3.5	ENTRY GATES/ROADS
UUU–VVV	0.2	PRIVATE DRIVES
WWW–XXX	0.7	COMMUNITY RECREATION FACILITY
YYY	0.9	POND
TOTAL	150.8	

PARKING SUMMARY:

LOT 287 (CLUBHOUSE AREA) = 7
(PARKING LOT) = 246
TOTAL = 253

EARTHWORK SUMMARY:

CUT: 2,609,550 CYS
FILL: 2,597,250 CYS
EXPORT: 12,300 CYS
REMEDIAL: 942,690 CYS

EXISTING EASEMENTS TO BE VACATED

Ⓐ "GRANT OF AIRSPACE EASEMENT" BY AND BETWEEN PACIFIC COAST HOMES, A CALIFORNIA CORPORATION AND CHEVRON U.S.A., INC A PENNSYLVANIA CORPORATION, RECORDED MAY 8, 1996 AS INSTRUMENT NO. 19960229907 OF OFFICIAL RECORDS.

LEGAL DESCRIPTION

A PORTION OF PARCEL 1 OF LOT LINE ADJUSTMENT NO 02–02 IN THE CITY OF LA HABRA, COUNTY OF ORANGE, STATE OF CALIFORNIA, PER INSTRUMENT NO2003001271343 OF OFFICIAL RECORDS.

STATEMENT OF OWNERSHIP

I HEREBY STATE THAT THIS MAP WAS PREPARED UNDER MY SUPERVISION AND THAT THE OWNER OF RECORD HAS KNOWLEDGE OF AND CONSENTS TO THE FILING OF THIS MAP.

______________________ DATE __________

REGISTERED PROFESSIONAL ENGINEER DOUGLAS L. STALEY NO. 38796 CIVIL STATE OF CALIFORNIA

RESIDENTIAL SUMMARY

PA-4 55x90 GROSS

Lot No.	S.F	Acres	Lot No.	S.F	Acres
1	7,417	0.2	42	8,979	0.2
2	5,918	0.1	43	7,744	0.2
3	6,693	0.2	44	8,609	0.2
4	7,503	0.2	45	7,708	0.2
5	6,134	0.1	46	8,753	0.2
6	6,786	0.2	47	7,165	0.2
7	5,696	0.1	48	8,082	0.2
8	4,991	0.1	49	6,796	0.2
9	5,297	0.1	50	5,299	0.1
10	8,368	0.2	51	6,303	0.1
11	8,082	0.2	52	7,349	0.2
12	8,190	0.2	53	7,171	0.2
13	6,658	0.2	54	6,046	0.1
14	6,771	0.2	55	7,212	0.2
15	5,613	0.1	56	7,459	0.2
16	5,760	0.1	57	6,181	0.1
17	5,060	0.1	58	5,382	0.1
18	5,060	0.1	59	8,099	0.2
19	6,488	0.1	60	6,247	0.1
20	6,635	0.2	61	4,956	0.1
21	5,540	0.1	62	4,950	0.1
22	5,665	0.1	63	4,950	0.1
23	5,855	0.1	64	5,716	0.1
24	6,575	0.2	65	7,755	0.2
25	6,611	0.2	66	9,334	0.2
26	6,007	0.1	67	5,834	0.1
27	6,888	0.2	68	5,696	0.1
28	10,405	0.2	69	5,648	0.1
29	9,353	0.2	70	5,691	0.1
30	6,602	0.2	71	5,787	0.1
31	6,522	0.2	72	6,049	0.1
32	6,965	0.2	73	6,245	0.1
33	7,086	0.2	74	6,072	0.1
34	5,898	0.1	75	5,401	0.1
35	5,710	0.1	76	5,089	0.1
36	5,374	0.1	77	5,030	0.1
37	5,395	0.1	78	5,533	0.1
38	5,485	0.1	79	5,961	0.1
39	6,106	0.1	80	7,635	0.2
40	9,670	0.2	81	6,182	0.1
41	13,920	0.3	82	5,813	0.1

TOTAL: 544,663 S.F.
12.5 AC.
AVERAGE: 6,642 S.F.
TOTAL UNITS: 82

PA-3 47x70 GROSS

Lot No.	S.F	Acres	Lot No.	S.F	Acres
83	4,152	0.095	122	3,711	0.1
84	5,449	0.125	123	3,861	0.1
85	7,098	0.163	124	3,878	0.1
86	5,816	0.134	125	3,887	0.1
87	5,587	0.1	126	3,830	0.1
88	5,218	0.1	127	3,905	0.1
89	5,382	0.1	128	3,903	0.1
90	5,377	0.1	129	4,071	0.1
91	5,960	0.1	130	4,925	0.1
92	5,978	0.1	131	6,945	0.2
93	4,097	0.1	132	4,998	0.1
94	3,610	0.1	133	3,481	0.1
95	3,952	0.1	134	5,951	0.1
96	4,680	0.1	135	4,947	0.1
97	5,244	0.1	136	4,426	0.1
98	6,091	0.1	137	3,751	0.1
99	5,011	0.1	138	3,610	0.1
100	4,115	0.1	139	3,794	0.1
101	3,675	0.1	140	3,893	0.1
102	3,876	0.1	141	3,590	0.1
103	3,918	0.1	142	3,560	0.1
104	3,901	0.1	143	3,563	0.1
105	3,870	0.1	144	3,564	0.1
106	3,779	0.1	145	3,698	0.1
107	3,714	0.1	146	5,012	0.1
108	3,703	0.1	147	4,271	0.1
109	3,629	0.1	148	7,067	0.2
110	3,755	0.1	149	7,237	0.2
111	3,540	0.1	150	4,354	0.1
112	3,631	0.1	151	3,728	0.1
113	4,107	0.1	152	3,666	0.1
114	5,730	0.1	153	3,619	0.1
115	4,306	0.1	154	4,067	0.1
116	4,293	0.1	155	4,913	0.1
117	3,807	0.1	156	4,383	0.1
118	3,753	0.1	157	4,605	0.1
119	3,777	0.1	158	5,396	0.1
120	3,666	0.1	159	10,919	0.3
121	3,666	0.1			

TOTAL: 347,892 S.F.
8.0 AC.
AVERAGE: 4,349 S.F.
TOTAL UNITS: 77

PA-2 48/54x80 GROSS

Lot No.	S.F	Acres	Lot No.	S.F	Acres	Lot No.	S.F	Acres
160	8,109	0.2	200	5,471	0.1	240	7,067	0.2
161	4,339	0.1	201	5,975	0.1	241	7,357	0.2
162	4,120	0.1	202	4,243	0.1	242	5,744	0.1
163	4,770	0.1	203	4,269	0.1	243	6,815	0.2
164	4,310	0.1	204	5,159	0.1	244	6,392	0.1
165	4,364	0.1	205	4,805	0.1	245	6,083	0.1
166	4,946	0.1	206	4,830	0.1	246	10,361	0.2
167	4,544	0.1	207	6,391	0.1	247	5,821	0.1
168	4,731	0.1	208	4,663	0.1	248	4,599	0.1
169	4,684	0.1	209	6,301	0.1	249	4,572	0.1
170	5,671	0.1	210	9,980	0.3	250	4,867	0.1
171	4,727	0.1	211	5,763	0.1	251	4,589	0.1
172	5,546	0.1	212	4,366	0.1	252*	4,617	0.1
173	4,835	0.1	213	5,014	0.1	253*	4,117	0.1
174	5,430	0.1	214	4,919	0.1	254*	3,877	0.1
175	4,769	0.1	215	5,007	0.1	255	3,945	0.1
176	4,296	0.1	216	5,355	0.1	256	4,119	0.1
177	4,940	0.1	217	4,311	0.1	257	4,595	0.1
178	5,353	0.1	218	5,153	0.1	258	4,830	0.1
179	7,719	0.2	219	5,009	0.1	259	5,146	0.1
180	5,988	0.1	220	4,577	0.1	260	4,173	0.1
181	5,524	0.1	221	4,430	0.1	261	3,937	0.1
182	4,378	0.1	222	5,041	0.1	262	4,511	0.1
183	4,822	0.1	223	4,825	0.1	263	4,097	0.1
184	5,439	0.1	224	5,410	0.1	264	4,217	0.1
185	7,703	0.2	225	4,127	0.1	265	4,332	0.1
186	6,216	0.1	226	4,135	0.1	266	4,459	0.1
187	5,575	0.1	227	4,665	0.1	267	6,156	0.1
188	5,350	0.1	228	4,668	0.1	268	4,905	0.1
189	4,654	0.1	229	5,186	0.1	269	4,324	0.1
190	4,716	0.1	230	5,357	0.1	270	4,230	0.1
191	5,158	0.1	231	4,078	0.1	271	4,637	0.1
192	6,543	0.2	232	3,974	0.1	272	4,099	0.1
193	7,205	0.2	233	4,532	0.1	273	4,074	0.1
194	9,765	0.2	234	4,715	0.1	274	4,090	0.1
195	5,517	0.1	235	4,868	0.1	275	4,859	0.1
196	5,737	0.1	236	4,832	0.1	276	8,265	0.2
197	6,155	0.1	237	4,639	0.1	277	8,682	0.2
198	4,687	0.1	238	4,002	0.1			
199	5,619	0.1	239	5,819	0.1			

* LOT SIZES ARE 47'X70'

TOTAL: 617,378 S.F.
14.1 AC.
AVERAGE: 5,232 S.F.
TOTAL UNITS: 118

MULTI-FAMILY

Lot No.	S.F	Acres
278	138,309	3.1
279	233,197	5.3

TOTAL: 371,506 S.F.
8.4 AC.

COMMERCIAL

Lot No.	S.F	Acres
280	107,568	2.4

TOTAL: 107,568 S.F.
2.4 AC.

OPEN SPACE SUMMARY

Lot No.	S.F	Acres	Planning Area	Lot No.	S.F	Acres	Planning Area
A	2,737	0.06	5	CC	24,392	0.56	4
B	3,519	0.08	5	DD	30,171	0.69	4
C	47,678	1.09	1	EE	128,773	2.96	6
D	25,336	0.58	1	FF	15,122	0.35	6
E	29,084	0.67	2	GG	39,306	0.90	6
F	79,509	1.83	2	HH	3,943	0.09	6
G	120,008	2.76	2	II	35,795	0.82	6
H	69,505	1.60	2	JJ	456,678	10.48	6
I	40,977	0.94	2	KK	46,336	1.06	6
J	16,859	0.39	2	LL	22,226	0.51	6
K	49,812	1.14	2	MM	13,730	0.32	6
L	1,228	0.03	2	NN	23,516	0.54	6
M	34,114	0.78	2	OO	50,420	1.16	6
N	50,716	1.16	2	PP	7,665	0.18	6
O	26,669	0.61	3	QQ	33,038	0.76	6
P	80,479	1.85	3	RR	46,337	1.06	6
Q	9,406	0.22	3	SS	28,817	0.66	6
R	60,125	1.38	3	TT	36,927	0.85	6
S	33,575	0.77	3	UU	145,684	3.34	6
T	8,700	0.20	3	VV	51,817	1.19	6
U	7,638	0.18	3	WW	117,541	2.70	6
V	26,610	0.61	3	XX	364,715	8.37	6
W	71,083	1.63	4	YY	88,151	2.02	7
X	32,899	0.76	4	ZZ	150,548	3.46	7
Y	15,442	0.35	4	AAA	153,713	3.53	7
Z	26,024	0.60	4	BBB	327,921	7.53	7
AA	17,619	0.40	4	CCC	123,904	2.84	7
BB	30,861	0.71	4				

TOTAL: 3,585,398 S.F.
82.30 AC.
82.31 AC.

STREET SUMMARY

Lot No.	S.F	Acres
DDD	39,340	0.9
EEE	20,588	0.5
FFF	10,710	0.2
GGG	91,325	2.1
HHH	38,940	0.9
III	31,509	0.7
JJJ	45,150	1.0
LLL	90,118	2.1
MMM	37,314	0.9
NNN	106,949	2.5
OOO	103,476	2.3
PPP	12,731	0.3
QQQ	74,768	1.7
RRR	10,890	0.2
SSS	16,550	0.4
TTT	51,970	1.2

TOTAL: 782,328 S.F.
17.9 AC.

RECREATIONAL FACILITY

Lot No.	S.F	Acres
WWW	11,649	0.3
XXX	16,049	0.4
281	141,260	3.2

TOTAL: 168,958 S.F.
3.9 AC.

PRIVATE DRIVES

Lot No.	S.F	Acres
UUU	4,942	0.1
VVV	3,009	0.1

TOTAL: 7,951 S.F.
0.2 AC.

POND SUMMARY

Lot No.	S.F	Acres
YYY	39,449	1.0

TOTAL: 39,449 S.F.
1.0 AC.

MAP DATE IDENTIFIER
DATE OF LATEST CHANGE TO THIS MAP: 02/13/18 BY: AM
DATE OF THIS PLOT: 02/13/18

DATE: 02/13/18
W.O.: 0252–93
GROSS AREA: 150.8 AC±
CONTOUR INTERVAL: 5'
NUMBER LOTS: 281
LETTER LOTS 76

SCALE: FEET 0 50 100 200 / INCHES 0 1/2 1 2

NO.	DATE	REVISIONS	APPROVED
	02–13–18	LOT CONFIGURATION	AM
	11–27–17	LOT CONFIGURATION	AM
	03–17–17	LOT CONFIGURATION	AM
	10–12–16	LOT CONFIGURATION	AM
	01–07–16	REVISED "L" & "K" STREETS	JS
	03–11–15	REVISED MULTIFAMILY PLOTTING	LP

DRAWN BY: AM
DESIGNED BY: JW
CHECKED BY: JW

PREPARED FOR: CALATLANTIC GROUP INC

OWNER: 02 SKY, INC.
1400 S. LA HABRA HILLS DR.
LA HABRA, CA
90631–6998

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

VESTING TENTATIVE TRACT NO.17845

City of La Habra

SHEET 1 OF 2

W.O.: 0252–93 (RANCHO LA HABRA) RM: 269 BIN: DOC.:

PLOTTED BY: Alex Martinez DATE: Feb. 13, 2018 02:28:47 PM FILE: F:\0766\Planning\SA_TTM_17845\Exh_TTM\Sht–1_TTM_17845.dwg

LEGAL DESCRIPTION

All that certain real property situated in the County of Orange, State of California, described as follows:

Parcel 1:

Parcel 1 of that certain Lot Line Adjustment No. 02-02, in the City of La Habra, County of Orange, State of California, recorded October 15, 2003 as Instrument No. 20030721343 of Official Records, more particularly described as follows:

Lot 232 of Tract No. 15030, in the City of La Habra, County of Orange, State of California, as shown on a map recorded in Book 766, Pages 20 through 34, inclusive, of Miscellaneous Maps, in the office of the County Recorder of said county.

Except therefrom, any of said Lot which lies Northeasterly of the following described line:

Commencing at the Northeasterly terminus of that certain course in the boundary of said Lot having a bearing of North 45° 08' 45" East and a distance of 1063.70 feet, said course also being the Southeasterly right-of-way line of Beach Boulevard as shown on said map; Thence along said Lot South 45° 08' 45" West 38.75 feet to the true point of beginning of said line; Thence South 44° 50' 20" East 200.27 feet; Thence South 45° 50' 20" East 181.91 feet; Thence South 82° 57' 35" East 63.84 feet to the intersection with that certain course in the boundary of said Lot 232 having a bearing of North 40° 00' 00" West and a distance of 312.54 feet.

Except therefrom any and all oil, gas, minerals, and other hydrocarbon substances lying below a depth of 500 feet, as more particularly set forth and provided in that certain document recorded October 25, 1990 as Instrument No. 90-566821 of Official Records.

Parcel 2:

A non-exclusive easement for storm drain and sewer line installation and maintenance and incidental purposes as more particularly set forth in that certain document entitled "Sewer Line and Storm Drain Easement" recorded November 10, 2003 as Instrument No. 20030317373 of Official Records, over, across and through that portion of Lot 232 of Tract No. 15030, in the City of La Habra, County of Orange, State of California, as shown on a map recorded in Book 766, Pages 20 through 34, inclusive, of Miscellaneous Maps, in the office of the County Recorder of said county and being more particularly described as follows:

Commencing at a point on the Southeasterly right of way of Beach Boulevard, 142 feet wide as shown on said Map, said point being the most Westerly corner of Parcel 2 as shown on a Map of Parcel Map No. 2000-140, filed in Book 325, at Pages 7 through 19, inclusive, of Parcel Maps, records of said county; Thence leaving said line South 44° 50' 20" East 38.75 feet; Thence South 45° 08' 45" West, a distance of 24.88 feet to the true point of beginning of the parcel herein described; Thence leaving said line and traversing the interior of said Lot 232, South 44° 59' 52" East, 200.27 feet; Thence North 82° 57' 35" West, 23.32 feet; Thence North 44° 50' 20" West, 181.91 feet to said right of way line; Thence along said line North 45° 08' 45" East, 13.96 feet to the true point of beginning.

TITLE REPORT EASEMENTS

Easements based on Lawyers Title Preliminary Report order no. 09513931 dated December 24, 2012.

SCHEDULE B =Section B

At the date hereof Exceptions to coverage in addition to the printed exceptions and exclusions in said policy form would be as follows:

A. Property taxes, which are a lien not yet due and payable, including any assessments collected with taxes to be levied for the fiscal year 2013-2014.

B. Property taxes, including any personal property taxes and any assessments collected with taxes, are as follows:

Tax Identification No.: 019-481-04
Fiscal Year: 2012-2013
1st Installment: $10,866.11, (Paid)
2nd Installment: $10,866.11, (Unpaid) (Delinquent after April 10)
Penalty and Cost: $1,629.81
Homeowners Exemption: $ Not Set Out
Code Area: 06074

C. Any liens or other assessments, bonds, or special district liens including without limitation, community facility districts, that arise by reason of any local, City, Municipal or County Project or Special District.

D. The lien of supplemental taxes, if any, assessed pursuant to the provisions of Chapter 3.5 (Commencing with Section 75) of the Revenue and Taxation Code of the State of California.

1. Water rights, claims or title to water, whether or not shown by the public records.

2. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (A)

Granted to: General Telephone Company of California
Purpose: pole line and conduits
Recorded: March 27, 1953, in Book 2477, Page 639, of Official Records
Affects: a portion of the land

3. The matters contained in a document entitled "Agreement" by and between Security First National Bank of Los Angeles, as Trustee and Standard Oil Company of California, recorded in Book 5549, Page 202, of Official Records
Reference is made to said document for full particulars.

4. A document subject to all the terms, provisions and conditions therein contained.

Entitled: Notice of Intent to Preserve Mineral Rights
Executed by: Chevron U.S.A. Inc., a California Corporation
Recorded: January 21, 1985, as Instrument No. 85-022485, of Official Records
Reference is made to said document for full particulars.

5. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (B)

Granted to: Chevron, U.S.A., Inc., a Pennsylvania Corporation
Purpose: electric utilities
Recorded: April 15, 1990, as Instrument No. 90-166822, of Official Records
Affects: a portion of said land

The matters contained in a document entitled "Amendment to Utility easement" by and between Pacific Coast Homes, a California Corporation and Chevron U.S.A., Inc., a Pennsylvania Corporation recorded March 19, 1996, as Instrument No. 19960134432, of Official Records

Reference is made to said document for full particulars.

The matters contained in a document entitled "Second Amendment and Restatement of Utility Easement" by and between Pacific coast Homes, a California Corporation and Chevron U.S.A., Inc., a Pennsylvania Corporation recorded May 8, 1996, as Instrument No. 19960229908, of Official Records.

Reference is made to said document for full particulars.

The matters contained in a document entitled "Quitclaim Deed" recorded December 29, 1999, as Instrument No. 19990575358, of Official Records.

Reference is made to said document for full particulars.

6. An easement for the purpose shown below and rights incidental thereto as set forth in a document. QUITCLAIMED

Granted to: Chevron U.S.A., Inc., a Pennsylvania Corporation
Purpose: power lines
Recorded: April 15, 1996, as Instrument No. 19960185194, of Official Records
Affects: a portion of the land

The matters contained in a document entitled "Quitclaim Deed" recorded October 15, 2003, as Instrument No. 20030721342, of Official Records.

Reference is made to said document for full particulars.

7. The matters contained in a document entitled "Grant of Airspace Easement" by and between Pacific Coast Homes, a California Corporation and Chevron U.S.A., Inc., a Pennsylvania Corporation, recorded May 8, 1996, as Instrument No. 19960229907, of Official Records (C)

Reference is made to said document for full particulars.

8. An easement for the purposes shown below and rights incidental thereto as shown or as offered for dedication on the recorded map of said Tract No. 15030. (D)

Purpose: a private storm drain to be reserved by the Homeowners Association
Affects: a portion of said land

9. An easement for the purposes shown below and rights incidental thereto as shown or as offered for dedication on the recorded map of said Tract No. 15030. (E)

Purpose: water line
Affects: a portion of the land

10. An easement for the purposes shown below and rights incidental thereto as shown or as offered for dedication on the recorded map of said Tract 15030. (G)

Purpose: sanitary sewer
Affects: a portion of the land

11. An easement for the purposes shown below and rights incidental thereto as shown or as offered for dedication on the recorded map of said Tract 15030. (F)

Purpose: storm drain
Affects: a portion of the land

12. An easement for the purposes shown below and rights incidental thereto as shown or as offered for dedication on the recorded map of said Tract 15030. (G)

Purpose: ingress and egress to be reserved by the Homeowners Association
Affects: a portion of the land

13. A document subject to all the terms, provisions and conditions therein contained **(SHOWN GRAPHICALLY IN DOCUMENT/LINES SHOWN SCALED OFF THE AERIAL TOPOGRAPHY)**

Entitled: Easement and Maintenance Agreement
Dated: September 1, 1998
Executed by: PLC, a General Partnership (G)
Recorded: September 16, 1998, as Instrument No. 19980620936, of Official Records

Reference is made to said document for full particulars.

Partial Assignments and Assumptions of duties under said Easement and Maintenance Agreement recorded as Instrument No. 20000182801, March 30, 2000, as Instrument No. 20000182802, August 21, 2000, as Instrument No. 20000434681, and October 5, 2000, as Instrument No. 20000535846, all of Official Records

14. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (H)

Granted to: Southern California Edison Company, a Corporation, its successors and assigns
Purpose: public utilities
Recorded: November 16, 1998, as Instrument No. 19981775327, of Official Records
Affects: a portion of the land

15. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (I)
DOES NOT AFFECT (PRIVATE STREETS WITHIN TRACT NO. 15030)
Granted to: Southern California Gas Company, a Corporation, its successors and assigns
Purpose: public utilities
Recorded: February 4, 1999, as Instrument No. 19990028263, of Official Records
Affects: a portion of the land (Note: the exact location of said easement is undetermined by the record).

16. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (J)

Granted to: The Westridge Community Association, a California nonprofit Mutual Benefit Corporation
Purpose: operating, maintaining, repairing, and/or replacing the roadway, landscaping, monuments, and other facilities within the Association
Recorded: April 23, 1999, as Instrument No. 19990239741, of Official Records
Affects: a portion of said land

17. Declaration of covenants, conditions and restrictions but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, source of income, gender, gender identity, gender expression, medical condition or genetic information, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the below document, which, among other things, may contain or provide for easements, assessments, liens and the subordination thereof, said covenants, conditions and restrictions provide that a violation thereof shall not defeat or render invalid the lien of any mortgage or deed of trust made in good faith and for value:
Recording Date: August 13, 1999
Recording No: as instrument No. 19990553646 of Official Records

18. A Trash Truck Hold Harmless Agreement, dated October 11, 1999, executed by Westridge Golf, Inc., a California Corporation, and recorded December 22, 1999, as instrument No. 19990585845, of Official Records

19. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (K)

Granted to: Chevron U.S.A. Inc., a Pennsylvania Corporation
Purpose: construction, installation, operation and maintenance of 12 KV electrical power distribution facilities and appurtenances thereto
Recorded: December 29, 1998, as Instrument No. 19980875360, of Official Records
Affects: that portion of said land as more particularly described therein.

20. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (L)

Granted to: Southern California Edison Company, a Corporation
Purpose: electrical supply and communication system
Recorded: January 28, 2000, as Instrument No. 20000055302, of Official Records
Affects: that portion of said land as more particularly described therein

21. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (M)

Granted to: City of La Habra, a Municipal Corporation
Purpose: water line purposes
Recorded: February 15, 2000, as Instrument No. 20000082145, of Official Records
Affects: that portion of said land as more particularly described therein.

22. An easement for the purpose shown below and rights incidental thereto as set forth in a document. (N)
(SHOWN GRAPHICALLY IN DOCUMENT/LINES SHOWN SCALED OFF THE AERIAL TOPOGRAPHY)
Granted to: The Westridge Community Association, a California Nonprofit Mutual Benefit Corporation (J)
Purpose: slopes
Recorded: February 4, 2000, as Instrument No. 20000053856; March 30, 2000, as Instrument No. 20000182801; March 30, 2000, as Instrument No. 20000182802; August 21, 2000, as Instrument No. 20000434681; and October 5, 2000, as Instrument No. 20000535846, all of Official Records
Affects: various portions of said land as described in said documents.

23. The matters contained in a document entitled "Agreement Between Adjacent Property owners" by and between Lee David, a married man as his sole and separate property, R. Scott Bell, a married man as his sole and separate property, Dan Rejkowski, a married man as his sole and separate property, and Los Angeles Habra Partnership, L.P., a California Limited Partnership, and Westridge Golf Club, a California limited liability company recorded June 29, 2001, as Instrument No. 20010436940, of Official Records (O)

Reference is made to said document for full particulars.

24. The matters contained in a document entitled "Sewer Line and Storm Drain Easement" recorded November 10, 2003 as Instrument No. 20030317373 of Official Records
(SAME AS PARCEL 2 IN LEGAL DESCRIPTION) (P)
Reference is made to said document for full particulars.
Affects: Parcel 2

25. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, or any other matters shown on

Map: Record of Survey No. 2004-1180
Recording Date: October 19, 2005
Recording No: In Book 209, Page(s) 4 to 10 Record of Survey

26. Easement(s) for the purpose(s) shown below and rights incidental thereto, as granted in a document: (Q)

Granted to: City of La Habra
Purpose: wall and slope encroachge
Recording Date: October 29, 2007
Recording No: as Instrument No. 20070006754859 of Official Records
Affects: said land more particularly described therein.

27. A deed of trust to secure an indebtedness in the amount shown below,

Amount: $5,200,000.00
Dated: June 26, 2009
Trustor/Grantor Westridge Golf, Inc., a California Corporation, as to an undivided 75% interest and KMC Property, LLC, a California limited liability company, as to an undivided 25% interest
Trustee: Chicago Title Company
Beneficiary: Nara Bank
Loan No.: 70534288
Recording Date: June 30, 2009
Recording No: as Instrument No. 20090002342969 of Official Records

28. An assignment of all moneys due, or to become due as rental or otherwise from said Land, to secure payment of an indebtedness, shown below and upon the terms and conditions therein
Amount: $5,200,000.00
Assigned to: Nara Bank
Assigned By: Westridge Golf, Inc., a California Corporation, as to an undivided 75% interest and KMC Property, LLC, a California limited liability company, as to an undivided 25% interest
Recording Date: June 30, 2009
Recording No: as Instrument No. 20090002342970 of Official Records

29. The matters contained in a document entitled "Hazardous Substances Certificate and Indemnity Agreement" by and between Westridge Golf, Inc., KMC Property, LLC and Nara Bank recorded June 30, 2009 as Instrument No. 20090002342971 of Official Records

Reference is made to said document for full particulars.

30. A deed of trust to secure an indebtedness in the amount shown below,

Amount: $810,000.00
Dated: June 26, 2009
Trustor/Grantor Westridge Golf, Inc., a California Corporation, as to an undivided 75% interest and KMC Property, LLC, a California limited liability company, as to an undivided 25% interest
Trustee: Chicago Title Company
Beneficiary: Nara Bank
Loan No.: 70534289
Recording Date: June 30, 2009
Recording No: as Instrument No. 20090002342972 of Official Records

Said deed of trust recites that it is subordinate to the trust deed recorded concurrently therewith.

A substitution of trustee under said deed of trust which names, as the substituted trustee, the following

Trustee: BBCN Bank
Recording Date: January 31, 2012
Recording No: as instrument No. 20120000055340 of Official Records

The effect of a full reconveyance recorded January 31, 2012 as Instrument No. 20120000055341 of Official Records, which purports to reconvey the above-mentioned Deed of Trust.

No statement is made hereto as to the effect or validity of said reconveyance.

The requirement that this Company be furnished with confirmation from the lender that the Deed of Trust has been released prior to issuance of a policy of title insurance.

31. An assignment of all moneys due, or to become due as rental or otherwise from said Land, to secure payment of an indebtedness, shown below and upon the terms and conditions therein

Amount: $810,000.00
Assigned to: Nara Bank
Assigned By: Westridge Golf, Inc., a California Corporation, as to an undivided 75% interest and KMC Property, LLC, a California limited liability company, as to an undivided 25% interest
Recording Date: June 30, 2009
Recording No: as instrument No. 20090002342973 of Official Records

32. The matters contained in a document entitled "Hazardous Substances Certificate and Indemnity Agreement" by and between Westridge Golf, Inc., KMC Property, LLC and Nara Bank recorded June 30, 2009 as Instrument No. 20090002342974 of Official Records.

Reference is made to said document for full particulars.

33. Covenants, conditions and restrictions but omitting any covenants or restrictions, if any, including but not limited to those based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, source of income, gender, gender identity, gender expression, medical condition or genetic information, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law, as set forth in the document: (R)

Recording Date: November 25, 2009
Recording No: as instrument No. 20091000638650 of Official Records

Conservation area:
Coastal Scrub: Parcels A-1, A-2
Southern Willow Scrub: Parcels A-4, A-8, A-9
Mulefat Scrub: Parcel A-10
Wetland: Parcel A-3
Freshwater Marsh: Parcels B-1 thru B-5
Open Water: Parcels Pond 1 and Pond 2

34. Any rights of the parties in possession of a portion of, or all of, said Land, which rights are not disclosed by the public records.

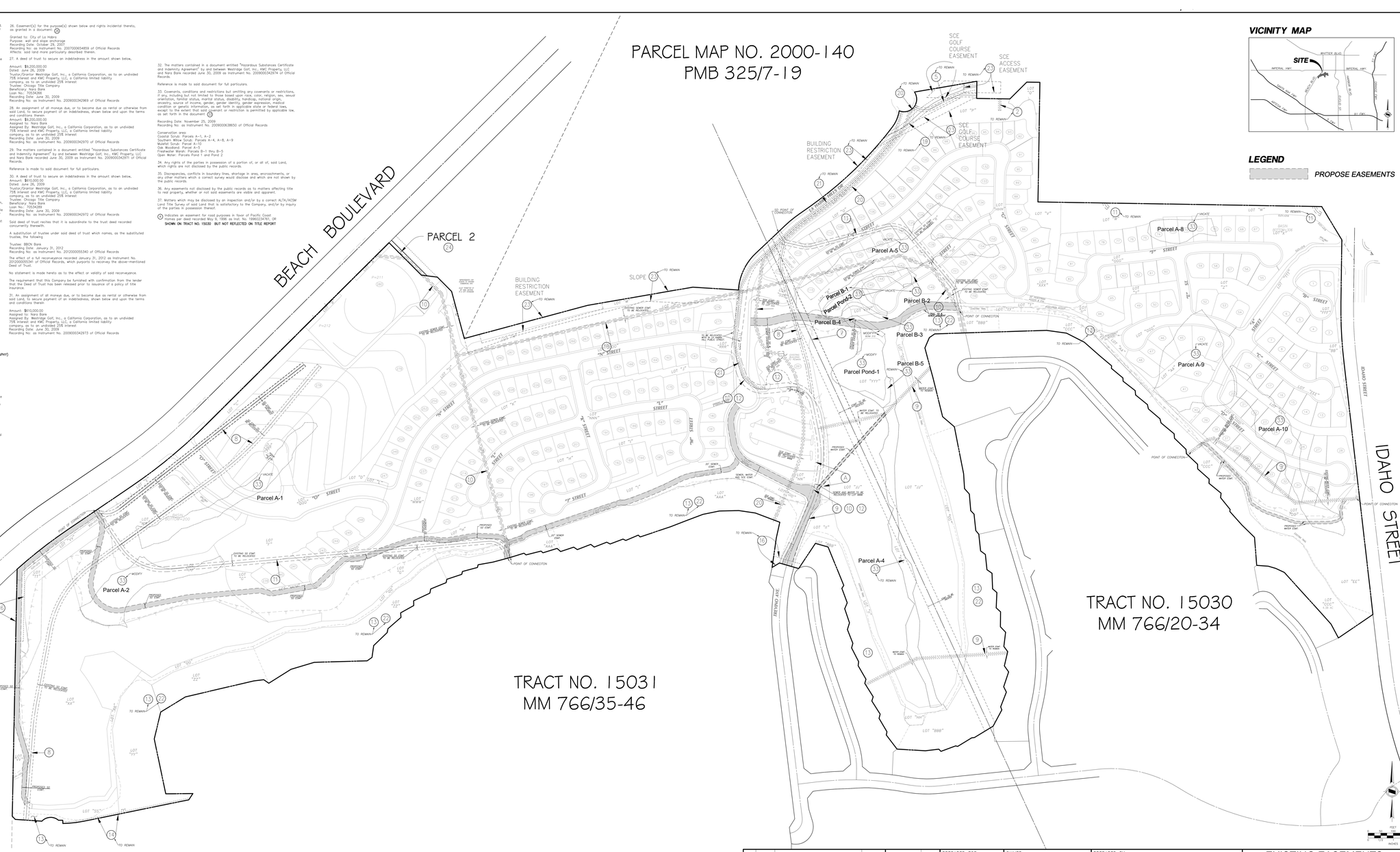
35. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, or any other facts which a correct survey would disclose and which are not shown by the public records.

36. Any easements not disclosed by the public records as to matters affecting title to real property, whether or not said easements are visible and apparent.

37. Matters which may be disclosed by an inspection and/or by a correct ALTA/ACSM Land Title Survey of said Land that is satisfactory to the Company, and/or by inquiry of the parties in possession thereof.

(A) Indicates an easement for road purposes in favor of Pacific Coast Homes per deed recorded May 8, 1996 as inst. No. 19960224781, OR
SHOWN ON TRACT NO. 15030 BUT NOT REFLECTED ON TITLE REPORT

PARCEL MAP NO. 2000-140
PMB 325/7-19


BEACH BOULEVARD
IDAHO STREET
PARCEL 2
SLOPE
BUILDING RESTRICTION EASEMENT
BUILDING RESTRICTION EASEMENT
SCE GOLF COURSE EASEMENT
SCE ACCESS EASEMENT
SCE GOLF COURSE EASEMENT
Parcel A-1
Parcel A-2
Parcel A-3
Parcel A-4
Parcel A-5
Parcel A-8
Parcel A-9
Parcel A-10
Parcel B-1
Parcel B-2
Parcel B-3
Parcel B-4
Parcel B-5
Parcel Pond-1
Parcel Pond-2
TRACT NO. 15031
MM 766/35-46
TRACT NO. 15030
MM 766/20-34
POINT OF CONNECTION
TO REMAIN
VACATE
MODIFY
PROPOSED WATER LINE
EXISTING WATER LINE TO BE RELOCATED
EXISTING SEWER LINE TO BE RELOCATED
PROPOSED SEWER LINE
EXISTING SEWER LINE TO REMAIN
EXISTING STORM DRAIN TO BE RELOCATED
PROPOSED STORM DRAIN
EXISTING STORM DRAIN TO REMAIN
PROPOSED SLOPE
EXISTING SLOPE TO REMAIN
EXISTING SLOPE TO BE REMOVED
PROPOSED RETAINING WALL
EXISTING RETAINING WALL TO REMAIN
EXISTING RETAINING WALL TO BE REMOVED
PROPOSED CURB
EXISTING CURB TO REMAIN
EXISTING CURB TO BE REMOVED
PROPOSED CURB & GUTTER
EXISTING CURB & GUTTER TO REMAIN
EXISTING CURB & GUTTER TO BE REMOVED
PROPOSED SIDEWALK
EXISTING SIDEWALK TO REMAIN
EXISTING SIDEWALK TO BE REMOVED
PROPOSED DRIVEWAY
EXISTING DRIVEWAY TO REMAIN
EXISTING DRIVEWAY TO BE REMOVED
PROPOSED CROSS GUTTER
EXISTING CROSS GUTTER TO REMAIN
EXISTING CROSS GUTTER TO BE REMOVED
PROPOSED ASPHALT
EXISTING ASPHALT TO REMAIN
EXISTING ASPHALT TO BE REMOVED
PROPOSED CONCRETE
EXISTING CONCRETE TO REMAIN
EXISTING CONCRETE TO BE REMOVED
PROPOSED CATCH BASIN
EXISTING CATCH BASIN TO REMAIN
EXISTING CATCH BASIN TO BE REMOVED
PROPOSED MANHOLE
EXISTING MANHOLE TO REMAIN
EXISTING MANHOLE TO BE REMOVED
PROPOSED WATER METER
EXISTING WATER METER TO REMAIN
EXISTING WATER METER TO BE REMOVED
PROPOSED FIRE HYDRANT
EXISTING FIRE HYDRANT TO REMAIN
EXISTING FIRE HYDRANT TO BE REMOVED
PROPOSED GATE VALVE
EXISTING GATE VALVE TO REMAIN
EXISTING GATE VALVE TO BE REMOVED
PROPOSED BLOW OFF
EXISTING BLOW OFF TO REMAIN
EXISTING BLOW OFF TO BE REMOVED
PROPOSED AIR VALVE
EXISTING AIR VALVE TO REMAIN
EXISTING AIR VALVE TO BE REMOVED
PROPOSED FIRE DEPARTMENT CONNECTION
EXISTING FIRE DEPARTMENT CONNECTION TO REMAIN
EXISTING FIRE DEPARTMENT CONNECTION TO BE REMOVED
PROPOSED DOUBLE DETECTOR CHECK VALVE
EXISTING DOUBLE DETECTOR CHECK VALVE TO REMAIN
EXISTING DOUBLE DETECTOR CHECK VALVE TO BE REMOVED
PROPOSED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER
EXISTING REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER TO REMAIN
EXISTING REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER TO BE REMOVED
PROPOSED IRRIGATION CONTROL VALVE
EXISTING IRRIGATION CONTROL VALVE TO REMAIN
EXISTING IRRIGATION CONTROL VALVE TO BE REMOVED
PROPOSED IRRIGATION CONTROLLER
EXISTING IRRIGATION CONTROLLER TO REMAIN
EXISTING IRRIGATION CONTROLLER TO BE REMOVED
PROPOSED IRRIGATION BACKFLOW PREVENTER
EXISTING IRRIGATION BACKFLOW PREVENTER TO REMAIN
EXISTING IRRIGATION BACKFLOW PREVENTER TO BE REMOVED
PROPOSED IRRIGATION QUICK COUPLER VALVE
EXISTING IRRIGATION QUICK COUPLER VALVE TO REMAIN
EXISTING IRRIGATION QUICK COUPLER VALVE TO BE REMOVED
PROPOSED IRRIGATION REMOTE CONTROL VALVE
EXISTING IRRIGATION REMOTE CONTROL VALVE TO REMAIN
EXISTING IRRIGATION REMOTE CONTROL VALVE TO BE REMOVED
PROPOSED IRRIGATION FLOW SENSOR
EXISTING IRRIGATION FLOW SENSOR TO REMAIN
EXISTING IRRIGATION FLOW SENSOR TO BE REMOVED
PROPOSED IRRIGATION MASTER VALVE
EXISTING IRRIGATION MASTER VALVE TO REMAIN
EXISTING IRRIGATION MASTER VALVE TO BE REMOVED
PROPOSED IRRIGATION POINT OF CONNECTION
EXISTING IRRIGATION POINT OF CONNECTION TO REMAIN
EXISTING IRRIGATION POINT OF CONNECTION

Section VII Educational Materials

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	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☒		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A

Educational Materials

The Ocean Begins at Your Front Door

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 washwater 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

The Ocean Begins at Your Front Door

Never allow pollutants to enter the street, gutter or storm drain!

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

Orange County Stormwater Program

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.ciwmb.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.uccemg.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

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

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of used oil is illegal and can lead to fines. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain.

Help prevent water pollution by taking your used oil and oil filters to a used oil collection center. Most major automotive maintenance centers will accept up to five gallons of used motor oil at no cost. For a list of locations, please visit www.cleanup.org.

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

For information about the proper disposal of household hazardous waste, call the **Household Waste Hotline** at **1-877-89-SPILL (1-877-897-7455)** 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.**

RECYCLE USED OIL

emc/rev9/08

Help Prevent Ocean Pollution:

Tips for the Home Mechanic

PROJECT Pollution PREVENTION

The Ocean Begins at Your Front Door

Tips for the Home Mechanic

WORK SITE

- Locate the storm drains on or near your property. Do not allow used oil or any materials to flow into these drains.
- Examine your home for sources of pollution.
- Perform automotive projects under cover and in a controlled area to prevent stormwater runoff.
- Sweep or vacuum your automotive workspace regularly
- Use a damp mop to clean work areas. Never hose down surfaces into the street, gutter or storm drain.

- Pour mop water into a sink or toilet. Never dispose of water in a parking lot, street, gutter or storm drain.

PREVENT LEAKS AND SPILLS

- Keep absorbent materials such as rags and/or cat litter in the work area
- Empty drip pans into a labeled, seal container before they are full
- Wipe up any spills or repair leaks as they happen. Don't let them sit.
- Place large pans under any wrecked cars until all fluids are drained.
- Promptly dispose of collected fluids into a hazardous waste drum or deliver them to an oil recycling center. Used oil recycling locations can be found at http://www.ochealthinfo.com/regulatory/usedoil.htm

CLEANING SPILLS

- Clean up spills immediately by using absorbent material such as rags, cat litter or sand. If the material spilled is hazardous, dispose of the rag, litter or sand in the same manner as hazardous waste. If the material spill is non-hazardous, dispose of it in the trash.

- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455) or visit www.ocwatersheds.com to fill out an incident report.
- Report emergencies to 911.

VEHICLE FLUID MANAGEMENT

- Vehicle fluids are hazardous waste and must be stored and disposed of in accordance with all local, state and federal laws.
- Designate an area to drain vehicle fluids away from storm drains and sanitary drains.
- When possible, drain vehicle fluids indoors or within covered areas, and only over floors that are constructed of a non-porous material such as concrete. Asphalt and dirt floors absorb spilled or leaked fluids, making the cleanup extremely difficult.

PROJECT Pollution PREVENTION

The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

1 Pesticides and Fertilizer

- **Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.

- **Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.

- **Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

3 Metals

- **Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.

- **Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

DID YOU KNOW?

Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community

4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.

- **Solution:** Pick up after your pets!

5 Trash and Debris

- **Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.

- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.

- **Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.

A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

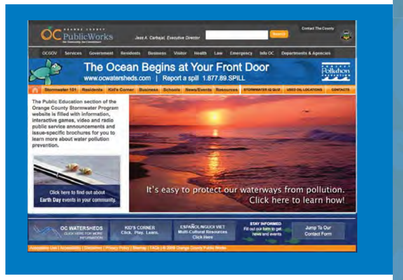
Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

www.uccemg.com



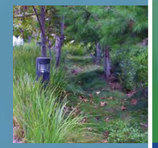
To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline at 1-877-89-SPILL \(1-877-897-7455)

Special Thanks to
The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention



The Ocean Begins at Your Front Door

RUNOFF, RAINWATER AND REUSE

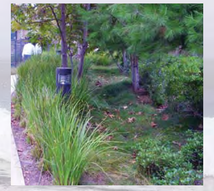
Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.

Water Conservation

Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides at least 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.



– Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

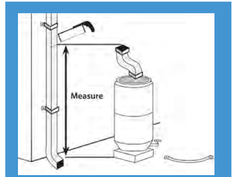
New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.

OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

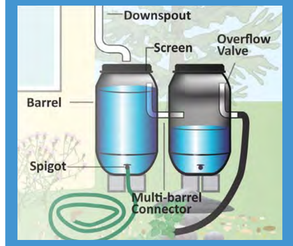
Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.

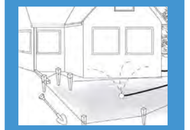


Rain Barrels

Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.



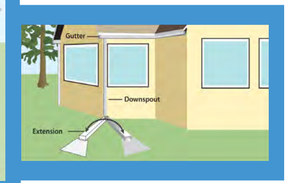
Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at www.ocvcd.org/mosquitoes3.php.



Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palate, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.



For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at www.larainwaterharvesting.org/

OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at www.bewaterwise.com/Gardensoft.

Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.

Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

IRRIGATE EFFICIENTLY

Water runoff from sprinklers left on too long will carry pollutants into our waterways.

Smart Irrigation Controllers

Smart Irrigation Controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy or too cold, the smart irrigation control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- **Set a timer for your sprinklers** – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- **Water at Sunrise** – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- **Water by hand** – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- **Fix leaks** - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure 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**

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

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

GENUINE RECYCLED PAPER
50% PRE-CONSUMER AND 15% POST-CONSUMER

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- ▲ **Batteries**
- ▲ **Paint thinners, paint strippers and removers**
- ▲ **Adhesives**
- ▲ **Drain openers**
- ▲ **Oven cleaners**
- ▲ **Wood and metal cleaners and polishes**
- ▲ **Herbicides and pesticides**
- ▲ **Fungicides/wood preservatives**
- ▲ **Automotive fluids and products**
- ▲ **Grease and rust solvents**
- ▲ **Thermometers and other products containing mercury**
- ▲ **Fluorescent lamps**
- ▲ **Cathode ray tubes, e.g. TVs, computer monitors**
- ▲ **Pool and spa chemicals**

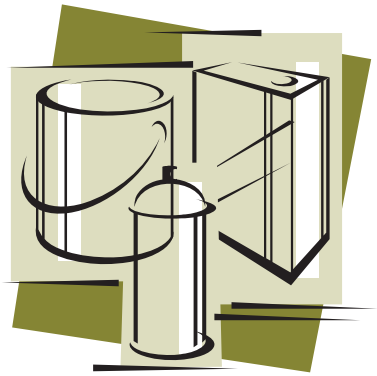
Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled "non-toxic," "phosphate free" or "biodegradable." Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and "hose off" engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.



R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	
Nutrients	
Bacteria	
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

List of most common HHW products:

Drain openers
Oven cleaners
Wood and metal cleaners and polishes
Automotive oil and fuel additives
Grease and rust solvents
Carburetor and fuel injection cleaners
Starter fluids
Batteries
Paint Thinners
Paint strippers and removers
Adhesives
Herbicides
Pesticides
Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE USED OIL

Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

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.

RECYCLE USED OIL

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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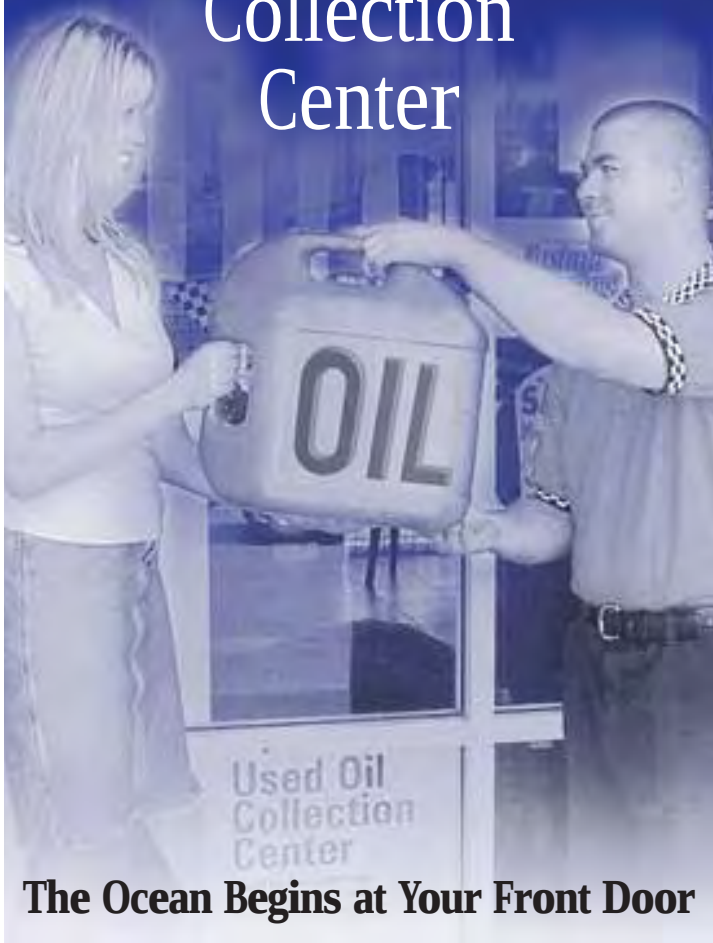
Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

NORTH COUNTY

Used Oil Collection Centers

Anaheim

All Seasons Tire and Auto Center, Inc.
817 S Brookhurst St., Anaheim, CA 92804
(714)772-6090( )
CIWMB#: 30-C-03177

AutoZone #3317
423 N Anaheim Blvd., Anaheim, CA 92805
(714)776-0787( )
CIWMB#: 30-C-05263

AutoZone #5226
2145 W Lincoln Ave., Anaheim, CA 92801
(714)533-6599( )
CIWMB#: 30-C-04604

Bedard Automotive
3601 E Miraloma Ave., Anaheim, CA 92806
(714)528-1380( )
CIWMB#: 30-C-02205

Classic Chevrolet
1001 Weir Canyon Rd., Anaheim, CA 92807
(714)283-5400( )
CIWMB#: 30-C-05223

Econo Lube N' Tune #4
3201 W Lincoln Ave., Anaheim, CA 92801
(714)821-0128( )
CIWMB#: 30-C-01485

EZ Lube Inc - Savi Ranch #43
985 N Weir Canyon Rd., Anaheim, CA 92807
(714)556-1312( )
CIWMB#: 30-C-06011

Firestone Store #71C7
1200 S Magnolia Ave., Anaheim, CA 92804
(949)598-5520( )
CIWMB#: 30-C-05743

Great Western Lube Express
125 N Brookhurst St., Anaheim, CA 92801
(714)254-1300( )
CIWMB#: 30-C-05542

HR Pro Auto Service Center
3180 W Lincoln Ave., Anaheim, CA 92801
(714)761-4343( )
CIWMB#: 30-C-05927

Ira Newman Automotive Services
1507 N State College Blvd., Anaheim, CA 92806
(714)635-2392( )
CIWMB#: 30-C-01482

Jiffy Lube #1028
2400 W Ball Rd., Anaheim, CA 92804
(714)761-5211( )
CIWMB#: 30-C-00870

Jiffy Lube #1903
2505 E Lincoln Ave., Anaheim, CA 92806
(714)772-4000( )
CIWMB#: 30-C-05511

Jiffy Lube #2340
2181 W Lincoln Ave., Anaheim, CA 92801
(714)533-1000( )
CIWMB#: 30-C-04647

Kragen Auto Parts #1303
1088 N State College Blvd., Anaheim, CA 92806
(714)956-7351( )
CIWMB#: 30-C-03438

Kragen Auto Parts #1399
2245 W Ball Rd., Anaheim, CA 92804
(714)490-1274( )
CIWMB#: 30-C-04094

Kragen Auto Parts #1565
2072 Lincoln Ave., Anaheim, CA 92806
(714)502-6992( )
CIWMB#: 30-C-04078

Kragen Auto Parts #1582
3420 W Lincoln Ave., Anaheim, CA 92801
(714)828-7977( )
CIWMB#: 30-C-04103

Pep Boys #613
10912 Katella Ave., Anaheim, CA 92804
(714)638-0863( )
CIWMB#: 30-C-01756

Pep Boys #663
3030 W Lincoln Anaheim, CA 92801
(714)826-4810( )
CIWMB#: 30-C-03417

Pep Boys #809
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808
(714)974-0105( )
CIWMB#: 30-C-03443

Pick Your Part
1235 S Beach Blvd., Anaheim, CA 92804
(714)527-1645( )
CIWMB#: 30-C-03744

PK Auto Performance
3106 W. Lincoln Ave., Anaheim, CA 92801
(714)826-2141( )
CIWMB#: 30-C-05628

Quick Change Lube and Oil
2731 W Lincoln Ave., Anaheim, CA 92801
(714)821-4464( )
CIWMB#: 30-C-04363

Saturn of Anaheim
1380 S Auto Center Dr., Anaheim, CA 92806
(714)648-2444( )
CIWMB#: 30-C-06332

Sun Tech Auto Service
105 S State College Blvd., Anaheim, CA 92806
(714)956-1389( )
CIWMB#: 30-C-06455

Vonic Truck Services
515 S Rose St., Anaheim, CA 92805
(714)533-3333( )
CIWMB#: 30-C-01142

Anaheim Hills

Anaheim Hills Car Wash & Lube
5810 E La Palma Ave., Anaheim Hills, CA 92807
(714)777-6605( )
CIWMB#: 30-C-01387

Brea

Firestone Store #27A9
891 E Imperial Hwy., Brea, CA 92821
(714)529-8404( )
CIWMB#: 30-C-01221

Oil Can Henry's
230 N Brea Blvd., Brea, CA 92821
(714)990-1900( )
CIWMB#: 30-C-04273

Buena Park

Firestone Store #71F7
6011 Orangethorpe Buena Park, CA 90620
(714)670-7912( )
CIWMB#: 30-C-01218

Firestone Store #71T8
8600 Beach Blvd., Buena Park, CA 90620
(714)827-5300( )
CIWMB#: 30-C-02121

Kragen Auto Parts #1204
5303 Beach Blvd., Buena Park, CA 90621
(714)994-1320( )
CIWMB#: 30-C-02623

Cypress

AutoZone #5521
5471 Lincoln Ave., Cypress, CA 90630
(714)995-4644( )
CIWMB#: 30-C-00836

Big O Tires
6052 Cerritos Ave., Cypress, CA 90630
(714)826-6334( )
CIWMB#: 30-C-04245

Econo Lube N' Tune #213
5497 Cerritos Ave., Cypress, CA 90630
(714)761-0456( )
CIWMB#: 30-C-06240

Jiffy Lube #851
4942 Lincoln Ave., Cypress, CA 90630
(626)965-9689( )
CIWMB#: 30-C-06182

M & N Coastline Auto & Tire Service
4005 Ball Rd., Cypress, CA 90630
(714)826-1001( )
CIWMB#: 30-C-04387

Masterlube #103
5904 Lincoln Cypress, CA 90630
(714)826-2323( )
CIWMB#: 30-C-01071

Masterlube #104
5971 Ball Rd., Cypress, CA 90630
(714)220-1555( )
CIWMB#: 30-C-04682

Metric Motors of Cypress
6042 Cerritos Ave., Cypress, CA 90630
(714)821-4702( )
CIWMB#: 30-C-05157

Fullerton

AutoZone #2898
146 N. Raymond Ave., Fullerton, CA 92831
(714)870-9772( )
CIWMB#: 30-C-04488

AutoZone #5522
1801 Orangethorpe W. Fullerton, CA 92833
(714)870-8286( )
CIWMB#: 30-C-06062

AutoZone #5523
102 N Euclid Fullerton, CA 92832
(714)870-8286( )
CIWMB#: 30-C-04755

EZ Lube #17
4002 N Harbor Blvd., Fullerton, CA 92835
(714)871-9980( )
CIWMB#: 30-C-03741

Firestone Store #27EH
1933 N Placentia Ave., Fullerton, CA 92831
(714)993-7100( )
CIWMB#: 30-C-02122

Fox Service Center
1018 W Orangethorpe Fullerton, CA 92833
(714)879-1430( )
CIWMB#: 30-C-02318

Fullerton College Automotive Technology
321 E Chapman Ave., Fullerton, CA 92832
(714)992-7275( )
CIWMB#: 30-C-03165

Kragen Auto Parts #0731
2978 Yorba Linda Fullerton, CA 92831
(714)996-4780( )
CIWMB#: 30-C-02628

Kragen Auto Parts #4133
904 W Orangethorpe Ave., Fullerton, CA 92832
(714)526-3570( )
CIWMB#: 30-C-06256

Pep Boys #642
1530 S Harbor Blvd., Fullerton, CA 92832
(714)870-0700( )
CIWMB#: 30-C-01755

Sunnyside 76 Car Care Center
2701 N Brea Blvd., Fullerton, CA 92835
(714)256-0773( )
CIWMB#: 30-C-01381

Garden Grove

76 Pro Lube Plus
9001 Trask Ave., Garden Grove, CA 92844
(714)393-0590( )
CIWMB#: 30-C-05276

AutoZone #5527
13190 Harbor Blvd., Garden Grove, CA 92843
(714)636-5665( )
CIWMB#: 30-C-04760

David Murray Shell
12571 Vly View St., Garden Grove, CA 92845
(714)898-0170( )
CIWMB#: 30-C-00547

Express Lube & Wash
8100 Lampson Ave., Garden Grove, CA 92841
(909)316-8261( )
CIWMB#: 30-C-06544

Firestone Store #7180
10081 Chapman Ave., Garden Grove, CA 92840
(714)530-4630( )
CIWMB#: 30-C-01224

Firestone Store #71W3
13961 Brookhurst St., Garden Grove, CA 92843
(714)590-2741( )
CIWMB#: 30-C-03690

Jiffy Lube #1991
13970 Harbor Blvd., Garden Grove, CA 92843
(714)554-0610( )
CIWMB#: 30-C-05400

Kragen Auto Parts #1251
13933 N Harbor Blvd., Garden Grove, CA 92843
(714)554-3780( )
CIWMB#: 30-C-02663

Kragen Auto Parts #1555
9851 Chapman Ave., Garden Grove, CA 92841
(714)741-8030( )
CIWMB#: 30-C-04079

Nissan of Grarden Grove
9670 Trask Ave., Garden Grove, CA 92884
(714)537-0900( )
CIWMB#: 30-C-06553

Toyota of Garden Grove
9444 Trask Ave., Garden Grove, CA 92844
(714)895-5595( )
CIWMB#: 30-C-06555

La Habra

AutoZone #5532
1200 W Imperial Hwy., La Habra, CA 90631
(562)694-5337( )
CIWMB#: 30-C-04784

Burch Ford
201 N Harbor Blvd., La Habra, CA 90631
(562)691-3225( )
CIWMB#: 30-C-05179

Firestone Store #2736
1071 S Beach Blvd., La Habra, CA 90631
(562)691-1731( )
CIWMB#: 30-C-01169

Kragen Auto Parts #1569
1621 W Whittier Blvd., La Habra, CA 90631
(562)905-2538( )
CIWMB#: 30-C-04076

Pep Boys #997
125 W Imperial Hwy., La Habra, CA 90631
(714)447-0601( )
CIWMB#: 30-C-04026

SpeeDee Oil Change & Tune-Up
1580 W Imperial Hwy., La Habra, CA 90631
(562)697-3513( )

Los Alamitos

Jiffy Lube #1740
3311 Katella Ave., Los Alamitos, CA 90720
(562)596-1827( )
CIWMB#: 30-C-03529

Midway City

Bolsa Transmission
8331 Bolsa Ave., Midway City, CA 92655
(714)799-6158( )
CIWMB#: 30-C-05768

Placentia

Advanced Auto & Diesel
144 S Bradford Placentia, CA 92870
(714)996-8222( )
CIWMB#: 30-C-06242

Castner's Auto Service
214 S. Bradford Ave., Placentia, CA 92870
(714)528-1311( )
CIWMB#: 30-C-06452

Econo Lube N' Tune
100 W Chapman Ave., Placentia, CA 92870
(714)524-0424( )
CIWMB#: 30-C-06454

Fairway Ford
1350 E Yorba Linda Blvd., Placentia, CA 92870
(714)524-1200( )
CIWMB#: 30-C-01863

Seal Beach

M & N Coastline Auto & Tire Service
12239 Seal Beach Blvd., Seal Beach, CA 90740
(714)826-1001( )
CIWMB#: 30-C-04433

Seal Beach Chevron
12541 Seal Beach Blvd., Seal Beach, CA 90740
(949)495-0774(14)
CIWMB#: 30-C-06425

Stanton

AutoZone #2806
11320 Beach Blvd., Stanton, CA 90680
(714)895-7665( )
CIWMB#: 30-C-04563

Joe's Auto Clinic
11763 Beach Blvd., Stanton, CA 90680
(714)891-7715( )
CIWMB#: 30-C-03253

Kragen Auto Parts #1742
11951 Beach Blvd., Stanton, CA 90680
(714)799-7574( )
CIWMB#: 30-C-05231

Scher Tire #20
7000 Katella Ave., Stanton, CA 90680
(714)892-9924( )
CIWMB#: 30-C-05907

USA 10 Minute Oil Change
8100 Lampson Ave., Stanton, CA 92841
(714)373-4432( )
CIWMB#: 30-C-05909

Westminster

AutoZone #5543
6611 Westminster Blvd., Westminster, CA 92683
(714)898-2898( )
CIWMB#: 30-C-04964

AutoZone #5544
8481 Westminster Blvd., Westminster, CA 92683
(714)891-3511( )
CIWMB#: 30-C-04966

City of Westminster Corporate Yard
14381 Olive St., Westminster, CA 92683
(714)895-2876(292)
CIWMB#: 30-C-02008

Honda World
13600 Beach Blvd., Westminster, CA 92683
(714)890-8900( )
CIWMB#: 30-C-03639

Jiffy Lube #1579
6011 Westminster Blvd., Westminster, CA 92683
(714)899-2727( )
CIWMB#: 30-C-02745

John's Brake & Auto Repair
13050 Hoover St., Westminster, CA 92683
(714)379-2088( )
CIWMB#: 30-C-05617

Kragen Auto Parts #0762
6562 Westminster Blvd., Westminster, CA 92683
(714)898-0810( )
CIWMB#: 30-C-02590

Midway City Sanitary District
14451 Cedarwood St., Westminster, CA 92683
(714)893-3553( )
CIWMB#: 30-C-01626

Pep Boys #653
15221 Beach Blvd., Westminster, CA 92683
(714)893-8544( )
CIWMB#: 30-C-03415

Yorba Linda

AutoZone #5545
18528 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)970-8933( )
CIWMB#: 30-C-04971

Econo Lube N' Tune
22270 La Palma Ave., Yorba Linda, CA 92887
(714)692-8394( )
CIWMB#: 30-C-06513

EZ Lube Inc. #41
17511 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)556-1312( )
CIWMB#: 30-C-05739

Firestone Store #27T3
18500 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)779-1966( )
CIWMB#: 30-C-01222

Jiffy Lube #1532
16751 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)528-2800( )
CIWMB#: 30-C-03777

Mike Schultz Import Service
4832 Eureka Ave., Yorba Linda, CA 92886
(714)528-4411( )
CIWMB#: 30-C-04313

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

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.

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:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental 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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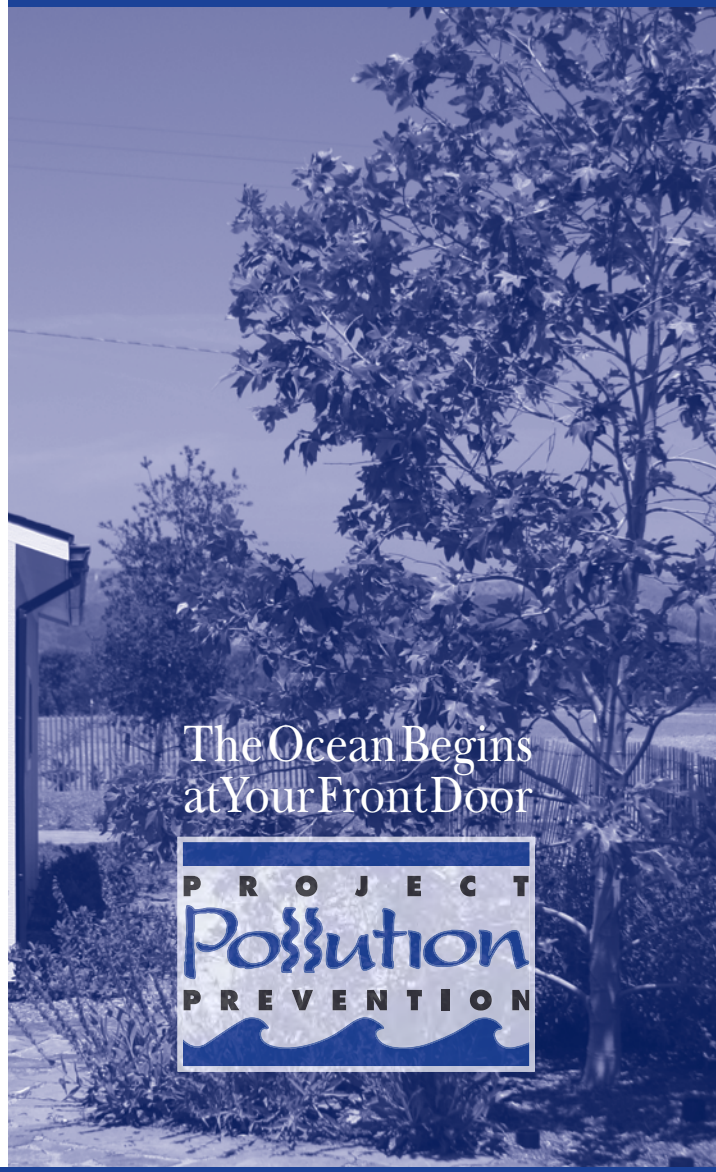
Help Prevent Ocean Pollution:

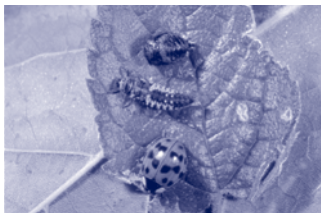
Responsible Pest Control



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.

UC CE University of California Cooperative Extension

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

PROJECT Pollution PREVENTION

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 (951) 782-4130
San Diego Region (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.

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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

PROJECT Pollution PREVENTION
www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). 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

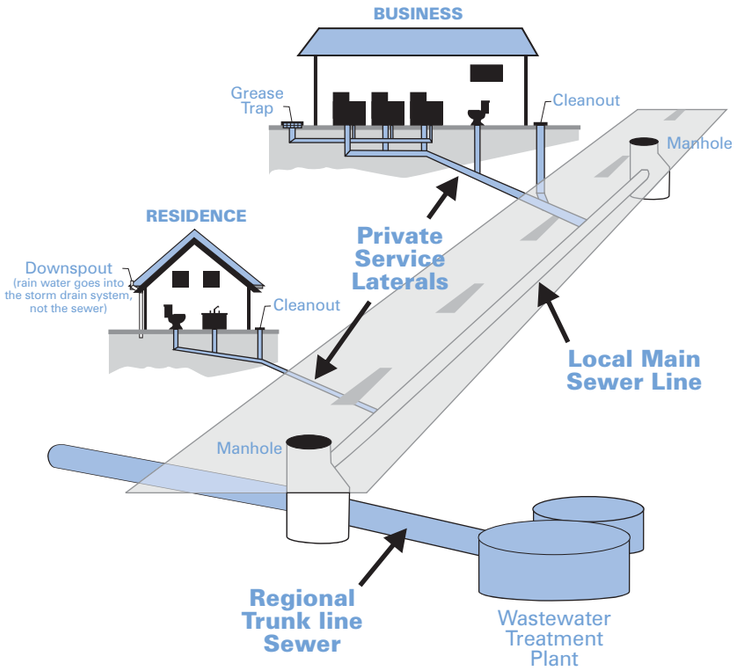
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

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. However, many common activities can lead to water pollution if you're not careful. Home improvement projects and work sites must be maintained to ensure that building materials 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 building materials into the ocean, so don't let them 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**

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.

The tips contained in this brochure provide useful information to help prevent water pollution while performing home improvement projects. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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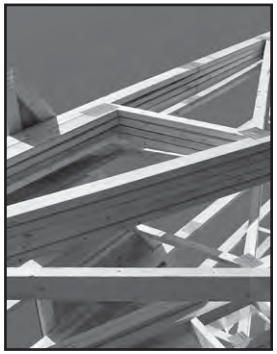
Help Prevent Ocean Pollution:

Tips for Home Improvement Projects

Tips for Home Improvement Projects

Home improvement projects can cause significant damage to the environment. Whether you hire a contractor or work on the house yourself, it is important to follow these simple tips while renovating, remodeling or improving your home:

General Construction



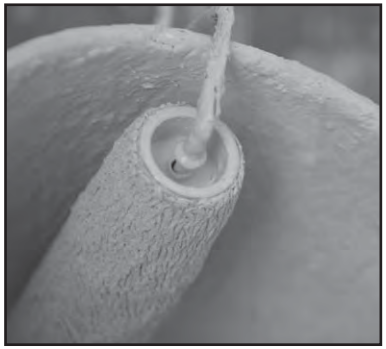
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the street, storm drain or adjacent properties.

Building Materials

- Never hose materials into a street, gutter or storm drain.
- Exposed piles of construction material should not be stored on the street or sidewalk.
- Minimize waste by ordering only the amount of materials needed to complete the job.
- Do not mix more fresh concrete than is needed for each project.
- Wash concrete mixers and equipment in a designated washout area where the water can flow into a containment area or onto dirt.
- Dispose of small amounts of dry excess materials in the trash. Powdery waste, such as dry concrete, must be properly contained within a box or bag prior to disposal. Call your local trash hauler for weight and size limits.

Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.
- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).



- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Erosion Control

- Schedule grading and excavation projects for dry weather.
- When temporarily removing soil, pile it in a contained, covered area where it cannot spill into the street, or obtain the required temporary encroachment or street closure permit and follow the conditions instructed by the permit.
- When permanently removing large quantities of soil, a disposal location must be found prior to excavation. Numerous businesses are available to handle disposal needs. For disposal options, visit **www.ciwmb.ca.gov/SWIS**.
- Prevent erosion by planting fast-growing annual and perennial grasses. They will shield and bind the soil.

Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.

- For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**

Spills

- Clean up spills immediately by using an absorbent material such as cat litter, then sweep it up and dispose of it in the trash.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy 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

UCCE Master Gardener Hotline:
(714) 708-1646

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

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Landscape & Gardening

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. 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 green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the 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 put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy 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

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

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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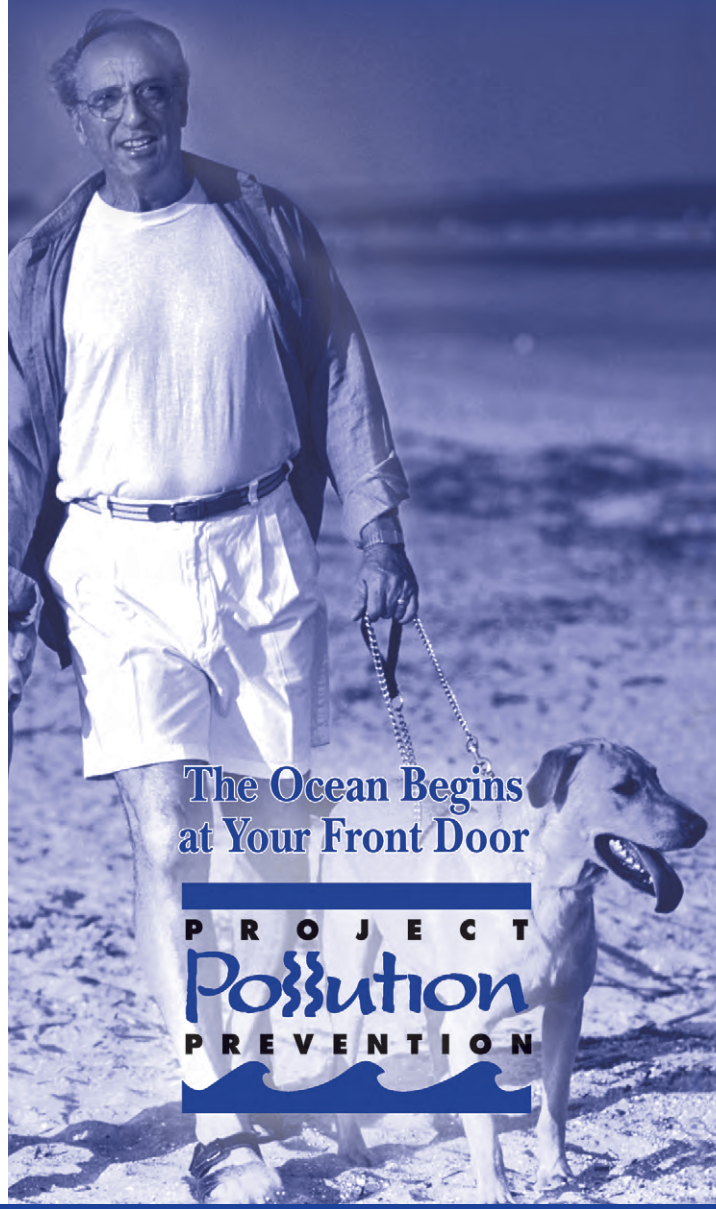
Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

Washing Your Pets

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Swimming pools and spas are common in Orange County, but they must be maintained properly to guarantee that chemicals aren't allowed to enter the street, where they can flow into the storm drains and then into the waterways. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pool chemicals into the ocean, so don't let it enter the storm drains. Follow these easy 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**

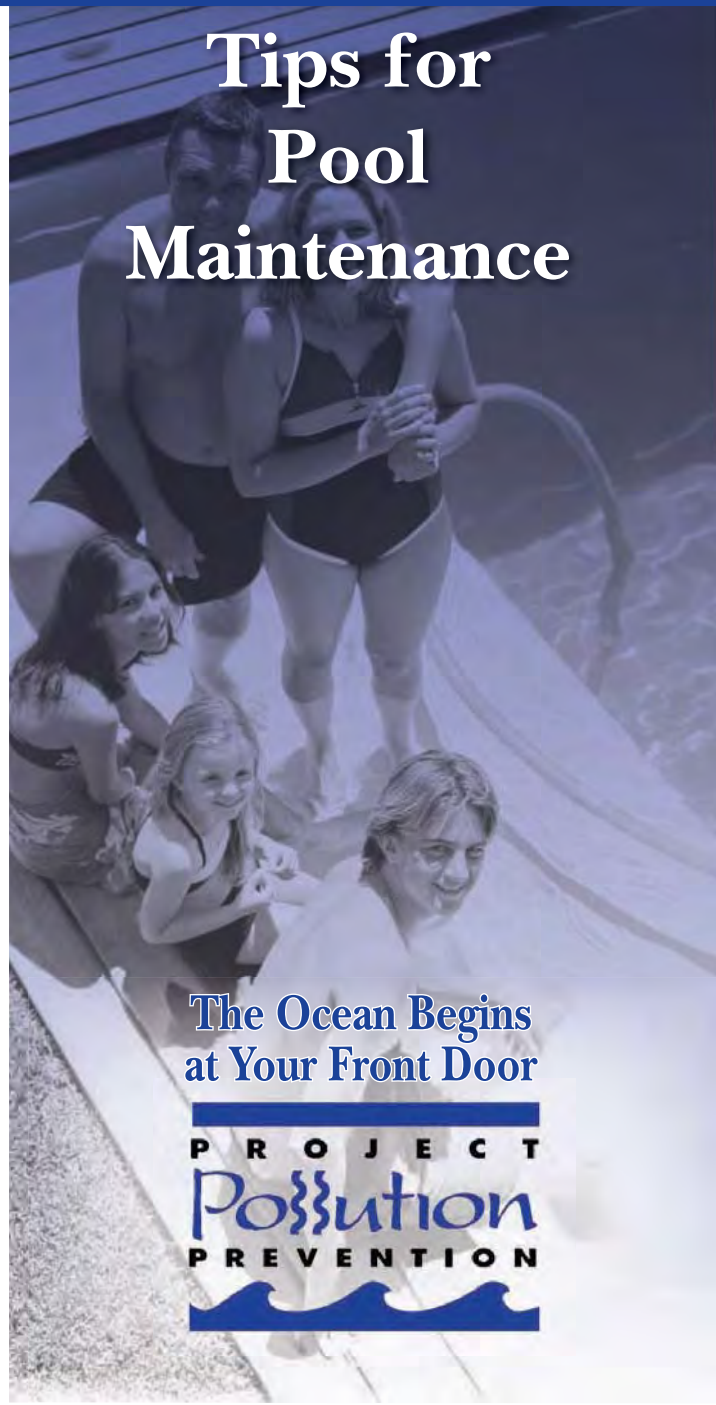
To report a spill, call the **Orange County 24-Hour Water Pollution Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while maintaining your pool. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Help Prevent Ocean Pollution:

Tips for Pool Maintenance



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Pool Maintenance

Many pools are plumbed to allow the pool to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.

Acceptable and Preferred Method of Disposal

When you cannot dispose of pool water in the sanitary sewer, the release of dechlorinated swimming pool water is allowed if all of these tips are followed:

- The residual chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.
- Some cities may have ordinances that do not allow pool water to be disposed into a storm drain. Check with your city.

How to Know if You're Following the Standards

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company. Always make sure to follow the instructions that come with any products you use.

Doing Your Part

By complying with these guidelines, you will make a significant contribution toward keeping pollutants out of Orange County's creeks, streams, rivers, bays and the ocean. This helps to protect organisms that are sensitive to pool chemicals, and helps to maintain the health of our environment.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does 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 paint into the ocean, so don't let it enter the storm drains. Follow these easy 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

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.

The tips contained in this brochure provide useful information to help prevent water pollution while using, storing and disposing of paint. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Projects Using Paint

Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the **"Stop & Swap"** that allows you to drop off or pick up partially used home care products free of charge. **"Stop & Swap"** programs are available at most HHWCCs.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION

Attachment B

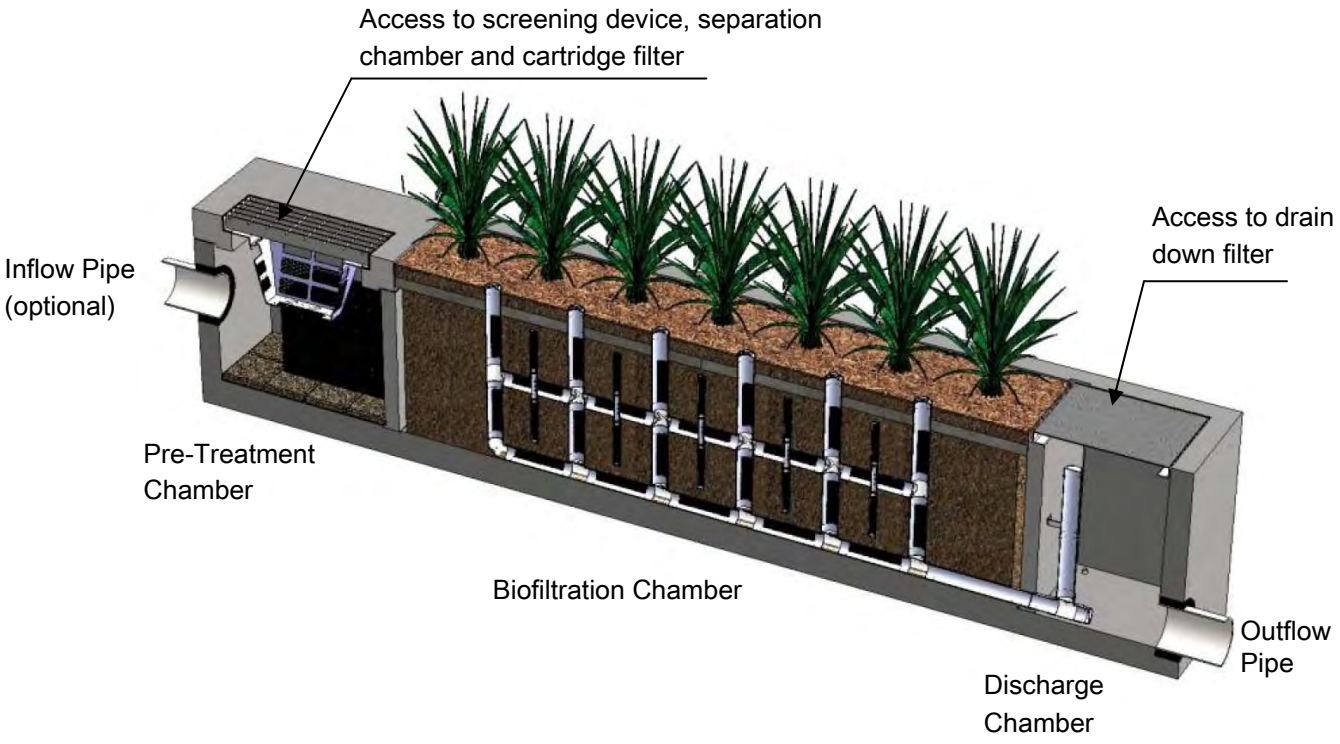
Operations and Maintenance (O&M) Plan

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

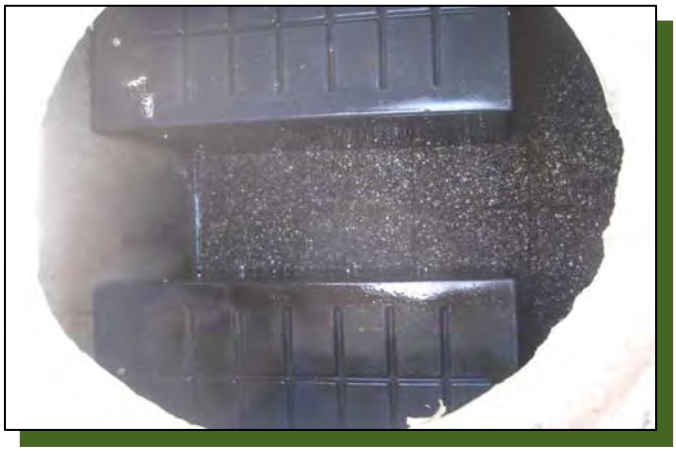
The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	**N1. Education for Property Owners, Tenants and Occupants** Educational materials will be provided to homeowners at close of escrow by the developer and thereafter on an annual basis by the HOA. Materials shall include those provided in Attachment A of the project WQMP and any updated materials.	At close of escrow and annually thereafter.	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Yes	**N2. Activity Restrictions** The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Yes	**N3. Common Area Landscape Management** Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Weekly	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N4. BMP Maintenance** Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing, as prescribed per WQMP.	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
No	**N5. Title 22 CCR Compliance** Not applicable to residential projects.		
No	**N6. Local Water Quality Permit Compliance** Not applicable. No local water quality permits are required for the operation of the project.		
No	**N7. Spill Contingency Plan** Not applicable to residential projects.		
No	**N8. Underground Storage Tank Compliance** Not applicable. None onsite.		
No	**N9. Hazardous Materials Disclosure Compliance** Not applicable to residential projects.		
No	**N10. Uniform Fire Code Implementation** Not applicable to residential projects.		
Yes	**N11. Common Area Litter Control** Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with landscape maintenance activities.	Ongoing patrols. Weekly (minimum) pick up and removal.	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N12. Employee Training** Train employees, contractors and subcontractors of HOA on the potential impacts of their actions on water quality. Provide training on proper material use and storage and proper clean up and disposal methods.	Annually and as needed	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
No	**N13. Housekeeping of Loading Docks** Not applicable. No loading docks onsite.		
Yes	**N14. Common Area Catch Basin Inspection** Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Yes	**N15. Street Sweeping Private Streets and Parking Lots** Streets must be swept at minimum, on a weekly basis. Streets shall also be swept as needed.	Weekly and as needed	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Structural Source Control BMPs			
Yes	**S1. Provide Storm Drain System Stenciling and Signage** Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**S2. Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction** Not applicable. No outdoor storage of hazardous materials onsite.		
Yes	**S3. Design Trash Enclosures to Reduce Pollutant Introduction** Inspect the integrity of structural elements that are subject to damage (i.e., screens, covers, and signs), make repairs as necessary.	Weekly	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Yes	**S4. Use Efficient Irrigation Systems and Landscape Design** In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Weekly	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
Yes	**S5. Protect Slopes and Channels** In conjunction with routine maintenance activities, inspect the vegetative cover and/or mulch on the project area slopes to eliminate exposed soils, and inspect the slopes to check for signs of erosion, gullies and sloughing.	Weekly and as needed	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
No	**S6. Loading Dock Areas** Not applicable. No loading docks onsite.		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**S7. Maintenance Bays and Docks** Not applicable. No maintenance bays onsite.		
No	**S8. Vehicle Wash Areas** Not applicable. Not vehicle wash areas onsite.		
No	**S9. Outdoor Processing Areas** Not applicable. No outdoor processing onsite.		
No	**S10. Equipment Wash Areas** Not applicable. No equipment wash areas onsite.		
No	**S11. Fueling Areas** Not applicable. No fueling areas onsite.		
Yes	**S12. Site Design and Landscape Planning (Hillside Landscaping)** In conjunction with routine maintenance activities, inspect the vegetative cover and/or mulch on the project area slopes to eliminate exposed soils, and inspect the slopes to check for signs of erosion, gullies and sloughing.	Weekly and as needed	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
No	**S13. Wash Water Controls for Food Preparation Areas** Not applicable. No restaurant facilities onsite.		
No	**S14. Community Car Wash Racks** Not applicable. No community car wash areas onsite.		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	Low Impact Development BMPs		
	HSC-2 Impervious Area Dispersion Inspect for standing water and that water infiltrates into underlying soil or evaporates completely.	After significant storm events and weekly with landscaping	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA
	Biotreatment BMP #1 **BIO-7. Proprietary Biotreatment (Modular Wetland System) –** a) Inspect unit for accumulated debris and sediment and plant health; remove trash from screening device and separation chamber; trim vegetation. b) Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media. c) Replace wetland media.	a) 6 to 12 months b) 1 to 2 years c) 20 years	Initially: Michael Battaglia CalAtlantic Homes Transferred to Owner/HOA upon close of escrow and/or formation of HOA

Required Permits

No additional permits are necessary for the operation and maintenane of the proposed BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained indefinitely and must be made available for review upon request.

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

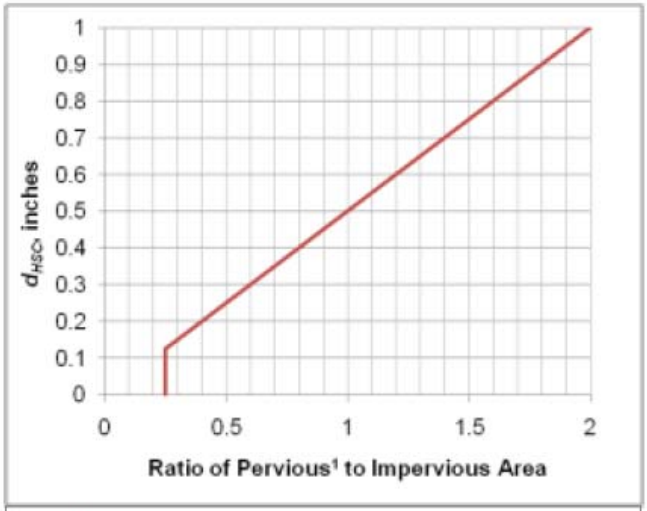
Attachment C

BMP Calculations, Feasibility Worksheets and Details

BMP Calculations

Worksheet A: Hydrologic Source Control Calculation Form

		Drainage area ID	DMA D	
		Total drainage area	0.50	acres
		Total drainage area Impervious Area (IA_{total})	0.50	acres
HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
Landscape	HSC-2 Impervious area dispersion. Paved areas and walkways to adjacent landscaping areas. Pervious/impervious ratio = 4.25 acres to 0.50 acres	Perv/Imp = 8.1:1 d_{hsc} = 1.0	0.50	0.5
		Box 1:	$\sum d_i \times IA_i$ =	0.5
		Box 2:	IA_{total} =	0.50
		[Box 1]/[Box 2]:	$d_{HSC\ total}$ =	1.0"
			*Percent Capture Provided by HSCs (*Table III.1*)*	80%



[1] Pervious area used in calculation should only include the pervious area receiving flow, not pervious area receiving only direct rainfall or upslope pervious drainage.

Worksheet A: Hydrologic Source Control Calculation Form

Table III.1: Fraction of Average Long Term Runoff Reduced (Capture Efficiency) by HSCs

Cumulative HSC Adjustment to Design Capture Storm Depth (d_{hsc})	Capture Efficiency Achieved Lowland Regions (<1,000 ft)	Capture Efficiency Achieved Mountainous Regions (>1,000 ft)
<0.05	0	0%
0.05"	8%	7%
0.1"	20%	16%
0.2"	37%	31%
0.3"	48%	42%
0.4"	57%	50%
0.5"	64%	57%
0.6"	70%	63%
0.7"	75%	68%
0.8"	80%	72%
0.9"	80%	76%
1.0"	80%	80%

Worksheet D: Capture Efficiency Method for Flow-Based BMPs – DMA-1

Step 1: Determine the design capture storm depth used for calculating volume						
			DMA 'A'	*DMA 'B'*	*DMA 'C'*	
1	Enter the time of concentration, T_c (min) (See Appendix IV.2) (per WinTR-55 Included herein)	T_c=	16.8 min (0.280 hr)	15.5 min (0.258 hr)	18.96 min (0.316 hr)	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.205	0.205	0.200	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	0	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	0	0	in/hr
6	Determine the design intensity that must be provided by BMP $I_{design} = I_1 - I_2$	I_{design}=	0.205	0.205	0.200	in/hr
			Step 2: Calculate the design flowrate			
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	27.3	19.7	74.6	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	36.3%	47.7%	33.9%	%
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.422	0.508	0.404	
4	Calculate design flow rate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	2.36	2.05	6.03	cfs
			Supporting Calculations			

Describe system: Runoff will be conveyed as sheet flow, gutter flow and pipe flow to water quality basins (dma a & c) or underground basin (dma B) before being treated by Modular Wetland Systems sized to achieve water quality objectives prior to discharging to the public storm drain system to the north.

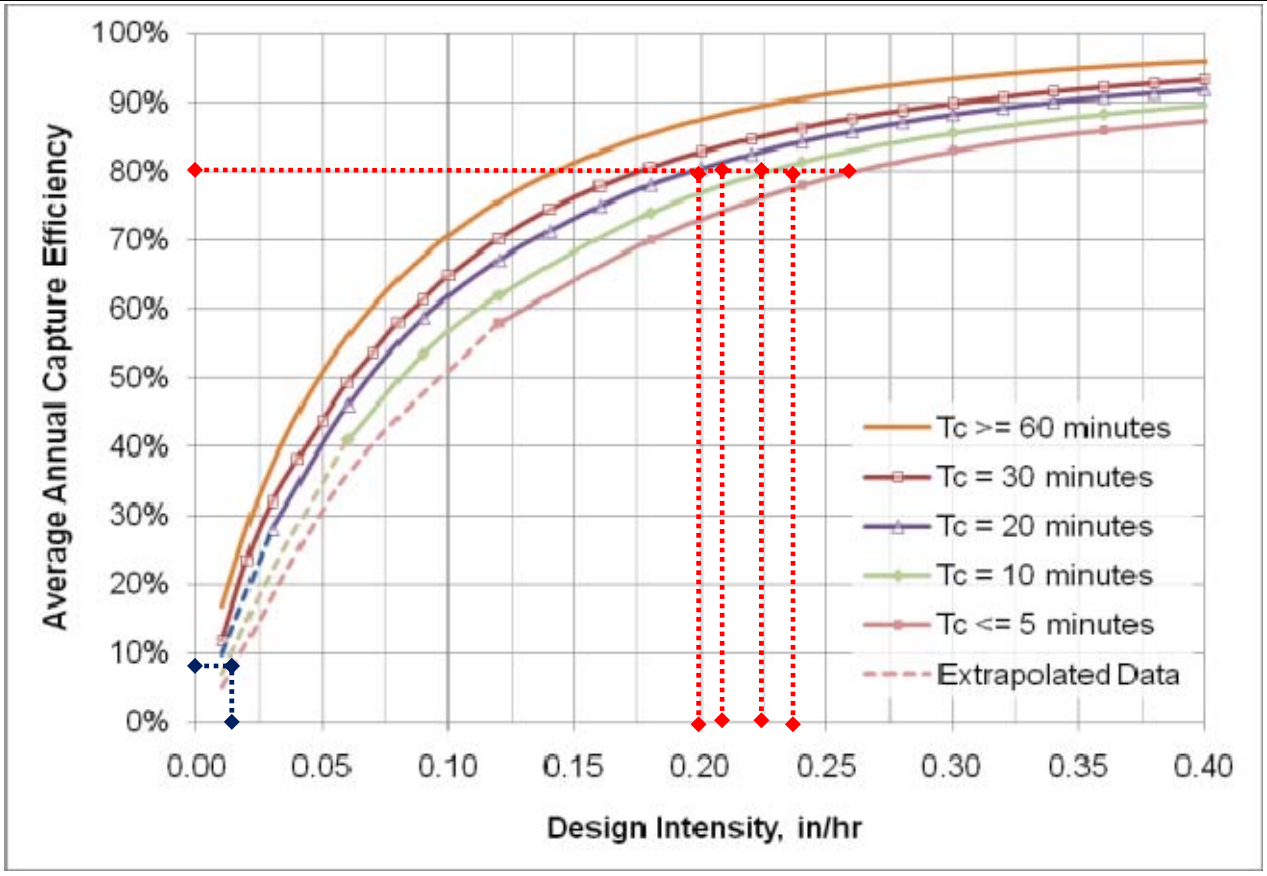
Provide time of concentration assumptions:
T_c is based on the WinTR-55 program calculations and are provided in this attachment.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs – DMA-1 (continued)

			DMA 'E-1'	*DMA 'E-2'*	*DMA 'F'*	
	Step 1: Determine the design capture storm depth used for calculating volume					
1	Enter the time of concentration, T_c (min) (See Appendix IV.2) (per hydrology analysis)	T_c=	12.5 min (0.209 hr)	12.5 min (0.209 hr)	7.5 min (0.125 hr)	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.225	0.225	0.235	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	0	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	0	0	in/hr
6	Determine the design intensity that must be provided by BMP $I_{design} = I_1 - I_2$	I_{design}=	0.225	0.225	0.235	in/hr
	Step 2: Calculate the design flowrate					
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	2.2	3.0	1.6	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	80.6%	69.7%	56.3%	%
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.754	0.673	0.572	
4	Calculate design flow rate, $Q_{design} = (C \times i_{design} \times A)$	Q_d=	0.367	0.460	0.215	cfs
	Supporting Calculations					
Describe system: Runoff will be conveyed as sheet flow and gutter flow towards and into Modular Wetland Systems (DMA E-1, E-2 & F) sized to achieve water quality objectives prior to discharging to the public storm drain system to the north.						
Provide time of concentration assumptions: T_c is based on the WinTR-55 program calculations and are provided in this attachment.						

Worksheet D: Capture Efficiency Method for Flow-Based BMPs – DMA-1 (continued)

Graphical Operations



WinTR-55 Current Data Description

--- Identification Data ---

User: Brian L
Project: La Habra
SubTitle: DMA 'A' PROPOSED
State: California
County: Orange
Filename: H:\0766\Engineering\WQMP\PARTS\TC Calcs\PR-DMA A.w55

Date: 1/17/2018
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
DMA 'A'	DMA 'A'	Outlet	27.3	87	.28
DMA 'B'	DMA 'B'	Outlet	19.7	89	0.258
DMA 'C'	DMA 'C'	Outlet	74.6	85	.316
DMA 'E'	DMA 'E'	Outlet	5.2	95	.209
DMA 'F'	DMA 'F'	Outlet	1.63	91	.125

Total area: 128.43 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.05	.0	.0	.0	.0	.0	.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type I
Dimensionless Unit Hydrograph: <standard>

La Habra
DMA 'A' PROPOSED
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 2-Yr (cfs) (hr)
SUBAREAS	
DMA 'A'	14.83 10.07
DMA 'B'	12.84 10.05
DMA 'C'	32.68 10.09
DMA 'E'	5.36 10.01
DMA 'F'	1.47 9.94
REACHES	
OUTLET	65.68

WinTR-20 Printed Page File Beginning of Input Data List
TR20.inp

WinTR-20: Version 1.10 0 0 0.05
La Habra
DMA 'A' PROPOSED

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316
DMA 'E'	Outlet	.00813	95.	.209
DMA 'F'	Outlet	.00255	91.	.125

STREAM REACH:

STORM ANALYSIS:
2-Yr 2.05 Type I 2

STRUCTURE RATING:

GLOBAL OUTPUT:
2 0.05 YYYYN YYYYNN

WinTR-20 Printed Page File End of Input Data List

La Habra
DMA 'A' PROPOSED

Name of printed page file:
TR20.out

STORM 2-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DMA 'A'	0.043		0.944		10.07	14.83	347.62

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.184	0.05	0.05	0.06	0.06	0.06	0.07	0.07
7.308	0.07	0.08	0.08	0.09	0.09	0.09	0.10
7.431	0.10	0.10	0.11	0.11	0.11	0.12	0.12
7.555	0.13	0.13	0.13	0.14	0.14	0.14	0.15
7.679	0.15	0.16	0.16	0.16	0.17	0.17	0.17
7.803	0.18	0.18	0.19	0.19	0.19	0.20	0.20
7.926	0.20	0.21	0.21	0.22	0.22	0.22	0.23
8.050	0.23	0.24	0.24	0.24	0.25	0.25	0.26
8.174	0.27	0.27	0.28	0.29	0.29	0.30	0.31
8.298	0.32	0.33	0.34	0.34	0.35	0.36	0.37
8.422	0.39	0.40	0.41	0.42	0.43	0.44	0.45
8.545	0.47	0.48	0.49	0.50	0.52	0.53	0.54
8.669	0.56	0.57	0.59	0.60	0.61	0.63	0.64
8.793	0.66	0.67	0.69	0.71	0.72	0.74	0.75
8.917	0.77	0.79	0.81	0.82	0.84	0.86	0.88
9.041	0.89	0.91	0.93	0.95	0.97	0.99	1.02
9.164	1.04	1.06	1.09	1.11	1.14	1.17	1.20
9.288	1.23	1.25	1.29	1.32	1.35	1.38	1.42
9.412	1.45	1.49	1.52	1.56	1.59	1.63	1.67
9.536	1.71	1.77	1.82	1.89	1.98	2.08	2.20

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

9.660	2.34	2.50	2.68	2.90	3.15	3.43	3.75
9.783	4.11	4.52	4.99	5.54	6.16	6.86	7.67
9.907	8.59	9.58	10.59	11.59	12.51	13.32	13.97
10.031	14.44	14.73	14.83	14.70	14.35	13.82	13.16
10.155	12.41	11.64	10.87	10.14	9.44	8.80	8.22
10.278	7.72	7.29	6.92	6.59	6.30	6.04	5.80
10.402	5.58	5.38	5.20	5.03	4.87	4.72	4.58
10.526	4.44	4.31	4.19	4.07	3.96	3.86	3.76
10.650	3.67	3.58	3.50	3.43	3.37	3.30	3.25
10.774	3.20	3.15	3.11	3.07	3.04	3.00	2.97
10.897	2.94	2.91	2.89	2.86	2.83	2.81	2.78
11.021	2.75	2.73	2.70	2.68	2.66	2.63	2.61
11.145	2.59	2.57	2.55	2.54	2.52	2.51	2.49
11.269	2.48	2.47	2.46	2.45	2.44	2.43	2.42
11.393	2.41	2.40	2.39	2.38	2.37	2.36	2.35
11.516	2.35	2.34	2.33	2.32	2.31	2.30	2.30
11.640	2.29	2.28	2.27	2.26	2.25	2.25	2.24
11.764	2.23	2.22	2.21	2.20	2.19	2.19	2.18
11.888	2.17	2.16	2.15	2.14	2.13	2.12	2.12
12.012	2.11	2.10	2.09	2.08	2.07	2.06	2.06

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)						
12.135	2.05	2.04	2.03	2.02	2.02	2.01	2.00
12.259	2.00	1.99	1.98	1.98	1.97	1.97	1.96
12.383	1.95	1.95	1.94	1.94	1.93	1.93	1.92
12.507	1.91	1.91	1.90	1.90	1.89	1.89	1.88
12.630	1.88	1.87	1.86	1.86	1.85	1.85	1.84
12.754	1.84	1.83	1.82	1.82	1.81	1.81	1.80
12.878	1.80	1.79	1.78	1.78	1.77	1.77	1.76
13.002	1.75	1.75	1.74	1.74	1.73	1.72	1.72
13.126	1.71	1.71	1.70	1.69	1.69	1.68	1.68
13.249	1.67	1.66	1.66	1.65	1.65	1.64	1.63
13.373	1.63	1.62	1.62	1.61	1.60	1.60	1.59
13.497	1.58	1.58	1.57	1.57	1.56	1.55	1.55
13.621	1.54	1.53	1.53	1.52	1.52	1.51	1.50
13.745	1.50	1.49	1.48	1.48	1.47	1.46	1.46
13.868	1.45	1.45	1.44	1.43	1.43	1.42	1.41
13.992	1.41	1.40	1.39	1.39	1.38	1.37	1.37
14.116	1.36	1.36	1.35	1.35	1.34	1.34	1.34
14.240	1.33	1.33	1.33	1.33	1.32	1.32	1.32
14.364	1.32	1.32	1.31	1.31	1.31	1.31	1.31
14.487	1.31	1.31	1.31	1.30	1.30	1.30	1.30
14.611	1.30	1.30	1.30	1.30	1.30	1.30	1.29
14.735	1.29	1.29	1.29	1.29	1.29	1.29	1.29
14.859	1.29	1.29	1.28	1.28	1.28	1.28	1.28
14.982	1.28	1.28	1.28	1.28	1.27	1.27	1.27
15.106	1.27	1.27	1.27	1.27	1.27	1.27	1.27
15.230	1.26	1.26	1.26	1.26	1.26	1.26	1.26

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

15.354	1.26	1.26	1.25	1.25	1.25	1.25	1.25
15.478	1.25	1.25	1.25	1.25	1.24	1.24	1.24
15.601	1.24	1.24	1.24	1.24	1.24	1.24	1.24
15.725	1.23	1.23	1.23	1.23	1.23	1.23	1.23
15.849	1.23	1.23	1.22	1.22	1.22	1.22	1.22
15.973	1.22	1.22	1.22	1.21	1.21	1.21	1.21
16.097	1.21	1.21	1.21	1.21	1.21	1.20	1.20
16.220	1.20	1.20	1.20	1.20	1.20	1.20	1.20
16.344	1.19	1.19	1.19	1.19	1.19	1.19	1.19
16.468	1.19	1.18	1.18	1.18	1.18	1.18	1.18
16.592	1.18	1.18	1.18	1.17	1.17	1.17	1.17
16.716	1.17	1.17	1.17	1.17	1.16	1.16	1.16
16.839	1.16	1.16	1.16	1.16	1.16	1.16	1.15
16.963	1.15	1.15	1.15	1.15	1.15	1.15	1.15
17.087	1.14	1.14	1.14	1.14	1.14	1.14	1.14
17.211	1.14	1.13	1.13	1.13	1.13	1.13	1.13
17.334	1.13	1.13	1.12	1.12	1.12	1.12	1.12
17.458	1.12	1.12	1.12	1.11	1.11	1.11	1.11
17.582	1.11	1.11	1.11	1.11	1.10	1.10	1.10
17.706	1.10	1.10	1.10	1.10	1.10	1.09	1.09
17.830	1.09	1.09	1.09	1.09	1.09	1.09	1.08
17.953	1.08	1.08	1.08	1.08	1.08	1.08	1.08
18.077	1.07	1.07	1.07	1.07	1.07	1.07	1.07
18.201	1.06	1.06	1.06	1.06	1.06	1.06	1.06
18.325	1.06	1.05	1.05	1.05	1.05	1.05	1.05

Line Start Time (hr)	Flow Values @ time increment of 0.018 hr (cfs)						
18.449	1.05	1.05	1.04	1.04	1.04	1.04	1.04
18.572	1.04	1.04	1.03	1.03	1.03	1.03	1.03
18.696	1.03	1.03	1.03	1.02	1.02	1.02	1.02
18.820	1.02	1.02	1.02	1.01	1.01	1.01	1.01
18.944	1.01	1.01	1.01	1.01	1.00	1.00	1.00
19.068	1.00	1.00	1.00	1.00	0.99	0.99	0.99
19.191	0.99	0.99	0.99	0.99	0.99	0.98	0.98
19.315	0.98	0.98	0.98	0.98	0.98	0.97	0.97
19.439	0.97	0.97	0.97	0.97	0.97	0.97	0.96
19.563	0.96	0.96	0.96	0.96	0.96	0.96	0.95
19.686	0.95	0.95	0.95	0.95	0.95	0.95	0.94
19.810	0.94	0.94	0.94	0.94	0.94	0.94	0.93
19.934	0.93	0.93	0.93	0.93	0.93	0.93	0.92
20.058	0.92	0.92	0.92	0.92	0.92	0.92	0.92
20.182	0.91	0.91	0.91	0.91	0.91	0.91	0.91
20.305	0.90	0.90	0.90	0.90	0.90	0.90	0.90
20.429	0.89	0.89	0.89	0.89	0.89	0.89	0.89
20.553	0.88	0.88	0.88	0.88	0.88	0.88	0.88
20.677	0.87	0.87	0.87	0.87	0.87	0.87	0.87
20.801	0.86	0.86	0.86	0.86	0.86	0.86	0.86
20.924	0.85	0.85	0.85	0.85	0.85	0.85	0.85

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

21.048	0.84	0.84	0.84	0.84	0.84	0.84	0.84
21.172	0.83	0.83	0.83	0.83	0.83	0.83	0.83
21.296	0.82	0.82	0.82	0.82	0.82	0.82	0.82
21.420	0.81	0.81	0.81	0.81	0.81	0.81	0.81
21.543	0.80	0.80	0.80	0.80	0.80	0.80	0.80
21.667	0.79	0.79	0.79	0.79	0.79	0.79	0.79
21.791	0.78	0.78	0.78	0.78	0.78	0.78	0.77
21.915	0.77	0.77	0.77	0.77	0.77	0.77	0.76
22.038	0.76	0.76	0.76	0.76	0.76	0.76	0.75
22.162	0.75	0.75	0.75	0.75	0.75	0.75	0.74
22.286	0.74	0.74	0.74	0.74	0.74	0.74	0.73
22.410	0.73	0.73	0.73	0.73	0.73	0.72	0.72
22.534	0.72	0.72	0.72	0.72	0.72	0.71	0.71
22.657	0.71	0.71	0.71	0.71	0.71	0.70	0.70
22.781	0.70	0.70	0.70	0.70	0.69	0.69	0.69
22.905	0.69	0.69	0.69	0.69	0.68	0.68	0.68
23.029	0.68	0.68	0.68	0.68	0.67	0.67	0.67
23.153	0.67	0.67	0.67	0.67	0.66	0.66	0.66
23.276	0.66	0.66	0.66	0.65	0.65	0.65	0.65
23.400	0.65	0.65	0.65	0.64	0.64	0.64	0.64
23.524	0.64	0.64	0.63	0.63	0.63	0.63	0.63
23.648	0.63	0.63	0.62	0.62	0.62	0.62	0.62
23.772	0.62	0.62	0.61	0.61	0.61	0.61	0.61
23.895	0.61	0.60	0.60	0.60	0.60	0.60	0.60
24.019	0.59	0.59	0.58	0.56	0.54	0.51	0.47
24.143	0.43	0.39	0.34	0.30	0.26	0.22	0.19
24.267	0.16	0.13	0.11	0.10	0.08	0.07	0.06

La Habra
DMA 'A' PROPOSED

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DMA 'B'	0.031		1.069		10.05	12.84	417.30

Line Start Time (hr)	Flow Values @ time increment of 0.016 hr (cfs)						
6.527	0.05	0.05	0.06	0.06	0.06	0.06	0.06
6.641	0.07	0.07	0.07	0.07	0.08	0.08	0.08
6.756	0.08	0.09	0.09	0.09	0.09	0.10	0.10
6.870	0.10	0.10	0.11	0.11	0.11	0.11	0.12
6.984	0.12	0.12	0.13	0.13	0.13	0.13	0.14
7.098	0.14	0.14	0.15	0.15	0.15	0.15	0.16
7.212	0.16	0.16	0.17	0.17	0.17	0.17	0.18
7.326	0.18	0.18	0.19	0.19	0.19	0.19	0.20
7.440	0.20	0.20	0.21	0.21	0.21	0.21	0.22
7.554	0.22	0.22	0.22	0.23	0.23	0.23	0.24

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28			
DMA 'B'	Outlet	.03078	89.	.258			
DMA 'C'	Outlet	.11656	85.	.316			

7.668	0.24	0.24	0.24	0.25	0.25	0.25	0.25
7.782	0.26	0.26	0.26	0.27	0.27	0.27	0.27
7.896	0.28	0.28	0.28	0.29	0.29	0.29	0.29
8.010	0.30	0.30	0.30	0.31	0.31	0.31	0.32
8.124	0.32	0.33	0.33	0.34	0.34	0.35	0.35
8.238	0.36	0.37	0.38	0.38	0.39	0.40	0.41
8.352	0.42	0.43	0.43	0.44	0.45	0.46	0.47
8.466	0.48	0.49	0.50	0.51	0.52	0.54	0.55
8.581	0.56	0.57	0.58	0.59	0.60	0.61	0.63
8.695	0.64	0.65	0.66	0.67	0.69	0.70	0.71
8.809	0.72	0.74	0.75	0.76	0.78	0.79	0.80
8.923	0.82	0.83	0.84	0.86	0.87	0.89	0.90
9.037	0.92	0.93	0.95	0.96	0.98	1.00	1.01
9.151	1.03	1.05	1.07	1.09	1.11	1.13	1.16
9.265	1.18	1.20	1.23	1.25	1.28	1.30	1.33
9.379	1.35	1.38	1.41	1.44	1.46	1.49	1.52
9.493	1.55	1.58	1.61	1.65	1.70	1.75	1.82
9.607	1.89	1.98	2.09	2.21	2.35	2.51	2.69
9.721	2.89	3.13	3.38	3.67	3.99	4.35	4.76
9.835	5.23	5.75	6.33	6.99	7.75	8.56	9.39
9.949	10.19	10.94	11.59	12.12	12.51	12.75	12.84
10.063	12.78	12.54	12.14	11.62	11.00	10.33	9.67
10.177	9.01	8.39	7.80	7.26	6.77	6.36	6.01
10.291	5.70	5.43	5.19	4.97	4.78	4.60	4.45
10.406	4.30	4.16	4.03	3.92	3.80	3.70	3.60
10.520	3.50	3.40	3.31	3.23	3.15	3.07	3.00
10.634	2.93	2.86	2.80	2.75	2.70	2.66	2.61
10.748	2.58	2.54	2.51	2.48	2.45	2.43	2.40
10.862	2.38	2.36	2.34	2.32	2.30	2.28	2.26
10.976	2.24	2.22	2.20	2.18	2.16	2.14	2.12
11.090	2.11	2.09	2.07	2.06	2.04	2.03	2.02
11.204	2.01	2.00	1.99	1.98	1.97	1.96	1.95
11.318	1.94	1.93	1.93	1.92	1.91	1.91	1.90
11.432	1.89	1.89	1.88	1.87	1.87	1.86	1.85
11.546	1.85	1.84	1.83	1.83	1.82	1.82	1.81

Line Start Time (hr)	Flow Values @ time increment of 0.016 hr (cfs)						
11.660	1.80	1.80	1.79	1.78	1.78	1.77	1.76
11.774	1.76	1.75	1.74	1.74	1.73	1.72	1.72
11.888	1.71	1.71	1.70	1.69	1.68	1.68	1.67
12.002	1.66	1.66	1.65	1.64	1.64	1.63	1.63
12.116	1.62	1.61	1.61	1.60	1.60	1.59	1.59
12.231	1.58	1.58	1.57	1.57	1.56	1.56	1.55
12.345	1.55	1.54	1.54	1.53	1.53	1.53	1.52
12.459	1.52	1.51	1.51	1.50	1.50	1.50	1.49
12.573	1.49	1.48	1.48	1.48	1.47	1.47	1.46
12.687	1.46	1.45	1.45	1.45	1.44	1.44	1.43
12.801	1.43	1.42	1.42	1.41	1.41	1.41	1.40

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

12.915	1.40	1.39	1.39	1.38	1.38	1.38	1.37
13.029	1.37	1.36	1.36	1.35	1.35	1.34	1.34
13.143	1.34	1.33	1.33	1.32	1.32	1.31	1.31
13.257	1.30	1.30	1.29	1.29	1.29	1.28	1.28
13.371	1.27	1.27	1.26	1.26	1.25	1.25	1.24
13.485	1.24	1.24	1.23	1.23	1.22	1.22	1.21
13.599	1.21	1.20	1.20	1.19	1.19	1.18	1.18
13.713	1.18	1.17	1.17	1.16	1.16	1.15	1.15
13.827	1.14	1.14	1.13	1.13	1.12	1.12	1.11
13.941	1.11	1.10	1.10	1.09	1.09	1.09	1.08
14.056	1.08	1.07	1.07	1.06	1.06	1.06	1.05
14.170	1.05	1.05	1.04	1.04	1.04	1.04	1.03
14.284	1.03	1.03	1.03	1.03	1.03	1.03	1.03
14.398	1.02	1.02	1.02	1.02	1.02	1.02	1.02
14.512	1.02	1.02	1.02	1.02	1.01	1.01	1.01
14.626	1.01	1.01	1.01	1.01	1.01	1.01	1.01
14.740	1.01	1.01	1.01	1.00	1.00	1.00	1.00
14.854	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14.968	1.00	0.99	0.99	0.99	0.99	0.99	0.99
15.082	0.99	0.99	0.99	0.99	0.99	0.99	0.99
15.196	0.98	0.98	0.98	0.98	0.98	0.98	0.98
15.310	0.98	0.98	0.98	0.98	0.98	0.97	0.97
15.424	0.97	0.97	0.97	0.97	0.97	0.97	0.97
15.538	0.97	0.97	0.97	0.96	0.96	0.96	0.96
15.652	0.96	0.96	0.96	0.96	0.96	0.96	0.96
15.766	0.96	0.95	0.95	0.95	0.95	0.95	0.95
15.881	0.95	0.95	0.95	0.95	0.95	0.95	0.94
15.995	0.94	0.94	0.94	0.94	0.94	0.94	0.94
16.109	0.94	0.94	0.94	0.93	0.93	0.93	0.93
16.223	0.93	0.93	0.93	0.93	0.93	0.93	0.93
16.337	0.93	0.92	0.92	0.92	0.92	0.92	0.92
16.451	0.92	0.92	0.92	0.92	0.92	0.91	0.91
16.565	0.91	0.91	0.91	0.91	0.91	0.91	0.91
16.679	0.91	0.91	0.90	0.90	0.90	0.90	0.90
16.793	0.90	0.90	0.90	0.90	0.90	0.90	0.89
16.907	0.89	0.89	0.89	0.89	0.89	0.89	0.89
17.021	0.89	0.89	0.89	0.89	0.88	0.88	0.88
17.135	0.88	0.88	0.88	0.88	0.88	0.88	0.88
17.249	0.87	0.87	0.87	0.87	0.87	0.87	0.87
17.363	0.87	0.87	0.87	0.87	0.86	0.86	0.86

Line Start Time (hr)	Flow Values @ time increment of 0.016 hr (cfs)						
17.477	0.86	0.86	0.86	0.86	0.86	0.86	0.86
17.592	0.86	0.85	0.85	0.85	0.85	0.85	0.85
17.706	0.85	0.85	0.85	0.85	0.85	0.84	0.84
17.820	0.84	0.84	0.84	0.84	0.84	0.84	0.84
17.934	0.84	0.83	0.83	0.83	0.83	0.83	0.83
18.048	0.83	0.83	0.83	0.83	0.83	0.82	0.82

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

18.162	0.82	0.82	0.82	0.82	0.82	0.82	0.82
18.276	0.82	0.82	0.81	0.81	0.81	0.81	0.81
18.390	0.81	0.81	0.81	0.81	0.81	0.80	0.80
18.504	0.80	0.80	0.80	0.80	0.80	0.80	0.80
18.618	0.80	0.79	0.79	0.79	0.79	0.79	0.79
18.732	0.79	0.79	0.79	0.79	0.79	0.78	0.78
18.846	0.78	0.78	0.78	0.78	0.78	0.78	0.78
18.960	0.78	0.77	0.77	0.77	0.77	0.77	0.77
19.074	0.77	0.77	0.77	0.77	0.76	0.76	0.76
19.188	0.76	0.76	0.76	0.76	0.76	0.76	0.76
19.302	0.75	0.75	0.75	0.75	0.75	0.75	0.75
19.417	0.75	0.75	0.75	0.74	0.74	0.74	0.74
19.531	0.74	0.74	0.74	0.74	0.74	0.74	0.74
19.645	0.73	0.73	0.73	0.73	0.73	0.73	0.73
19.759	0.73	0.73	0.73	0.72	0.72	0.72	0.72
19.873	0.72	0.72	0.72	0.72	0.72	0.72	0.71
19.987	0.71	0.71	0.71	0.71	0.71	0.71	0.71
20.101	0.71	0.70	0.70	0.70	0.70	0.70	0.70
20.215	0.70	0.70	0.70	0.70	0.69	0.69	0.69
20.329	0.69	0.69	0.69	0.69	0.69	0.69	0.69
20.443	0.68	0.68	0.68	0.68	0.68	0.68	0.68
20.557	0.68	0.68	0.68	0.67	0.67	0.67	0.67
20.671	0.67	0.67	0.67	0.67	0.67	0.67	0.66
20.785	0.66	0.66	0.66	0.66	0.66	0.66	0.66
20.899	0.66	0.66	0.65	0.65	0.65	0.65	0.65
21.013	0.65	0.65	0.65	0.65	0.64	0.64	0.64
21.127	0.64	0.64	0.64	0.64	0.64	0.64	0.64
21.242	0.63	0.63	0.63	0.63	0.63	0.63	0.63
21.356	0.63	0.63	0.63	0.62	0.62	0.62	0.62
21.470	0.62	0.62	0.62	0.62	0.62	0.61	0.61
21.584	0.61	0.61	0.61	0.61	0.61	0.61	0.61
21.698	0.61	0.60	0.60	0.60	0.60	0.60	0.60
21.812	0.60	0.60	0.60	0.59	0.59	0.59	0.59
21.926	0.59	0.59	0.59	0.59	0.59	0.59	0.58
22.040	0.58	0.58	0.58	0.58	0.58	0.58	0.58
22.154	0.58	0.57	0.57	0.57	0.57	0.57	0.57
22.268	0.57	0.57	0.57	0.57	0.56	0.56	0.56
22.382	0.56	0.56	0.56	0.56	0.56	0.56	0.55
22.496	0.55	0.55	0.55	0.55	0.55	0.55	0.55
22.610	0.55	0.55	0.54	0.54	0.54	0.54	0.54
22.724	0.54	0.54	0.54	0.54	0.53	0.53	0.53
22.838	0.53	0.53	0.53	0.53	0.53	0.53	0.53
22.952	0.52	0.52	0.52	0.52	0.52	0.52	0.52
23.067	0.52	0.52	0.51	0.51	0.51	0.51	0.51
23.181	0.51	0.51	0.51	0.51	0.50	0.50	0.50

Line Start Time (hr)	Flow Values @ time increment of 0.016 hr (cfs)						
23.295	0.50	0.50	0.50	0.50	0.50	0.50	0.50

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

23.409	0.49	0.49	0.49	0.49	0.49	0.49	0.49
23.523	0.49	0.49	0.48	0.48	0.48	0.48	0.48
23.637	0.48	0.48	0.48	0.48	0.47	0.47	0.47
23.751	0.47	0.47	0.47	0.47	0.47	0.47	0.47
23.865	0.46	0.46	0.46	0.46	0.46	0.46	0.46
23.979	0.46	0.46	0.45	0.45	0.44	0.43	0.42
24.093	0.40	0.37	0.34	0.31	0.27	0.24	0.21
24.207	0.18	0.15	0.13	0.11	0.09	0.08	0.07
24.321	0.06						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DMA 'C'	0.117		0.832		10.09	32.68	280.37

Line Start Time (hr) — Flow Values @ time increment of 0.020 hr (cfs)

7.755	0.05	0.06	0.07	0.08	0.09	0.09	0.10
7.895	0.11	0.12	0.13	0.14	0.15	0.16	0.17
8.034	0.19	0.20	0.21	0.22	0.23	0.24	0.25
8.174	0.27	0.28	0.29	0.31	0.32	0.34	0.36
8.314	0.38	0.39	0.41	0.43	0.45	0.48	0.50
8.453	0.52	0.55	0.57	0.60	0.62	0.65	0.68
8.593	0.71	0.74	0.77	0.80	0.83	0.86	0.89
8.733	0.93	0.96	1.00	1.03	1.07	1.11	1.14
8.873	1.18	1.22	1.26	1.30	1.34	1.39	1.43
9.012	1.47	1.52	1.57	1.61	1.66	1.71	1.77
9.152	1.82	1.88	1.94	2.00	2.06	2.13	2.19
9.292	2.27	2.34	2.41	2.49	2.57	2.66	2.74
9.431	2.83	2.92	3.01	3.10	3.20	3.30	3.42
9.571	3.56	3.71	3.90	4.13	4.40	4.72	5.10
9.711	5.55	6.08	6.71	7.43	8.25	9.22	10.36
9.851	11.71	13.28	15.10	17.18	19.48	21.89	24.32
9.990	26.64	28.71	30.39	31.62	32.40	32.68	32.39
10.130	31.56	30.32	28.81	27.15	25.45	23.80	22.22
10.270	20.74	19.40	18.22	17.21	16.32	15.54	14.85
10.409	14.22	13.64	13.10	12.61	12.16	11.74	11.34
10.549	10.96	10.61	10.27	9.96	9.66	9.39	9.13
10.689	8.89	8.67	8.47	8.29	8.13	7.98	7.84
10.828	7.71	7.59	7.48	7.38	7.29	7.20	7.12
10.968	7.04	6.96	6.89	6.81	6.74	6.68	6.61
11.108	6.55	6.49	6.43	6.37	6.32	6.27	6.23
11.248	6.18	6.15	6.11	6.08	6.04	6.02	5.99
11.387	5.96	5.93	5.91	5.89	5.86	5.84	5.82
11.527	5.79	5.77	5.75	5.73	5.70	5.68	5.66
11.667	5.64	5.61	5.59	5.57	5.55	5.53	5.50
11.806	5.48	5.46	5.44	5.41	5.39	5.37	5.34

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

Line Start Time (hr)	Flow Values @ time increment of 0.020 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.946	5.32	5.30	5.27	5.25	5.23	5.20	5.18
12.086	5.16	5.13	5.11	5.09	5.07	5.05	5.03
12.226	5.01	4.99	4.97	4.95	4.94	4.92	4.90
12.365	4.89	4.87	4.85	4.84	4.82	4.81	4.79
12.505	4.78	4.76	4.75	4.73	4.72	4.70	4.69
12.645	4.67	4.66	4.64	4.63	4.61	4.60	4.58
12.784	4.57	4.55	4.53	4.52	4.50	4.49	4.47
12.924	4.46	4.44	4.43	4.41	4.39	4.38	4.36
13.064	4.35	4.33	4.31	4.30	4.28	4.26	4.25
13.203	4.23	4.22	4.20	4.18	4.17	4.15	4.13
13.343	4.12	4.10	4.08	4.07	4.05	4.03	4.01
13.483	4.00	3.98	3.96	3.95	3.93	3.91	3.89
13.623	3.88	3.86	3.84	3.82	3.81	3.79	3.77
13.762	3.75	3.74	3.72	3.70	3.68	3.67	3.65
13.902	3.63	3.61	3.59	3.58	3.56	3.54	3.52
14.042	3.50	3.49	3.47	3.45	3.44	3.42	3.41
14.181	3.39	3.38	3.37	3.36	3.35	3.34	3.34
14.321	3.33	3.32	3.32	3.31	3.31	3.30	3.30
14.461	3.30	3.29	3.29	3.29	3.28	3.28	3.28
14.601	3.27	3.27	3.27	3.27	3.26	3.26	3.26
14.740	3.25	3.25	3.25	3.25	3.24	3.24	3.24
14.880	3.24	3.23	3.23	3.23	3.23	3.22	3.22
15.020	3.22	3.21	3.21	3.21	3.21	3.20	3.20
15.159	3.20	3.20	3.19	3.19	3.19	3.18	3.18
15.299	3.18	3.18	3.17	3.17	3.17	3.16	3.16
15.439	3.16	3.16	3.15	3.15	3.15	3.14	3.14
15.578	3.14	3.14	3.13	3.13	3.13	3.12	3.12
15.718	3.12	3.12	3.11	3.11	3.11	3.10	3.10
15.858	3.10	3.09	3.09	3.09	3.09	3.08	3.08
15.998	3.08	3.07	3.07	3.07	3.06	3.06	3.06
16.137	3.06	3.05	3.05	3.05	3.04	3.04	3.04
16.277	3.03	3.03	3.03	3.02	3.02	3.02	3.02
16.417	3.01	3.01	3.01	3.00	3.00	3.00	2.99
16.556	2.99	2.99	2.98	2.98	2.98	2.97	2.97
16.696	2.97	2.96	2.96	2.96	2.95	2.95	2.95
16.836	2.95	2.94	2.94	2.94	2.93	2.93	2.93
16.975	2.92	2.92	2.92	2.91	2.91	2.91	2.90
17.115	2.90	2.90	2.89	2.89	2.89	2.88	2.88
17.255	2.88	2.87	2.87	2.87	2.86	2.86	2.86
17.395	2.85	2.85	2.85	2.84	2.84	2.84	2.83
17.534	2.83	2.82	2.82	2.82	2.81	2.81	2.81
17.674	2.80	2.80	2.80	2.79	2.79	2.79	2.78
17.814	2.78	2.78	2.77	2.77	2.77	2.76	2.76
17.953	2.76	2.75	2.75	2.74	2.74	2.74	2.73
18.093	2.73	2.73	2.72	2.72	2.72	2.71	2.71
18.233	2.71	2.70	2.70	2.69	2.69	2.69	2.68
18.373	2.68	2.68	2.67	2.67	2.67	2.66	2.66
18.512	2.65	2.65	2.65	2.64	2.64	2.64	2.63
18.652	2.63	2.63	2.62	2.62	2.61	2.61	2.61
18.792	2.60	2.60	2.60	2.59	2.59	2.59	2.58
18.931	2.58	2.57	2.57	2.57	2.56	2.56	2.56

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

La Habra
DMA 'A' PROPOSED

Line Start Time (hr)	Flow Values @ time increment of 0.020 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
19.071	2.55	2.55	2.54	2.54	2.54	2.53	2.53
19.211	2.53	2.52	2.52	2.51	2.51	2.51	2.50
19.350	2.50	2.49	2.49	2.49	2.48	2.48	2.48
19.490	2.47	2.47	2.46	2.46	2.46	2.45	2.45
19.630	2.45	2.44	2.44	2.43	2.43	2.43	2.42
19.770	2.42	2.41	2.41	2.41	2.40	2.40	2.39
19.909	2.39	2.39	2.38	2.38	2.38	2.37	2.37
20.049	2.36	2.36	2.36	2.35	2.35	2.34	2.34
20.189	2.34	2.33	2.33	2.32	2.32	2.32	2.31
20.328	2.31	2.30	2.30	2.30	2.29	2.29	2.28
20.468	2.28	2.28	2.27	2.27	2.26	2.26	2.26
20.608	2.25	2.25	2.24	2.24	2.24	2.23	2.23
20.748	2.22	2.22	2.22	2.21	2.21	2.20	2.20
20.887	2.20	2.19	2.19	2.18	2.18	2.18	2.17
21.027	2.17	2.16	2.16	2.16	2.15	2.15	2.14
21.167	2.14	2.14	2.13	2.13	2.12	2.12	2.12
21.306	2.11	2.11	2.10	2.10	2.09	2.09	2.09
21.446	2.08	2.08	2.07	2.07	2.07	2.06	2.06
21.586	2.05	2.05	2.05	2.04	2.04	2.03	2.03
21.725	2.02	2.02	2.02	2.01	2.01	2.00	2.00
21.865	2.00	1.99	1.99	1.98	1.98	1.97	1.97
22.005	1.97	1.96	1.96	1.95	1.95	1.95	1.94
22.145	1.94	1.93	1.93	1.92	1.92	1.92	1.91
22.284	1.91	1.90	1.90	1.89	1.89	1.89	1.88
22.424	1.88	1.87	1.87	1.87	1.86	1.86	1.85
22.564	1.85	1.84	1.84	1.84	1.83	1.83	1.82
22.703	1.82	1.81	1.81	1.81	1.80	1.80	1.79
22.843	1.79	1.78	1.78	1.78	1.77	1.77	1.76
22.983	1.76	1.75	1.75	1.75	1.74	1.74	1.73
23.123	1.73	1.72	1.72	1.72	1.71	1.71	1.70
23.262	1.70	1.69	1.69	1.69	1.68	1.68	1.67
23.402	1.67	1.66	1.66	1.66	1.65	1.65	1.64
23.542	1.64	1.63	1.63	1.63	1.62	1.62	1.61
23.681	1.61	1.60	1.60	1.59	1.59	1.59	1.58
23.821	1.58	1.57	1.57	1.56	1.56	1.56	1.55
23.961	1.55	1.54	1.54	1.53	1.51	1.49	1.45
24.100	1.39	1.31	1.22	1.11	1.00	0.89	0.77
24.240	0.67	0.57	0.48	0.41	0.34	0.29	0.25
24.380	0.21	0.18	0.15	0.13	0.11	0.09	0.08
24.520	0.07	0.06					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DMA 'E'	0.008		1.524		10.01	5.36	658.70

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

La Habra
DMA 'A' PROPOSED

Line Start Time (hr)	Flow Values @ time increment of 0.013 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.385	0.05	0.05	0.05	0.05	0.05	0.05	0.05
4.477	0.05	0.05	0.05	0.05	0.06	0.06	0.06
4.570	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.662	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.754	0.06	0.06	0.06	0.06	0.07	0.07	0.07
4.847	0.07	0.07	0.07	0.07	0.07	0.07	0.07
4.939	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5.032	0.07	0.07	0.07	0.07	0.07	0.07	0.08
5.124	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.216	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.309	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.401	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.494	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.586	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.678	0.09	0.09	0.09	0.10	0.10	0.10	0.10
5.771	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.863	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.956	0.10	0.10	0.10	0.10	0.10	0.10	0.11
6.048	0.11	0.11	0.11	0.11	0.11	0.11	0.11
6.140	0.11	0.11	0.11	0.11	0.11	0.11	0.11
6.233	0.11	0.12	0.12	0.12	0.12	0.12	0.12
6.325	0.12	0.12	0.12	0.12	0.13	0.13	0.13
6.418	0.13	0.13	0.13	0.13	0.13	0.13	0.13
6.510	0.14	0.14	0.14	0.14	0.14	0.14	0.14
6.602	0.14	0.14	0.15	0.15	0.15	0.15	0.15
6.695	0.15	0.15	0.15	0.15	0.16	0.16	0.16
6.787	0.16	0.16	0.16	0.16	0.16	0.17	0.17
6.880	0.17	0.17	0.17	0.17	0.17	0.17	0.17
6.972	0.18	0.18	0.18	0.18	0.18	0.18	0.18
7.064	0.18	0.19	0.19	0.19	0.19	0.19	0.19
7.157	0.19	0.19	0.19	0.19	0.20	0.20	0.20
7.249	0.20	0.20	0.20	0.20	0.20	0.20	0.20
7.342	0.20	0.20	0.21	0.21	0.21	0.21	0.21
7.434	0.21	0.21	0.21	0.21	0.21	0.21	0.21
7.526	0.21	0.22	0.22	0.22	0.22	0.22	0.22
7.619	0.22	0.22	0.22	0.22	0.22	0.22	0.22
7.711	0.22	0.23	0.23	0.23	0.23	0.23	0.23
7.804	0.23	0.23	0.23	0.23	0.23	0.23	0.23
7.896	0.24	0.24	0.24	0.24	0.24	0.24	0.24
7.988	0.24	0.24	0.24	0.24	0.24	0.24	0.25
8.081	0.25	0.25	0.25	0.25	0.25	0.26	0.26
8.173	0.26	0.26	0.27	0.27	0.27	0.28	0.28

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

8.266	0.28	0.29	0.29	0.29	0.30	0.30	0.31
8.358	0.31	0.31	0.32	0.32	0.33	0.33	0.34
8.450	0.34	0.34	0.35	0.35	0.36	0.36	0.37
8.543	0.37	0.37	0.38	0.38	0.39	0.39	0.40
8.635	0.40	0.41	0.41	0.42	0.42	0.42	0.43
8.728	0.43	0.44	0.44	0.45	0.45	0.46	0.46
8.820	0.47	0.47	0.47	0.48	0.48	0.49	0.49
8.912	0.50	0.50	0.51	0.51	0.52	0.52	0.53
9.005	0.53	0.54	0.54	0.55	0.55	0.56	0.56

Line Start Time (hr)	Flow Values @ time increment of 0.013 hr (cfs)						
9.097	0.57	0.57	0.58	0.59	0.59	0.60	0.61
9.190	0.61	0.62	0.63	0.64	0.64	0.65	0.66
9.282	0.67	0.68	0.69	0.69	0.70	0.71	0.72
9.374	0.73	0.74	0.75	0.76	0.77	0.77	0.78
9.467	0.79	0.80	0.81	0.82	0.83	0.84	0.86
9.559	0.88	0.90	0.93	0.97	1.00	1.05	1.09
9.652	1.14	1.20	1.27	1.35	1.43	1.51	1.60
9.744	1.70	1.81	1.93	2.07	2.21	2.36	2.53
9.836	2.71	2.90	3.12	3.38	3.65	3.95	4.24
9.929	4.51	4.76	4.98	5.15	5.27	5.34	5.36
10.021	5.33	5.26	5.15	4.99	4.80	4.57	4.31
10.114	4.04	3.77	3.50	3.25	3.01	2.79	2.60
10.206	2.43	2.29	2.17	2.06	1.97	1.88	1.81
10.298	1.74	1.68	1.63	1.58	1.53	1.49	1.45
10.391	1.41	1.38	1.35	1.32	1.29	1.26	1.23
10.483	1.20	1.17	1.15	1.12	1.10	1.08	1.06
10.576	1.04	1.02	1.00	0.98	0.96	0.95	0.93
10.668	0.92	0.91	0.90	0.88	0.88	0.87	0.86
10.760	0.85	0.84	0.84	0.83	0.82	0.82	0.81
10.853	0.80	0.80	0.79	0.78	0.78	0.77	0.77
10.945	0.76	0.76	0.75	0.75	0.74	0.73	0.73
11.038	0.72	0.72	0.71	0.71	0.70	0.70	0.69
11.130	0.69	0.69	0.68	0.68	0.68	0.67	0.67
11.222	0.67	0.66	0.66	0.66	0.66	0.65	0.65
11.315	0.65	0.65	0.65	0.64	0.64	0.64	0.64
11.407	0.64	0.63	0.63	0.63	0.63	0.63	0.62
11.500	0.62	0.62	0.62	0.62	0.61	0.61	0.61
11.592	0.61	0.61	0.60	0.60	0.60	0.60	0.60
11.684	0.59	0.59	0.59	0.59	0.59	0.58	0.58
11.777	0.58	0.58	0.58	0.57	0.57	0.57	0.57
11.869	0.57	0.57	0.56	0.56	0.56	0.56	0.56
11.962	0.55	0.55	0.55	0.55	0.55	0.54	0.54
12.054	0.54	0.54	0.54	0.53	0.53	0.53	0.53
12.146	0.53	0.53	0.52	0.52	0.52	0.52	0.52
12.239	0.52	0.52	0.51	0.51	0.51	0.51	0.51
12.331	0.51	0.51	0.50	0.50	0.50	0.50	0.50
12.424	0.50	0.50	0.50	0.49	0.49	0.49	0.49

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

12.516	0.49	0.49	0.49	0.49	0.48	0.48	0.48
12.608	0.48	0.48	0.48	0.48	0.48	0.47	0.47
12.701	0.47	0.47	0.47	0.47	0.47	0.47	0.46
12.793	0.46	0.46	0.46	0.46	0.46	0.46	0.46
12.886	0.45	0.45	0.45	0.45	0.45	0.45	0.45
12.978	0.45	0.44	0.44	0.44	0.44	0.44	0.44
13.070	0.44	0.44	0.43	0.43	0.43	0.43	0.43
13.163	0.43	0.43	0.43	0.42	0.42	0.42	0.42
13.255	0.42	0.42	0.42	0.42	0.41	0.41	0.41
13.348	0.41	0.41	0.41	0.41	0.40	0.40	0.40
13.440	0.40	0.40	0.40	0.40	0.40	0.39	0.39
13.532	0.39	0.39	0.39	0.39	0.39	0.39	0.38
13.625	0.38	0.38	0.38	0.38	0.38	0.38	0.38
13.717	0.37	0.37	0.37	0.37	0.37	0.37	0.37

La Habra
DMA 'A' PROPOSED

Line Start Time (hr)	Flow Values @ time increment of 0.013 hr (cfs)						
13.810	0.37	0.36	0.36	0.36	0.36	0.36	0.36
13.902	0.36	0.35	0.35	0.35	0.35	0.35	0.35
13.994	0.35	0.35	0.34	0.34	0.34	0.34	0.34
14.087	0.34	0.34	0.34	0.34	0.33	0.33	0.33
14.179	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.272	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.364	0.33	0.33	0.33	0.33	0.33	0.33	0.33
14.456	0.33	0.32	0.32	0.32	0.32	0.32	0.32
14.549	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.641	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.734	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.826	0.32	0.32	0.32	0.32	0.32	0.32	0.32
14.918	0.32	0.32	0.32	0.32	0.32	0.32	0.31
15.011	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.103	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.196	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.288	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.380	0.31	0.31	0.31	0.31	0.31	0.31	0.31
15.473	0.31	0.31	0.31	0.31	0.30	0.30	0.30
15.565	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.658	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.750	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.842	0.30	0.30	0.30	0.30	0.30	0.30	0.30
15.935	0.30	0.30	0.30	0.30	0.30	0.30	0.30
16.027	0.30	0.30	0.29	0.29	0.29	0.29	0.29
16.120	0.29	0.29	0.29	0.29	0.29	0.29	0.29
16.212	0.29	0.29	0.29	0.29	0.29	0.29	0.29
16.304	0.29	0.29	0.29	0.29	0.29	0.29	0.29
16.397	0.29	0.29	0.29	0.29	0.29	0.29	0.29
16.489	0.29	0.29	0.29	0.29	0.29	0.29	0.29
16.582	0.28	0.28	0.28	0.28	0.28	0.28	0.28
16.674	0.28	0.28	0.28	0.28	0.28	0.28	0.28

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

16.766	0.28	0.28	0.28	0.28	0.28	0.28	0.28
16.859	0.28	0.28	0.28	0.28	0.28	0.28	0.28
16.951	0.28	0.28	0.28	0.28	0.28	0.28	0.28
17.044	0.28	0.28	0.28	0.28	0.27	0.27	0.27
17.136	0.27	0.27	0.27	0.27	0.27	0.27	0.27
17.228	0.27	0.27	0.27	0.27	0.27	0.27	0.27
17.321	0.27	0.27	0.27	0.27	0.27	0.27	0.27
17.413	0.27	0.27	0.27	0.27	0.27	0.27	0.27
17.506	0.27	0.27	0.27	0.27	0.27	0.27	0.27
17.598	0.27	0.26	0.26	0.26	0.26	0.26	0.26
17.690	0.26	0.26	0.26	0.26	0.26	0.26	0.26
17.783	0.26	0.26	0.26	0.26	0.26	0.26	0.26
17.875	0.26	0.26	0.26	0.26	0.26	0.26	0.26
17.968	0.26	0.26	0.26	0.26	0.26	0.26	0.26
18.060	0.26	0.26	0.26	0.26	0.25	0.25	0.25
18.152	0.25	0.25	0.25	0.25	0.25	0.25	0.25
18.245	0.25	0.25	0.25	0.25	0.25	0.25	0.25
18.337	0.25	0.25	0.25	0.25	0.25	0.25	0.25
18.430	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Line Start Time (hr)	Flow Values @ time increment of 0.013 hr (cfs)						
18.522	0.25	0.25	0.25	0.25	0.25	0.25	0.25
18.614	0.25	0.24	0.24	0.24	0.24	0.24	0.24
18.707	0.24	0.24	0.24	0.24	0.24	0.24	0.24
18.799	0.24	0.24	0.24	0.24	0.24	0.24	0.24
18.892	0.24	0.24	0.24	0.24	0.24	0.24	0.24
18.984	0.24	0.24	0.24	0.24	0.24	0.24	0.24
19.076	0.24	0.24	0.24	0.24	0.23	0.23	0.23
19.169	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.261	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.354	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.446	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.538	0.23	0.23	0.23	0.23	0.23	0.23	0.23
19.631	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.723	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.816	0.22	0.22	0.22	0.22	0.22	0.22	0.22
19.908	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.000	0.22	0.22	0.22	0.22	0.22	0.22	0.22
20.093	0.22	0.22	0.22	0.21	0.21	0.21	0.21
20.185	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.278	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.370	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.462	0.21	0.21	0.21	0.21	0.21	0.21	0.21
20.555	0.21	0.21	0.21	0.21	0.21	0.21	0.20
20.647	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.740	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.832	0.20	0.20	0.20	0.20	0.20	0.20	0.20
20.924	0.20	0.20	0.20	0.20	0.20	0.20	0.20

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

21.017	0.20	0.20	0.20	0.20	0.20	0.20	0.20
21.109	0.20	0.20	0.19	0.19	0.19	0.19	0.19
21.202	0.19	0.19	0.19	0.19	0.19	0.19	0.19
21.294	0.19	0.19	0.19	0.19	0.19	0.19	0.19
21.386	0.19	0.19	0.19	0.19	0.19	0.19	0.19
21.479	0.19	0.19	0.19	0.19	0.19	0.19	0.19
21.571	0.19	0.19	0.19	0.19	0.19	0.18	0.18
21.664	0.18	0.18	0.18	0.18	0.18	0.18	0.18
21.756	0.18	0.18	0.18	0.18	0.18	0.18	0.18
21.848	0.18	0.18	0.18	0.18	0.18	0.18	0.18
21.941	0.18	0.18	0.18	0.18	0.18	0.18	0.18
22.033	0.18	0.18	0.18	0.18	0.18	0.18	0.18
22.126	0.17	0.17	0.17	0.17	0.17	0.17	0.17
22.218	0.17	0.17	0.17	0.17	0.17	0.17	0.17
22.310	0.17	0.17	0.17	0.17	0.17	0.17	0.17
22.403	0.17	0.17	0.17	0.17	0.17	0.17	0.17
22.495	0.17	0.17	0.17	0.17	0.17	0.17	0.17
22.588	0.17	0.17	0.16	0.16	0.16	0.16	0.16
22.680	0.16	0.16	0.16	0.16	0.16	0.16	0.16
22.772	0.16	0.16	0.16	0.16	0.16	0.16	0.16
22.865	0.16	0.16	0.16	0.16	0.16	0.16	0.16
22.957	0.16	0.16	0.16	0.16	0.16	0.16	0.16
23.050	0.16	0.16	0.16	0.16	0.16	0.15	0.15
23.142	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Line Start Time (hr)	Flow Values @ time increment of 0.013 hr (cfs)						
23.234	0.15	0.15	0.15	0.15	0.15	0.15	0.15
23.327	0.15	0.15	0.15	0.15	0.15	0.15	0.15
23.419	0.15	0.15	0.15	0.15	0.15	0.15	0.15
23.512	0.15	0.15	0.15	0.15	0.15	0.15	0.15
23.604	0.14	0.14	0.14	0.14	0.14	0.14	0.14
23.696	0.14	0.14	0.14	0.14	0.14	0.14	0.14
23.789	0.14	0.14	0.14	0.14	0.14	0.14	0.14
23.881	0.14	0.14	0.14	0.14	0.14	0.14	0.14
23.974	0.14	0.14	0.14	0.14	0.13	0.13	0.13
24.066	0.12	0.12	0.11	0.10	0.09	0.08	0.07
24.158	0.06	0.05					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Peak Flow Time (hr)	Peak Flow Rate (cfs)	Peak Flow Rate (csm)
DMA 'F'	0.003		1.116		9.94	1.47	574.88

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

8.253	0.05	0.05	0.05	0.05	0.05	0.05	0.05
8.308	0.05	0.05	0.05	0.06	0.06	0.06	0.06
8.363	0.06	0.06	0.06	0.06	0.06	0.06	0.06
8.419	0.06	0.06	0.06	0.06	0.06	0.06	0.06
8.474	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.529	0.07	0.07	0.07	0.07	0.07	0.07	0.07
8.584	0.07	0.07	0.07	0.07	0.08	0.08	0.08
8.640	0.08	0.08	0.08	0.08	0.08	0.08	0.08
8.695	0.08	0.08	0.08	0.08	0.08	0.08	0.09
8.750	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.806	0.09	0.09	0.09	0.09	0.09	0.09	0.09
8.861	0.09	0.10	0.10	0.10	0.10	0.10	0.10
8.916	0.10	0.10	0.10	0.10	0.10	0.10	0.10
8.971	0.10	0.11	0.11	0.11	0.11	0.11	0.11
9.027	0.11	0.11	0.11	0.11	0.11	0.11	0.11
9.082	0.12	0.12	0.12	0.12	0.12	0.12	0.12
9.137	0.12	0.12	0.12	0.13	0.13	0.13	0.13
9.192	0.13	0.13	0.13	0.13	0.14	0.14	0.14
9.248	0.14	0.14	0.14	0.14	0.14	0.15	0.15
9.303	0.15	0.15	0.15	0.15	0.15	0.15	0.16
9.358	0.16	0.16	0.16	0.16	0.16	0.16	0.17
9.413	0.17	0.17	0.17	0.17	0.17	0.17	0.17
9.469	0.18	0.18	0.18	0.18	0.18	0.18	0.19
9.524	0.19	0.19	0.20	0.20	0.21	0.21	0.22
9.579	0.23	0.24	0.24	0.25	0.26	0.26	0.27
9.634	0.28	0.29	0.30	0.32	0.33	0.35	0.36
9.690	0.38	0.39	0.41	0.42	0.44	0.45	0.47
9.745	0.49	0.52	0.54	0.57	0.60	0.63	0.66
9.800	0.68	0.71	0.74	0.77	0.80	0.84	0.89

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
9.856	0.94	1.00	1.07	1.13	1.19	1.25	1.31
9.911	1.36	1.40	1.43	1.46	1.47	1.47	1.46
9.966	1.44	1.42	1.40	1.38	1.36	1.34	1.31
10.021	1.29	1.26	1.22	1.18	1.13	1.07	1.00
10.077	0.94	0.87	0.81	0.76	0.71	0.66	0.62
10.132	0.59	0.56	0.54	0.52	0.50	0.48	0.47
10.187	0.45	0.44	0.43	0.42	0.42	0.41	0.40
10.242	0.40	0.39	0.39	0.38	0.38	0.37	0.37
10.298	0.36	0.36	0.35	0.35	0.35	0.34	0.34
10.353	0.34	0.33	0.33	0.33	0.32	0.32	0.32
10.408	0.31	0.31	0.31	0.30	0.30	0.30	0.29
10.463	0.29	0.29	0.28	0.28	0.27	0.27	0.27
10.519	0.27	0.26	0.26	0.26	0.26	0.25	0.25
10.574	0.25	0.24	0.24	0.24	0.24	0.24	0.23
10.629	0.23	0.23	0.23	0.23	0.23	0.23	0.22
10.684	0.22	0.22	0.22	0.22	0.22	0.22	0.22
10.740	0.22	0.22	0.22	0.21	0.21	0.21	0.21

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
10.795	0.21	0.21	0.21	0.21	0.21	0.21	0.21
10.850	0.21	0.20	0.20	0.20	0.20	0.20	0.20
10.906	0.20	0.20	0.20	0.20	0.20	0.20	0.20
10.961	0.19	0.19	0.19	0.19	0.19	0.19	0.19
11.016	0.19	0.19	0.19	0.19	0.19	0.19	0.18
11.071	0.18	0.18	0.18	0.18	0.18	0.18	0.18
11.127	0.18	0.18	0.18	0.18	0.18	0.18	0.18
11.182	0.18	0.18	0.18	0.18	0.18	0.18	0.18
11.237	0.17	0.17	0.17	0.17	0.17	0.17	0.17
11.292	0.17	0.17	0.17	0.17	0.17	0.17	0.17
11.348	0.17	0.17	0.17	0.17	0.17	0.17	0.17
11.403	0.17	0.17	0.17	0.17	0.17	0.17	0.17
11.458	0.17	0.17	0.17	0.17	0.17	0.17	0.16
11.513	0.16	0.16	0.16	0.16	0.16	0.16	0.16
11.569	0.16	0.16	0.16	0.16	0.16	0.16	0.16
11.624	0.16	0.16	0.16	0.16	0.16	0.16	0.16
11.679	0.16	0.16	0.16	0.16	0.16	0.16	0.16
11.734	0.16	0.16	0.16	0.16	0.16	0.15	0.15
11.790	0.15	0.15	0.15	0.15	0.15	0.15	0.15
11.845	0.15	0.15	0.15	0.15	0.15	0.15	0.15
11.900	0.15	0.15	0.15	0.15	0.15	0.15	0.15
11.956	0.15	0.15	0.15	0.15	0.15	0.15	0.15
12.011	0.15	0.15	0.15	0.15	0.14	0.14	0.14
12.066	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.121	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.177	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.232	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.287	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.342	0.14	0.14	0.14	0.14	0.14	0.14	0.14
12.398	0.14	0.14	0.13	0.13	0.13	0.13	0.13
12.453	0.13	0.13	0.13	0.13	0.13	0.13	0.13
12.508	0.13	0.13	0.13	0.13	0.13	0.13	0.13
12.563	0.13	0.13	0.13	0.13	0.13	0.13	0.13
12.619	0.13	0.13	0.13	0.13	0.13	0.13	0.13

Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
12.674	0.13	0.13	0.13	0.13	0.13	0.13	0.13
12.729	0.13	0.13	0.13	0.13	0.13	0.13	0.13
12.784	0.13	0.13	0.13	0.13	0.13	0.12	0.12
12.840	0.12	0.12	0.12	0.12	0.12	0.12	0.12
12.895	0.12	0.12	0.12	0.12	0.12	0.12	0.12
12.950	0.12	0.12	0.12	0.12	0.12	0.12	0.12
13.006	0.12	0.12	0.12	0.12	0.12	0.12	0.12
13.061	0.12	0.12	0.12	0.12	0.12	0.12	0.12
13.116	0.12	0.12	0.12	0.12	0.12	0.12	0.12
13.171	0.12	0.12	0.12	0.12	0.12	0.12	0.11
13.227	0.11	0.11	0.11	0.11	0.11	0.11	0.11
13.282	0.11	0.11	0.11	0.11	0.11	0.11	0.11

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
13.337	0.11	0.11	0.11	0.11	0.11	0.11	0.11
13.392	0.11	0.11	0.11	0.11	0.11	0.11	0.11
13.448	0.11	0.11	0.11	0.11	0.11	0.11	0.11
13.503	0.11	0.11	0.11	0.11	0.11	0.11	0.11
13.558	0.11	0.11	0.11	0.11	0.11	0.11	0.10
13.613	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.669	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.724	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.779	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.834	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.890	0.10	0.10	0.10	0.10	0.10	0.10	0.10
13.945	0.10	0.10	0.10	0.10	0.10	0.09	0.09
14.000	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.056	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.111	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.166	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.221	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.277	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.332	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.387	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.442	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.498	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.553	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.608	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.663	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.719	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.774	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.829	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.884	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.940	0.09	0.09	0.09	0.09	0.09	0.09	0.09
14.995	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.050	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.106	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.161	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.216	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.271	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.327	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.382	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.437	0.09	0.09	0.09	0.09	0.09	0.09	0.09

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
15.492	0.09	0.09	0.09	0.09	0.09	0.09	0.09
15.548	0.09	0.09	0.09	0.09	0.09	0.08	0.08
15.603	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.658	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.713	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.769	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.824	0.08	0.08	0.08	0.08	0.08	0.08	0.08

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

15.879	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.934	0.08	0.08	0.08	0.08	0.08	0.08	0.08
15.990	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.045	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.100	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.156	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.211	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.266	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.321	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.377	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.432	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.487	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.542	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.598	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.653	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.708	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.763	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.819	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.874	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.929	0.08	0.08	0.08	0.08	0.08	0.08	0.08
16.984	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.040	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.095	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.150	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.206	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.261	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.316	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.371	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.427	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.482	0.08	0.08	0.08	0.08	0.08	0.08	0.08
17.537	0.08	0.08	0.08	0.08	0.07	0.07	0.07
17.592	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.648	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.703	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.758	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.813	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.869	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.924	0.07	0.07	0.07	0.07	0.07	0.07	0.07
17.979	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.034	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.090	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.145	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.200	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.256	0.07	0.07	0.07	0.07	0.07	0.07	0.07

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
18.311	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.366	0.07	0.07	0.07	0.07	0.07	0.07	0.07

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28		
DMA 'B'	Outlet	.03078	89.	.258		
DMA 'C'	Outlet	.11656	85.	.316		

18.421	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.477	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.532	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.587	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.642	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.698	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.753	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.808	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.863	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.919	0.07	0.07	0.07	0.07	0.07	0.07	0.07
18.974	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.029	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.084	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.140	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.195	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.250	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.306	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.361	0.07	0.07	0.07	0.07	0.07	0.07	0.07
19.416	0.07	0.07	0.07	0.06	0.06	0.06	0.06
19.471	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.527	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.582	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.637	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.692	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.748	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.803	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.858	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.913	0.06	0.06	0.06	0.06	0.06	0.06	0.06
19.969	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.024	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.079	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.134	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.190	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.245	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.300	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.356	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.411	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.466	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.521	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.577	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.632	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.687	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.742	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.798	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.853	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.908	0.06	0.06	0.06	0.06	0.06	0.06	0.06
20.963	0.06	0.06	0.06	0.06	0.06	0.06	0.06
21.019	0.06	0.06	0.06	0.06	0.06	0.06	0.06
21.074	0.06	0.06	0.06	0.06	0.06	0.06	0.06

Line

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

Start Time	Flow Values @ time increment of 0.008 hr						
(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
21.129	0.06	0.06	0.06	0.06	0.06	0.06	0.06
21.184	0.06	0.06	0.06	0.06	0.06	0.06	0.06
21.240	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.295	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.350	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.406	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.461	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.516	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.571	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.627	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.682	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.737	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.792	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.848	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.903	0.05	0.05	0.05	0.05	0.05	0.05	0.05
21.958	0.05	0.05	0.05	0.05	0.05	0.05	0.05
22.013	0.05	0.05	0.05	0.05	0.05	0.05	0.05
22.069	0.05	0.05	0.05	0.05	0.05	0.05	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Peak Flow Elevation (ft)	Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	0.201		0.924		10.06	65.68	327.27

Line

Start Time	Flow Values @ time increment of 0.008 hr						
(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
4.392	0.05	0.05	0.05	0.05	0.05	0.05	0.05
4.448	0.05	0.05	0.05	0.05	0.05	0.05	0.05
4.503	0.05	0.05	0.06	0.06	0.06	0.06	0.06
4.558	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.613	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.669	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.724	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4.779	0.06	0.06	0.06	0.06	0.07	0.07	0.07
4.834	0.07	0.07	0.07	0.07	0.07	0.07	0.07
4.890	0.07	0.07	0.07	0.07	0.07	0.07	0.07
4.945	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5.000	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5.056	0.07	0.07	0.07	0.07	0.07	0.07	0.08
5.111	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.166	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.221	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.277	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.332	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5.387	0.08	0.08	0.08	0.09	0.09	0.09	0.09
5.442	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.498	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.553	0.09	0.09	0.09	0.09	0.09	0.09	0.09

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

La Habra
DMA 'A' PROPOSED

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
5.608	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.663	0.09	0.09	0.09	0.09	0.09	0.09	0.09
5.719	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.774	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.829	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.884	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.940	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5.995	0.10	0.10	0.10	0.10	0.10	0.11	0.11
6.050	0.11	0.11	0.11	0.11	0.11	0.11	0.11
6.106	0.11	0.11	0.11	0.11	0.11	0.11	0.11
6.161	0.11	0.11	0.11	0.11	0.11	0.11	0.11
6.216	0.11	0.11	0.11	0.12	0.12	0.12	0.12
6.271	0.12	0.12	0.12	0.12	0.12	0.12	0.12
6.327	0.12	0.12	0.12	0.12	0.12	0.12	0.12
6.382	0.13	0.13	0.13	0.13	0.13	0.13	0.13
6.437	0.13	0.13	0.13	0.13	0.13	0.13	0.13
6.492	0.13	0.13	0.14	0.15	0.18	0.18	0.19
6.548	0.19	0.19	0.20	0.20	0.20	0.20	0.20
6.603	0.20	0.21	0.21	0.21	0.21	0.21	0.21
6.658	0.22	0.22	0.22	0.22	0.22	0.23	0.23
6.713	0.23	0.23	0.23	0.23	0.24	0.24	0.24
6.769	0.24	0.24	0.25	0.25	0.25	0.25	0.25
6.824	0.26	0.26	0.26	0.26	0.26	0.27	0.27
6.879	0.27	0.27	0.27	0.28	0.28	0.28	0.28
6.934	0.28	0.29	0.29	0.29	0.29	0.29	0.30
6.990	0.30	0.30	0.30	0.30	0.31	0.31	0.31
7.045	0.31	0.32	0.32	0.32	0.32	0.32	0.33
7.100	0.33	0.33	0.33	0.33	0.34	0.34	0.34
7.156	0.34	0.35	0.37	0.38	0.39	0.40	0.41
7.211	0.41	0.41	0.42	0.42	0.43	0.43	0.43
7.266	0.44	0.44	0.44	0.45	0.45	0.45	0.46
7.321	0.46	0.46	0.47	0.47	0.47	0.48	0.48
7.377	0.48	0.49	0.49	0.49	0.50	0.50	0.50
7.432	0.51	0.51	0.51	0.52	0.52	0.52	0.53
7.487	0.53	0.53	0.54	0.54	0.55	0.55	0.55
7.542	0.56	0.56	0.56	0.57	0.57	0.57	0.58
7.598	0.58	0.58	0.59	0.59	0.59	0.60	0.60
7.653	0.60	0.61	0.61	0.61	0.62	0.62	0.62
7.708	0.63	0.63	0.63	0.64	0.66	0.68	0.69
7.763	0.70	0.71	0.72	0.73	0.73	0.74	0.75
7.819	0.75	0.76	0.77	0.78	0.78	0.79	0.80
7.874	0.80	0.81	0.82	0.83	0.83	0.84	0.85
7.929	0.86	0.86	0.87	0.88	0.89	0.89	0.90
7.984	0.91	0.92	0.93	0.93	0.94	0.95	0.96
8.040	0.96	0.97	0.98	0.99	1.00	1.01	1.02
8.095	1.02	1.03	1.04	1.05	1.06	1.07	1.08
8.150	1.09	1.11	1.12	1.13	1.14	1.15	1.17
8.206	1.18	1.19	1.21	1.22	1.24	1.25	1.32

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

8.261	1.33	1.35	1.37	1.38	1.40	1.42	1.44
8.316	1.45	1.47	1.49	1.51	1.53	1.55	1.57
8.371	1.59	1.61	1.63	1.65	1.67	1.69	1.71

La Habra
DMA 'A' PROPOSED

Line Start Time (hr) — Flow Values @ time increment of 0.008 hr (cfs)

8.427	1.73	1.75	1.78	1.80	1.82	1.84	1.87
8.482	1.89	1.91	1.94	1.96	1.98	2.01	2.03
8.537	2.06	2.08	2.10	2.13	2.15	2.18	2.21
8.592	2.23	2.26	2.28	2.31	2.34	2.36	2.39
8.648	2.42	2.44	2.47	2.50	2.53	2.56	2.58
8.703	2.61	2.64	2.67	2.70	2.73	2.76	2.79
8.758	2.82	2.85	2.88	2.91	2.94	2.97	3.00
8.813	3.03	3.06	3.09	3.12	3.15	3.19	3.22
8.869	3.25	3.28	3.32	3.35	3.38	3.42	3.45
8.924	3.48	3.52	3.55	3.59	3.62	3.65	3.69
8.979	3.72	3.76	3.80	3.83	3.87	3.90	3.94
9.034	3.98	4.02	4.05	4.09	4.13	4.17	4.21
9.090	4.25	4.29	4.34	4.38	4.42	4.46	4.51
9.145	4.55	4.60	4.65	4.69	4.74	4.79	4.84
9.200	4.89	4.94	4.99	5.05	5.10	5.16	5.21
9.256	5.27	5.33	5.38	5.44	5.50	5.56	5.62
9.311	5.68	5.74	5.81	5.87	5.93	6.00	6.06
9.366	6.13	6.20	6.26	6.33	6.40	6.47	6.54
9.421	6.61	6.68	6.75	6.82	6.89	6.96	7.04
9.477	7.11	7.18	7.26	7.34	7.41	7.50	7.59
9.532	7.68	7.78	7.88	8.00	8.12	8.25	8.40
9.587	8.55	8.71	8.89	9.08	9.28	9.50	9.74
9.642	10.00	10.28	10.58	10.89	11.23	11.58	11.96
9.698	12.36	12.78	13.25	13.73	14.25	14.80	15.37
9.753	15.99	16.64	17.31	18.05	18.81	19.64	20.49
9.808	21.39	22.36	23.36	24.46	25.61	26.84	28.18
9.863	29.58	31.11	32.69	34.36	36.12	37.92	39.82
9.919	41.74	43.70	45.65	47.60	49.50	51.37	53.18
9.974	54.92	56.61	58.10	59.53	60.83	61.98	63.05
10.029	63.88	64.61	65.15	65.47	65.68	65.60	65.43
10.084	65.07	64.54	63.93	63.09	62.16	61.06	59.85
10.140	58.58	57.23	55.86	54.45	53.02	51.59	50.16
10.195	48.74	47.34	45.98	44.65	43.37	42.11	40.91
10.250	39.76	38.64	37.61	36.60	35.66	34.76	33.90
10.306	33.11	32.35	31.64	30.96	30.32	29.73	29.14
10.361	28.59	28.07	27.55	27.07	26.60	26.16	25.73
10.416	25.32	24.92	24.53	24.16	23.80	23.44	23.10
10.471	22.76	22.45	22.13	21.83	21.53	21.24	20.95
10.527	20.67	20.39	20.13	19.87	19.61	19.36	19.12
10.582	18.88	18.65	18.43	18.21	17.99	17.78	17.58
10.637	17.38	17.19	17.00	16.83	16.65	16.48	16.32
10.692	16.17	16.02	15.87	15.74	15.60	15.47	15.35
10.748	15.23	15.12	15.01	14.90	14.80	14.70	14.60

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

10.803	14.51	14.42	14.34	14.25	14.17	14.09	14.02
10.858	13.94	13.87	13.80	13.73	13.67	13.60	13.54
10.913	13.47	13.41	13.35	13.29	13.23	13.17	13.11
10.969	13.06	13.00	12.94	12.89	12.84	12.78	12.73
11.024	12.68	12.62	12.57	12.52	12.47	12.42	12.37
11.079	12.32	12.27	12.23	12.18	12.13	12.09	12.05
11.134	12.00	11.96	11.92	11.88	11.84	11.80	11.76
11.190	11.73	11.69	11.66	11.63	11.60	11.56	11.53

La Habra
DMA 'A' PROPOSED

Line
Start Time Flow Values @ time increment of 0.008 hr

(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
11.245	11.51	11.48	11.45	11.42	11.40	11.37	11.35
11.300	11.32	11.30	11.28	11.26	11.23	11.21	11.19
11.356	11.17	11.15	11.13	11.11	11.09	11.07	11.05
11.411	11.03	11.01	11.00	10.98	10.96	10.94	10.92
11.466	10.91	10.89	10.87	10.85	10.83	10.82	10.80
11.521	10.78	10.77	10.75	10.73	10.71	10.70	10.68
11.577	10.66	10.65	10.63	10.61	10.59	10.58	10.56
11.632	10.54	10.53	10.51	10.49	10.47	10.46	10.44
11.687	10.42	10.41	10.39	10.37	10.36	10.34	10.32
11.742	10.30	10.29	10.27	10.25	10.23	10.22	10.20
11.798	10.18	10.17	10.15	10.13	10.11	10.10	10.08
11.853	10.06	10.04	10.03	10.01	9.99	9.97	9.96
11.908	9.94	9.92	9.90	9.88	9.87	9.85	9.83
11.963	9.81	9.79	9.78	9.76	9.74	9.72	9.70
12.019	9.69	9.67	9.65	9.63	9.62	9.60	9.58
12.074	9.56	9.54	9.53	9.51	9.49	9.48	9.46
12.129	9.44	9.43	9.41	9.39	9.38	9.36	9.35
12.184	9.33	9.32	9.30	9.29	9.27	9.26	9.24
12.240	9.23	9.22	9.20	9.19	9.18	9.16	9.15
12.295	9.14	9.12	9.11	9.10	9.09	9.08	9.06
12.350	9.05	9.04	9.03	9.01	9.00	8.99	8.98
12.406	8.97	8.96	8.94	8.93	8.92	8.91	8.90
12.461	8.89	8.87	8.86	8.85	8.84	8.83	8.82
12.516	8.81	8.79	8.78	8.77	8.76	8.75	8.74
12.571	8.73	8.71	8.70	8.69	8.68	8.67	8.66
12.627	8.65	8.63	8.62	8.61	8.60	8.59	8.58
12.682	8.56	8.55	8.54	8.53	8.52	8.51	8.50
12.737	8.48	8.47	8.46	8.45	8.44	8.43	8.41
12.792	8.40	8.39	8.38	8.37	8.36	8.34	8.33
12.848	8.32	8.31	8.30	8.28	8.27	8.26	8.25
12.903	8.24	8.23	8.21	8.20	8.19	8.18	8.17
12.958	8.15	8.14	8.13	8.12	8.11	8.09	8.08
13.013	8.07	8.06	8.05	8.03	8.02	8.01	8.00
13.069	7.99	7.97	7.96	7.95	7.94	7.92	7.91
13.124	7.90	7.89	7.88	7.86	7.85	7.84	7.83
13.179	7.81	7.80	7.79	7.78	7.76	7.75	7.74
13.234	7.73	7.72	7.70	7.69	7.68	7.67	7.65
13.290	7.64	7.63	7.62	7.60	7.59	7.58	7.57

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

13.345	7.55	7.54	7.53	7.52	7.50	7.49	7.48
13.400	7.47	7.45	7.44	7.43	7.41	7.40	7.39
13.456	7.38	7.36	7.35	7.34	7.33	7.31	7.30
13.511	7.29	7.27	7.26	7.25	7.24	7.22	7.21
13.566	7.20	7.19	7.17	7.16	7.15	7.13	7.12
13.621	7.11	7.10	7.08	7.07	7.06	7.04	7.03
13.677	7.02	7.00	6.99	6.98	6.97	6.95	6.94
13.732	6.93	6.91	6.90	6.89	6.87	6.86	6.85
13.787	6.83	6.82	6.81	6.80	6.78	6.77	6.76
13.842	6.74	6.73	6.72	6.70	6.69	6.68	6.66
13.898	6.65	6.64	6.62	6.61	6.60	6.58	6.57
13.953	6.56	6.54	6.53	6.52	6.50	6.49	6.48
14.008	6.46	6.45	6.44	6.43	6.41	6.40	6.39

Line Start Time (hr) — Flow Values @ time increment of 0.008 hr (cfs)

14.063	6.37	6.36	6.35	6.34	6.32	6.31	6.30
14.119	6.29	6.28	6.27	6.26	6.25	6.24	6.23
14.174	6.22	6.21	6.20	6.19	6.19	6.18	6.17
14.229	6.16	6.16	6.15	6.14	6.14	6.13	6.13
14.284	6.12	6.12	6.11	6.11	6.10	6.10	6.10
14.340	6.09	6.09	6.08	6.08	6.08	6.07	6.07
14.395	6.07	6.06	6.06	6.06	6.06	6.05	6.05
14.450	6.05	6.04	6.04	6.04	6.04	6.03	6.03
14.506	6.03	6.03	6.02	6.02	6.02	6.02	6.01
14.561	6.01	6.01	6.01	6.01	6.00	6.00	6.00
14.616	6.00	5.99	5.99	5.99	5.99	5.99	5.98
14.671	5.98	5.98	5.98	5.98	5.97	5.97	5.97
14.727	5.97	5.96	5.96	5.96	5.96	5.96	5.95
14.782	5.95	5.95	5.95	5.95	5.94	5.94	5.94
14.837	5.94	5.94	5.93	5.93	5.93	5.93	5.93
14.892	5.92	5.92	5.92	5.92	5.91	5.91	5.91
14.948	5.91	5.91	5.90	5.90	5.90	5.90	5.90
15.003	5.89	5.89	5.89	5.89	5.89	5.88	5.88
15.058	5.88	5.88	5.87	5.87	5.87	5.87	5.87
15.113	5.86	5.86	5.86	5.86	5.86	5.85	5.85
15.169	5.85	5.85	5.85	5.84	5.84	5.84	5.84
15.224	5.83	5.83	5.83	5.83	5.83	5.82	5.82
15.279	5.82	5.82	5.81	5.81	5.81	5.81	5.81
15.334	5.80	5.80	5.80	5.80	5.80	5.79	5.79
15.390	5.79	5.79	5.78	5.78	5.78	5.78	5.78
15.445	5.77	5.77	5.77	5.77	5.76	5.76	5.76
15.500	5.76	5.76	5.75	5.75	5.75	5.75	5.74
15.556	5.74	5.74	5.74	5.74	5.73	5.73	5.73
15.611	5.73	5.72	5.72	5.72	5.72	5.72	5.71
15.666	5.71	5.71	5.71	5.70	5.70	5.70	5.70
15.721	5.70	5.69	5.69	5.69	5.69	5.68	5.68
15.777	5.68	5.68	5.68	5.67	5.67	5.67	5.67
15.832	5.66	5.66	5.66	5.66	5.65	5.65	5.65

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28	
DMA 'B'	Outlet	.03078	89.	.258	
DMA 'C'	Outlet	.11656	85.	.316	

15.887	5.65	5.65	5.64	5.64	5.64	5.64	5.63
15.942	5.63	5.63	5.63	5.62	5.62	5.62	5.62
15.998	5.62	5.61	5.61	5.61	5.61	5.60	5.60
16.053	5.60	5.60	5.60	5.59	5.59	5.59	5.59
16.108	5.58	5.58	5.58	5.58	5.57	5.57	5.57
16.163	5.57	5.56	5.56	5.56	5.56	5.56	5.55
16.219	5.55	5.55	5.55	5.54	5.54	5.54	5.54
16.274	5.53	5.53	5.53	5.53	5.52	5.52	5.52
16.329	5.52	5.52	5.51	5.51	5.51	5.51	5.50
16.384	5.50	5.50	5.50	5.49	5.49	5.49	5.49
16.440	5.48	5.48	5.48	5.48	5.47	5.47	5.47
16.495	5.47	5.47	5.46	5.46	5.46	5.46	5.45
16.550	5.45	5.45	5.45	5.44	5.44	5.44	5.44
16.606	5.43	5.43	5.43	5.43	5.42	5.42	5.42
16.661	5.42	5.41	5.41	5.41	5.41	5.41	5.40
16.716	5.40	5.40	5.40	5.39	5.39	5.39	5.39
16.771	5.38	5.38	5.38	5.38	5.37	5.37	5.37
16.827	5.37	5.36	5.36	5.36	5.36	5.35	5.35

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
16.882	5.35	5.35	5.34	5.34	5.34	5.34	5.33
16.937	5.33	5.33	5.33	5.32	5.32	5.32	5.32
16.992	5.31	5.31	5.31	5.31	5.30	5.30	5.30
17.048	5.30	5.29	5.29	5.29	5.29	5.28	5.28
17.103	5.28	5.28	5.27	5.27	5.27	5.27	5.26
17.158	5.26	5.26	5.26	5.25	5.25	5.25	5.25
17.213	5.24	5.24	5.24	5.24	5.23	5.23	5.23
17.269	5.23	5.22	5.22	5.22	5.22	5.21	5.21
17.324	5.21	5.21	5.20	5.20	5.20	5.20	5.19
17.379	5.19	5.19	5.19	5.18	5.18	5.18	5.18
17.434	5.17	5.17	5.17	5.17	5.16	5.16	5.16
17.490	5.16	5.15	5.15	5.15	5.15	5.14	5.14
17.545	5.14	5.14	5.13	5.13	5.13	5.13	5.12
17.600	5.12	5.12	5.11	5.11	5.11	5.11	5.10
17.656	5.10	5.10	5.10	5.09	5.09	5.09	5.09
17.711	5.08	5.08	5.08	5.08	5.07	5.07	5.07
17.766	5.07	5.06	5.06	5.06	5.06	5.05	5.05
17.821	5.05	5.05	5.04	5.04	5.04	5.03	5.03
17.877	5.03	5.03	5.02	5.02	5.02	5.02	5.01
17.932	5.01	5.01	5.01	5.00	5.00	5.00	5.00
17.987	4.99	4.99	4.99	4.99	4.98	4.98	4.98
18.042	4.97	4.97	4.97	4.97	4.96	4.96	4.96
18.098	4.96	4.96	4.95	4.95	4.95	4.94	4.94
18.153	4.94	4.93	4.93	4.93	4.93	4.92	4.92
18.208	4.92	4.92	4.91	4.91	4.91	4.91	4.90
18.263	4.90	4.90	4.90	4.89	4.89	4.89	4.88
18.319	4.88	4.88	4.88	4.87	4.87	4.87	4.87
18.374	4.86	4.86	4.86	4.86	4.85	4.85	4.85

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

18.429	4.84	4.84	4.84	4.84	4.83	4.83	4.83
18.484	4.83	4.82	4.82	4.82	4.81	4.81	4.81
18.540	4.81	4.80	4.80	4.80	4.80	4.79	4.79
18.595	4.79	4.79	4.78	4.78	4.78	4.77	4.77
18.650	4.77	4.77	4.76	4.76	4.76	4.76	4.75
18.706	4.75	4.75	4.74	4.74	4.74	4.74	4.73
18.761	4.73	4.73	4.73	4.72	4.72	4.72	4.71
18.816	4.71	4.71	4.71	4.70	4.70	4.70	4.70
18.871	4.69	4.69	4.69	4.68	4.68	4.68	4.68
18.927	4.67	4.67	4.67	4.67	4.66	4.66	4.66
18.982	4.65	4.65	4.65	4.65	4.64	4.64	4.64
19.037	4.64	4.63	4.63	4.63	4.62	4.62	4.62
19.092	4.62	4.61	4.61	4.61	4.60	4.60	4.60
19.148	4.60	4.59	4.59	4.59	4.59	4.58	4.58
19.203	4.58	4.57	4.57	4.57	4.57	4.56	4.56
19.258	4.56	4.56	4.55	4.55	4.55	4.54	4.54
19.313	4.54	4.54	4.53	4.53	4.53	4.52	4.52
19.369	4.52	4.52	4.51	4.51	4.51	4.50	4.50
19.424	4.50	4.50	4.49	4.49	4.49	4.49	4.48
19.479	4.48	4.48	4.47	4.47	4.47	4.47	4.46
19.534	4.46	4.46	4.45	4.45	4.45	4.45	4.44
19.590	4.44	4.44	4.43	4.43	4.43	4.43	4.42
19.645	4.42	4.42	4.42	4.41	4.41	4.41	4.40

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
19.700	4.40	4.40	4.40	4.39	4.39	4.39	4.38
19.756	4.38	4.38	4.38	4.37	4.37	4.37	4.36
19.811	4.36	4.36	4.36	4.35	4.35	4.35	4.34
19.866	4.34	4.34	4.34	4.33	4.33	4.33	4.32
19.921	4.32	4.32	4.32	4.31	4.31	4.31	4.30
19.977	4.30	4.30	4.30	4.29	4.29	4.29	4.28
20.032	4.28	4.28	4.28	4.27	4.27	4.27	4.26
20.087	4.26	4.26	4.26	4.25	4.25	4.25	4.24
20.142	4.24	4.24	4.24	4.23	4.23	4.23	4.22
20.198	4.22	4.22	4.22	4.21	4.21	4.21	4.20
20.253	4.20	4.20	4.20	4.19	4.19	4.19	4.18
20.308	4.18	4.18	4.18	4.17	4.17	4.17	4.16
20.363	4.16	4.16	4.16	4.15	4.15	4.15	4.14
20.419	4.14	4.14	4.13	4.13	4.13	4.13	4.12
20.474	4.12	4.12	4.11	4.11	4.11	4.11	4.10
20.529	4.10	4.10	4.09	4.09	4.09	4.09	4.08
20.584	4.08	4.08	4.07	4.07	4.07	4.07	4.06
20.640	4.06	4.06	4.05	4.05	4.05	4.04	4.04
20.695	4.04	4.04	4.03	4.03	4.03	4.02	4.02
20.750	4.02	4.02	4.01	4.01	4.01	4.00	4.00
20.806	4.00	4.00	3.99	3.99	3.99	3.98	3.98
20.861	3.98	3.97	3.97	3.97	3.97	3.96	3.96
20.916	3.96	3.95	3.95	3.95	3.95	3.94	3.94

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

20.971	3.94	3.93	3.93	3.93	3.92	3.92	3.92
21.027	3.92	3.91	3.91	3.91	3.90	3.90	3.90
21.082	3.90	3.89	3.89	3.89	3.88	3.88	3.88
21.137	3.87	3.87	3.87	3.87	3.86	3.86	3.86
21.192	3.85	3.85	3.85	3.84	3.84	3.84	3.84
21.248	3.83	3.83	3.83	3.82	3.82	3.82	3.82
21.303	3.81	3.81	3.81	3.80	3.80	3.80	3.79
21.358	3.79	3.79	3.79	3.78	3.78	3.78	3.77
21.413	3.77	3.77	3.76	3.76	3.76	3.76	3.75
21.469	3.75	3.75	3.74	3.74	3.74	3.73	3.73
21.524	3.73	3.73	3.72	3.72	3.72	3.71	3.71
21.579	3.71	3.70	3.70	3.70	3.70	3.69	3.69
21.634	3.69	3.68	3.68	3.68	3.68	3.67	3.67
21.690	3.67	3.66	3.66	3.66	3.65	3.65	3.65
21.745	3.65	3.64	3.64	3.64	3.63	3.63	3.63
21.800	3.62	3.62	3.62	3.61	3.61	3.61	3.61
21.856	3.60	3.60	3.60	3.59	3.59	3.59	3.58
21.911	3.58	3.58	3.58	3.57	3.57	3.57	3.56
21.966	3.56	3.56	3.55	3.55	3.55	3.55	3.54
22.021	3.54	3.54	3.53	3.53	3.53	3.52	3.52
22.077	3.52	3.52	3.51	3.51	3.51	3.50	3.45
22.132	3.45	3.44	3.44	3.44	3.44	3.43	3.43
22.187	3.43	3.42	3.42	3.42	3.41	3.41	3.41
22.242	3.41	3.40	3.40	3.40	3.39	3.39	3.39
22.298	3.38	3.38	3.38	3.38	3.37	3.37	3.37
22.353	3.36	3.36	3.36	3.35	3.35	3.35	3.35
22.408	3.34	3.34	3.34	3.33	3.33	3.33	3.32
22.463	3.32	3.32	3.32	3.31	3.31	3.31	3.30

Line Start Time (hr)	Flow Values @ time increment of 0.008 hr (cfs)						
22.519	3.30	3.30	3.29	3.29	3.29	3.29	3.28
22.574	3.28	3.28	3.27	3.27	3.27	3.26	3.26
22.629	3.26	3.26	3.25	3.25	3.25	3.24	3.24
22.684	3.24	3.23	3.23	3.23	3.22	3.22	3.22
22.740	3.22	3.21	3.21	3.21	3.20	3.20	3.20
22.795	3.19	3.19	3.19	3.19	3.18	3.18	3.18
22.850	3.17	3.17	3.17	3.16	3.16	3.16	3.16
22.906	3.15	3.15	3.15	3.14	3.14	3.14	3.13
22.961	3.13	3.13	3.12	3.12	3.12	3.12	3.11
23.016	3.11	3.11	3.10	3.10	3.10	3.09	3.09
23.071	3.09	3.09	3.08	3.08	3.08	3.07	3.07
23.127	3.07	3.06	3.06	3.06	3.05	3.05	3.05
23.182	3.05	3.04	3.04	3.04	3.03	3.03	3.03
23.237	3.02	3.02	3.02	3.02	3.01	3.01	3.01
23.292	3.00	3.00	3.00	2.99	2.99	2.99	2.98
23.348	2.98	2.98	2.98	2.97	2.97	2.97	2.96
23.403	2.96	2.96	2.95	2.95	2.95	2.94	2.94
23.458	2.94	2.94	2.93	2.93	2.93	2.92	2.92

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28			
DMA 'B'	Outlet	.03078	89.	.258			
DMA 'C'	Outlet	.11656	85.	.316			

23.513	2.92	2.91	2.91	2.91	2.90	2.90	2.90
23.569	2.90	2.89	2.89	2.89	2.88	2.88	2.88
23.624	2.87	2.87	2.87	2.86	2.86	2.86	2.86
23.679	2.85	2.85	2.85	2.84	2.84	2.84	2.83
23.734	2.83	2.83	2.82	2.82	2.82	2.82	2.81
23.790	2.81	2.81	2.80	2.80	2.80	2.79	2.79
23.845	2.79	2.78	2.78	2.78	2.78	2.77	2.77
23.900	2.77	2.76	2.76	2.76	2.75	2.75	2.75
23.956	2.74	2.74	2.74	2.74	2.73	2.73	2.72
24.011	2.72	2.71	2.70	2.69	2.67	2.65	2.62
24.066	2.60	2.56	2.52	2.47	2.42	2.36	2.29
24.121	2.22	2.15	2.07	1.99	1.91	1.82	1.74
24.177	1.65	1.57	1.46	1.37	1.29	1.22	1.14
24.232	1.07	1.00	0.94	0.88	0.82	0.77	0.72
24.287	0.67	0.62	0.58	0.54	0.50	0.47	0.44
24.342	0.40	0.36	0.32	0.30	0.28	0.26	0.23
24.398	0.20	0.18	0.16	0.15	0.14	0.13	0.12
24.453	0.12	0.11	0.10	0.10	0.09	0.08	0.08
24.508	0.07	0.07	0.06	0.06	0.06		

La Habra
DMA 'A' PROPOSED

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	Peak Flow by Storm 2-Yr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)
DMA 'A'	0.043		14.83				
DMA 'B'	0.031		12.84				
DMA 'C'	0.117		32.68				
DMA 'E'	0.008		5.36				
DMA 'F'	0.003		1.47				
OUTLET	0.201		65.68				

WinTR-20: Version 1.10 0 0 0.05
bra (continued)
DMA 'A' PROPOSED

STORM 2-Yr

SUB-AREA:

DMA 'A'	Outlet	.04266	87.	.28
DMA 'B'	Outlet	.03078	89.	.258
DMA 'C'	Outlet	.11656	85.	.316

Feasibility Worksheets

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		X
Provide basis: Based on TGD and County of Orange GIS data, there are no restrictions for infiltration.			
2	Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): The BMP can only be located less than 50 feet away from slopes steeper than 15 percent. The BMP can only be located less than eight feet from building foundations or an alternative setback. A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis: Per TGD, site is not located in plume or contamination area. No restrictions placed by geotechnical engineer.			
3	Would infiltration of the DCV from drainage area violate downstream water rights?		X
Provide basis: No restrictions on water rights for project site.			
	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility located on HSG D soils or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	X	
Provide basis: Per NRCS Web Soil Survey data, site resides on HSG Group C and D soils, which is not recommended for infiltration.			
5	Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.		X
Provide basis: Based on the predominate soils type being type C, infiltration is not recommended. Infiltration testing will be performed to verify infeasibility.			

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
6	Would reduction of over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: **Project discharges to storm drains and channels that are not ephemeral.**			
7	Would an increase in infiltration over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: **Based on TGD and county GIS records, no restrictions on infiltration due to groundwater concerns.**			
Infiltration Screening Results (check box corresponding to result):			
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: **Per TGD and County of Orange GIS data, project is not located in an area where increase in I&I to the sanitary sewer is of concern.**		X
9	If any answer from row 1-3 is yes: infiltration of any volume is not feasible within the DMA or equivalent.	Provide basis: **Answers to all questions are "no".**	
10	If any answer from row 4-7 is yes, infiltration is permissible but is not presumed to be feasible for the entire DCV. Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply.	Provide basis: **Based on the predominate soils type being type C, infiltration is not recommended. Infiltration testing will be performed to verify infeasibility.**	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	Provide basis: **Answer to item 4 is yes item 5 will be field verified as infeasible**	

Worksheet J: Summary of Harvested Water Demand and Feasibility

1	What demands for harvested water exist in the tributary area (check all that apply):			
2	Toilet and urinal flushing		☒	
3	Landscape irrigation		☒	
4	Other:_____		☐	
5	What is the design capture storm depth? (Figure III.1)	d	0.95	inches
6	What is the project size? 150.8 ac.	A	150.8	ac
7	What is the acreage of impervious area?	IA	50.4	ac
	For projects with multiple types of demand (toilet flushing, irrigation demand, and/or other demand)			
8	What is the minimum use required for partial capture? (Table X.6)			gpd
9	What is the project estimated wet season total daily use (Section X.2)?			gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)			
	For projects with only toilet flushing demand			
11	What is the minimum TUTIA for partial capture? (Table X.7)		117	users/ac
12	What is the project estimated TUTIA? (420 units = 1,260 users per 50.4 ac imp = 25.0 users/ac)		25.0	users/ac
13	Is partial capture potentially feasible? (Line 12 > Line 11?)		No	
	For projects with only irrigation demand			
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8)		53.9	ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)		33.3	ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)		No	

Provide supporting assumptions and citations for controlling demand calculation:
Item 11 – From Table X.7 – 117 users/imp acre
Item 12 – Estimate based on 420 units and 3 residents per unit. = 1,260 users / 50.4 ac imp
Item 14 – From Table X.8 – K_L = 0.35, $Depth_{DC}$ = 0.95, Santa Ana. (1.07 * 50.4 acres = 53.9 acres)
Item 15 – 26.9 ac (common area landscaping) x 1.0 + 3.2 ac (common area turf) * 2 = 33.3 ac
Since the project's toilet flushing and irrigation demands are less than the minimum based on Tables X.7 and X.8 of the TGD, the project does not have the demand necessary to consider harvest and use feasible.

BMP Details

Hydrologic Source Controls (HSC)

HSC-2: Impervious Area Dispersion

Impervious area dispersion refers to the practice of routing runoff from impervious areas, such as rooftops, walkways, and patios onto the surface of adjacent pervious areas. Runoff is dispersed uniformly via splash block or dispersion trench and soaks into the ground as it move slowly across the surface of pervious areas. Minor ponding may occur, but it is not the intent of this practice to actively promote localized on-lot storage (See HSC-1: Localized On-Lot Infiltration).

Also known as:

- *Downspout disconnection*
- *Impervious area disconnection*
- *Sheet flow dispersion*

Simple Downspout Dispersion
Source: toronto.ca/environment/water.htm

Feasibility Screening Considerations

- Impervious area dispersion can be used where infiltration would otherwise be infeasible, however dispersion depth over landscaped areas should be limited by site-specific conditions to prevent standing water or geotechnical issues.

Opportunity Criteria

- Rooftops and other low traffic impervious surface present in drainage area.
- Soils are adequate for infiltration. If not, soils can be amended to improve capacity to absorb dispersed water (see MISC-2: Amended Soils).
- Significant pervious area present in drainage area with shallow slope
- Overflow from pervious area can be safely managed.

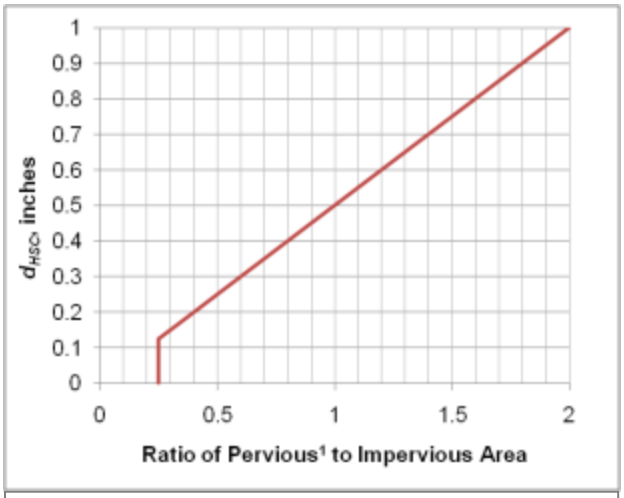
OC-Specific Design Criteria and Considerations

- ☐ Soils should be preserved from their natural condition or restored via soil amendments to meet minimum criteria described in Section .
- ☐ A minimum of 1 part pervious area capable of receiving flow should be provided for every 2 parts of impervious area disconnected.
- ☐ The pervious area receiving flow should have a slope ≤ 2 percent and path lengths of ≥ 20 feet per 1000 sf of impervious area.
- ☐ Dispersion areas should be maintained to remove trash and debris, loose vegetation, and protect any areas of bare soil from erosion.
- ☐ Velocity of dispersed flow should not be greater than 0.5 ft per second to avoid scour.

Calculating HSC Retention Volume

- The retention volume provided by downspout dispersion is a function of the ratio of impervious to pervious area and the condition of soils in the pervious area.
- Determine flow patterns in pervious area and estimate footprint of pervious area receiving dispersed flow. Calculate the ratio of pervious to impervious area.
- Check soil conditions using the soil condition design criteria below; amend if necessary.
- Look up the storm retention depth, d_{HSC} from the chart below.

- The max d_{HSC} is equal to the design storm depth for the project site.



[1] Pervious area used in calculation should only include the pervious area receiving flow, not pervious area receiving only direct rainfall or upslope pervious drainage.

Soil Condition Design Criteria

☐ Maximum slope of 2 percent

☐ Well-established lawn or landscaping

☐ Minimum soil amendments per criteria in MISC-2: Amended Soils.

Configuration for Use in a Treatment Train

- Impervious area disconnection is an HSC that may be used as the first element in any treatment train
- The use of impervious area disconnection reduces the sizing requirement for downstream LID and/or treatment control BMPs

Additional References for Design Guidance

- SMC LID Manual (pp 131) http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- City of Portland Bureau of Environmental Services. 2010. How to manage stormwater – Disconnect Downspouts. http://www.portlandonline.com/bes/index.cfm?c=43081&a=177702
- Seattle Public Utility: http://www.cityofseattle.org/util/stellent/groups/public/@spu/@usm/documents/webcontent/spu01_006395.pdf
- Thurston County, Washington State (pp 10): http://www.co.thurston.wa.us/stormwater/manual/docs-faqs/DG-5-Roof-Runoff-Control_Rev11Jan24.pdf

HSC-3: Street Trees

By intercepting rainfall, trees can provide several aesthetic and stormwater benefits including peak flow control, increased infiltration and ET, and runoff temperature reduction. The volume of precipitation intercepted by the canopy reduces the treatment volume required for downstream treatment BMPs. Shading reduces the heat island effect as well as the temperature of adjacent impervious surfaces, over which stormwater flows, and thus reduces the heat transferred to downstream receiving waters. Tree roots also strengthen the soil structure and provide infiltrative pathways, simultaneously reducing erosion potential and enhancing infiltration.

Also known as:

- *Canopy interception*

Street trees
Source: Geosyntec Consultants

Feasibility Screening Considerations

- Not applicable

Opportunity Criteria

- Street trees can be incorporated in green streets designs along sidewalks, streets, parking lots, or driveways.
- Street trees can be used in combination with bioretention systems along medians or in traffic calming bays.
- There must be sufficient space available to accommodate both the tree canopy and root system.

OC-Specific Design Criteria and Considerations

☐ Mature tree canopy, height, and root system should not interfere with subsurface utilities, suspended powerlines, buildings and foundations, or other existing or planned structures. Required setbacks should be adhered to.

☐ Depending on space constarints, a 20 to 30 foot diameter canopy (at maturity) is recommended for stormwater mitigation.

☐ Native, drought-tolerant species should be selected in order to minimize irrigation requirements and improve the long-term viability of trees.

☐ Trees should not impede pedstrian or vehicle sight lines.

☐ Planting locations should receive adequate sunlight and wind protection; other environmental factors should be considered prior to planting.

☐ Frequency and degree of vegetation management and maintenance should be considered with respect to owner capabilities (e.g., staffing, funding, etc.).

☐ Soils should be preserved in their natural condition (if appropriate for planting) or restored via soil amendments to meet minimum criteria described in MISC-2: Amended Soils. If necessary, a landscape architect or plant biologist should be consulted.

☐ A street tree selection guide, such as that specific to the City of Los Angeles, may need to be consulted to select species appropriate for the site design constraints (e.g., parkway size, tree height, canopy spread, etc.)

☐ Infiltration should not cause geotechnical hazards related to adjacent structures (buildings,

roadways, sidewalks, utilities, etc.)

Calculating HSC Retention Volume

- The retention volume provided by streets trees via canopy interception is dependent on the tree species, time of the year, and maturity.
- To compute the retention depth, the expected impervious area covered by the full tree canopy after 4 years of growth must be computed (IA_{HSC}). The maximum retention depth credit for canopy interception (d_{HSC}) is 0.05 inches over the area covered by the canopy at 4 years of growth.

Configuration for Use in a Treatment Train

- As a HSC, street trees would serve as the first step in a treatment train by reducing the treatment volume and flow rate of a downstream treatment BMP.

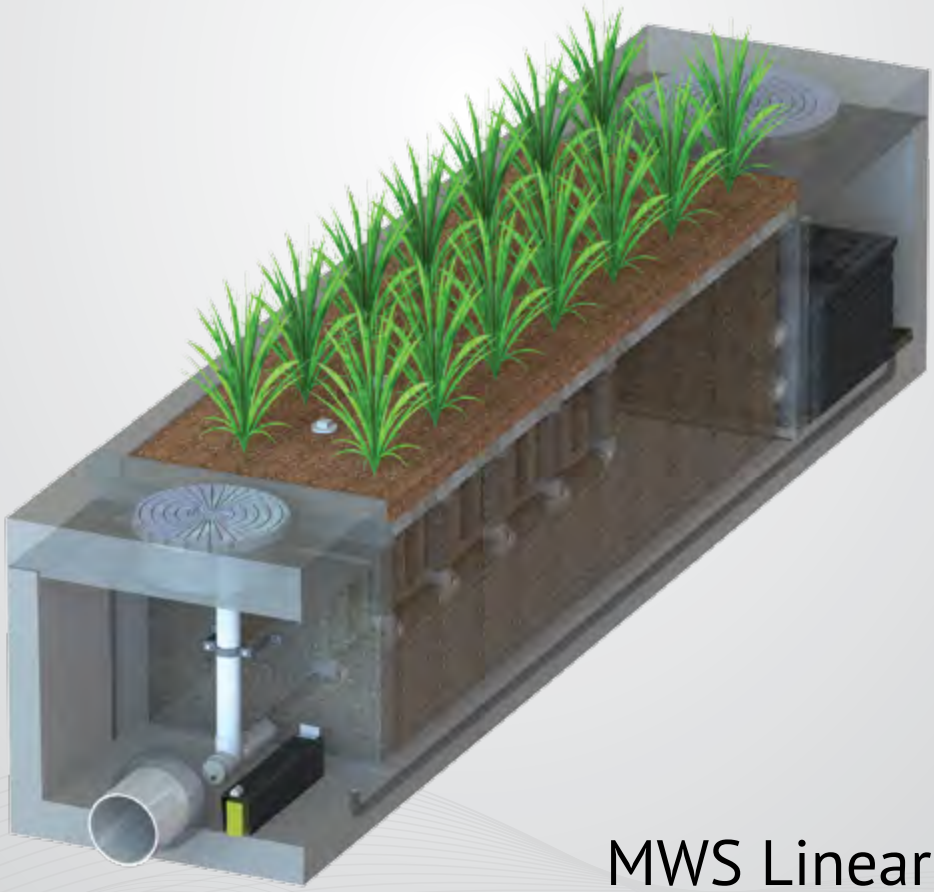
Additional References for Design Guidance

- California Stormwater BMP Handbook.
  http://www.cabmphandbooks.com/Documents/Development/Section_3.pdf
- City of Los Angeles, Street Tree Division - Street Tree Selection Guide.
  http://bss.lacity.org/UrbanForestryDivision/StreetTreeSelectionGuide.htm
- Portland Stormwater Management Manual.
  http://www.portlandonline.com/bes/index.cfm?c=35122&a=55791
- San Diego County – Low Impact Development Fact Sheets.
  http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

Biotreatment
(Modular Wetland System by BioClean)

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear

Contents

1 Introduction

2 Applications

3 Configurations

4 Advantages

5 Operation

6 Orientations | Bypass

7 Performance | Approvals

8 Sizing

9 Installation | Maintenance | Plants

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.

MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.

Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.

Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

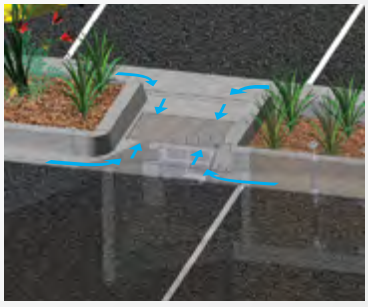
- Agriculture
- Reuse
- Low Impact Development
- Waste Water

Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.

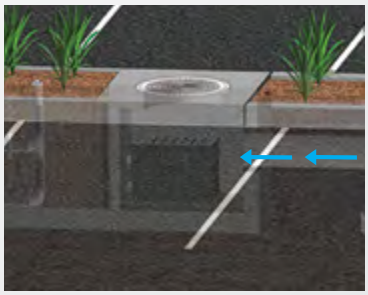
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

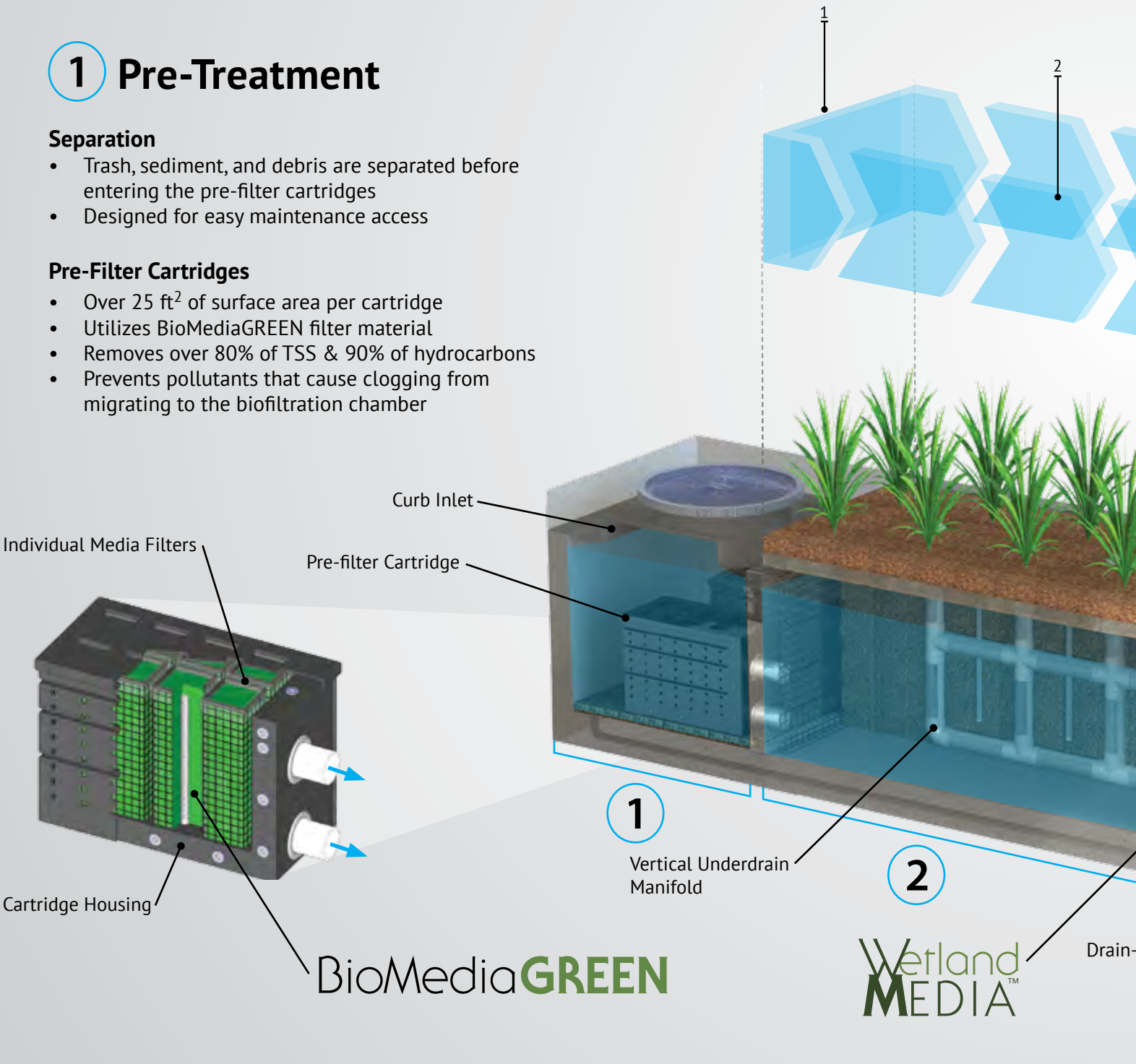
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



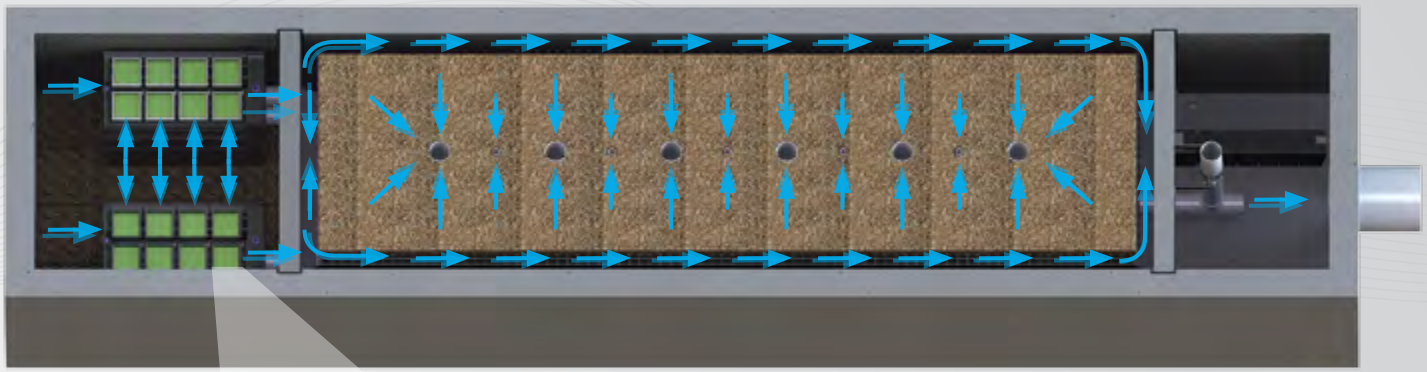


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

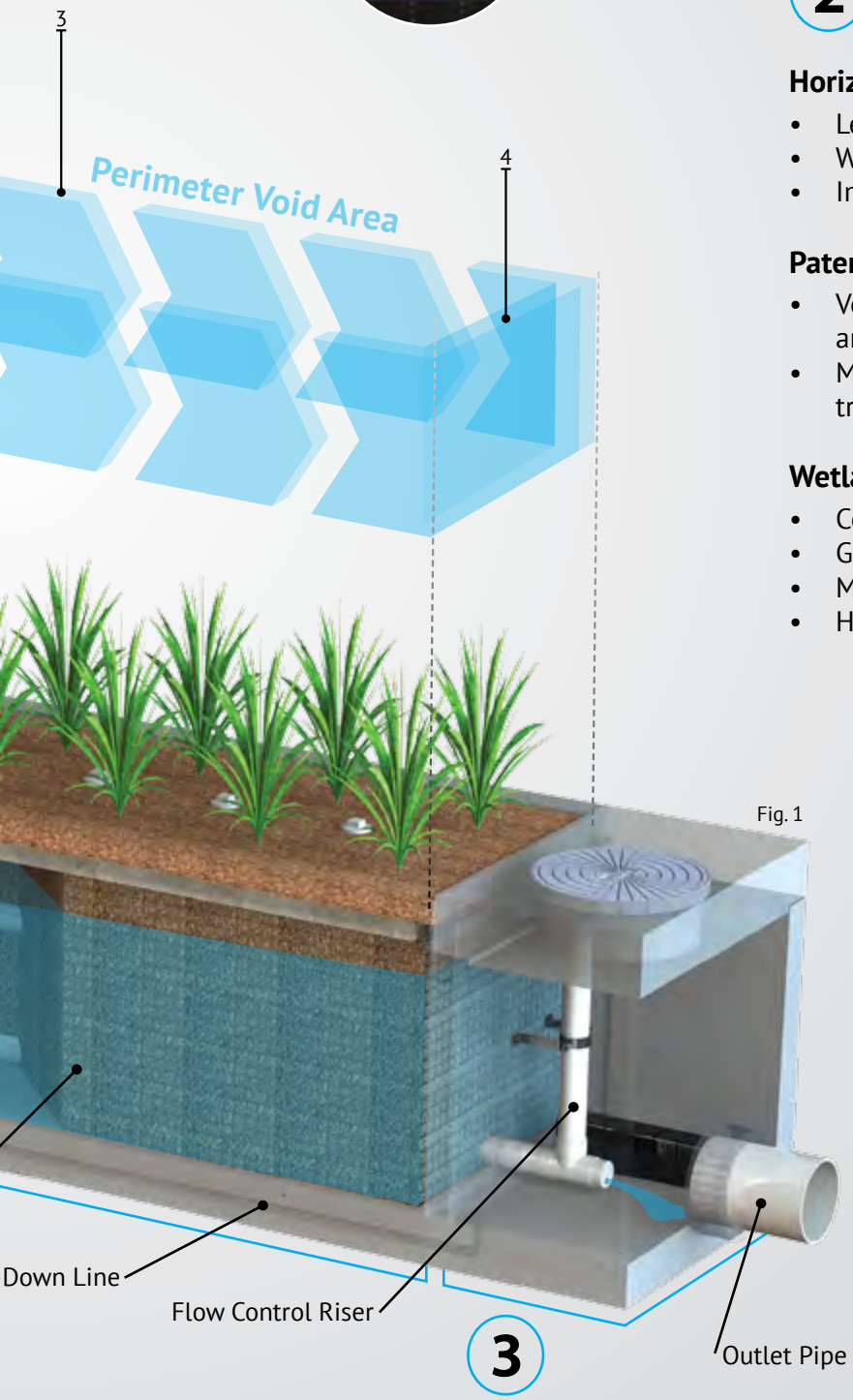


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

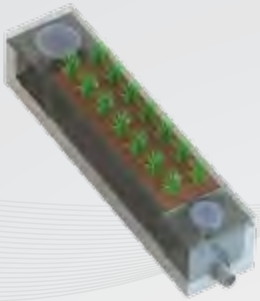
Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations

Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

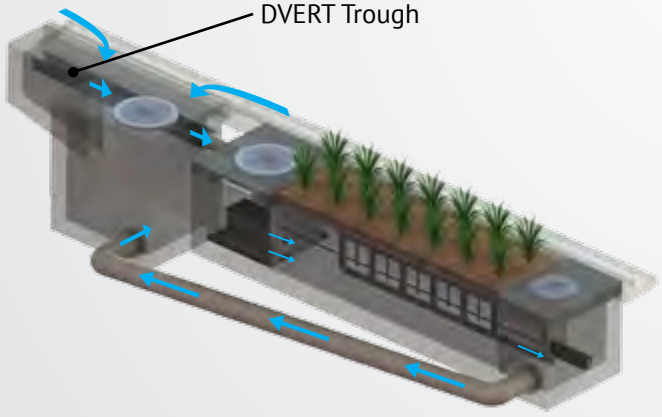
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.

Washington State DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%

DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.

MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.

Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

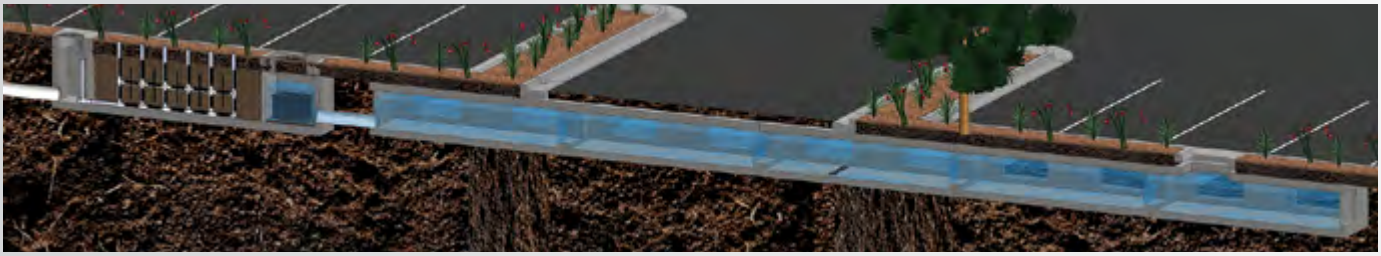
The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.

Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.

Installation Guidelines for Modular Wetland System

Delivery & Unloading/Lifting

1. Modular Wetland Systems, Inc. shall deliver the unit(s) to the site in coordination with the Contractor.

2. The Contractor will require spreader bars and chains/cables to safely and securely lift the main structure, lids and risers (if applicable). Modular Wetlands will supply a set of suitable lifting hooks, knuckles, shackles and eye bolts with each project at no extra charge.

3. The main structure and lid can be lifted together or separately.

   Please see Modular Wetland Weights and Lifting Details. Contact Modular Wetlands for additional lifting details.

Inspection

1. Inspection of the Modular Wetland unit and all parts contained in or shipped outside of the unit shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the Modular Wetland shipping ticket. Damage to the unit during and after unloading shall be corrected at the expense of the Contractor. Any necessary repairs to the Modular Wetland unit shall be made to the acceptance of the Engineer/Inspector.

Site Preparation

1. The Contractor is responsible for providing adequate and complete site/inlet protection when the Modular Wetland unit is installed prior to final site stabilization (full landscaping, grass cover, final paving, and street sweeping completed).

2. The Contractor shall adhere to all jurisdictional and/or OSHA safety rules in providing temporary shoring of the excavation.

3. The Contractor or Owner is responsible for appropriately barricading the Modular Wetland unit from traffic (in accordance with local codes).

Installation Guidelines for Modular Wetland System

Installation

1. Each unit shall be constructed at the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.

2. The unit shall be placed on the compacted sub-grade with a minimum 6-inch gravel base matching the final grade of the curb line in the area of the unit. The unit is to be placed such that the unit and top slab match the grade of the curb in the area of the unit. Compact undisturbed sub-grade materials to 95% of maximum density at +1% to 2% of the optimum moisture. Unsuitable material below sub-grade shall be replaced to site engineer's approval. Please see Modular Wetlands Weights and Lifting Details. Contact Modular Wetlands for guidance where slope exceeds 5%.

3. Once the unit is set, the internal wooden forms and protective silt fabric cover must be left intact (if WetlandMedia pre-installed). The top lid(s) should be sealed onto the box section before backfilling, using a non-shrink grout, butyl rubber or similar waterproof seal. The boards on the top of the lid and boards sealed in the unit's throat must NOT be removed. The Supplier will remove these sections at the time of activation.

4. Outlet connections shall be aligned and sealed to meet the approved drawings with modifications necessary to meet site conditions and local regulations. The correct outlet will be marked on the Modular Wetland unit.

5. Backfilling should be performed in a careful manner, bringing the appropriate fill material up in 6-inch lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of the Modular Wetland unit shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures" unless specified otherwise in contract documents.

6. It is the responsibility of the Contractor to provide curb and gutter and transition to the Modular Wetland unit for proper stormwater flow into the system through the throat, pipe or grate opening. A standard drawing of the throat and gutter detail is available in the following section; however the plans and contract documents supersede all standard drawings. Several variations of the standard design are available. Effective bypass for the Modular Wetland System is essential for correct operation (i.e. bypass to an overflow at lower elevation).

Installation Procedure

A set of lifting hooks, shackles, knuckles and eye bolts are provided by Modular Wetlands with the first delivery of every project.

The contractor **MUST** provide all rigging And lifting apparatus, such as all cables and chains or straps.

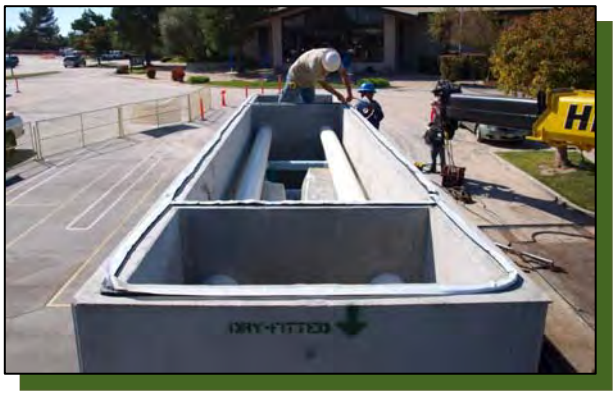
It is the contractor's responsibility to provide suitable lifting equipment to off-load the Modular Wetland unit.

Modular Wetland units are designed to be off-loaded using the contractor's spreader bar.

1. Apply Butyl Tape Seal

Apply butyl tape seal along the top of the box section. Butyl tape seal is provided with every unit.

Modular Wetland installed protective throat board and installed silt fabric must be left in place to protect the unit from construction sediment.



2. Unload and Set Box

Unload the Modular Wetland unit
the prepared hole with appropriate sub-grade.*

* Compacted sub-grade with a minimum
of six inches of gravel base which must match
the final grade of curb line the area of the unit.

3. Set Top On Box

Set the top slab on the box.

The Contractor is responsible for providing
adequate and complete site/inlet protection
when the Modular Wetland is installed prior
to final site stabilization (full landscaping,
grass cover, final paving, and street sweeping
completed).

4. Connect Outfall Pipe

The correct outlet will be marked on the
Modular Wetland.

Invert of outlet pipe **MUST** be even
with the floor of the system.

5. Install Curb & Gutter

It is the responsibility of the Contractor to provide curb and gutter and transition to the Modular Wetland for proper flow into the system through a 5”- 7” throat opening. A standard drawing of the throat and gutter detail in the following section. CONTRACTOR RESPONSIBLE FOR GROUTING IN ANY VISIBLE LIFTING POINTS.

6. Activation

Activation is performed **ONLY** by Modular Wetland personnel.

Activation can occur once the project site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed) and there is a 5” - 7” throat opening.

Call 760-433-7640 to schedule your activation.

NOTE: WetlandMedia Installation

For Larger models (MWS-L-4-13 and above) the system will be delivered without WetlandMedia pre-installed to minimize pick weight and prevent contamination of the media during construction. For these models the WetlandMedia will be delivered in bulk or in super sacks. It will be responsibility of the contractor to fill the system with the WetlandMedia during the installation process. Installation of the WetlandMedia can be done after the unit is fully installed to avoid contamination. See following pages for details.

WetlandMedia Install (if applicable)

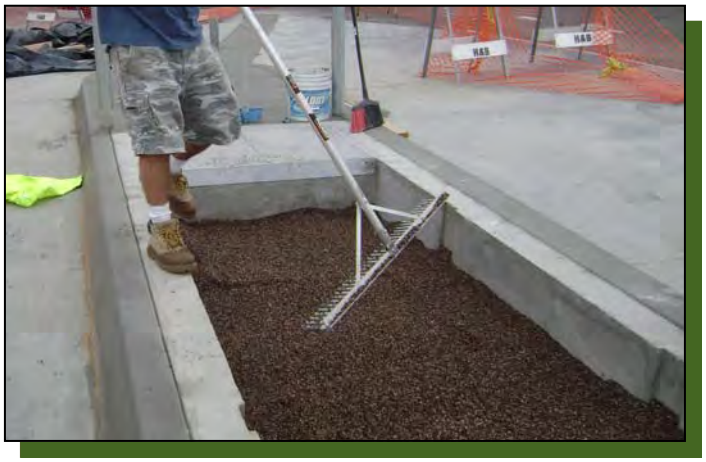
1. Fill WetlandMedia

Position super sack of WetlandMedia over wetland chamber. Bottom of sack should not be more than 2' above top of system. Open sack and fill evenly*.

* One to several hundred cubic yards of WetlandMedia will be required based upon the model number and size of the system. For large scale jobs WetlandMedia will be delivered in bulk and will require a bobcat of similar to fill the system. All equipment is the responsibility of the contractor.

2. Install Plant Propagation Layer

Fill WetlandMedia up to 9" below the top of the wetland chamber. Level out the WetlandMedia as shown. Ensure that the level does not vary more than one inch or plant growth will be affected.



3. Install Plant Propagation Layer

Utilize plant propagation blocks provided by the manufacturer. Each block is approximately 40" by 6" by 3" thick. Blocks shall be placed side by side and end to end and cover the entire length and width of the wetland chamber unless specified.

4. Finish Filling WetlandMedia

After plant propagation blocks are installed repeat step 1 and fill the system to the top of the wetland chamber as shown. WetlandMedia must be filled within 2” of the top of the unit.

5. Planting

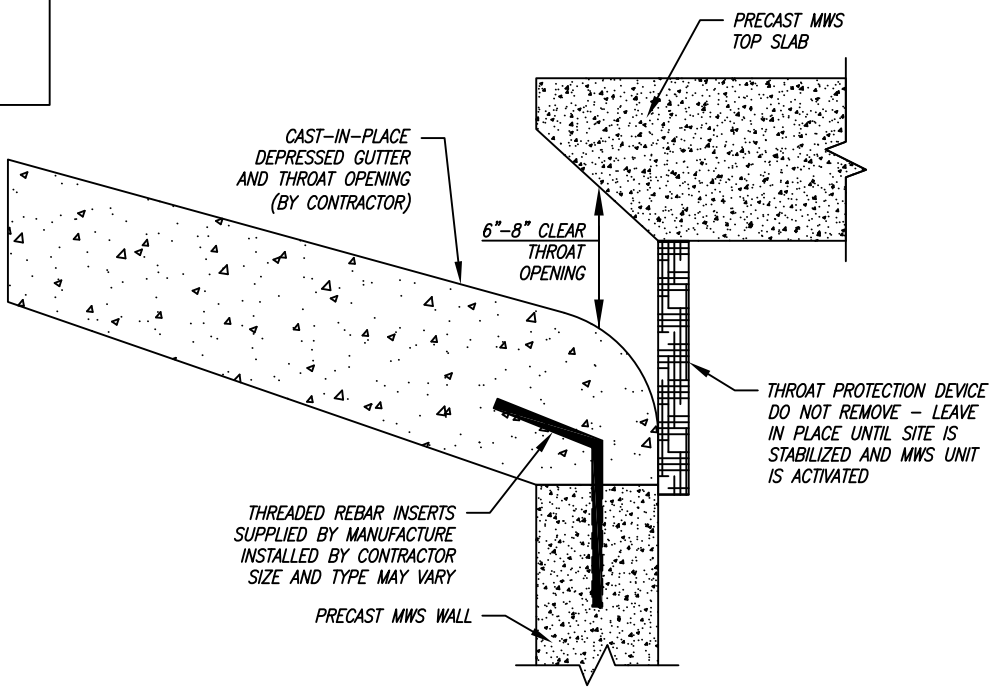
After system is filled with WetlandMedia planting of vegetation can begin. Utilizing 1 gallon plants dig down until The plant propagation blocks are reached. Remove plant and it’s root ball from the container. Set the bottom of the root ball on the tops of the blocks. Fill hole back in with WetlandMedia. After planting a thorough watering of the plants is necessary. The plant propagation blocks must be saturated to provide a water source for the plants during the establishment phase. It is recommended that hand watering is done three times a week for the first two months. Hand water can be supplemented with drip or spray irrigation after the second week. Please call the manufacturer for more details on plants, planting arrangement and irrigation options.

NOTE: planting is required on all units, including units delivered with WetlandMedia pre-installed.

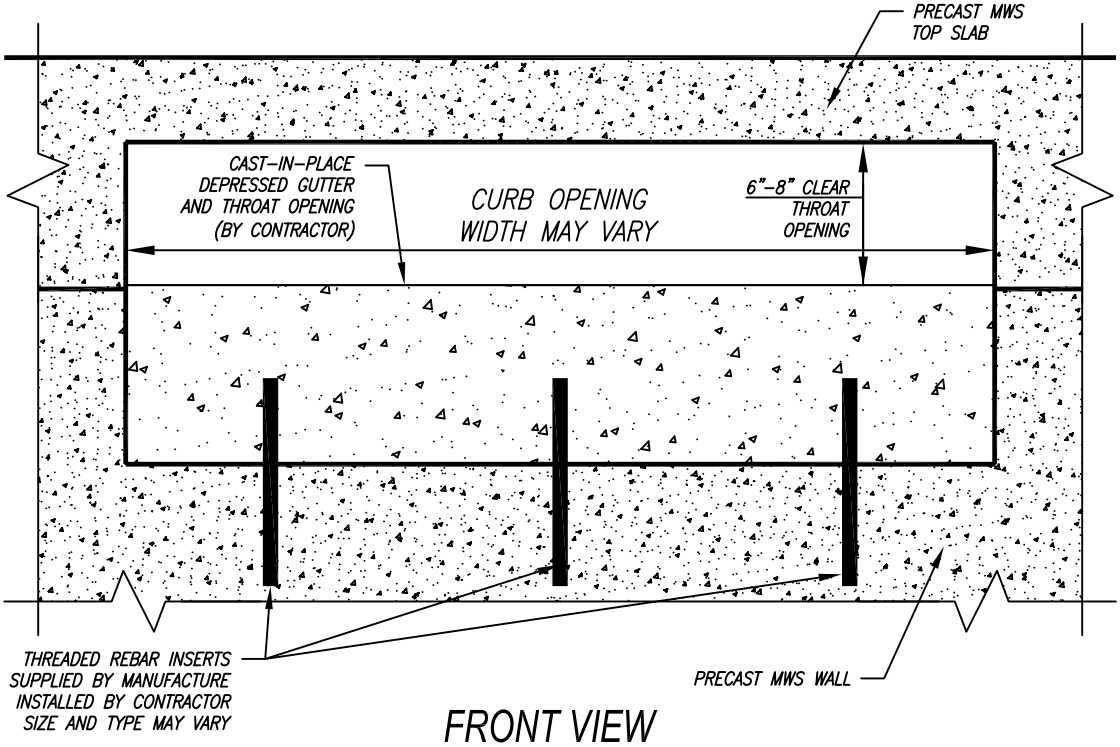
Curb and Gutter Details

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com



SECTION VIEW
STANDARD MODULAR WETLAND CURB OPENING



FRONT VIEW
STANDARD MODULAR WETLAND CURB OPENING

MODULAR WETLAND SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
www.ModularWetlands.com

	NAME	DATE
DRAWN	John	5/3/13
EDITED		

TITLE: MWS LINEAR 2.0 CURB INLET DETAILS

PROPRIETARY AND CONFIDENTIAL

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COMMENTS:

SIZE	DWG. NO.	REV

SCALE NTS	UNITS = INCHES	SHEET 1 OF 1

Weights and Lifting Details

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

MWS-L 2.0 Max Pick Weights

Model #	Size (O.D)	Size (I.D)	Unit Weight (lbs)	Media Weight (lbs)	Total Weight (lbs)
MWS-L-4-4	5' x 5'	4' x 4'	7500.0	1447.1	8947.1
MWS-L-4-6 MWS-L-4-6.5	5' x 7' 5 x 7.5'	4' x 6' 4' x 6.5'	11,000 11,500	1619.2	12,619.2 13,119.2
MWS-L-4-8	5' x 9'	8' x 4'	12500	3570	16070
MWS-L-4-13	5' x 14'	13' x 4'	21200	5306	26506
MWS-L-4-15	5' x 16'	15' x 4'	23700	7236	30936
MWS-L-4-17	5' x 18'	17' x 4'	26500	9165	35665
MWS-L-4-19	5' x 20'	19' x 4'	28300	11095	39395
MWS-L-4-21	5' x 22'	21' x 4'	30000	13024	43024

Max Pick Weight if Shipped Without Media Installed

Max Pick Weight if Shipped With Media Installed

Note: All weights listed hereon are standard max pick weights, actual pick weights may vary based upon state and local regulations and variation in concerte and rebar standards. For project specific pick weights contact the manufacturer prior to shipping of the unit(s). Is is the contractors responsibility to off-load the unit with an adequate size crane. Units are shipped with WetlandMEDIA in superbags and installed by contractor.

When Available see project contract terms, if lifting points are on the inside of the unit due to custom designs or installations requiring pionts to be on the inside the media will be shipped in bags and the contractor will be reponsibile to install after the unit is installed. For example, units places against a wall.

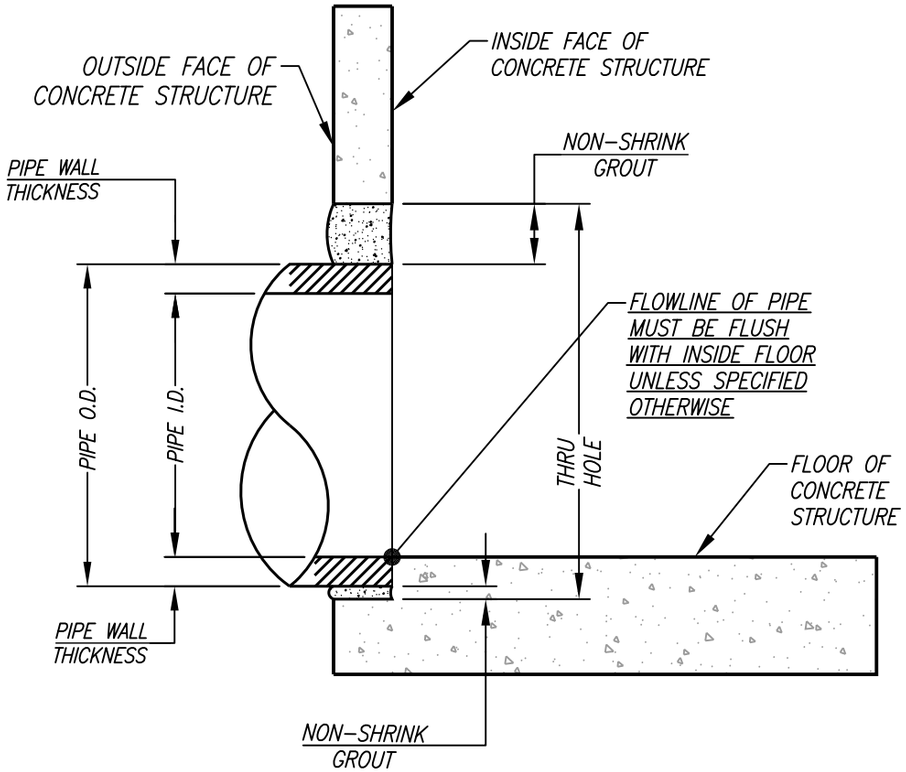
For Questions or Comments Please Call 760-433-7640 or email: info@modularwetlands.com

MODULAR WETLANDS

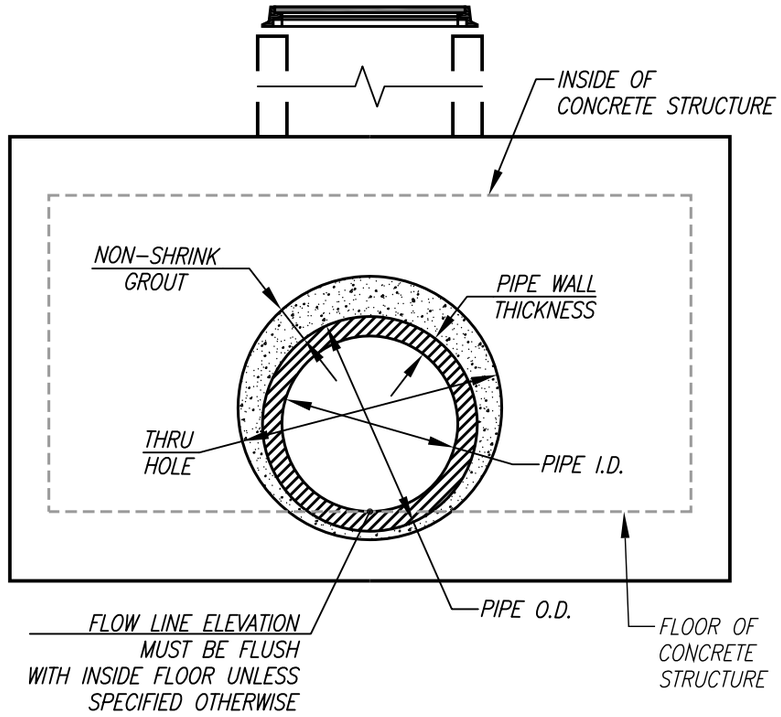
Connection Details

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com



ELEVATION VIEW



END VIEW

INSTALLATION NOTES

1. ALL CONNECTION PIPES SUPPLIED AND INSTALLED BY CONTRACTOR. MODULAR WETLAND UNIT WILL BE DELIVERED WITH A THRU HOLE AND ITS THE CONTRACTORS RESPONSIBILITY TO SUPPLY PIPE, AND ALL LABOR AND MATERIAL TO CONNECT PIPE AND SEAL UNIT WATER TIGHT INCLUDING BUT NOT LIMITED TO GROUT, CONCRETE LUG, REBAR, PLUG, ANCHORS, COUPLER, FITTINGS AND/OR ALL SUPPORT AND CONNECTING HARDWARE.
2. ALL CONNECTIONS ARE TO BE FLUSH WITH THE INSIDE SURFACE OF THE CONCRETE STRUCTURE. (CAN NOT INTRUDE BEYOND FLUSH) ALL PIPE FLOWLINES SHALL BE FLUSH WITH INSIDE FLOOR UNLESS SPECIFIED OTHERWISE.
3. ALL GROUT AND/OR CONCRETE SHALL BE NON–SHRINK AND MEET OR EXCEED LOCAL PIPE CONNECTION STANDARDS.
4. REFER TO AGENCY SPECIFICATIONS WHERE APPLICABLE.

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

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MODULAR WETLANDS

PIPE CONNECTION
STANDARD DETAIL

Section [_____]
Modular Subsurface Flow Wetland System

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Modular Subsurface Flow Wetland Systems used for biofiltration of stormwater runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Modular Subsurface Flow Wetland Systems (MSFWS) are used for filtration of stormwater runoff including dry weather flows. The MSFWS is a pre-engineered biofiltration system composed of a pretreatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing a sorptive media mix which does not contain any organic material and a layer of plant establishment media, and a discharge chamber containing an orifice control structure . Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber and orifice control structure.

01.03.00 Manufacturer
The manufacturer of the MSFWS shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the MSFWS(s) shall be a filter device Manufactured by Bio Clean Environmental Services, Inc., or Modular Wetland Systems, Inc., or assigned distributors or licensees. Bio Clean Environmental Services Inc., and Modular Wetland Systems, Inc., can be reached at:

Corporate Headquarters:
Bio Clean Environmental Service, Inc.
2972 San Luis Rey Road
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

Corporate Headquarters:
Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92049
Phone: (760) 433-7650
www.modularwetlands.net

01.04.00 Submittals

01.04.01 Shop drawings are to be submitted with each order to the contractor and consulting engineer.

01.04.02 Shop drawings are to detail the MSFWS and all components required and the sequence for installation, including:

- System configuration with primary dimensions
- Interior components
- Any accessory equipment called out on shop drawings

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of MSFWS.

01.05.02 Manufacturer to supply components of the MSFWS(s):

- Pretreatment chamber components (pre-assembled)
- Concrete Structure(s)
- Biofiltration chamber components (pre-assembled)
- Flow control discharge structure (pre-assembled)

01.06.00 Reference Standards

ASTM C 29	Standard Test Method for Unit Weight and Voids in Aggregate
ASTM C 88	C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C131	C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 330	C 330 Standard Specification for Lightweight Aggregate for Structural Concrete
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft3 (600 kN-m/m3)
ASTM D 1621	10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D 1777	ASTM D1777 - 96(2007) Standard Test Method for Thickness of Textile Materials
ASTM D 4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
AASHTO T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop
AASHTO T 104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 260	Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
AASHTO T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
AASHTO T 289	Standard Method of Test for Determining ph of Soil for Use in Corrosion Testing
AASHTO T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil
AASHTO T 290	T 290 Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil

PART 2 – COMPONENTS

The Modular Subsurface Flow Wetland Systems (MSFWS) and all of its components shall be self-contained within a concrete structure constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60, and supports and H20 loading as indicated by AASHTO. Each Chamber shall have appropriate access hatches for easy maintenance and sized to allow removal of all internal components without disassembly. All water transfer system components shall conform with the following;

- Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Drainage cells shall be manufactured of lightweight injection-molded plastic and have a minimum compressive strength test of 6,000 psi and a void area along the surface making contact with the filter media of 75% or greater. The cells shall be at least 2" in thickness and allow water to freely flow in all four directions.

02.01.00 Pretreatment Chamber Components

02.01.01 Filter Cartridges shall operate at a loading rate not to exceed 3 gallons per minute per square foot surface area.

02.01.02 Drain Down System shall include a pervious floor that allows water to drain into the underdrain pipe that is connected to the discharge chamber.

02.02.00 Biofiltration Chamber Components

02.02.01 Media shall consist of ceramic material produced by expanding and vitrifying select material in a rotary kiln. Media must be produced to meet the requirements of ASTM C330, ASTM C331, and AASHTO M195. Aggregates must have a minimum 24-hour water absorption of 10.5% mass. Media shall not contain any organic material. Flow through media shall be horizontal from the outer perimeter of the chamber toward the centralized and vertically extending underdrain. The retention time in the media shall be at least 3 minutes. Downward flow filters are not acceptable alternatives. The thickness of the media shall be at least 19" from influent end to effluent end. The loading rate on the media shall not exceed 1.1 gallons per minute per square foot surface area. Media must be contained within structure that spaces the surface of the media at least 2" from all vertically extending walls of the concrete structure.

02.02.02 Planting shall be native, drought tolerant species recommend by manufacturer and/or landscape architect.

02.02.03 Plant Support Media shall be made of a 3" thick moisture retention cell that is inert and contains no chemicals or fertilizers, is not made of organic material and has an internal void percentage of 80%.

02.03.00 Discharge Chamber

The discharge device shall house a flow control orifice plate that restricts flows greater than designed treatment flow rate. All piping components shall be made of a high-density polyethylene. The discharge chamber shall also contain a drain down filter if specified on the drawing.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The MSFWS has no moving internal components and functions based on gravity flow, unless otherwise specified. The MSFWS is composed of a pretreatment chamber, a biofiltration chamber and a discharge chamber. The pretreatment device houses cartridge media filters, which consist of filter media housed in a perforated enclosure. The untreated runoff flows into the system via subsurface piping and or surface inlet. Water entering the system is forced through the filter cartridge enclosures by gravity flow. Then the flow contacts the filter media. The flow through the media is horizontal toward the center of each individual media filter. In the center of the media shall be a round slotted PVC pipe of no greater than 1.5" in diameter. The slotted PVC pipe shall extend downward into the water transfer cavity of the cartridge. The slotted PVC pipe shall be threaded on the bottom to connect to the water transfer cavity. After pollutants have been removed by the filter media the water discharges the pretreatment chamber and flows into the water transfer system and is conveyed to the biofiltration chamber. Once runoff has been filtered by the biofiltration chamber it is collected by the vertical underdrain and conveyed to a discharge chamber equipped with a flow control orifice plate. Finally the treated flow exits the system.

03.01.02 Pollutants - The MSFWS will remove and retain debris, sediments, TSS, dissolved and particulate metals and nutrients including nitrogen and phosphorus species, bacteria, BOD, oxygen demanding substances, organic compounds and hydrocarbons entering the filter during frequent storm events and continuous dry weather flows.

03.01.03 Treatment Flow Rate and Bypass - The MSFWS operates in-line. The MSFWS will treat 100% of the required water quality treatment flow based on a minimum filtration capacities listed in section 03.02.00. The size of the system must match those provided on the drawing to ensure proper performance and hydraulic residence time.

Minimum Treatment Capabilities

• System must be capable of treating flows to the specified treatment flow rate on the drawings. The flow rate shall be controlled by an orifice plate.

PART 4 - EXECUTION

04.01.00 General

The installation of the MSFWS shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (MSFWS) device(s) and appurtenances in accordance with the drawings and these specifications.

04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.

04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations prior to installation of MSFWS components.

04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations, and with a minimum of 6" of gravel under all concrete structures.

04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.02.05 Subsurface Flow Wetland Media shall be carefully loaded into area so not to damage the Wetland Liner or Water Transfer Systems. The entire wetland area shall be filled to a level 9 inches below finished surface.

04.02.06 Planting layer shall be installed per manufacturer's drawings and consist of a minimum 3" grow enhancement media that ensures greater than 95% plant survival rate, and 6" of wetland media. Planting shall consist of native plants recommended by manufacturer and/or landscape architect. Planting shall be drip irrigated for at least the first 3 months to insure long term plant growth. No chemical herbicides, pesticides, or fertilizers shall be used in the planting or care and maintenance of the planted area.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – MSFWS shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the MSFWS and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The MSFWS(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The MSFWS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the MSFWS has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the MSFWS and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the MSFWS has been installed per the manufacturer's specifications and recommendations. All

components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal maintenance of once a year and replacement of the Cartridge Filters as needed. The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the MSFWS. A Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the MSFWS shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURNACE

05.01.00 Warranty

The Manufacturer shall guarantee the MSFWS against all manufacturing defects in materials and workmanship for a period of (5) years from the date of delivery to the _____. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The MSFWS is limited to recommended application for which it was designed.

05.02.00 Performance Certification

The MSFWS manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certificate" certifying the MSFWS is capable of achieving the specified removal efficiency for suspended solids, phosphorous and dissolved metals.

Attachment D

WQMP Notice of Transfer of Responsibility

Water Quality Management Plan

Notice of Transfer of Responsibility

Tracking No. Assigned by the City of La Habra: _____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of La Habra 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 a portion thereof) to the New Owner, as further discussed.

I. Previous Owner/Previous Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	Zip:	Phone:

II. Information about Site Transferred

Name of Project (if applicable): 'Rancho La Habra'		Contact Person: Michael Battaglia	
Title of WQMP applicable to Site: Preliminary WQMP – Rancho La Habra			
Planning Area (PA) and/or Tract Number(s) for Site Lot Numbers (if Site is a portion of a tract):			
Date WQMP Prepared (and revised if applicable):			
Street Address of Site: 1400 S. La Habra Hills Drive			
City: La Habra	State: CA	Zip: 90631	Phone: 949-789-1600

III. New Owner/New Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	Zip:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/Parcel Subject to WQMP Retained by Owner (if any):
Lot/Tract Numbers of Site Transferred to New Owner:	
Remaining Lot/Tract Numbers Subject to WQMP Still Held by Owner (if any):	
Date of Ownership Transfer:	

Note: When the Previous Owner is transferring a site that is a portion of a larger project/parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/parcel not transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled "Previous Owner," and those portions previously transferred by Previous Owner shall be labeled as "Previously Transferred."

V. Purpose of Transfer

The purpose of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Owner is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I Certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I Certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature of New Owner Representative:	Date:

Attachment E

Geotechnical Reference

LGC Geotechnical, Inc.

PROJECT MEMORANDUM

To: Cal Atlantic Homes
15360 Barranca Parkway
Irvine, California 92618

REGISTERED PROFESSIONAL ENGINEER
DENNIS BORATYNEC
No. 2770
Exp. 12/31/18
GEOTECHNICAL
STATE OF CALIFORNIA

Date: January 10, 2018
Project No.: 14057-01

Attention: Mr. Michael Battaglia

From: Dennis Boratynec, GE 2770 DDB

Subject: ***Geotechnical Response to City of La Habra Priority Water Quality Management (WQMP) Comment No. 3 dated January 24, 2017, Proposed Rancho La Habra Residential Development, VTTM 17845, City of La Habra, California***

References: City of La Habra, 2017, Priority Water Quality Management (WQMP) Checklist, 1400 South La Habra Hills Drive, dated January 24, 2017.

County of Orange, 2013, Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), Exhibit 7.III, December 20, 2013.

LGC Geotechnical, Inc., 2016, Preliminary Report for Proposed Rancho La Habra, Residential Development, VTTM 17845, City of La Habra, California, Project No. 14057-01, dated June 23, 2016.

In accordance with your request, LGC Geotechnical, Inc. (LGC Geotechnical) has prepared this memorandum to respond to Comment No. 3 within the City of La Habra WQMP checklist dated January 24, 2017 (City of La Habra, 2017) for the proposed Rancho La Habra Residential Development, VTTM 17845, City of La Habra, California.

Site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays which have infiltration rates below 0.3 inches per hour. This is a hillside project and our experience indicates the vast majority of landslides are caused by inappropriate handling of surface/subsurface water. Additionally, a portion of the site is located in a State of California Seismic Hazard Zone for liquefaction potential. Intentional storm water infiltration would result in significant increased risks of geotechnical hazards such as liquefaction and landslides and therefore is not recommended. Refer to storm water infiltration infeasibility outlined in Section 2.4.2.4 of the Technical Guidance Document (County of Orange, 2013).

Should you have any questions regarding this memorandum, please do not hesitate to contact our office.

LGC Geotechnical, Inc.

August 19, 2015 Project No. 14057-01

Mr. Michael Battaglia
Standard Pacific Homes
15360 Barranca Parkway
Irvine, California 92618

Subject: ***Preliminary Geotechnical Report for Proposed Westridge Residential Development, VTTM 17845, City of La Habra, California***

In accordance with your request and authorization, LGC Geotechnical, Inc. has prepared a preliminary geotechnical report for the proposed "Westridge" residential development generally located south of Imperial Highway and an adjacent commercial center between Beach Boulevard and Idaho Street within the City of La Habra, California. The purpose of our study was to evaluate the existing onsite geotechnical conditions and to confirm that the site can be developed from a geotechnical perspective.

Should you have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Respectfully Submitted,

LGC Geotechnical, Inc.

Brad Zellmer, GE 2618
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
BRAD ZELLMER
NO. 2618
EXP. 12-31-16
GEOTECHNICAL
STATE OF CALIFORNIA

Katie Maes, CEG 2216
Project Geologist

PROFESSIONAL GEOLOGIST
KATHERIN M. MAES
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CERTIFIED ENGINEERING GEOLOGIST
Exp. 10-31-16
STATE OF CALIFORNIA

Dennis Boratynec, GE 2770
Vice President

REGISTERED PROFESSIONAL ENGINEER
DENNIS BORATYNEC
No. 2770
Exp. 12/31/16
GEOTECHNICAL
STATE OF CALIFORNIA

BTZ/DJB/KTM/ala

Distribution: (1) Addressee (1 electronic copy)
(3) VCS Environmental (2 hard copies, 1 electronic copy)
Attn: Mr. Peter Carlson

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1.0 INTRODUCTION

1.1 Purpose and Scope of Services

This report presents the results of our preliminary geotechnical evaluation for the proposed "Westridge" residential development, Vesting Tentative Tract No. 17845, located in the City of La Habra, California. The preliminary grading plan by Hunsaker and Associates, Inc. (Hunsaker, 2015) was utilized as a base map for our Geotechnical Map (Sheet 1), and Geotechnical Cross-Sections (Sheets 2 & 3).

The purpose of our study was to evaluate the existing onsite geotechnical conditions and to confirm that the site can be developed from a geotechnical perspective. As part of this report, we have: 1) reviewed available geotechnical reports, geologic maps, and air photos pertinent to the site (Appendix A); 2) performed a subsurface geotechnical evaluation of the site; 3) prepared a geotechnical map of the site incorporating available geotechnical information; 4) prepared geotechnical cross-sections depicting the interpreted subsurface conditions of the site relative to the proposed design; 5) performed global slope stability analysis in support of the proposed design; and 6) prepared this summary report presenting our preliminary findings and conclusions for the proposed development.

The findings and conclusions presented herein should be considered preliminary and will need to be confirmed as part of a grading plan review report to be provided at a later date. It should be noted that LGC Geotechnical does not provide environmental consulting services.

1.2 Existing Conditions

The approximately 150-acre site is currently an 18-hole golf course at the location depicted on the Site Location Map, Figure 1 (Page 6). The golf course includes a clubhouse, associated parking areas and cart paths, a driving range, and three lake features. The irregular-shaped parcel is bound on the west by Beach Boulevard, to the north by existing commercial and residential located along Imperial Highway, to the east by Idaho Street, and to the south by existing residential Tracts 15031 and 15030. An existing street, Trevino Avenue, traverses the site and provides access to the clubhouse at the central portion of the site and gated access to the residential tracts south of the site.

The site has moderate relief, the lowest in the northern portion at an approximate elevation of 220 feet, the highest at the southeastern corner up to an approximate elevation of 470 feet. The existing residential tracts to the south of the site are generally at higher elevations and separated from the subject site by an ascending slope.

1.3 Project Description

The proposed development includes 280 lots consisting of multi and single-family residential and commercial pads, associated roadways, parks and open space areas. The commercial pads and associated parking areas are planned on approximately 3 acres at the north/central portion of the site. The development will include a water quality basin located in the western portion of the site with a maximum design water elevation of 208 feet above sea level (Hunsaker, 2015). Four Mechanically Stabilized Earth (MSE) retaining walls up to approximately 13 feet in height are proposed within the

development including a mid-slope MSE retaining wall up to approximately 12 feet in height. In addition, numerous conventional retaining walls are proposed.

The maximum proposed cut and fill slopes are approximately 80 and 40 feet, respectively. The grading plan depicts planned cuts and fills (not including required remedial grading) up to approximately 55 and 35 feet, respectively. No changes are depicted at the existing central clubhouse, and minor changes depicted on the southern of two existing lake features near the clubhouse. The northern of the two lake features near the existing clubhouse and an existing lake feature at the western portion of the site are planned to be removed as part of the proposed development.

1.4 Background

The subject site is located within a portion of the former West Coyote Oil Field located along the southern boundary of La Habra. Petroleum production by Chevron and affiliated companies started in the region in the early 1900's and ceased in approximately 1995. As part of oil production activities, site topography was altered slightly with construction of oil extraction pads and roads throughout the hills (Continental, 2014). The transition from an oil field to a golf course was undertaken over several years with the involvement of various geotechnical and environmental consultants, as detailed below. Please note that the available reports and maps obtained from the City of La Habra documenting the geotechnical history of the site are incomplete in several cases, and some documents referenced within those reports were not available for review.

On October 1, 1968 while the site was still an active oil field, a fault ruptured offsite and to the east of the site near Idaho Street. Subsequent extensive fault trenching in 1970 by Converse, Davis, & Associates (Converse) allowed for detailed mapping of the approximately 3-inch, vertically offset, fault trace. The well-defined lineament was documented, evaluated, and became known as the "Unnamed West Coyote Hills Fault" as presented in the referenced Fault Evaluation Report and Supplemental Report published by California Department of Mines and Geology (CDMG, 1977 & 1978). CDMG, 1978, suggests that the probable cause of fault rupture was due to oil field operations (subsidence due to oil extraction and groundwater injection activities). The fault was assigned a State of California Alquist-Priolo Earthquake Fault Zone (CDMG, 1991). As is typical, the Earthquake Fault Zone extends well beyond the lineament of the fault in order to ensure that any potential fault splays are investigated by a geologist prior to construction of habitable structures within the Zone. The mapped lineament and the limits of the Earthquake Fault Zone are presented on the Geotechnical Map (Sheet 1).

Leighton and Associates (Leighton) performed a fault study of the region in the early 1990's by trenching the area of the subject site and the two proposed adjacent tracts to the south. Numerous existing inactive north-south trending faults that characterize the uplifted Coyote Hills geologic structure for this area are presented on a map and cross sections by Leighton (1992: Figures Only) that were reviewed as part of this study. Leighton also depicted the (offsite) location of the historically active Unnamed West Coyote Hills Fault as mapped by Converse, and a recommended structural setback extending 100 feet from either side of the lineament. None of the faults except the Unnamed West Coyote Hills Fault are considered to be active or potentially active.

A geotechnical field evaluation was performed in 1996 by Goffman, McCormick and Urban, Inc., (GMU, 1996: Text Only), as part of a grading plan review for the proposed golf course and adjacent Tracts 15030 and 15031 to the south. The field evaluation consisted of 60 test pits and 36 large-

diameter borings up to approximately 66 feet below grade. Although the geotechnical figures showing boring logs and locations were not available as part of our review of the original report of geotechnical studies by GMU, those figures were obtained from a subsequent response to comments report by another consulting firm. Geosoils, Inc. became the geotechnical consultant of record for construction of the Westridge Golf Course and responded to geotechnical review comments in the referenced report (Geosoils, 1997). Selected borings logged by GMU are presented herein on the Geotechnical Map, Sheet 1 (In Pocket), and boring logs in Appendix B.

During the period between the fault evaluation report by Leighton, 1992, and the geotechnical investigation by GMU, 1996, demolition of concrete features was reportedly ongoing at the site. Limited information is available regarding an approximate 25-foot-deep excavation where alternating layers of concrete rubble and soil was placed under observation and testing by Leighton, as described in GMU, 1996. The approximate location of the concrete disposal area is depicted on the Geotechnical Map, Sheet 1; however, the actual elevations and details regarding the material are not available.

The existing golf course was rough graded between 1997 and 1999 during grading of adjacent residential Tracts 15030 and 15031 under geotechnical observation and testing by GeoSoils, Inc. (1999). Grading of the golf course generally involved cuts and fills up to approximately 35 feet, greater in select areas of the westernmost portion of the site. Remedial grading included removal and stockpiling of crude oil-affected native soils. Buttress keyways were constructed for stabilization of ascending slopes to the south of the golf course, and smaller stabilization fill keyways were constructed for the 2:1 (H:V) slopes along the northern perimeter of the golf course. During grading, approximately nine ancient "major" and numerous "minor" northwest and northeast trending normal faults (typical for the region) were encountered and mapped by GeoSoils. Fault locations were generally as anticipated from the fault map presented in Leighton, 1992. As stated above, these faults were not considered active or potentially active and reportedly all residential lots exposing them were overexcavated and capped with a minimum of 5 feet of compacted fill, in order to minimize the potential for differential settlement (GeoSoils, 1999). Notably, as shown on the Geotechnical Map (Sheet 1), no faults were mapped by GeoSoils during grading that are within or adjacent to the State of California Earthquake Fault Zone (CDMG, 1991).

Grading of the golf course included placement of both structural fill (i.e., compacted fill with a required minimum relative compaction of 90 percent) and non-structural fill considered unsuitable for support of structures (i.e., fill placed with a required minimum relative compaction of 85 percent). Structural fill was reportedly placed along the southern perimeter of the golf course in support of the adjacent developments (Tracts 15030 and 15031), below structures and utility alignments across the golf course, and within adjacent perimeter slopes and roadways (Geosoils, 1997). Non-structural artificial fill was placed within the central area of the western portion of the subject site and within several small canyons at the eastern portion of the site. Removals of the near-surface weathered alluvial deposits were reportedly limited in these areas and not specifically removed to competent native soils prior to fill placement (Geosoils, 1999).

Three controlled zones called environmental Re-Use Areas (RUA) are located within non-structural artificial fill at the western half of the site, where specifically "diluted" crude oil-affected soils were placed under environmental observation and testing by Miller Brooks Environmental, Inc. (1999). As part of remedial grading activities, the affected soils were stockpiled, blended as necessary, and placed as artificial fill at specific locations in general accordance with project specifications. Evaluation of the crude oil-affected soils and potential impacts to future grading are being addressed by others.

Previously constructed keyways, geologic mapping by others, and limits of structural and non-structural artificial fill, concrete disposal and environmental Re-Use Areas (RUA) are presented on the Geotechnical Map, Sheet 1 (In Pocket).

In 2001, a geotechnical evaluation was performed for the adjacent commercial center located northwest of the site (Eberhart, 2001). The commercial center is approximately 57 acres with large retail stores and associated parking. The field evaluation consisted of 121 hollow-stem borings (mostly shallow) and two large-diameter borings excavated up to approximately 50 feet below grade. Select borings were reviewed as part of this study.

In 2003, a geotechnical evaluation was performed for a banquet room addition to the existing golf clubhouse by Pacific Geosoils, Inc. (2003). Two small-diameter hand-auger borings were drilled to depths of approximately 12 and 13 feet below existing grade. Pacific Geosoils reported that the subsurface soils in the area of the proposed construction consist of fill soils underlain by bedrock. The geotechnical report concluded that existing fill soils were unsuitable for support of foundations and recommended that the building addition be supported on drilled piers into site bedrock, in lieu of performing earthwork removals.

1.5 Subsurface Geotechnical Evaluation

During July 2014 and February 2015, LGC Geotechnical performed a subsurface geotechnical evaluation of the site consisting of the excavation of five large-diameter bucket auger borings, eighteen hollow-stem auger borings, and eleven Cone Penetration Test (CPT) soundings to evaluate onsite geotechnical conditions.

Five bucket auger borings (B-1 through B-5) were drilled by Al-Roy Drilling and Haven Geotechnical under subcontract to LGC Geotechnical. The maximum depth of the bucket auger borings was approximately 115 feet below existing grade. The bucket auger borings were excavated to evaluate the geologic structure of the bedrock materials and to obtain samples for laboratory testing. The large-diameter boreholes were surface logged during excavation and downhole logged by an engineering geologist in order to obtain structural geologic information. Borings were subsequently backfilled with cuttings and tamped.

Eighteen hollow-stem borings (HS-1 through HS-18) were drilled by 2R Drilling, Inc. under subcontract to LGC Geotechnical. The depth of the hollow-stem borings ranged from approximately 21.5 to 76.5 feet below existing grade. An LGC Geotechnical representative observed the drilling operations, logged the borings, and collected soil samples for laboratory testing. The borings were excavated using a limited access drill rig equipped with 8-inch-diameter hollow-stem augers. Driven soil samples were collected by means of the Standard Penetration Test (SPT) and Modified California Drive (MCD) sampler generally obtained at 5-foot vertical increments. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch-tall brass rings. The SPT sampler and MCD sampler were driven using a 140-pound automatic hammer falling 30 inches to advance the sampler a total depth of 18 inches or until refusal. The blow counts for each 6-inch increment of penetration were recorded on the boring logs. Bulk samples were also collected and logged at select depths for laboratory testing. At the completion of drilling, the borings were backfilled and tamped.

Eleven Cone Penetration Test (CPT) soundings (CPT-1A through CPT-11B) were performed by Kehoe Testing and Engineering, Inc. under subcontract to LGC Geotechnical. CPT soundings were pushed to depths ranging between approximately 5 to 69 feet below existing grade, to practical refusal. The CPT soundings were pushed using an electronic cone penetrometer in general accordance with the current ASTM standards (ASTM D5778 and ASTM D3441). The CPT equipment consisted of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The interior of the cone penetrometer is instrumented with strain gauges that allow the simultaneous measurement of cone tip and friction sleeve resistance during penetration. The cone penetration assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of 0.8 inches per second while the cone tip resistance and sleeve friction resistance are recorded at approximately every 2 inches and stored in digital form. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly.

The approximate locations of borings and CPT soundings are shown on the Geotechnical Map (Sheet 1). Boring and CPT logs are presented in Appendix B.

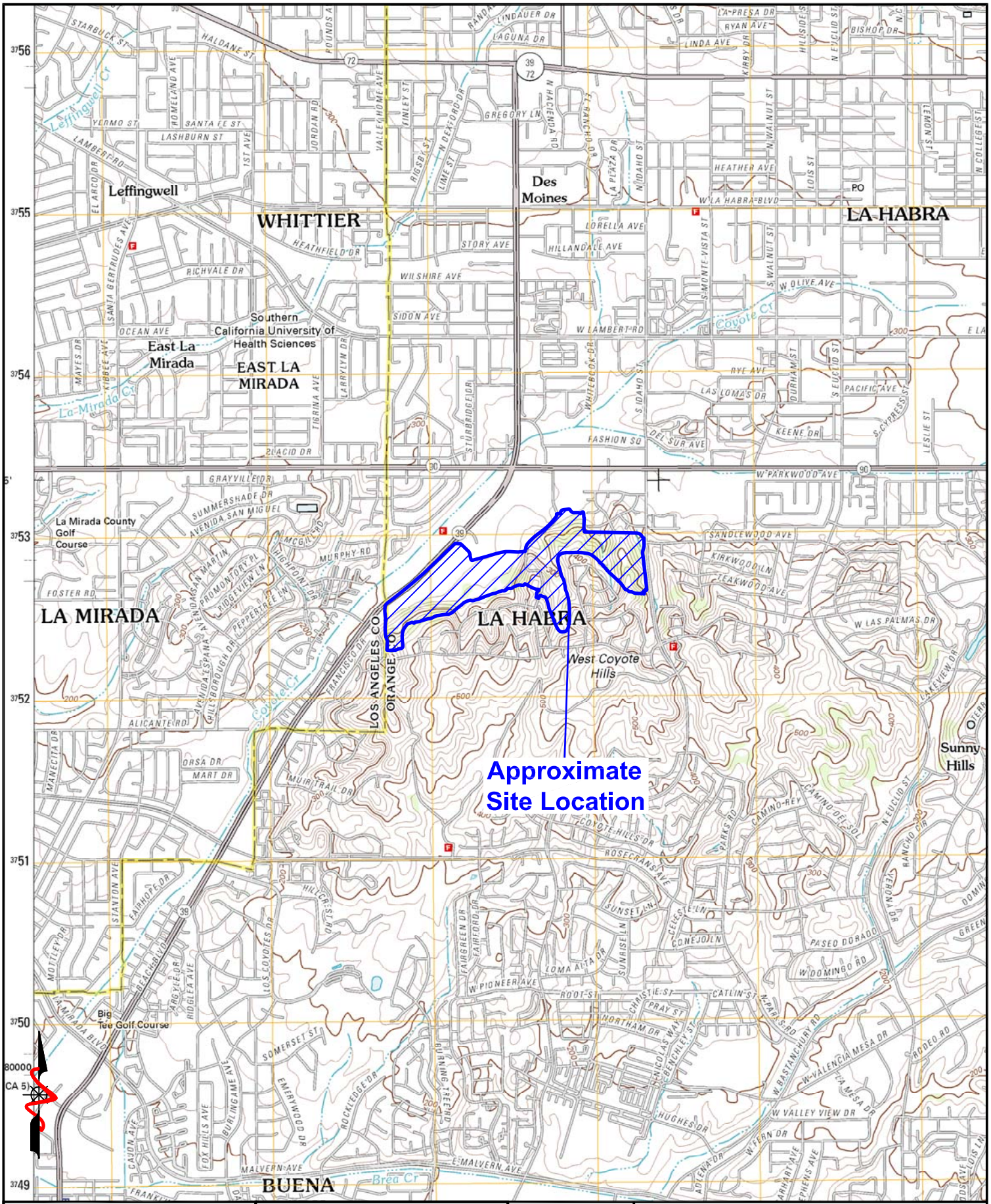
1.6 Laboratory Testing

Representative bulk and driven samples were retained for laboratory testing during our field evaluation. Laboratory testing included in-situ moisture content and in-situ dry density, Atterberg Limits, grain size analysis, consolidation, direct shear, expansion index, laboratory compaction and corrosion (sulfate, chloride, pH and minimum resistivity).

The following is a summary of the laboratory test results.

- Dry density of the samples collected ranged from approximately 95 pounds per cubic foot (pcf) to 134 pcf, with an average of 113 pcf. Field moisture contents ranged from approximately 1 percent to 26 percent, with an average of 13 percent.
- Twenty Atterberg Limit (liquid limit and plastic limit) tests were performed. Results indicated Plasticity Index values ranging from 1 to 48.
- Sixteen fines content tests were performed and indicated fines content (passing No. 200 sieve) of approximately 7 to 84 percent. According to the Unified Soils Classification System (USCS), eleven of the tested samples are classified as “coarse-grained” soil.
- Direct shear tests were performed on select driven samples and samples remolded to 90 percent relative compaction. The plots are provided in Appendix C.
- Consolidation tests were performed on select samples. The deformation versus vertical stress plots are provided in Appendix C.
- Three Expansion Index (EI) tests were performed. Results indicate EI values ranging from 15 to 37, corresponding to “Very Low” and “Low” expansion potential.
- Laboratory compaction testing of five bulk samples indicated maximum dry density values ranging from 115.0 to 140.0 pounds per cubic foot (pcf) and optimum moisture contents ranging from 5.5 to 14.5 percent.
- Corrosion testing indicated soluble sulfate contents ranging from approximately 0.01 to 0.05 percent, chloride contents ranging from approximately 33 to 175 parts per million (ppm), pH values ranging from 7.6 to 8.2, and minimum resistivity values ranging from 478 to 1,898 ohm-cm.

A summary of the results is presented in Appendix C. The moisture and dry density test results are presented on the boring logs in Appendix B.



PROJECT NAME	Westridge
PROJECT NO.	14057-01
ENG. / GEOL.	DJB / KTM
SCALE	Not to Scale
DATE	August 2015

LGC Geotechnical, Inc.

FIGURE 1
Site Location Map

2.0 GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The site is located at the eastern edge of the Los Angeles Basin, within the Peninsular Ranges Geomorphic Province. The Los Angeles Basin consists of a thick sequence of sedimentary deposits partially derived from erosion of the nearby hills and mountain ranges to the north and east of the subject site. The La Habra Heights are a portion of the northwest-trending hills north of the subject area that are bound along their south edge by the active Whittier Fault. The smaller Coyote Hills that underlie the subject site are also of tectonic origin. The Coyote Hills produced oil from structural traps created by faulting and the presence of an east-west domal anticline that coincides with the topographic crest of the hills to the south of the site. The site is located on the gently north-dipping homoclinal limb of the anticline. In general, the region has a complex geologic history influenced by periods of uplift, subsidence, sea level changes, folding, and faulting (Morton, 2004). No active or potentially active faults are known to specifically transect the site.

2.2 Site-Specific Geology

The subject site is located partially on alluvium deposits and partially within the uplifted bedrock that forms the low hills of the Coyote Hills geologic complex south of the site (Morton, 2004). The comparatively young alluvium locally incised a broad, very old alluvial fan that spans the La Habra area to the north. The local alluvium consists of interfingered deposits derived from upstream to the northeast and from the low hills ascending to the south of the site. The bedrock unit underlying the site consists of Quaternary San Pedro Formation, and two existing landslides derived from this material have been identified within the limits of the site. Also, both structural and non-structural artificial fills mantle portions of the site. A brief description of these geologic units is presented in the following sections (from youngest to oldest) and their approximate lateral extents are depicted on the site Geotechnical Map (Sheet 1).

2.2.1 Artificial Fill – Older (Map Symbol - Afo)

Older artificial fill soils encountered at the subject site are generally considered structural, reportedly having been placed in relatively thin lifts, at near optimum moisture content, and compacted with heavy construction equipment to achieve a minimum relative compaction of at least 90 percent (GeoSoils, 1999). Structural fill was placed at certain locations for support of golf course structures and utility alignments, along the southern perimeter of the site for support of adjacent tracts to the south, and along the northern perimeter in areas of 2:1 (H:V) slopes. The material consists of variable layers of silty clay to clayey sand with some gravel, generally moist to very moist, stiff to very stiff/dense.

2.2.2 Artificial Fill – Unsuitable (Map Symbol - Afu)

Unsuitable artificial fill soils were encountered within the western-central area of the subject site and within several small canyon fill areas within the eastern portion of the site as reported in GeoSoils, 1999. The unsuitable fill is considered non-structural and has a minimum relative compaction of 85 percent. Reportedly, the non-structural fill was placed directly on native soils with minimal remedial grading with the exception of areas graded for

environmental mitigation (GeoSoils, 1999). The material consists of variable layers of silty clay to clayey sand with some gravel, generally moist to very moist, stiff to very stiff/medium dense to dense. Environmental Re-Use Areas (RUA), aka crude oil affected soils, are located within this material; approximate limits depicted on the Geotechnical Map, Sheet 1 (Miller Brooks, 1999).

2.2.3 Quaternary Alluvium (Map Symbol – Qal)

Quaternary alluvium underlies the majority of the western portion of the site (GeoSoils, 1999), undifferentiated from colluvium observed by others within the smaller canyons of the Coyote Hills to the south. It generally consists of medium dense silty and clayey sands and stiff to very stiff sandy clays with minor amounts of gravel.

2.2.4 Quaternary Landslide Deposit (Map Symbol – Qls)

Several bedrock-block type landslides were encountered in the vicinity of the subject site during previous investigations and grading activities by others (Goffman, 1996; GeoSoils, 1997 and 1999). Two landslides were removed during grading of the adjacent tracts to the south and one on-site landslide at the western side of the site was stabilized with shear keyways and left in place. Another small, relatively thin landslide was identified in a boring by others at the northeastern edge of the site that was subsequently determined to have been left in place based on Cross-Section 7-7' (Sheet 2).

Where encountered, the landslide material was observed to be similar to the bedrock unit at the site, but highly fractured and weathered.

2.2.5 Quaternary San Pedro Formation (Map Symbol – Qsp)

The sedimentary bedrock unit that underlies the site is the Pleistocene-age Quaternary San Pedro Formation, derived from a shallow marine depositional environment. The formation is broken into four units that vary in dominant material type, variably exposed between the faults that intersect the site. The fossiliferous material generally consists of sandy siltstone and minor amounts of claystone interbedded with medium to coarse, weakly to well-cemented sandstone. The eastern portion of the site has more sandstone, while the central and western portions of the site have a more variable mix of interbedded siltstone, sandstone, and clayey siltstone.

2.3 Geologic Structure

Geologic structure of the bedrock is controlled by the east-west trending domal anticline that crests with the original topographic high of the Coyote Hills to the south of the site. Bedding from GeoSoils, 1999, and as observed during our recent site investigation, indicates a gentle, west-northwesterly dip within the western portion of the site and an east-northeasterly dip within the eastern portion of the site. Bedding attitudes vary due to localized folding and faulting. Bedding was noted to have zones of high-energy depositional environments producing rip-up clasts and other pre-lithification sedimentary structures. Bedrock cementation ranged from non-cemented siltstone and friable sandstone to well cemented layers up to 2 feet thick. Gypsum, manganese oxide and iron oxide were observed in the

upper weathered portion of site bedrock.

An inactive fault encountered at depth within LGC-B-4 was observed along a steeply-dipping, tight, clay-lined shear that marked a sharp change in material type and bedding inclination. The fault is consistent with the many ancient faults identified by others prior to and during grading of the golf course and residential tracts to the south (Leighton, 1992 & Geosoils, 1999). Geologic information collected by others is presented on the Geotechnical Map (Sheet1) along with the results of the recent subsurface investigation.

2.4 Groundwater

During our subsurface evaluation, groundwater was encountered at a depth of approximately 29 feet in HS-17 and as seepage at depth within the large-diameter borings LGC-B-4 and LGC-B-5. Groundwater was not encountered in the remaining hollow-stem borings to the maximum explored depth of approximately 76.5 feet below existing grade. Groundwater was encountered at 46 to 49 feet below existing grade within the alluvium to the north of the site as investigated and reported by Eberhart (2001) as part of construction of the commercial development to the north of the site. The referenced grading plan review report by GMU, 1996, stated that "subsurface flow was encountered at depths of about 20 feet within the older alluvium underlying the major valley bottom area."

Seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Local perched groundwater conditions or surface seepage may develop once site development is completed and landscape irrigation commences.

2.5 Faulting and Seismic Hazards

The Coyote Hills region surrounding the subject site has a complex geologic history influenced by periods of uplift, gentle folding, and faulting (Morton, 2004). Former uses of the subject site included a working oil field that was active for many years, as described in detail in the section titled "Background" (Section 1.4). On October 1, 1968 while the site was still an active oil field, a fault ruptured just east of Idaho Street as defined by approximately 3-inches of vertical displacement.

Extensive fault trenching by Converse, Davis, & Associates in 1970 allowed detailed mapping of the fault trace including its lateral limits. The well-defined lineament was extensively documented and evaluated and became known as the "Unnamed West Coyote Hills Fault" as presented in the referenced Fault Evaluation Report and Supplemental Report (CDMG, 1977 & 1978). CDMG, 1978 suggests that the probable cause of fault rupture was due to oil field operations (subsidence due to oil extraction and groundwater injection activities). Refer to the Geotechnical Map, Sheet 1, for the location of Unnamed West Coyote Hills Fault with respect to the subject site.

Per the State Geologist, a fault is generally considered "active" if evidence of surface rupture in Holocene time (the last approximately 11,000 years) is present. The Unnamed West Coyote Hills Fault has been evaluated to be "historically active," because displacement has occurred within the last 200 years, therefore a State of California Earthquake Fault Zone was established for the fault. More specifically, a minimum 100-foot-wide structural setback zone was recommended on either side of the Unnamed West Coyote Hills Fault as it was determined that the fault had been accurately

located (CDMG, 1978 & Leighton, 1992). It is typical for an Earthquake Fault Zone to extend laterally well beyond the known trace. As shown on the Geotechnical Map (Sheet 1), the recommended setback is a total of 200 feet wide, while the "width" of the Earthquake Fault Zone is approximately 500 feet.

The previously existing oil field at the subject site was re-developed in the late 1990's into the Westridge Golf Course and adjacent residential communities to the south. These sites were rough graded under the observation and testing of GeoSoils (1997 &1999). The portion of the golf course that is included within the Earthquake Fault Zone was mapped by GeoSoils during grading at that time and no faults were reported there (Geosoils, 1999).

As shown on Sheet 1, proposed residential Lots 12, 28 and 29 are located within the limits of the State of California Earthquake Fault Zone. However, the proposed residential structures for all three lots are located at least 200 feet from the Unnamed West Coyote Hills Fault, significantly more than the previously recommended 100 foot structural setback (CDMG, 1978 & Leighton, 1992). Based on the information shown on Sheet 1 and our review of the referenced documents, it is our opinion that proposed Lots 12, 28 and 29 are not underlain by an active fault. However, those three lots will require verification geologic mapping prior to construction of habitable structures. Recommendations relative to verification mapping are presented in the section titled "Preliminary Recommendations."

Due to the distance from the proposed structures to the Unnamed West Coyote Hills Fault, the possibility of damage due to ground rupture is considered low, provided that the portion of development located within the limits of the Earthquake Fault Zone is verified to be lacking fault indicators in accordance with the current standards of practice, State of California guidelines, and City of La Habra guidelines.

Nearby active faults and corresponding monument magnitude are summarized in Table 1 below.

TABLE 1

Near Site Fault Parameters - Westridge VTTM 17845

Fault	Distance from Site (km)	Maximum Earthquake Magnitude (Mmax)
Puente Hills (Coyote Hills)	4.4	6.8*
Elsinore (Whittier Section)	5.2	6.9*
Puente Hills (Santa Fe Springs)	3.2	6.6*
Unnamed West Coyote Hills	<0.1	2.2 to 2.6**

* from Caltrans, 2015

** from CDMG, 1977

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching and shallow ground rupture, soil liquefaction, and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependant on the distance between the site and causative fault and the onsite geology. A discussion of these secondary effects is provided in the following sections.

2.5.1 Liquefaction and Dynamic Settlement

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similar to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction (Bray & Sancio, 2006). Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Dynamic settlement of dry loose sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

A portion of the site is located within a State of California Seismic Hazard Zone (CDMG, 1998) for liquefaction potential; refer to Figure 2 (rear of text). The majority of the developed site will consist of compacted fill over dense/hard bedrock and is not considered susceptible to liquefaction. However, a portion of the site contains alluvial soils that may be susceptible to liquefaction depending primarily on their apparent density (e.g., loose to dense) and plasticity. The majority of the alluvial soils tested are considered to be cohesive and not considered to be susceptible to liquefaction based on their saturated moisture content compared to their Liquid Limit (Bray & Sancio, 2006).

Liquefaction potential was evaluated using the procedures outlined by Special Publication 117A (SCEC, 1999 & CGS, 2008). Based on the applicable seismic criteria (e.g., 2013 CBC), the data obtained from our field evaluation indicates that the site contains isolated sandy layers susceptible to liquefaction in the upper 50 feet. Based on the data obtained from our field evaluation, total seismic settlements are estimated to be on the order of 1 to 2 inches. Differential seismic settlement can be estimated as half of the total estimated settlement over a horizontal span of about 30 feet. Seismically induced settlements were estimated by using the procedure of Tokimatsu & Seed (1987). These methods are based on a relatively limited empirical data. Therefore, predictions of seismically-induced settlement should be considered approximate.

2.5.2 Lateral Spreading

Lateral spreading is a type of liquefaction-induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the lack of an adjacent free face, the potential for lateral spreading is considered very low.

2.5.3 Earthquake Induced Landslide

A portion of the site is located within a State of California Seismic Hazard Zone (CDMG, 1998) for earthquake-induced landslide, as depicted on Figure 2 (rear of text). The hillside zones depicted on the seismic hazard potential map were originally delineated on the pre-existing topography of the region and are no longer applicable. The hillside grading performed in the late 1990's as reported in GeoSoils, 1999, specifically mitigated this seismic hazard potential. Remedial grading for the golf course and the existing residential tracts to the south consisted of buttress keyways and replacement fill slopes as evaluated during this phase of site investigation and presented on the Geotechnical Map and Cross Sections (Sheets 1 through 3). For this reason, potential for earthquake-induced landslide at the site is considered low.

2.6 Seismic Design Criteria

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2013 CBC. Since the site contains soils that are susceptible to liquefaction (refer to Section 2.6.1), ASCE 7 which has been adopted by the CBC requires that site soils be assigned Site Class "F" and a site-specific response spectrum be performed. However, in accordance with Section 20.3.1 of ASCE 7, if the fundamental periods of vibration of the planned structure are equal to or less than 0.5 second (anticipated for the planned residential structures), a site specific response spectrum is not required and ASCE 7/2013 CBC site class and seismic parameters may be used in lieu of a site-specific response spectrum. **It should be noted that the seismic parameters provided herein are not applicable for any structure having a fundamental period of vibration greater than 0.5 second.** Representative site coordinates of latitude 33.9146 degrees north and longitude -117.9640 degrees west were utilized in our analyses. The maximum considered earthquake (MCE) spectral response accelerations (S_{MS} and S_{M1}) and adjusted design spectral response acceleration parameters (S_{DS} and S_{D1}) for Site Class D are provided in Table 2 on the following page.

TABLE 2

Seismic Design Parameters

Selected Parameters from 2013 CBC, Section 1613 - Earthquake Loads	Seismic Design Values
Site Class per Chapter 20 of ASCE 7	D*
Risk-Targeted Spectral Acceleration for Short Periods (S_S)**	1.973g
Risk-Targeted Spectral Accelerations for 1-Second Periods (S_1)**	0.713g
Site Coefficient F_a per Table 1613.3.3(1)	1.0
Site Coefficient F_v per Table 1613.3.3(2)	1.5
Site Modified Spectral Acceleration for Short Periods (S_{MS}) for Site Class D [Note: $S_{MS} = F_aS_S$]	1.973g
Site Modified Spectral Acceleration for 1-Second Periods (S_{M1}) for Site Class D [Note: $S_{M1} = F_vS_1$]	1.070g
Design Spectral Acceleration for Short Periods (S_{DS}) for Site Class D [Note: $S_{DS} = (^2/_3)S_{MS}$]	1.315g
Design Spectral Acceleration for 1-Second Periods (S_{D1}) for Site Class D [Note: $S_{D1} = (^2/_3)S_{M1}$]	0.713g
Mapped Risk Coefficient at 0.2 sec Spectral Response Period, C_{RS} (per ASCE 7)	0.951
Mapped Risk Coefficient at 1 sec Spectral Response Period, C_{R1} (per ASCE 7)	0.970
PGA_M (Section 11.8.3 of ASCE 7)	0.760g

* Site Class F modified due to building period ≤ 0.5 second, refer to discussion above.

** From USGS, 2014

A deaggregation of the PGA based on a 2,475-year average return period indicates that an earthquake magnitude of 6.7 at a distance of approximately 4.9 km from the site would contribute the most to this ground motion (USGS, 2008).

2.7 Soil Shear Strength Parameters

The soil shear strength parameters utilized in our slope stability analysis are based on laboratory testing of the onsite materials, previous site shear parameters and published shear strength data (CDMG, 2001). Soil shear strength parameters were increased (less than composite peak strength values) for seismic loading conditions. Laboratory test results are provided in Appendix C.

TABLE 3

Soil Shear Strength Parameters for Static Slope Stability Analysis

Soil Type	ϕ (Degrees)	Cohesion (psf)
Qsp – Cross Bedding	32	300
Qsp - Along Bedding	27	200
Compacted Fill	30	150
Landslide Material	24	200
Alluvium	28	200

2.8 Global Slope Stability Analyses

Global slope stability analyses were performed on cross-sections (1-1' through 12-12') positioned throughout the site based on the proposed design profile. Slope stability analysis was performed using the computer program GSTABL7 with STEDwin version 2.005.3 (Gregory Geotechnical Software, 2013). Potential rotational and block failure modes were analyzed using Bishop's Modified Method and Janbu's Simplified Method, respectively. A minimum factor of safety of 1.5 is typically required for static loading conditions. Seismic slope stability analysis was performed in accordance with the County of Orange Grading Manual (1991). The County of Orange Grading Manual requires a horizontal seismic coefficient (Kh) of 0.15 with a minimum resulting factor of safety of 1.1.

Geogrid reinforcement (beyond requirements for local stability) is required for the planned mid-slope MSE retaining wall located below Lots 240 through 245 for adequate global factors of safety (Cross-Section 3A-3A').

For the proposed water quality basin depicted on Cross-Sections 1-1' and 2-2', slope stability analysis was performed for a "rapid draw-down" condition based on the peak water level. Based on preliminary information provided by the project civil engineer, the water quality basin will have a peak water storage elevation of approximately 208 feet above mean sea level.

Based on the proposed grading plan, slope stability analysis indicates a global factor of safety greater than 1.5 and 1.1 for static and pseudo-static (seismic) loading conditions, respectively. Slope stability analysis is provided in Appendix D.

Please note, the analysis conducted and presented within is to address the global stability of the site. Additional slope stability analysis will need to be performed once the rough grading plans have been prepared and more details are available regarding finalized slope and MSE wall configurations, etc. This additional analysis may include additional cross-sections and static and pseudo-static slope stability analysis.

2.9 Expansion Potential

Based on the results of previous nearby and current laboratory testing, site soils have a "Very Low" to "Very High" expansion potential. Final expansion potential of site soils should be determined at the completion of grading.

2.10 Soil Corrosivity

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils on buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary. Preliminary corrosion testing indicated soluble sulfate contents ranging from 0.01 to 0.05 percent, chloride contents ranging from 33 to 175 parts per million (ppm), pH values ranging from 7.6 to 8.2 and minimum resistivity values ranging from 478 to 1,898 ohm-cm. Sulfate testing from the adjacent tracts to the south indicated sulfate contents ranging from approximately 0.02 to 0.56 percent (GSI, 1999). Based on Caltrans Corrosion Guidelines (2012), soils are considered corrosive to structural elements if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 2,000 ppm (0.2 percent) or greater.

Based on preliminary and previous laboratory sulfate test results, the near-surface soils have a severity categorization of "Not Applicable" to "Severe" and are designated to classes "S0" and "S2" per ACI 318, Table 4.2.1 with respect to sulfates. Determination of design elements with respect to sulfates must be based on as-graded conditions.

2.11 Infiltration Potential

Based on our site evaluation and subsurface investigation, the majority of site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays that are known to have a very low permeability and therefore have very low infiltration rates. Within the majority of small and large-diameter borings excavated during our subsurface field work, no groundwater was encountered. Isolated seepage was observed at depth in several borings; however, no signs of surface infiltration were observed. Although we understand that the City of La Habra considers the geologic formation underlying the golf course to be a source of recharge to the City's groundwater basin (Malcolm Pirnie, 2010), it is our opinion that infiltration of surface water is not currently occurring through the surface of the golf course.

At the completion of grading, the proposed development will consist of either a thick cap of compacted fill (approximately 30 to 60 feet thick) over alluvium at the western half of the site or a thinner cap of compacted fill over bedrock at the eastern half of the site. Engineered fill is considered unacceptable for infiltration in accordance with the Orange County Technical Guidance Document "Section VII.1.6, Fill Condition," that states infiltration must extend to native soils below the fill (County of Orange, 2013). However, siltstone bedrock (native soils) below the engineered fill is also unacceptable for infiltration from a geotechnical standpoint. By definition, bedrock materials do not readily transmit water. The onsite bedrock materials are generally more than 50 percent fine-grained (i.e., clays and silts corresponding to hydrologic soil groups C and D) and bedrock structure includes numerous clayey siltstone interbeds that consist entirely of fine-grained material. The limited amount of water that does enter the bedrock may be transmitted laterally along bedding and through fractures to unknown locations. Deeply buried alluvium at the western portion of the site is also not a geotechnically acceptable medium for infiltration due to that portion of the site being located in a mapped State of California Seismic Hazard Zone for liquefaction as depicted on Figure 2, Seismic Induced Hazard Map (Rear of Text) (CDMG, 1998).

Purposeful infiltration of water to the subsurface at the subject site is neither feasible nor acceptable from a geotechnical standpoint given the onsite materials and the hillside nature of the site.

3.0 CONCLUSIONS

Based on the results of our subsurface evaluation and geotechnical review of the proposed plan, it is our opinion that the proposed improvements are feasible from a geotechnical standpoint, provided that the recommendations provided here and in future reports are incorporated during site grading and development. A summary of our geotechnical conclusions are as follows:

- The bedrock geologic unit mapped on the site is the Quaternary San Pedro Formation. Artificial fill placed during original grading of the existing golf site overlies alluvium and bedrock across the majority of the site.
- The site contains previously placed non-structural fill and near-surface alluvium soils that are not suitable for the proposed development in their present condition. Earthwork removals will be required as outlined in the recommendation section.
- Groundwater was encountered at a depth of approximately 29 feet in HS-17 and as seepage at depth within the large-diameter borings LGC-B-4 and LGC-B-5. Groundwater was not encountered in the remaining hollow-stem borings to the maximum explored depth of approximately 76.5 feet below existing grade. Design groundwater is estimated at 15 feet below site alluvium. While isolated seepage was observed within the sandy layers of the San Pedro Formation bedrock, it is not considered a groundwater table. Groundwater may be encountered during grading.
- A portion of the site is located in a State of California Seismic Hazard Zone for liquefaction potential (Figure 2, rear of text). The majority of the developed site will consist of compacted fill over dense/hard bedrock and not considered susceptible to liquefaction. However, a portion of the site contains alluvial soils that are generally considered susceptible to liquefaction depending on their apparent density and plasticity. Based on lab testing, the majority of site alluvial soils is cohesive and not considered susceptible to liquefaction. However, subsurface data indicates that relatively isolated sandy layers within alluvial soils are susceptible to liquefaction and dynamic settlement within the upper 50 feet. Total dynamic settlement is estimated to be on the order of 1 to 2 inches. Differential dynamic settlement can be estimated at half of the total settlement over a horizontal span of 30 feet.
- A portion of the site is located within a State of California Seismic Hazard Zone as having potential for earthquake-induced landslides (Figure 2, rear of text). This potential hazard has been generally mitigated with remedial grading measures including buttress keyways that were constructed during grading of the residential tracts south of the golf course.
- As shown on the Geotechnical Map, Sheet 1, proposed residential Lots 12, 28 and 29 are located within the limits of the State of California Earthquake Fault Zone. However, the proposed residential structures for all three lots are located at least 200 feet from the "Unnamed West Coyote Hills Fault," significantly more than the recommended 100-foot structural setback (CDMG, 1978 & Leighton, 1992). Based on our review of applicable documents, it is our opinion that proposed Lots 12, 28 and 29 are not underlain by an active fault. However, this will have to be verified during grading as detailed in the following "Preliminary Recommendations" section.
- Proposed increase of grades over existing alluvium in portions of the site is estimated to induce on the order of up to 2½ inches of settlement within the alluvium. Settlement of alluvial soils is estimated to take approximately 6 to 12 months after the completion of rough grading. These values should be further evaluated as part of the grading plan review report.
- Due to planned fill depths and/or significant increasing of grades over existing alluvium, settlement monitoring will be required at the completion of grading.
- The main seismic hazard that may affect the site is from ground shaking from one of the active regional faults. The subject site will likely experience strong seismic ground shaking during its design life.

- Based on the results of our evaluation and analysis provided herein, and provided our recommendations are properly implemented during construction, the proposed development of the site is not anticipated to significantly impact adjacent perimeter properties.
- Design fill slopes are anticipated to be both grossly and surficially stable, as long as they are constructed in accordance with our geotechnical recommendations and are properly landscaped and maintained throughout their design life.
- Existing native and cut slopes surrounding the development are anticipated to be grossly stable; however, minor surficial failures may occur.
- Global slope stability analysis indicates that (global) geogrid reinforcement is necessary in order to provide an adequate factor of safety for the proposed MSE walls located below Lots 240 through 245 (Cross-Section 3A-3A').
- From a geotechnical perspective, the existing onsite soils including existing fill are considered suitable material for use as general fill (with the exception of MSE wall backfill and conventional retaining wall backfill), provided that they are relatively free from rocks (larger than 8 inches in maximum dimension), construction debris, and significant organic material. Significant moisture conditioning will be required to obtain the required compaction. It should be noted that the site contains soils that are suitable for backfill of MSE and conventional retaining walls. However, select grading and/or stockpiling will be required. In addition, import of soils suitable for backfill of MSE and conventional retaining walls will also likely be required.
- Specific zones of crude oil-affected artificial fill will require evaluation and recommendations by a qualified environmental consultant. LGC Geotechnical is not an environmental consultant.
- Based on the results of previous nearby and current laboratory testing, site soils have a "Very Low" to "Very High" expansion potential. Mitigation measures will be required for any planned foundations and site improvements such as concrete flatwork to minimize the impacts of expansive soils. In addition, improvements located adjacent to slopes will be impacted by slope creep. Final expansion potential of site soils should be determined at the completion of grading.
- Site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays which have very low permeability and therefore have very low infiltration rates. It is our opinion that infiltration of surface water is not currently occurring. At the completion of grading, the proposed development will consist of either a thick cap of compacted fill over alluvium or a thin cap of compacted fill over bedrock and therefore purposeful infiltration of water is not feasible nor recommended from a geotechnical standpoint.

4.0 PRELIMINARY RECOMMENDATIONS

A grading plan review report based on the 40-scale rough grading plans should be prepared in order to provide updated geotechnical recommendations (as necessary) for the proposed development. Additional field work and laboratory testing may be required. Additional and/or modified geotechnical recommendations may also be required.

Based on our preliminary study, the following is a summary of our preliminary geotechnical recommendations.

- The majority of artificial fill placed for construction of the existing golf course is considered non-structural and is not suitable for support of the proposed residential/commercial development in its current condition. Removals of unsuitable material up to approximately 50 feet deep below existing grades are recommended for the western portion of the site and within several isolated small canyon areas at the eastern portion of the site, as noted on the Geotechnical Map, Sheet 1. The western portion of the site (Cross-Sections 1'1' through 5-5') is anticipated to require removal of non-structural fill and removal of approximately 5 feet of the underlying alluvium in order to expose competent material suitable for placement of structural fill. The smaller canyon areas at the eastern portion of the site are anticipated to require removal of localized alluvium (Cross-Sections 6-6', 7-7', and 8-8') and one area of relatively thin surficial landslide (Cross-Section 7-7') to expose competent bedrock. Estimated remedial grading profiles are depicted on the Cross-Sections, Sheets 2 & 3.
- As part of remedial grading, unsuitable soils should be removed to competent soils, temporarily stockpiled (where necessary) and replaced as properly compacted fill. Prior to placement as compacted fill, significant organic materials or other unsuitable materials shall be removed and properly exported offsite. Local conditions may be encountered during excavation that could require additional removals beyond the minimums presented herein in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading should be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Preliminary estimated removals are shown on the Geotechnical Map (Sheet 1), and as estimated remedial profiles on Cross-Sections (Sheets 2 & 3).
- The soils within the re-use areas (RUA 1 through 3) shall be removed and replaced as properly compacted fill. The location of where these soils are placed and the thickness of the clean soil cap shall be determined by the project environmental consultant. The design cut slope potentially exposing RUA 3 (Cross-Section 1-1') should be provided with a compacted replacement fill slope consisting of clean soil as determined by the project environmental consultant.
- Stabilization fill keyways should be constructed for design cut slopes that are not undercut by remedial grading. Locations of recommended stabilization fill keyways are shown on the Geotechnical Map, Sheet 1. Design cut lots, or lots with less than 5 feet of design fill, should be overexcavated a minimum of 5 feet below respective pad grades.
- Proposed fill slopes should be constructed at a slope ratio of 2:1 (horizontal:vertical) or flatter.
- Fills placed deeper than 40 feet below proposed grade should be compacted to an increased minimum relative compaction of 93 percent relative compaction. Fill should be moisture-conditioned to be between optimum moisture content and 2 percent over optimum moisture content, per ASTM D1557.
- Materials from the concrete disposal area may be placed in general fill provided it is environmental suitable and crushed such that it is no larger than 8-inches in maximum dimension and well blended (i.e., no nesting and voids) into site fills. Any concrete material placed in MSE wall backfill areas should be crushed to meet gradation requirements of aggregate base per the latest edition of the Greenbook.
- Three lots at the eastern boundary of the site (Lots 12, 28 and 29) are located within the limits of the State of California Earthquake Fault Zone that encompasses the offsite, active Unnamed West Coyote

Hills Fault. During grading, the limits of the Earthquake Fault Zone should be staked by the project surveyor and the exposed bedrock carefully mapped by the project geologist. Proposed Lots 12, 28 and 29 are design cut areas requiring finished grade to be lowered by approximately 5 to 15 feet. Additional grading to expose bedrock in this area may be required. The City of La Habra's geotechnical reviewer should be notified to observe and confirm the geologic mapping. Due to previous grading that has occurred within the limits of the Earthquake Fault Zone, it's likely that soil horizons typically utilized for dating faults (to determine whether it's active or not) have already been removed. In the event that a fault splay deemed active is observed during grading within the limits of the Earthquake Fault Zone, a minimum 50-foot structural setback will be recommended.

- Settlement monuments should be installed promptly after the completion of grading within fill areas greater than approximately 40 feet below finish grade and where significant amount of fill is placed over left in place alluvium. Settlement monuments should be read by a licensed surveyor with an off-site benchmark. The survey readings should be obtained four times in the first two months, twice in the third month, and then once a month unless otherwise requested by the geotechnical consultant. Shallow footings and slab-on-grade foundations should be constructed after settlement monitoring data indicates future total settlements are within tolerable limits. Temporary surcharge loading may be used to decrease the settlement waiting period.
- Due to the height of the proposed fill slope and Mechanically Stabilized Earth (MSE) wall, additional geogrid reinforcement length (beyond local stability requirements to be determined by the MSE wall designer) will be required for adequate global stability factors of safety for the MSE wall located below Lots 240 through 245 (Cross-Sections 3-3' and 3A-3A'). Preliminary slope stability analysis indicates at least 6 layers of geogrid reinforcement lengths of 60 feet, with an allowable strength (after appropriate reduction factors are applied by the manufacturer) of approximately 3.3 kips per foot, spaced at a maximum vertical spacing of 2 feet, are required for adequate global factors of safety. Further refinement of the design for required global stability geogrid will occur during preparation of the 40-scale grading plan and with input from the MSE wall designer.
- MSE walls and conventional retaining walls should be backfilled with relatively sandy soils. Portions of the onsite soils are too fine-grained and therefore are not suitable for MSE and conventional retaining wall backfill. Therefore, select grading of on-site sandy soils and/or import of sandy soils meeting project recommendations will be required. Sandy soils should comprise the geogrid zone required for local stability as determined by the MSE wall designer. For conventional retaining walls, the sandy import zone should be a minimum of one-half the height of the retaining wall.
- Allowance in the earthwork volumes budget should be made for an estimated 5 to 10 percent reduction in volume of existing soils. It should be stressed that these values are only estimates and that an actual shrinkage factor would be extremely difficult to predetermine. Subsidence due to earthwork activities is expected to be on the order of 0.1 to 0.2 feet. These values are estimates only and exclude losses due to removal of vegetation or debris. The effective shrinkage of onsite soils will depend primarily on the type of compaction equipment and method of compaction used onsite by the contractor, and the accuracy of the topographic survey.
- Due to onsite expansive soils, mitigation measures such as stiffened and/or post-tensioned slab foundations are recommended. Pre-soaking of the subgrade soils will be required to reduce the potential impact of expansive soils.
- At completion of grading, additional testing will be required to confirm the characteristics of the fill materials including expansion potential and corrosivity characteristics. While LGC Geotechnical does not provide recommendations for corrosion, based on our experience typical mitigation measures include increased compressive strength for structural concrete, decreased water-to-cement ratio for structural concrete and/or encapsulation of post-tensioned cables.

- Due to liquefaction potential in portions of the site, stiffened and/or post-tensioned slab foundations are recommended.
- Due to site soils being predominately compacted fill and bedrock consisting of fine grained soils (silts and clays), the hillside nature of the site, and the presence of potentially liquefiable alluvial soils, we strongly recommend against the intentional infiltration of storm water.

5.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

This report is based on data obtained from limited observations of the site, which have been extrapolated to characterize the site. While the scope of services performed is considered suitable to adequately characterize the site geotechnical conditions relative to the proposed development, no practical evaluation can completely eliminate uncertainty regarding the anticipated geotechnical conditions in connection with a subject site. Variations may exist and conditions not observed or described in this report may be encountered during grading and construction.

The findings of this report are valid as of the present date. However, changes in the conditions of a site can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. The findings and conclusions presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. This report is intended exclusively for use by the client, any use of or reliance on this report by a third party shall be at such party's sole risk.

In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and modification.

MAP EXPLANATION

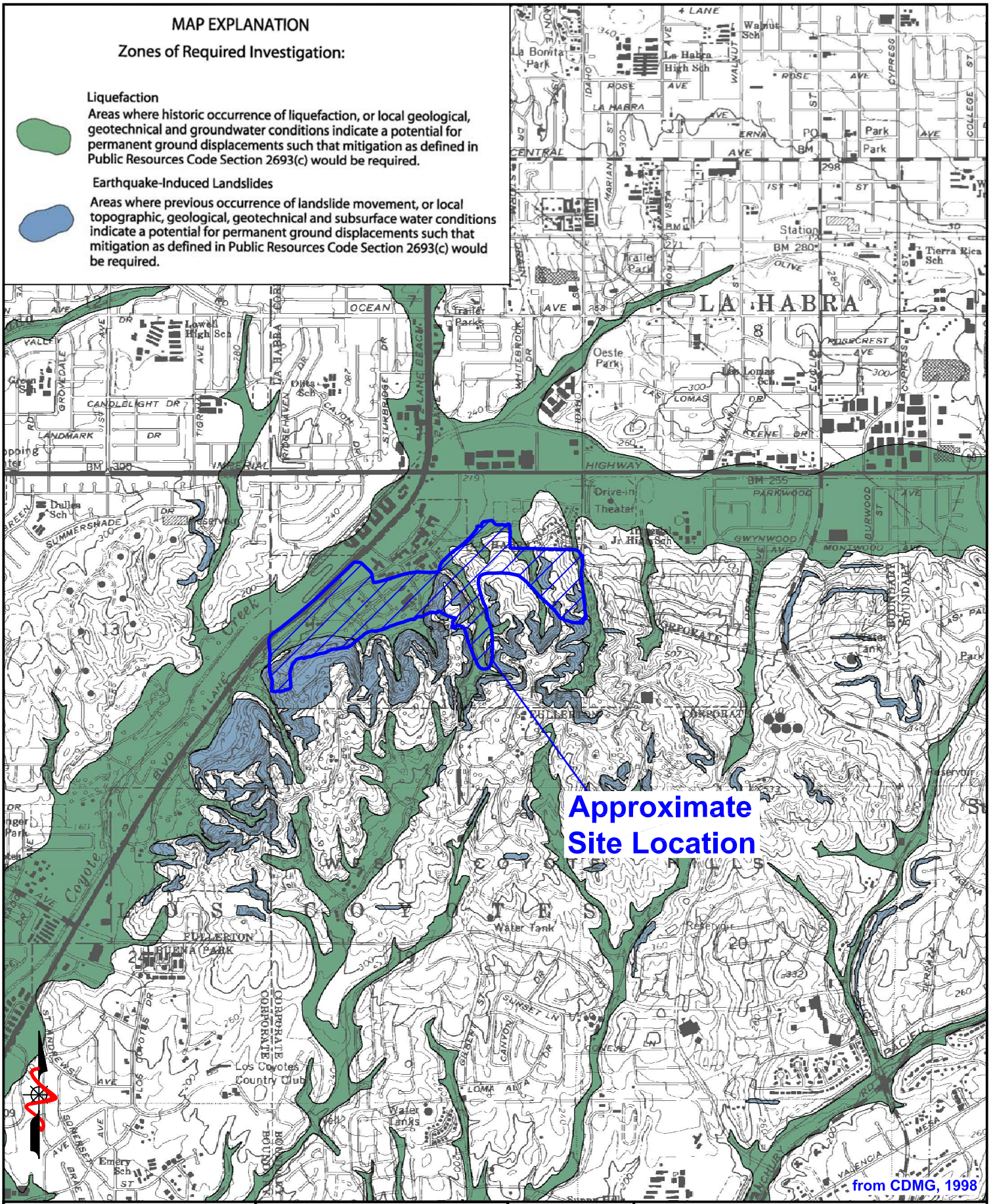
Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.



PROJECT NAME	Westridge
PROJECT NO.	14057-01
ENG. / GEOL.	DJB / KTM
SCALE	Not to Scale
DATE	August 2015

LGC Geotechnical, Inc.

FIGURE 2
Seismic Induced Hazard Map

Appendix A
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APPENDIX A

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Appendix B
Logs of Exploratory Borings and CPT Soundings

Geotechnical Boring Log B-1

Date :	7/23/2014 Page 1 of 2	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	Earthdrill Bucket Auger
Project Number :	14057-01	**Drop :** 12"	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 323 ' MSL	**Drive Weight :**	0' to 23': #2400; 24' to 43': #1550; 44' to 62': #850
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
320	0								**@ 0' to T.D. <u>Quaternary San Pedro Formation (Qsp)</u>** @ 0' 3" of Asphalt Concrete over 6" of Aggregate Base @ 1' Silty fine SANDSTONE with scattered rip-up clasts of fine Sandy SILTSTONE, light orange brown and gray mottled, dry upper foot grades to slightly moist, dense, few angular rocks up to 2", oxidation stains	
	5		GB: N20E, 18NW	B-1					@ 5' B-1, Silty fine SANDSTONE to fine Sandy SILTSTONE, light brown, moist, moderately dense @ 6' General bedding on Sandy laminations, vague @ 7' SILTSTONE with Clay and Sand, light blue gray, moist, very stiff to slightly hard, non planar, scattered manganese nodules, angular concretions up to 2"; color varies to greenish gray, blue gray, and some orange brown, scattered fossil shells. Variable sand and clay content, decrease in oxidation with depth.	EI CR
315										
	10			R-1	6	101.3	21.5		@ 10' SILTSTONE with fine Sand, light blue gray, slightly moist, dense	
310										
	15								@ 15' Increase sand content	
305										
	20			R-2	9	109.6	18.2	CL	@ 20' SILTSTONE with fine SAND, light blue gray, moist, very stiff to hard, few oxidation/fine sand lenses, low angle bedding	DS
300										
	25		GB: N50E, 13N						@ 25' General bedding, vague SAND laminations and oxidation banding, non-continuous, scattered shell fossils	
295			B: N10E, 12W						@ 28' Bedding on 3" thick concretion and sand laminations, slightly undulatory, not continuous around hole, soft sediment deformation	

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Last Edited: 1/14/2015

Geotechnical Boring Log B-1

Date :	7/23/2014 Page 2 of 2	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	Earthdrill Bucket Auger
Project Number :	14057-01	**Drop :** 12"	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 323 ' MSL	**Drive Weight :**	0' to 23': #2400; 24' to 43': #1550; 44' to 62': #850
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30			R-3	11	104.1	21.1	CL	@ 30' SILTSTONE, blue gray, moist, very stiff to hard	DS AL
290										
	35			B-2					@ 34' Gradual increase in hardness, lacks oxidation, lacks defects, scattered manganese and few shells	
285										
	40			R-4	15	106.6	20.3	CL-ML	@ 40' SILTSTONE with trace fine Sand, moderately gray, moist, very stiff to hard, lacks structure, lacks oxidation, gradual increase in moisture with depth	DS
280									@ 42' Few fine SANDY laminations, very short, vague	
	45									
275									@ 48' End visual log.	
	50			R-5	26	106.1	19.7	CL-ML	@ 50' Same as above	
270									**Total Depth = 51.5'** **No Ground Water Encountered** **Backfilled with Cuttings and Capped with AC to 6 inches on 7/23/2014**	
	55									
265										

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
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TEST TYPES:

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SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-2

Date :	7/23/2014 Page 1 of 2	**Drilling Company :**	Haven Geotechnical Const. Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 325 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
325	0		J: N79E, 73N						**@ 0' to 14' Quaternary Landslide Deposit (Qls)** @ 0' Extremely weathered fine Sandy SILTSTONE, very light brown, dry, slightly stiff, roots, iron oxide, manganese oxide, blocky @ 3' Joint in fine Sandy SILTSTONE, light brown to light gray, slightly moist, stiff, Rootlets to 6'. Gradual increase in moisture and density with depth.	
320	5		B: N15W, 9W						@ 6' Bedding, thin SAND lens	
315	10		GB: N30E, 17W RS: N35W, 12W						@ 12' General bedding, broken concretion, lens @ 13' Gypsum @ 14' Rupture surface attitude, thin SAND lens, Silty CLAY, and gypsum in a 3" thick zone, very moist, continuous, planar, oxidized.	
310	15		B: N5W, 7W						**@ 14' to T.D. Quaternary San Pedro Formation (Qsp)** @14' Sandy SILTSTONE with Sand lenses, light gray, moist, very stiff @ 17' Bedding, SAND lenses, minor cross bedding, laminations, thin SILTSTONE interbeds, oxidized, abundant gypsum, all SAND is fine grained, scattered concretions	
305	20		B: N10E, 13W						@ 23' Bedding, pebble conglomerate, beach sand crossbeds, shells, pebbles (rounded), quartz rich, moist, moderately dense, zones of cementation, soft sediment deformation, minor belling	
300	25								@ 27' Grades to fine Sandy SILTSTONE, light orangish brown, moist, dense, gypsum subplanar to 1/4", manganese oxide	

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

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MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
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CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Last Edited: 1/14/2015

Geotechnical Boring Log B-2

Date :	7/23/2014 Page 2 of 2	**Drilling Company :**	Haven Geotechnical Const. Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 325 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
295	30		B: N15E, 5W						@ 30' Bedding.	
			B: N12E, 14W						@ 33' Bedding, interbedded SANDSTONE and SILTSTONE, light greenish gray with orange and light brown, moist, dense/very stiff, oxidation and gypsum stringers, laminations of micas, manganese oxide	
290	35								@ 35' Lenses of fine SAND in SILTSTONE, mottled orange and gray, very moist, very stiff, soft sediment deformation, manganese oxide nodules, iron oxide nodules, non-planar fractures lined with iron oxide	
285	40									
			J: N85W, vert.						@ 43' Short joint, iron oxide lined	
280	45									
			J: N85W, vert.						@ 48' Short joint, iron oxide lined. End visual log.	
275	50								**Total Depth = 50'** **No Ground Water Encountered** **Backfilled with Cuttings on 7/23/2014**	
270	55									

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

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MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-3

Date :	2/4/2015 Page 1 of 2	**Drilling Company :**	Haven Geotechnical Construction Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 313 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by N/A

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
310	0								**@ 0' to T.D. Quaternary San Pedro Formation (Qsp)** @ 0' Sandy CLAY with scattered rounded Gravel: moderate brown, very moist, stiff; piece of wood, roots. @ 2' Pebbly SAND interfingered with SANDSTONE and SILTSTONE, CLAYSTONE rip-up clasts up to 10", light orange, brown, and light gray, very moist, dense, iron oxide, crystalline gypsum	
305	5		B: N50E, 12N						@ 8' Bedding attitude on oxidation banding. Approximately 70% fine to coarse SANDSTONE and 30% SILTSTONE/CLAYSTONE rip up clasts, gypsum crystals	
300	10		GB: N75E, 16N						@ 10' General bedding attitude on cross-bedding within pebbly sandstone	
295	15								@ 14' North half of borewall is large SILTSTONE block, tightly next to Pebbly SANDSTONE, gypsum along contact and within siltstone. SANDSTONE coarsens downward, pebbles up to 3" in diameter, rounded	
290	20								@ 19' SANDSTONE with few Pebbles, light orange and faint gray mottling, slightly moist, dense, weakly cemented	
285	25								@ 23' Gray Siltstone concretions up to 1' in diameter, scattered small shells	
									@ 26' Concretion nodule, gypsum crystals	
									@ 28' Sandy SILTSTONE with CLAY, light gray and orange mottled, very moist, very dense, iron oxide, manganese oxide	

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Last Edited: 4/2/2015

Geotechnical Boring Log B-3

Date :	2/4/2015 Page 2 of 2	**Drilling Company :**	Haven Geotechnical Construction Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 313 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by N/A

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
280	30			B-1				CL	@ 30' Bulk B-1. Fine Sandy SILTSTONE with trace CLAY, light orange and light gray mottled, very moist, dense, weakly cemented @ 33' Slight increase in clay content @ 34' End visual log. Concretion zone below as observed in tailings.	-200 AL DS MD
	35								**Total Depth = 35'** **No Ground Water Encountered** **Backfilled with Cuttings on 2/4/2015**	
275	40									
270	45									
265	50									
260	55									
255										

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-4

Date :	2/11/2015 Page 1 of 4	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	EZ Bore
Project Number :	14057-01	**Drop :** 12 "	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 315 ' MSL	**Drive Weight :**	0' to 24':#4800; 25' to 58':#3350; 59' to 86':#2045; 87' to115':#1200
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0								**@ 0' to 30' Unsuitable Artificial Fill (afu)** 4" of grass over fine Sandy SILT and Silty fine SAND and Clayey SILT, light and dark brown mottled, moist, stiff/slightly dense layers, variable	
310	5									
305	10			R-1	2	111.4	16.8	SM-ML	@ 10' Fine Sandy SILT, light brown and dark gray mottled, moist, stiff, wood fragment	
300	15								Increase sand content. Scattered pebbles and rootlets.	
295	20			R-2	4	118.0	9.8	SM-ML	@ 20' Fine to medium SAND, light brown and light gray mottled, moist, dense	
290	25									

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Last Edited: 4/2/2015

Geotechnical Boring Log B-4

Date :	2/11/2015 Page 2 of 4	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	EZ Bore
Project Number :	14057-01	**Drop :** 12 "	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 315 ' MSL	**Drive Weight :**	0' to 24':#4800; 25' to 58':#3350; 59' to 86':#2045; 87' to115':#1200
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		C: N60W, 20NE	R-3	3	109.0	5.4	SM	**@30' to T.D. Quaternary San Pedro Formation (Qsp)** @ 30' Contact attitude, fill to bedrock contact in sample. Bedrock is SANDSTONE with Silt and some SILTSTONE, light orangish brown, slightly moist, dense. Zones of rounded cobbles and pebbles, crossbeds, moderately to highly weathered, few rootlets in upper portion	
			B: N62W, 10N to 28N							
285	35								@ 33' Bedding attitude, dip varies due to cross-bedding in sandstone	-200 AL DS MD
				B-1						
280	40			R-4	4	104.1	4.2	ML	@ 40' Fine SANDSTONE with Silt to Silty fine SANDSTONE, light orange brown and light gray mottled, slightly moist, very dense, oxidation banding, scattered nodules of white mineral.	DS AL
			B: N62E, 16NW						@ 44' Bedding attitude on Siltstone bed, 1/4" thick, planar continuous, rootlets below is fine SANDSTONE with Silt, moist, dense, mottled iron oxide staining	
275	45									
270	50			R-5	3	112.0	1.4	SM-ML	@ 50' Fine Sandy SILTSTONE to Silty fine SANDSTONE, light orange brown and light gray mottled, moist, dense	
			B: N20W, 47E						@ 52' Bedding attitude on SANDSTONE bed, soft sediment deformation, minor oxidation and shearing, scattered concretions, rounded pebbles	
265	55		F: N15W, 59E	GB-1					@ 54' Abundant soft sediment deformation and rip-ups, truncated by fault	
									@ 55' Fault attitude (top at 53, bottom at 57'), planar, clay-lined shear (small grab sample GB-1). Few rootlets, hard white mineral. Below is CLAYSTONE with trace fine SAND, gray with light orange, moist, very stiff	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-4

Date :	2/11/2015 Page 3 of 4	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	EZ Bore
Project Number :	14057-01	**Drop :** 12 "	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 315 ' MSL	**Drive Weight :**	0' to 24':#4800; 25' to 58':#3350; 59' to 86':#2045; 87' to115':#1200
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	60		J: N70E, 68W	R-6	5	102.1	23.3	CL	@ 60' Clayey SILTSTONE with trace fine Sand, light gray to brownish gray, moist, slightly hard, minor oxidation, slightly weathered. @ 61' Joint attitude, rough and manganese oxide lined	DS
260	65									
255	70			R-7	5	102.4	22.9		@ 70' Clayey SILTSTONE, moderate gray and orangish brown mottled, moist, slightly hard, iron oxide staining	DS
			J: N8W, 49N; B: N5E, 9W						@ 73' Joint attitude. Bedding attitude on vague laminations within massive strata	
250	75								@ 75' Becomes unoxidized light gray SILTSTONE with CLAY and fine SAND, light gray, very moist, very stiff, scattered shells	
245	80			R-8	7	106.3	21.8	SM-ML	@ 80' SILTSTONE with fine SAND, moderate gray, most, slightly hard to hard, fossiliferous with shells and burrow traces. @ 81' Seepage from east wall.	
240	85								@ 85' Grades to fine Sandy SILTSTONE with CLAY, very moist to wet zones, dense, very stiff	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-4

Date :	2/11/2015 Page 4 of 4	**Drilling Company :**	Alroy Drilling
Project Name :	Westridge	**Type of Rig :**	EZ Bore
Project Number :	14057-01	**Drop :** 12 "	**Hole Diameter :** 28"
Elevation of Top of Hole :	~ 315 ' MSL	**Drive Weight :**	0' to 24':#4800; 25' to 58':#3350; 59' to 86':#2045; 87' to115':#1200
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	90			R-9	14	107.3	20.7	SM-ML	@ 90' Sandy SILTSTONE with Clay, light gray, wet, slightly hard. Widely scattered tight, faint, non-planar fractures, few fossils, seepage	
235	95								@ 95' Increase sand content and decrease clay content. Fine Sandy SILTSTONE with trace Clay to Silty SANDSTONE, wet, hard	
230	100			R-10	16	106.1	21.4	SM-ML	@ 100' As above at 95'	
225	105								@ 105' Decrease fracturing. Bedrock generally fresh.	
220	110			R-11	15	103.8	22.8	SM-ML	@ 110' As above @ 95'	
									@ 111' End visual log.	
									@ 113' Standing water.	
215	115								**Total Depth = 115'**	
									Minor seepage @ 74' , Heavy seepage @ 85' to 113', Standing Groundwater Encountered @ 113'	
									Backfilled with Cuttings and Tamped on 2/4/2015	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

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MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log B-5

Date :	2/12/2015 Page 1 of 2	**Drilling Company :**	Haven Geotechnical Construction Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 350 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0								**@ 0' to T.D. Quaternary San Pedro Formation (Qsp)**	
									@ 0' Sandy SILTSTONE, light yellow and light gray, dry, dense, moderately weathered, iron oxide, fossil shells to 4".	
			B: N5W, 13W						@ 3' Bedding attitude on very thin silt lens	
			B: N20E, 14W						@ 4' Bedding attitude, very thin brown sandstone lens. Scattered manganese oxide and fossils	
345	5									
			B: N10W, 15W						@ 8' Bedding attitude on very thin interbeds, weakly cemented, iron oxide stained, moist, very dense/slightly hard with zones of well cemented. Rootlets in few fractures.	
340	10									
335	15		B: N30E, 12W						@ 15' Bedding attitude on 2" sandstone interbed, orangish brown and gray fine Sandy SILTSTONE and SANDSTONE interbeds, slightly moist, very dense/ hard, weakly cemented.	
			B: N32E, 18W						@ 18' Bedding attitude, brown, friable sandbed with cross laminations, 12" thick, overlies very hard concretion, mostly continuous around borehole.	
330	20								@ 20' Very thin, Clayey SILTSTONE interbed within SANDSTONE that indicates soft sediment deformation occurred	
325	25								@ 25' Concretion, 6" thick within friable sandstone. Below is Silty SANDSTONE with SILTSTONE interbeds, moist, slightly hard and dense to very dense, manganese oxide, iron oxide, soft sediment deformation, very tight.	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Last Edited: 2/17/2015

Geotechnical Boring Log B-5

Date :	2/12/2015 Page 2 of 2	**Drilling Company :**	Haven Geotechnical Construction Inc.
Project Name :	Westridge	**Type of Rig :**	Limited Access Bucket Auger
Project Number :	14057-01	**Drop :** N/A	**Hole Diameter :** 24"
Elevation of Top of Hole :	~ 350 ' MSL	**Drive Weight :**	N/A
Hole Location :	See Geotechnical Map		

Logged by KTM

Sampled by KTM

Elevation (ft)	Depth (ft)	Graphic Log	Attitudes	Sample Number	Blow Count	Dry Density(pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		B: N28E, 18W						@ 30' Bedding attitude. Clayey SILTSTONE with fine SAND, light gray, very moist, very stiff. Grades to fine Sandy SILTSTONE below.	
320	35		B: N10W, 10E						@ 33' Orange with mica laminations, SANDSTONE bed, 8" thick, iron oxide, moist to very moist, very dense. @ 34' Increase moisture, manganese oxide stained, fine Sandy SILTSTONE, light orange brown. @ 35' Bedding attitude, thin SILTSTONE interbed. Wet material but no visible free water	
									@ 38' Heavy seepage	
315	40								@ 41' End visual log	
310	45								**Total Depth = 45' Heavy Seepage Encountered at 38' Backfilled with Cuttings on 2/12/2015**	
305	50									
300	55									

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE
G	GRAB SAMPLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE

Geotechnical Boring Log Borehole HS-1

Date: 7/14/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~274' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 25' - <u>Unsuitable Artifical Fill (afu)</u>**	
270			R-1	6 16 28	132.9	8.3	SC	@2.5' - Clayey SAND with Gravel, brownish orange, slightly moist, dense	
	5								
265									
	10		R-2	13 10 14	121.4	12.4		@10' - Clayey SAND with Gravel, orangish light brown, moist, medium dense	
260									
	15								
255									
	20		R-3	5 5 7	116.4	8.0	SM	@20' - Silty SAND with Gravel, brown, moist, loose	
250									
	25							**@25' to 33' - <u>Quaternary Alluvium (Qal)</u>**	EI, CR
		B-1							
245			R-4	7 8 11	118.3	10.7		@29' - Clayey SILT with Gravel, orangish brown, slightly moist to moist, stiff; rootlets	
	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-1

Date: 7/14/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~274' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30							**@33' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>**	
240	35		R-5	10 15 17	114.8	6.7	SM	@35' - Silty SAND with Gravel, orange and light brown, moist, medium dense	
235	40	B-2	R-6	12 17 18	108.2	5.6		@40' - Silty SAND, light brown to white, orange, mottled, slightly moist, medium dense	MD, DS
230	45		R-7	12 22 40	111.8	15.8		@45' - Silty SAND, orange, gray, white, mottled grading to homogeneous orange, very moist, dense	
225	50		R-8	13 20 29	99.4	24.6	CL	@50' - CLAY, light brown, very moist, hard; very thin Calcium Carbonate lens present	
220	55							Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 7/14/2014	
215	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
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CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-2

Date: 7/14/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~302' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
300	0							**@0' to 30' - <u>Unsuitable Artifical Fill (afu)</u>**	
			R-1	20 50/6"	118.6	12.1	SM	@2.5' - Silty SAND with Gravel, light brown, orange, mottled, slightly moist, very dense	
295	5								
290	10		R-2	18 25 37	114.6	14.8	CL-ML to SP	@10' - Silty CLAY grading to SAND, brown to gray, moist, hard/dense	
285	15								
280	20		R-3	10 16 37	115.8	15.7	SC	@20' - Clayey SAND with Gravel, orangish light brown, moist, dense	
275	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-2

Date: 7/14/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~302' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 3

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
270	30		R-4	50/6"	106.6	10.0	SC	**@30'± to 50' - Possibly Older Artificial Fill (afo)** @30' - Clayey SAND with Gravel, moist, very dense	
265	35	B-1							
260	40		R-5	30 22 50/5"	114.6	14.5		@40' - Clayey SAND with Gravel, grayish brown with some orange, moist, very dense, dark organic clasts	
255	45							**@50' to 60' - Quaternary Alluvium (Qal)**	
250	50		R-6	26 30 50/6"	117.2	14.5		@50' Clayey SAND with Gravel, orange, moist, very dense, rootlets present	
245	55		R-7	22 50/5"	118.3	10.5	SM	@55' - Silty SAND, grayish brown, moist, very dense, rootlets present	
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-2

Date: 7/14/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~302' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 3 of 3

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
240	60		R-8	20 40 50/5"			CL	**@60' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>** @60' - CLAY with Sand and Gravel, light brown to black and dark gray, moist, hard	
235	65	B-2	R-9	25 50/6"				@65' - Sandy CLAY with Gravel, gray with some orange mottling, very moist, dark organic clasts, hard @67' - Cuttings very wet, potential perched groundwater	
230	70		R-10	13 20 30			SC	@70' - Clayey SAND, dark gray with white mottling, moist, dense, clasts of bluish gray clay	
225	75		R-11	16 30 50/6"			SC/ SP-SM	@75' - Clayey SAND, dark gray, moist to very moist, dense, dark organic clasts; distinct change to SAND with Silt, orange and light brown, very moist, very dense	
220	80							Total Depth = 76.5' Free Groundwater Not Encountered Backfilled with Cuttings on 7/14/2014	
215	85								
	90								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-3

Date: 7/14/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~214' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 10' - Unsuitable Artifical Fill (afu)**	
210			R-1	12 16 26	115.3	12.9	SM	@2.5' - Silty SAND, dark brown, orangish brown, gray, mottled, moist, dense	
	5		R-2	14 20 20	109.3	18.0	SC	@5' - Clayey SAND with trace Gravel, brown, moist, medium dense to dense, rootlets present	
205								**@10' to T.D. - Quaternary Alluvium (Qal)**	
	10		R-3	5 9 9	118.1	11.6	CL	@10' - CLAY with trace Gravel, dark grayish brown, moist, stiff	AL CN
200									
	15	B-1	R-4	5 6 8	115.1	9.7		@15' - Sandy CLAY with Gravel, dark yellowish brown, slightly moist, stiff	AL CN
							SM	@17' - Silty SAND with Gravel, moist	MD DS
195									
	20		R-5	15 6 11	114.0	9.9	CL	@ 20' - Sandy CLAY with Gravel, orangish brown, slightly moist, stiff	
190									
	25		R-6	5 6 11	103.2	21.3		@ 25' - CLAY with Gravel, dark yellowish brown with gray lenses, very moist, stiff	AL CN
185								Total Depth = 26.5' Groundwater Not Encountered Backfilled with Cuttings on 7/14/2014	
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-4

Date: 7/15/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~257' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>**	
255			R-1	22 40 42	115.3	12.9	ML	@2.5' - SILT with Sand, gray, light brown, orange, mottled, moist, hard	
	5		R-2	18 30 50/6"	109.3	18.0	CL-ML	@5' - Silty CLAY, gray, light brown, orange, mottled, slightly moist, hard	
250									
	10		R-3	18 37 48	105.7	20.7	CL	@10' - CLAY, dark gray, moist, hard	
245									
	15	B-1	R-4	15 30 40	106.0	21.1	ML	@15' - SILT with Sand, light brown, gray, orange, mottled, moist, hard	
240									
	20		R-5	30 50/6"	108.3	19.7	CL-ML	@20' - Silty CLAY with Sand, dark gray with some orange mottling, moist, hard	
235								Total Depth = 21.5' Groundwater Not Encountered Backfilled with Cuttings on 7/15/2014	
	25								
230									
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-5

Date: 7/15/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~233' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 30' - <u>Older Artificial Fill (afo)</u>**	
230			R-1	22 25 35	121.9	7.1	SM	@2.5' - Silty SAND with Gravel, brown and light brown, dry to slightly moist, dense	
	5								
225									
	10		R-2	17 17 27	111.4	14.2	SC	@10' - Clayey SAND with trace Gravel, orange, light brown with a distinct change to gray and light brown half way through sample, moist, dense	
220									
	15								
215									
	20			38 50/5"				@20' - No Sample Recovery	
210			R-3	8 14 19	103.4	22.8	CL	@23' -CLAY with Sand, gray and orange mottled, moist, very stiff	
	25								
205			R-4	17 27 41	121.9	11.3	SC	@28' - Clayey SAND with black organic clasts and trace Gravel, blue gray, moist, dense to very dense	
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-5

Date: 7/15/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~233' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	Logged By CNJ Sampled By CNJ Checked By BTZ DESCRIPTION	Type of Test
	30							**@30' to T.D. - <u>Quaternary Alluvium (Qal)</u>**	
200			R-5	6 15 23	119.4	13.7	CL	@33' - CLAY with Sand, mottled brown, orange, and gray, moist, very stiff, organic clasts	
	35								
195			R-6	25 35 50/6"	120.1	13.7	SC-SM	@38' - Clayey Silty SAND with trace Gravel and organic clasts, brownish gray, moist, very dense	
	40							Total Depth = 39.5' Groundwater Not Encountered Backfilled with Cuttings on 7/15/2014	
190									
	45								
185									
	50								
180									
	55								
175									
	60								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-6

Date: 7/15/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~280' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 13' - Unsuitable Artifical Fill (afu)**	
			R-1	18 24 33	110.6	18.1	ML	@2.5' - SILT with trace gravel, gray, orange, light brown, mottled, very moist, hard, organic clasts, rootlets present	
275	5								
270	10		R-2	10 17 19	120.9	10.5	SC	@10' - Clayey SAND with Gravel, orange brown, slightly moist, medium dense, tile piece present	
								@13' to 28' - Quaternary Landslide Deposit (Qls)	
			R-3	5 11 16	115.0	13.2		@13' - Clayey SAND with Gravel, orange and brown, moist, medium dense	
265	15								
			R-4	9 14 18		12.7	CL	@18' - CLAY with Gravel, brown with white patches, moist, very stiff, sample disturbed	
260	20								
		B-1	R-5	6 7 9	113.6	10.6	SC	@23' - Clayey SAND with Gravel, brown with some orange, moist, medium dense	EI, CR
255	25								
								@28' to T.D. - Quaternary San Pedro Formation (Qsp)	
			R-6	9 11 16	104.2	10.3	ML	@28' - Sandy SILT, light orange, slightly moist, very stiff, rootlets present	
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-6

Date: 7/15/2014	**Drilling Company:** 2R
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~280' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	Logged By CNJ Sampled By CNJ Checked By BTZ DESCRIPTION	Type of Test
	30								
			R-7	8 21 37	111.0	12.1	ML	@33' - Sandy SILT, light orange, slightly moist, hard	
250	35							Total Depth = 34.5' Groundwater Not Encountered Backfilled with Cuttings on 7/15/2014	
245	40								
240	45								
235	50								
230	55								
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-7

Date: 7/15/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~260' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>**	
			R-1	18 38 45	117.5	8.5	SM	@2.5' - Silty SAND and fine Gravel, orangish grayish brown, moist, very dense	
255	5		R-2	22 35 50/5"	116.7	4.0		@5' - Silty SAND with Gravel, mottled orange and light brown, slightly moist, very dense	
250	10		R-3	22 50/6"	105.3	4.3	SP	@10' - SAND with Gravel, mottled orange and light brown, moist, very dense	
245	15		R-4	30 25 42	105.6	4.4		@15' - SAND, slightly moist, light brown with some mottled orange, dense to very dense, trace organic material	
240	20		R-5	25 50/4"	107.2	5.4	SM	@20' - Silty SAND, orangish light brown, slightly moist, very dense	
235	25							Total Depth = 21.5' Groundwater Not Encountered Backfilled with Cuttings on 7/15/2014	
	30								

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-8

Date: 7/16/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~310' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 20' - Older Artificial Fill (afo)**	
			R-1	50/5"	111.5	5.1	ML	@2.5' - Sandy SILT with Gravel, light brown, slightly moist, hard, roots and plant material present	
305	5								
300	10		R-2	24 26 29	114.2	12.2	CL	@10' - Sandy CLAY with Gravel, slightly moist, hard, black organic streaks	
295	15								
								@20' to T.D. - Quaternary San Pedro Formation (Qsp)	
290	20		R-3	11 13 15	124.1	10.2	SC	@20' - Clayey SAND with fine Gravel, bluish, brownish, gray, slightly moist, medium dense	
			R-4	10 25 50/6"	118.9	11.8		@22' - Clayey SAND with fine Gravel, bluish, greenish gray, moist, very dense, black organic streaks	
								@24' - Rig Chatter	
285	25								
			R-5	12 21 22	124.8	3.4	SP-SM	@27' - SAND with Silt and medium to coarse Gravel, orange and light brown, slightly moist, dense	
	30							@28' - Significant Rig Chatter and gravel encountered in cuttings	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-8

Date: 7/16/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~310' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		SPT-1	23 12 9		9.5	SM	@30' - Silty SAND with Gravel, dark gray, moist, medium dense	
280	35							Total Depth = 31.5' (Auger Refusal) Groundwater Not Encountered Backfilled with Cuttings on 7/16/2014	
275	40								
270	45								
265	50								
260	55								
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-9

Date: 7/16/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~330' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>**	
			R-1	17 17 18	104.4	10.2	SM	@2.5' - Silty SAND with Gravel, light brown, orange, mottled, moist, medium dense	
325	5		R-2	17 50/5"	112.7	3.5		@5' - Silty SAND with Gravel, light brown grades to brown, slightly moist, very dense, roots present in finer material	
320	10		R-3	50/6"	94.8	13.4	SP-SM	@10' - SAND with Silt and trace Gravel, light brown and orange mottled, very moist, very dense	
315	15			50/4"				@15' - No sample recovery	
								@18' - Rig Chatter	
310	20		R-4	18 26 30	102.7	12.6	CL	@20' - CLAY, light brown and light orange mottled, moist, hard	
								Total Depth = 21.5' Groundwater Not Encountered Backfilled with Cuttings on 7/16/2014	
305	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-10

Date: 7/16/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~330' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 25' - <u>Unsuitable Artifical Fill (afu)</u>**	
			R-1	20 22 50/5"	117.9	11.3	SM	@2.5' - Silty SAND with little Gravel, brown, very dense, rootlets present	
325	5								
320	10		R-2	18 28 30	118.6	10.9	CL	@10' - Sandy CLAY with Gravel, brown, slightly moist, hard	
315	15								
310	20		R-3	14 28 48	125.2	8.3	SC	@20' - Clayey SAND with little Gravel, dark brown, black organic streaks, slightly moist, very dense	
305	25							**@25' to 48' - <u>Quaternary Alluvium (Qal)</u>**	
	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 7/17/2014

Geotechnical Boring Log Borehole HS-10

Date: 7/16/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~330' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-4	10 17 21	123.1	12.0	CL	@30' - CLAY with Gravel, brown, slightly moist, very stiff	
			R-5	10 15 20	122.1	12.3		@33' - Same as above	
300	35								
			R-6	12 23 27	121.1	12.5		@38' - Sandy CLAY with fine Gravel, mottled light brown and brown, slightly moist, hard	
295	40								
			R-7	6 10 15	118.4	12.5		@43' - Sandy CLAY with Gravel, brown, slightly moist, very stiff	
290	45							**@48' to T.D. - <u>Quaternary San Pedro Formation (Qsp)</u>**	
			R-8	10 13 16	117.9	12.8	SC	@48' - Clayey SAND, mottled orange and light brown, Sand and Clay mottled, moist, medium dense	
285	50								
			R-9	13 15 10	109.6	4.3	SP-SM	@53' - SAND with Silt, mottled orange, light brown, slightly moist, medium dense	
280	55							Total Depth = 54.5' Groundwater Not Encountered Backfilled with Cuttings on 7/16/2014	
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-11

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~249' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
245	0							**@0' to 35' - Unsuitable Artificial Fill (afu)**	
240	5								
	10		R-1	12 26 25	126.4	9.3	CL	@10' - Sandy CLAY with Gravel, orangish brown, slightly moist to moist, hard	
235	15								
230	20		R-2	7 18 47	116.8	15.1	ML	@20' - Sandy SILT with Gravel, gray with brown and orange mottling present, moist, hard, dark organic streaks present	
225	25								
220	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
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AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2014

Geotechnical Boring Log Borehole HS-11

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~249' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-3	20 20 50	122.6	4.2	SM	@30' - Silty SAND with Gravel, dark brown, slightly moist, very dense	
215									
	35		R-4	8 8 11	116.2	6.2	SM	**@35' to T.D. - <u>Quaternary Alluvium (Qal)</u>** @35' - Silty SAND with Gravel, brown, slightly moist, medium dense	-200
210									
	40		R-5	8 11 15	119.2	4.6	SC-SM	@40' - Silty Clayey SAND with trace Gravel, orangish brown, slightly moist, medium dense, white rootlet casts present	AL -200
205									
	45		R-6	8 12 16	119.9	6.5	SC	@45' - Clayey SAND with trace Gravel, orangish brown, slightly moist, medium dense, white rootlet casts present	
200									
	50		R-7	8 12 22	124.9	3.9		@50' - Clayey SAND with trace Gravel, orangish brown, slightly moist, medium dense, white rootlet casts present	
195								Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 7/31/2014	
	55								
190									
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-12

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~230' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 35' - Older Artificial Fill (afo)**	
225	5								
220	10		R-1	12 20 34	114.7	12.4	SC to CL	@10' - Clayey SAND grading to Sandy CLAY, gray brown, moist, dense/hard, trace plant matter present	
215	15								
210	20		R-2	17 24 30	117.1	11.4	SM	@20' - Silty SAND, orange brown, slightly moist, dense	
205	25								
	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2014

Geotechnical Boring Log Borehole HS-12

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~230' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-3	16 36 46	124.6	9.6	SC to CL	@30' - Clayey SAND with Gravel grading to Sandy CLAY with Gravel, orangish grayish brown, slightly moist, very dense/hard	
200	35							**@35' to T.D. - <u>Quaternary Alluvium (Qal)</u>**	
195	40		R-4	5 11 16	115.7	14.8	CL	@40' - CLAY with Sand, dark brown to grayish brown, moist, very stiff	AL CN
190	45		R-5	5 9 12	109.3	18.7		@45' CLAY with Sand, yellowish brown, very moist, stiff to very stiff	
185	50		R-6	5 8 14	97.5	25.7		@ 50' - Lean CLAY with trace Gravel, olive gray with orange to red oxidation mottling, very moist, very stiff	AL CN
180	55		R-7	5 10 14	100.2	23.9		@55' - Same as above but lacks gravel	
	60							Total Depth = 56.5' Groundwater Not Encountered Backfilled with Cuttings on 7/31/2014	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-13

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~234' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 14' - Unsuitable Artificial Fill (afu)**	
230	5								
225	10		R-1	12 21 30	114.6	15.1	CL	@10' - Sandy CLAY, orangish brown, moist, hard	
220								**@14' to 46' - Quaternary Alluvium (Qal)**	
	15		R-2	5 5 4	105.3	6.7	SM	@15' - Silty SAND with trace Gravel, brown, slightly moist, loose	AL -200
215	20		R-3	9 15 20	122.9	7.6	SC	@20' - Clayey SAND with some Gravel, brown, slightly moist, medium dense	
210	25		R-4	7 7 8	111.7	6.9	SM	@25' - Silty SAND with Gravel, light brown to brown, slightly moist, medium dense	-200
205	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2014

Geotechnical Boring Log Borehole HS-13

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~234' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
200	30		R-5	7 11 14	118.7	6.8	ML	@30' - Sandy SILT with trace Gravel, brown, slightly moist, very stiff	
	35		R-6	4 6 7	106.9	9.8	SM-SC	@35' - Silty Clayey SAND with some fine Gravel, brown, slightly moist, loose, white rootlet casts present	AL -200
195	40		R-7	7 11 28	116.4	9.0		@40' - Medium dense	-200
190	45		R-8	8 12 15	117.3	9.3	SM	@45' - Silty SAND with trace Gravel, light brown to brown, moist, medium dense, white rootlet casts **@46' to T.D. - Quaternary San Pedro Formation (Qsp)**	
185	50		R-9	12 35 50	115.8	10.7		@50' - SAND with trace Gravel, light brown to brown with orange oxidation nodules, moist, very dense	
180	55							Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 7/31/2014	
175	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-14

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~234' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							Approximately 4" of Asphalt Concrete over 5" of Aggregate Base **@0' to 15' - Unsuitable Artificial Fill (afu)**	
230	5		R-1	10 10 12	111.6	11.7	CL	@5' - Sandy Clay, orangish light brown to gray brown, moist, very stiff	
225	10		R-2	9 13 17	107.5	21.4		@10' - CLAY, dark olive gray with orange iron oxidation nodules, moist, very stiff	AL CN
220	15		R-3	13 23 25	122.7	8.5	SC	**@15' to T.D. - Quaternary Alluvium (Qal)** @15' - Clayey SAND with some Gravel, brown, moist, dense, iron oxidation nodules	
215	20		R-4	4 5 7	115.3	9.1	SC	@20' - Clayey SAND with trace Gravel, olive brown, moist, loose	AL CN
210	25		R-5	4 5 10	116.8	8.6		@25' - Clayey SAND with trace Gravel, brown to yellow brown, moist, medium dense, root traces and calcium carbonate present	
205	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
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TEST TYPES:

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MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
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AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2014

Geotechnical Boring Log Borehole HS-14

Date: 7/31/2014 | **Drilling Company:** 2R

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~234' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-6	7 8 10	122.7	8.5	SC	@30' - Clayey SAND with trace Gravel, brown, slightly moist, medium dense, calcium carbonate present	
200									
	35		R-7	6 9 10	116.1	8.7		@35' - Rootlets present	
195									
	40		R-8	11 21 27	129.0	10.1	CL	@40' - Sandy CLAY with trace Gravel, brown, slightly moist, hard	
190									
	45		R-9	12 20 20	126.7	8.2	SC	@45' - Clayey SAND with trace fine Gravel, brown, slightly moist, dense	
185									
	50		R-10	11 16 20	119.3	12.3	CL	@50' - Sandy CLAY with trace Gravel, brown, moist, very stiff	
180								Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings and Capped with Asphalt Concrete Cold Patch on 7/31/2014	
	55								
175									
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
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TEST TYPES:

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MD	MAXIMUM DENSITY
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-15

Date: 2/3/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~263' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						**@0' to 20' - Older Artificial Fill (afo)**	
260									
	5		R-1	12 26 50/3"	118.0	14.4	SC	@5' - Clayey SAND with some very fine Gravel, brown with dark brown and orange blebs, moist, very dense	
255									
	10		R-2	12 20 20	116.3	12.6	SP-SC	@10' - SAND with Clay and medium Gravel, yellow orange brown with gray clayey blebs, very moist to wet, medium dense	
250									
	15		R-3	12 16 25	102.8	22.0	SC	@15' - Clayey SAND with fine Gravels, medium brown with dark organic blebs and gray clayey blebs, very moist, dense	
245									
	20		R-4	16 33 45	124.2	7.6		**@20' to 26.5' - Quaternary Alluvium (Qal)** @20' - Clayey SAND with very fine to fine Gravel, orange and yellow matrix, moist to very moist, very dense; iron oxide nodules, rounded gravel	AL -200
240									
	25		R-5	16 25 31	119.2	13.4		@25' - Clayey SAND, medium brown with colorful clasts, moist to very moist, dense, iron oxide nodules	AL CN
235								**@26.5' to T.D. - Quaternary San Pedro Formation (Qsp)** @26.5' - Silty fine SAND, gray and orange mottling, micaceous	
	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/19/2015

Geotechnical Boring Log Borehole HS-15

Date: 2/3/2015	**Drilling Company:** 2R Drilling
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~263' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-6	36 50/4"	100.2	12.6	SM	@30' - Silty SAND, gray and orange mottling, slightly moist to moist, very dense, micaceous	
230								Total Depth = 31.5' Groundwater Not Encountered Backfilled with Cuttings on 2/3/2015	
	35								
225									
	40								
220									
	45								
215									
	50								
210									
	55								
205									
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

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TEST TYPES:

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SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-16

Date: 2/3/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~215' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 10' - Older Artificial Fill (afo)**	
210	5		R-1	19 25 27	121.9	9.6	SC	@5' - Clayey SAND with some Gravel, medium brown, moist, dense to very dense, blebs or sand, clay, and dark brown material	
205	10		R-2	6 7 10	110.7	12.6	SM	**@10' to 27' - Quaternary Alluvium (Qal)** @10' - Fine Silty SAND, brown to dark brown, moist, medium dense, homogeneous texture and rounded colorful sand	
200	15		R-3	12 14 18	109.8	11.0	CL	@15' - Sandy CLAY, orange brown, moist, dense, root cast	-200
195	20		R-4	7 9 15	111.7	16.4		@20' - CLAY, orange brown to medium dark brown, moist, trace gravel	CN AL
190	25		R-5	11 18 28	104.3	22.1		@25' - CLAY with Sand, reddish brown, moist, rounded clasts that coarsen with sample depth, white mineralization around clasts, iron oxide nodules	-200
	30							**@27' to T.D. - Quaternary San Pedro Formation** @27' - Clayey SILT, gray and orange mottling, iron oxide	

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
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▽	GROUNDWATER TABLE

TEST TYPES:

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EI	EXPANSION INDEX
CN	CONSOLIDATION
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AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/19/2015

Geotechnical Boring Log Borehole HS-16

Date: 2/3/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~215' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-6	17 32 45	106.3	19.9	ML	@30' - SILT with Sand, dark orange and gray brown mottling, moist, hard, micaceous, iron oxide	
185	35		R-7	24 34 46	104.1	21.7		@35' - SILT with Sand, orange and gray brown mottling, moist to very moist, hard, micaceous, trace fossils, iron oxide	AL -200
180	40		R-8	20 40 45	98.2	26.2	ML-CL	@40' - Silty CLAY with fine Sand, orange and gray and brown mottling, very moist, hard, shells, micaceous	
175	45		R-9	38 50-5"		20.6		@45' - Silty CLAY, dark gray, moist to very moist, hard	
170	50		R-10	50/3"			ML	@50' - SILT with Sand, dark gray, hard, partial recovery	
								Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 2/3/2015	
165	55								
	60								

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AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-17

Date: 2/4/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~208' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By ASR
Sampled By ASR
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 10' - Older Artificial Fill (afo)**	
205									
	5	B-1	R-1	12 19 35	112.3	19.0	CL	@5' - Sandy CLAY, light brown, moist, hard	AL DS -200 MD
200									
	10		R-2	12 24 22	114.8	9.7	ML	**@10' to 48' - Quaternary Alluvium (Qal)** @10' Sandy SILT, reddish light brown, moist, hard	
195									
	15		R-3	8 13 19	105.1	9.1	SM	@15' - Silty SAND, light brown, moist, medium dense	-200
190									
	20		R-4	4 6 7	99.0	26.3	CL	@20' - CLAY, yellowish brown, very moist, medium stiff	CN AL
185									
	25		R-5	5 8 14	110.4	18.2		@25' - CLAY, dark yellowish brown, moist, very stiff	CN AL
180		▽							
	30								

LGC Geotechnical, Inc.

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CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/19/2015

Geotechnical Boring Log Borehole HS-17

Date: 2/4/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~208' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By ASR
Sampled By ASR
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-6	5 13 22	107.4	21.2	SM	@30' - Silty SAND, light brown, very moist, medium dense	-200
175									
	35		R-7	16 33 50/5"	112.7	18.6		@35' - Silty SAND, light brown, wet, very dense	
170									
	40		R-8	11 15 20		18.5	SP-SM	@40' - SAND with Silt, light brown, wet, medium dense	-200
165									
	45		R-9	7 14 46	107.2	21.5	SC	@45' - Clayey SAND, light gray, wet, dense	
160								**@48' to T.D.' - <u>Quaternary San Pedro Formation (Qsp)</u>**	
	50		R-10	15 50/5"	111.9	18.2		@50' - Clayey SAND, light gray, wet, very dense	
155									
	55		R-11	17 50/5"	109.5	19.6	SM	@55' - Silty SAND, light gray, wet, very dense	
150									
	60								

LGC Geotechnical, Inc.

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RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-17

Date: 2/4/2015 | **Drilling Company:** 2R Drilling

Project Name: Westridge | **Type of Rig:** Limited Access Hollow Stem

Project Number: 14057-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~208' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By ASR
Sampled By ASR
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
145	60		R-12	21 29 36	128.1	9.8	SP-SM	@60' - SAND with Silt, wet, dense	
140	65		R-13	10 50/5"	133.7	7.7		@65' - SAND with Silt, wet, very dense, very rounded, shell fragment present	
	70		SPT-1	32 50/3"		5.4		@70' - SAND with Silt, slightly moist, very dense	
135	75							Total Depth = 71' Groundwater Encountered at Approximately 29' Backfilled with Cuttings on 2/4/2015	
130	80								
125	85								
120	90								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

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R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
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▽	GROUNDWATER TABLE

TEST TYPES:

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SA	SIEVE ANALYSIS
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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-18

Date: 2/4/2015	**Drilling Company:** 2R Drilling
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~290' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 2

Logged By ASR
Sampled By ASR
Checked By BTZ

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						**@0' to 40' - Unsuitable Artificial Fill (afu)**	
285	5		R-1	11 17 12			SM	@5' - Silty SAND, dark gray, slight moist, stiff, dense	
280	10		R-2	7 10 12			CL	@10' - CLAY, dark gray, slightly moist, very stiff	
275	15		R-3	11 13 17				@15' - CLAY, dark gray, slightly moist to moist, very stiff	
270	20		R-4	11 13 14				@20' - CLAY with Sand, dark gray, slightly moist to moist, stiff	
265	25		R-5	19 24 33			SM	@25' - Silty SAND, dark gray, slightly moist to moist, dense	
	30								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

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AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 2/19/2015

Geotechnical Boring Log Borehole HS-18

Date: 2/4/2015	**Drilling Company:** 2R Drilling
Project Name: Westridge	**Type of Rig:** Limited Access Hollow Stem
Project Number: 14057-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~290' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	Logged By ASR Sampled By ASR Checked By BTZ DESCRIPTION	Type of Test
	30		R-6	8 12 17			SM	@30' - Silty SAND, dark gray, slightly moist to moist, medium dense	
260	35		R-7	18 38 44				@35' - Silty SAND, light gray, slight moist, dense to very dense	
255	40		R-8	26 50/5"	106.3	21.2	CL	**@40' to T.D. - <u>Quaternary Landslide Deposit/Quaternary San Pedro Formation Undifferentiated (Qls/Qsp)</u>** @40' - Silty fine SAND, light gray and brown, slightly moist, very dense, iron oxide staining	
250	45		R-9	38 50/5"	104.5	22.6	ML	@45' - SILT with Sand, light gray and brown, moist, very dense, iron oxide	
245	50		R-10	32 50/5"	100.3	25.0		@50' - SILT with Sand, light brown, moist, very dense	
240	55							Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 2/4/2015	
	60								

LGC Geotechnical, Inc.

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SAMPLE TYPES:

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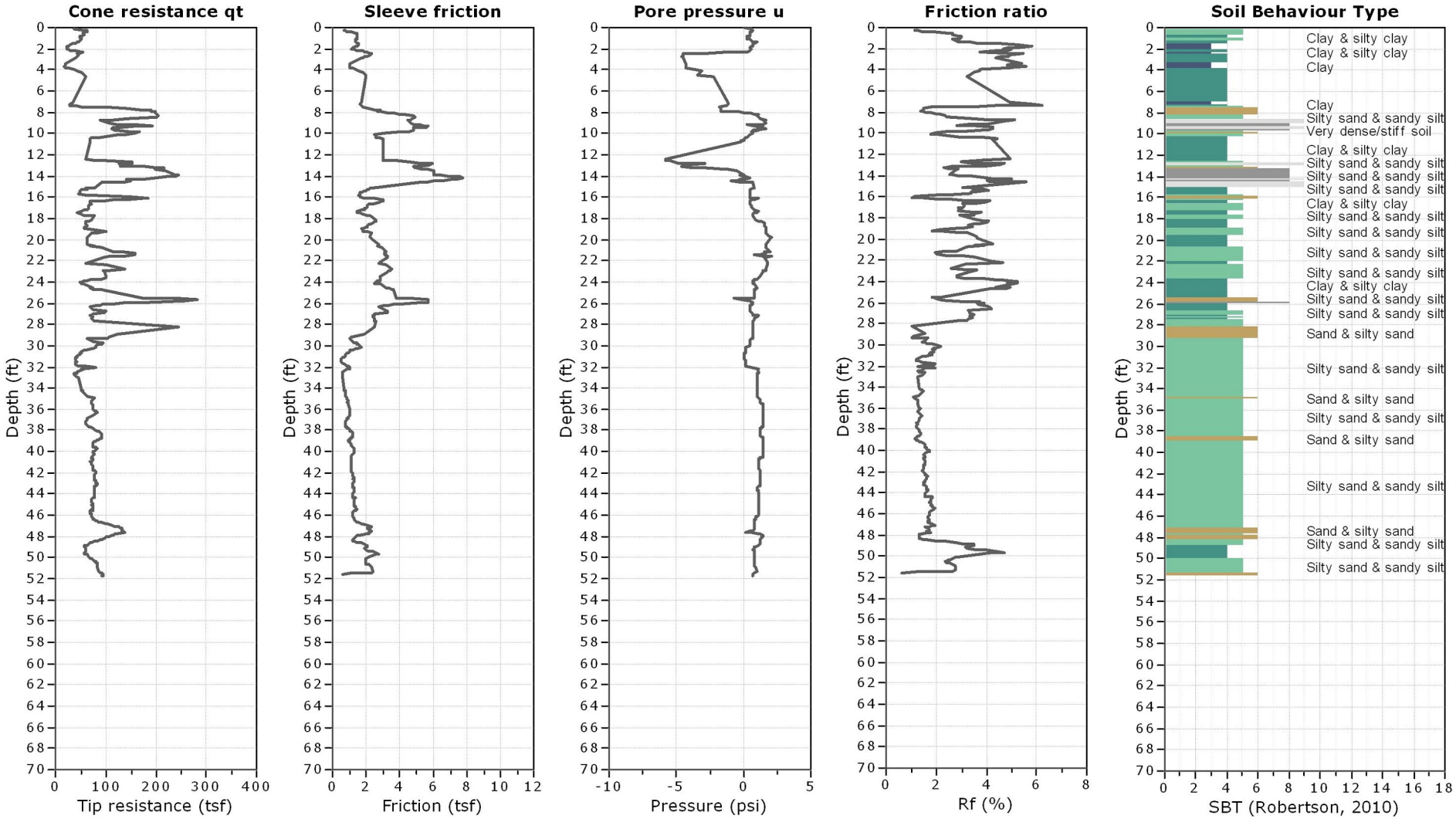
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-1A

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 51.74 ft, Date: 7/22/2014
Cone Type: Vertek



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714-901-7270
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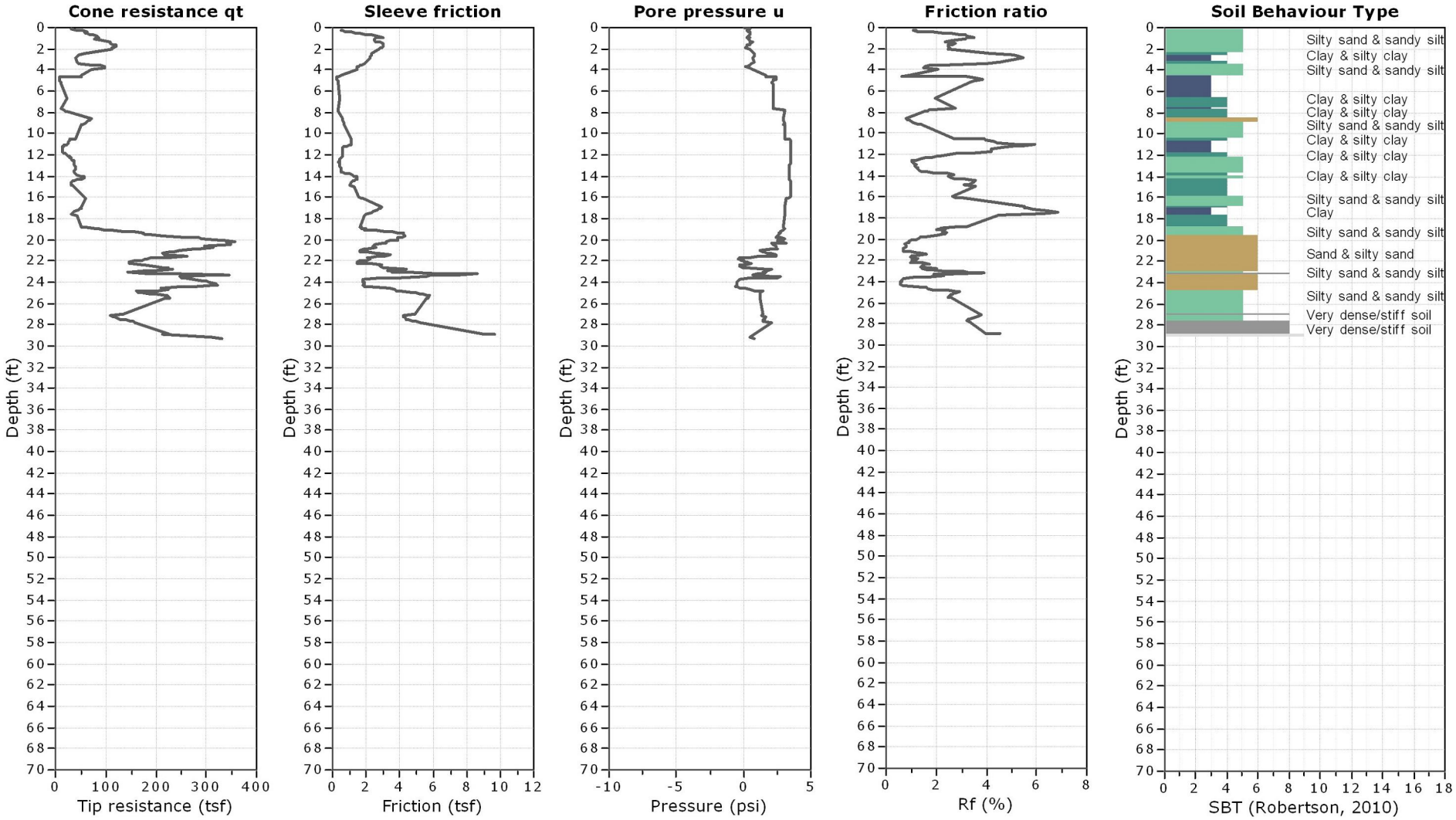
www.kehoetesting.com

CPT: CPT-2

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 29.28 ft, Date: 7/22/2014
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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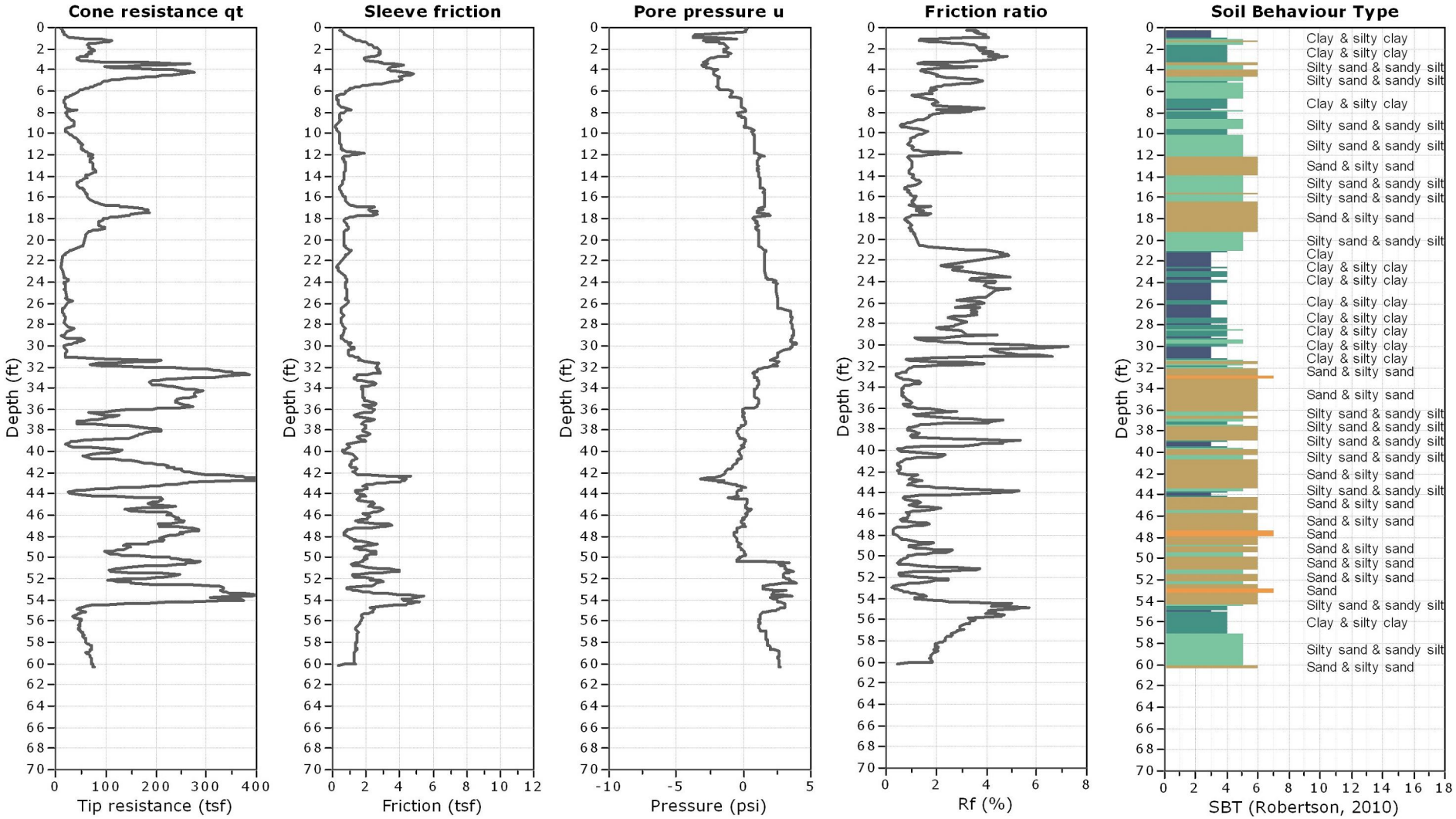
www.kehoetesting.com

CPT: CPT-3

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 60.34 ft, Date: 7/22/2014
Cone Type: Vertek

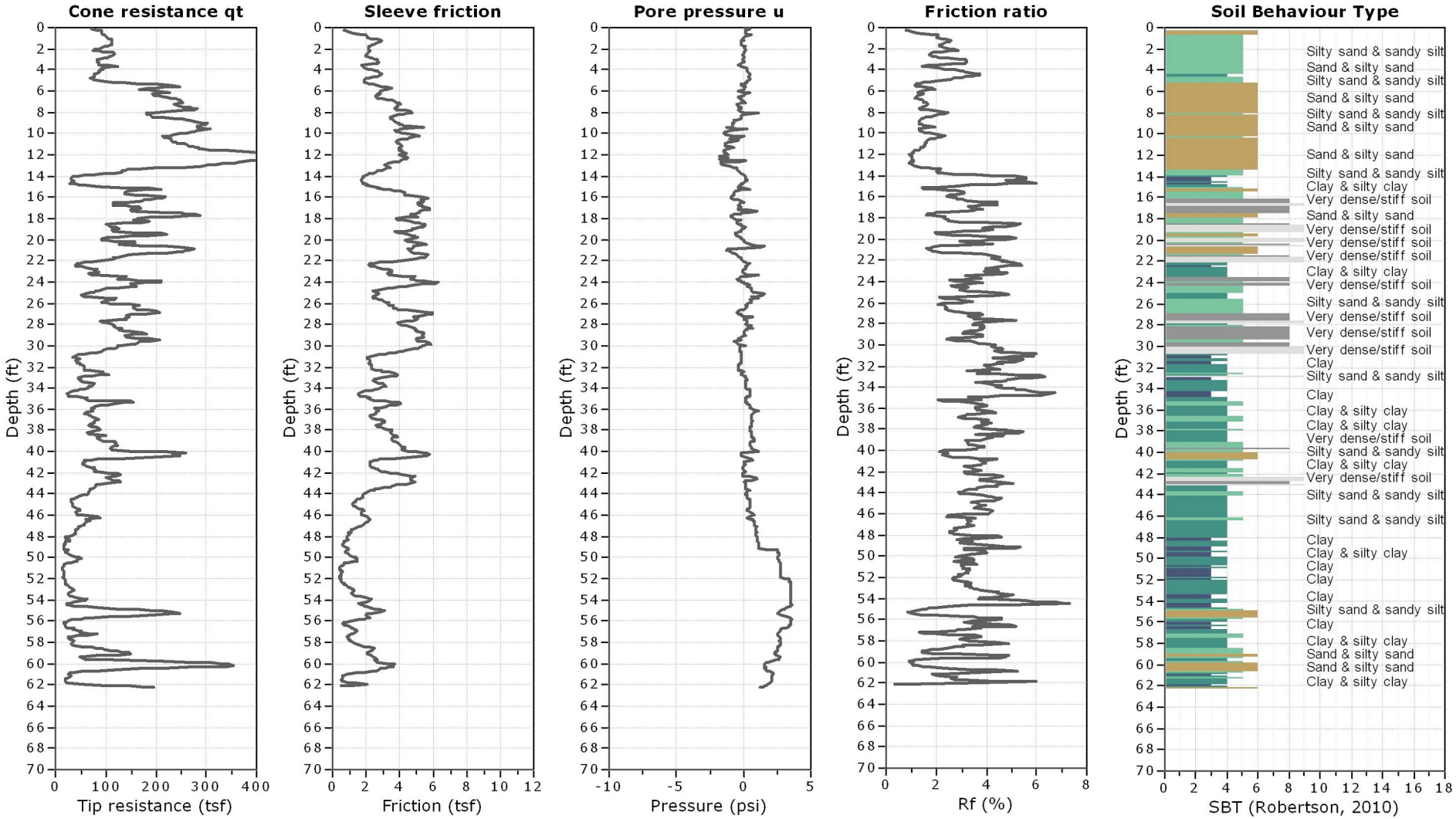


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-4

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 62.25 ft, Date: 7/22/2014
Cone Type: Vertek



Kehoe Testing and Engineering
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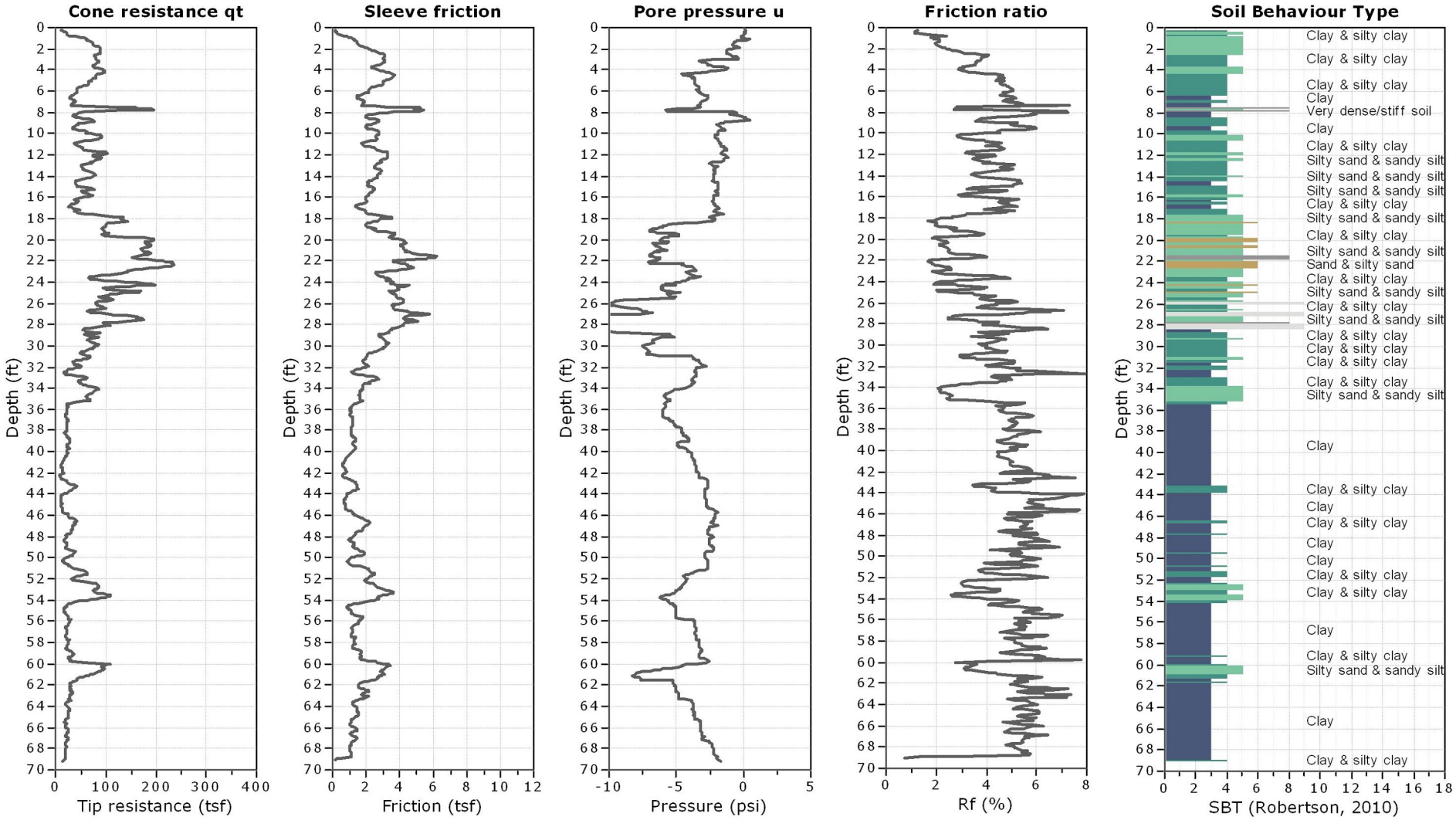
www.kehoetesting.com

CPT: CPT-5

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 69.17 ft, Date: 7/22/2014
Cone Type: Vertek

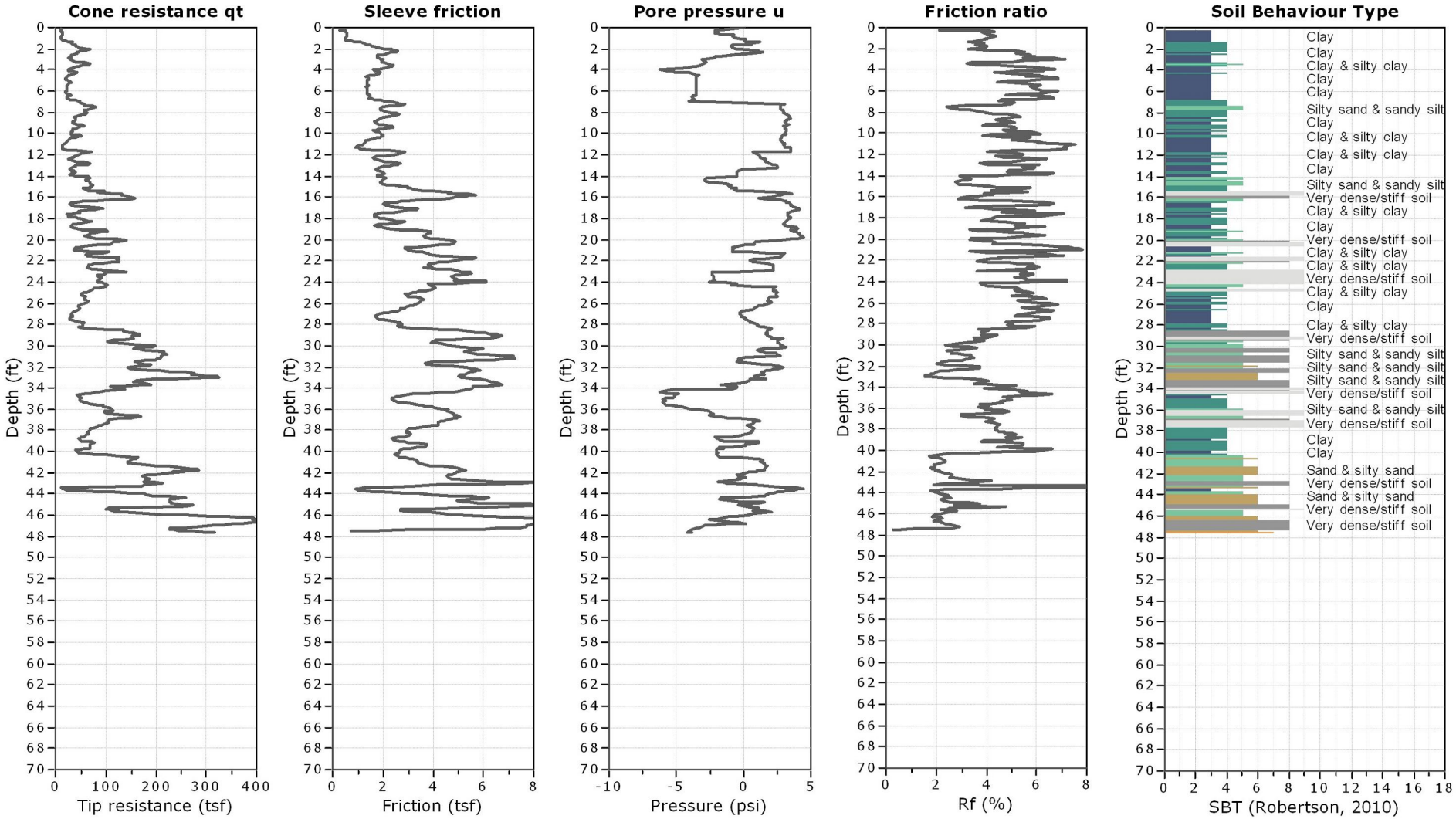


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-6

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 47.65 ft, Date: 7/22/2014
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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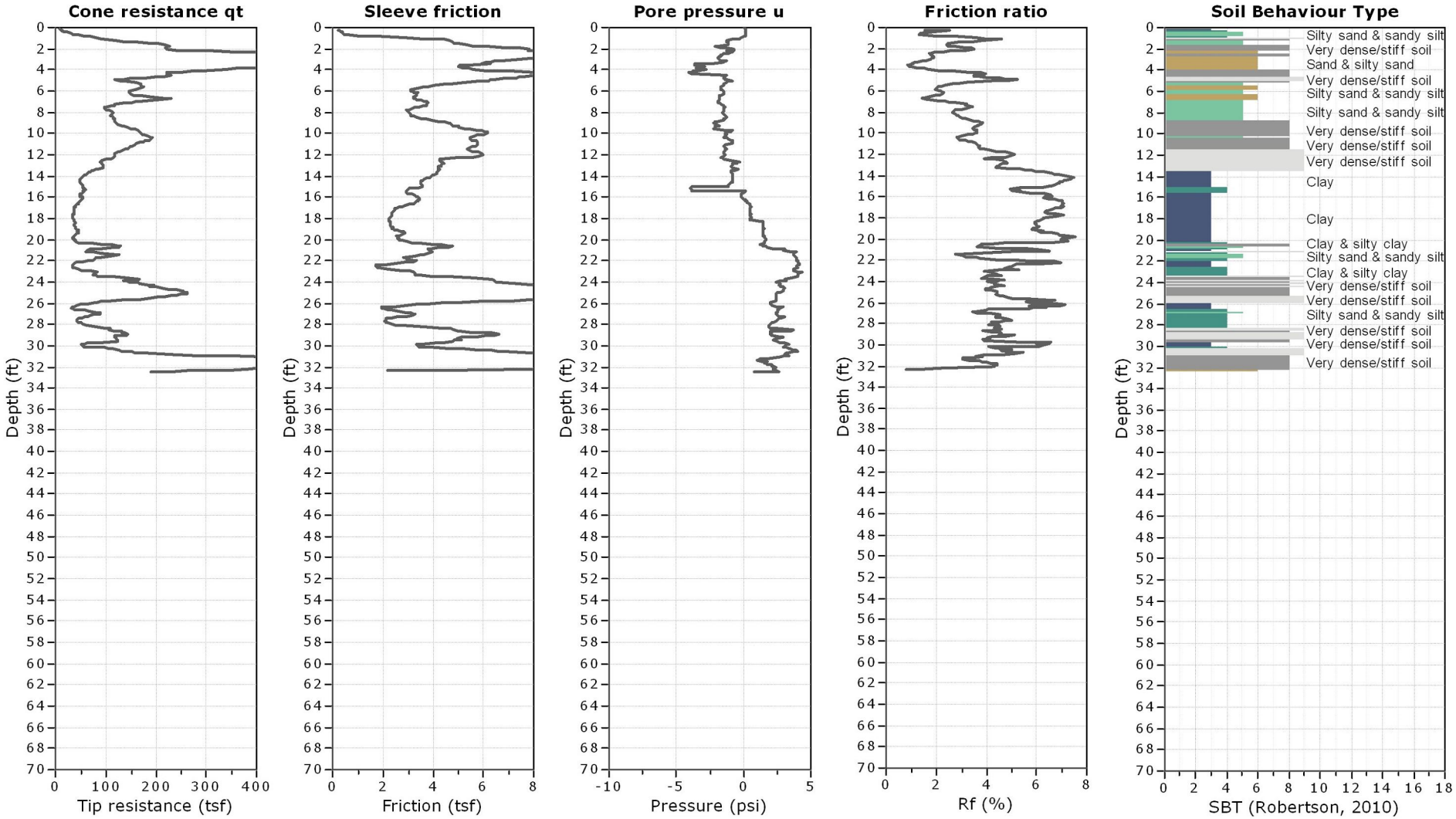
www.kehoetesting.com

CPT: CPT-7A

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 32.50 ft, Date: 7/23/2014
Cone Type: Vertek

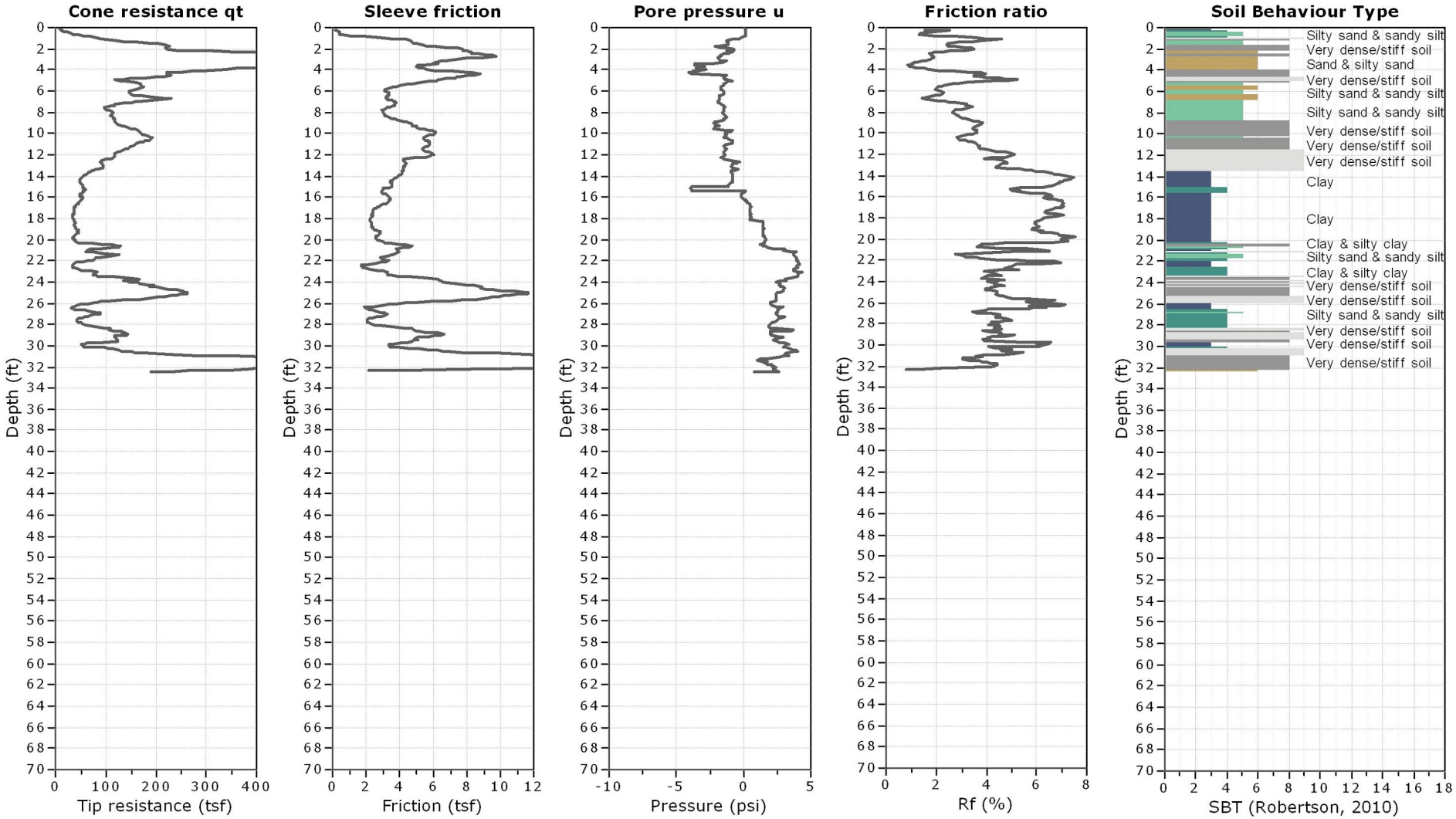


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-8

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 32.50 ft, Date: 7/23/2014
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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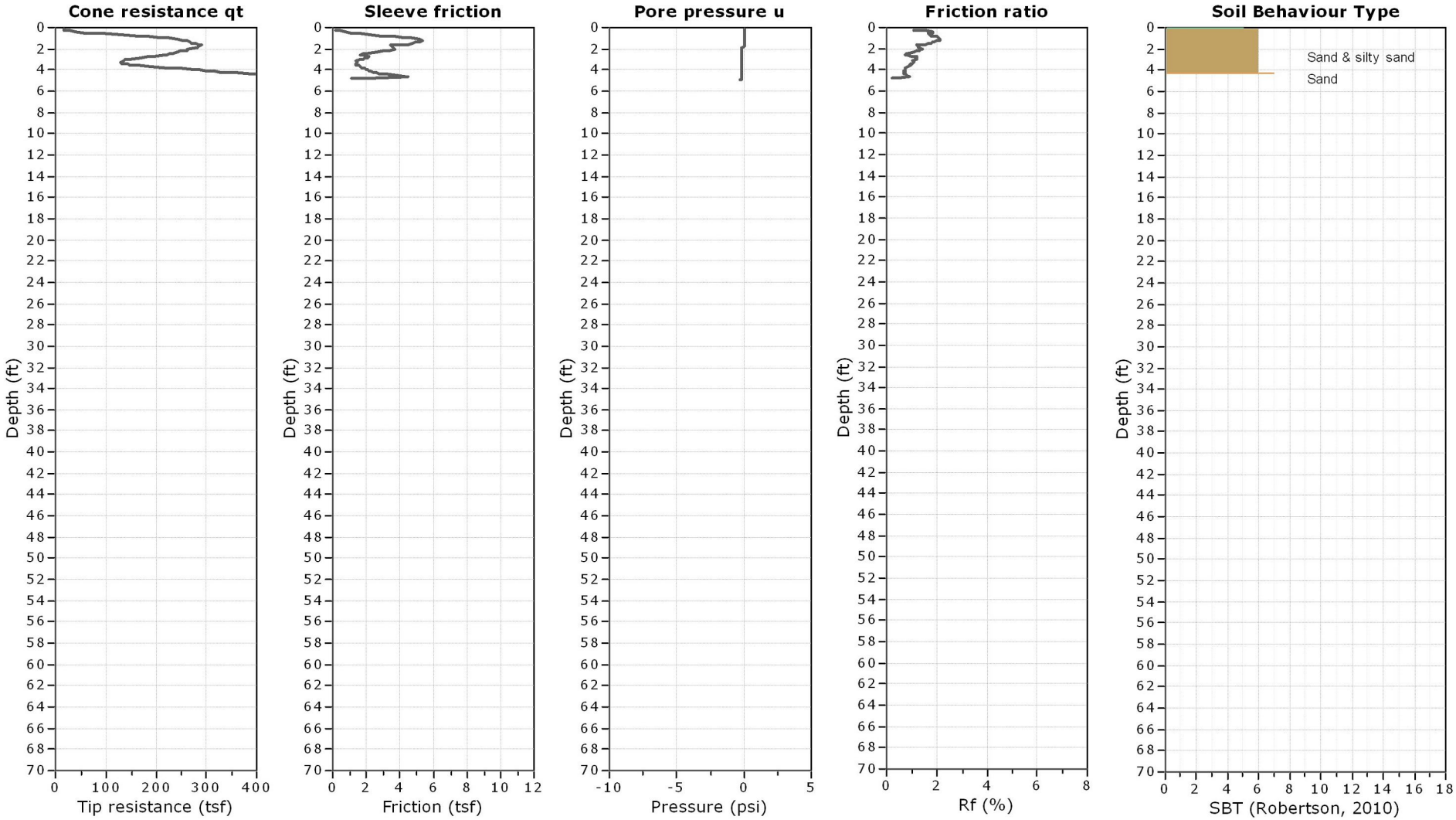
www.kehoetesting.com

CPT: CPT-9A

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 4.96 ft, Date: 7/24/2014
Cone Type: Vertek

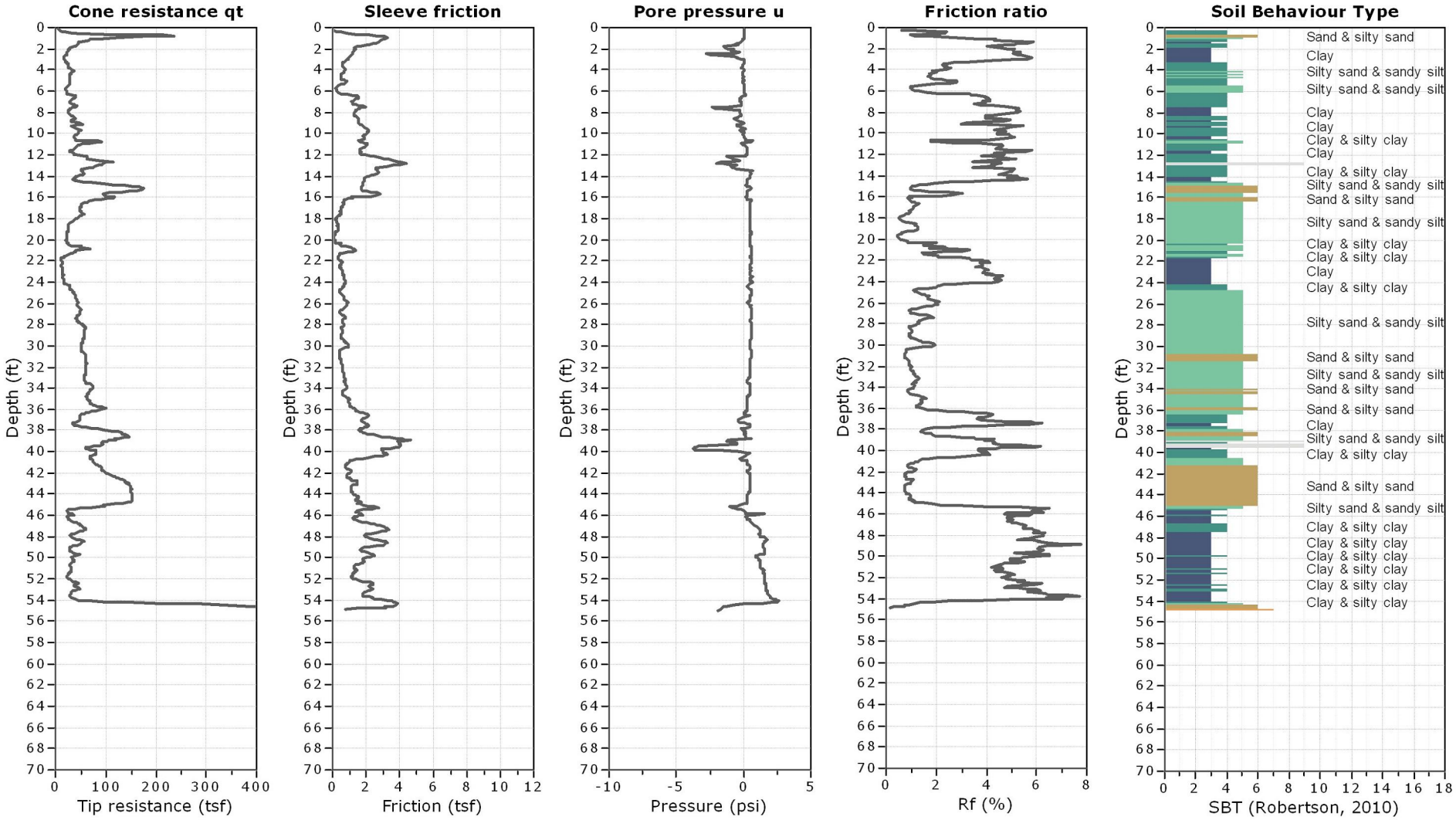


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-10

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 54.96 ft, Date: 7/24/2014
Cone Type: Vertek

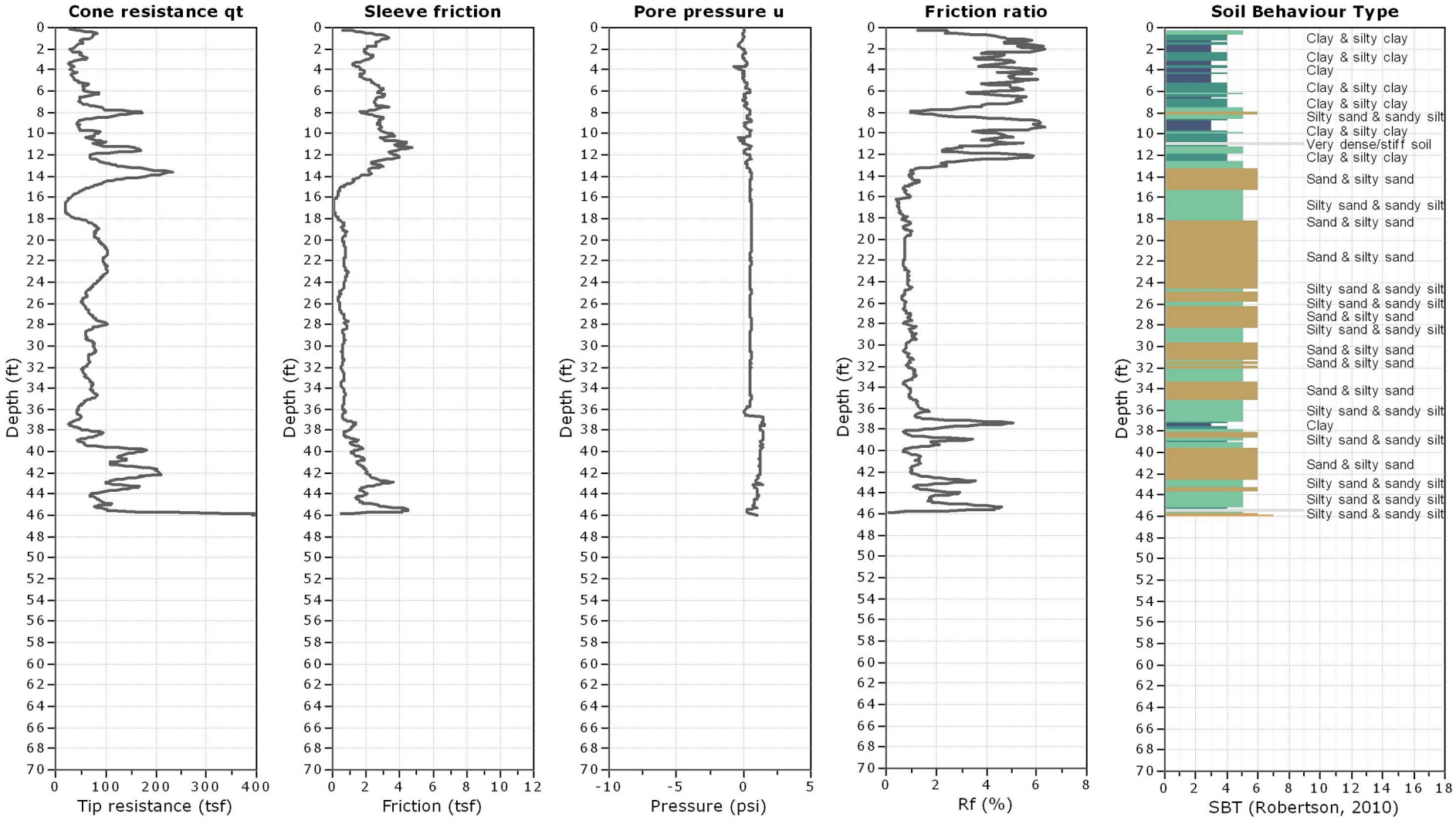


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-11B

Project: **LGC Geotechnical, Inc./Westridge Golf Course**
Location: **1400 La Habra Hills Dr. La Habra Heights, CA**

Total depth: 46.03 ft, Date: 7/24/2014
Cone Type: Vertek



From GMU, 1996

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 257±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary Bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 41 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 1/30/96

REMARKS

Bottom at 41 feet
No caving or water
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	COLLUVIUM/OLDER ALLUVIUM, (Qcol/Qoal)	SILTY SAND (SM), fine, light brown, dry to damp, loose;	255									
5		becoming very fine below 3 feet;		5			P	2400	5	101		
		becoming tan to light brown below 5 feet;	250									
10		rounded, medium gravel at 8 feet.		10			5	2400	4	110		CN
		WELL GRADED SAND (SW), with gravel, light brown, damp, medium dense.	245									
15		SILTY SAND (SM), fine, tan to light brown, damp, medium dense;		15			3	2400	7	111		
			240									
20		with very fine sand at 20 feet;		20			3	2400	8	107		CN
			235									
25				25			2	1550	12	104		
		damp to moist below 28 feet.	230									
30		SILT (ML), with very fine sand, light brown, damp to moist, stiff, slightly porous; becoming mottled olive gray to light brown below 30 feet.		30			6	1550	17	103		
			225									
35				35			7	1550	23	99		
			220									
	SAN PEDRO FM, (Qsp), siltstone	SILT (ML), mottled olive gray to light brown, moist, stiff.										

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 1

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.1

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA			TEST DATA			ADDITIONAL TESTS
						SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	
						■	8	1550	24	97		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 1

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.1

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 295± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 56 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/7/96

REMARKS

Bottom at 56 feet
No water or caving
Hole backfilled with native soils

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Af), very fine grained sand	SILTY SAND (SM), light brown, damp, loose to medium dense; becoming light olive brown in color below 3 feet.	295									
5		SILT (ML) with fine sand, light olive brown, damp, firm,	290	5			1	2400	14	101		
10		becoming moist below 9 feet.	285	10			1	2400	16	99		
15		SILTY SAND (SM), fine, light brown, damp to moist, loose to medium dense.	280	15			1	2400	10	110		
	COLLUVIUM/ALLUVIUM (Qcol/Qoal)	SILTY SAND (SM), fine, olive brown, moist, medium dense;										
20			275	20			3	2400	11	114		
25		less fines at 25 feet.	270	25			4	1550	12	81		
		LEAN CLAY (CL), olive, moist, stiff.										
30			265	30			6	1550	19	106		
		SILTY SAND (SM) with small gravel, olive brown, moist, medium dense.										
35		LEAN CLAY (CL) with silt, olive, wet, firm;	260	35			3	1550	21	102		
			255									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 4

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.4

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		with some fine sand at 41 feet.	255				P	1550	25	100		
45			250	45			9	1550	25	98		
	SAN PEDRO FM (Qsp), siltstone	SILT (ML), olive gray, moist, stiff, slightly micaceous;										
50		becoming gray below 50 feet.	245	50			50	850	23	106		
55			240	55			35	850	22	105		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 4

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.4

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 275±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rovary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 60 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/7/96

REMARKS

Bottom at 56 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
0	FILL (Af)	SILTY SAND (SM), fine brown, damp, loose;	275	0								
5		becoming light brown below 4 feet;	270	5			2	2400	5	110		
		becoming brown in color below 8 feet.										
10	COLLUVIUM/OLDER ALLUVIUM (Qcol/Qoal)	SILTY SAND (SM), fine, brown, damp, medium dense;										
		with medium to coarse sand at 10 feet;	265	10			3	2400	6	114		
15		with some small gravel at 13 feet;	260	15			2	2400	5	112		
		moist at 16 feet;										
20		damp below 20 feet;	255	20			4	2400	4	113		
	large rounded gravel at 21 feet											
25		fine to medium sand at 26 feet.	250	25			3	1550	6	110		CN
30			245	30			7	1550	5	116		
		WELL GRADED SAND (SW), light brown, damp, medium dense;										
35		small gravel at 33 feet;	240	35			8	1550	3	119		
			230									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 5

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.5

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		becoming damp to moist below 40 feet.	235				8	1550	7	117		CN
		SILTY SAND (SM), light brown, damp to moist, medium dense.										
45		WELL GRADED SAND (SW) with gravel, light brown, damp, medium dense.	230	45			10	1550	8	115		
	SAN PEDRO FM (Qsp), siltstone	SILT (ML), olive, moist, stiff;										
50			225	50			16	850	26	98		
		becoming olive-gray in color below 53 feet.										
55			220	55			21	850	28	95		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 5

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.5

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 410±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 61 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/13/96

REMARKS

Bottom at 61 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Af)	SILT (ML), light brown, dry to damp, firm.	410									
	LANDSLIDE DEBRIS (Qls), light brown silt with fine sand, highly fractured with rootlets to 8 feet.	SILT (ML), light brown, damp, firm;										
5		becoming orange brown below 5 feet.	405	5								
10	sharp contact with fine grained sand, B-N85E, 28SE, at 9 feet	POORLY GRADED SAND (SP), fine, light brown, damp.	400	10			4	2400	3	101		
15	contact with coarse grain sand, B-N15E, 50SW at 14 feet		395	15								
	3" clay bed highly sheared, B-N30W, 45SW, at 17 feet, becoming a gray silt below 17 feet	SILT (ML), olive, damp to moist, firm to stiff;										
20	stiff below 21 feet	becoming olive gray below 20 feet.	390	20			6	2400	18	105		
25	slightly micaceous below 25 feet		385	25								
	bedding within slide, B-N40W, 12NE at 29 feet											
30	1/2" thick fine sand layer, B-N40E, 15NW at 34 feet, 2" thick clay shear, rupture surface, RS-N10W, 20SW, at 35 feet		380	30			10	1550	23	102		
35	SAN PEDRO FM (Qsp), olive siltstone with very fine sand	SILT (ML), olive gray, damp to moist, firm to stiff;	375	35								
			370									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 17

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.17

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	TEST DATA: ADDITIONAL TESTS
		slightly micaceous with fine sand below 40 feet.	370				12	1550	21	103		
	bedding break, B-N70E, 9NW, at 42 feet, gray siltstone, slightly fractured below 42 feet											
45	J-N50W, 55NE		365	45								
	thinnly bedded siltstone, B-N25E, 8NW at 47 feet											
50			360	50			50	850	25	102		
	J-N40W, 60NE, at 51 feet											
55	shear, S-N30W, 42NE, at 55 feet		355	55								
60			350	60			33/8"	850	21	98		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 17

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.17

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 270±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH 41.0 ELEVATION 229.0
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 61 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/14/96

REMARKS

Bottom at 61 feet
Seepage at 41 feet, no caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	ASPHALT, 2" thick asphalt FILL (Af), with 2" diameter, well rounded gravel	SILTY SAND (SW), fine, tan to light brown, dry to damp, loose.	270									
	LANDSLIDE DEBRIS (Qls), light brown, fine sandy silt, soft to 17 feet	SILT (ML) with small gravel, light brown, damp, firm.										
5			265	5								
10			260	10			2	2400	7	103		
15			255	15								
	silty, fine grained sand, below 17 feet	SILTY SAND (SM), fine to medium, reddish light brown, damp, medium dense;										
20	abundant well rounded pebbles, gradational contact to a fine grained yellow brown, friable sand below, 20 feet	with some gravel and small cobbles below 20 feet.	250	20			8	2400	5	114		
		POORLY GRADED SAND (SP), reddish light brown, damp, medium dense;										
25	silty fine sand, moderatly dense below 24 feet	change to tan light brown below 25 feet.	245	25								
	gradational change to a silt with very fine sand below 28 feet	SILTY SAND (SM), fine, tan to light brown, damp, medium dense.										
30			240	30			20	1550	13	100		
		SILT (ML) with fine sand, tan to light brown, damp to moist, stiff;										
35	olive color silt, stiff, slightly, micaceous below 35 feet orange rust staining between fractures at 37 feet 4" thick fine moist to wet sand layer, B-N50W, 35NE, at	becoming light olive in color below 37 feet.	235	35								
			230									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 19

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.19

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	39 feet rupture surface, clay shear with seepage, RS-N45W, 50NE at 41 feet		230				10	1550	23	102		
45	SAN PEDRO FM (Qsp), gray color siltstone, highly fractured to 45 feet	SILT (ML), gray, moist, firm becoming gray in color below 44 feet; micaceous below 45 feet.	225	45								
	bedding break, N10E, 14NW, at 48 feet											
50			220	50			30	850	25	101		
	very stiff below 54 feet											
55	bedding break, B-N50W, 6SW, at 55 feet		215	55								
60	1" thick hard silicious layer with slight seepage, N-S, 12SW at 59 feet		210	60			35	850	24	102		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 19

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.19

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 485±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 66 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/16/96

REMARKS

Bottom at 66 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	TOPSOIL, dark brown clay with rootlets	LEAN CLAY (CL), brown, damp to moist, firm to stiff, with rootlets.	485									
5	SAN PEDRO FM (Qsp), olive gray siltstone with orange staining, weathered to 6 feet 3" thick gray clay layer, B-N55W, 14NE, at 5 feet gradational change to fine grained sand at 6 feet change back to siltstone below 7 feet caliche streaking at 8.5 feet	SILT (ML), light gray, moist, firm to stiff; becoming olive color below 8 feet;	480	5								
10	becoming thinnly bedded at 10 feet, with interbedded fine sand layers approx. 2" thick 1/4" thick gypsum bed, B-N70W, 15NE, at 11 feet B-N60W, 18NE, at 13 feet	becoming stiff below 10 feet;	475	10			8	2400	11	102		
15	12" thick dark gray clay bed at 15 feet shear with hairline roots, S-N20W, 44SW, at 16 feet	becoming olive gray in color below 15 feet;	470	15								
20	Approx. B-N-S, 12E, at 18 feet olive color, very fine grained sand below 19 feet fine sand at 21 feet	change to light gray below 18 feet, with fine sand;	465	20			6	2400	8	99		
25	olive silt below 23 feet B-N40W, 18NE, at 24 feet		460	25								
30	becoming very stiff below 27 feet very fine sand at 28 feet gypsum lined joint, J-E-W, vertical at 29 feet		455	30			14	1550	20	103		
35	1 foot layer fine sand at 33 feet 1 foot layer olive gray silt, very stiff at 34 feet light gray silty sandstone below 36 feet		450	35								

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 21

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.21

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		with very fine sand at 40 feet.	445				17	1550	11	119		
	5" thick layer of silty fine sandstone at 42 feet fine grained sandstone below 44 feet 4" thick sandy gravel offset by fault, S-N20W, 50SW, at 45 feet 6" thick olive siltstone bed at 45.5 feet well graded friable sandstone below 46 feet	SILTY SAND (SP), fine, light gray, damp, dense; moist at 45 feet.	440	45								
50	abundant pebbles and gravel, well rounded below 47 feet 4" thick clay shear, gypsum within clay, S-N50E, 38NW, at 50 feet	WELL GRADED SAND (SW) with gravel, light gray, damp, dense.	435	50			30/10"	850	6	110		
55	18" thick gravel bed, approximate bedding, B-N70E, 30NW, at 55 feet fine grained sandstone, light gray below 55 feet dark gray siltstone at 58 feet		430	55								
		POORLY GRADED SAND (SP), fine, light gray, damp, dense.										
60	2" thick, very moist clay bed, B-N50E, 18NW, at 59 feet 4", well cemented, sandy conglomerate at 60 feet, shear S-N85, 50NW	SILTY GRAVEL (GM), medium, light brown to gray, damp to moist, dense.	425	60								
65		WELL GRADED SAND (SW), light gray, damp, dense.	420	65			40/9"	850	2	132		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 21

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.21

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 485± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 51 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/16/96

REMARKS

Bottom at 50.5 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
0	SAN PEDRO FM (Qsp), brown color fine sandstone with rootlets light brown silt at 1 foot 1/4" thick clay bed, B-N20W, 8NE, at 1.5 feet 2" thick fine to medium grained sand layer at 2 feet thinnly bedded siltstone below 2.5 feet 1" thick gypsum layer, rust stained, B-N10E, 15SE, at 4 feet massive olive siltstone below 5 feet becoming a fine sandy siltstone below 9 feet dense olive gray silty fine sandstone, moderatly bedded, below 10 feet fine grained friable sandstone below 15 feet becoming fine to medium grained below 18 feet 6" thick well graded sand layer at 20 feet 2" thick clay bed, B-N80W, 16NE, at 20.5 feet 6" thick gravel layer at 22 feet fine sandstone below 22.5 feet gravel layer between 24 and 27 feet 6" thick siltstone blebs within gravel, clay shear seperating small and larger gravel, S-E-W, 55N, at 24 feet coarse sand with gravel below 27 feet B-N80E, 14NW, at 29 feet 6" thick claybed, B-N55W, 11NE, at 32 feet friable fine sand at 33 feet well graded sand below 33 feet 3" thick gravel layer, B-N55W, 18NE, at 38 feet massive fine sandstone below	SILTY SAND (SW), fine, light brown, damp, loose.	485	0								
5			480	5								
		SILT (ML), olive gray, moist, stiff.										
10			475	10			10	2400	15	105		
15		SILTY SAND (SW), fine, light brown, damp to moist, dense.	470	15								
20			465	20			15	2400	4	109		
25			460	25								
30		POORLY GRADED GRAVEL (GP), tan to light brown, damp, dense.	455	30								
		SILTY SAND (SW), fine, light brown, damp, dense.										
35			450	35			20/10"	1550	4	103	85	CP,CS,HY,AL,EI,CH,DS(R)
		POORLY GRADED SAND (SP), fine, light gray, damp, dense.										
			445									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 22

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.22

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	39 feet		445									
45			440	45			30/10"	1550	7	99		
50			435	50			40/5"	850	3	106		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 22

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.22

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills,
GROUND SURFACE ELEVATION 425± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 61 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 2/19/96

REMARKS
Bottom at 61 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	TOPSOIL, slightly porous brown clay	LEAN CLAY (CL), brown, damp to moist, firm.	425									
	SAN PEDRO FM (Qsp), alternating layers of fine sands and silts to 8 feet, hairline rootlets along joint/fractures to 10 feet B-N65W, 5NE, at 5 feet	POORLY GRADED SAND (SP), very fine, olive brown, damp to moist, loose.	420	5								
10	B-N25E, 15SE, at 9 feet 4" thick fine sand layer, gray silt with fine sand below 9.5 feet becoming stiffer below 11 feet	LEAN CLAY (CL) with fine sand, olive, moist, stiff.	415	10			4	2400	22	98		
15	light gray fine grained friable sand below 14 feet, approx. bedding, B-N65W, 15NE, at 14 feet olive gray silt below 17 feet, B-N60W, 20NE, at 17 feet	POORLY GRADED SAND (SP), fine, olive, moist, medium dense.	410	15								
		SILTY SAND (SM), fine, olive, moist, stiff, medium dense.										
20	siltstone highly fractured below 20 feet	LEAN CLAY (CL) with fine sand, olive, moist, stiff with orange rust staining.	405	20			4	2400	21	103		
	shear with polished surface, S-N80E, 55NW, at 23 feet	SILT (ML), olive gray, moist, stiff.										
25	B-N60E, 20NW, at 25 feet 1 foot layer fine sand at 27 feet olive gray silt below 28 feet		400	25								
30	silty fine sandstone below 30 feet		395	30			8	1550	20	100		
35	dense fine grained sand below 34 feet	SILTY SAND (SM), fine, olive, damp to moist, medium dense.	390	35								
	2" thick silt bed, B-N50W, 15NE, at 37 feet shear, S-N35E, 18SE, at 38 feet		380									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 24

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.24

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
			385									
	B-N30E, 20SE, at 43 feet						12	1550	19	100		
45	fine to medium sand below 44.5 feet		380	45								
	dark gray siltstone, B-N70W, 14NE, at 46 feet											
	gradational change to silty fine grained sand below 47 feet	POORLY GRADED SAND (SP), fine, light gray, dense.										
50			375	50			25	850	16	99		
	gray silt with fine sand below 51 feet	LEAN CLAY (CL), gray, moist, stiff.										
	dark gray clay stone, very stiff and moist below 53 feet	SILT (ML), olive gray, moist, stiff.										
55	end visual log at 53 feet		370	55								
60			365	60			24	850	20	105		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 24

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.24

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 222± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rovary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 61 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Oen drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/4/96

REMARKS
No water or caving
Hole tamped while backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	ASPHALT, 3"	SILTY SAND (SW), fine to medium, dark gray, damp to moist, medium dense;										
	FILL (Af), red brick pieces	becoming brown in color below 2 feet;	220									
		petroleum odor at 4 feet; becoming very fine grained below 5 feet		5								
5	COLLUVIUM/OLDER ALLUVIUM (Qcol/Qoal)	SILT (ML) with fine sand, olive, moist, firm to stiff;					1	2400	10	108		
			215									
10				10			1	2400	12	104		
			210									
15		becoming light olive color below 15 feet.		15			2	2400	9	111		
			205									
20		SILTY SAND (SW), fine to medium, with small gravel, olive, moist, medium dense.		20			3	2400	8	113		
			200									
25		SILT (ML) with small gravel, olive, moist, firm to stiff;		25			3	1550	13	109		
			195									
30		with some fine sand at 30 feet.		30			5	1550	11	115		
			190									
35		CLAYEY SAND (SC), fine, brown, moist, medium dense.		35			6	1550	15	116		
			185									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 25

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.25

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
45		SILTY SAND (SM), fine, brown, moist, medium dense.	180	45			5	1550				
							14	1550				
			175									
50		LEAN CLAY (CL), grayish-brown, moist to wet, firm.		50			10	850				
			170									
55	SAN PEDRO FM (Qsp), siltstone	SILT (ML), olive, moist, stiff; becoming gray in color below 57 feet.		55			25	850				
			165									
60				60			35	850				

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 25

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.25

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 230±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH 50.0 ELEVATION 180.0
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 56 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/4/96

REMARKS

Bottom at 56 feet
Water at 50 feet, no caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
0	COLLUVIUM/OLDER ALLUVIUM (Qclo/Qoal)	SILTY SAND (SW), fine, light brown, damp, loose.	230									
5			225	5			2	2400	5	101		
10		SILT (ML), with fine sand, light brown, damp, firm.	220	10			2	2400	8	106		
15			215	15			2	2400	9	105		
20		SILTY SAND (SW), fine, with small to medium gravel, light brown, damp, medium dense.	210	20			2	2400	8	107		
25		SILT (ML) with fine sand, light brown, damp, firm; becoming stiff below 25 feet.	205	25			4	1550	7	108		
30			200	30			5	1550	4	114		
35		SILTY SAND (SW), fine, light brown, damp, medium dense.	195	35			7	1550	8	111		
			190									

LEGEND ON PLATE A-3

LOG OF DRILL HOLE

DH 26

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		LEAN CLAY (CL) with fine sand, brown, moist, firm to stiff.	190				4	1550	16	105		
45		SILTY SAND (SM), fine, light brown, damp, medium dense; becoming moist below 46 feet; seepage at 50 feet.	185	45			11	1550	10	97		
50	SAN PEDRO FM (Qsp), siltstone	SILT (ML) with fine sand, olive brown, wet, stiff; mottled olive-grey below 52 feet	180	50			20	850	26	97		
55			175	55			11	850	25	98		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 26

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.26

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 205± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH 20.0 ELEVATION 185.0
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 41 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/18/96

REMARKS

Bottom at 41 feet
Seepage at 20 feet, caving below 20 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Qaf)	SILTY SAND (SM), fine, damp to moist, loose to medium dense.	205				4	1550				
5	COLLUVIUM/OLDER ALLUVIUM (Qccol/Qoal)	FAT CLAY (CH), dark brown, moist, firm;	200	5			P	2400	17	99		CN
		light yellow brown at 7 feet.										
10		SILT (ML), light brown, moist, firm;	195	10			1	2400	17	102		CN
		very moist, yellow brown at 12 feet;										
15		becoming brown in color at 15 feet;	190	15			1	2400	17	107		
20		moist to wet below 20 feet, seepage at 20 feet.	185	20			1	2400	22	99		
25		LEAN CLAY (CL), yellowish brown, wet, stiff.	180	25					20	108		
30			175	30			1	1550	19	109		
		LEAN CLAY (CL), yellowish brown, wet, stiff.										
35			170	35			2	1550	25	98		
			165									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 27

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.27

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA			TEST DATA			ADDITIONAL TESTS
						SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	
			165			■	3	1550	20	107		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 27

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.27

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 295± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 31 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/18/96

REMARKS

Bottom at 31 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Qaf)	SILT (ML) with fine sand, light brown, dry to damp, loose;	295									
5		with some coarse grain sand at 5 feet;	290	5			P	2400	7	98		
10		roots and organic debris at 9 feet.	285	10								
15	COLLUVIUM/OLDER ALLUVIUM (Qcol/Qoal)	SILT (ML) with clay, olive brown, moist, firm;	280	15			P	2400	15	102		
20	SAN PEDRO FM (Qsp), siltstone	SILT (ML), olive, moist, stiff;	275	20			5	2400	20	106		
25		becoming olive gray below 28 feet.	270	25								
30			265	30			12	1550	24	102		

LEGEND ON PLATE A-3

SHEET 1 OF 1

LOG OF DRILL HOLE

DH 29

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.29

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 265± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 51 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/19/96

REMARKS

Bottom at 51 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	TOPSOIL, brown, very moist clay, soft to firm	FAT CLAY (CH), dark brown, moist, firm.	265									
5	LANDSLIDE DEBRIS (Qls), highly weathered, slightly porous silt	SILT (ML) with clay, light brown, moist, firm.	260	5								
10	rootlets to 10 feet	SILTY SAND (SM), fine, olive, damp, medium dense.	255	10			5	2400	16	98		
15	silt with fine sand, no discernable bedding at 14 feet 1 foot thick dark gray clay shear with slicken sides, S-N60W, 22NE, at 18 feet	LEAN CLAY (CL), olive, moist, firm.	250	15			3	2400	25	96		
20	SAN PEDRO FM (Qsp), ~~siltstone, massive bedding~~	SILT (ML) with clay, olive-gray, moist, stiff.	245	20			5	2400	24	99		
25	light gray, medium grained sand, slightly friable, B-N35W, 20NE at 26 feet	WELL GRADED SAND (SW), orange-brown, damp to moist, dense.	240	25			17	1550	24	98		
30			235	30			9	1550	10	111		
35	gray, fine sand B-N25W, 20NE, at 32 feet orange-brown, silty fine sand below 37 feet	POORLY GRADED SAND (SP), fine, gray, damp, dense.	230	35								

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 32

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.32

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		SILTY SAND (SM), fine, orange-brown, damp, dense.	225				17	1550	10	108		
45			220	45								
50			215	50					11	98		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 32

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.32

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 247± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 51 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/20/96

REMARKS

Bottom at 51 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Qaf), asphalt at surface, dark brown clay	SILTY SAND (SW), very fine, light brown, damp to moist, loose.	245									
5	SAN PEDRO FM (Qsp), or LANDSLIDE DEBRIS (Qls), olive siltstone firm, massive bedding becoming firmer at 7 feet	SILT (ML) with fine sand, light brown, damp, firm; becoming light olive in color below 8 feet; becoming stiff below 10 feet.	240	5								
10				10			8	2400	15	104		
	B-N55E, 8NW, at 12 feet thinnly bedded below 12 feet		235									
15	B-N45E, 30NW, at 15 feet		230	15								
20	possible rupture surface, 4" thick clay shear, S-N40E, 30NW			20			5	2400	25	99		
	SAN PEDRO FM (Qsp), siltstone, becoming stiffer below 22 feet		225									
25			220	25								
30		LEAN CLAY (CL), olive, moist, stiff.	215	30			14	1550	23	103		
35		SILT (ML), olive, moist, stiff.	210	35								

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 34

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.34

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		LEAN CLAY (CL), olive, moist, stiff.	205				12	1550	22	104		
45	slightly friable sand below 44 feet, B-N20E, 20NW, at 44 feet	SILTY SAND (SM), fine, light olive, damp to moist, dense.		45								
	large rounded gravel at 48 feet silty clay at 49 feet	POORLY GRADED SAND (SP), fine, light olive, damp, dense.	200									
50		LEAN CLAY (CL), dark olive, moist, very stiff.		50			40	850	23	102		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 34

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.34

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 245± FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 51 FEET DIAMETER(S) OF HOLE 18 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/20/96

REMARKS

Bottom at 51 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	FILL (Qaf), loose, silty sand with rootlets, wood, wire, and asphalt debris dispersed thru-out fill	SILTY SAND (SM), fine, brown, moist, loose.	245									
	1	SILT (ML), light olive, damp to moist, firm.										
5	SAN PEDRO FM (Qsp), olive color very fine grained sandstone, massively bedded to 12 feet	SILT (ML), light olive, damp to moist, firm; with fine sand at 8 feet.	240	5								
10	thinnly beded siltstone, B-N10E, 10SE, at 12 feet very fine grained sandstone below 13 feet	SILTY SAND (SM), fine, tan to light brown, damp, medium dense.	235	10			8	2400	6	104		
15	friable fine sand below 15 feet	POORLY GRADED SAND (SP), fine, orange-brown, damp to moist, medium dense.	230	15								
	well graded sand with rounded gravel at 17 feet sharp contact with olive gray silt at 18 feet	SILT (ML), olive, moist, stiff.										
20	F-N15W, 75SW, at 19 feet, 1 foot seperation of upper sand and lower silt		225	20			6	2400	3	108		
		WELL GRADED SAND (SW), orange-brown, damp, medium dense.										
25	silt becoming very stiff below 23 feet	LEAN CLAY (CL), olive-gray, moist, stiff with rust staining.	220	25								
30			215	30			10	1550	23	101		
35	seepage along 2" thick clay gouge zone, F-N35W, 75SW, at 34 feet	SILT (ML), olive-gray, moist, stiff.	210	35								
			205									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 35

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.35

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
		LEAN CLAY (CL), olive-gray, moist, stiff;	205				10	1550	25	99		
45		becoming gray in color below 46 feet.	200	45								
50			195	50			30/10"	850	23	101		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 35

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.35

PROJECT Pacfic Coast Homes
LOCATION West Coyote Hills.
GROUND SURFACE ELEVATION 250±FEET
DATUM Mean Sea Level
GROUNDWATER DEPTH _____ ELEVATION _____
DRILLING METHOD Rotary bucket
CONTRACTOR Al-Roy Drilling Inc.
TOTAL DEPTH OF HOLE 41 FEET DIAMETER(S) OF HOLE 24 INCHES

SAMPLING INFORMATION
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD kelly DROP 12 inches

LOGGED BY EDL
DATE DRILLED 3/20/96

REMARKS

Bottom at 41 feet
No water or caving
Petroleum odor at 29 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
0	FILL (Gaf)	SILTY SAND (SM), fine, brown, moist, loose.	250									
		SILT (ML), light olive, moist, firm;										
5			245	5								
	COLLUVIUM/OLDER ALLUVIUM (Qcol/Qoal), no visual log due to petroleum fumes	SILT (ML), light olive, moist, firm.										
10			240	10			P	2400	19	106		
15			235	15								
		SILT (ML) with fine sand, olive, moist, firm;										
20		with some clay at 20 feet;	230	20			P	2400	19	100		
	SAN PEDRO FM (Qsp)	becoming very moist at 24 feet.										
25		LEAN CLAY (CL), gray, moist, firm;	225	25								
30		with some dark gray fine sand, and petroleum odor at 29 feet; stiff below 30 feet.	220	30			8	1550	26	98		
35			215	35								
			210									

LEGEND ON PLATE A-3

SHEET 1 OF 2

LOG OF DRILL HOLE

DH 36

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.36

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA			TEST DATA			ADDITIONAL TESTS
						SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	
			210			■	12	1550	24	101		

LEGEND ON PLATE A-3

SHEET 2 OF 2

LOG OF DRILL HOLE

DH 36

PROJECT 96-01

Goffman, McCormick & Urban, Inc.

PLATE A-1.36

Appendix C
Laboratory Test Results

APPENDIX C

Laboratory Test Results

The laboratory testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Moisture and Density Determination Tests: Moisture content (ASTM D2216) and dry density determinations (ASTM D2937) were performed on driven samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from undisturbed or disturbed samples.

Grain Size Distribution/Fines Content: Representative samples were dried, weighed, and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve (ASTM D1140). Where applicable, the portion retained on the No. 200 sieve was dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D6913 (sieve) or ASTM D422 (sieve and hydrometer).

Sample Location	Description	% Passing # 200 Sieve
HS-11 @ 35 ft	Silty Sand	34
HS-11 @ 40 ft	Silty-Clayey Sand	42
HS-13 @ 15 ft	Silty Sand	28
HS-13 @ 25 ft	Silty Sand	28
HS-13 @ 35 ft	Silty-Clayey Sand	44
HS-13 @ 40 ft	Silty-Clayey Sand	36
HS-15 @ 20 ft	Clayey Sand	15
HS-16 @ 15 ft	Sandy Clay	51
HS-16 @ 25 ft	Clay with Sand	75
HS-16 @ 35 ft	Silt with Sand	84
HS-17 @ 5-7 ft	Sandy Clay	51
HS-17 @ 15 ft	Silty Sand	25
HS-17 @ 30 ft	Silty Sand	44
HS-17 @ 40 ft	Sand with Silt	7
B-3 @ 30-33 ft	Sandy Clay	51
B-4 @ 35-40 ft	Silty Sand	20

Laboratory Test Results

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined per ASTM D4318 for engineering classification of fine-grained material and presented in the table below. The USCS soil classification indicated in the table below is based on the portion of sample passing the No. 40 sieve and may not necessarily be representative of the entire sample. The plots are provided in this Appendix.

Sample Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	USCS Soil Classification
HS-3 @ 10 ft	27	14	13	CL
HS-3 @ 15 ft	25	15	10	CL
HS-3 @ 25 ft	39	16	23	CL
HS-11 @ 40 ft	24	20	4	CL-ML
HS-12 @ 40 ft	37	14	23	CL
HS-12 @ 50 ft	42	20	22	CL
HS-13 @ 15 ft	21	20	1	ML
HS-13 @ 35 ft	24	20	4	CL-ML
HS-14 @ 10 ft	39	16	23	CL
HS-14 @ 20 ft	25	15	10	CL
HS-15 @ 20 ft	67	19	48	CH
HS-15 @ 25 ft	42	21	21	CL
HS-16 @ 20 ft	36	19	17	CL
HS-16 @ 35 ft	38	27	11	ML
HS-17 @ 5-7 ft	31	16	15	CL
HS-17 @ 20 ft	42	20	22	CL
HS-17 @ 25 ft	32	17	15	CL
B-1 @ 30 ft	44	24	20	CL
B-3 @ 30-33 ft	33	23	10	CL
B-4 @ 40 ft	NP	NP	NP	ML
B-4 @ 35-40 ft	NP	NP	NP	SM
B-4 @ 60 ft	49	23	26	CL

Direct Shear: Direct shear tests were performed on selected driven and remolded samples, which were soaked for a minimum of 24 hours prior to testing. The samples were tested under various normal loads using a motor-driven, strain-controlled, direct-shear testing apparatus (ASTM D3080). The plots are provided in this Appendix.

Laboratory Test Results

Consolidation: Consolidation tests were performed per ASTM D2435. Samples (2.4 inches in diameter and 1 inch in height) were placed in a consolidometer and increasing loads were applied. The samples were allowed to consolidate under "double drainage" and total deformation for each loading step was recorded. The percent consolidation for each load step was recorded as the ratio of the amount of vertical compression to the original sample height. The consolidation pressure curves are provided in this Appendix.

Expansion Index: The expansion potential of selected representative samples was evaluated by the Expansion Index Test per ASTM D4829.

Sample Location	Expansion Index	Expansion Potential*
HS-1 @ 30 ft	15	Very Low
HS-6 @ 23-28 ft	37	Low
B-1 @ 5-8 ft	36	Low

* Per ASTM D4829

Laboratory Compaction: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below.

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
HS-1 @ 40-45 ft	Light Olive Brown Silty Sand	125.5	10.5
HS-3 @ 15-20 ft	Olive Brown Silty Sand with Gravel	140.0*	5.5*
HS-17 @ 5-7 ft	Olive Brown Sandy Clay	127.0*	9.0*
B-3 @ 30-33 ft	Light Olive Brown Sandy Clay	115.0	14.5
B-4 @ 35-40 ft	Light Olive Brown Silty Sand	120.0	11.5

*Includes oversize rock correction factor

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The test results are presented in the table below.

Sample Location	Sulfate Content
HS-1 @ 30 ft	0.013%
HS-6 @ 23-28 ft	0.050%
B-1 @ 5-8 ft	0.011%

Laboratory Test Results

Chloride Content: Chloride content was tested per CTM 422. The results are presented below.

Sample Location	Chloride Content, ppm
HS-1 @ 30 ft	75
HS-6 @ 23-28 ft	175
B-1 @ 5-8 ft	33

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
HS-1 @ 30 ft	8.2	1,075
HS-6 @ 23-28 ft	7.8	478
B-1 @ 5-8 ft	7.6	1,898

ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/07/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/11/14
Boring No.:	HS-3	Checked By:	J. Ward		
Sample No.:	R-3	Depth (ft.)	10.0		
Soil Identification:	Dark grayish brown lean clay (CL)				

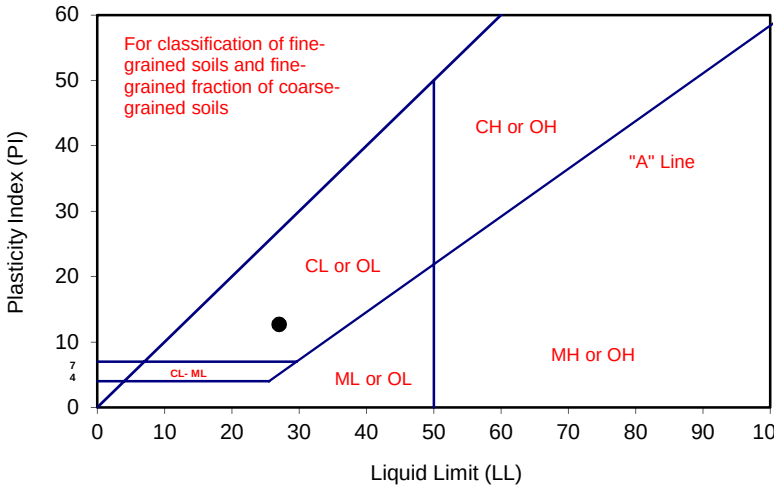
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	29	22	17
Wet Wt. of Soil + Cont. (g)	20.57	19.92	29.15	27.75	27.08	26.16
Dry Wt. of Soil + Cont. (g)	19.43	18.89	25.92	24.78	24.20	23.43
Wt. of Container (g)	11.50	11.65	13.59	13.61	13.58	13.62
Moisture Content (%) [Wn]	14.38	14.23	26.20	26.59	27.12	27.83

Liquid Limit	**27**
Plastic Limit	**14**
Plasticity Index	**13**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 5.11

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

☐ Wet Preparation

Multipoint - Wet

☒ Dry Preparation

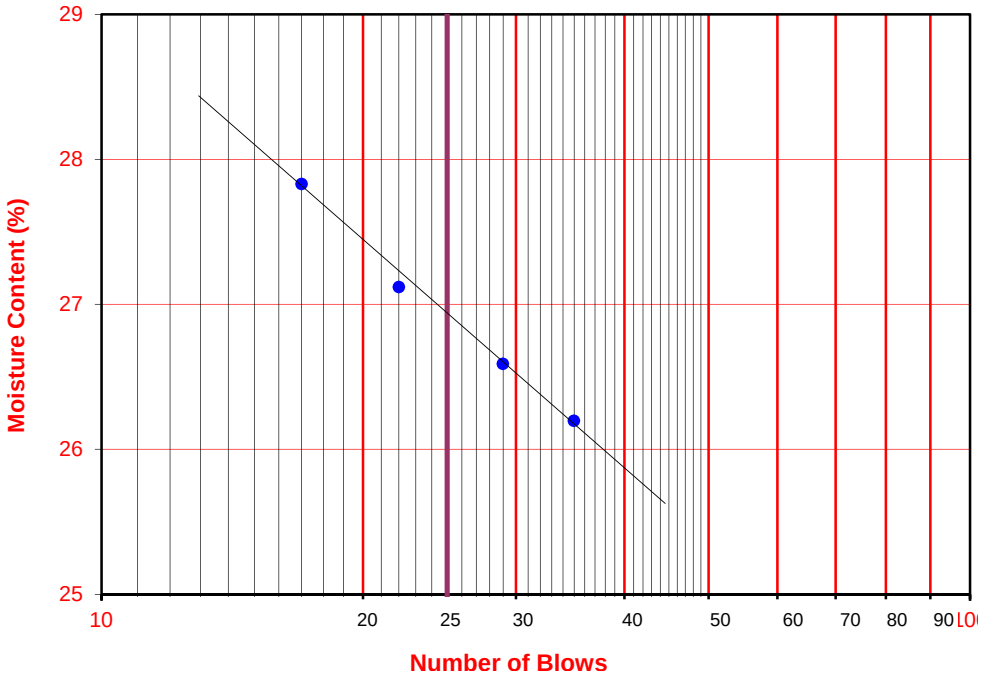
Multipoint - Dry

☒ Procedure A

Multipoint Test

☐ Procedure B

One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/11/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-3	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	15.0		
Soil Identification:	Dark yellowish brown sandy lean clay s(CL)				

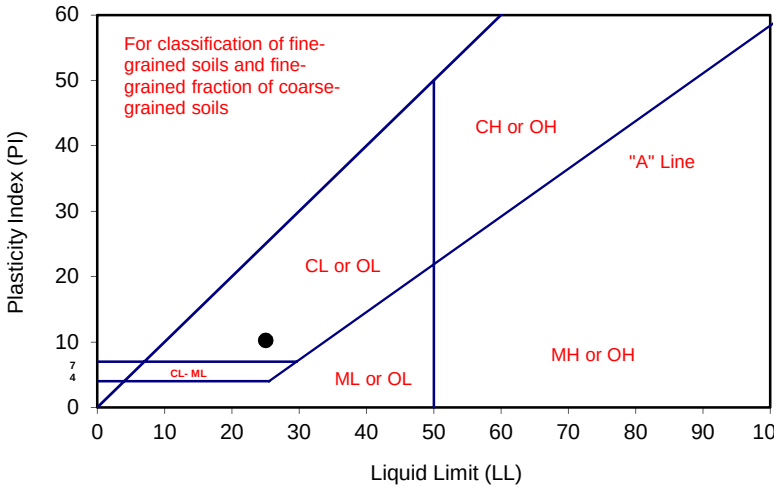
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	26	20	
Wet Wt. of Soil + Cont. (g)	26.29	24.43	28.49	29.36	29.42	
Dry Wt. of Soil + Cont. (g)	24.65	22.79	25.61	26.23	26.16	
Wt. of Container (g)	13.56	11.65	13.50	13.63	13.55	
Moisture Content (%) [Wn]	14.79	14.72	23.78	24.84	25.85	

Liquid Limit	**25**
Plastic Limit	**15**
Plasticity Index	**10**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 3.65

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



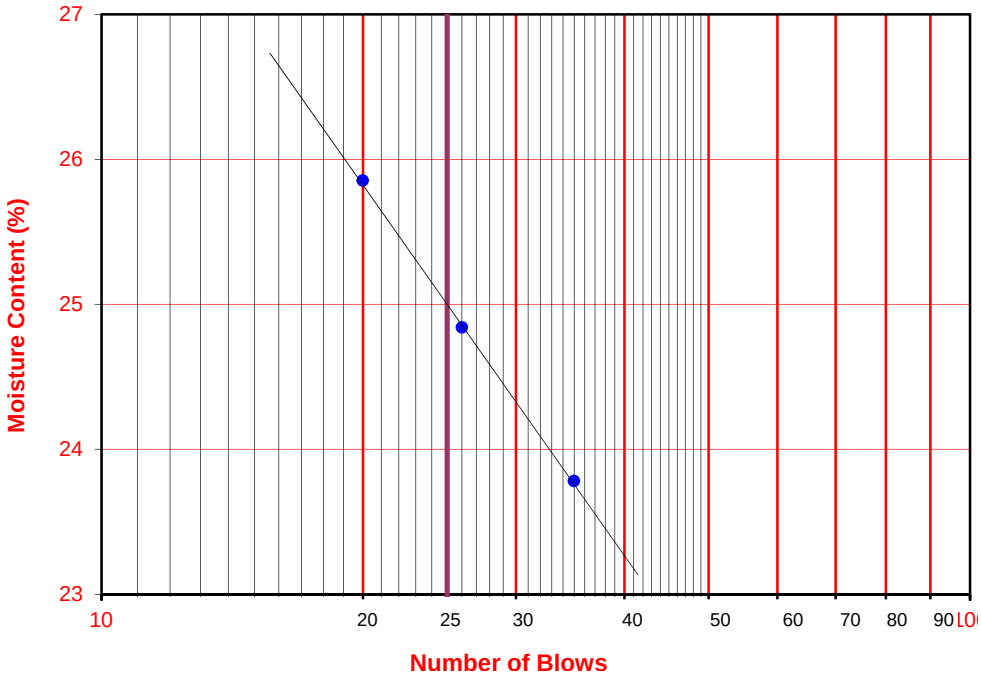
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/11/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-3	Checked By:	J. Ward		
Sample No.:	R-6	Depth (ft.)	25.0		
Soil Identification:	Dark yellowish brown lean clay (CL)				

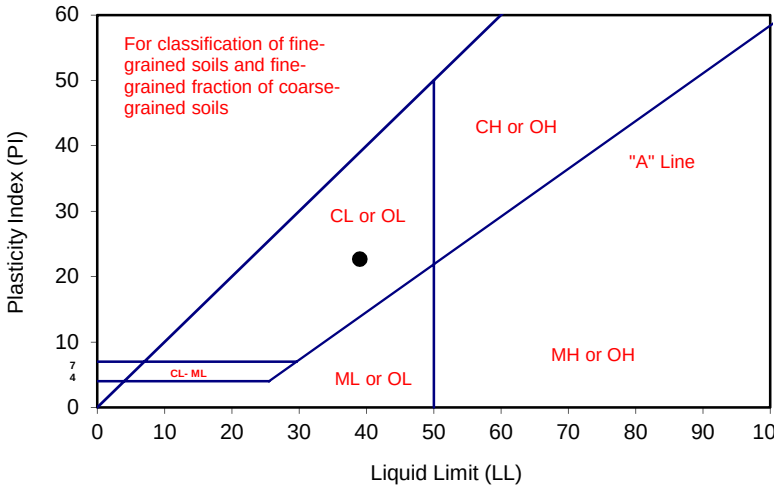
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	27	19	
Wet Wt. of Soil + Cont. (g)	26.58	25.13	25.97	27.30	30.10	
Dry Wt. of Soil + Cont. (g)	24.76	23.52	22.64	23.51	25.34	
Wt. of Container (g)	13.63	13.64	13.62	13.56	13.50	
Moisture Content (%) [Wn]	16.35	16.30	36.92	38.09	40.20	

Liquid Limit	**39**
Plastic Limit	**16**
Plasticity Index	**23**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 13.87

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



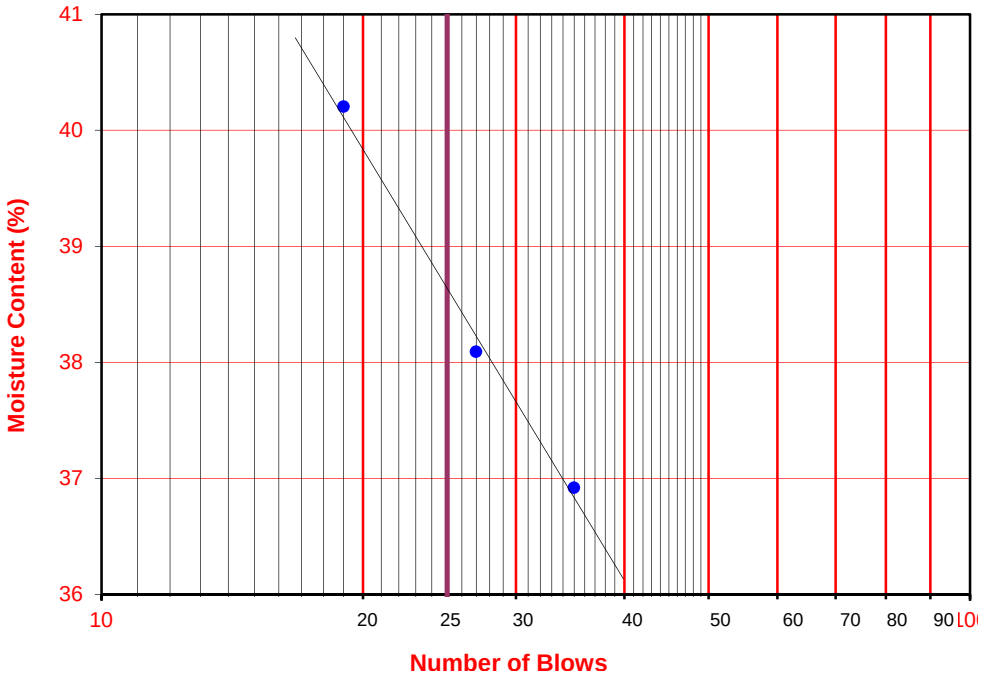
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

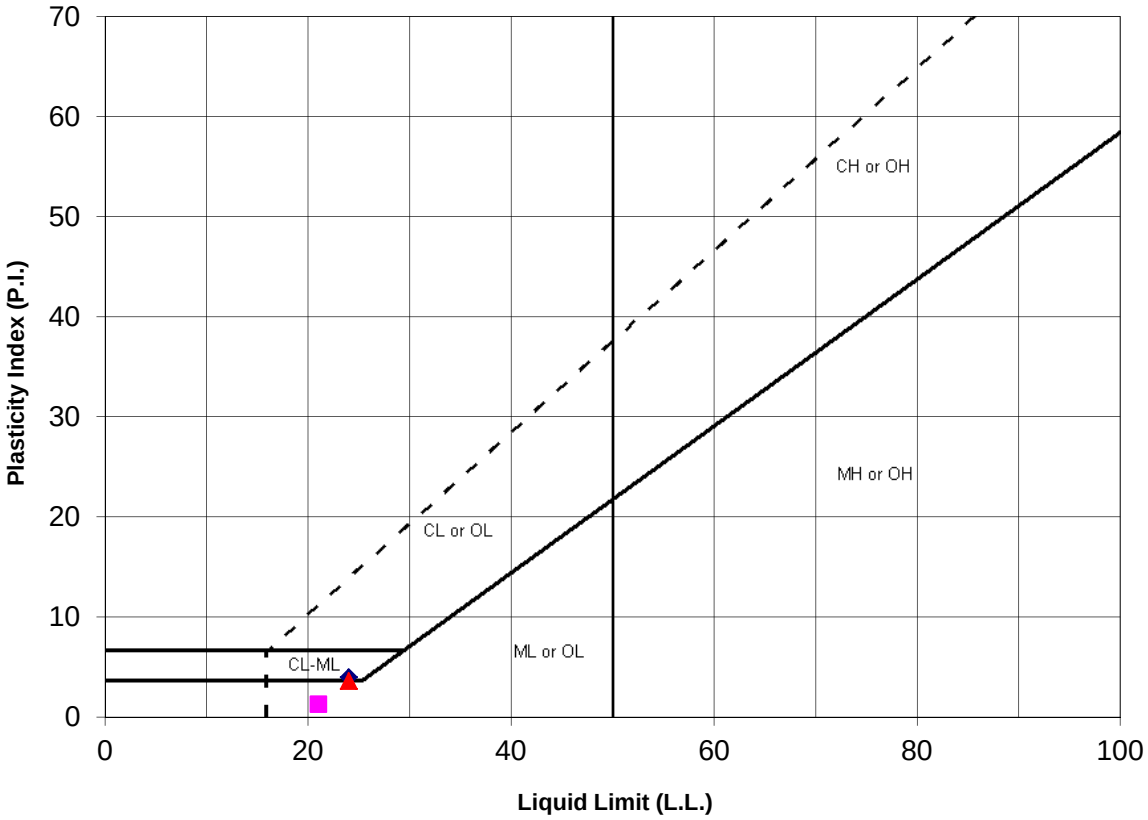
☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



PLASTICITY CHART - CLASSIFICATION OF FINE-GRAINED SOILS



Symbol	Location.:	Sample No.:	Depth (ft)	Passing No. 200 Sieve (%)	Liquid Limit (%) LL	Plastic Limit (%) PL	Plasticity Index (%) PI	USCS
◆	HS-11	R-5	40	42	24	20	4	CL-ML
■	HS-13	R-2	15	28	21	20	1	ML
▲	HS-13	R-6	35	44	24	20	4	CL-ML

LGC Geotechnical, Inc.

ATTERBERG LIMITS
(ASTM D 4318)

Project Number: 14057-01
Date: Aug-14

Westridge

ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/12/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-12	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	40.0		
Soil Identification:	Dark grayish brown lean clay with sand (CL)s				

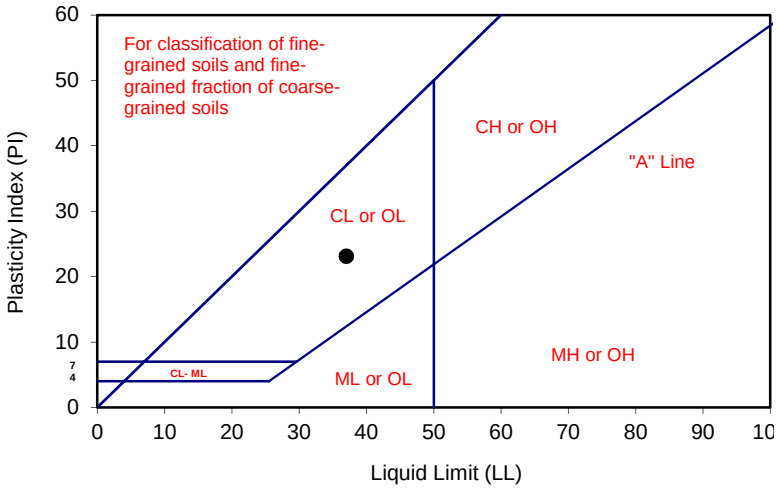
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	26	21	16
Wet Wt. of Soil + Cont. (g)	19.92	21.42	27.77	31.25	31.04	31.02
Dry Wt. of Soil + Cont. (g)	18.89	20.23	24.17	26.53	26.21	25.96
Wt. of Container (g)	11.49	11.65	13.62	13.62	13.58	13.59
Moisture Content (%) [Wn]	13.92	13.87	34.12	36.56	38.24	40.91

Liquid Limit	**37**
Plastic Limit	**14**
Plasticity Index	**23**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 12.41

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



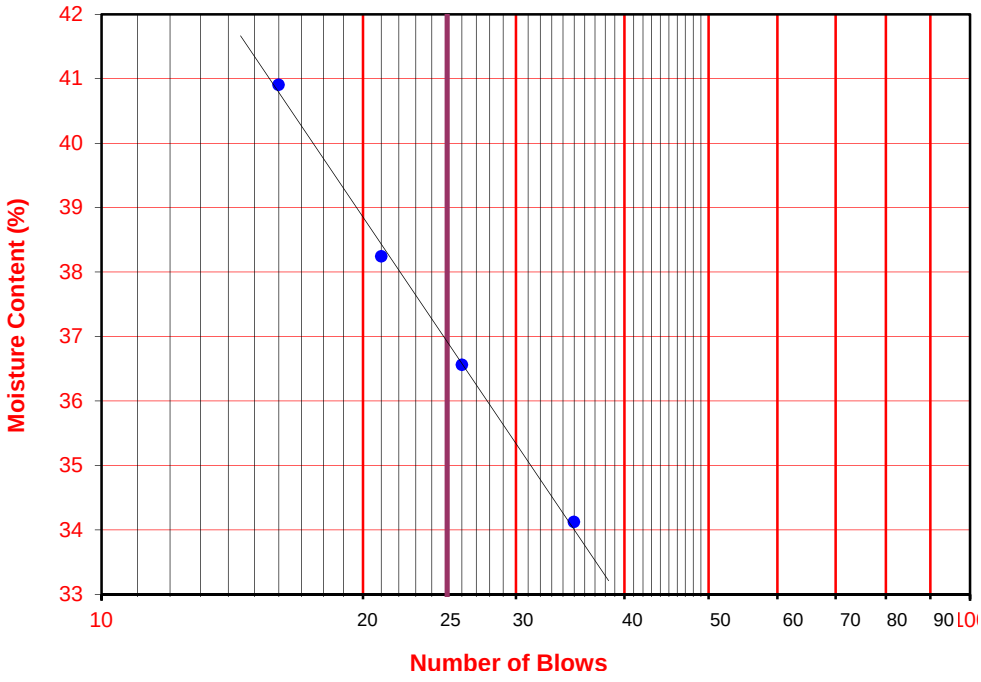
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/12/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-12	Checked By:	J. Ward		
Sample No.:	R-6	Depth (ft.)	50.0		
Soil Identification:	Olive gray lean clay (CL)				

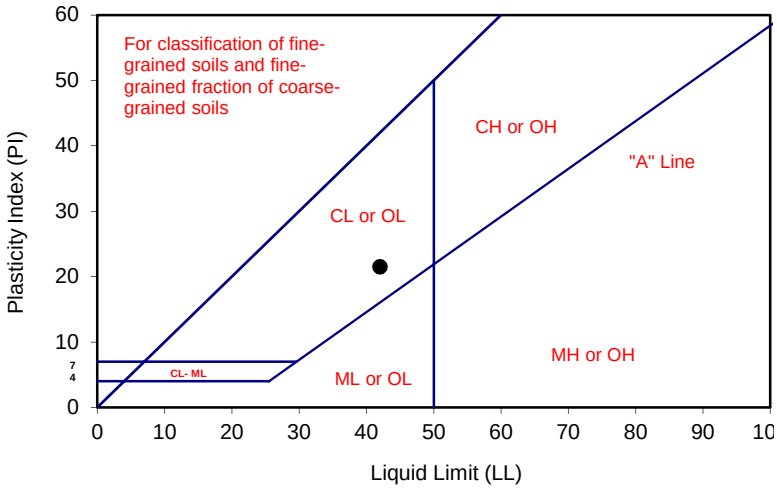
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	25	16	
Wet Wt. of Soil + Cont. (g)	18.08	21.91	27.32	27.07	27.68	
Dry Wt. of Soil + Cont. (g)	16.97	20.15	23.37	23.05	23.34	
Wt. of Container (g)	11.50	11.65	13.54	13.55	13.64	
Moisture Content (%) [Wn]	20.29	20.71	40.18	42.32	44.74	

Liquid Limit	**42**
Plastic Limit	**20**
Plasticity Index	**22**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 16.06

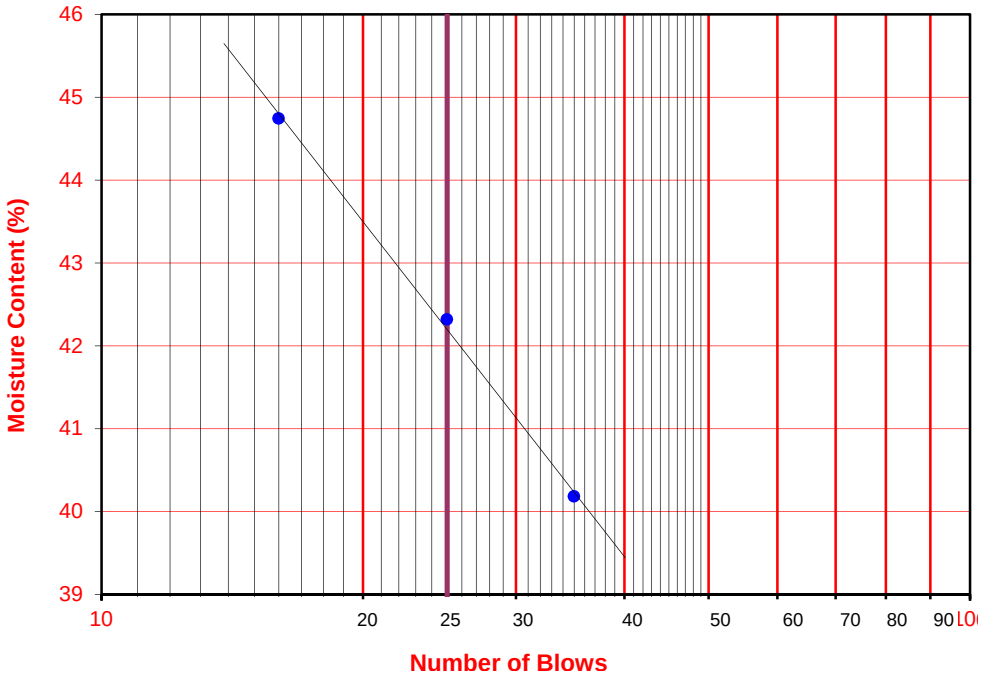
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/13/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-14	Checked By:	J. Ward		
Sample No.:	R-2	Depth (ft.)	10.0		
Soil Identification:	Dark olive gray lean clay (CL)				

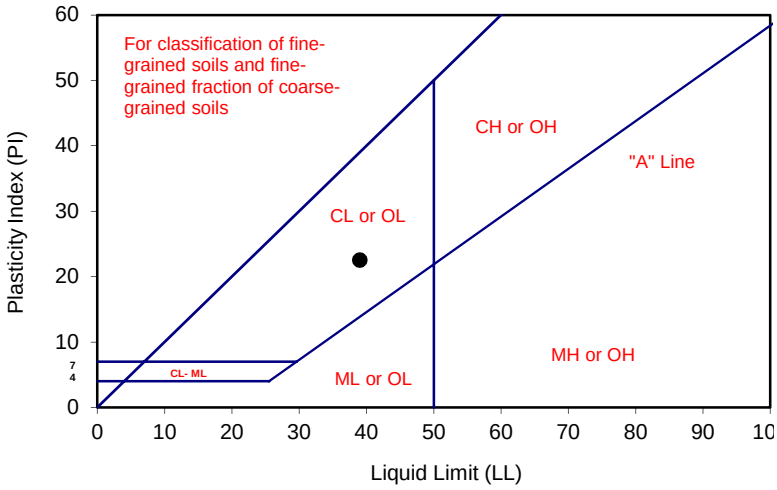
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	28	19	
Wet Wt. of Soil + Cont. (g)	23.31	24.20	27.49	29.16	29.79	
Dry Wt. of Soil + Cont. (g)	21.95	22.68	23.77	24.82	25.07	
Wt. of Container (g)	13.57	13.59	13.63	13.59	13.50	
Moisture Content (%) [Wn]	16.23	16.72	36.69	38.65	40.80	

Liquid Limit	**39**
Plastic Limit	**16**
Plasticity Index	**23**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 13.87

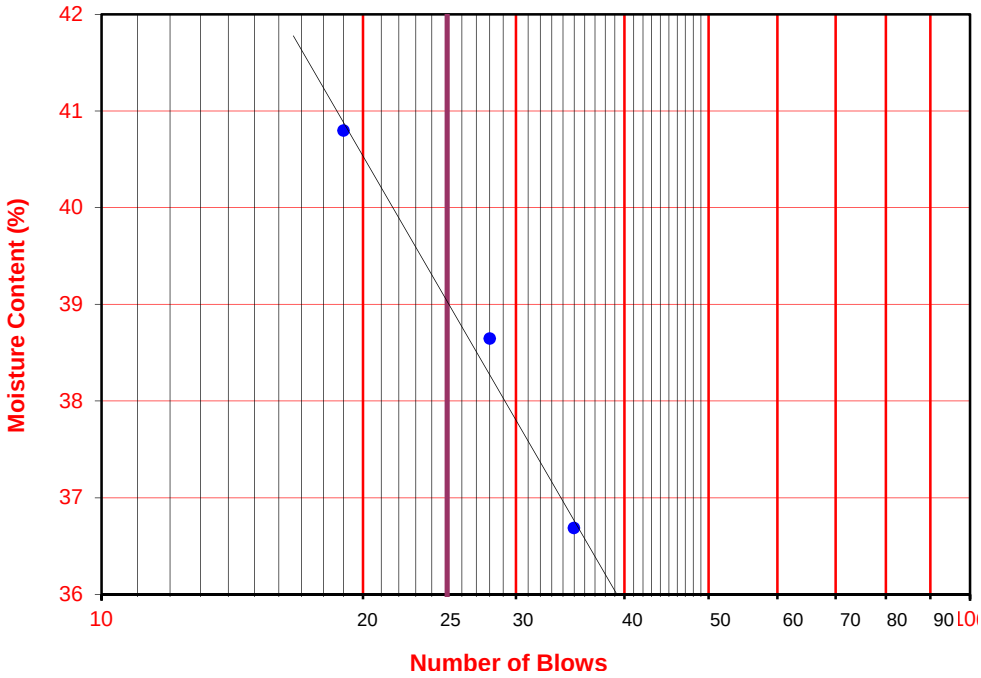
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	08/14/14
Project No. :	14057-01	Input By:	J. Ward	Date:	08/15/14
Boring No.:	HS-14	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	20.0		
Soil Identification:	Olive brown clayey sand (SC)				

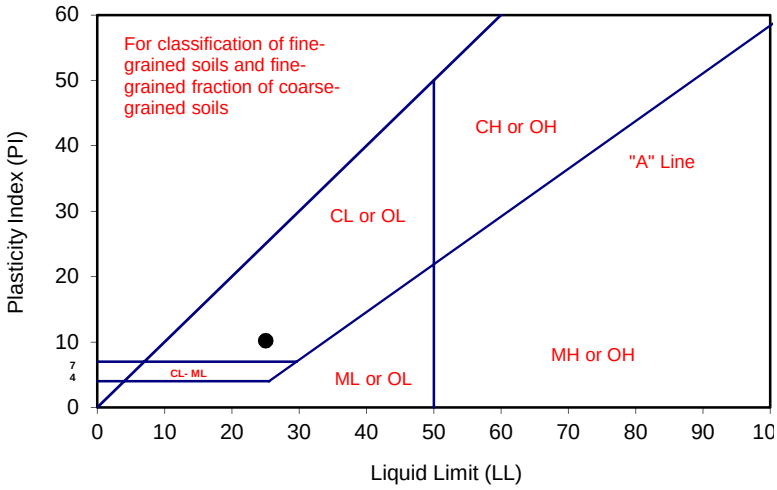
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			31	26	17	
Wet Wt. of Soil + Cont. (g)	23.92	22.64	28.00	26.93	27.22	
Dry Wt. of Soil + Cont. (g)	22.32	21.22	25.24	24.28	24.38	
Wt. of Container (g)	11.50	11.64	13.60	13.50	13.58	
Moisture Content (%) [Wn]	14.79	14.82	23.71	24.58	26.30	

Liquid Limit	**25**
Plastic Limit	**15**
Plasticity Index	**10**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 3.65

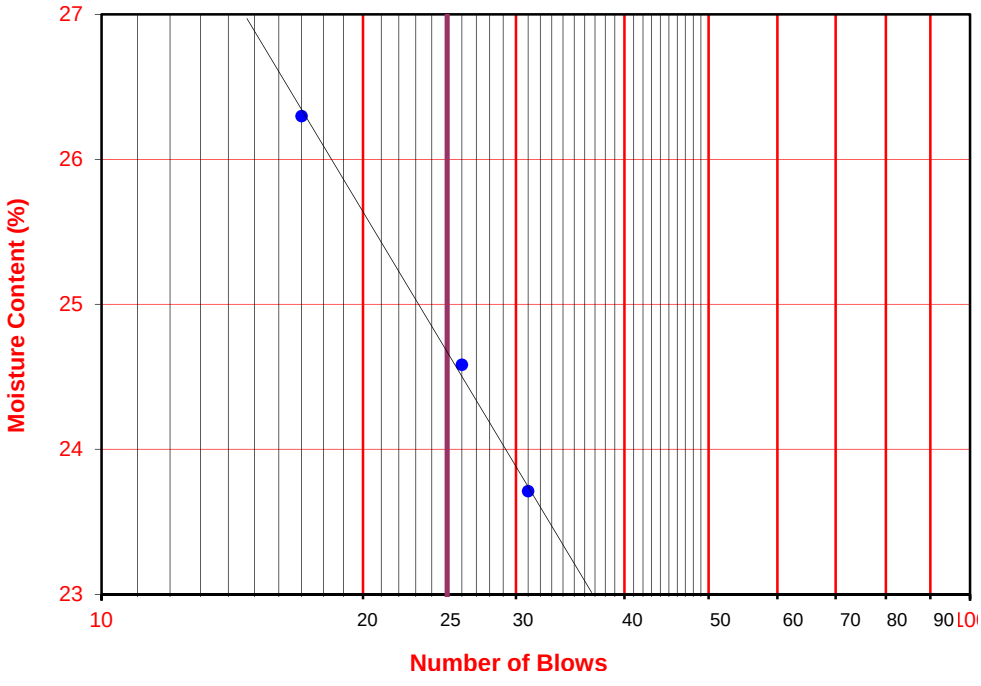
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$

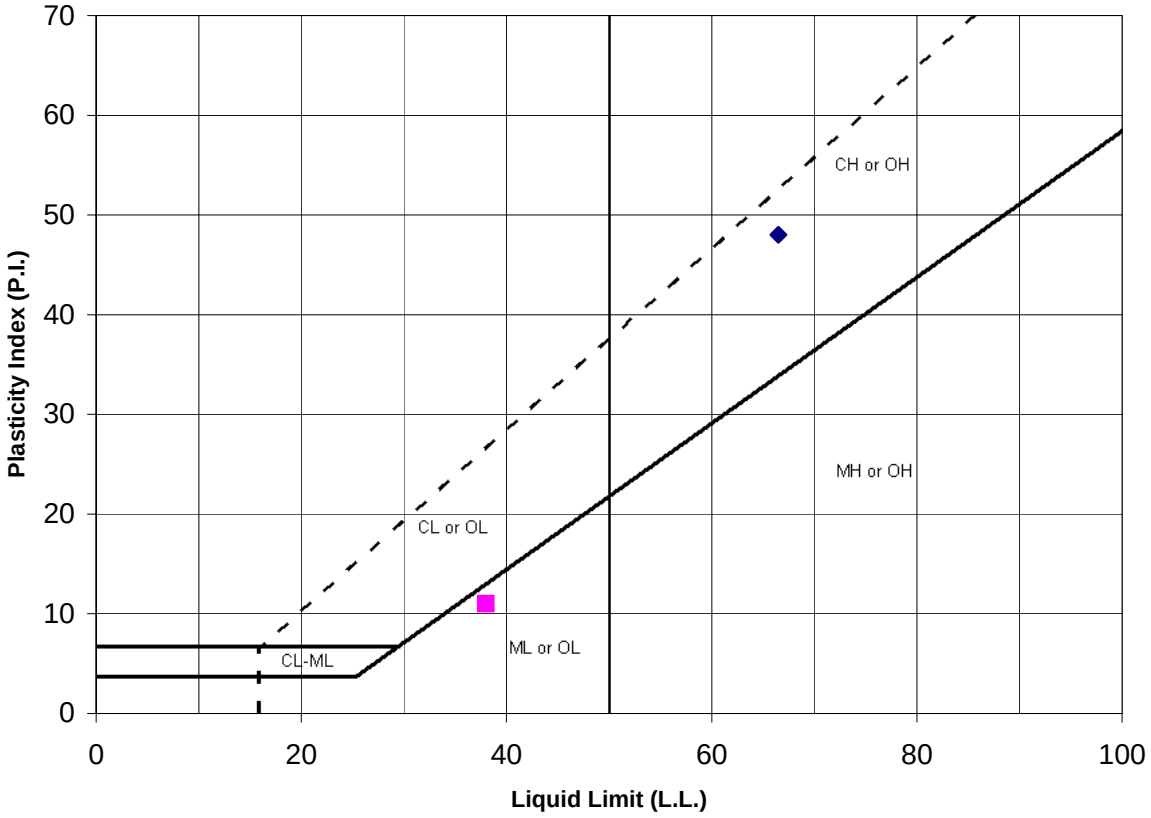


PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



PLASTICITY CHART - CLASSIFICATION OF FINE-GRAINED SOILS



Symbol	Location.:	Sample No.:	Depth (ft)	Passing No. 200 Sieve (%)	Liquid Limit (%) LL	Plastic Limit (%) PL	Plasticity Index (%) PI	USCS
◆	HS-15	R-4	20	15	67	19	48	CH
■	HS-16	R-7	35	84	38	27	11	ML

LGC Geotechnical, Inc.

ATTERBERG LIMITS
(ASTM D 4318)

Project Number: 14057-01
Date: Feb-15

La Habra - Westridge

ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	S. Felter	Date:	03/09/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/13/15
Boring No.:	HS-15	Checked By:	J. Ward		
Sample No.:	R-5	Depth (ft.)	25.0		
Soil Identification:	Olive brown clayey sand (SC)				

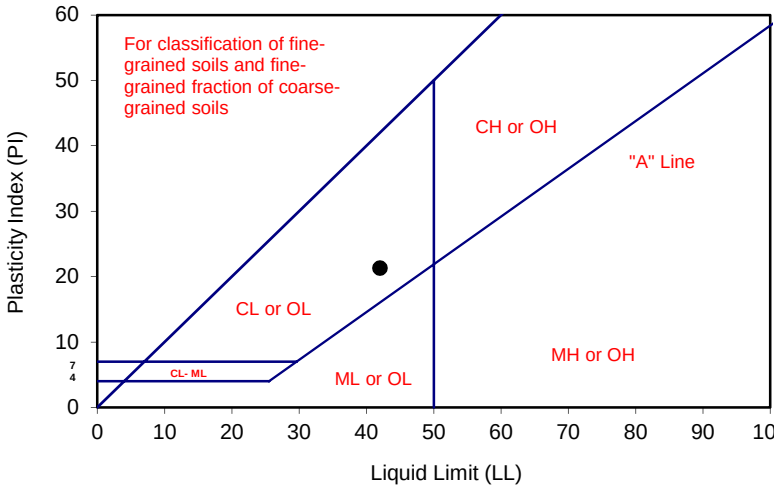
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			33	27	20	
Wet Wt. of Soil + Cont. (g)	23.69	23.74	35.36	35.28	36.64	
Dry Wt. of Soil + Cont. (g)	21.96	21.99	29.24	28.96	29.63	
Wt. of Container (g)	13.56	13.59	13.60	13.58	13.55	
Moisture Content (%) [Wn]	20.60	20.83	39.13	41.09	43.59	

Liquid Limit	**42**
Plastic Limit	**21**
Plasticity Index	**21**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 16.06

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

☐ Wet Preparation

Multipoint - Wet

☒ Dry Preparation

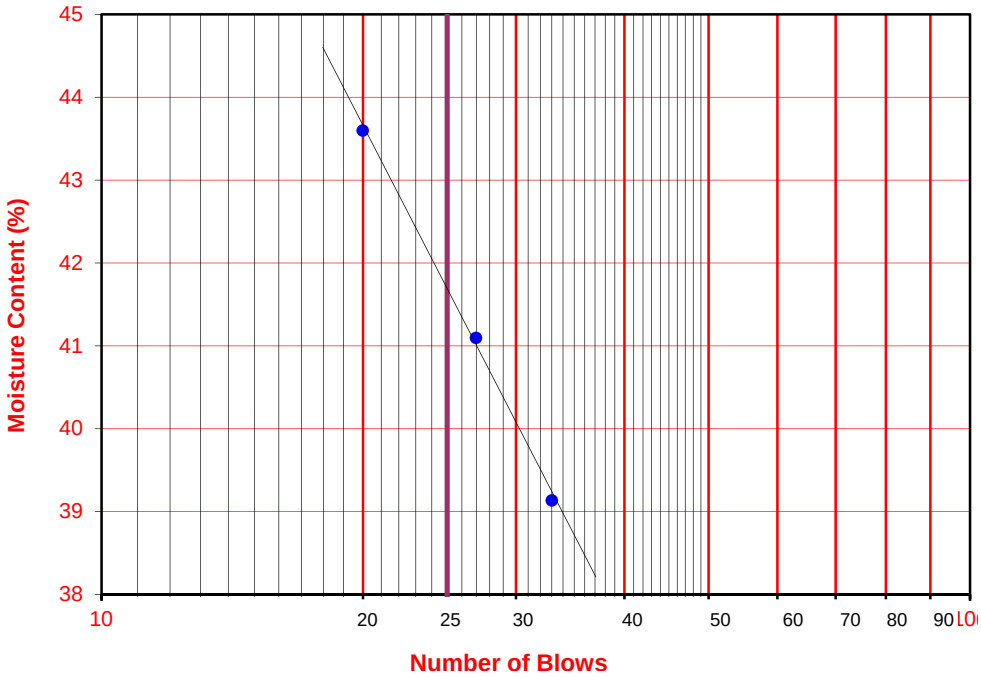
Multipoint - Dry

☒ Procedure A

Multipoint Test

☐ Procedure B

One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	S. Felter	Date:	03/10/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/13/15
Boring No.:	HS-16	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	20.0		
Soil Identification:	Brown lean clay (CL)				

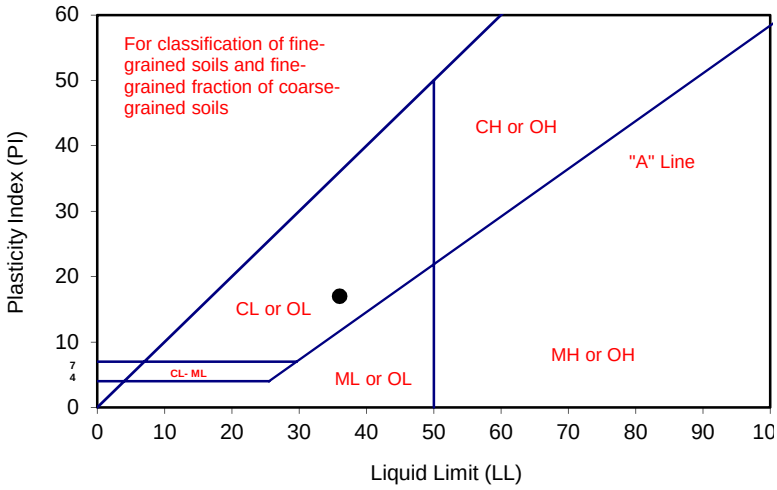
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	28	19	
Wet Wt. of Soil + Cont. (g)	23.59	23.76	35.34	35.91	37.07	
Dry Wt. of Soil + Cont. (g)	22.00	22.11	29.62	29.95	30.76	
Wt. of Container (g)	13.52	13.56	13.63	13.54	13.62	
Moisture Content (%) [Wn]	18.75	19.30	35.77	36.32	36.81	

Liquid Limit	**36**
Plastic Limit	**19**
Plasticity Index	**17**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 11.68

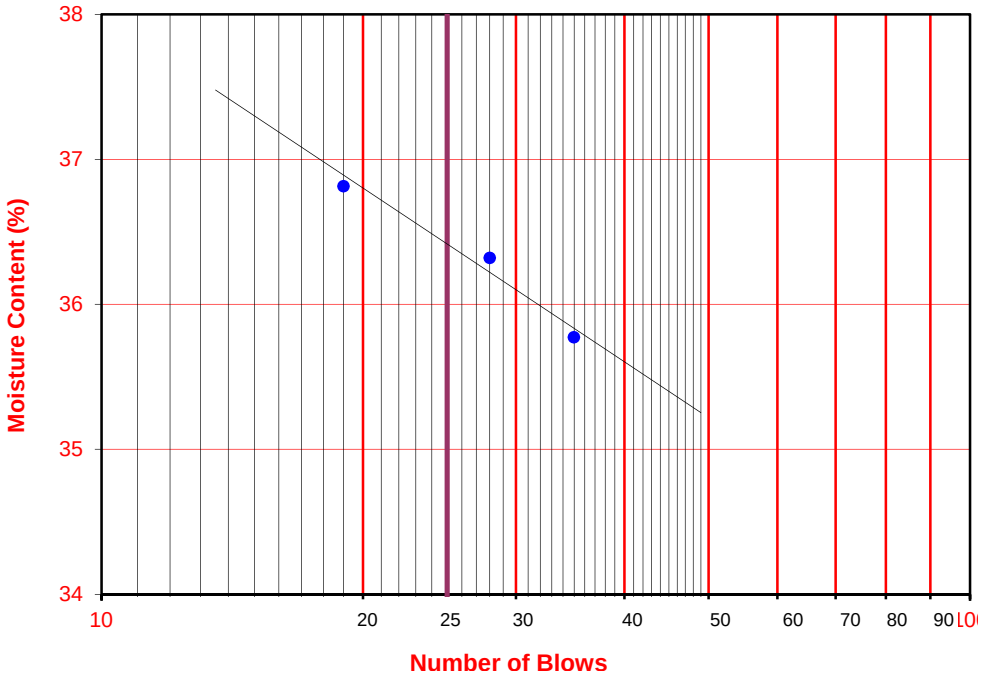
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	02/15/15
Project No. :	14057-01	Input By:	J. Ward	Date:	02/16/15
Boring No.:	HS-17	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	5-7		
Soil Identification:	Olive brown sandy lean clay s(CL)				

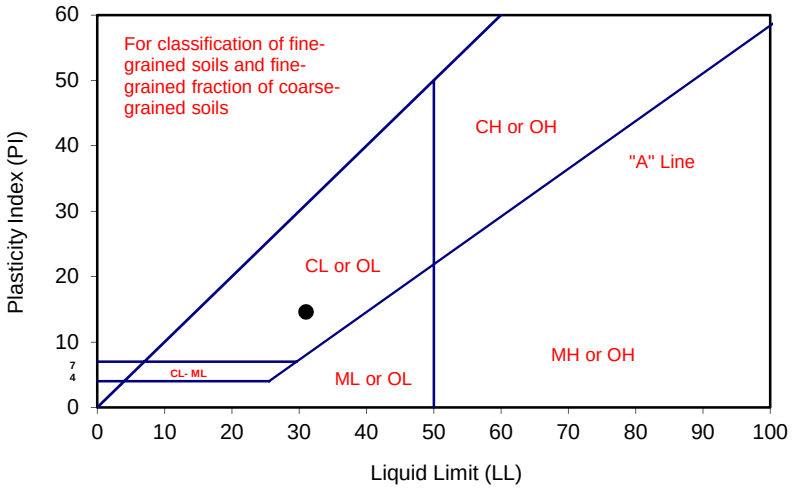
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			33	24	17	
Wet Wt. of Soil + Cont. (g)	21.08	19.93	27.88	30.56	29.08	
Dry Wt. of Soil + Cont. (g)	19.72	18.77	24.62	26.57	25.29	
Wt. of Container (g)	11.50	11.65	13.57	13.63	13.56	
Moisture Content (%) [Wn]	16.55	16.29	29.50	30.83	32.31	

Liquid Limit	**31**
Plastic Limit	**16**
Plasticity Index	**15**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 8.03

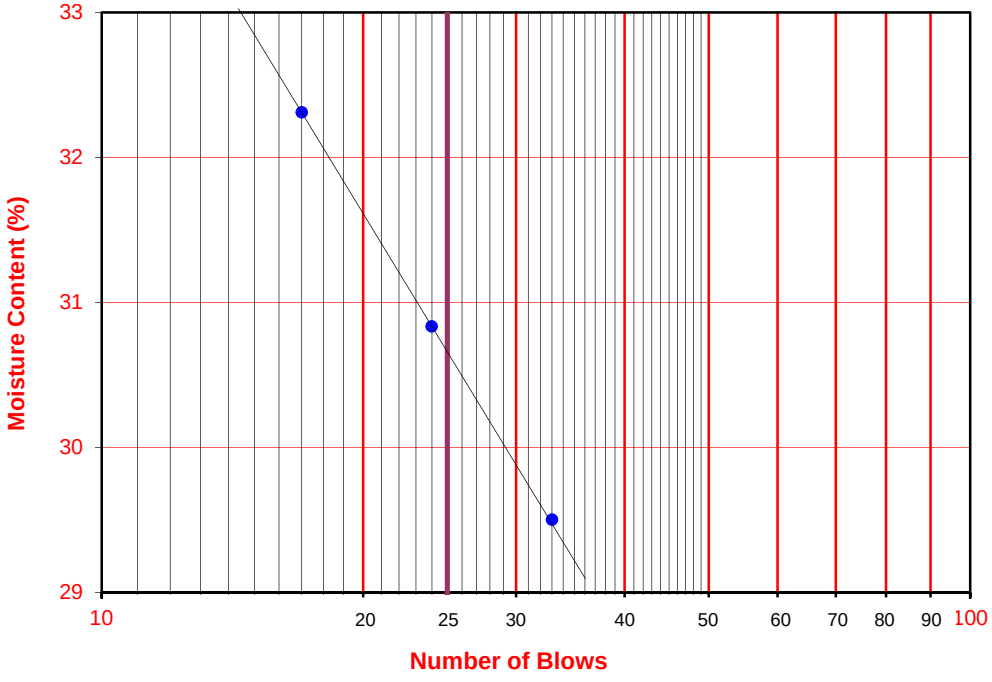
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	S. Felter	Date:	03/10/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/13/15
Boring No.:	HS-17	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	20.0		
Soil Identification:	Yellowish brown lean clay (CL)				

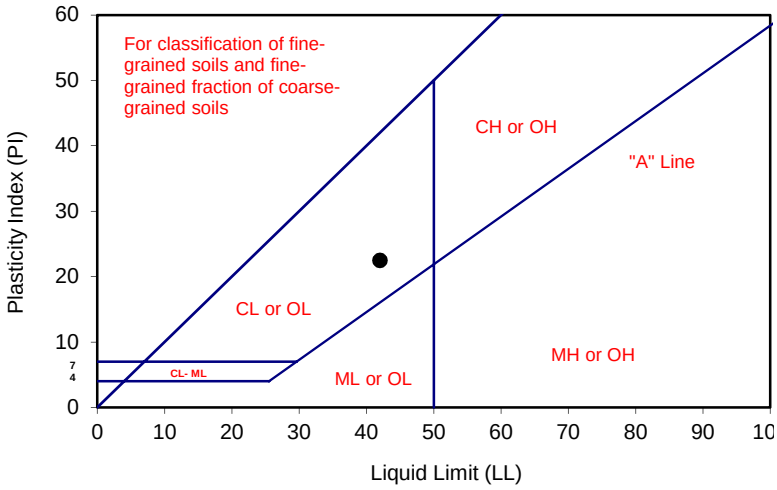
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	27	19	
Wet Wt. of Soil + Cont. (g)	23.80	24.58	34.59	35.15	35.69	
Dry Wt. of Soil + Cont. (g)	22.11	22.81	28.63	28.88	29.03	
Wt. of Container (g)	13.57	13.60	13.61	13.57	13.58	
Moisture Content (%) [Wn]	19.79	19.22	39.68	40.95	43.11	

Liquid Limit	**42**
Plastic Limit	**20**
Plasticity Index	**22**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 16.06

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



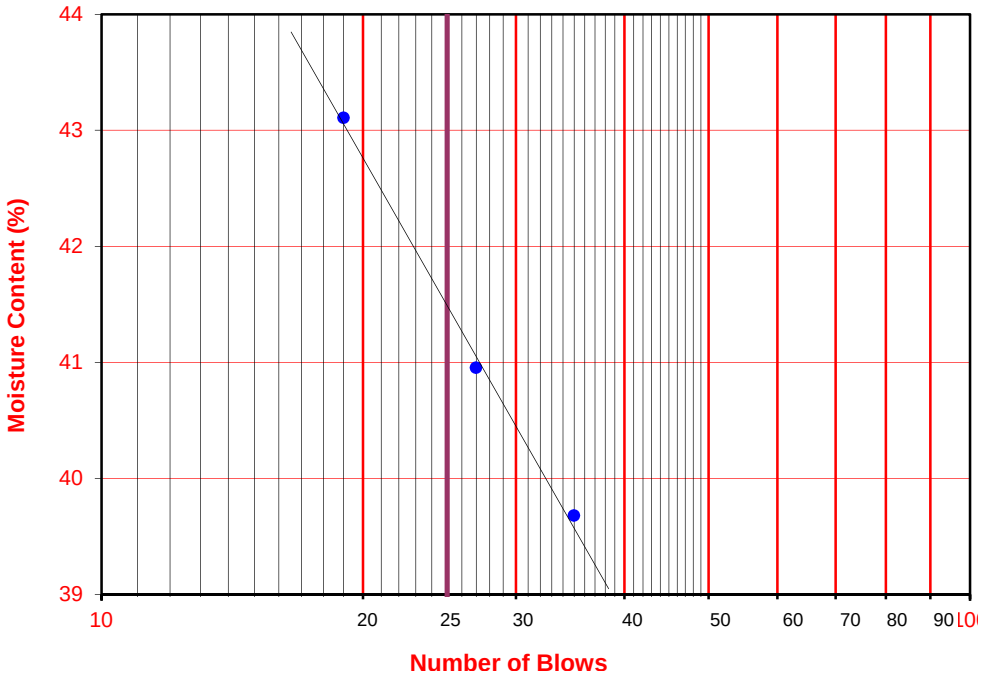
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	S. Felter	Date:	03/10/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/13/15
Boring No.:	HS-17	Checked By:	J. Ward		
Sample No.:	R-5	Depth (ft.)	25.0		
Soil Identification:	Dark yellowish brown lean clay (CL)				

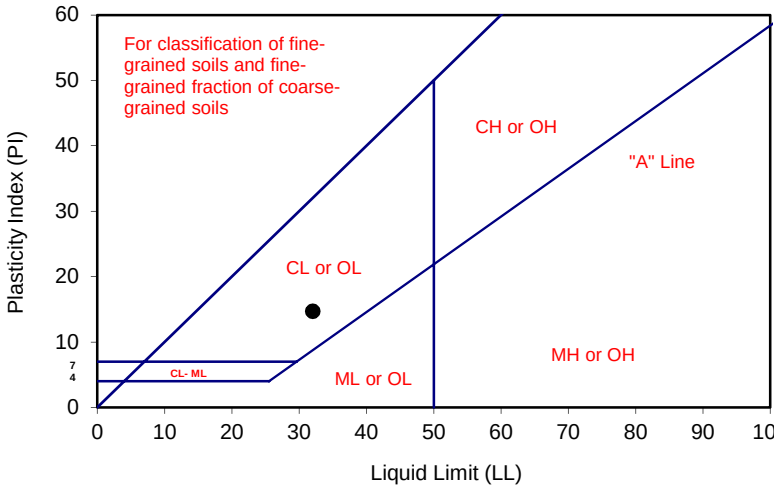
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			34	25	19	
Wet Wt. of Soil + Cont. (g)	23.85	24.02	36.89	35.23	34.57	
Dry Wt. of Soil + Cont. (g)	22.35	22.46	31.49	30.08	29.36	
Wt. of Container (g)	13.62	13.52	13.50	13.55	13.64	
Moisture Content (%) [Wn]	17.18	17.45	30.02	31.16	33.14	

Liquid Limit	**32**
Plastic Limit	**17**
Plasticity Index	**15**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 8.76

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



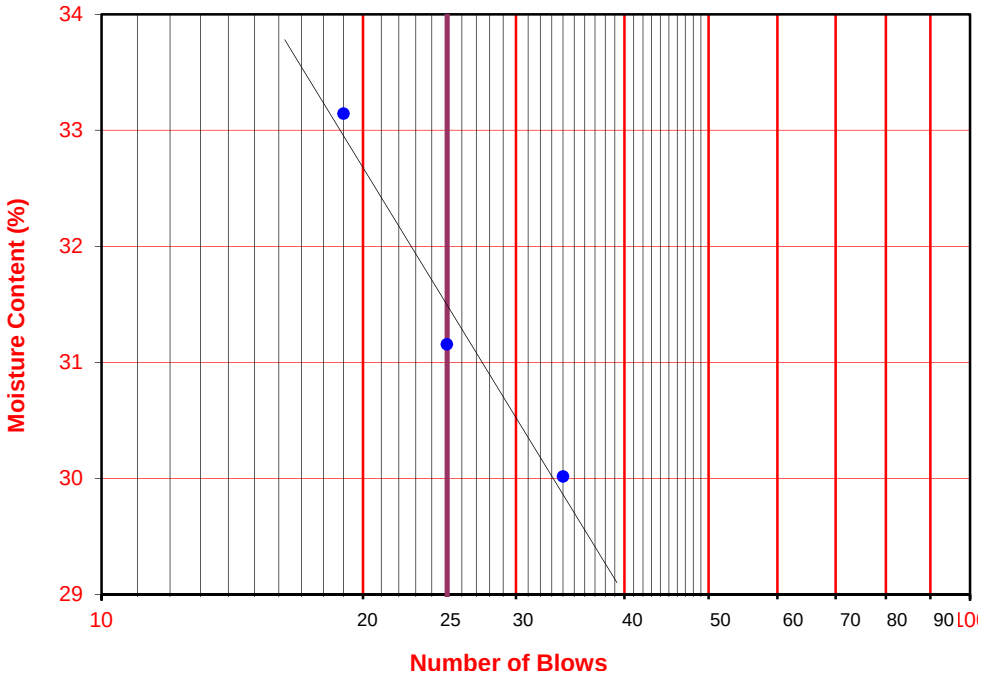
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	03/26/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/27/15
Boring No.:	B-1	Checked By:	J. Ward		
Sample No.:	R-3	Depth (ft.)	30.0		
Soil Identification:	Dark olive gray lean clay'stone' (CL)				

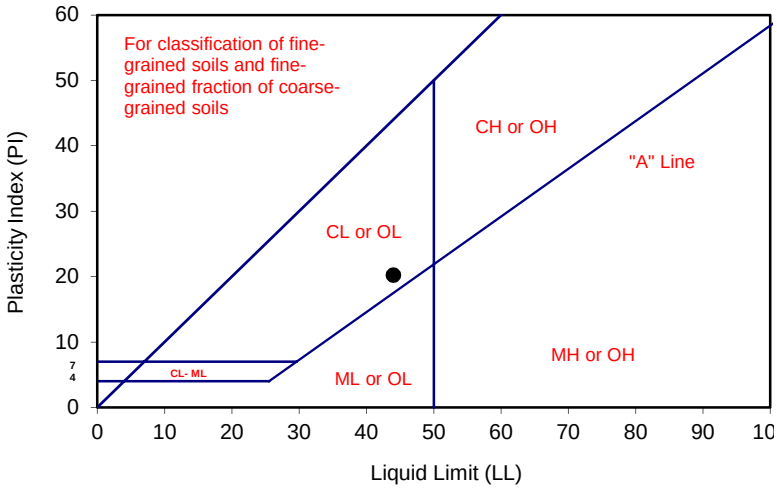
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			34	29	23	15
Wet Wt. of Soil + Cont. (g)	22.15	22.14	25.17	24.93	25.30	25.60
Dry Wt. of Soil + Cont. (g)	20.10	20.13	21.76	21.48	21.68	21.76
Wt. of Container (g)	11.50	11.66	13.63	13.53	13.53	13.63
Moisture Content (%) [Wn]	23.84	23.73	41.94	43.40	44.42	47.23

Liquid Limit	**44**
Plastic Limit	**24**
Plasticity Index	**20**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 17.52

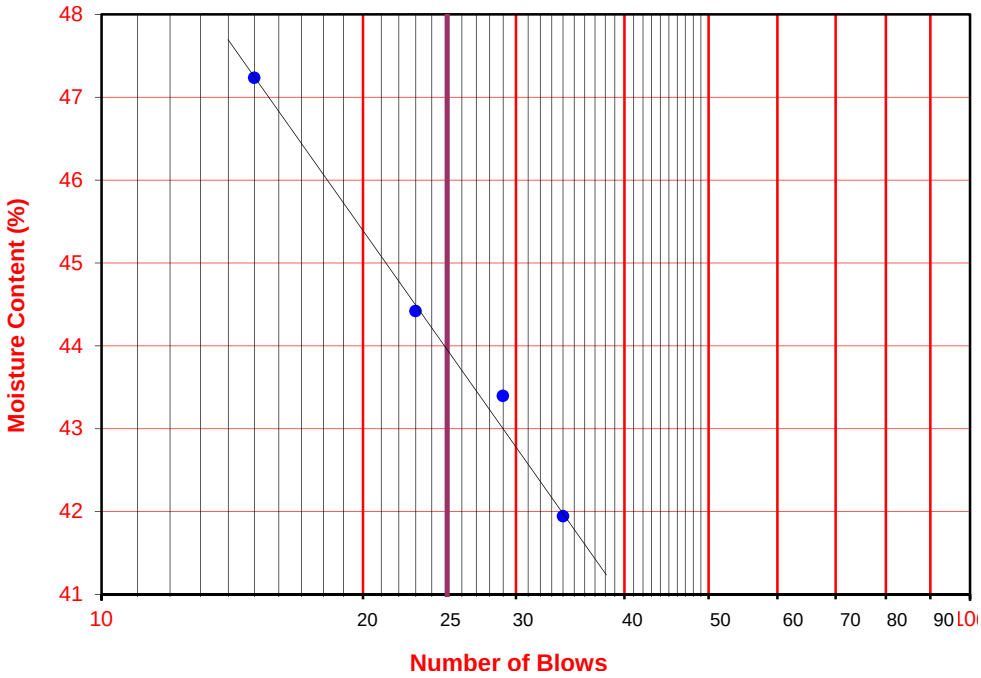
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	02/10/15
Project No. :	14057-01	Input By:	J. Ward	Date:	02/16/15
Boring No.:	B-3	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	30-33		
Soil Identification:	Light olive brown sandy lean clay s(CL)				

TEST	PLASTIC LIMIT		LIQUID LIMIT		
NO.	1	2	1	2	
Number of Blows [N]			20	22	Trial 1 = 33
Wet Wt. of Soil + Cont. (g)	22.37	22.56	27.55	28.64	Trial 2 = 33
Dry Wt. of Soil + Cont. (g)	20.34	20.54	24.02	24.84	Ave. LL = **33**
Wt. of Container (g)	11.50	11.65	13.64	13.55	(see equation below)
Moisture Content (%) [Wn]	22.96	22.72	34.01	33.66	

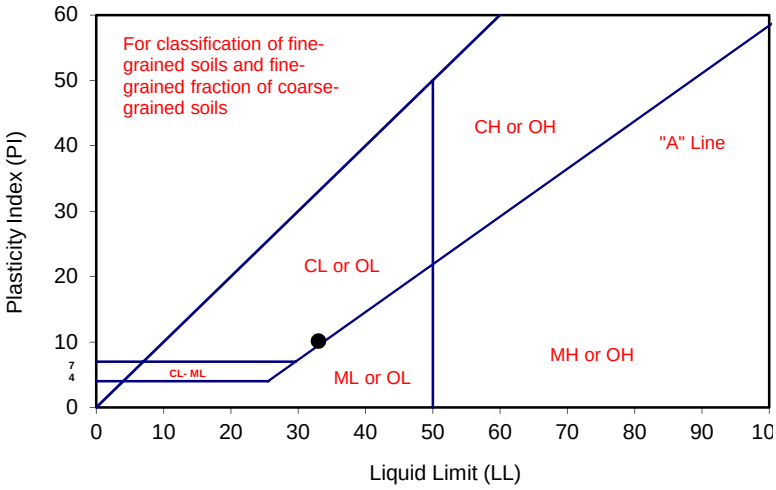
Liquid Limit	**33**
Plastic Limit	**23**
Plasticity Index	**10**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 9.49

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$

(Wn = water content, N = number of blows)



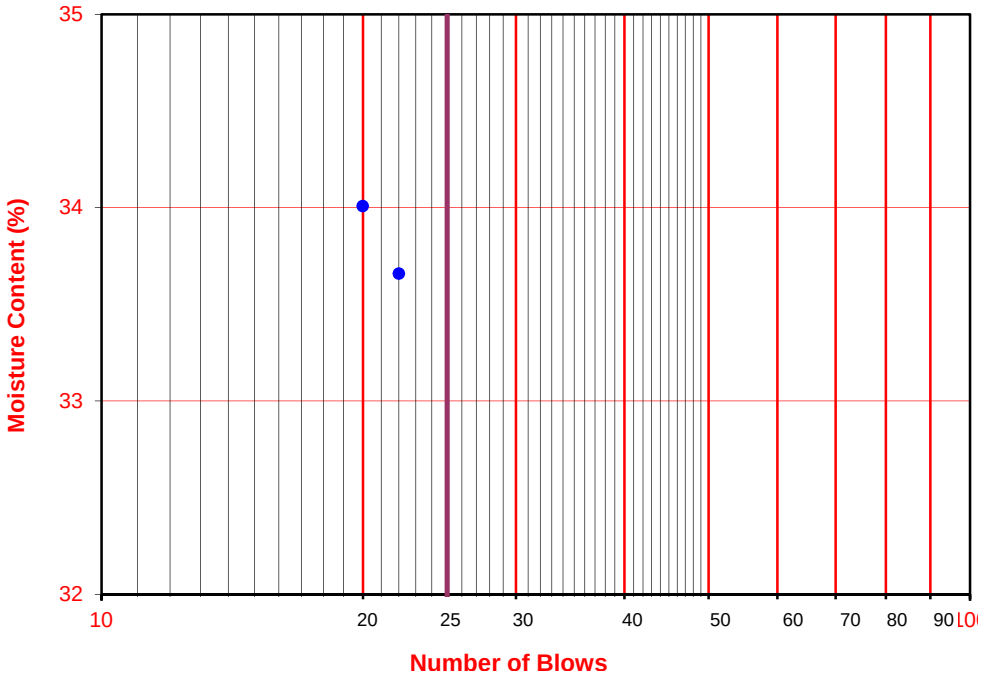
PROCEDURES USED

☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
One-point

☐ Procedure A
Multipoint Test

☒ Procedure B
One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	03/26/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/27/15
Boring No.:	B-4	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	40.0		
Soil Identification:	Brownish yellow sandy silt s(ML)				

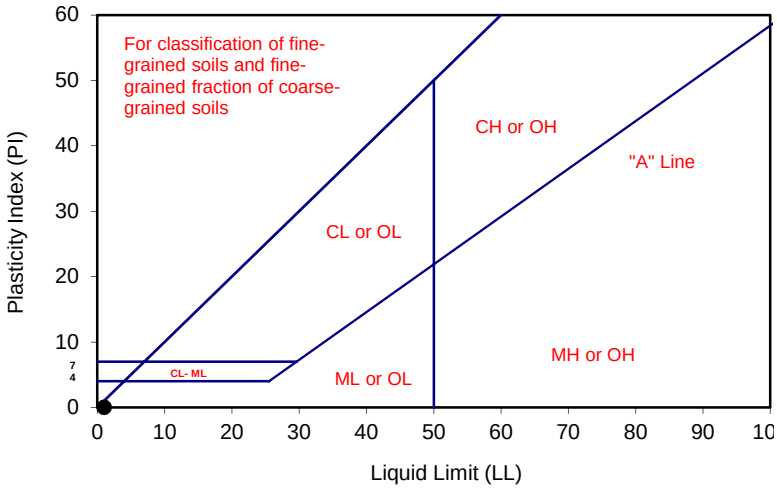
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			8			
Wet Wt. of Soil + Cont. (g)	**Cannot be rolled:**		31.41	**Cannot get more than 8 blows:**		
Dry Wt. of Soil + Cont. (g)	**NonPlastic**		27.25	**NonPlastic**		
Wt. of Container (g)			13.55			
Moisture Content (%) [Wn]			30.36			

Liquid Limit	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
Classification	**NP**

PI at "A" - Line = 0.73(LL-20) =

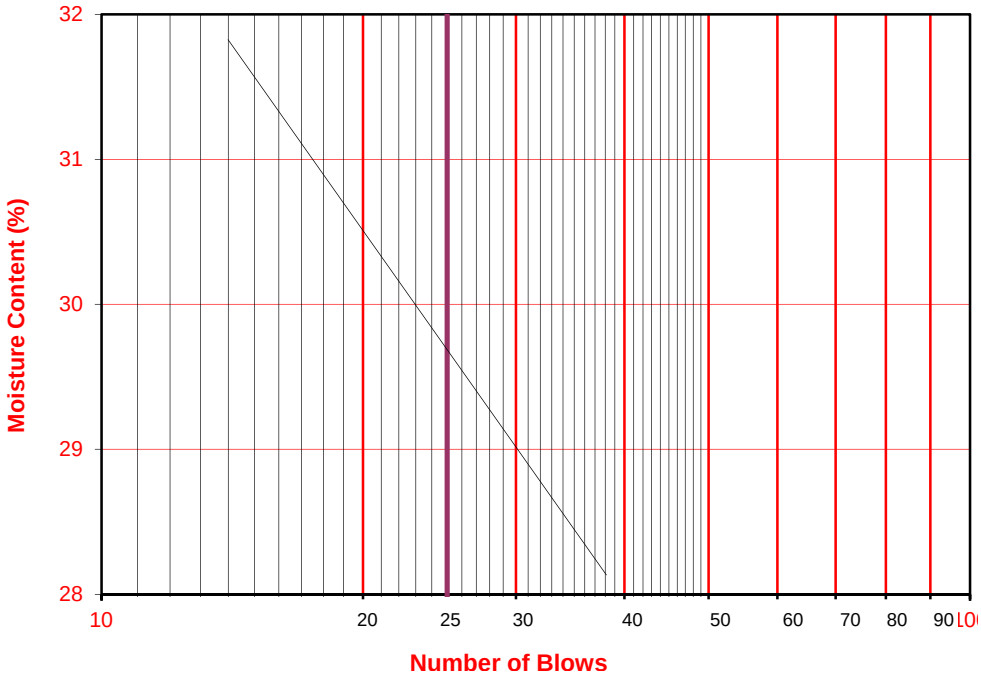
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

☐	Wet Preparation Multipoint - Wet
X	Dry Preparation Multipoint - Dry
X	Procedure A Multipoint Test
☐	Procedure B One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	A. Santos	Date:	03/01/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/11/15
Boring No.:	B-4	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	35-40		
Soil Identification:	Light olive brown silty sand (SM)				

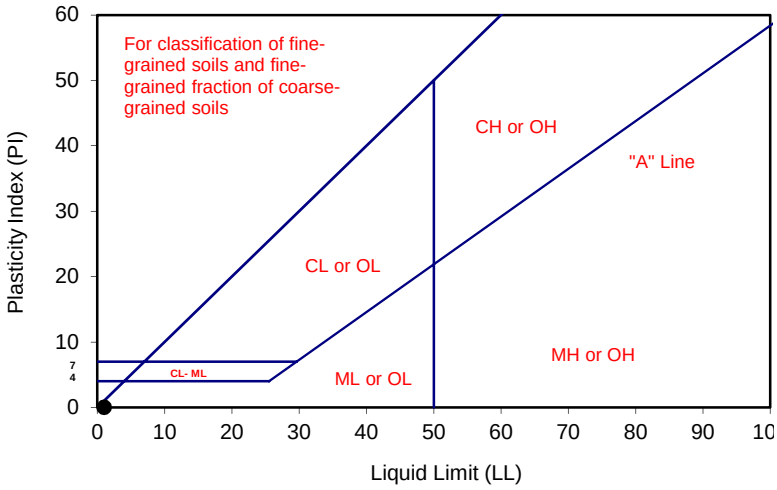
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			5			
Wet Wt. of Soil + Cont. (g)	**Cannot be rolled:**		23.75	**Cannot get more than 5 blows:**		
Dry Wt. of Soil + Cont. (g)	**NonPlastic**		19.41	**NonPlastic**		
Wt. of Container (g)			1.07			
Moisture Content (%) [Wn]			23.66			

Liquid Limit	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
Classification	**NP**

PI at "A" - Line = 0.73(LL-20) =

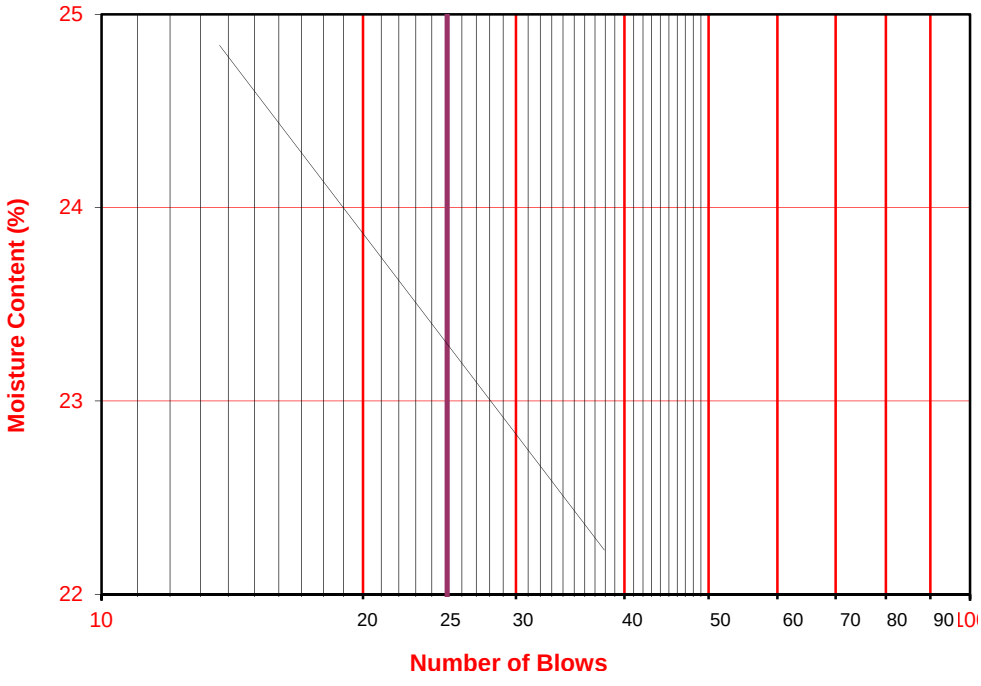
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	La Habra	Tested By:	G. Bathala	Date:	02/27/15
Project No. :	14057-01	Input By:	J. Ward	Date:	03/11/15
Boring No.:	B-4	Checked By:	J. Ward		
Sample No.:	R-6	Depth (ft.)	60.0		
Soil Identification:	Olive lean clay (CL)				

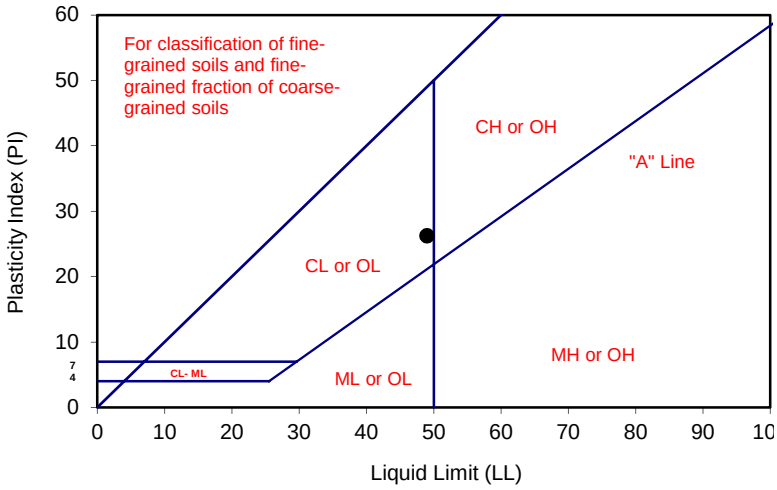
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			34	27	21	15
Wet Wt. of Soil + Cont. (g)	21.11	22.34	24.08	24.82	26.28	26.20
Dry Wt. of Soil + Cont. (g)	19.31	20.38	20.74	21.14	22.03	21.84
Wt. of Container (g)	11.50	11.65	13.57	13.54	13.55	13.59
Moisture Content (%) [Wn]	23.05	22.45	46.58	48.42	50.12	52.85

Liquid Limit	**49**
Plastic Limit	**23**
Plasticity Index	**26**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 21.17

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



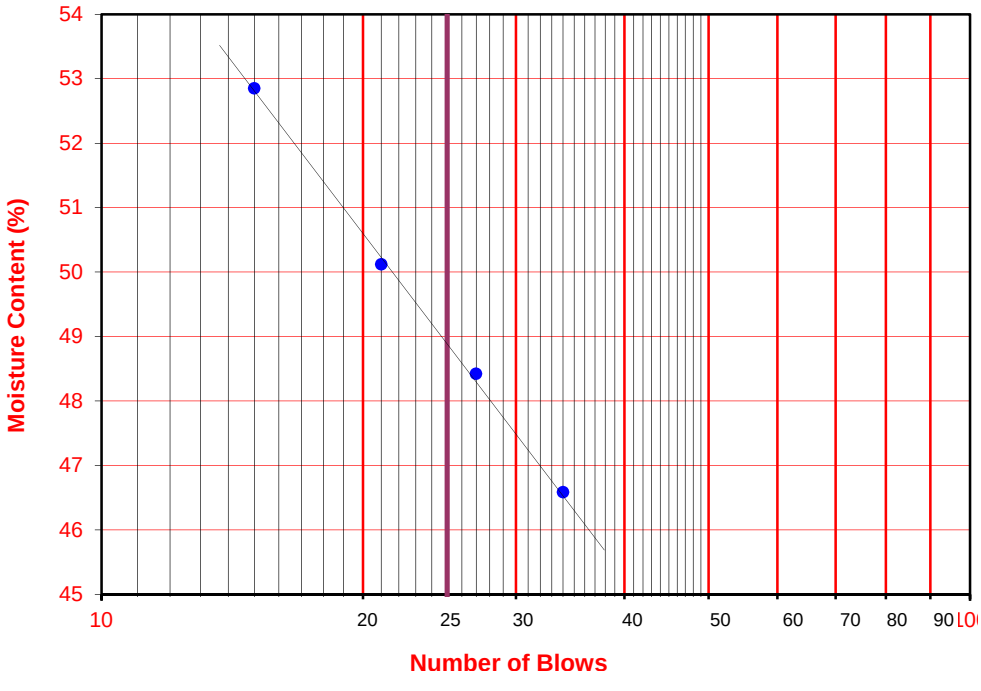
PROCEDURES USED

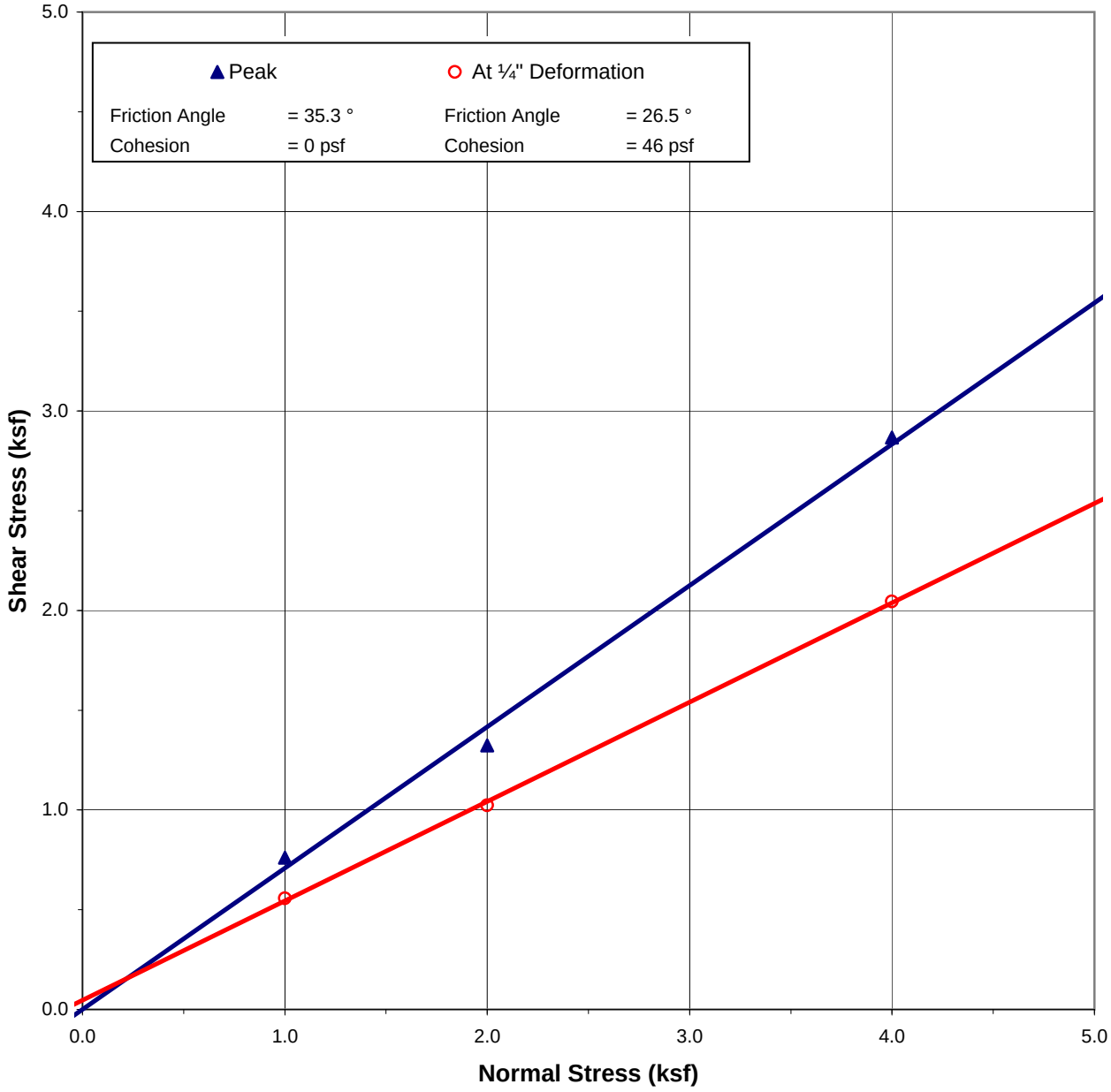
☐ Wet Preparation
Multipoint - Wet

☒ Dry Preparation
Multipoint - Dry

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test





Location:	Sample No.:	Depth (ft)	Sample Type	Shear Rate (inch/min)	Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
B-1	**R-2**	**20'**	**Ring**	**0.0005**	**109.6**	**18.2**	**24.0**

Sample Description: Fine sandy siltstone

LGC Geotechnical, Inc.

DIRECT SHEAR PLOT

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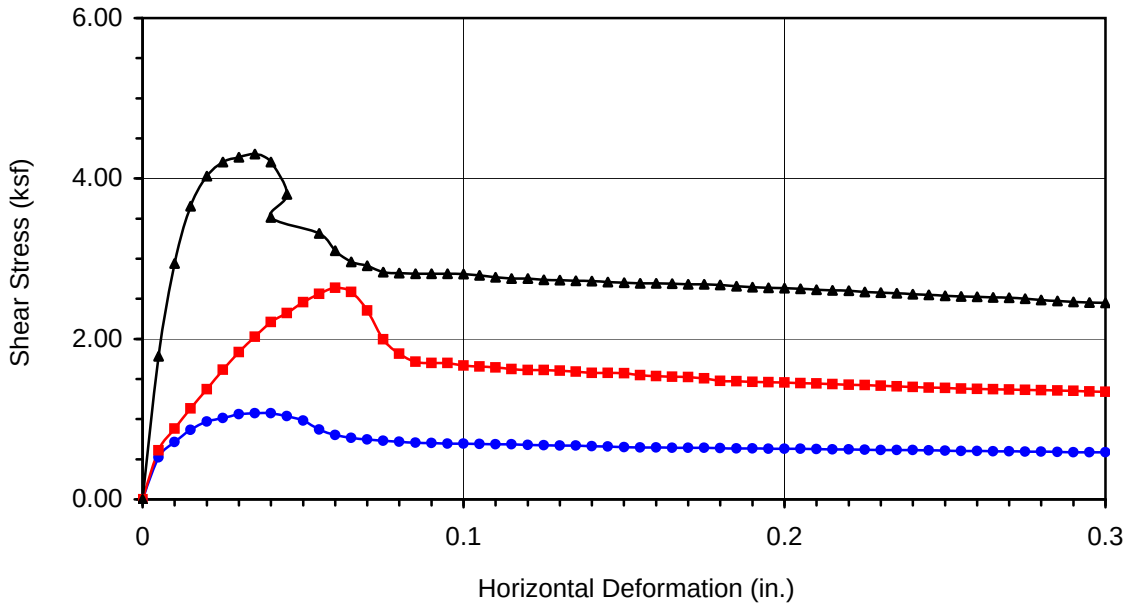
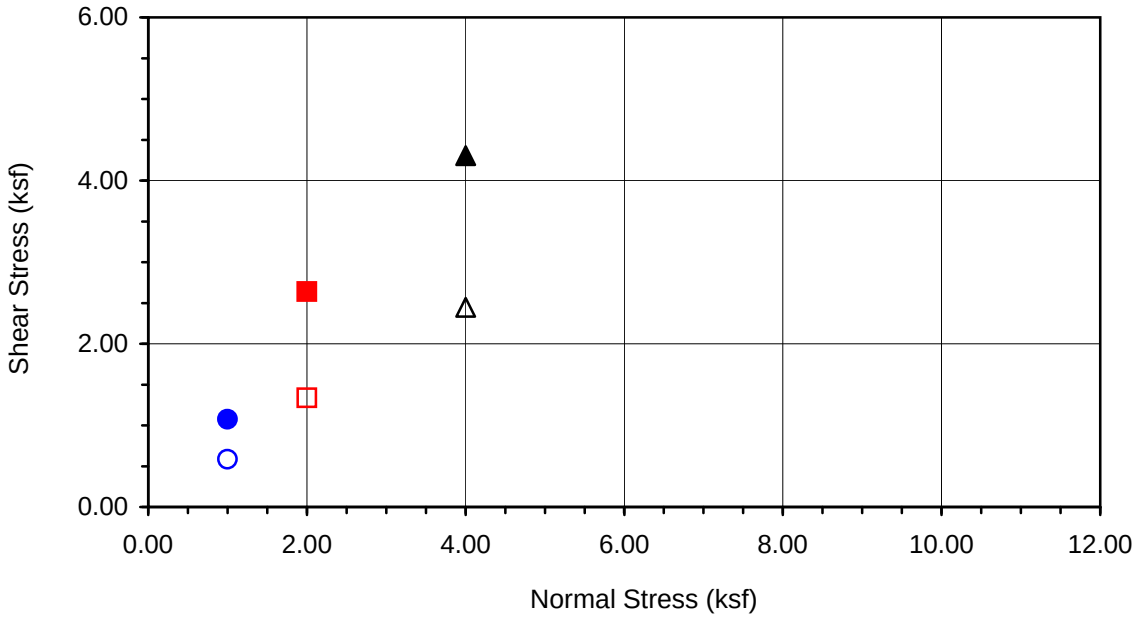
Westridge





Boring No.	**B-1**
Sample No.	**R-3**
Depth (ft)	**30**
Sample Type: Ring	
Soil Identification: Dark olive gray clay stone (CL)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.075	■ 2.638	▲ 4.304
Shear Stress @ End of Test (ksf)	○ 0.585	□ 1.339	△ 2.449
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	20.26	20.26	20.26
Dry Density (pcf)	97.3	103.4	105.0
Saturation (%)	74.8	86.9	90.4
Soil Height Before Shearing (in.)	0.9956	0.9908	0.9872
Final Moisture Content (%)	27.5	25.2	24.6

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 14057-01

La Habra

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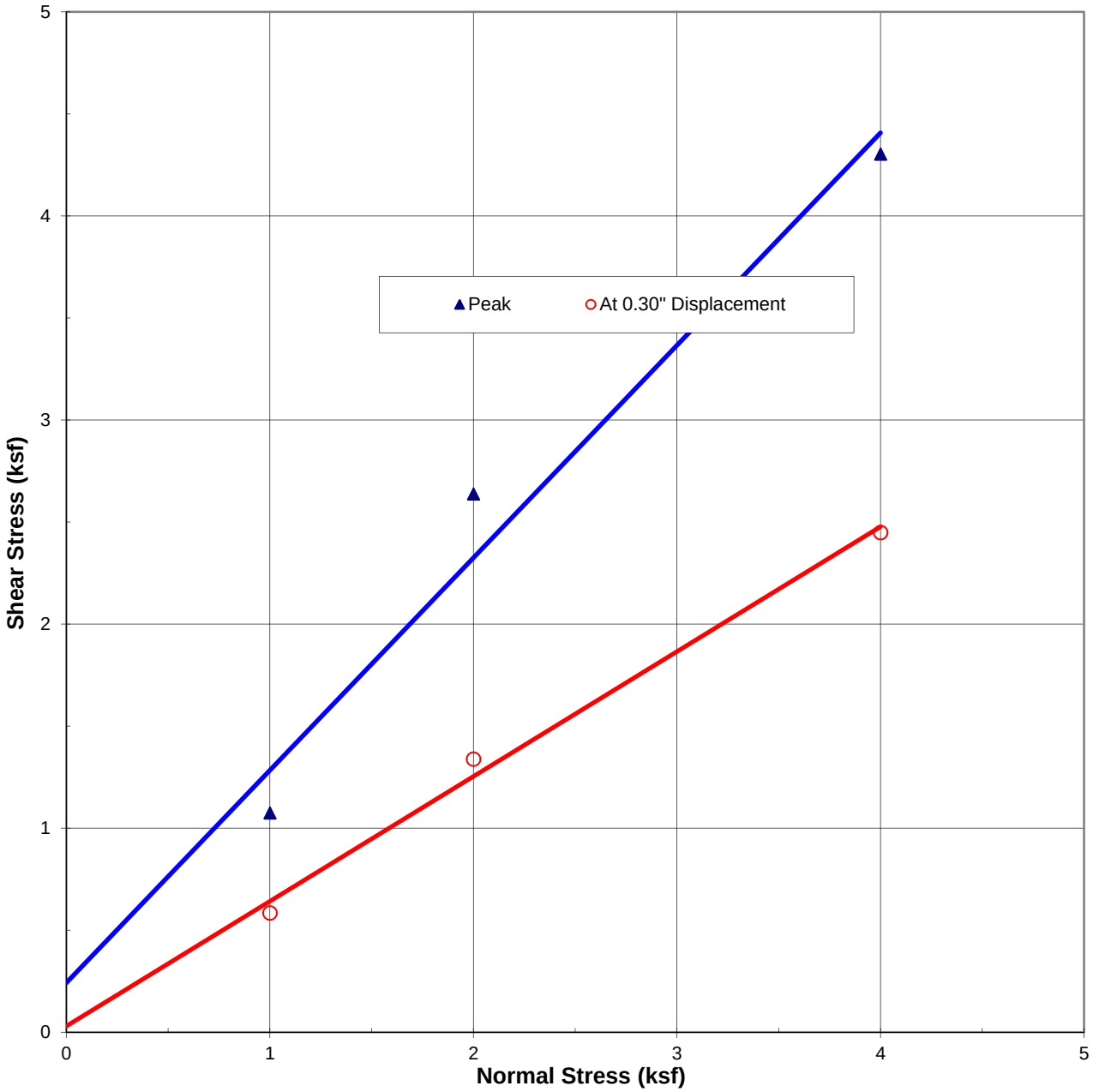
DS B-1, R-3 @ 30



Tested Sample:
B-1 at 30 ft

Peak:	At 0.30" Displacement:
46.2 Degrees	31.5 Degrees
0 ksf	0.03 ksf

LGC Geotechnical, Inc.

DIRECT SHEAR PLOT

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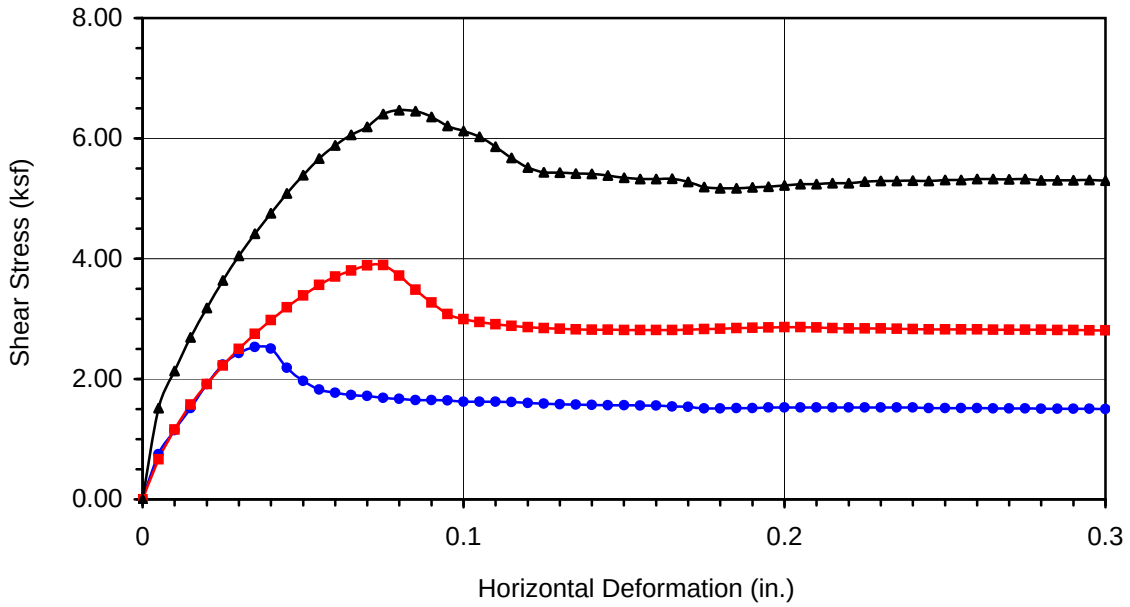
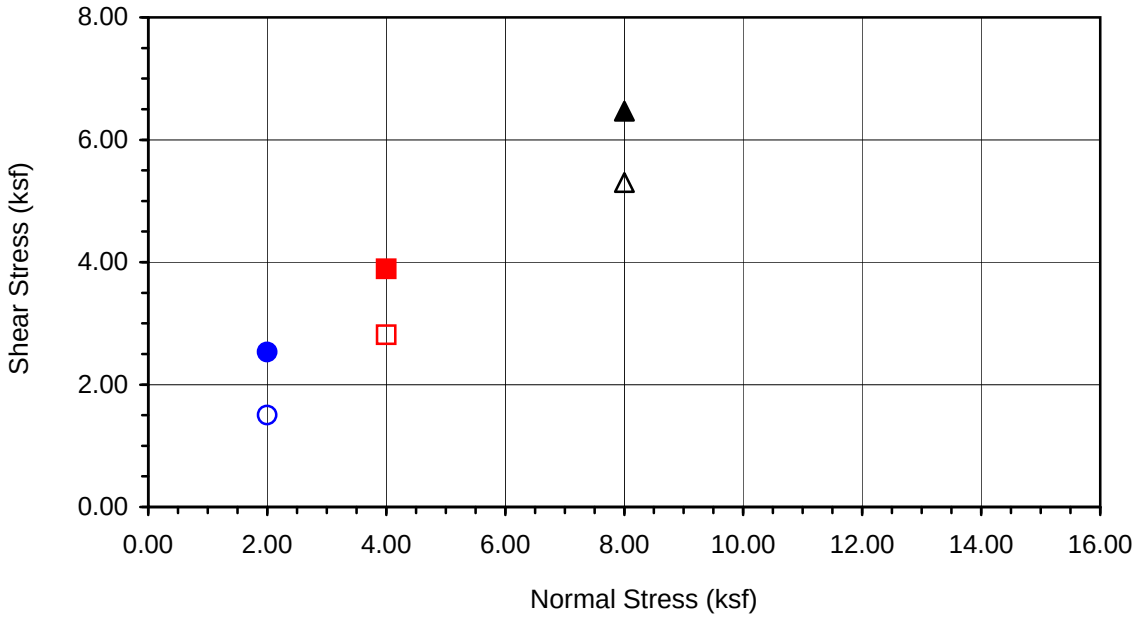
Westridge / La Habra





Boring No.	**B-1**
Sample No.	**R-4**
Depth (ft)	**40**
Sample Type:	
Ring	
Soil Identification:	
Dark olive gray silty clay stone (CL-ML)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 2.531	■ 3.892	▲ 6.467
Shear Stress @ End of Test (ksf)	○ 1.500	□ 2.811	△ 5.300
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	17.51	17.51	17.51
Dry Density (pcf)	100.0	105.1	106.9
Saturation (%)	68.9	78.3	81.9
Soil Height Before Shearing (in.)	0.9898	0.9829	0.9698
Final Moisture Content (%)	22.2	21.3	23.6

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

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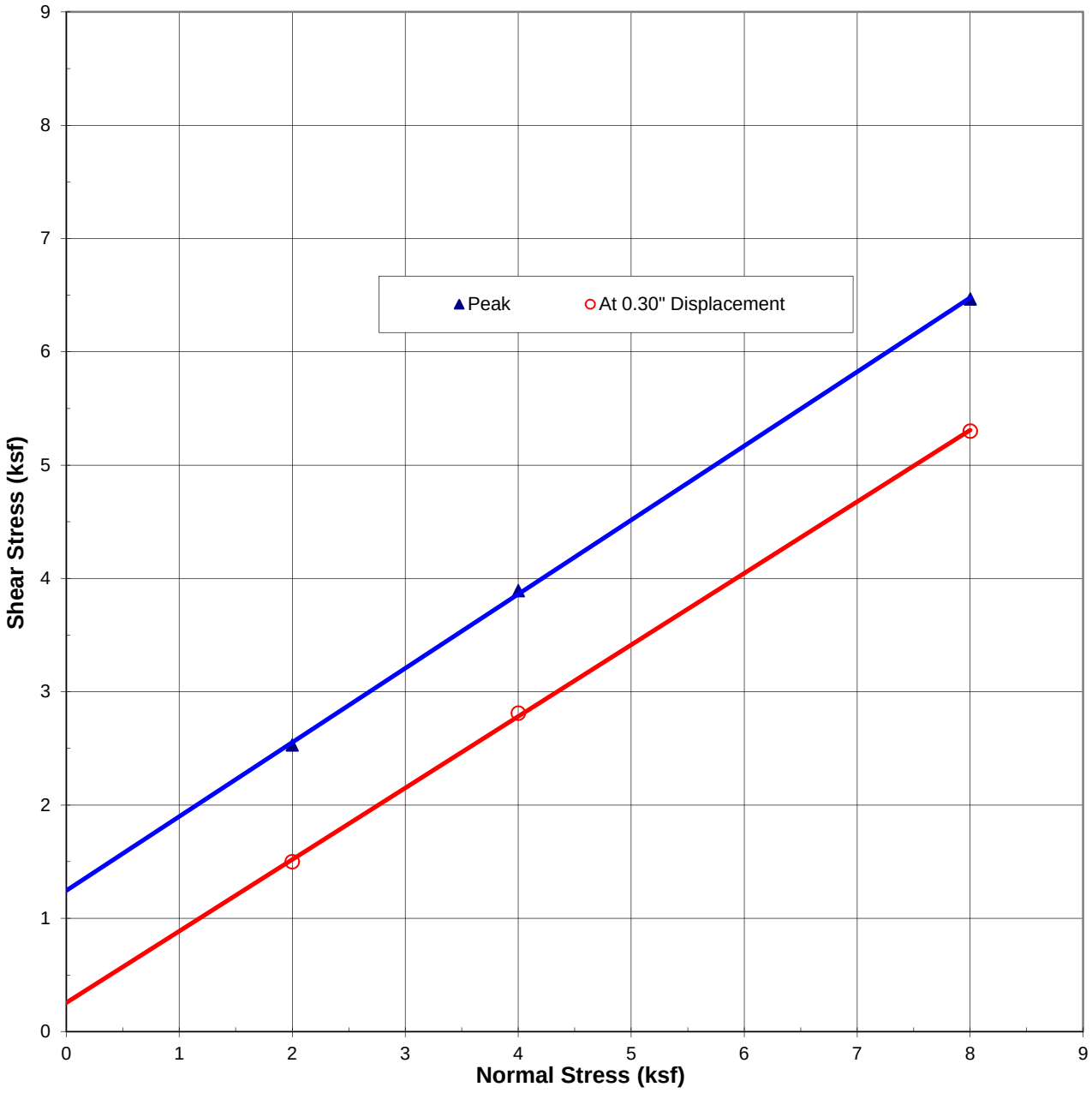

Tested Sample:
B-1 at 40 ft

Peak:	At 0.30" Displacement:
33.2 Degrees	32.3 Degrees
1.2 ksf	0.26 ksf

LGC Geotechnical, Inc.

DIRECT SHEAR PLOT

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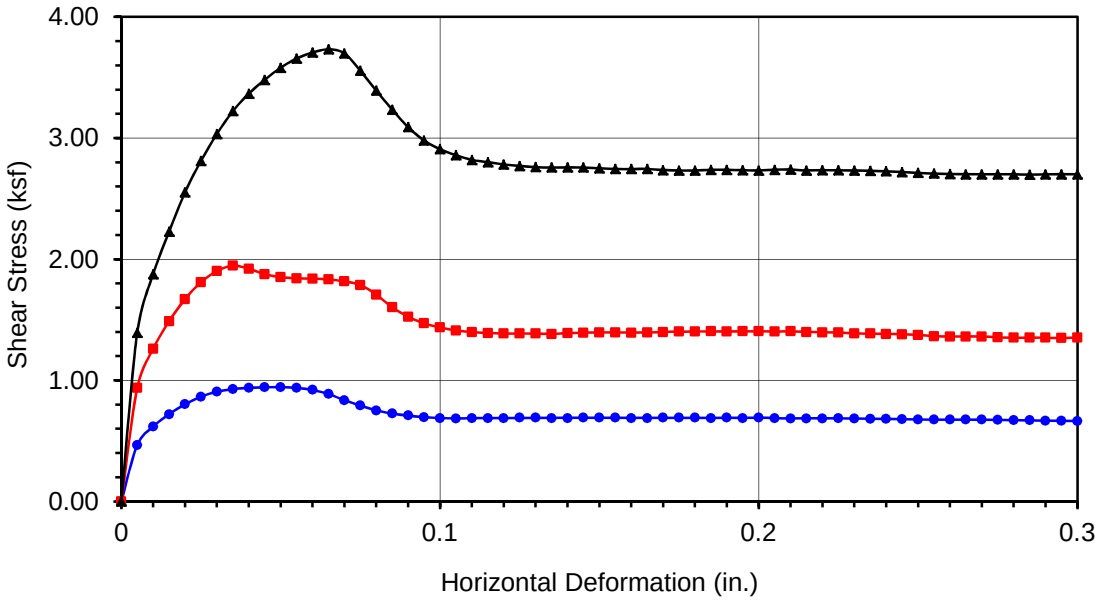
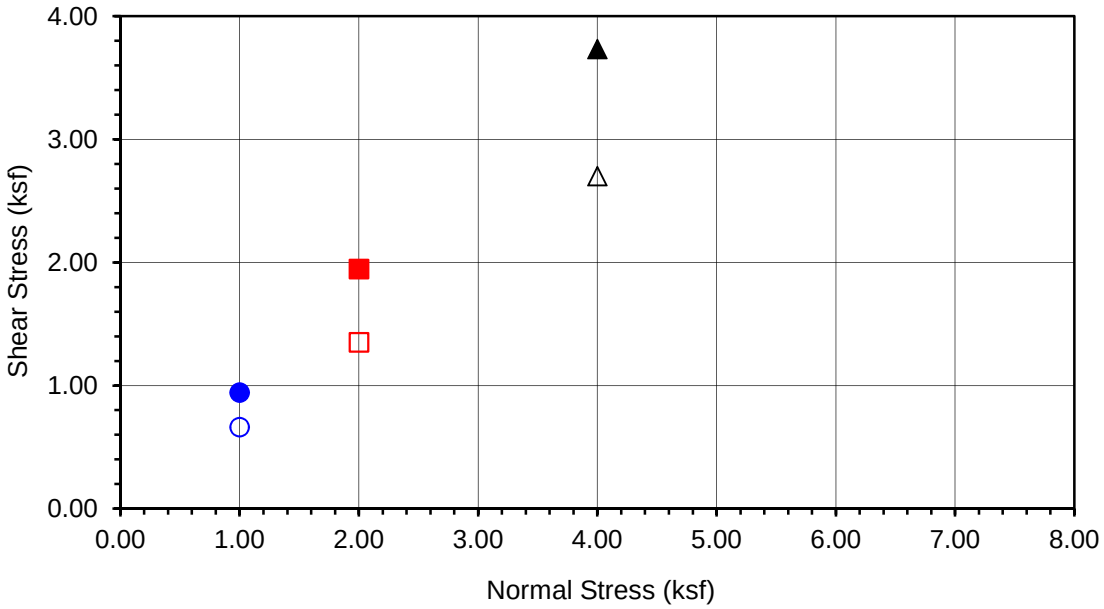
Westridge / La Habra





Boring No.	**B-4**
Sample No.	**R-4**
Depth (ft)	**40**
Sample Type: Ring	
Soil Identification: Brownish yellow sandy silt s(ML)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.943	■ 1.946	▲ 3.732
Shear Stress @ End of Test (ksf)	○ 0.663	□ 1.352	△ 2.701
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	4.23	4.23	4.23
Dry Density (pcf)	101.2	104.1	107.2
Saturation (%)	17.2	18.5	20.0
Soil Height Before Shearing (in.)	0.9959	0.9935	0.9844
Final Moisture Content (%)	23.0	20.8	20.4

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

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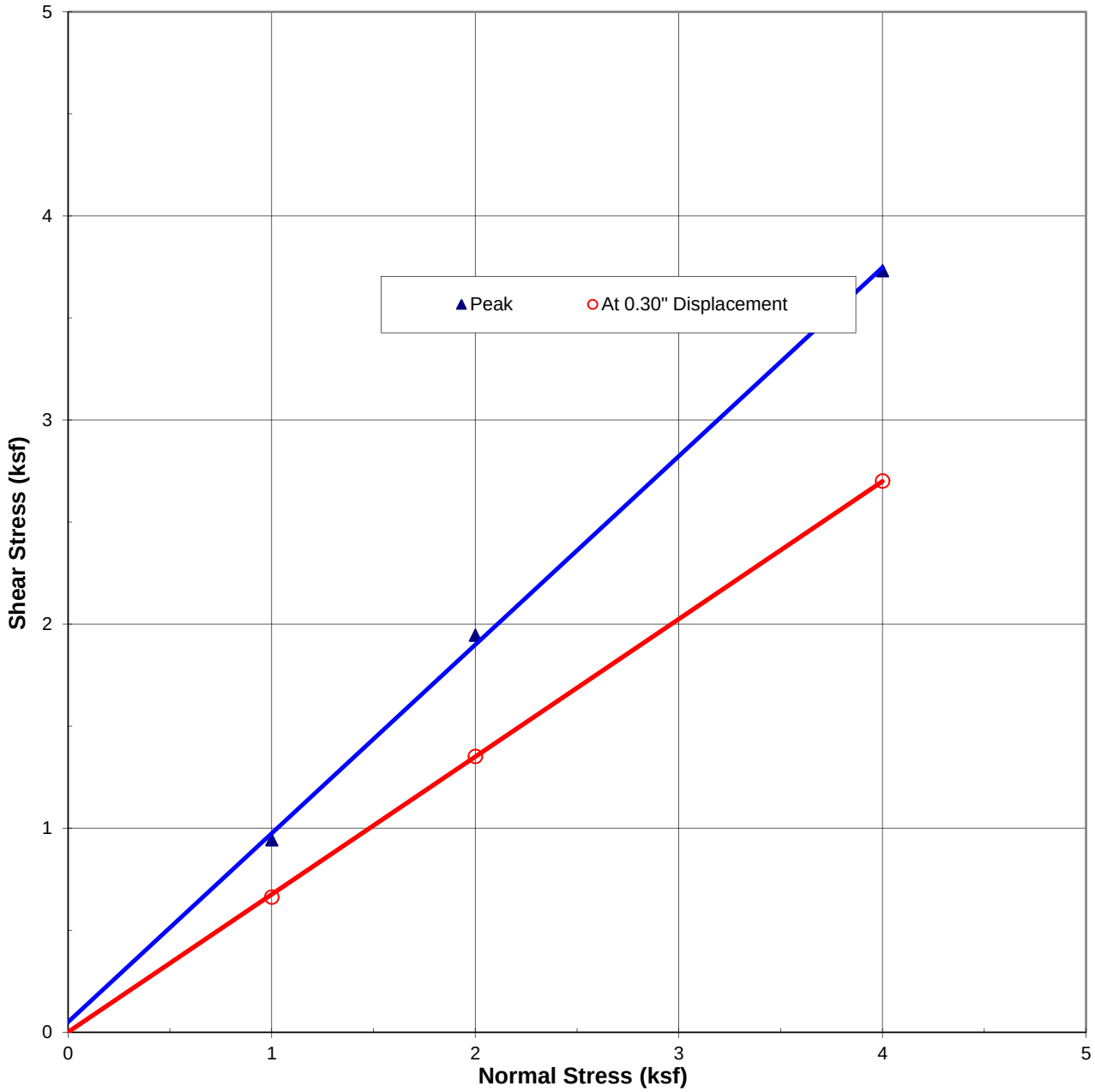

Tested Sample:
B-4 at 40 ft

Peak:	At 0.30" Displacement:
42.8 Degrees	34.0 Degrees
0 ksf	0 ksf

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DIRECT SHEAR PLOT

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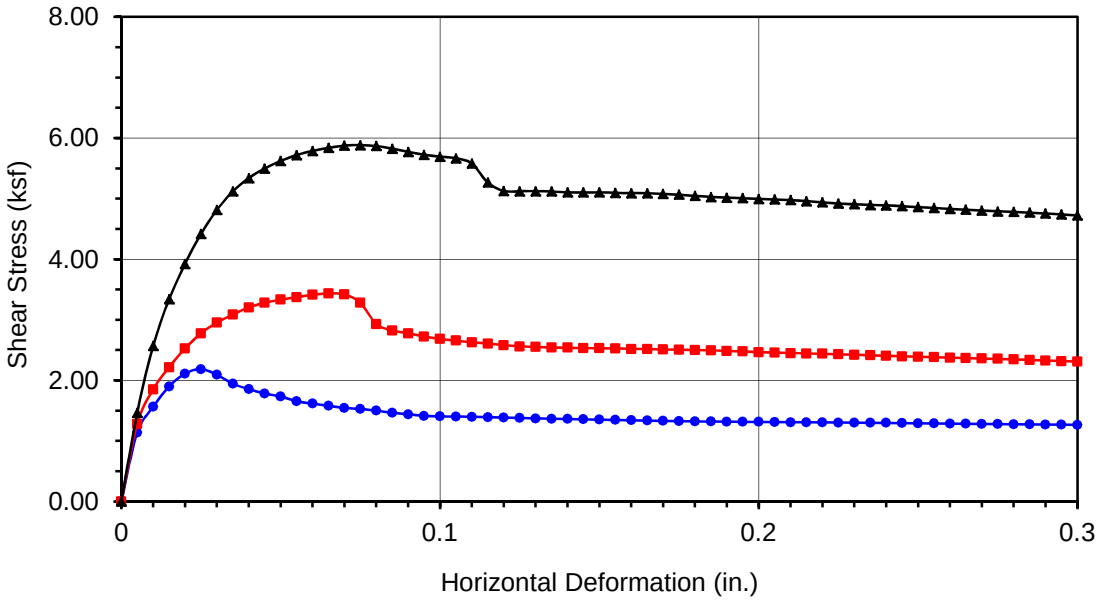
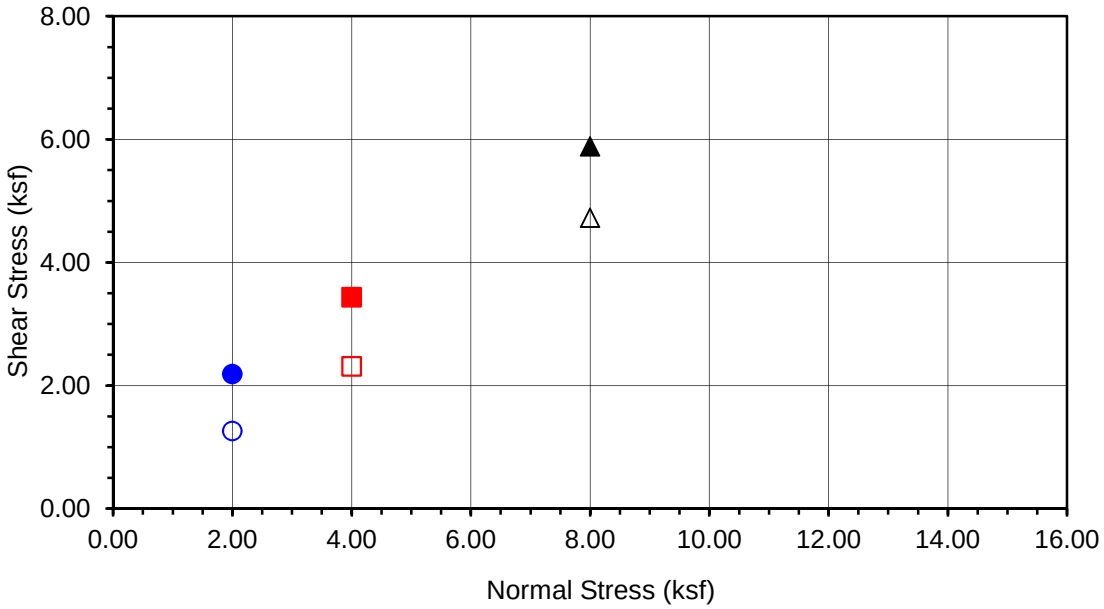
Westridge / La Habra





Boring No.	**B-4**
Sample No.	**R-6**
Depth (ft)	**60**
Sample Type:	
Ring	
Soil Identification:	
Olive silty clay (CL-ML)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 2.185	■ 3.433	▲ 5.882
Shear Stress @ End of Test (ksf)	○ 1.264	□ 2.311	△ 4.725
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	23.28	23.28	23.28
Dry Density (pcf)	101.7	102.2	102.4
Saturation (%)	95.7	96.8	97.2
Soil Height Before Shearing (in.)	0.9932	0.9886	0.9764
Final Moisture Content (%)	27.0	25.3	24.1

DIRECT SHEAR TEST RESULTS

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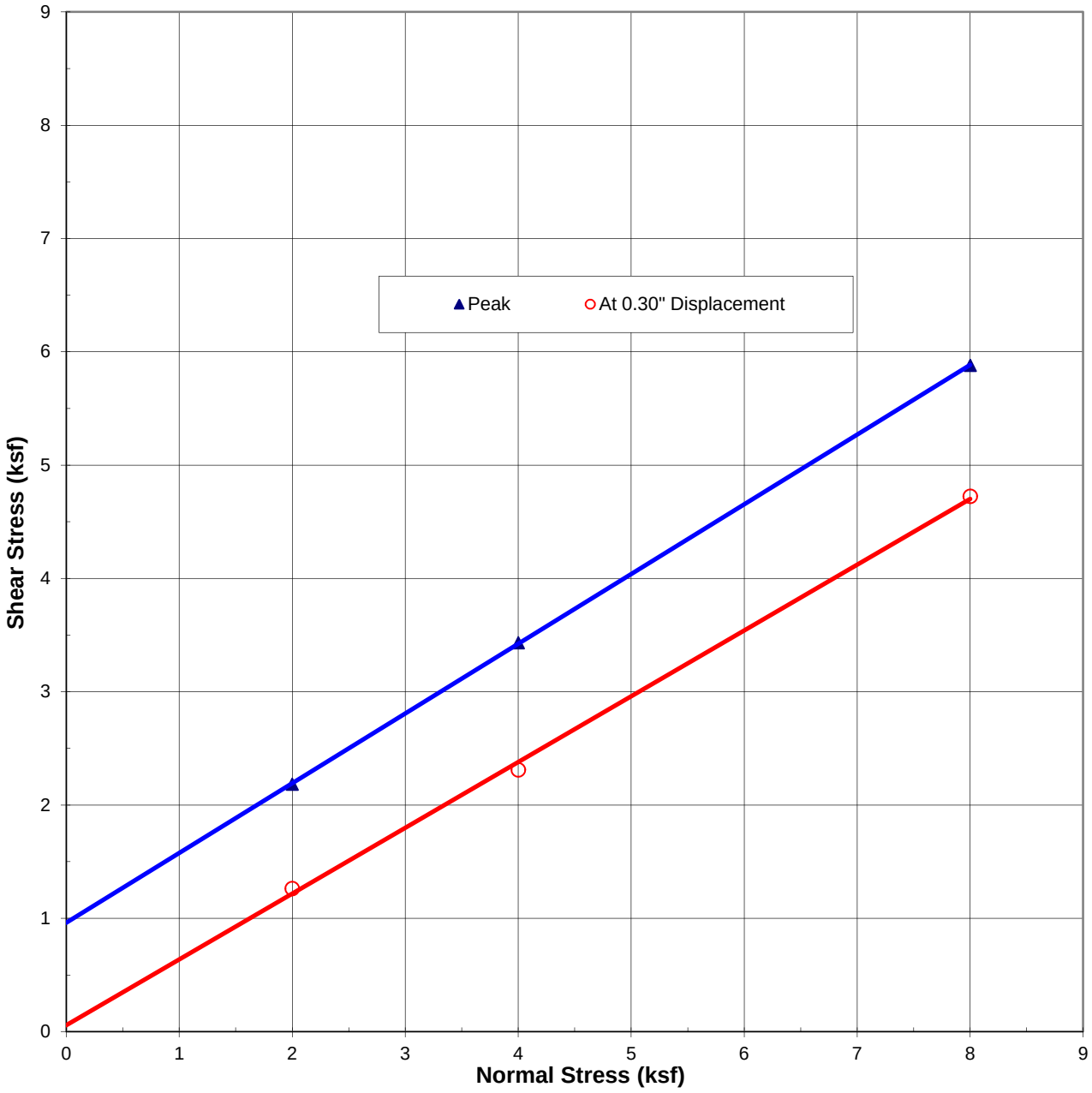

Tested Sample:

B-4 at 60 ft

Peak:		At 0.30" Displacement:	
31.6	Degrees	30.1	Degrees
1.0	ksf	0.06	ksf

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DIRECT SHEAR PLOT

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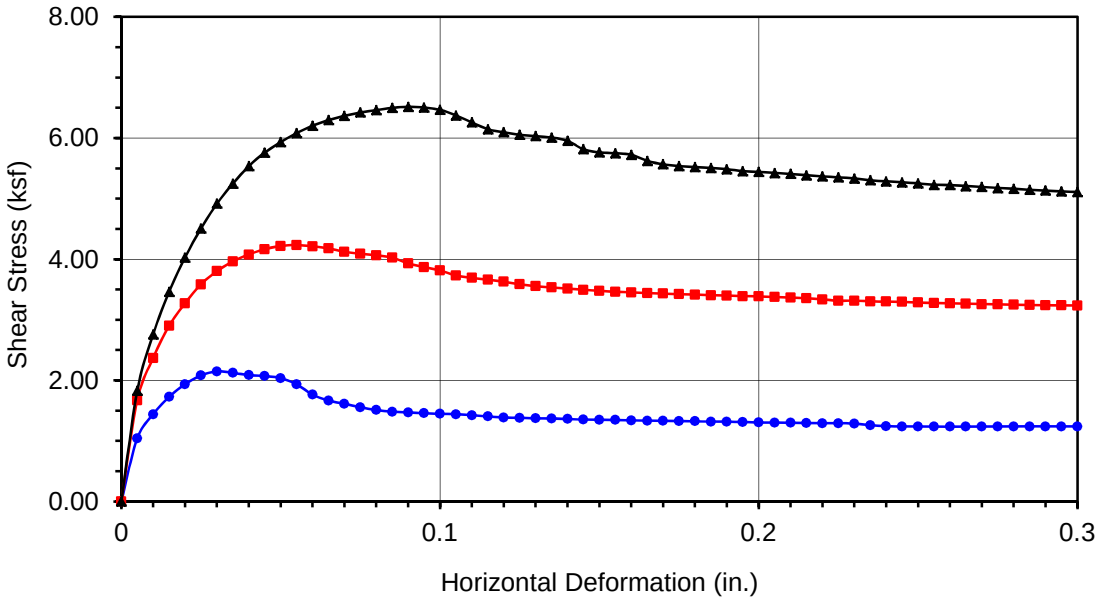

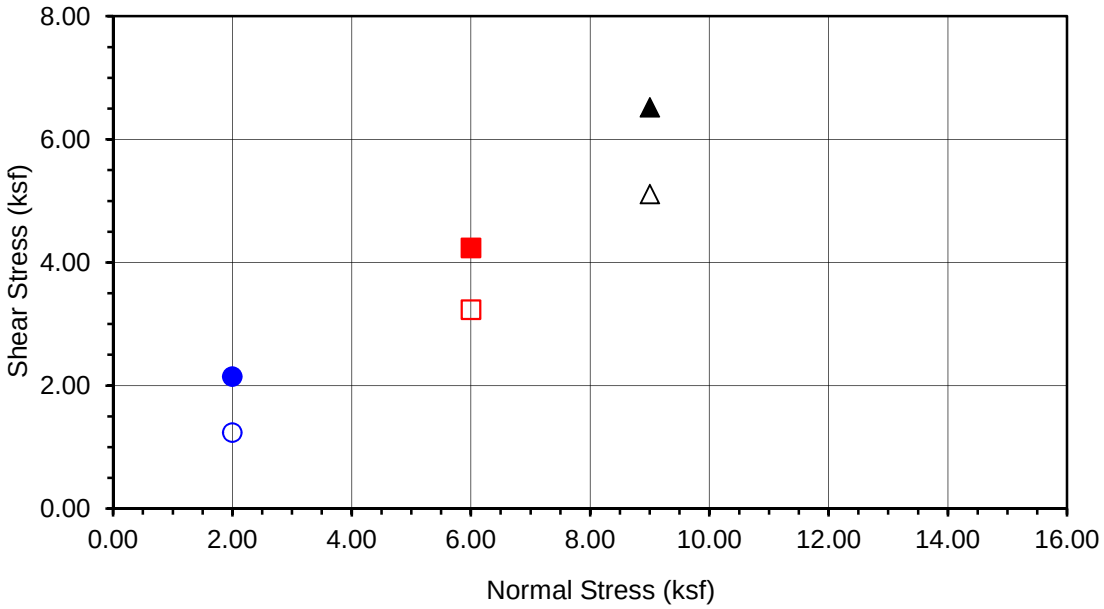

Boring No.	**B-4**
Sample No.	**R-7**
Depth (ft)	**70**
Sample Type:	
Ring	
Soil Identification:	
Olive lean clay'stone' (CL)	

Normal Stress (kip/ft²)	2.000	6.000	9.000
Peak Shear Stress (kip/ft²)	● 2.147	■ 4.235	▲ 6.517
Shear Stress @ End of Test (ksf)	○ 1.236	□ 3.232	△ 5.109
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.88	22.88	22.88
Dry Density (pcf)	102.0	102.5	102.7
Saturation (%)	94.7	95.9	96.4
Soil Height Before Shearing (in.)	0.9936	0.9846	0.9705
Final Moisture Content (%)	25.2	24.5	23.8

DIRECT SHEAR TEST RESULTS

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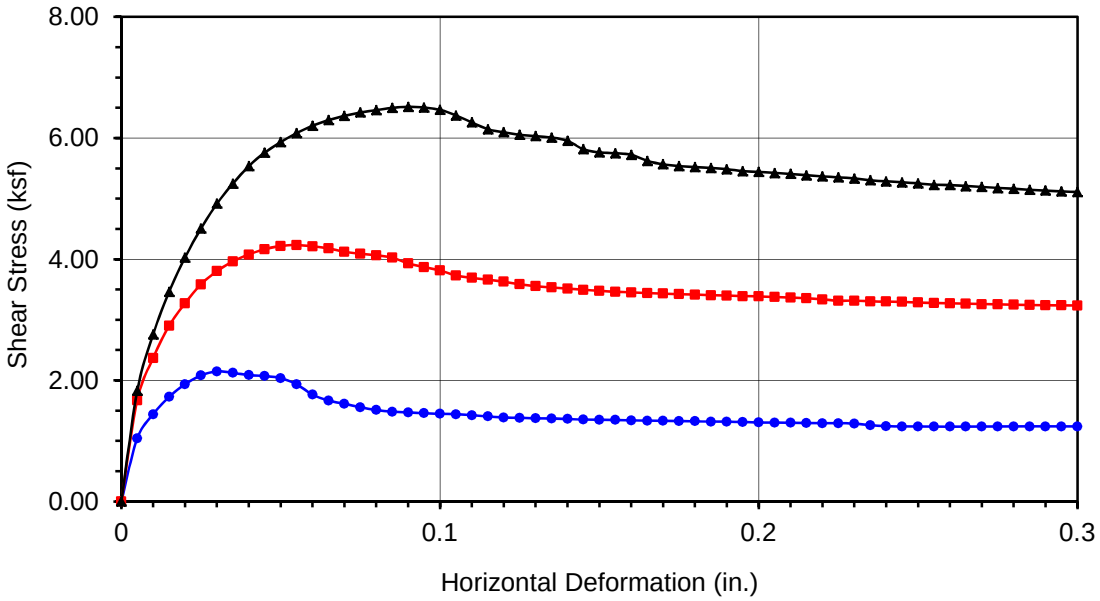

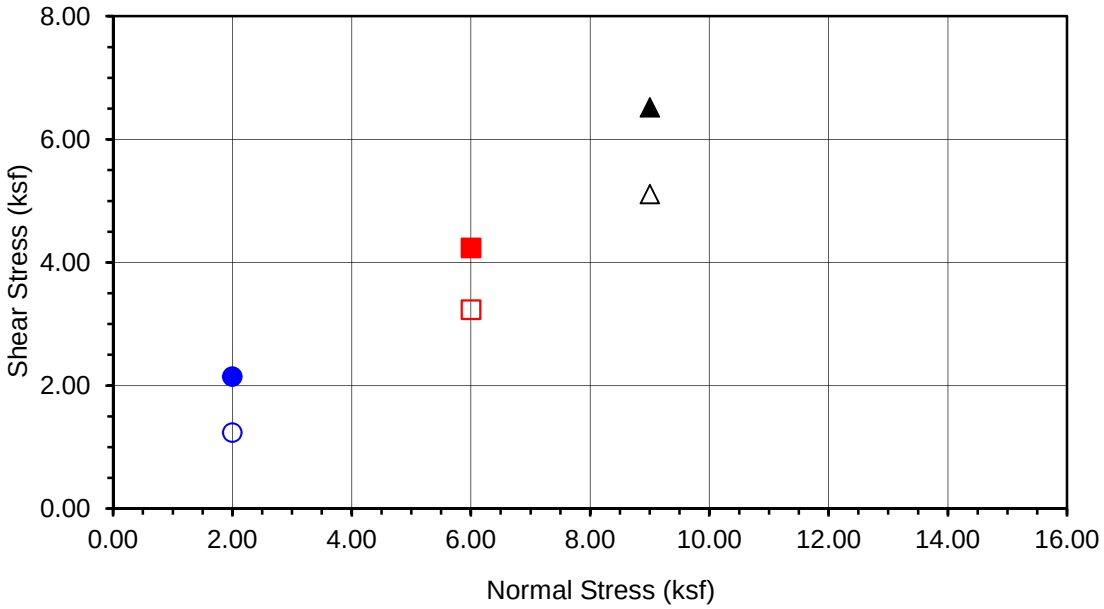

Boring No.	**B-4**
Sample No.	**R-7**
Depth (ft)	**70**
Sample Type:	
Ring	
Soil Identification:	
Olive lean clay'stone' (CL)	

Normal Stress (kip/ft²)	2.000	6.000	9.000
Peak Shear Stress (kip/ft²)	● 2.147	■ 4.235	▲ 6.517
Shear Stress @ End of Test (ksf)	○ 1.236	□ 3.232	△ 5.109
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	22.88	22.88	22.88
Dry Density (pcf)	102.0	102.5	102.7
Saturation (%)	94.7	95.9	96.4
Soil Height Before Shearing (in.)	0.9936	0.9846	0.9705
Final Moisture Content (%)	25.2	24.5	23.8

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

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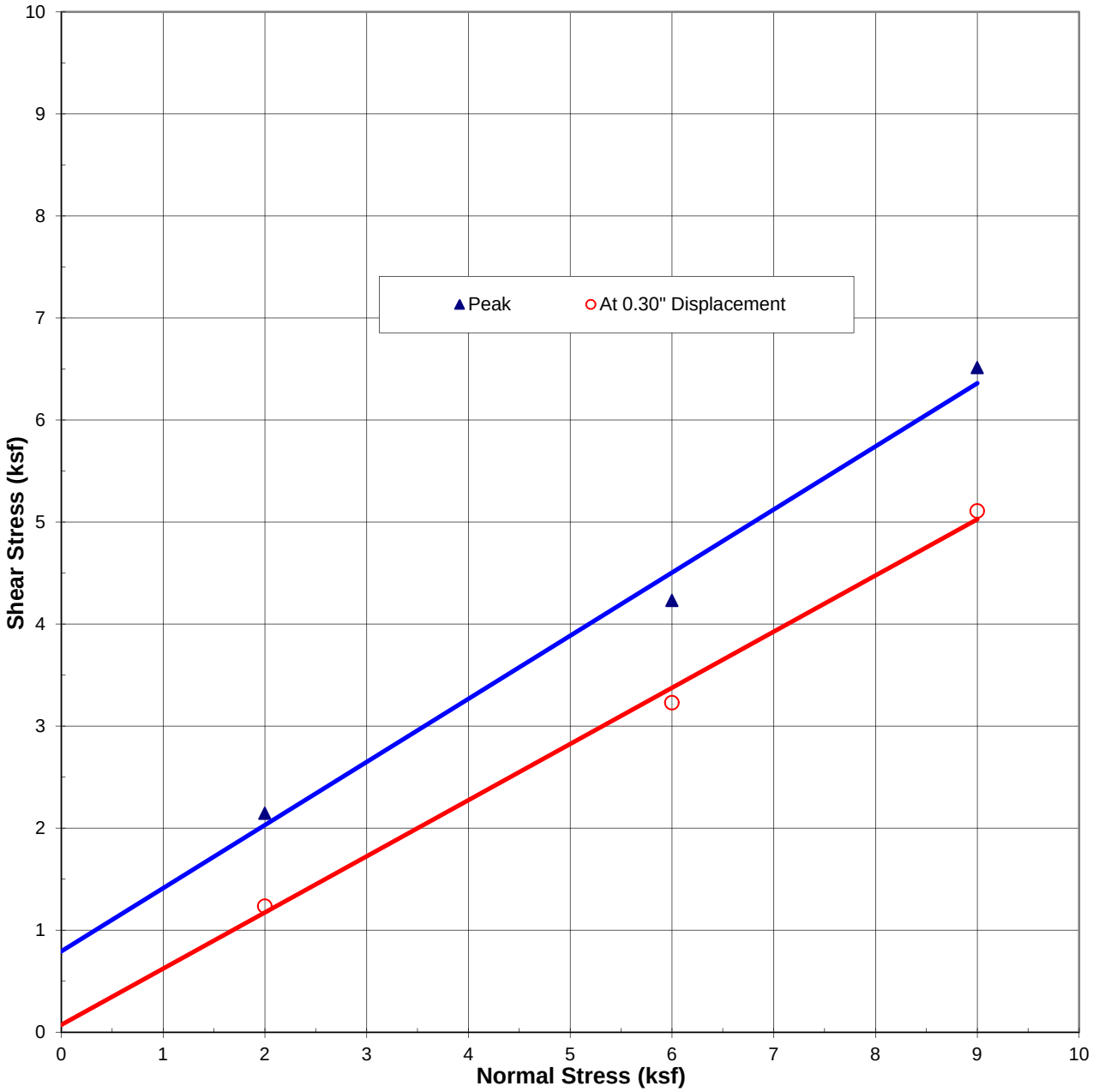

Tested Sample:

B-4 at 70 ft

Peak:		At 0.30" Displacement:	
31.7	Degrees	28.8	Degrees
0.8	ksf	0.07	ksf

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DIRECT SHEAR PLOT

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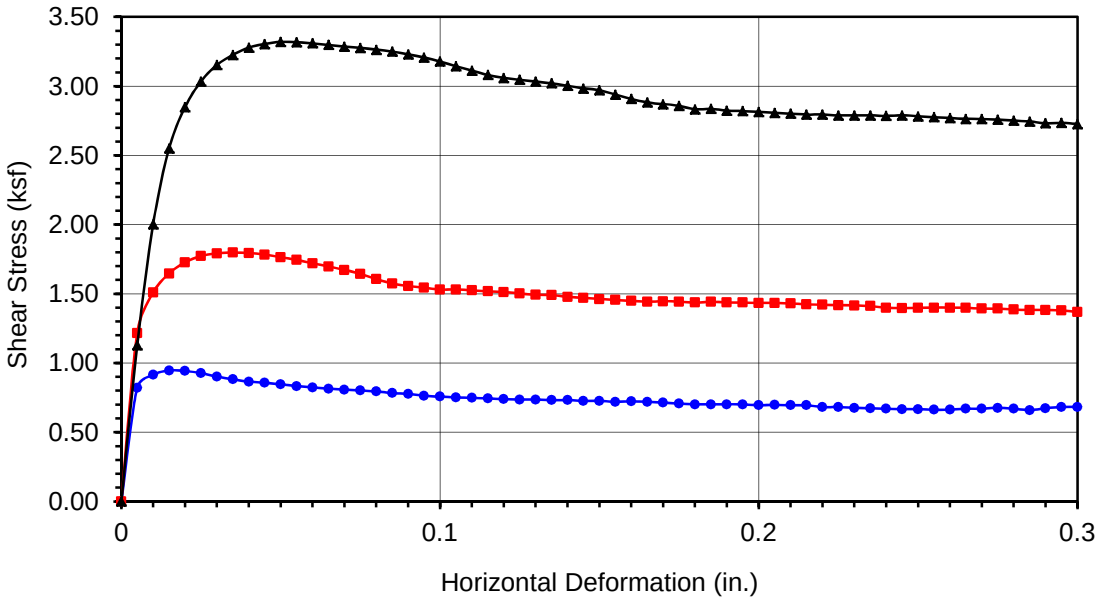

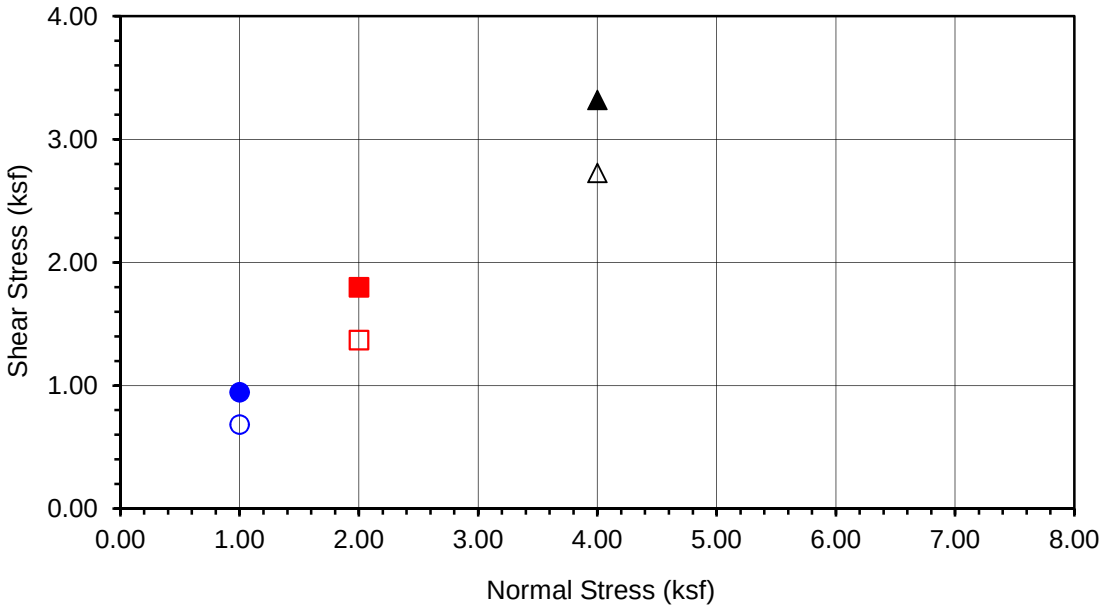

Boring No.	**HS-1**
Sample No.	**B-2**
Depth (ft)	**40-45**
Sample Type: 90% Remold	
Soil Identification: Light olive brown silty sand (SM)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.946	■ 1.798	▲ 3.320
Shear Stress @ End of Test (ksf)	○ 0.682	□ 1.368	△ 2.726
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	10.30	10.30	10.30
Dry Density (pcf)	113.3	113.2	113.2
Saturation (%)	57.0	56.9	56.9
Soil Height Before Shearing (in.)	0.9960	0.9897	0.9844
Final Moisture Content (%)	14.8	14.5	14.4

DIRECT SHEAR TEST RESULTS

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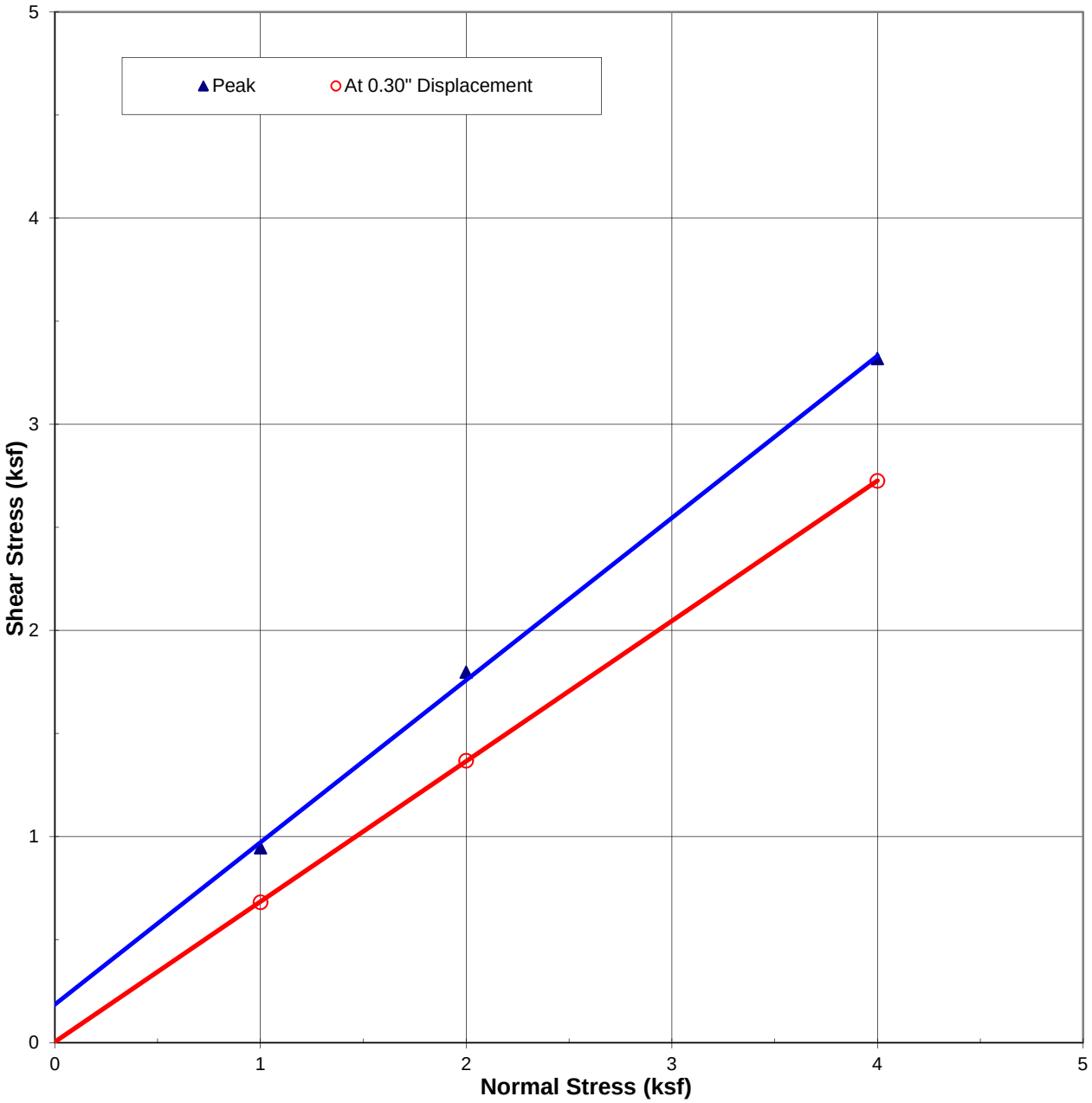
10-05



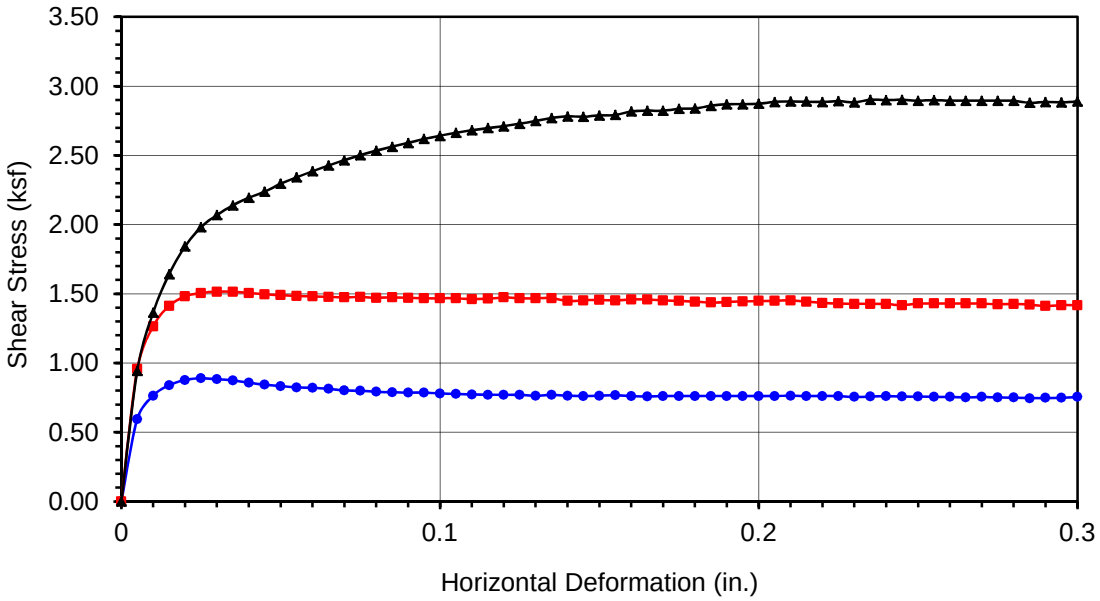
Tested Sample:

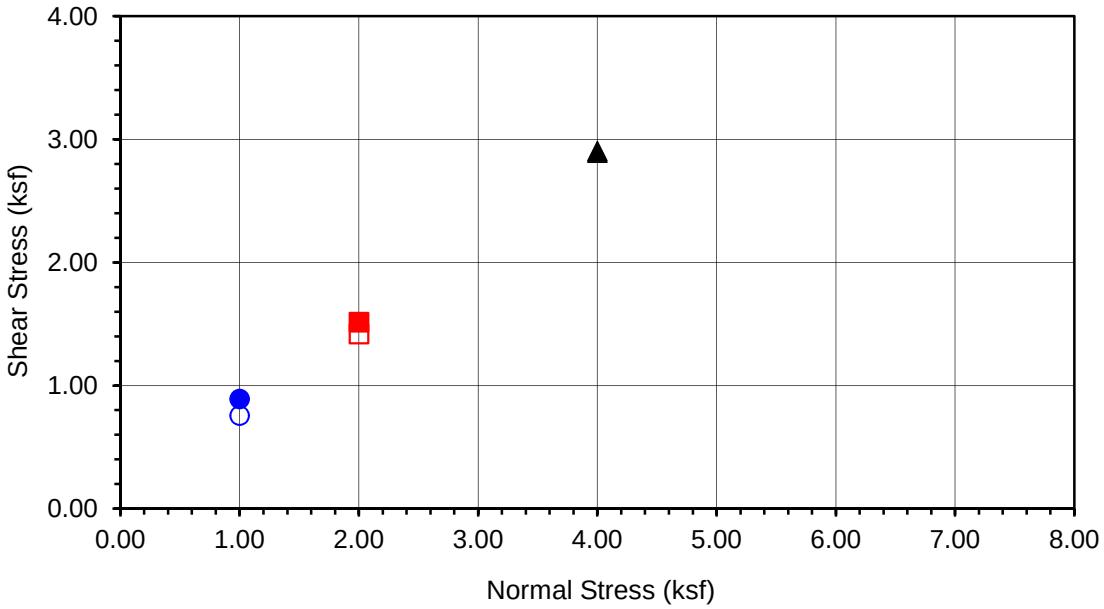
HS-1 at 40-45 ft (Af)

Peak:		At 0.30" Displacement:	
38.2	Degrees	34.3	Degrees
0.19	ksf	0.0	ksf

Samples Remolded to 90% R.C.

LGC Geotechnical, Inc.	**DIRECT SHEAR PLOT**	**Project Number:** 14057-01 **Date:** Jan-15
		Westridge / La Habra





Boring No.	**HS-3**
Sample No.	**B-1**
Depth (ft)	**15-20**
Sample Type: 90% Remold	
Soil Identification: Olive brown silty sand with gravel (SM)g	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.890	■ 1.515	▲ 2.902
Shear Stress @ End of Test (ksf)	○ 0.755	□ 1.418	△ 2.889
Deformation Rate (in./min.)	0.0025	0.0025	0.0025
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	6.77	6.77	6.77
Dry Density (pcf)	119.2	119.2	119.2
Saturation (%)	44.2	44.2	44.1
Soil Height Before Shearing (in.)	0.9939	0.9904	0.9820
Final Moisture Content (%)	12.6	12.2	11.8

DIRECT SHEAR TEST RESULTS

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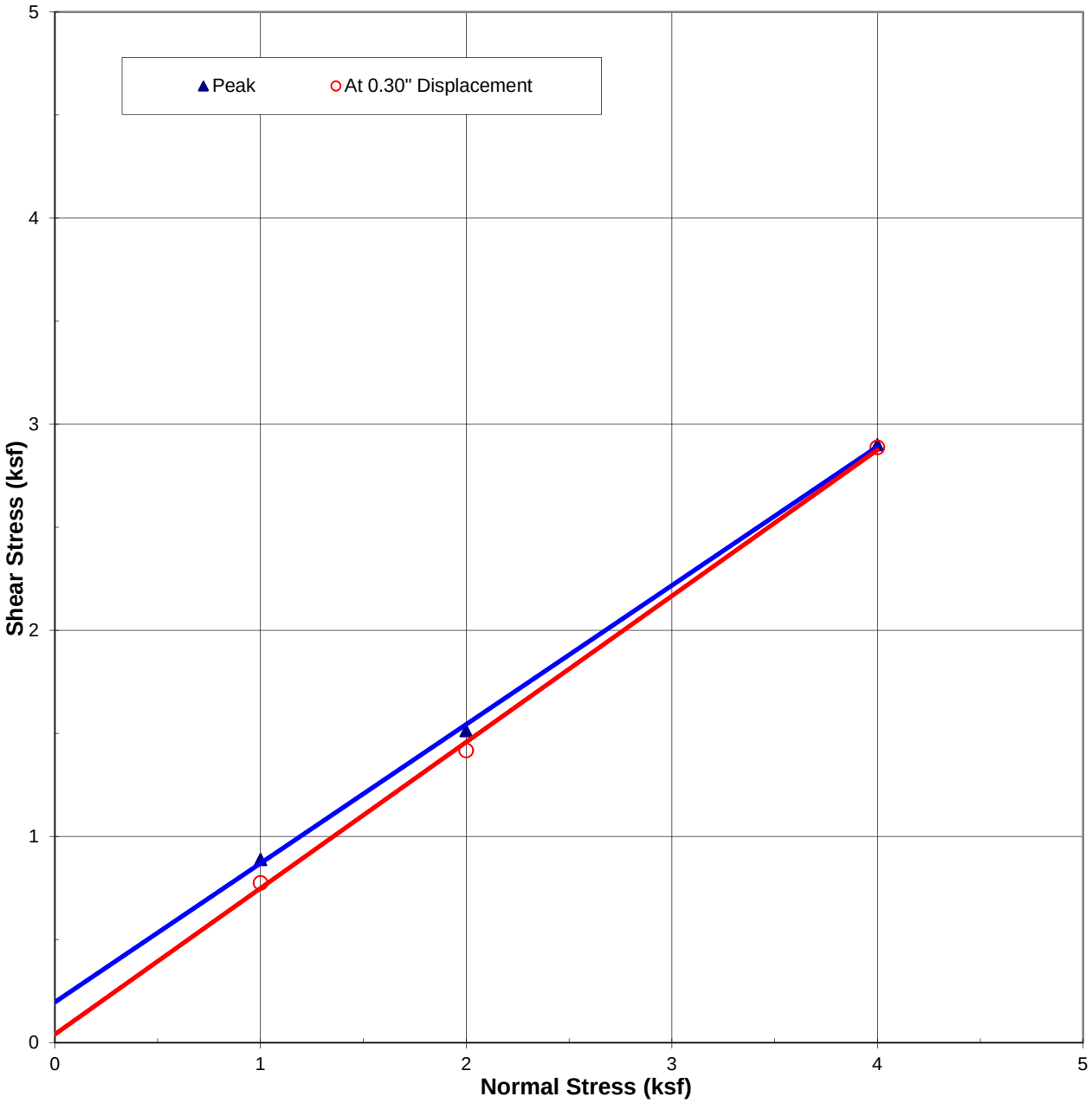


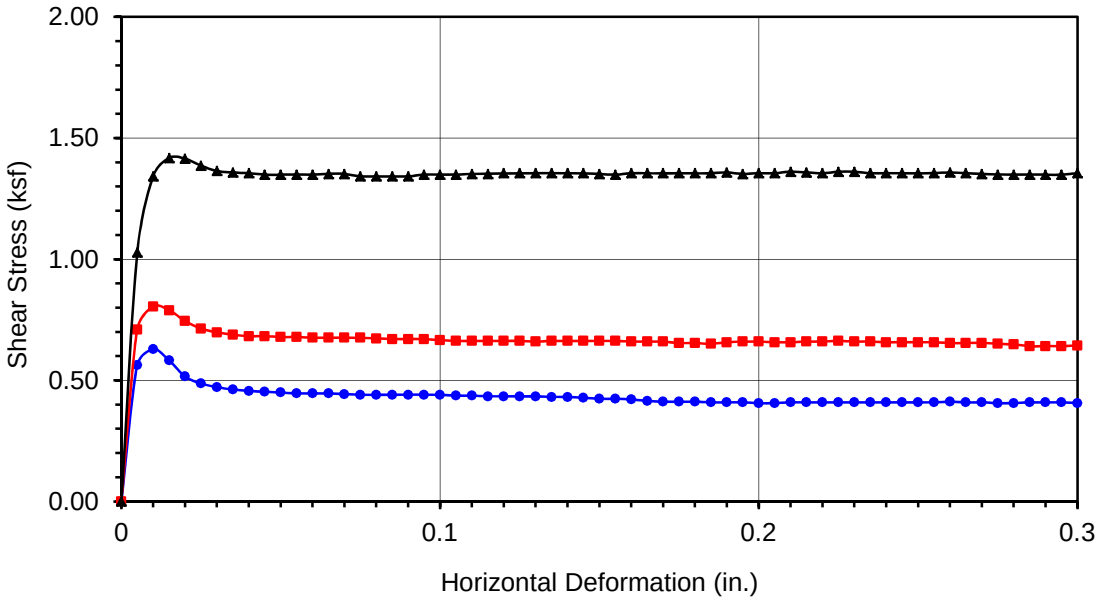
Tested Sample:

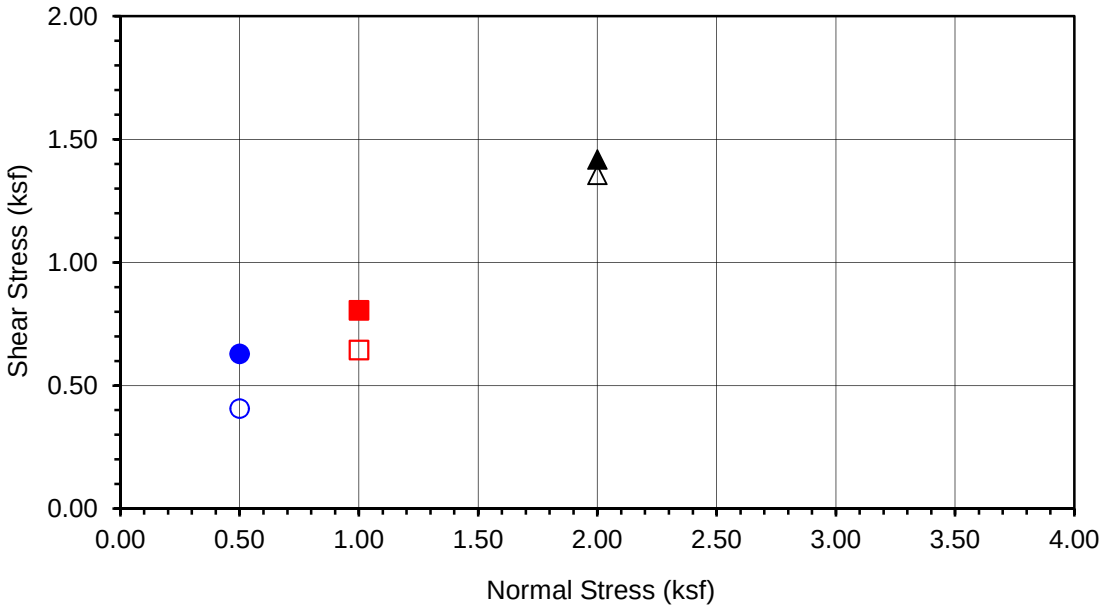
HS-3 at 15-20 ft (Af)

	Peak:	At 0.30" Displacement:
	34.0 Degrees	35.3 Degrees
	0.20 ksf	0.0 ksf

Samples Remolded to 90% R.C.

LGC Geotechnical, Inc.	**DIRECT SHEAR PLOT**	**Project Number:** 14057-01 **Date:** Jan-15
		Westridge / La Habra





Boring No.	**HS-17**
Sample No.	**B-1**
Depth (ft)	**5-7**
Sample Type: 90% Remold	
Soil Identification: Olive brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	0.500	1.000	2.000
Peak Shear Stress (kip/ft²)	● 0.629	■ 0.805	▲ 1.418
Shear Stress @ End of Test (ksf)	○ 0.406	□ 0.644	△ 1.355
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	9.51	9.51	9.51
Dry Density (pcf)	113.1	113.1	113.0
Saturation (%)	52.3	52.3	52.2
Soil Height Before Shearing (in.)	1.0059	0.9997	0.9901
Final Moisture Content (%)	16.8	16.5	16.1

DIRECT SHEAR TEST RESULTS

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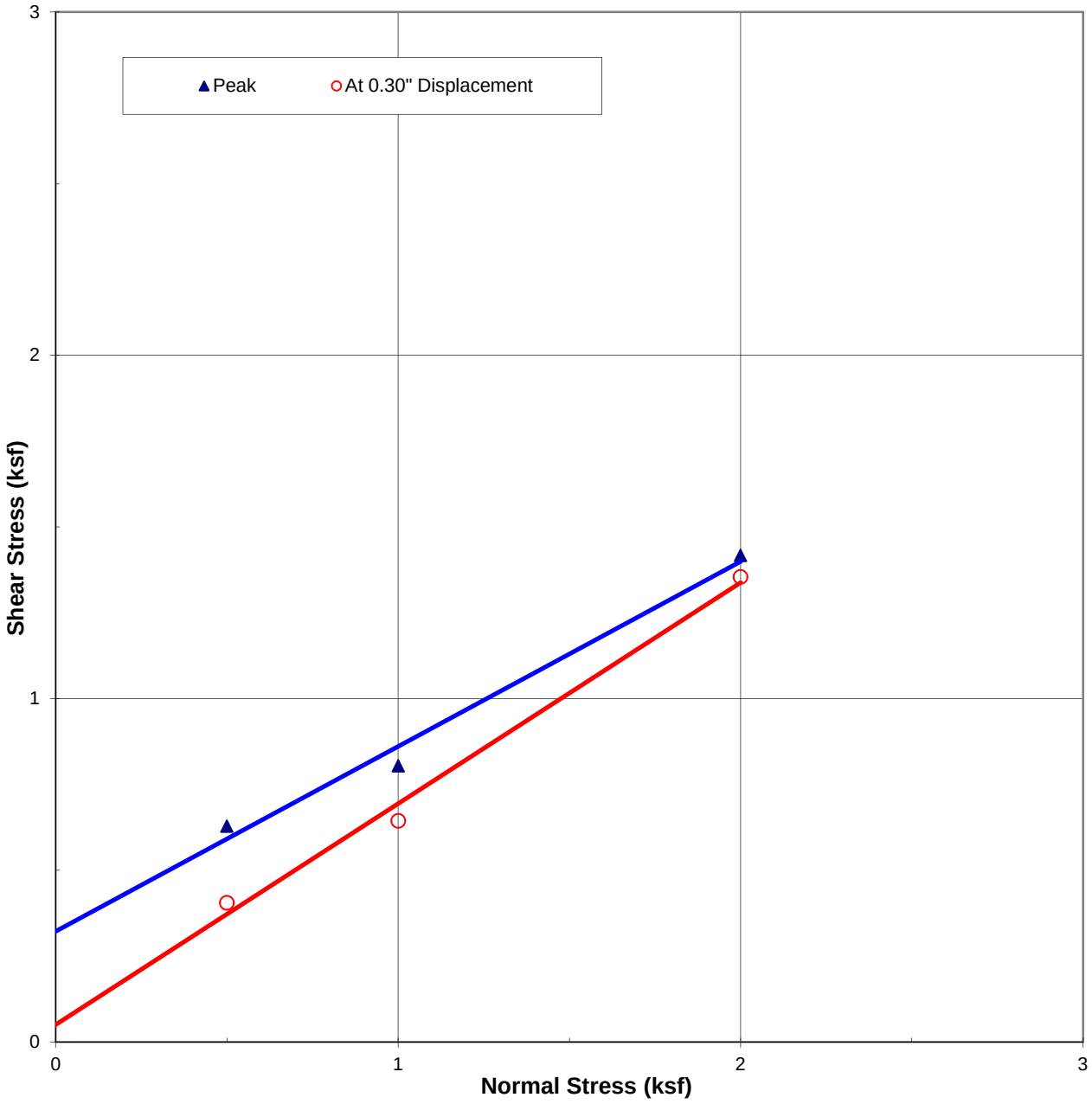

Tested Sample:

HS-17 at 5-7 ft (Af)

	Peak:	At 0.30" Displacement:
	28.3 Degrees	32.8 Degrees
	0.32 ksf	0.05 ksf

Samples Remolded to 90% R.C.

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DIRECT SHEAR PLOT

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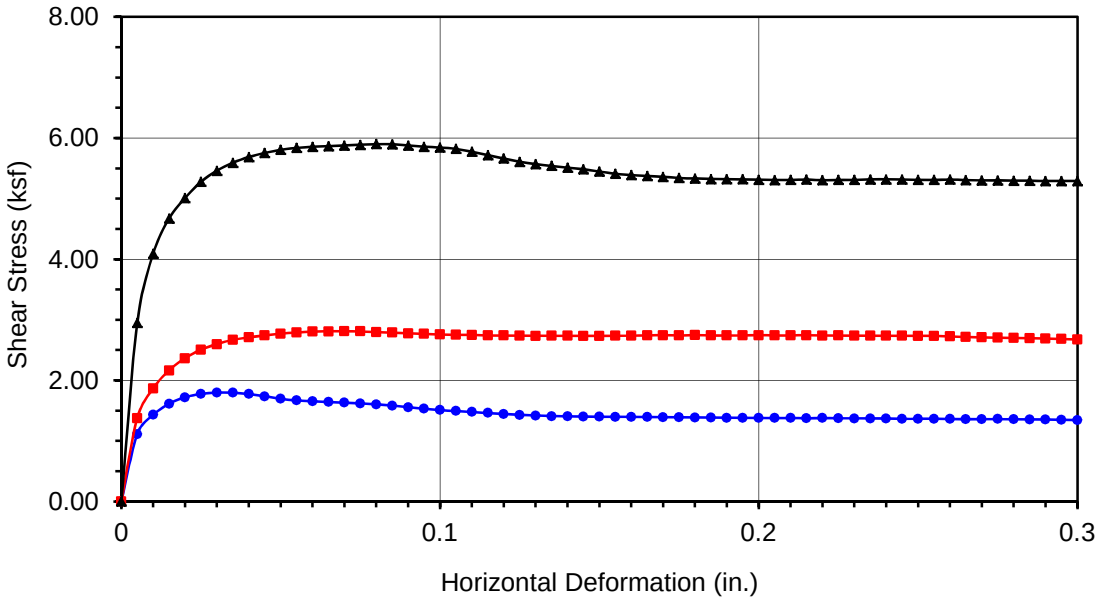
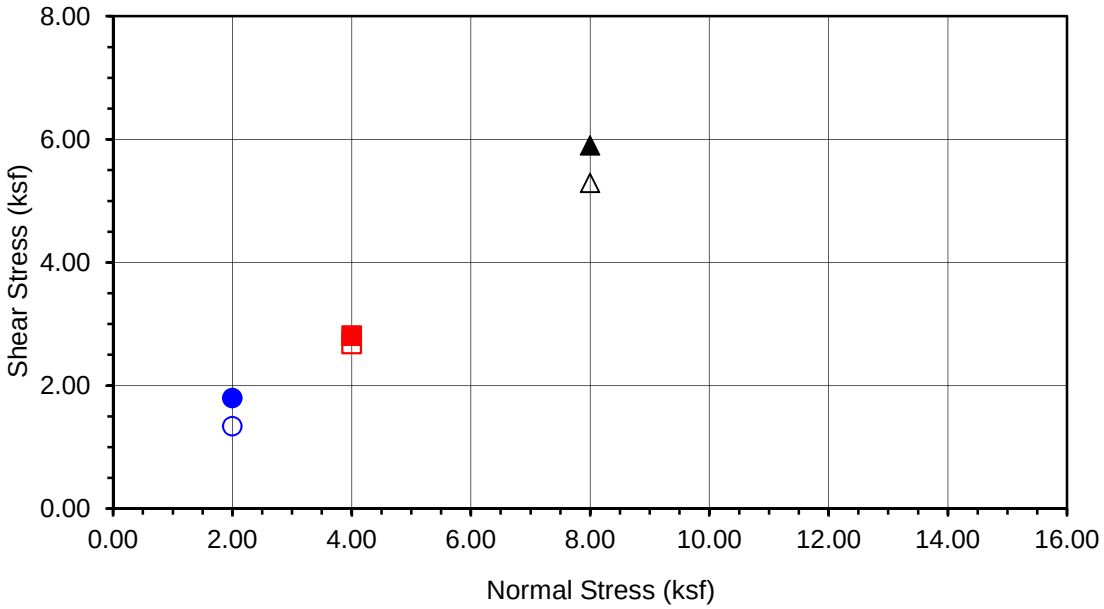
Westridge / La Habra





Boring No.	**B-3**
Sample No.	**B-1**
Depth (ft)	**30-33**
Sample Type: 90% Remold	
Soil Identification: Light olive brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.795	■ 2.811	▲ 5.901
Shear Stress @ End of Test (ksf)	○ 1.342	□ 2.675	△ 5.291
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	14.58	14.58	14.58
Dry Density (pcf)	103.5	103.5	103.5
Saturation (%)	62.6	62.6	62.6
Soil Height Before Shearing (in.)	0.9922	0.9862	0.9804
Final Moisture Content (%)	21.3	20.7	19.6

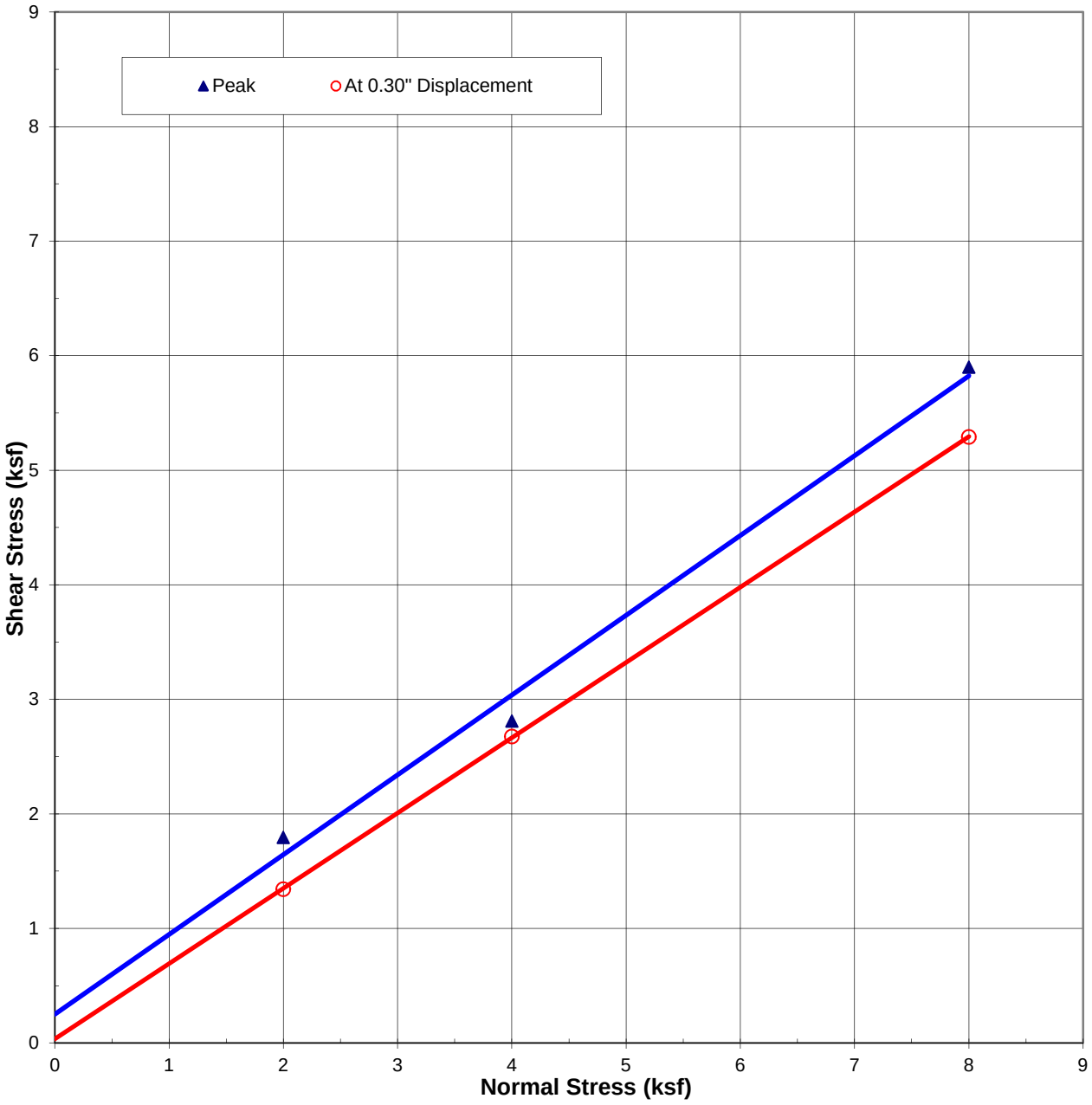
DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 14057-01

La Habra

02-15



Tested Sample:

B-3 at 30-33 ft (Af)

Peak:		At 0.30" Displacement:	
34.9	Degrees	33.3	Degrees
0.25	ksf	0.03	ksf

Samples Remolded to 90% R.C.

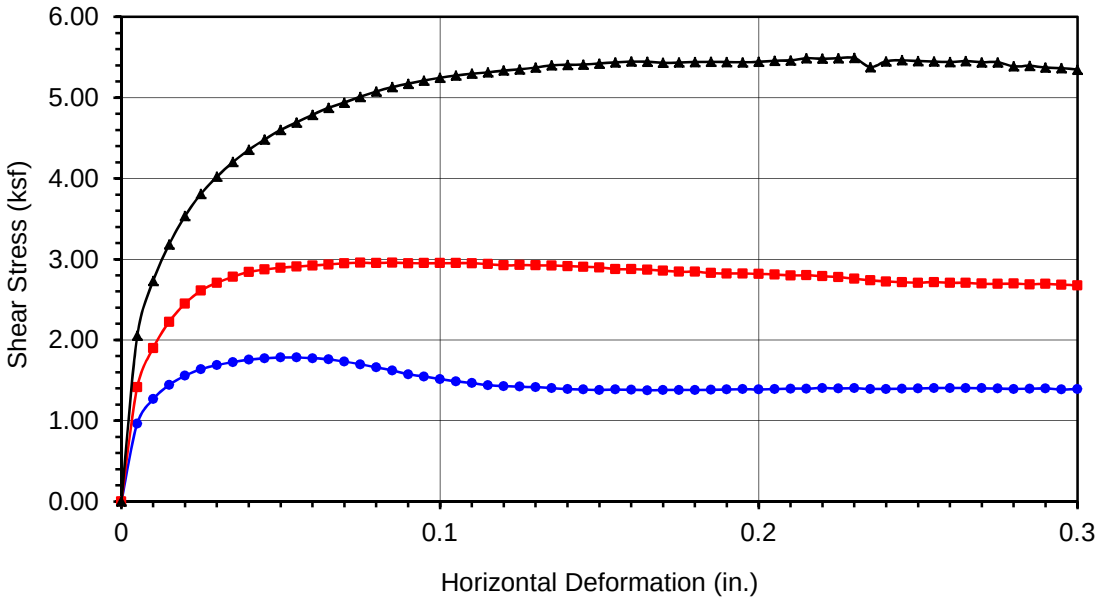
LGC Geotechnical, Inc.

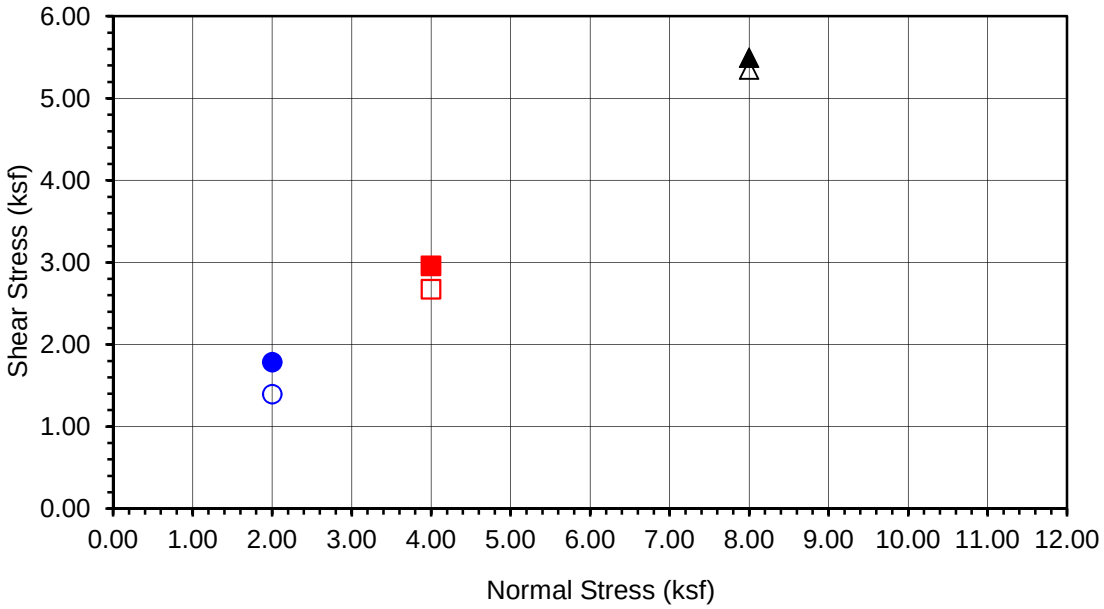
DIRECT SHEAR PLOT

Project Number: 14057-01

Date: Feb-15

Westridge / La Habra





Boring No.	**B-4**
Sample No.	**B-1**
Depth (ft)	**35-40**
Sample Type: 90% Remold	
Soil Identification: Light olive brown silty sand (SM)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.783	■ 2.958	▲ 5.492
Shear Stress @ End of Test (ksf)	○ 1.393	□ 2.675	△ 5.348
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	11.62	11.62	11.62
Dry Density (pcf)	108.0	108.0	108.0
Saturation (%)	55.9	55.9	55.9
Soil Height Before Shearing (in.)	0.9892	0.9851	0.9711
Final Moisture Content (%)	16.9	16.3	15.4

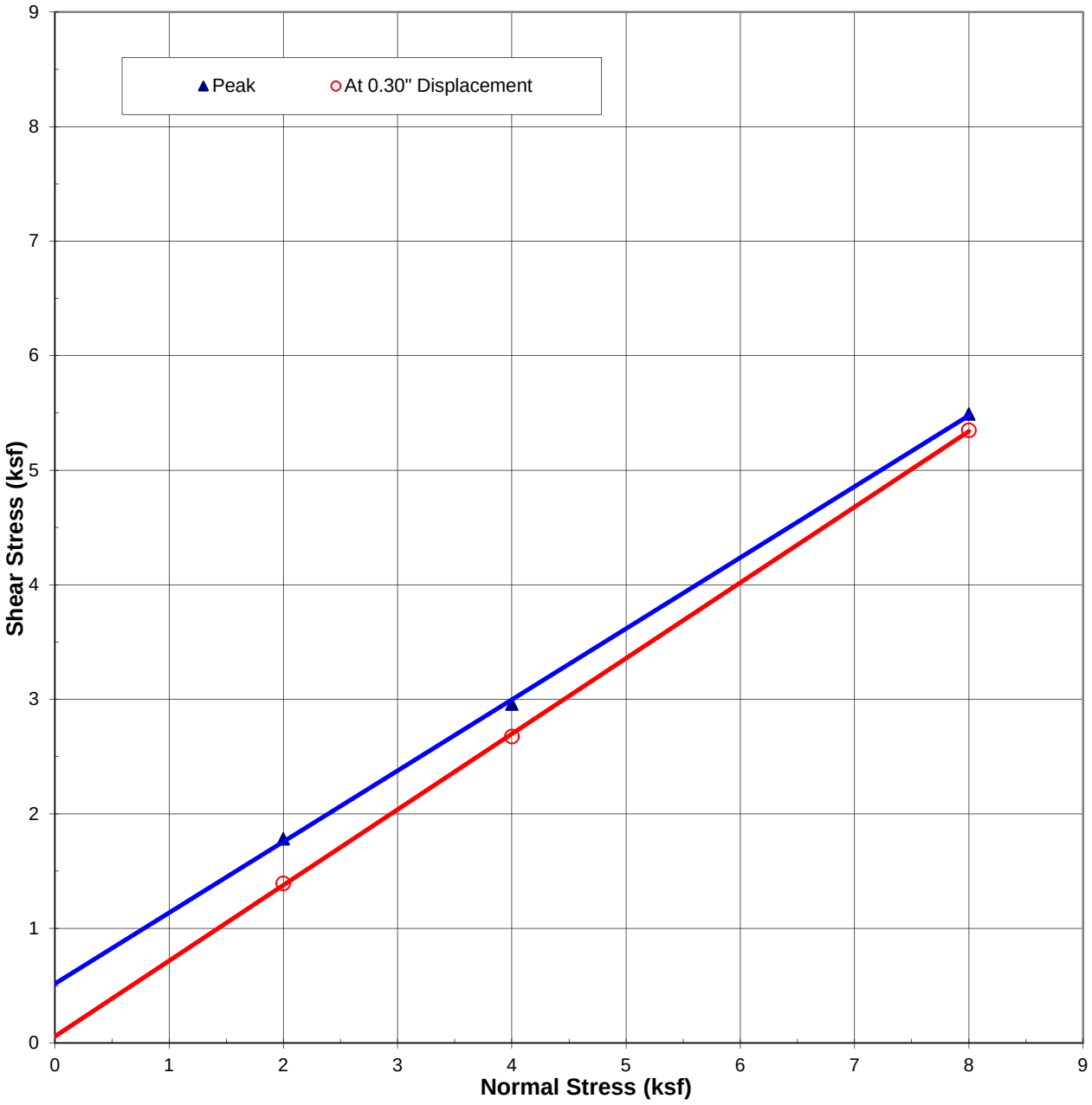
DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 14057-01

La Habra

03-15



Tested Sample:

B-4 at 35-40 ft (Af)

	Peak:	At 0.30" Displacement:
	31.8 Degrees	33.4 Degrees
	0.52 ksf	0.06 ksf

Samples Remolded to 90% R.C.

LGC Geotechnical, Inc.

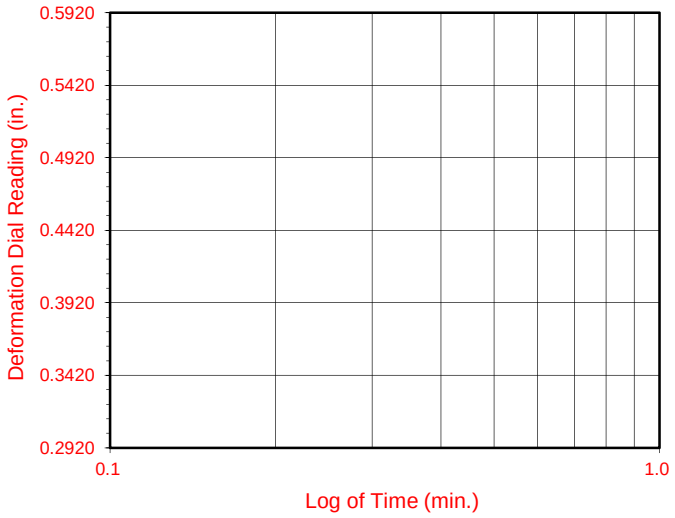
DIRECT SHEAR PLOT

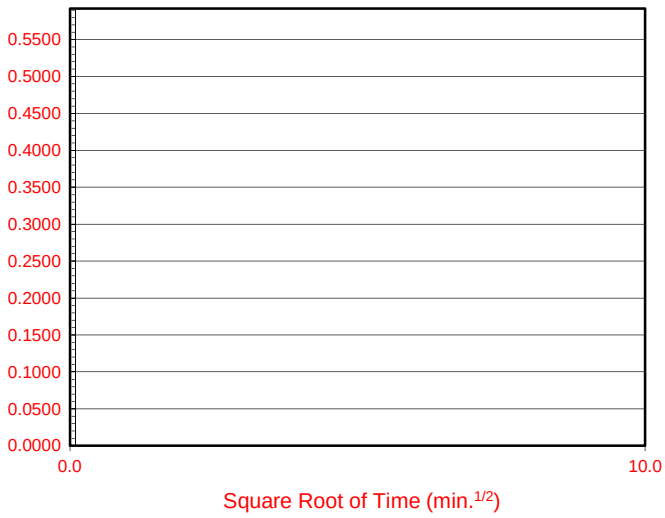
Project Number: 14057-01

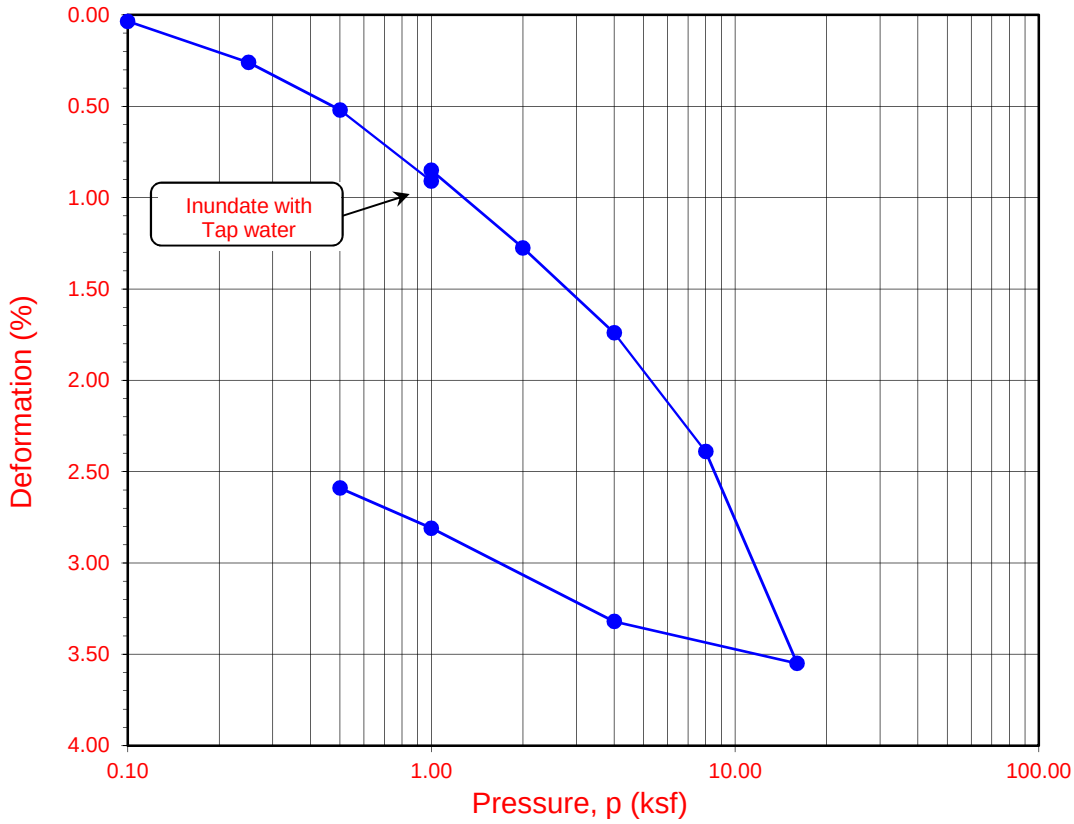
Date: Mar-15

Westridge / La Habra

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-3	**R-3**	**10.0**	**11.6**	**13.2**	**118.1**	**120.9**	**0.428**	**0.391**	**73**	**91**

Soil Identification: Dark grayish brown lean clay (CL)

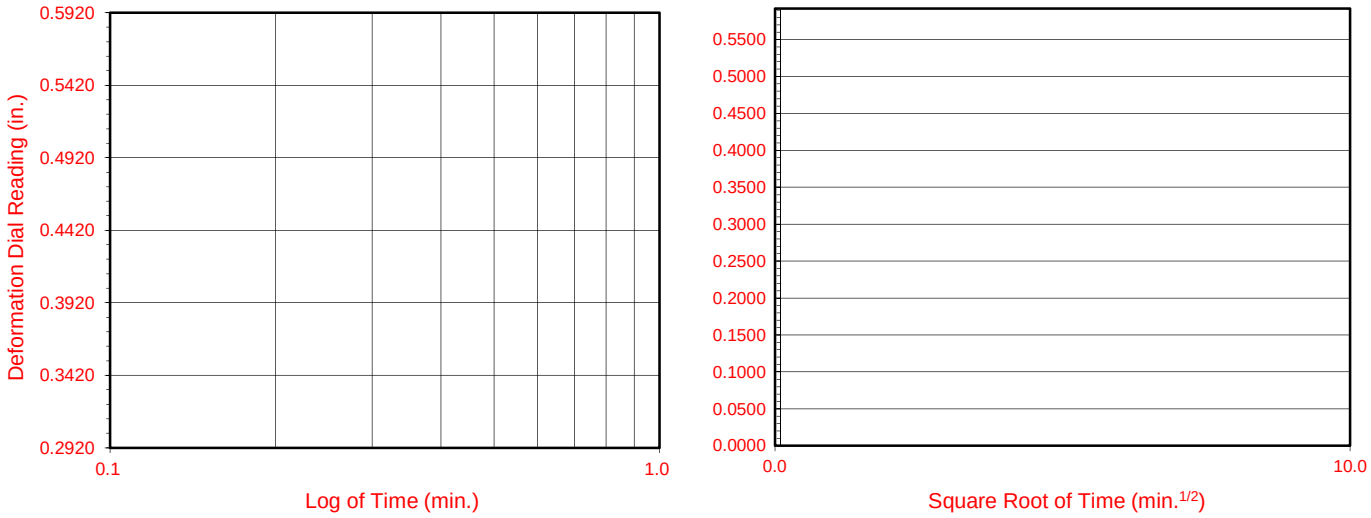
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

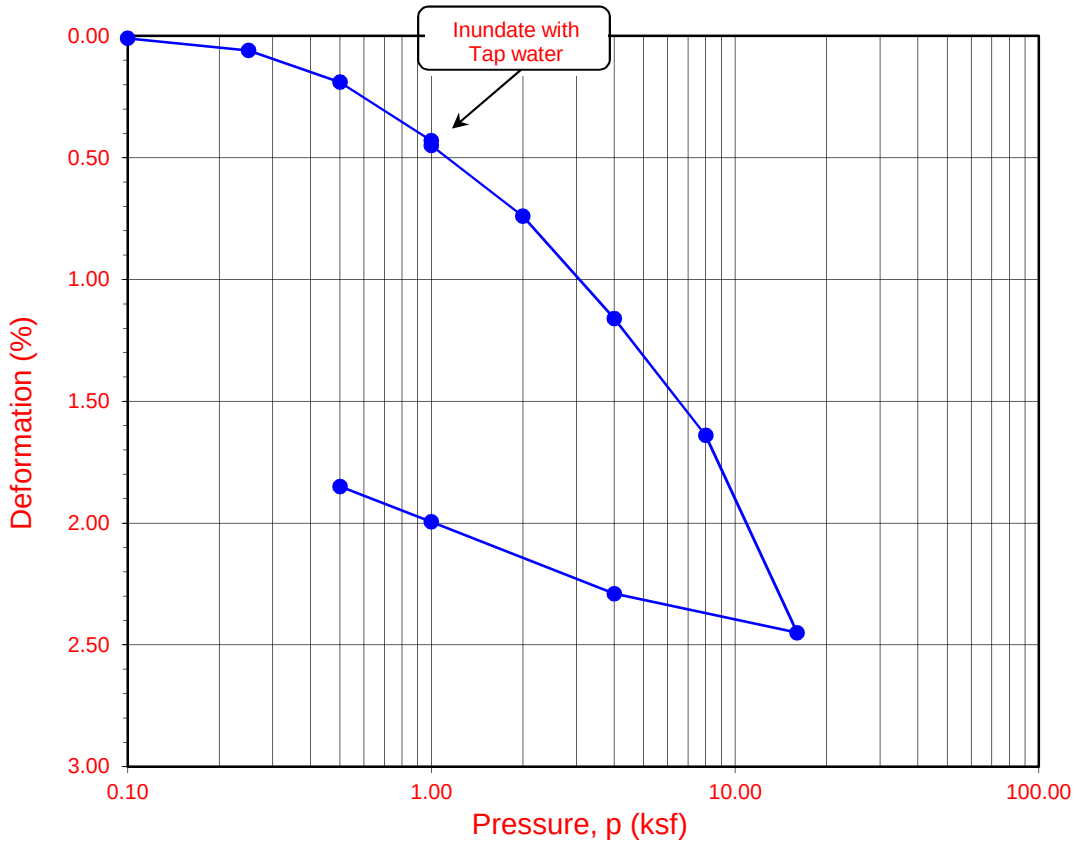
Project No.: 14057-01

La Habra

08-14

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-3	**R-4**	**15.0**	**9.7**	**13.1**	**115.1**	**118.1**	**0.464**	**0.437**	**57**	**83**

Soil Identification: Dark yellowish brown sandy lean clay s(CL)

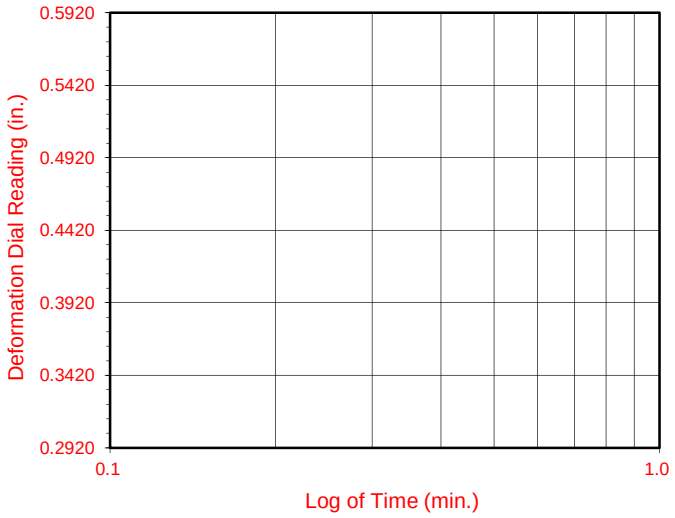
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

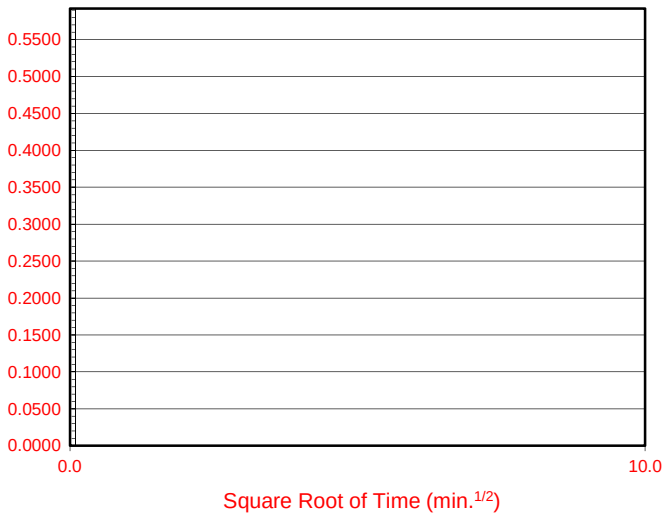
Project No.: 14057-01

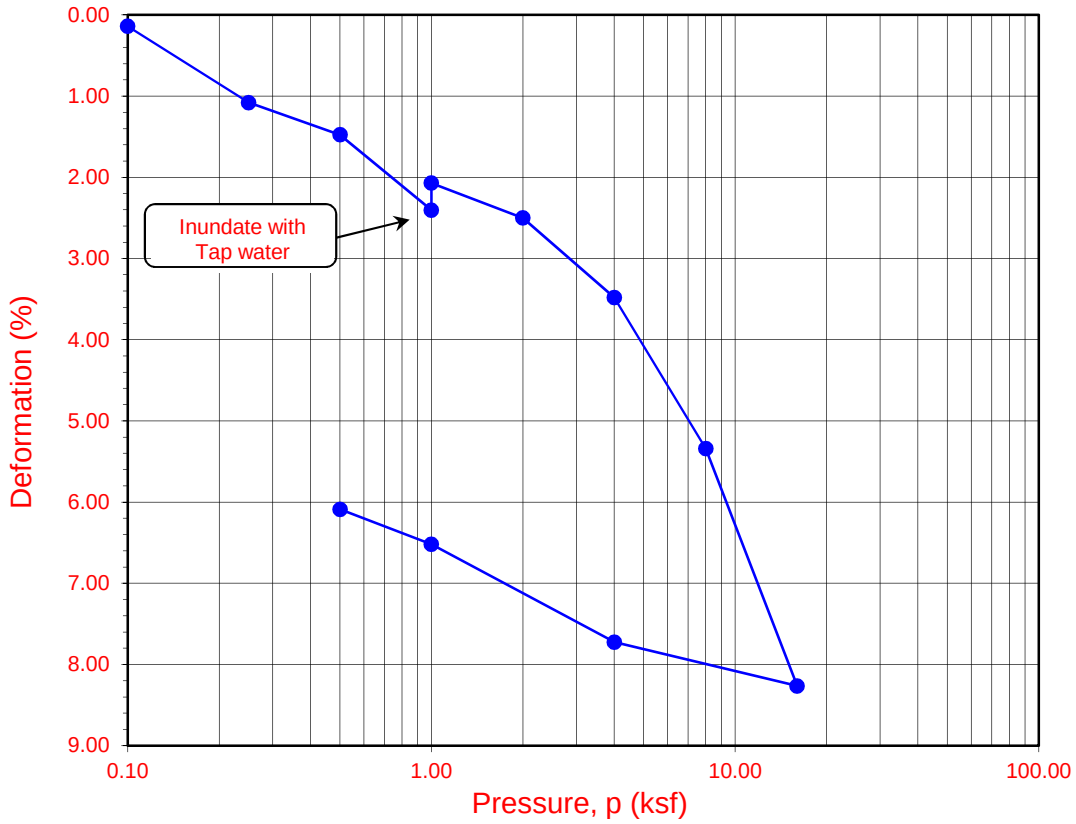
La Habra

08-14

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-3	**R-6**	**25.0**	**21.3**	**19.5**	**103.2**	**109.7**	**0.634**	**0.535**	**91**	**98**

Soil Identification: Dark yellowish brown lean clay (CL)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 14057-01

La Habra

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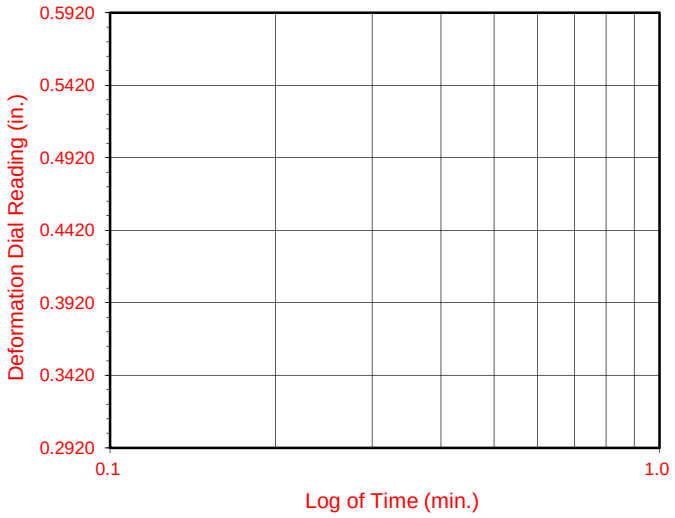
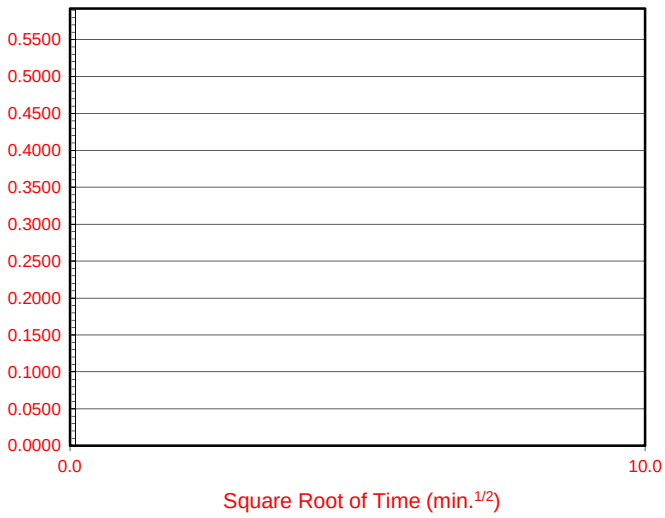
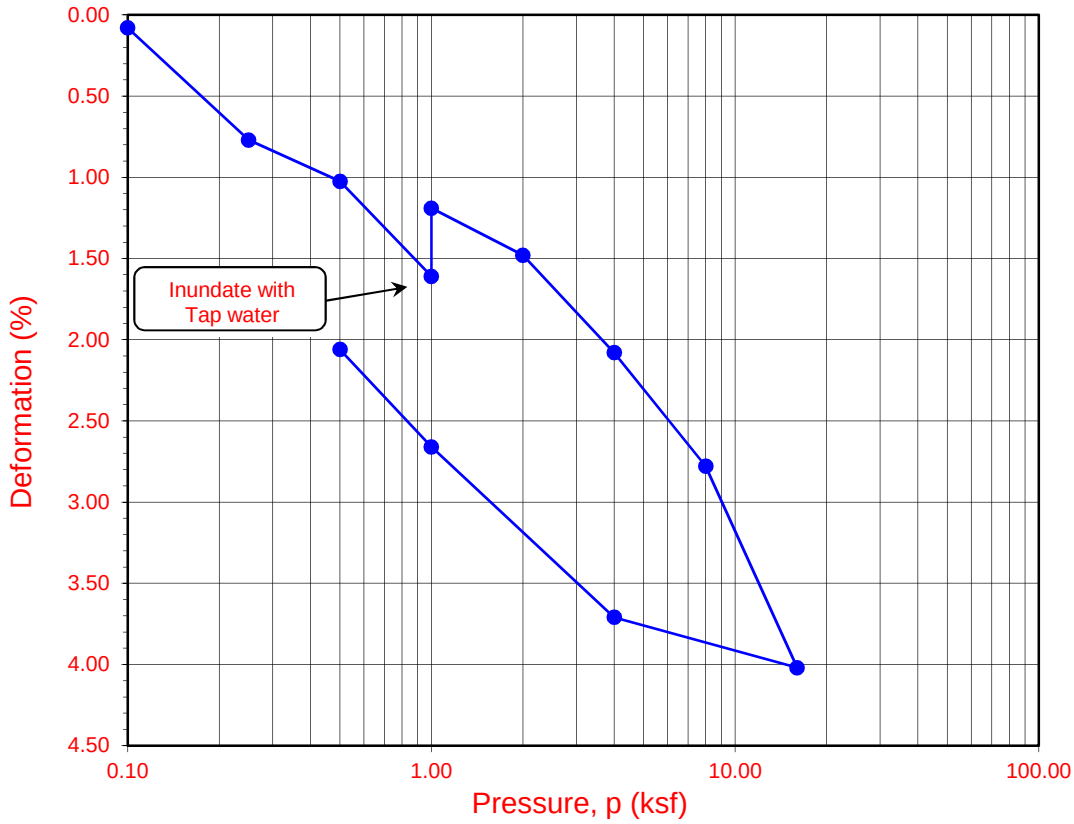
No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-12	**R-4**	**40.0**	**14.8**	**15.1**	**115.7**	**117.8**	**0.457**	**0.427**	**88**	**95**

Soil Identification: Dark grayish brown lean clay with sand (CL)s

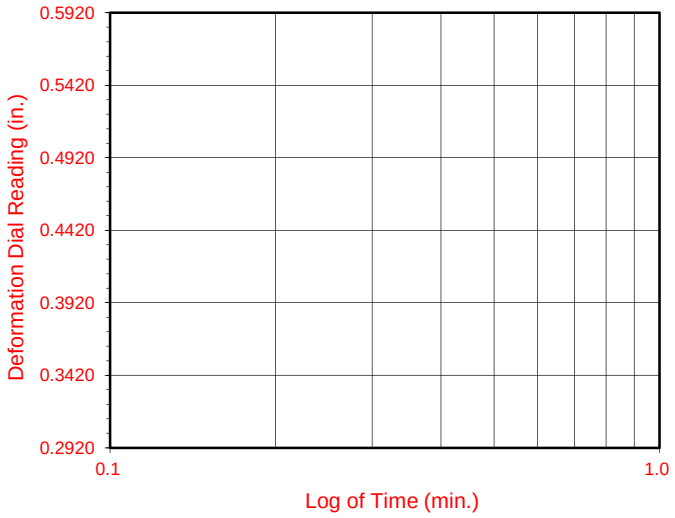
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

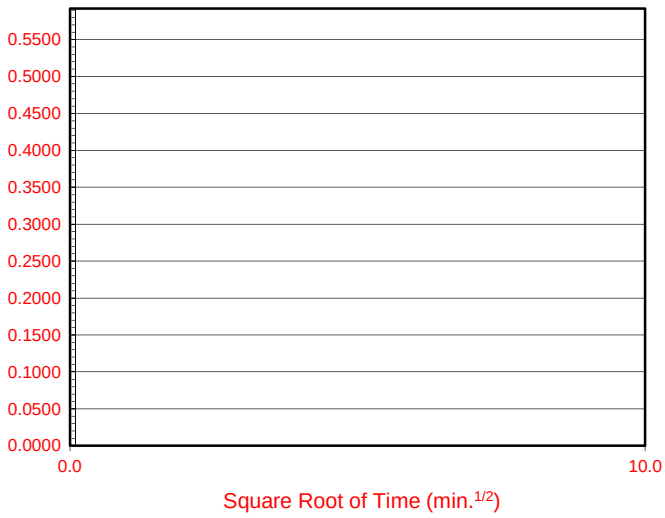
Project No.: 14057-01

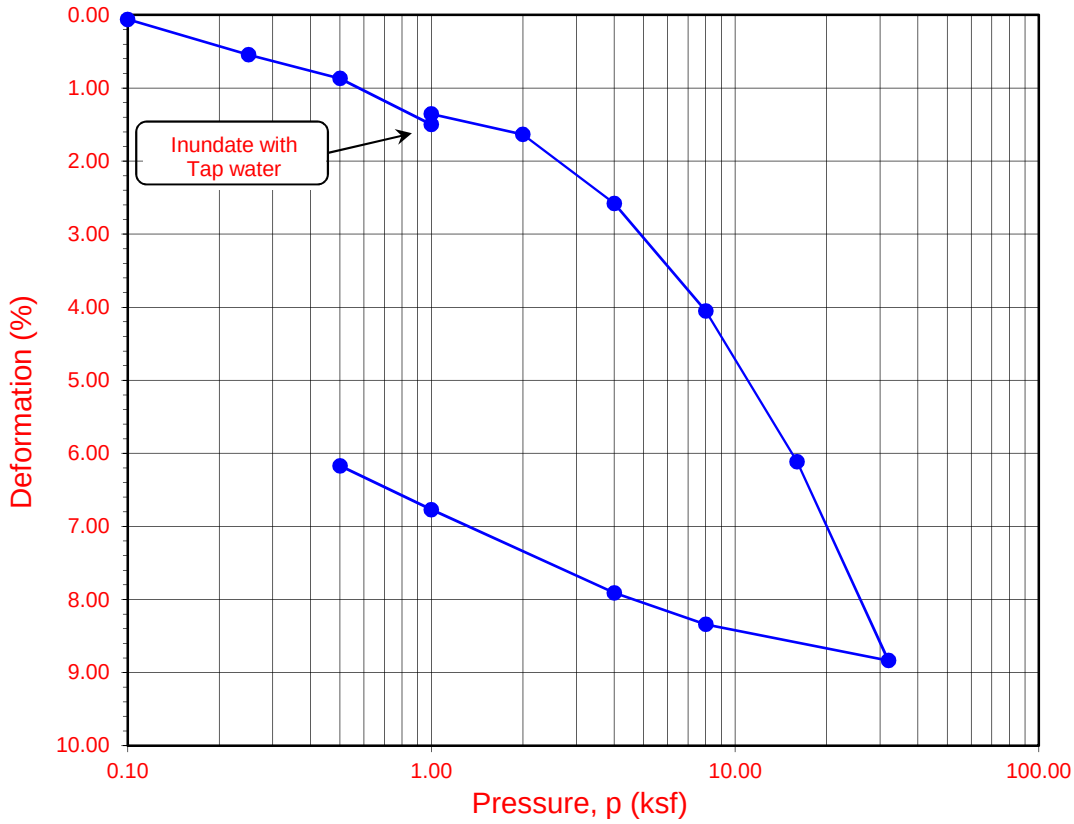
La Habra

08-14

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-12	**R-6**	**50.0**	**25.7**	**22.6**	**97.5**	**103.7**	**0.729**	**0.623**	**95**	**98**

Soil Identification: Olive gray lean clay (CL)

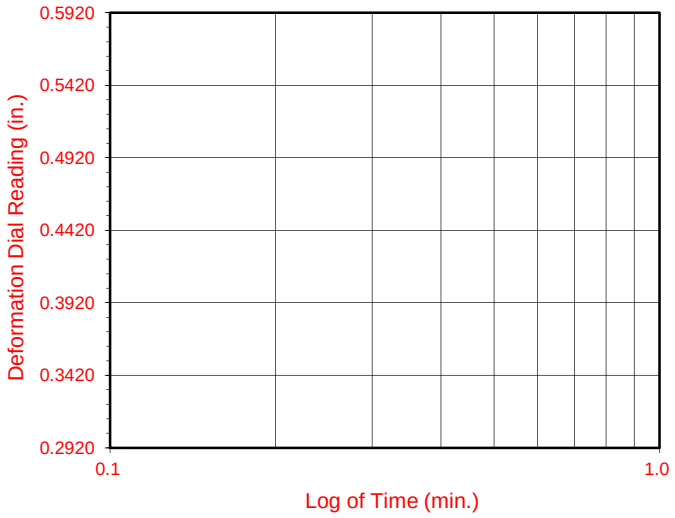
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

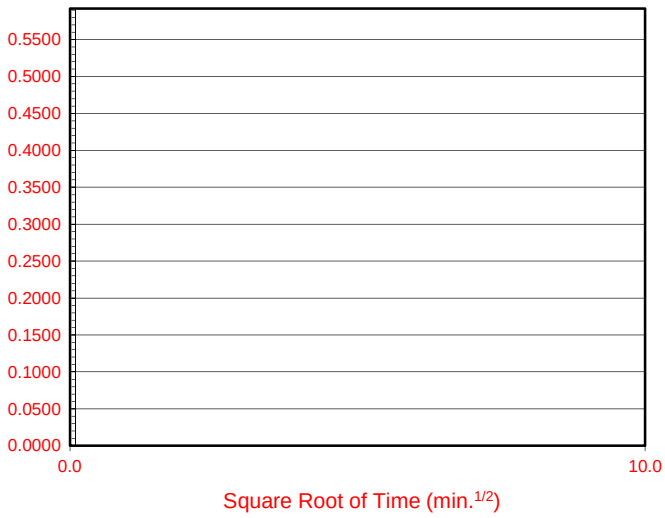
Project No.: 14057-01

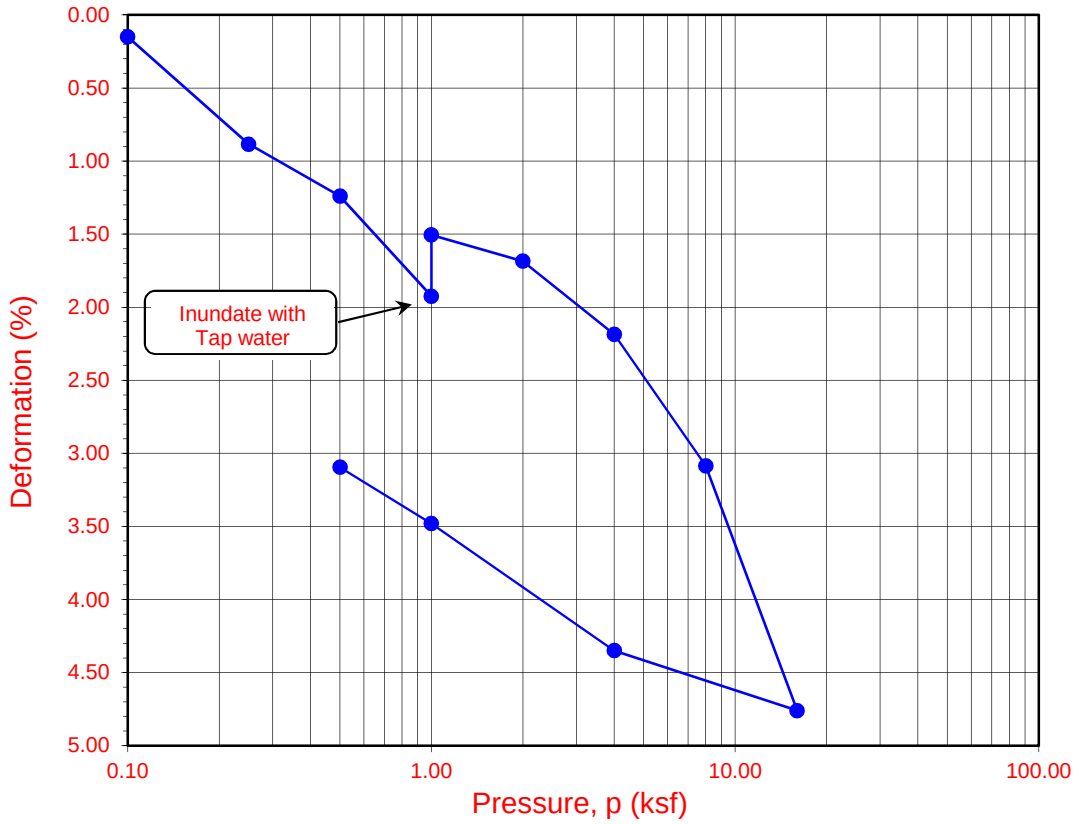
La Habra

08-14

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-14	**R-2**	**10.0**	**21.4**	**18.5**	**107.5**	**112.5**	**0.580**	**0.531**	**100**	**99**

Soil Identification: Dark olive gray lean clay (CL)

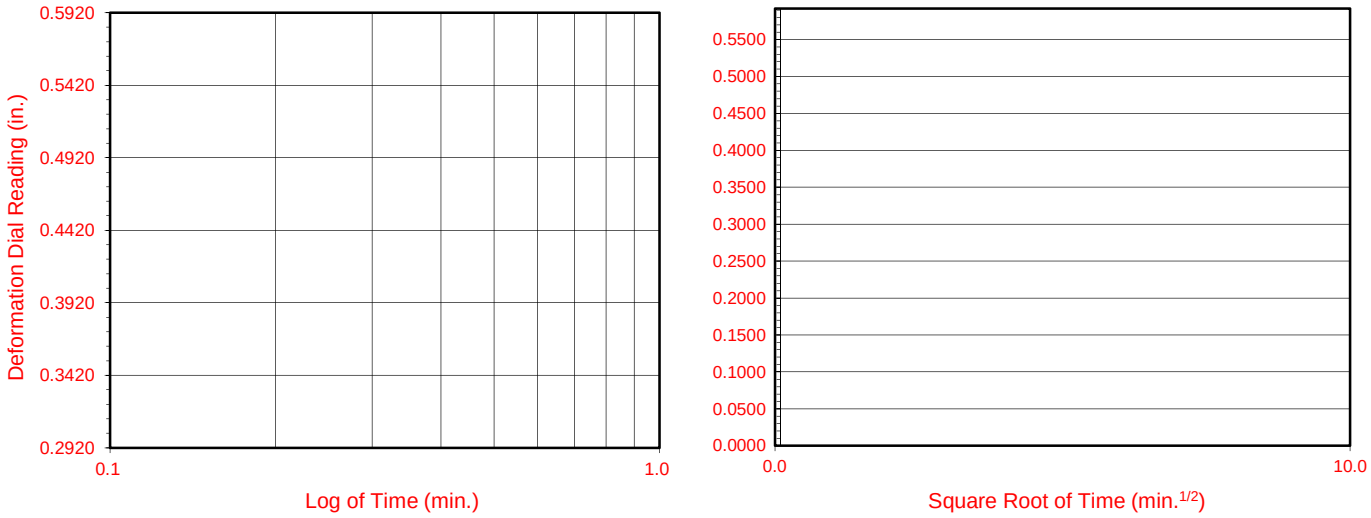
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

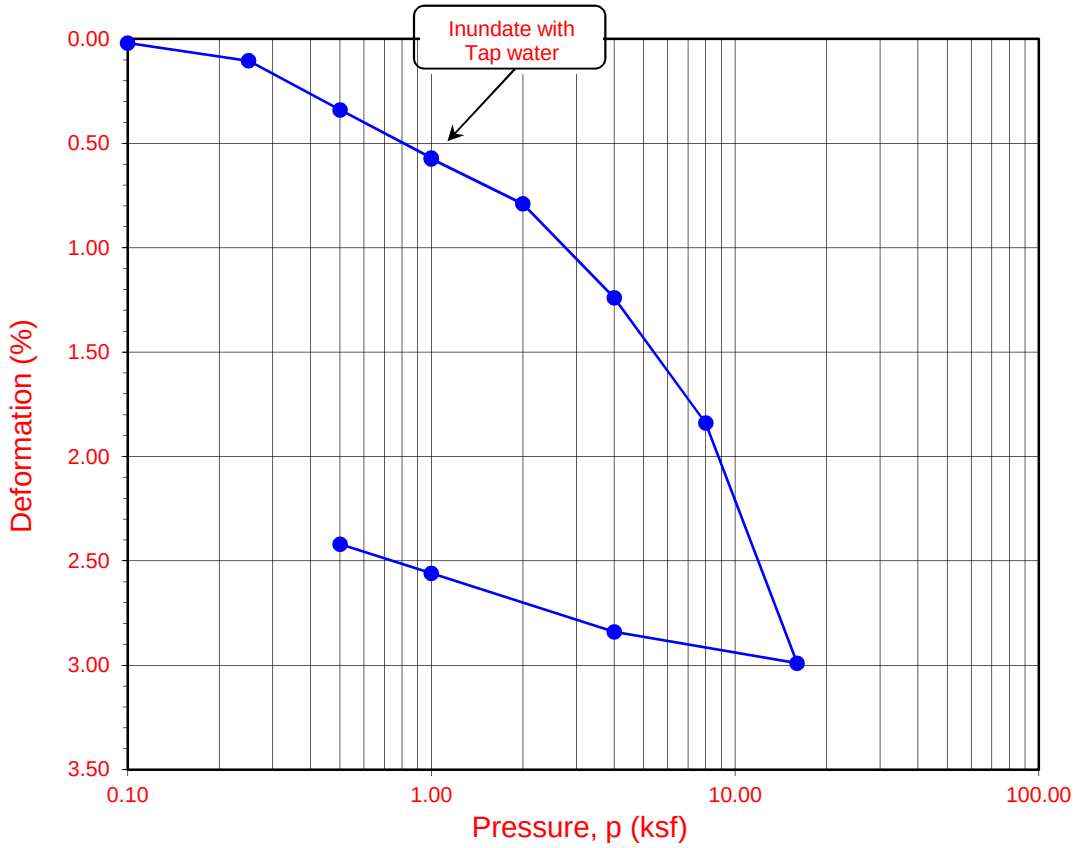
Project No.: 14057-01

La Habra

08-14

No Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-14	**R-4**	**20.0**	**9.1**	**13.4**	**115.3**	**117.8**	**0.462**	**0.427**	**53**	**84**

Soil Identification: Olive brown clayey sand (SC)

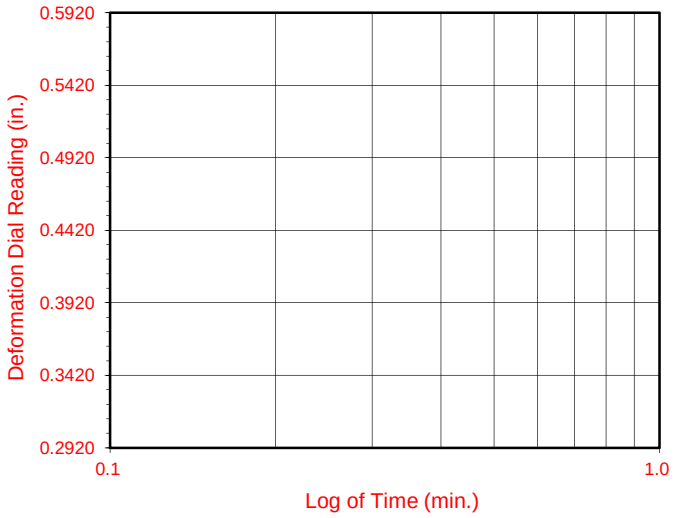
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

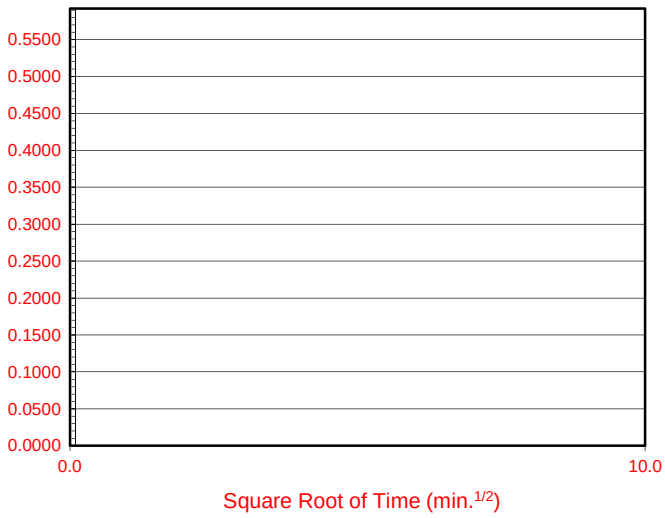
Project No.: 14057-01

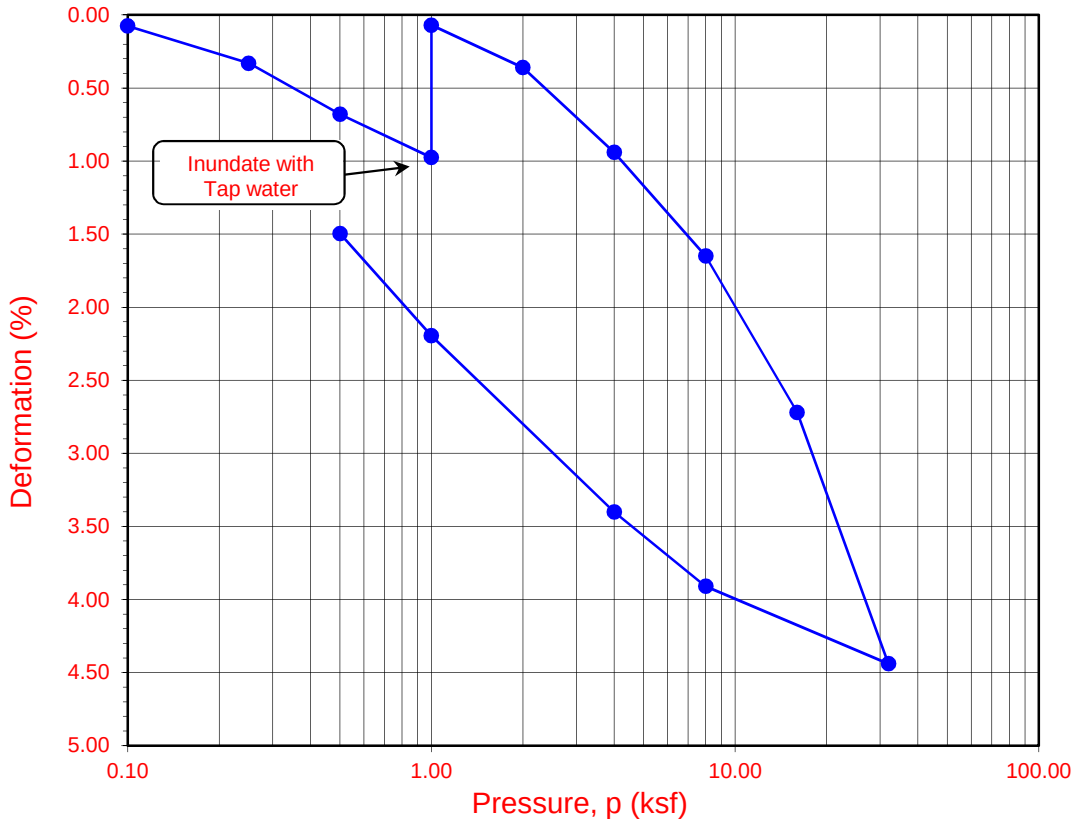
La Habra

08-14

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-15	**R-5**	**25.0**	**13.4**	**14.8**	**119.2**	**120.5**	**0.414**	**0.393**	**88**	**100**

Soil Identification: Olive brown clayey sand (SC)

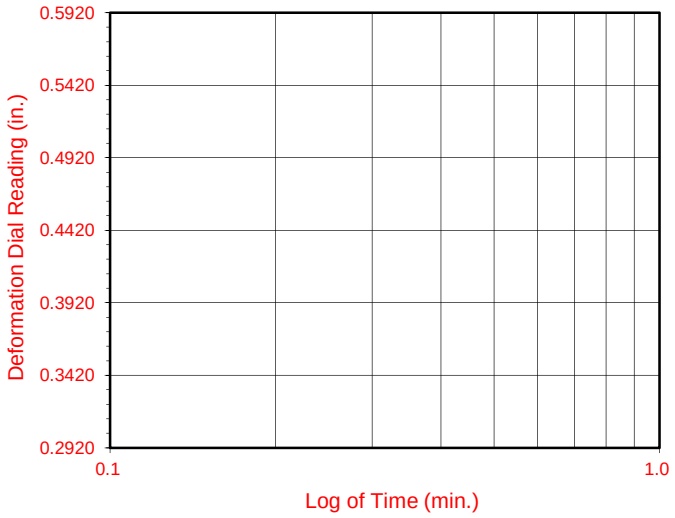
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

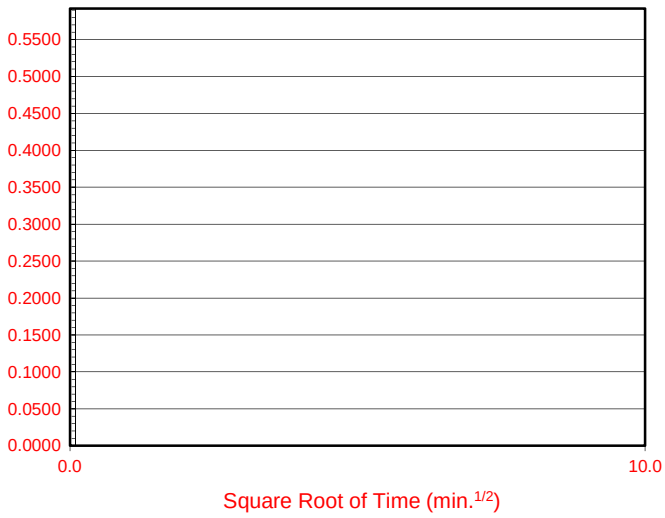
Project No.: 14057-01

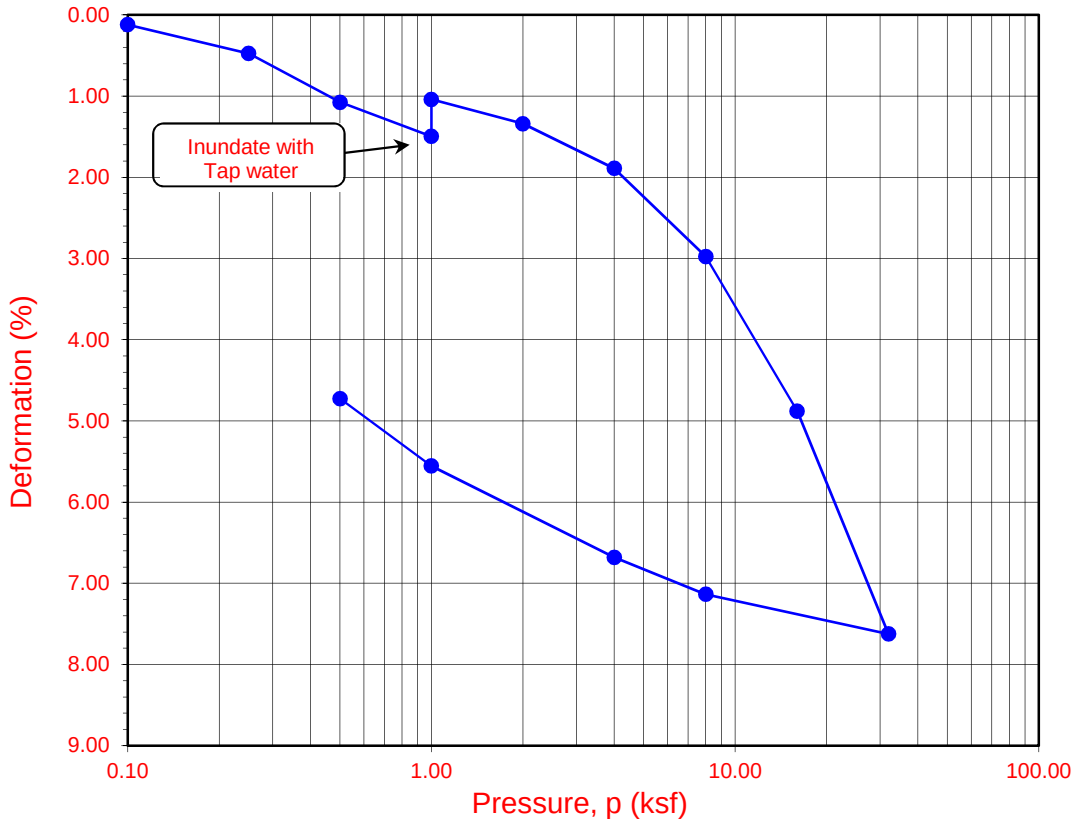
La Habra

03-15

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-16	**R-4**	**20.0**	**16.4**	**16.4**	**112.0**	**116.9**	**0.505**	**0.434**	**88**	**100**

Soil Identification: Brown lean clay (CL)

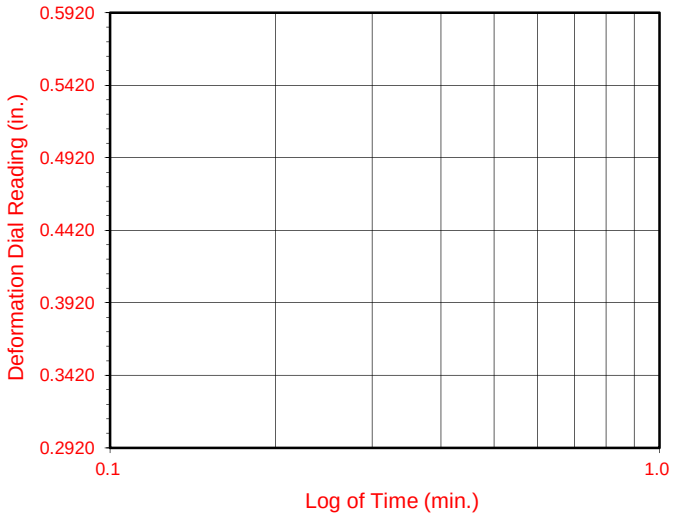
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

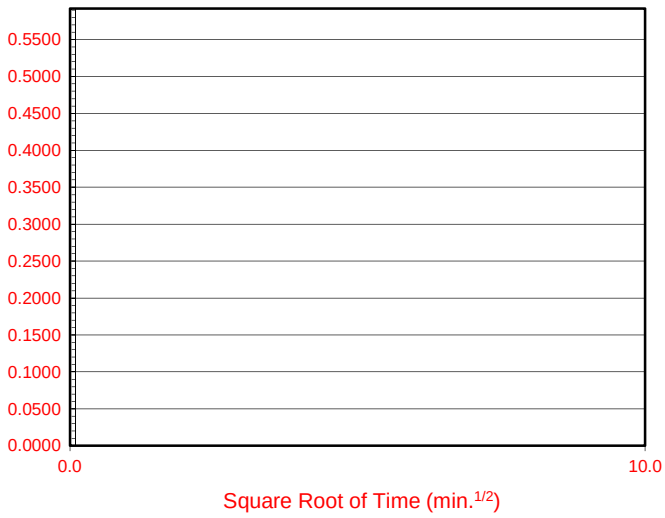
Project No.: 14057-01

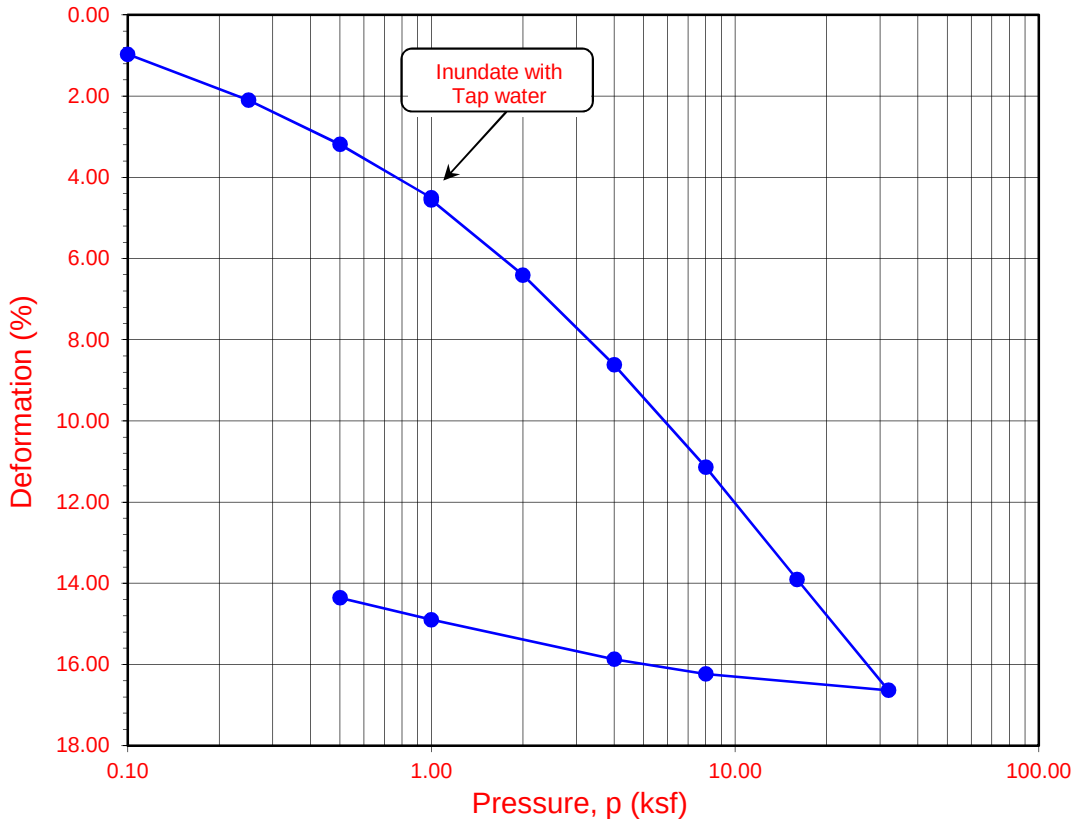
La Habra

03-15

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-17	**R-4**	**20.0**	**26.3**	**17.6**	**97.6**	**113.8**	**0.728**	**0.480**	**98**	**99**

Soil Identification: Yellowish brown lean clay (CL)

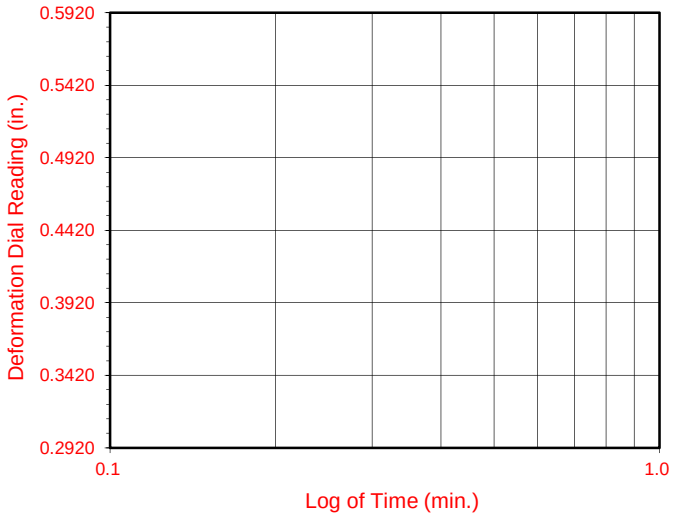
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

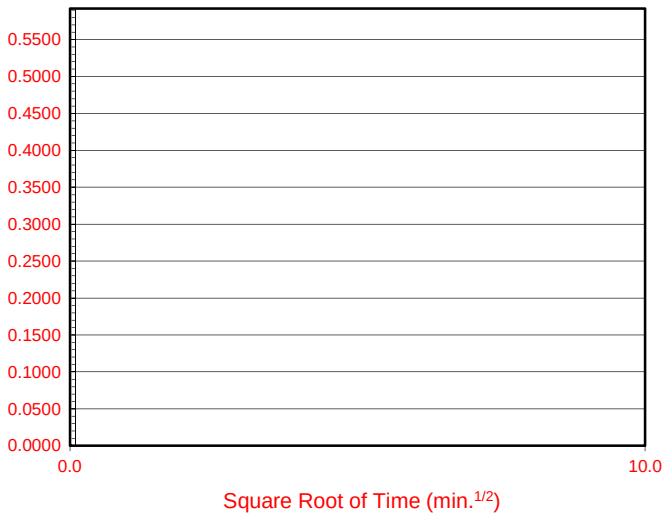
Project No.: 14057-01

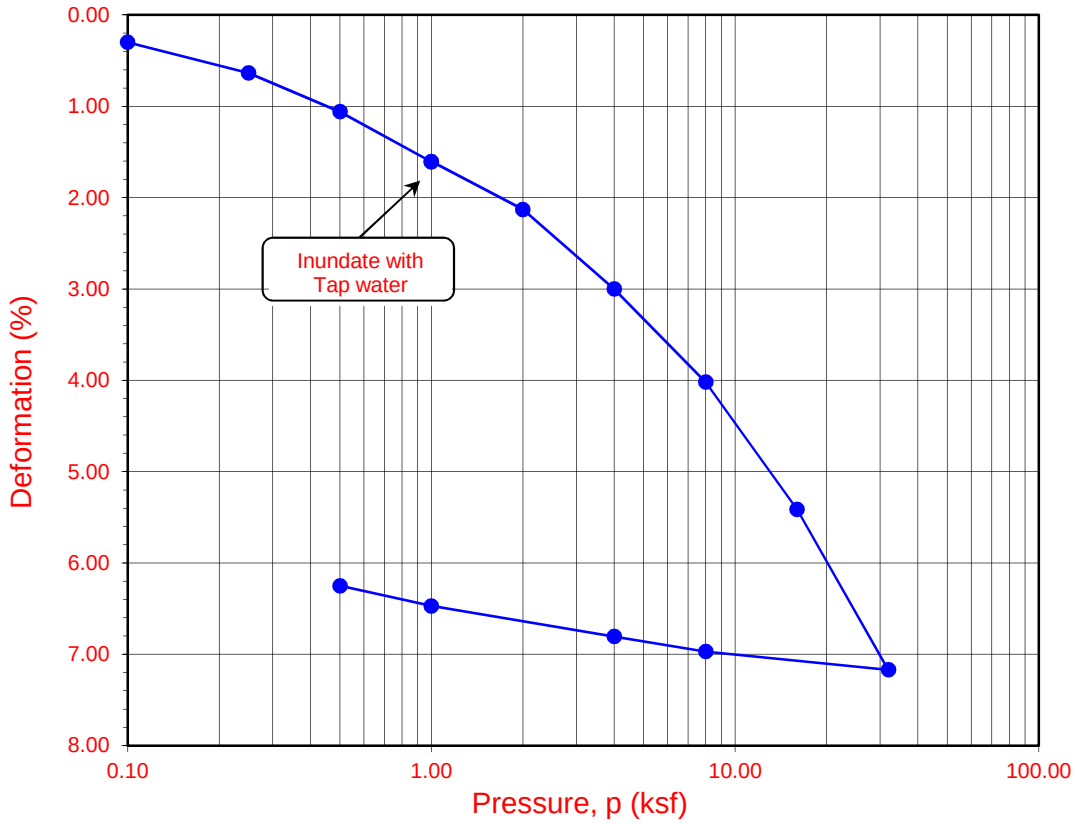
La Habra

03-15

No Time Readings







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-17	**R-5**	**25.0**	**18.2**	**15.9**	**112.0**	**118.8**	**0.522**	**0.427**	**95**	**100**

Soil Identification: Dark yellowish brown lean clay (CL)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 14057-01

La Habra

03-15

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	La Habra	Tested By:	S. Felter	Date:	08/06/14
Project No.:	14057-01	Checked By:	J. Ward	Date:	08/11/14
Boring No.:	B-1	Depth (ft.):	5-8		
Sample No.:	B-1				
Soil Identification:	Olive silt (ML)				

Dry Wt. of Soil + Cont. (g)	1000.00
Wt. of Container No. (g)	0.00
Dry Wt. of Soil (g)	1000.00
Weight Soil Retained on #4 Sieve	0.00
Percent Passing # 4	100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0355
Wt. Comp. Soil + Mold (g)	585.10	414.29
Wt. of Mold (g)	207.50	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	757.60	621.79
Dry Wt. of Soil + Cont. (g)	675.80	544.34
Wt. of Container (g)	0.00	207.50
Moisture Content (%)	12.10	22.99
Wet Density (pcf)	113.9	120.7
Dry Density (pcf)	101.6	98.1
Void Ratio	0.659	0.718
Total Porosity	0.397	0.418
Pore Volume (cc)	82.2	89.6
Degree of Saturation (%) [S_{meas}]	**49.6**	86.5

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
08/06/14	13:44	1.0	0	0.1945
08/06/14	13:54	1.0	10	0.1940
Add Distilled Water to the Specimen				
08/06/14	14:32	1.0	38	0.2250
08/07/14	6:11	1.0	977	0.2300
08/07/14	7:46	1.0	1072	0.2300

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**36**

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	La Habra	Tested By:	S. Felter	Date:	08/06/14
Project No.:	14057-01	Checked By:	J. Ward	Date:	08/11/14
Boring No.:	HS-1	Depth (ft.):	30.0		
Sample No.:	B-1				
Soil Identification:	Dark brown clayey sand (SC)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0145
Wt. Comp. Soil + Mold (g)	622.40	433.28
Wt. of Mold (g)	208.40	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	821.80	641.68
Dry Wt. of Soil + Cont. (g)	754.70	588.60
Wt. of Container (g)	0.00	208.40
Moisture Content (%)	8.89	13.96
Wet Density (pcf)	124.9	128.8
Dry Density (pcf)	114.7	113.0
Void Ratio	0.470	0.491
Total Porosity	0.320	0.329
Pore Volume (cc)	66.2	69.2
Degree of Saturation (%) [S_{meas}]	**51.1**	76.7

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
08/06/14	11:38	1.0	0	0.0180
08/06/14	11:48	1.0	10	0.0175
Add Distilled Water to the Specimen				
08/06/14	14:30	1.0	162	0.0325
08/07/14	6:13	1.0	1105	0.0325
08/07/14	7:42	1.0	1194	0.0325

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**15**

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	La Habra	Tested By:	S. Felter	Date:	08/06/14
Project No.:	14057-01	Checked By:	J. Ward	Date:	08/11/14
Boring No.:	HS-6	Depth (ft.):	23-28		
Sample No.:	B-1				
Soil Identification:	Dark brown clayey sand (SC)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0360
Wt. Comp. Soil + Mold	(g)	568.20	436.16
Wt. of Mold	(g)	166.50	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	800.20	602.66
Dry Wt. of Soil + Cont.	(g)	728.10	532.04
Wt. of Container	(g)	0.00	166.50
Moisture Content	(%)	9.90	19.32
Wet Density	(pcf)	121.2	127.0
Dry Density	(pcf)	110.3	106.4
Void Ratio		0.529	0.584
Total Porosity		0.346	0.369
Pore Volume	(cc)	71.6	79.1
Degree of Saturation (%) [S_{meas}]		**50.5**	89.3

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
08/06/14	13:12	1.0	0	0.1330
08/06/14	13:22	1.0	10	0.1320
Add Distilled Water to the Specimen				
08/06/14	14:31	1.0	69	0.1650
08/07/14	6:12	1.0	1010	0.1690
08/07/14	7:44	1.0	1102	0.1690

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**37**

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	La Habra	Tested By:	O. Figueroa	Date:	01/09/15
Project No.:	14057-01	Input By:	J. Ward	Date:	01/12/15
Boring No.:	HS-1	Depth (ft.):	40-45		
Sample No.:	B-2				
Soil Identification:	Light olive brown silty sand (SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03330 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3788.0	3893.0	3964.0	3869.0		
Weight of Mold (g)	1870.0	1870.0	1870.0	1870.0		
Net Weight of Soil (g)	1918.0	2023.0	2094.0	1999.0		
Wet Weight of Soil + Cont. (g)	396.90	402.30	410.60	461.50		
Dry Weight of Soil + Cont. (g)	376.80	374.20	374.40	411.30		
Weight of Container (g)	38.50	38.60	37.30	38.30		
Moisture Content (%)	5.94	8.37	10.74	13.46		
Wet Density (pcf)	127.0	133.9	138.6	132.3		
Dry Density (pcf)	119.9	123.6	125.2	116.6		

Maximum Dry Density (pcf) **125.5** **Optimum Moisture Content (%)** **10.5**

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

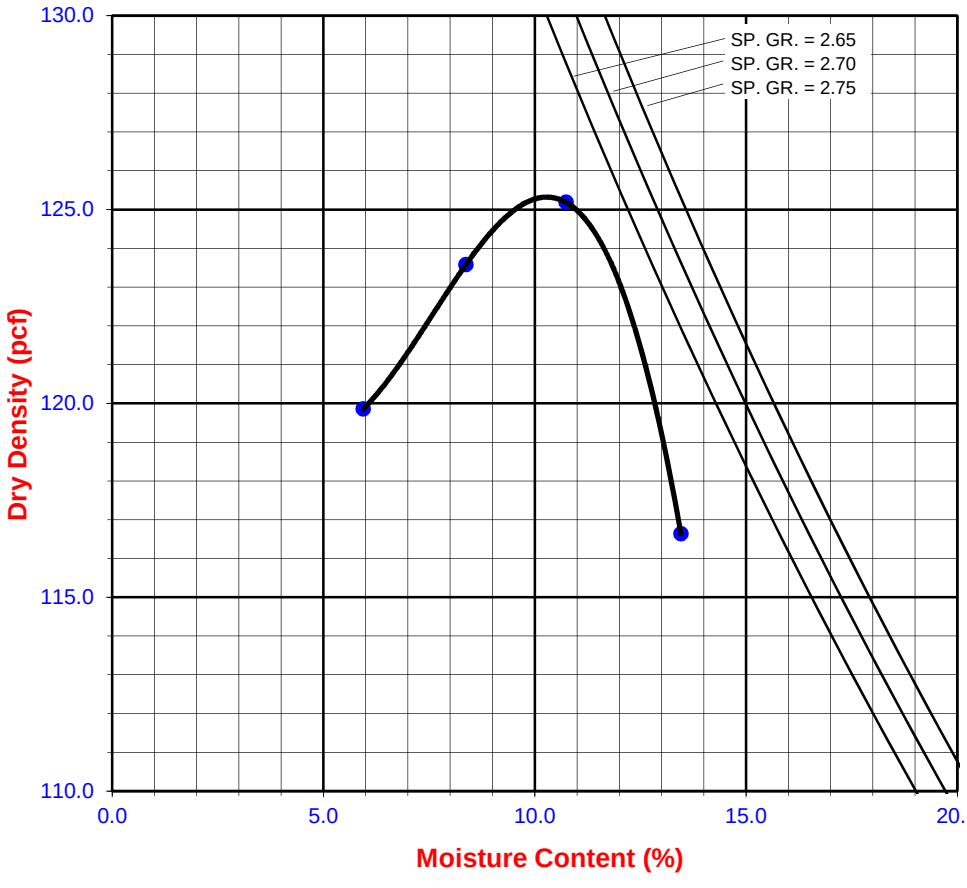
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



MX HS-1, B-2 @ 40-45

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	La Habra	Tested By:	O. Figueroa	Date:	01/09/15
Project No.:	14057-01	Input By:	J. Ward	Date:	01/12/15
Boring No.:	HS-3	Depth (ft.):	15-20		
Sample No.:	B-1				
Soil Identification:	Olive brown silty sand with gravel (SM)g				

Preparation Method:	X	Moist	Scalp Fraction (%)		Rammer Weight (lb.) = 10.0
		Dry	#3/4		Height of Drop (in.) = 18.0
Compaction Method	X	Mechanical Ram	#3/8		
		Manual Ram	#4	26.5	Mold Volume (ft³) 0.03330

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3851.0	4007.0	3997.0			
Weight of Mold (g)	1880.0	1880.0	1880.0			
Net Weight of Soil (g)	1971.0	2127.0	2117.0			
Wet Weight of Soil + Cont. (g)	424.60	437.50	430.60			
Dry Weight of Soil + Cont. (g)	408.70	412.00	397.30			
Weight of Container (g)	37.60	38.20	37.90			
Moisture Content (%)	4.28	6.82	9.27			
Wet Density (pcf)	130.5	140.8	140.2			
Dry Density (pcf)	125.1	131.8	128.3			

Maximum Dry Density (pcf)	**132.0**	**Optimum Moisture Content (%)**	**7.0**
Corrected Dry Density (pcf)	**140.0**	**Corrected Moisture Content (%)**	**5.5**

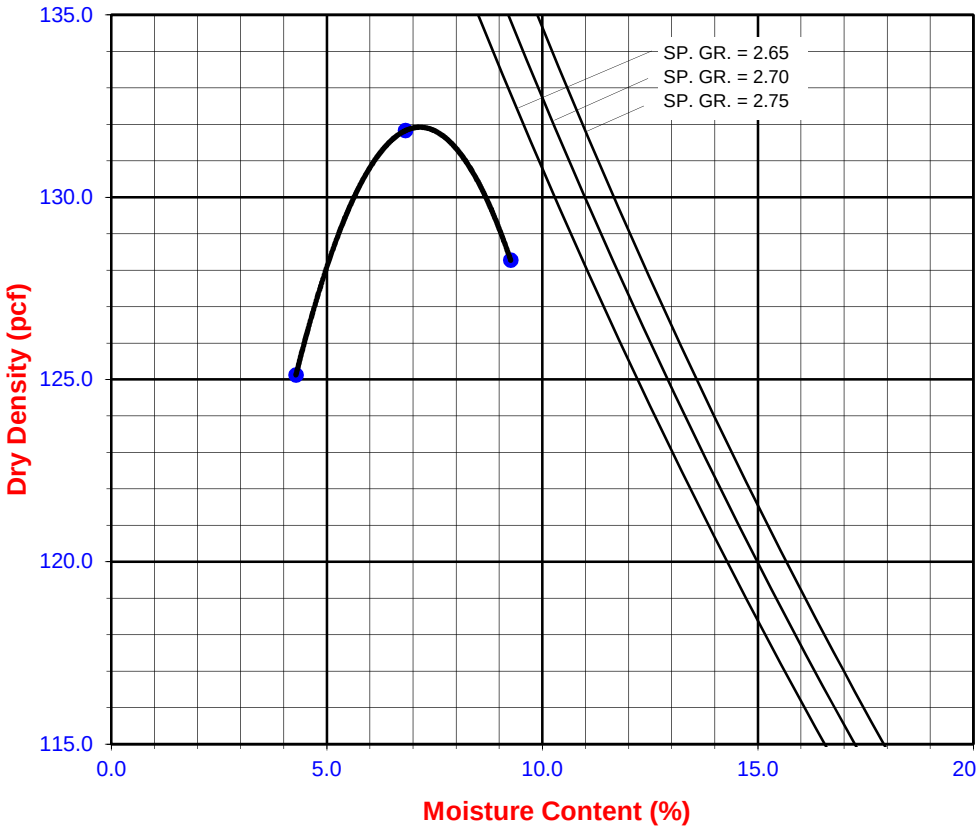
X Procedure A
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

☐ Procedure B
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

☐ Procedure C
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	La Habra	Tested By:	O. Figueroa	Date:	02/09/15
Project No.:	14057-01	Input By:	J. Ward	Date:	02/16/15
Boring No.:	HS-17	Depth (ft.):	5-7		
Sample No.:	B-1				
Soil Identification:	Olive brown sandy lean clay s(CL)				

Note: Corrected dry density calculation assumes specific gravity of 2.70 and moisture content of 1.0% for oversize particles

Preparation Method:	X	Moist	Scalp Fraction (%)		Rammer Weight (lb.) =	10.0
		Dry	#3/4		Height of Drop (in.) =	18.0
Compaction Method	X	Mechanical Ram	#3/8			
		Manual Ram	#4	4.9	Mold Volume (ft³)	0.03330

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3758.0	3876.0	3952.0	3918.0		
Weight of Mold (g)	1870.0	1870.0	1870.0	1870.0		
Net Weight of Soil (g)	1888.0	2006.0	2082.0	2048.0		
Wet Weight of Soil + Cont. (g)	341.60	477.20	460.40	531.60		
Dry Weight of Soil + Cont. (g)	327.80	447.40	423.10	477.40		
Weight of Container (g)	37.60	38.10	38.80	37.80		
Moisture Content (%)	4.76	7.28	9.71	12.33		
Wet Density (pcf)	125.0	132.8	137.8	135.6		
Dry Density (pcf)	119.3	123.8	125.6	120.7		

Maximum Dry Density (pcf)	**125.5**	**Optimum Moisture Content (%)**	**9.5**
Corrected Dry Density (pcf)	**127.0**	**Corrected Moisture Content (%)**	**9.0**

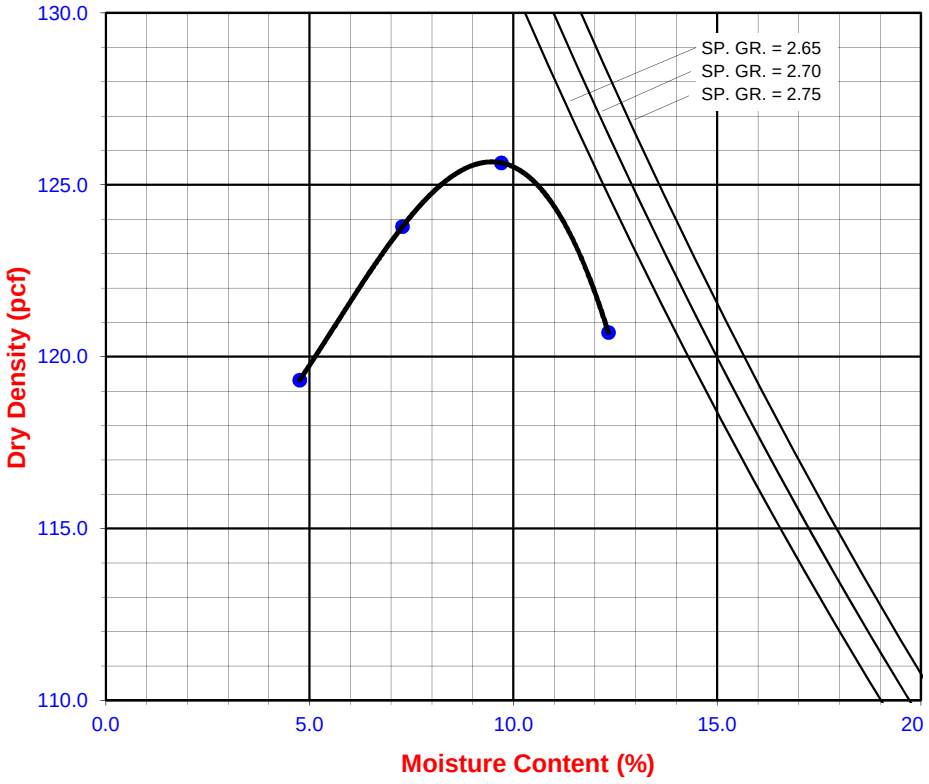
X Procedure A
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

☐ Procedure B
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

☐ Procedure C
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
5:45:50
GR:SA:FI

Atterberg Limits:
31,16,15
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	La Habra	Tested By:	O. Figueroa	Date:	02/08/15
Project No.:	14057-01	Input By:	J. Ward	Date:	02/09/15
Boring No.:	B-3	Depth (ft.):	30-33		
Sample No.:	B-1				
Soil Identification:	Light olive brown sandy lean clay s(CL)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03330 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3723.0	3791.0	3856.0	3817.0		
Weight of Mold (g)	1870.0	1870.0	1870.0	1870.0		
Net Weight of Soil (g)	1853.0	1921.0	1986.0	1947.0		
Wet Weight of Soil + Cont. (g)	457.00	453.60	449.80	529.10		
Dry Weight of Soil + Cont. (g)	422.10	411.10	399.90	459.50		
Weight of Container (g)	54.60	55.70	53.10	54.70		
Moisture Content (%)	9.50	11.96	14.39	17.19		
Wet Density (pcf)	122.7	127.2	131.5	128.9		
Dry Density (pcf)	112.0	113.6	114.9	110.0		

Maximum Dry Density (pcf) **115.0** **Optimum Moisture Content (%)** **14.5**

PROCEDURE USED

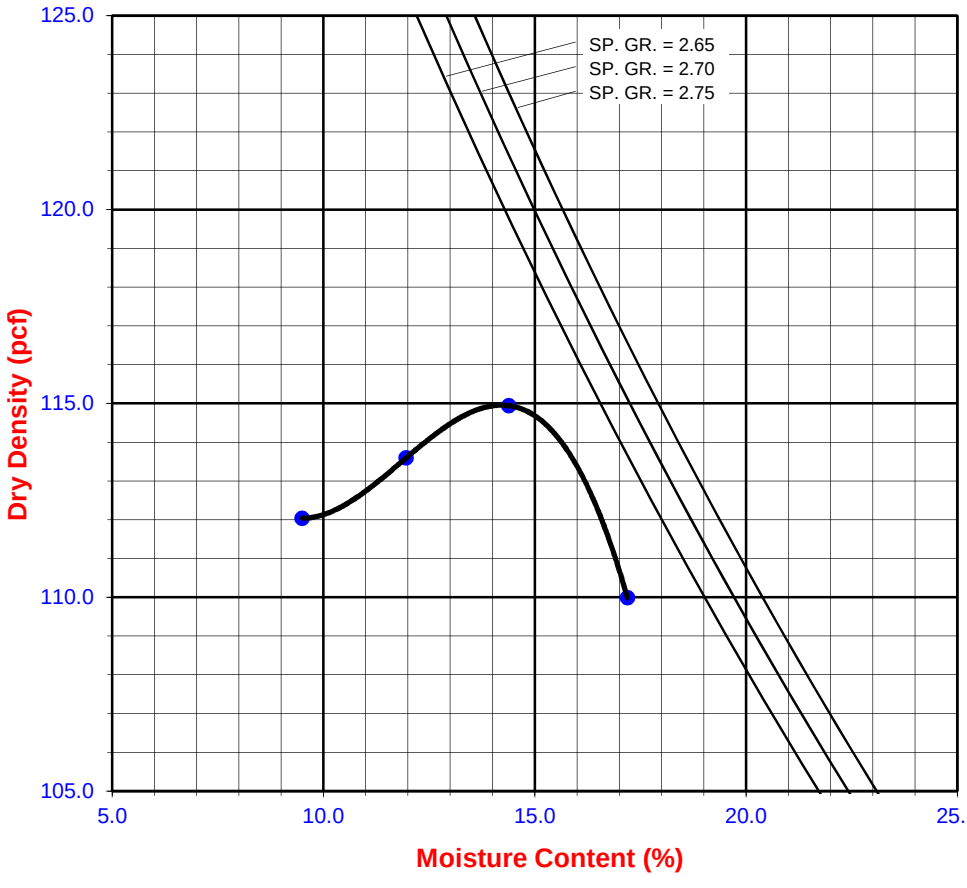
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
1:48:51
GR:SA:FI

Atterberg Limits:
33,23,10
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	La Habra	Tested By:	O. Figueroa	Date:	02/25/15
Project No.:	14057-01	Input By:	J. Ward	Date:	02/27/15
Boring No.:	B-4	Depth (ft.):	35-40		
Sample No.:	B-1				
Soil Identification:	Light olive brown silty sand (SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03330 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3793.0	3882.0	3893.0			
Weight of Mold (g)	1870.0	1870.0	1870.0			
Net Weight of Soil (g)	1923.0	2012.0	2023.0			
Wet Weight of Soil + Cont. (g)	416.80	383.50	422.80			
Dry Weight of Soil + Cont. (g)	388.10	350.70	377.90			
Weight of Container (g)	54.70	54.60	51.30			
Moisture Content (%)	8.61	11.08	13.75			
Wet Density (pcf)	127.3	133.2	133.9			
Dry Density (pcf)	117.2	119.9	117.7			

Maximum Dry Density (pcf) 120.0 **Optimum Moisture Content (%)** 11.5

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

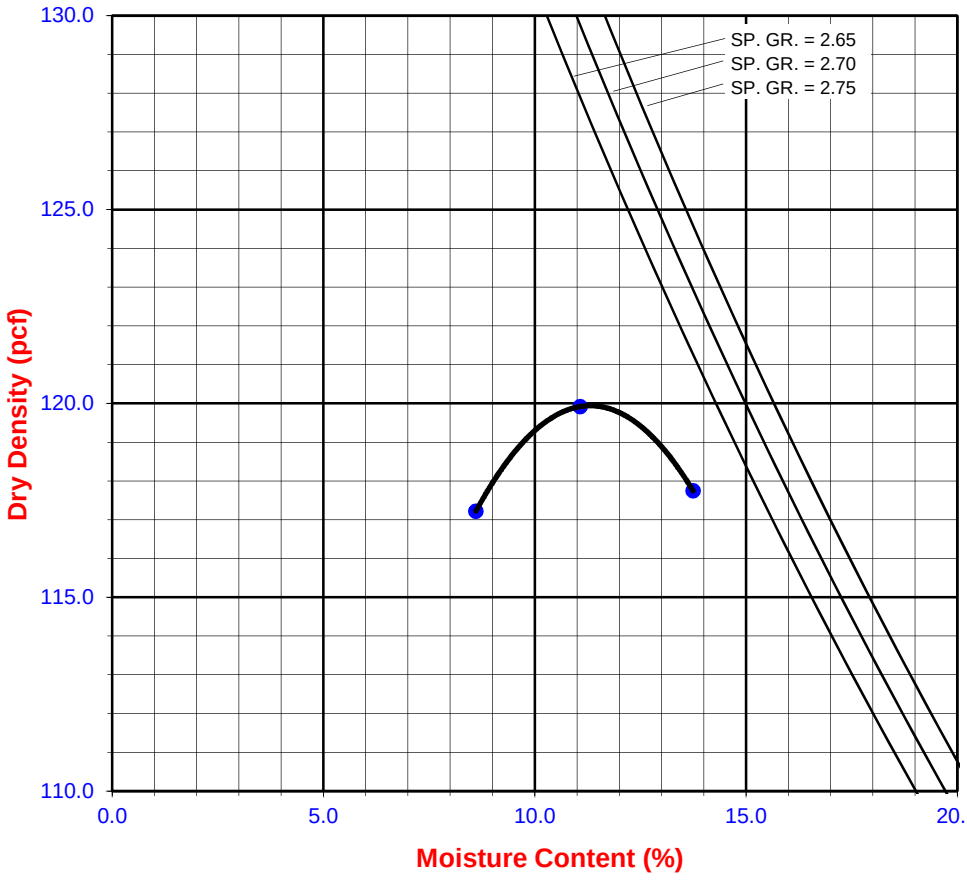
Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

NP

LL,PL,PI



TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: La Habra | Tested By : G. Berdy | Date: 08/05/14

Project No. : 14057-01 | Data Input By: J. Ward | Date: 08/11/14

Boring No.	HS-1	HS-6	B-1	
Sample No.	B-1	B-1	B-1	
Sample Depth (ft)	30.0	23-28	5-8	
Soil Identification:	Dark brown SC	Dark brown SC	Olive ML	
Wet Weight of Soil + Container (g)	240.29	273.38	212.07	
Dry Weight of Soil + Container (g)	228.82	257.24	197.54	
Weight of Container (g)	60.29	67.29	55.98	
Moisture Content (%)	6.81	8.50	10.26	
Weight of Soaked Soil (g)	100.70	100.40	100.01	

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	26	36	40	
Crucible No.	15	18	20	
Furnace Temperature (°C)	840	840	840	
Time In / Time Out	10:35/11:20	10:35/11:20	10:35/11:20	
Duration of Combustion (min)	45	45	45	
Wt. of Crucible + Residue (g)	20.3232	19.7515	21.2331	
Wt. of Crucible (g)	20.3202	19.7403	21.2308	
Wt. of Residue (g) (A)	0.0030	0.0112	0.0023	
PPM of Sulfate (A) x 41150	123.45	460.88	94.65	
PPM of Sulfate, Dry Weight Basis	**132**	**504**	**105**	

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30	15	30	
ml of AgNO3 Soln. Used in Titration (C)	0.9	1.0	0.5	
PPM of Chloride (C -0.2) * 100 * 30 / B	70	160	30	
PPM of Chloride, Dry Wt. Basis	**75**	**175**	**33**	

pH TEST, DOT California Test 532/643

pH Value	**8.16**	**7.81**	**7.60**	
Temperature °C	22.2	22.2	22.2	

SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Project Name: La Habra
Project No. : 14057-01
Boring No.: HS-1
Sample No. : B-1
Soil Identification:* Dark brown SC

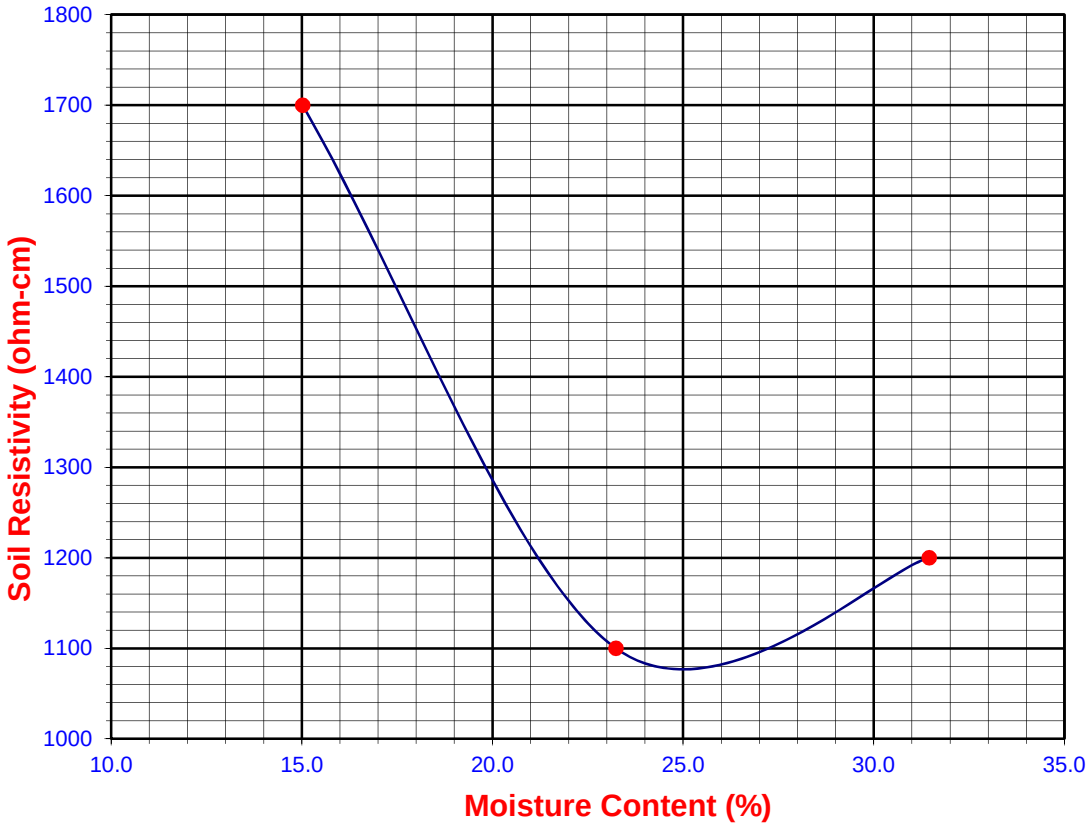
Tested By : G. Berdy Date: 08/07/14
Data Input By: J. Ward Date: 08/11/14
Depth (ft.) : 30.0

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	10	15.02	1700	1700
2	20	23.24	1100	1100
3	30	31.45	1200	1200
4				
5				

Moisture Content (%) (MCi)	6.81
Wet Wt. of Soil + Cont. (g)	240.29
Dry Wt. of Soil + Cont. (g)	228.82
Wt. of Container (g)	60.29
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
1075	**25.0**	**132**	**75**	**8.16**	**22.2**



SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Project Name:	La Habra		Tested By :	G. Berdy	Date: 08/07/14
Project No. :	14057-01		Data Input By:	J. Ward	Date: 08/11/14
Boring No.:	HS-6		Depth (ft.) :	23-28	
Sample No. :	B-1				

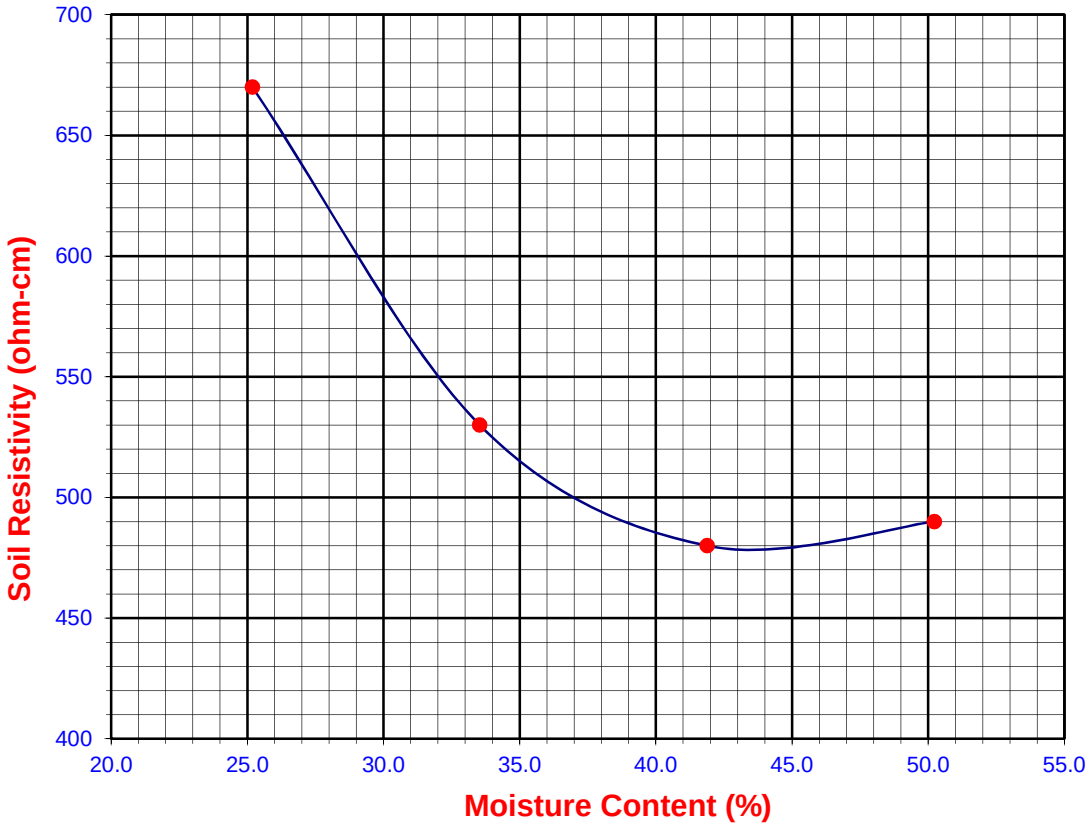
Soil Identification:* Dark brown SC

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	25.19	670	670
2	30	33.53	530	530
3	40	41.88	480	480
4	50	50.23	490	490
5				

Moisture Content (%) (MCi)	8.50
Wet Wt. of Soil + Cont. (g)	273.38
Dry Wt. of Soil + Cont. (g)	257.24
Wt. of Container (g)	67.29
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
478	**43.5**	**504**	**175**	**7.81**	**22.2**



SOIL RESISTIVITY TEST

DOT CA TEST 532 / 643

Project Name:	La Habra		Tested By :	G. Berdy	Date: 08/08/14
Project No. :	14057-01		Data Input By:	J. Ward	Date: 08/11/14
Boring No.:	B-1		Depth (ft.) :	5-8	
Sample No. :	B-1				

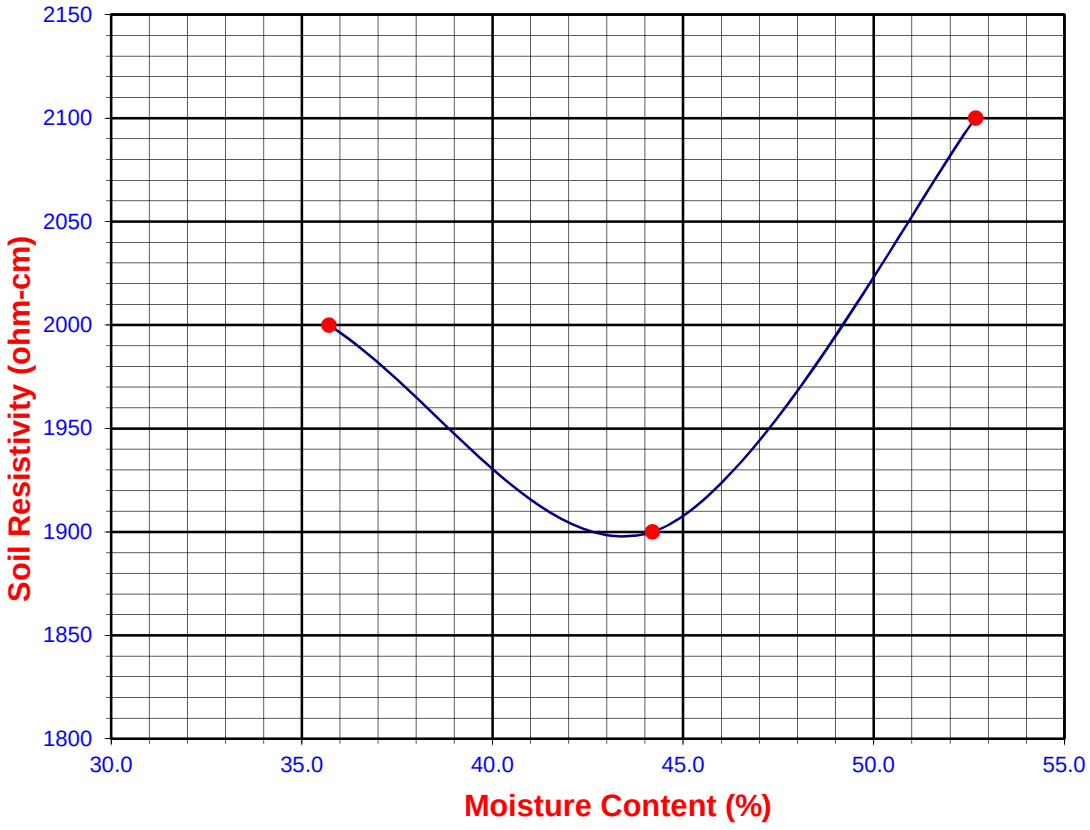
Soil Identification:* Olive ML

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	35.71	2000	2000
2	40	44.19	1900	1900
3	50	52.67	2100	2100
4				
5				

Moisture Content (%) (MCi)	10.26
Wet Wt. of Soil + Cont. (g)	212.07
Dry Wt. of Soil + Cont. (g)	197.54
Wt. of Container (g)	55.98
Container No.	
Initial Soil Wt. (g) (Wt)	130.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
1898	**43.4**	**105**	**33**	**7.60**	**22.2**



From GMU, 1996

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES
ASTM Designation: D 2487
(Based on Unified Soil Classification System)

SOIL ENGINEERING

			Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests	Soil Classification: Group Symbol	Soil Classification: Group Name
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$	GW	Well graded gravel
			$Cu < 4$ and/or $1 > Cc > 3$	GP	Poorly graded gravel
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel
			Fines classify as CL or CH	GC	Clayey gravel
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$	SW	Well-graded sand
			$Cu < 6$ and/or $1 > Cc > 3$	SP	Poorly graded sand
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand
			Fines classify as CL or CH	SC	Clayey sand
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay
			PI < 4 or plots below "A" line[J]	ML	Silt
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay Organic silt
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay
			PI plots below "A" line	MH	Elastic silt
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay Organic silt
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

ADDITIONAL TESTS

DS	Direct Shear Test
HY	Hydrometer Test
TC	Triaxial Compression Test
CN	Consolidation Test
(T)	Time Rate
EX	Expansion Test
CP	Compaction Test
GS	Grain Size Distribution
EI	Expansion Index
SE	Sand Equivalent Test
AL	Atterberg Limits
CH	Chemical Tests
RV	Resistance Value
(N)	Natural Undisturbed Sample
(R)	Remolded Sample

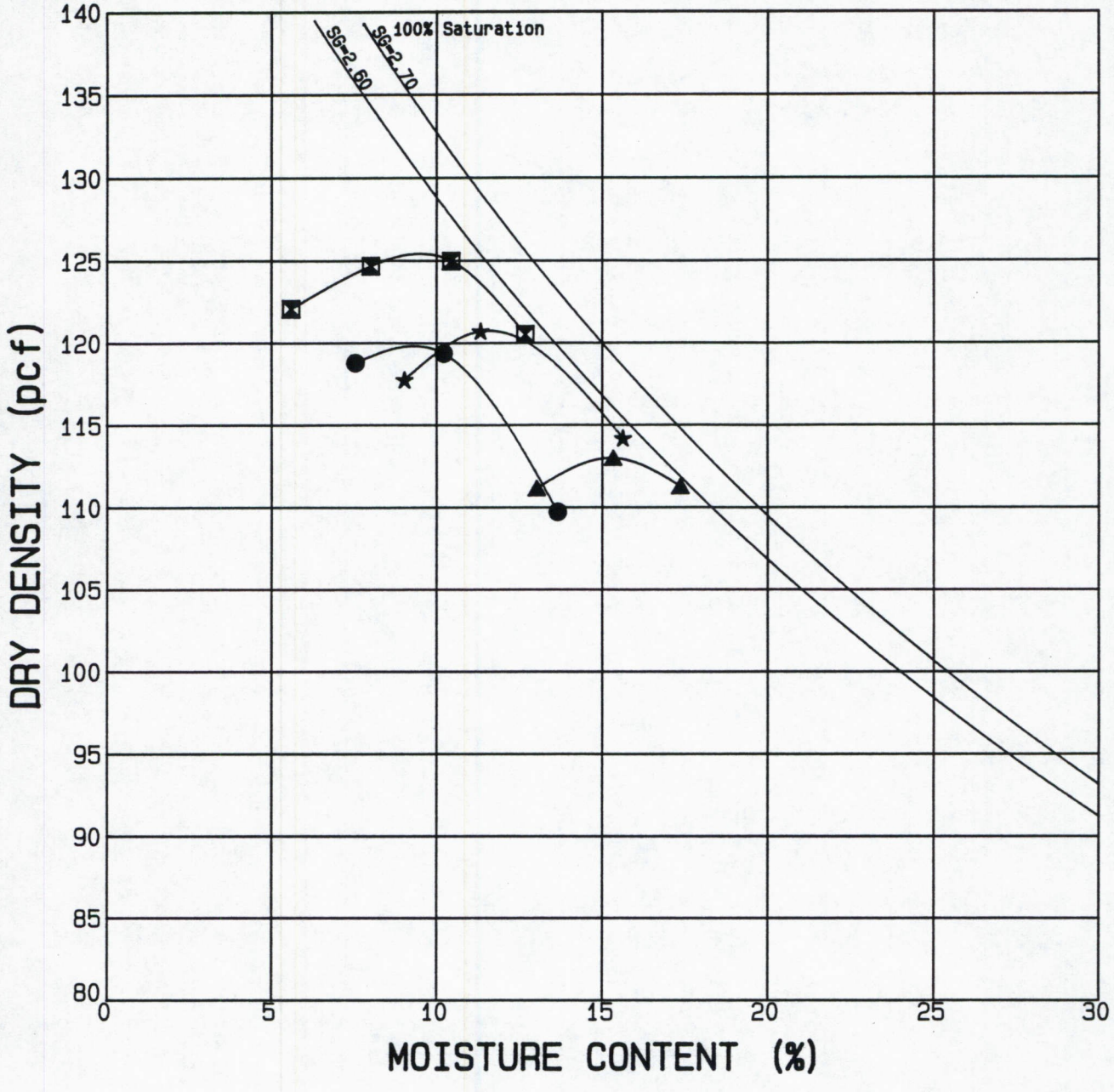
SAMPLE SYMBOLS

- ■ Undisturbed Sample
- ⊠ Disturbed Sample
- ⊡ Unsuccessful Sampling Attempt

GEOLOGIC STRUCTURE

	B N75W 50S (B=Bedding)
STRIKE AND DIP	C N15E 75W (C=Contact)
	J N45W 85E (J=Jointing)
	S N30E 45W (S=Shear)

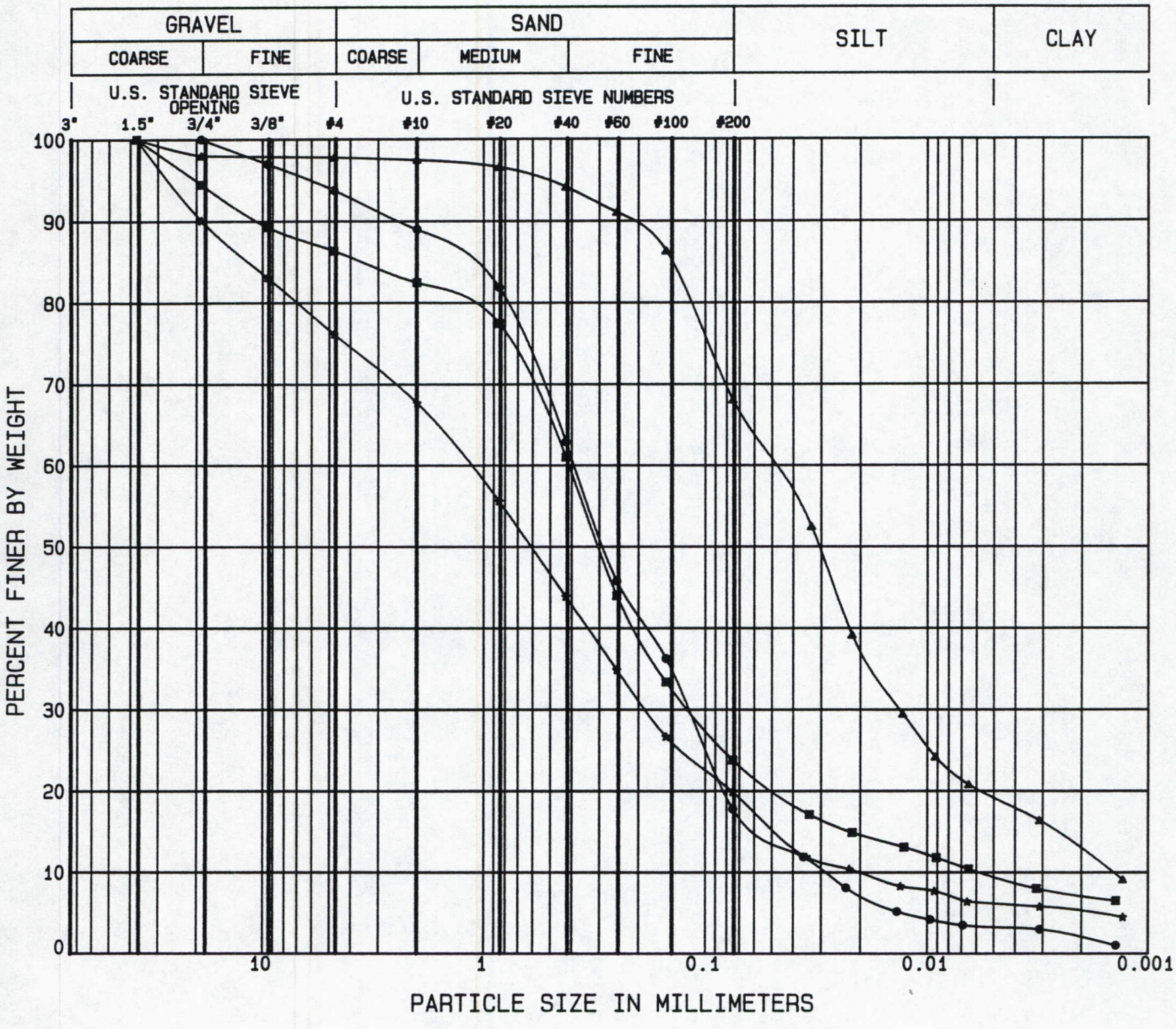
LEGEND TO LOGS



	SAMPLE LOCATION	SOURCE	MAXIMUM DRY DENSITY, pcf	OPTIMIUM MOISTURE CONTENT %
●	DH 2 @ 16.00'	Qcol/Qoal	120	9
⊠	DH 11 @ 25.00'	Qsp	125	10
▲	DH 18 @ 20.00'	Qsp	113	15
★	DH 22 @ 35.00'	Qsp	121	12

COMPACTION TEST DATA

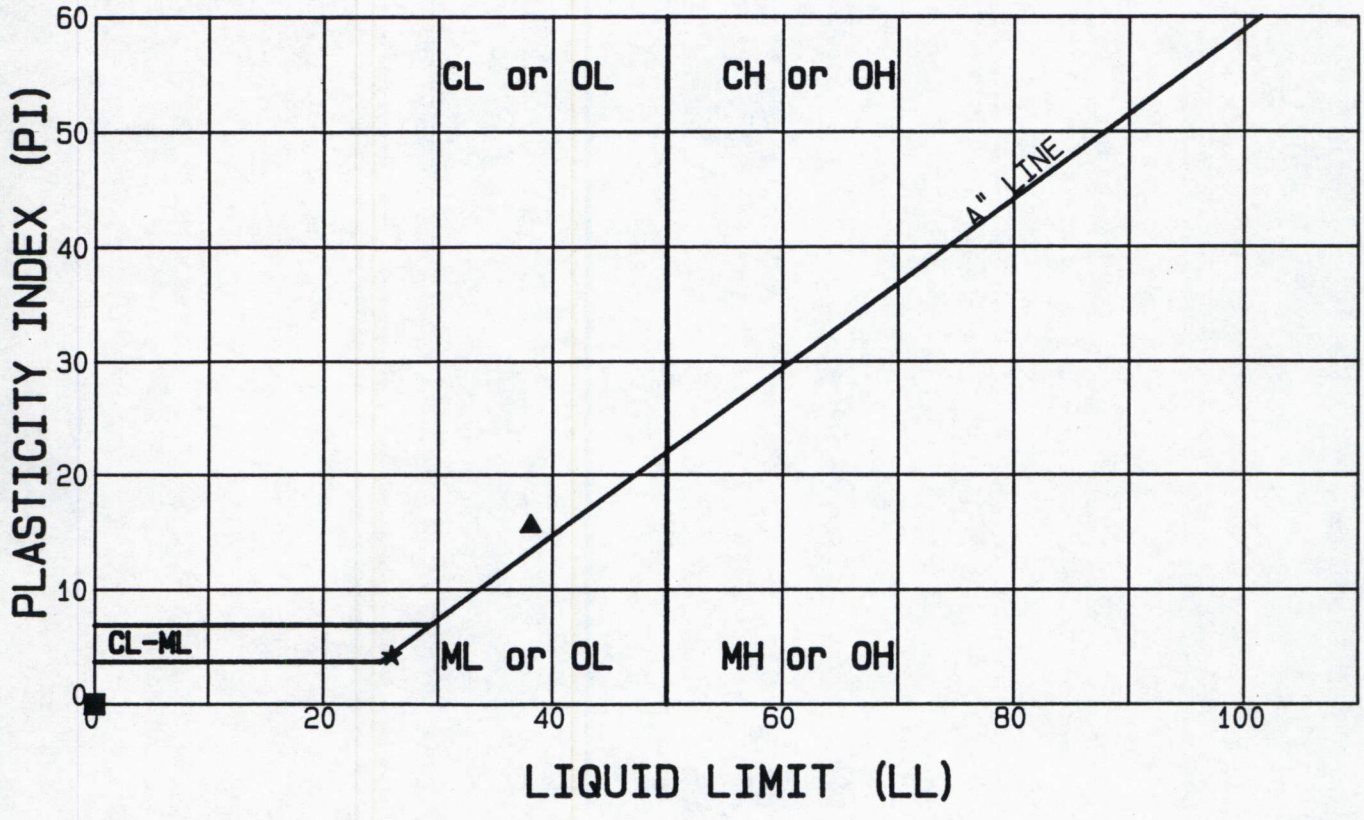
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-4



SAMPLE LOCATION	SOURCE	CLASSIFICATION
● DH 2 @ 16.00'	Qcol/Qoal	SILTY SAND (SM) fine to medium, non-plastic
⊠ DH 11 @ 25.00'	Qsp	SILTY SAND (SM) fine to medium, non-plastic
▲ DH 18 @ 20.00'	Qsp	SANDY LEAN CLAY (CL) moderate plasticity, fine
★ DH 22 @ 35.00'	Qsp	SILTY SAND with GRAVEL (SM) fine to medium, low plasticity, fine to coarse

PARTICLE SIZE DISTRIBUTION

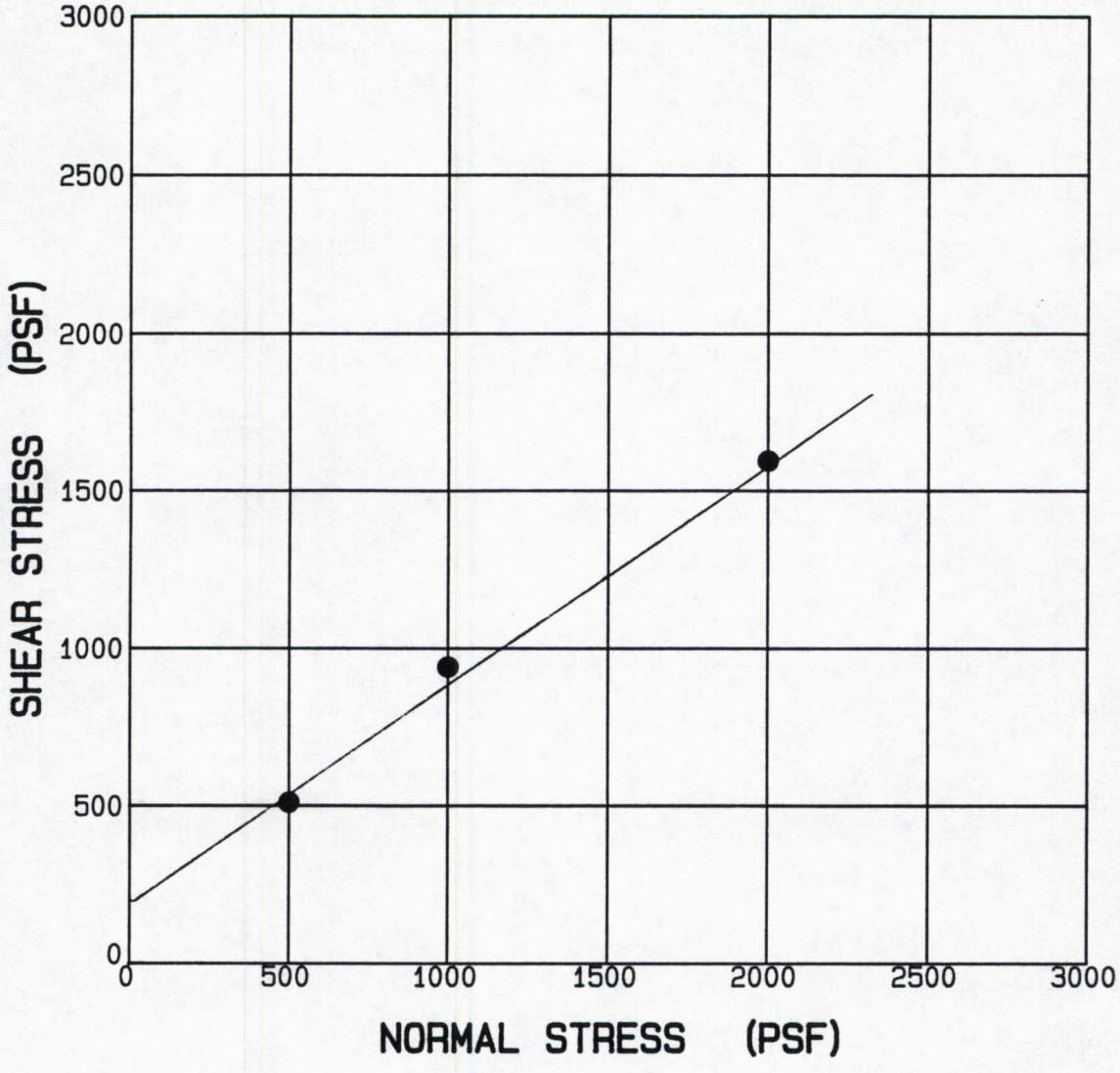
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-5



	SAMPLE LOCATION	SOURCE	LL	PL	PI
●	DH 2 @ 16.00'	Qcol/Qoal	NP	NP	NP
⊠	DH 11 @ 25.00'	Qsp	NP	NP	NP
▲	DH 18 @ 20.00'	Qsp	38	22	16
★	DH 22 @ 35.00'	Qsp	26	22	4

ATTERBERG LIMITS

PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-6

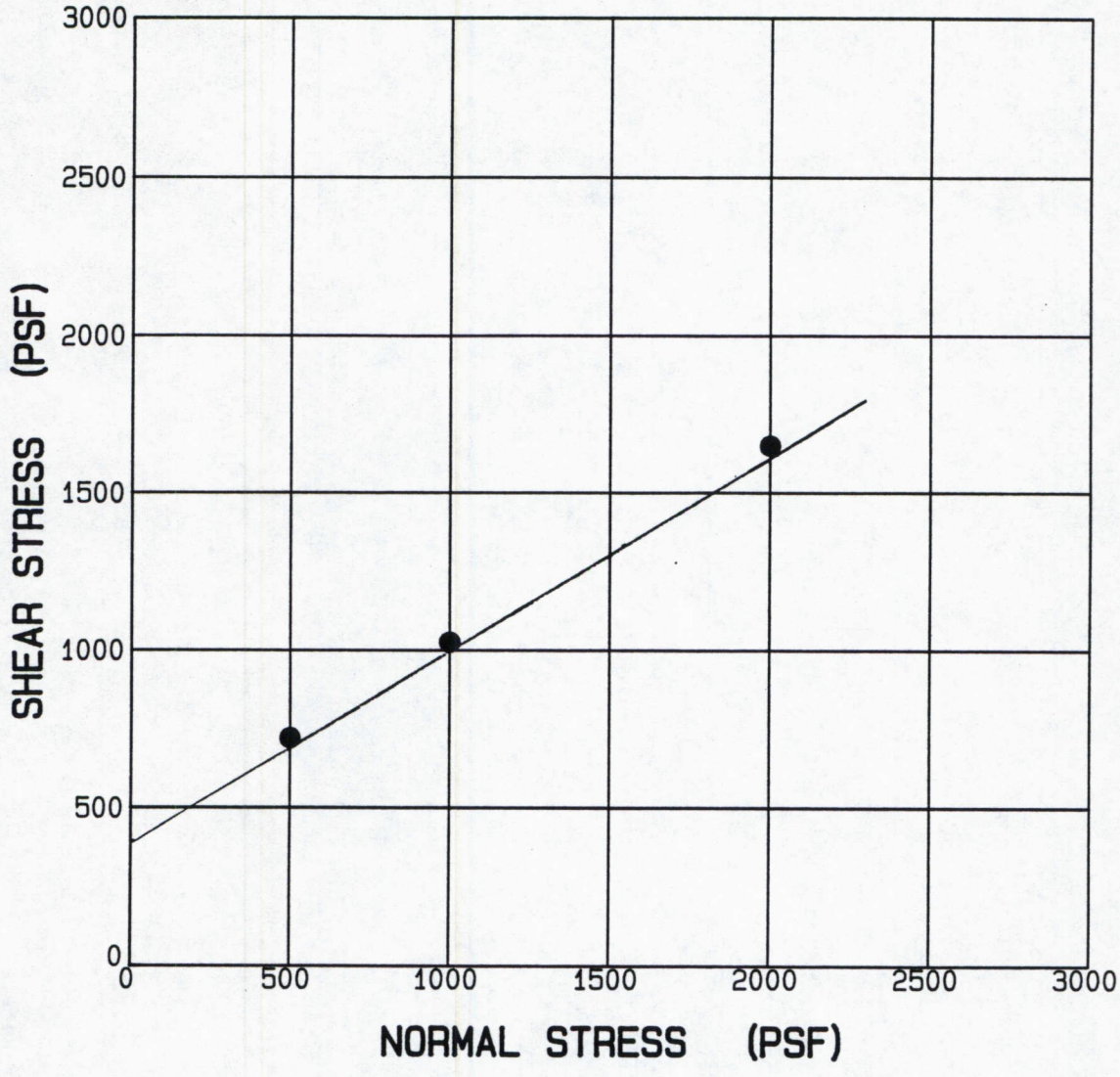


SAMPLE AND TEST DESCRIPTION

SAMPLE LOCATION:	DH 2 @ 16.00'
SOURCE:	Qcol/Goal
TEST DESCRIPTION:	DIRECT SHEAR, STRAIN RATE: .10 IN/MIN
AVG.DRY DENSITY (PCF): 103	AVG.MOISTURE CONTENT (%): 16
AVG.SATURATION (%): 72	AVG.VOID RATIO: 0.5994
COHESION (PSF): 200	FRICTION ANGLE (DEG): 34

SHEAR TEST DATA

PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-7.1

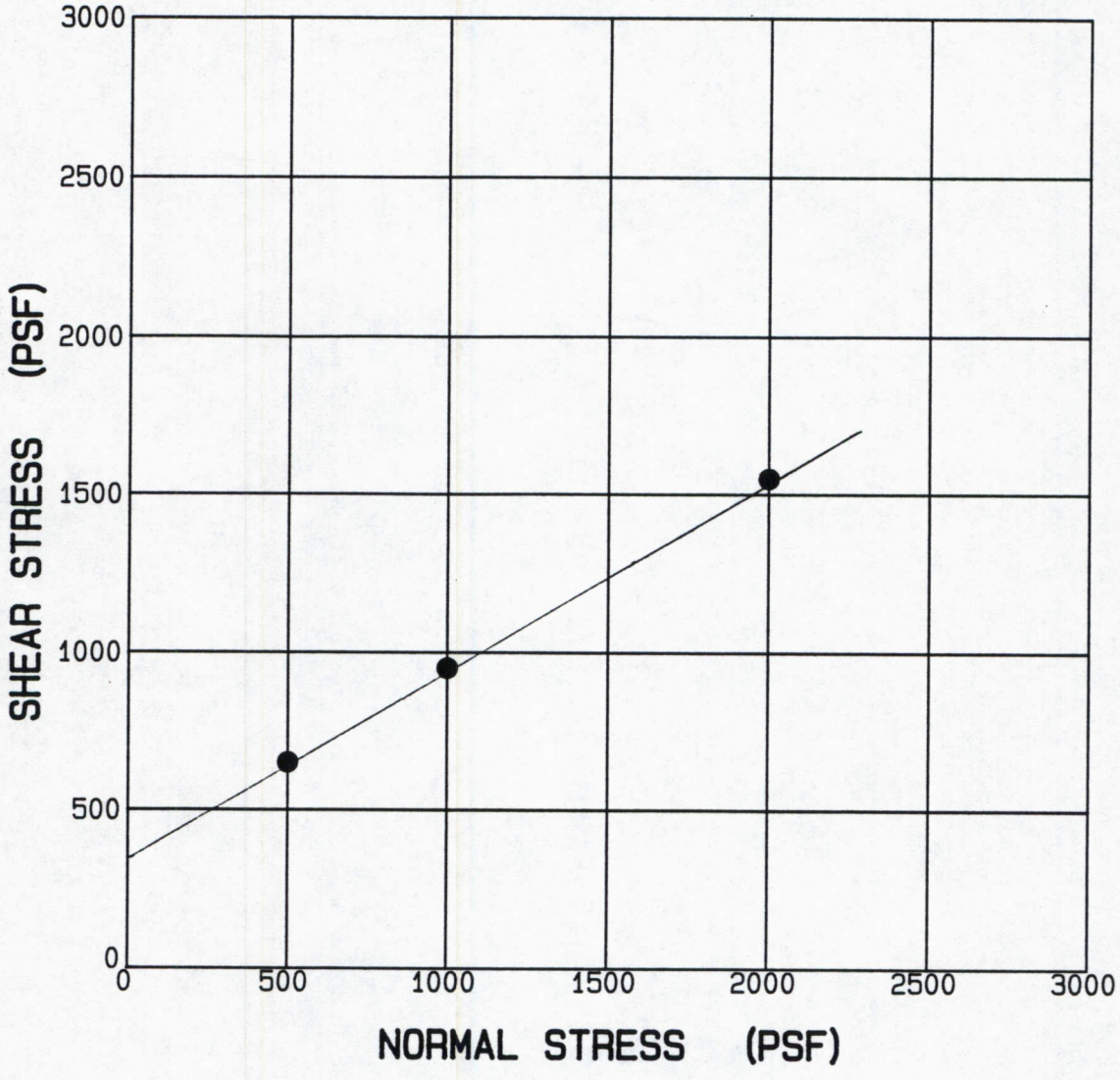


SAMPLE AND TEST DESCRIPTION

SAMPLE LOCATION: DH 18 @ 20.00'
SOURCE: Qsp
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: .01 IN/MIN
AVG.DRY DENSITY (PCF): 97 AVG.MOISTURE CONTENT (%): 24
AVG.SATURATION (%): 88 AVG.VOID RATIO: 0.7089
COHESION (PSF): 400 FRICTION ANGLE (DEG): 31

SHEAR TEST DATA

PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-7.2

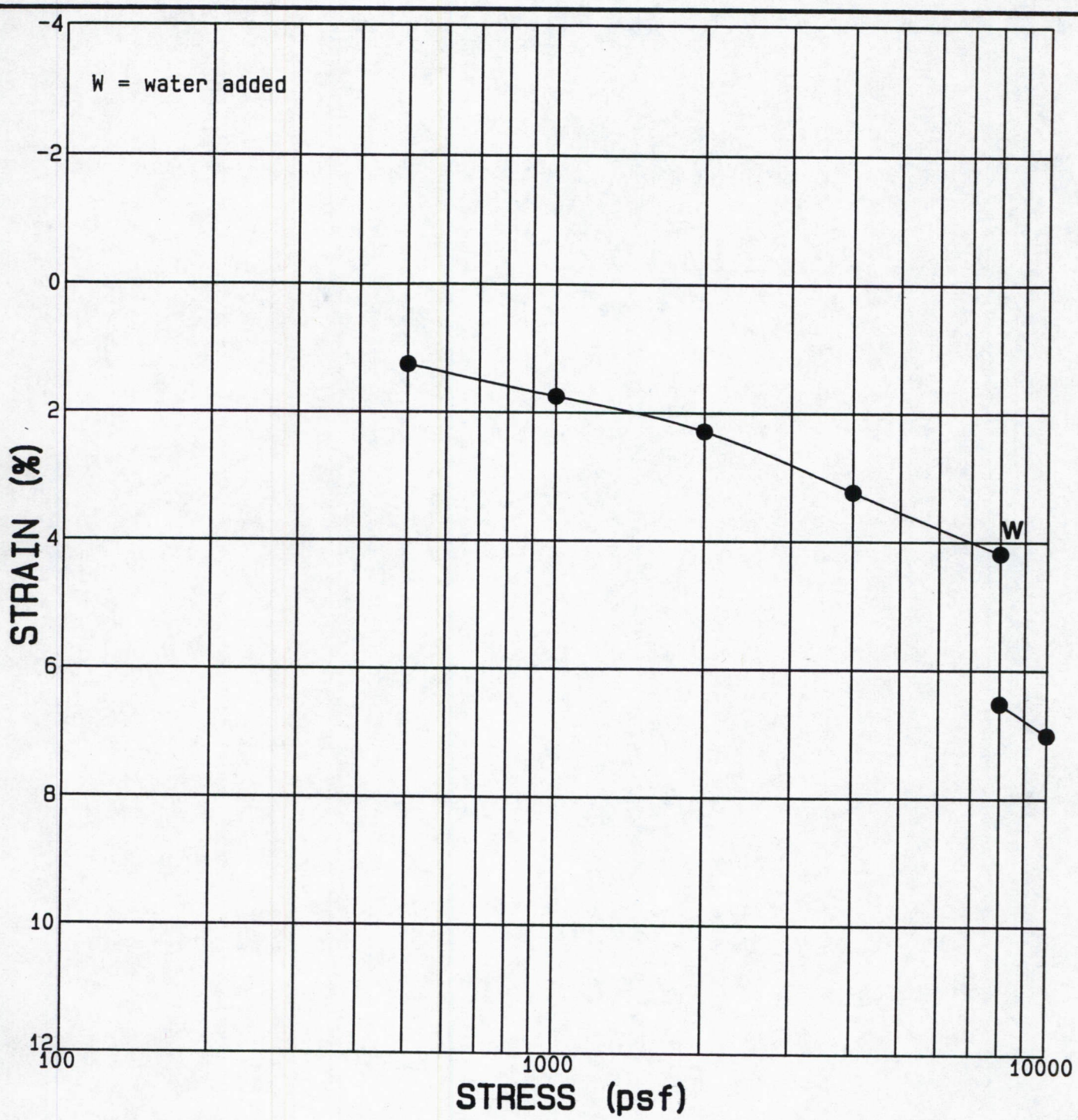


SAMPLE AND TEST DESCRIPTION

SAMPLE LOCATION: DH 22 @ 35.00'
SOURCE: Qsp
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: .01 IN/MIN
AVG.DRY DENSITY (PCF): 106 AVG.MOISTURE CONTENT (%): 19
AVG.SATURATION (%): 91 AVG.VOID RATIO: 0.5624
COHESION (PSF): 350 FRICTION ANGLE (DEG): 30

SHEAR TEST DATA

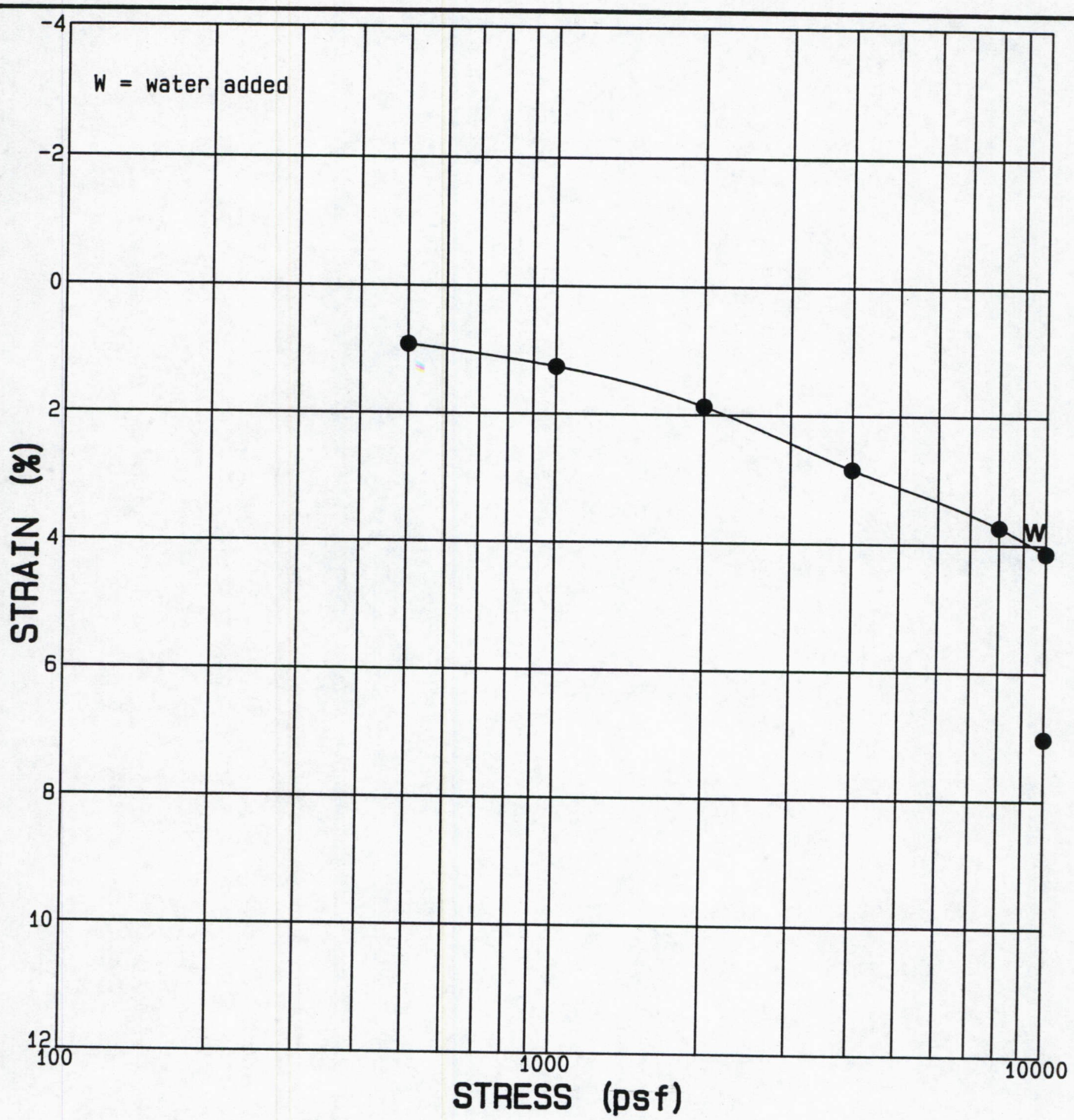
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-7.3



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 1 @ 10.00'	Qcol/Qoal	0.5637	4	106	

CONSOLIDATION TEST DATA

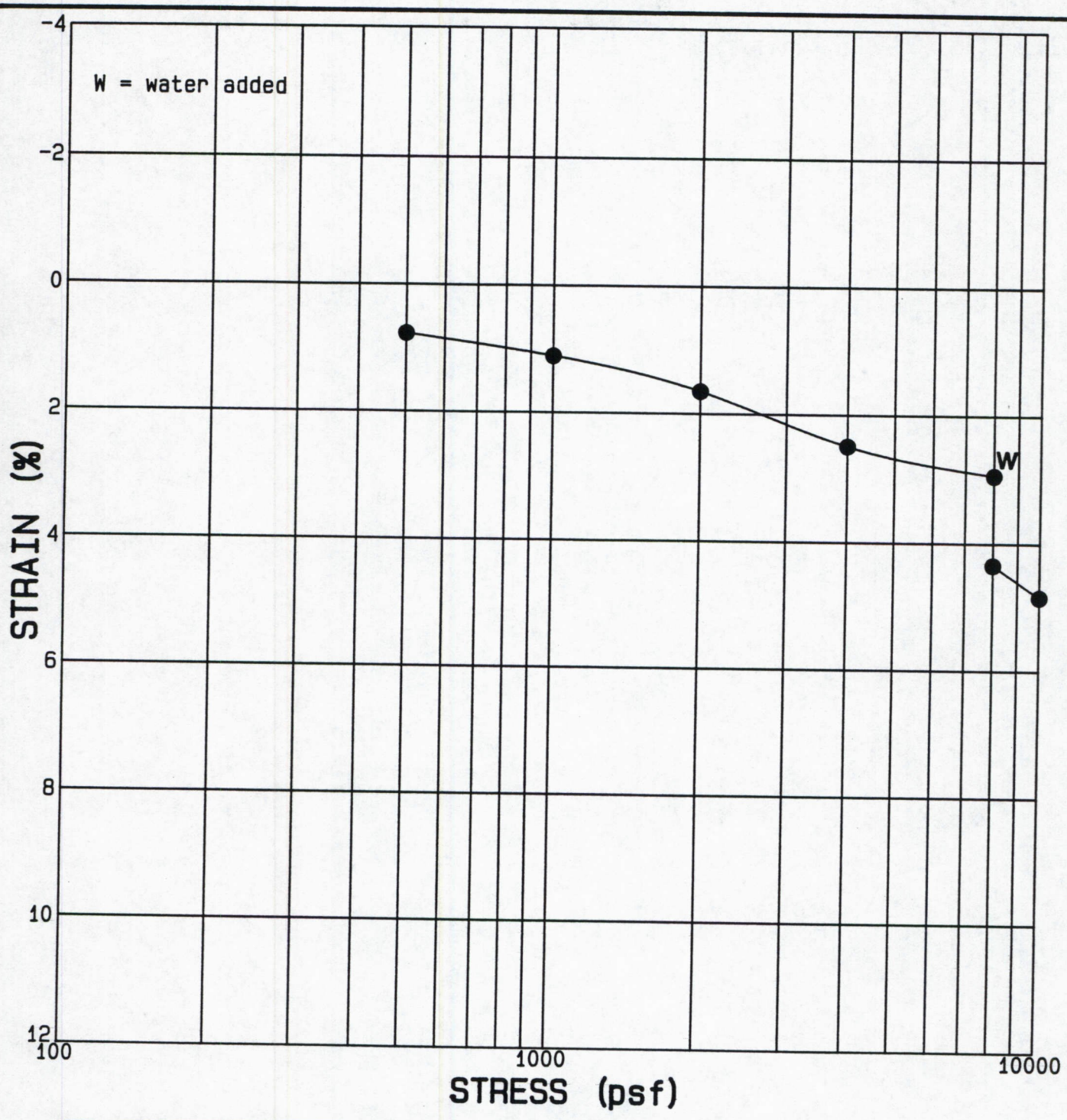
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.1



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 1 @ 20.00'	Qcol/Qoal	0.5953	7	104	

CONSOLIDATION TEST DATA

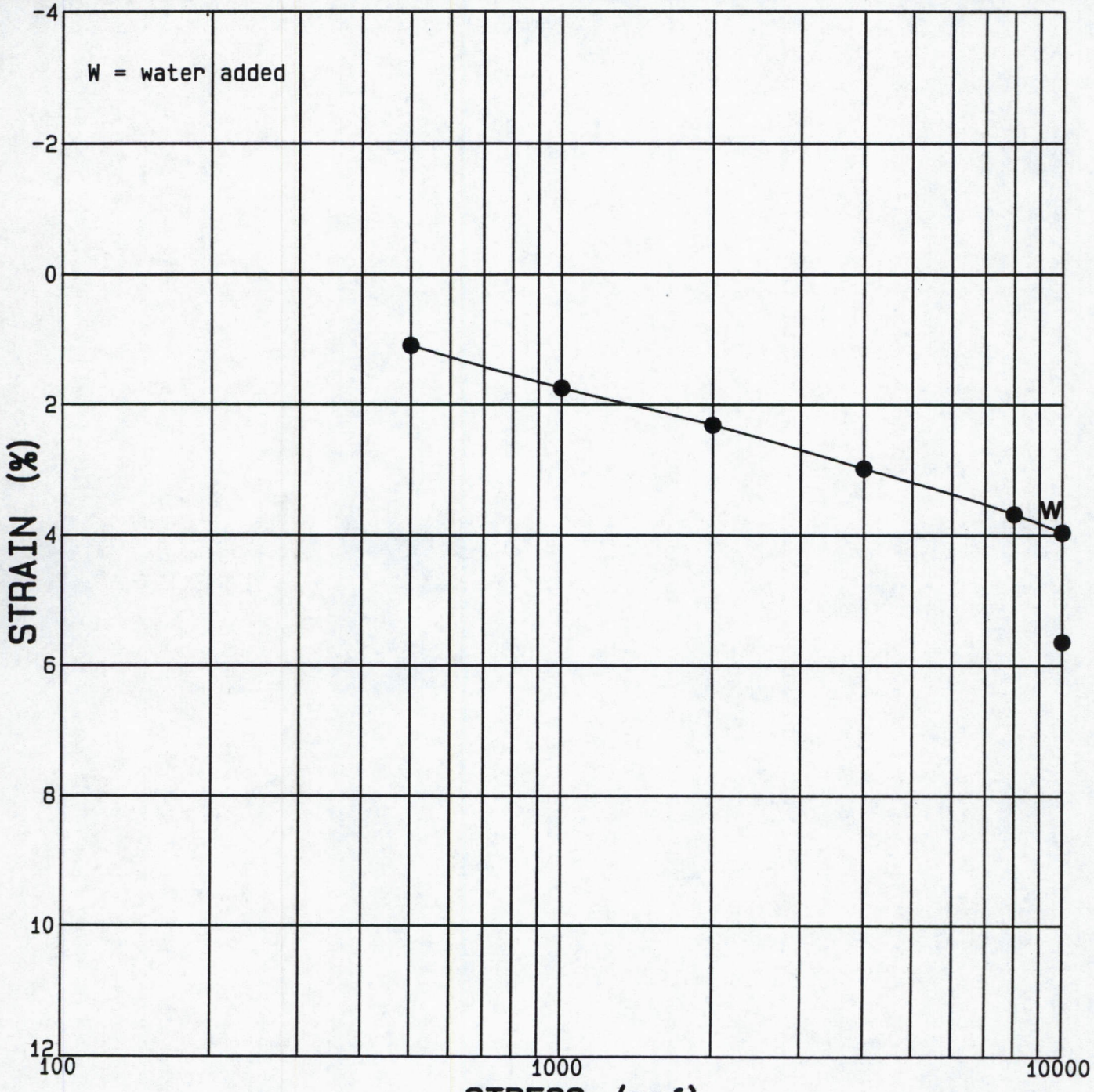
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.2



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 5 @ 25.00'	Qcol/Qoal	0.4904	4	111	

CONSOLIDATION TEST DATA

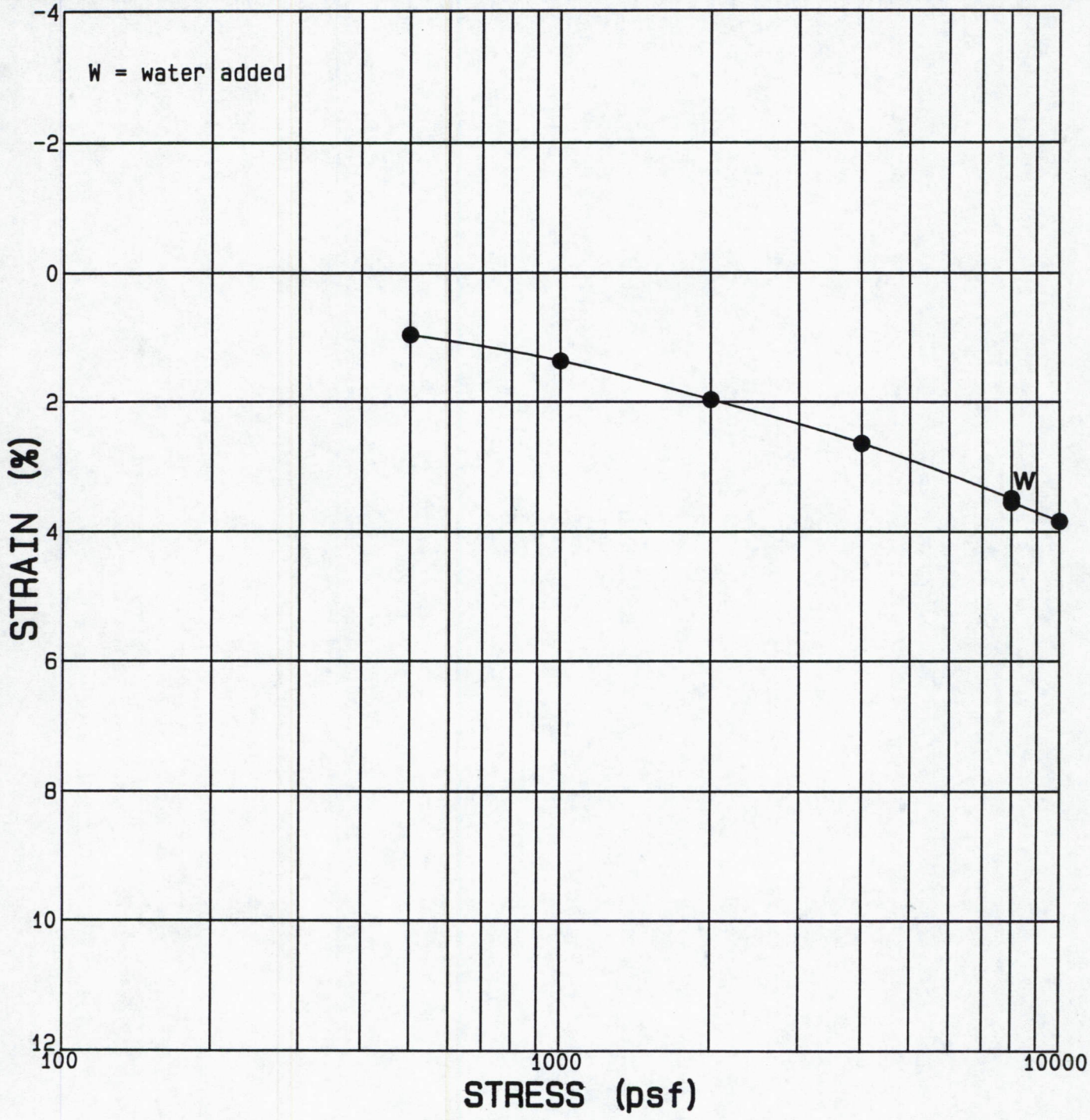
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.3



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 5 @ 40.00'	Qcol/Qoal	0.3616	4	121	

CONSOLIDATION TEST DATA

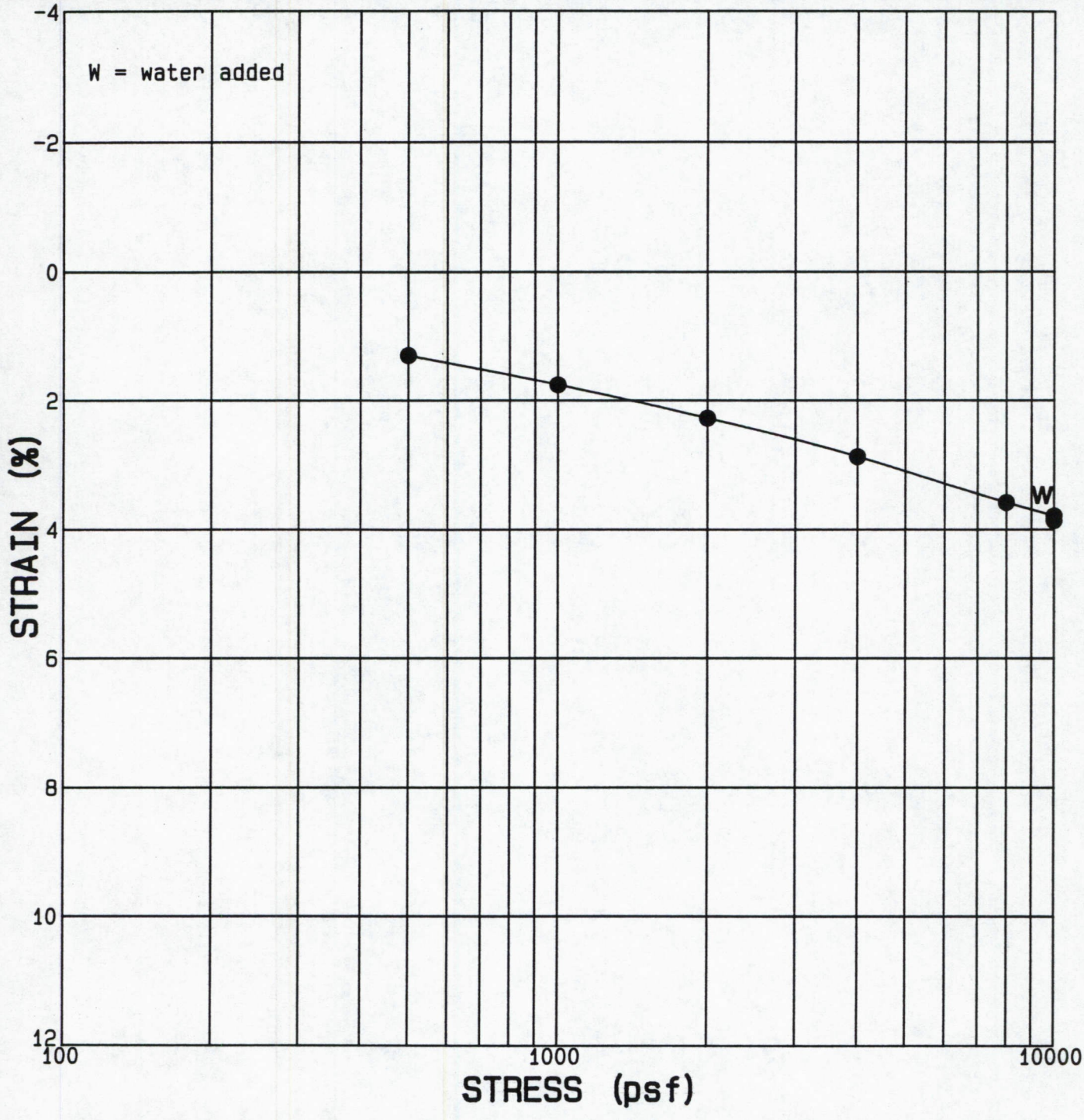
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.4



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 8 @ 15.00'	Qcol/Qoal	0.3088	5	126	

CONSOLIDATION TEST DATA

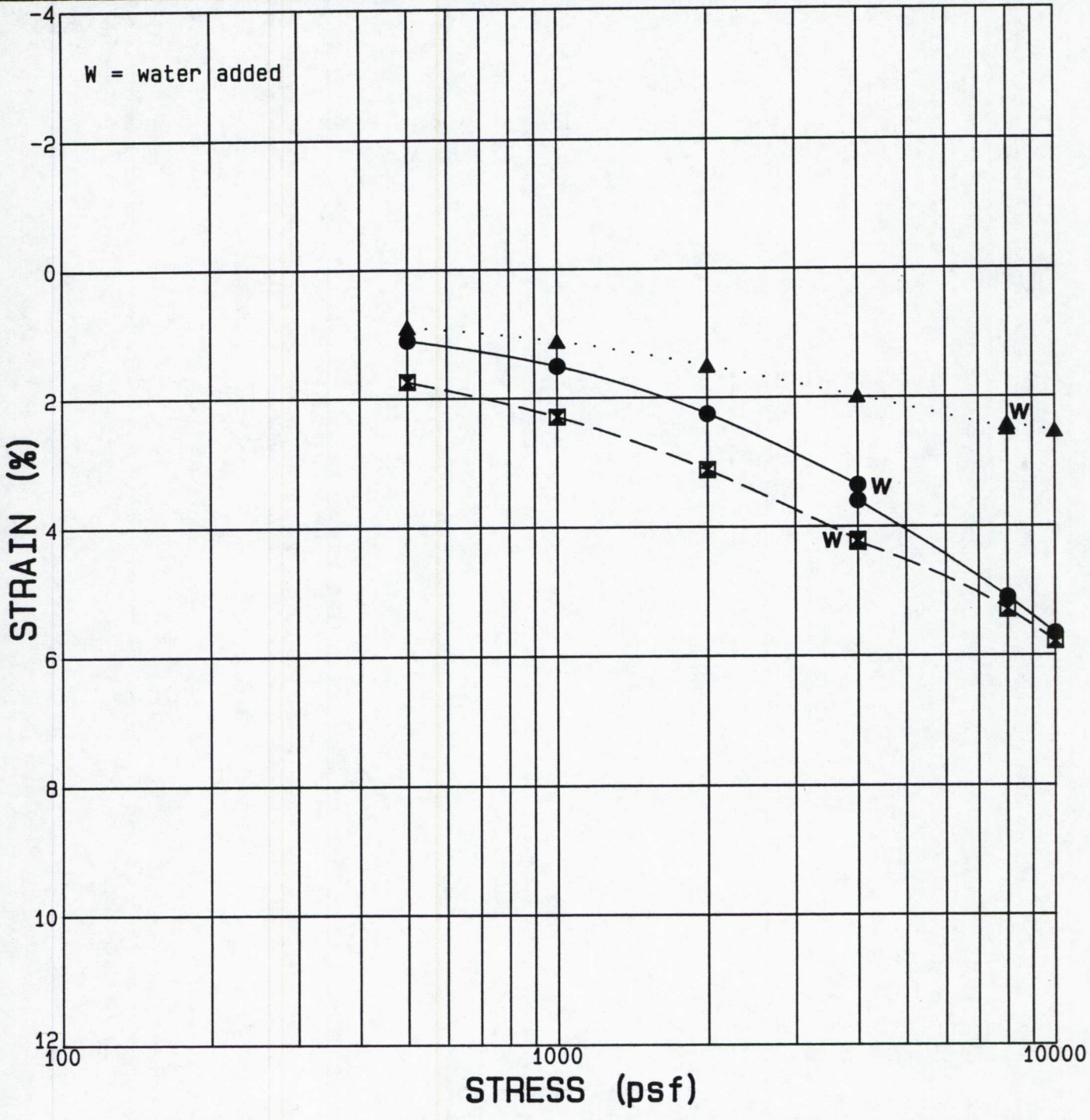
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.5



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 8 @ 25.00'	Qcol/Qoal	0.4904	16	111	

CONSOLIDATION TEST DATA

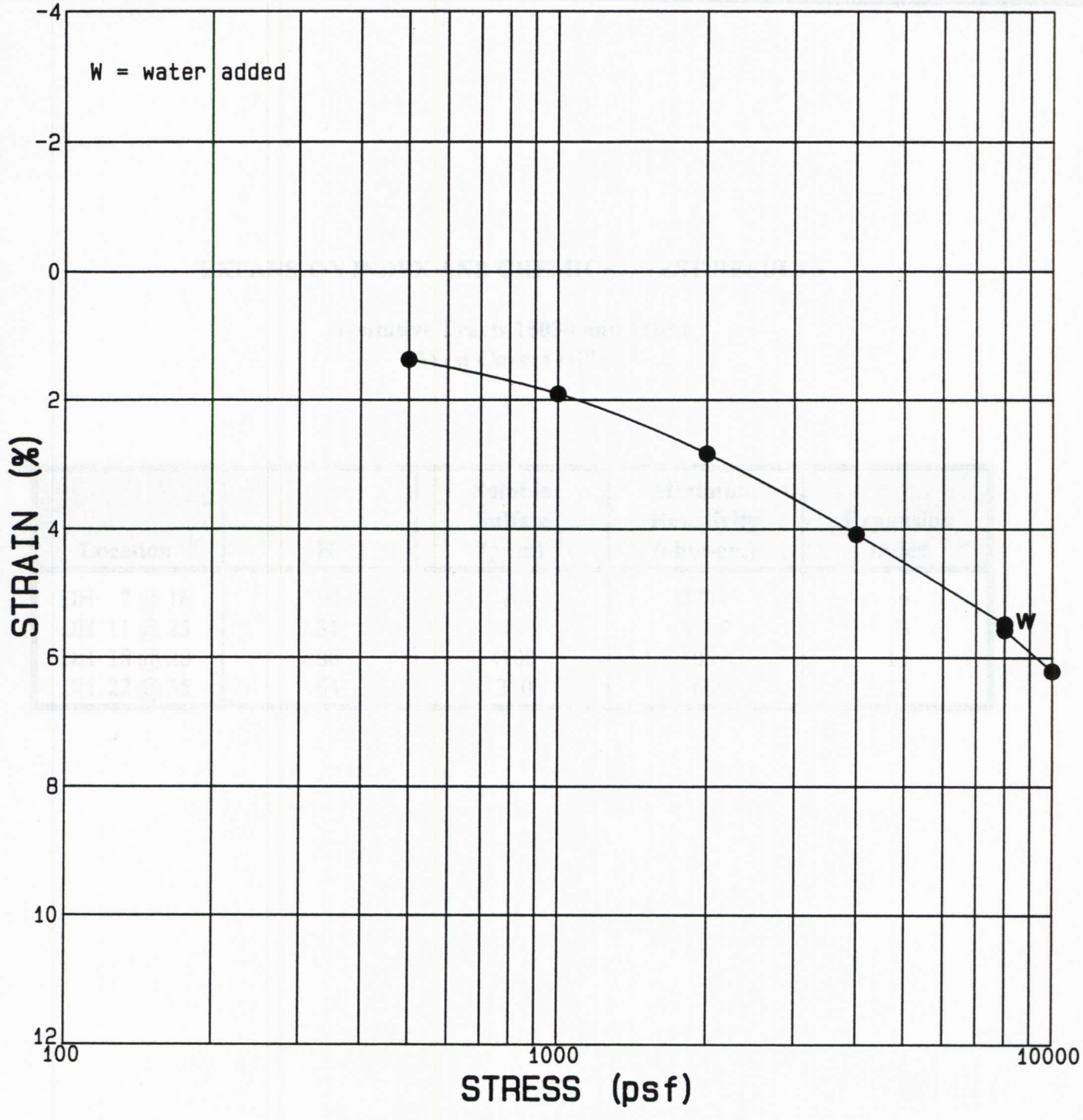
PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.6



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 27 @ 5.00'	Qcol/Qoal	0.5290	16	108	
⊠	DH 27 @ 10.00'	Qcol/Qoal	0.5476	18	107	
▲	DH 28 @ 5.00'	Qcol/Qoal	0.3309	9	124	

CONSOLIDATION TEST DATA

PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.7



	SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
●	DH 28 @ 10.00'	Qcol/Qoal	0.4891	15	111	

CONSOLIDATION TEST DATA

PROJECT 96-01 **Goffman, McCormick & Urban, Inc.** PLATE A-8.8

Appendix D
Slope Stability Analyses

Summary of Slope Stability Analysis

Cross-Section	File Name	Factor of Safety	Description
1-1’	x1dl	1.65	Lower Basin Cut Slope - Static
	x1dle	1.22	Seismic
2’-2”	x2l	1.90	Lower Basin Slope - Static
	x2le	1.38	Seismic
3-3’	x3ub	1.88	Upper Slope - Static
	x3ube	1.40	Seismic
	x3u	2.22	Upper Slope - Static
	x3ue	1.69	Seismic
3A-3A’	x3a	1.57	MSE Wall – Static
	x3ae	1.35	Seismic
4-4’	x4u	1.58	Upper Slope – Static
	x4ue	1.34	Seismic
5-5’	x5du	1.85	Upper Slope – Static
	x5due	1.44	Seismic
6-6’	x6dur	1.85	Upper Slope – Rotational – Static
	x6dure	1.56	Seismic
	x6du	2.32	Upper Slope – Block – Static
	x6due	1.93	Seismic
7-7’	x7du	2.20	Upper Slope – Static
	x7du	1.89	Seismic
8-8’	x8du	2.61	Upper Slope – Static
	x8due	1.88	Seismic
	x8dl	1.82	Lower Slope – Static
	x8dle	1.53	Seismic
9-9’	x9dexrf	1.61	Upper Slope – Rotational – Static
	x9dexrfe	1.36	Seismic
	x9dex	2.17	Upper Slope – Block – Static
	x9dexe	1.82	Seismic
10-10’	x10	2.03	Static
	x10e	1.70	Seismic
11-11’	x11	2.06	Upper Slope - Static
	x11e	2.25	Seismic
12’-12’”	x12	1.89	Upper Slope - Static
	x12e	1.53	Seismic

Please Note:

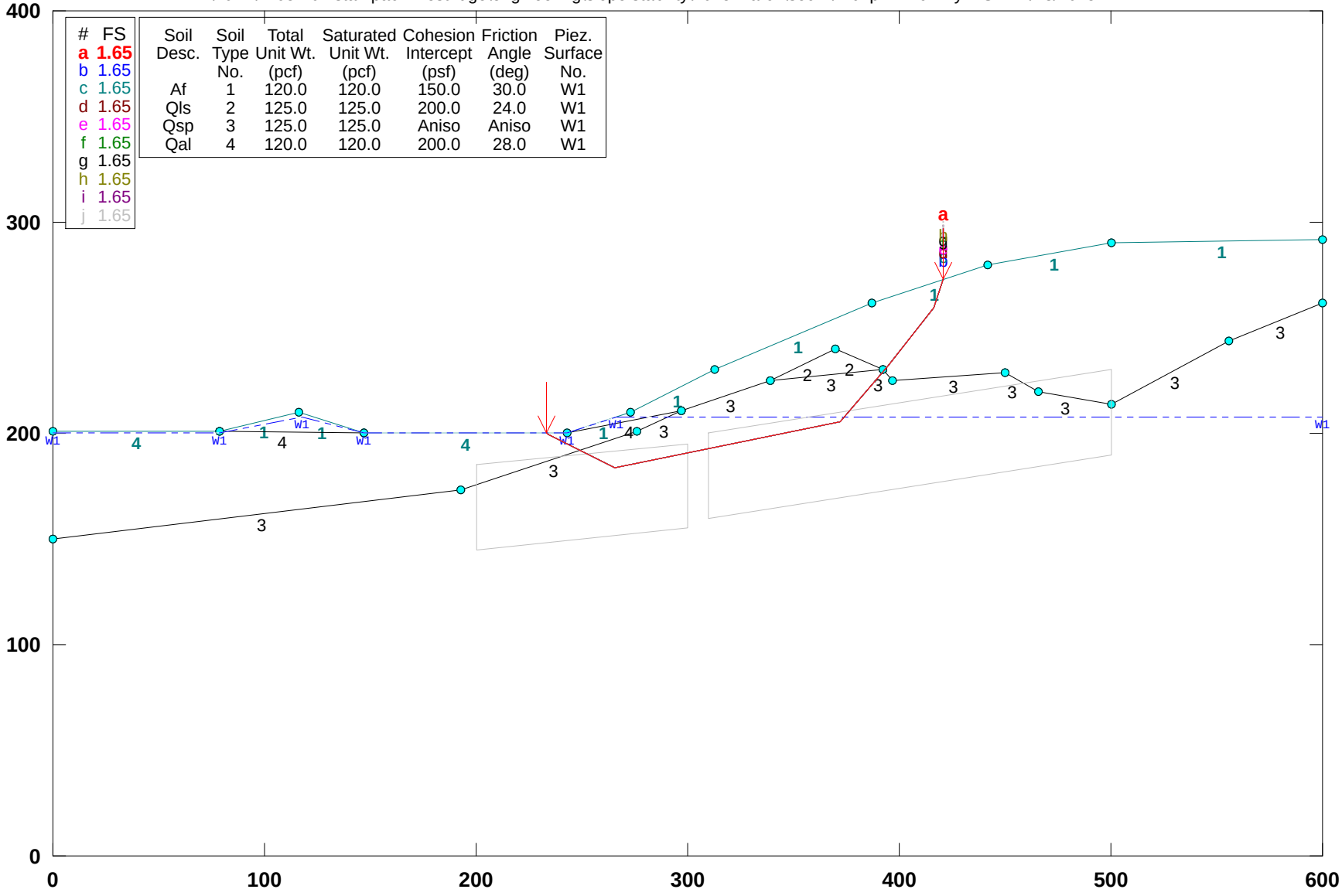
The current design topo map is dated 6/11/2015. Cross Sections 1, 6 through 9 reflect design date of 3/13 which did not change based on the current topo map dated 6/11/2015.

Discussion Regarding Geogrid-Reinforcement Strengths:

Global slope stability analysis was performed using the computer program GSTABL7 with STEDwin version 2.005.3 (Gregory Geotechnical Software, 2013). The program GSTABL7 uses what is commonly referred to as Method "B" with respect to calculating factors of safety with the inclusion of added reinforcements such as geogrid. In Method "B" the reinforcement are added to the resisting force/moments in the stability equations thereby the reinforcement will automatically be divided by the factor of safety in the same manner as the soil strength. It is appropriate to use "limiting" values of reinforcement compared to the allowable reinforcement strength values within the slope stability program. Thereby, the required allowable geogrid-reinforcement strength (as defined below) can be obtained by dividing the "limiting" geogrid strength by the slope stability factor of safety of 1.5 (i.e., 5 kips/ft divided by 1.5 = 3.33 kips/ft). The allowable strength of the geogrid reinforcement is the ultimate strength reduced by series of reduction factors (e.g., creep, installation damage, etc.) determined by the geogrid manufacturer.

Westridge/14057-01/Sec 1-1'/ 3/13 Design- Lower Basin Cut Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 1\x1dl.pl2 Run By: ASR 4/13/2015 12:24PM



GSTABL7 v.2 FSmin=1.65

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
(All Rights Reserved-Unauthorized Use Prohibited)

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 12:24PM
Run By: ASR
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dl.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dl.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dl.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 1-1'/ 3/13 Design
- Lower Basin Cut Slope - Static

BOUNDARY COORDINATES
10 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	201.00	79.00	201.00	4
2	79.00	201.00	116.00	210.00	1
3	116.00	210.00	147.00	200.00	1
4	147.00	200.00	243.00	200.00	4
5	243.00	200.00	273.00	210.00	1
6	273.00	210.00	313.00	230.00	1
7	313.00	230.00	387.00	262.00	1
8	387.00	262.00	442.00	280.00	1
9	442.00	280.00	500.00	290.00	1
10	500.00	290.00	600.00	292.00	1
11	79.00	201.00	147.00	200.00	4
12	243.00	200.00	297.00	211.00	4
13	0.00	150.00	193.00	173.00	3
14	193.00	173.00	276.00	201.00	3
15	276.00	201.00	297.00	211.00	3
16	297.00	211.00	339.00	225.00	3
17	339.00	225.00	370.00	240.00	2
18	370.00	240.00	392.00	230.00	2
19	392.00	230.00	397.00	225.00	3
20	397.00	225.00	450.00	229.00	3
21	450.00	229.00	466.00	220.00	3
22	466.00	220.00	500.00	214.00	3
23	500.00	214.00	556.00	244.00	3
24	556.00	244.00	600.00	262.00	3
25	339.00	225.00	392.00	230.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	79.00	200.00
3	118.00	208.00
4	147.00	200.00
5	243.00	200.00
6	266.00	208.00
7	600.00	208.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 35.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	200.00	165.00	300.00	175.00	40.00
2	310.00	180.00	500.00	210.00	40.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
5	394.624	231.923
6	416.565	259.192
7	420.909	273.098

Factor of Safety
*** 1.649 ***

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	9.3	0.0	5.4	0.	0.	0.0	0.0	0.0
2	8.9	2710.9	0.0	1582.1	0.	0.	0.0	0.0	0.0
3	6.3	5628.5	0.0	3126.5	0.	0.	0.0	0.0	0.0
4	16.0	32925.8	0.0	18098.5	0.	0.	0.0	0.0	0.0
5	0.7	2029.5	0.0	1008.9	0.	0.	0.0	0.0	0.0

6	7.0	20775.3	0.0	10392.0	0.	0.	0.0	0.0	0.0
7	3.0	9236.4	0.0	4258.8	0.	0.	0.0	0.0	0.0
8	6.3	20378.4	0.0	8526.8	0.	0.	0.0	0.0	0.0
9	8.4	29661.9	0.0	10650.6	0.	0.	0.0	0.0	0.0
10	6.3	23885.0	0.0	7359.3	0.	0.	0.0	0.0	0.0
11	16.0	67147.3	0.0	16371.8	0.	0.	0.0	0.0	0.0
12	26.0	126117.2	0.0	19508.8	0.	0.	0.0	0.0	0.0
13	31.0	175516.0	0.0	11779.1	0.	0.	0.0	0.0	0.0
14	1.6	10027.6	0.0	274.8	0.	0.	0.0	0.0	0.0
15	2.2	13006.4	0.0	252.3	0.	0.	0.0	0.0	0.0
16	13.2	70363.3	0.0	0.0	0.	0.	0.0	0.0	0.0
17	5.0	22194.1	0.0	0.0	0.	0.	0.0	0.0	0.0
18	0.5	2101.9	0.0	0.0	0.	0.	0.0	0.0	0.0
19	2.1	8494.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	21.9	59315.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	4.3	3254.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
5	394.624	231.923
6	416.565	259.192
7	420.909	273.098

Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832

Point No.	X-Surf (ft)	Y-Surf (ft)
4	371.636	205.530
5	394.624	231.923
6	416.565	259.192
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
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Factor of Safety
*** 1.649 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
5	394.624	231.923
6	416.565	259.192
7	420.909	273.098

Factor of Safety
*** 1.649 ***

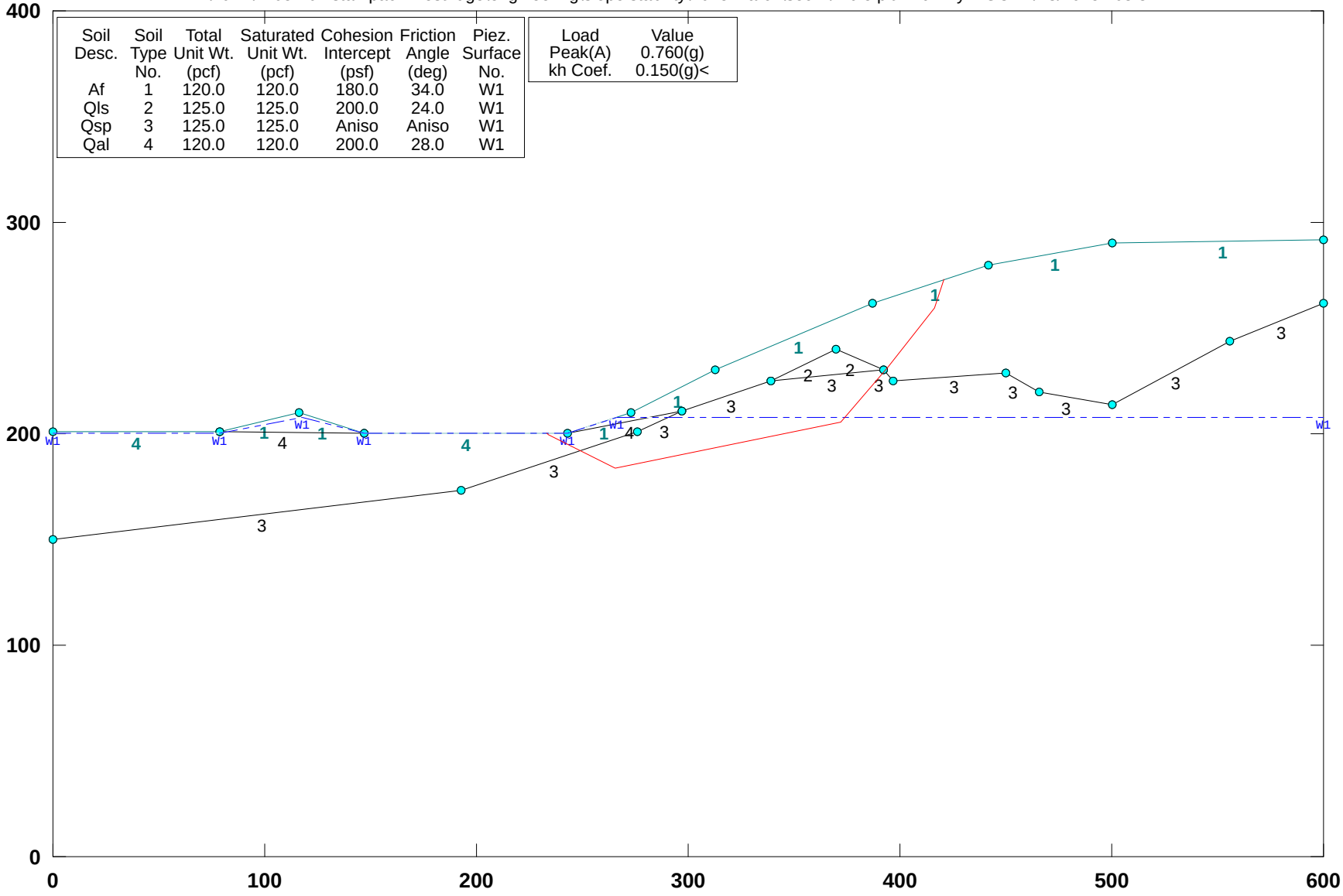
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 1-1'/ 3/13 Design- Lower Basin Cut Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 1\x1dle.plt Run By: LGC 4/13/2015 03:31PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
Peak(A)	0.760(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.22

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 03:31PM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dle.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dle.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 1\x1dle.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 1-1'/ 3/13 Design
- Lower Basin Cut Slope - Seismic

BOUNDARY COORDINATES
10 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	201.00	79.00	201.00	4
2	79.00	201.00	116.00	210.00	1
3	116.00	210.00	147.00	200.00	1
4	147.00	200.00	243.00	200.00	4
5	243.00	200.00	273.00	210.00	1
6	273.00	210.00	313.00	230.00	1
7	313.00	230.00	387.00	262.00	1
8	387.00	262.00	442.00	280.00	1
9	442.00	280.00	500.00	290.00	1
10	500.00	290.00	600.00	292.00	1
11	79.00	201.00	147.00	200.00	4
12	243.00	200.00	297.00	211.00	4
13	0.00	150.00	193.00	173.00	3
14	193.00	173.00	276.00	201.00	3
15	276.00	201.00	297.00	211.00	3
16	297.00	211.00	339.00	225.00	3
17	339.00	225.00	370.00	240.00	2
18	370.00	240.00	392.00	230.00	2
19	392.00	230.00	397.00	225.00	3
20	397.00	225.00	450.00	229.00	3
21	450.00	229.00	466.00	220.00	3
22	466.00	220.00	500.00	214.00	3
23	500.00	214.00	556.00	244.00	3
24	556.00	244.00	600.00	262.00	3
25	339.00	225.00	392.00	230.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	79.00	200.00
3	118.00	208.00
4	147.00	200.00
5	243.00	200.00
6	266.00	208.00
7	600.00	208.00

Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.564	200.000
2	234.115	199.720
3	265.302	183.832
4	371.636	205.530
5	394.624	231.923
6	416.565	259.192
7	420.909	273.098

Janbu's Empirical Coefficient (fo) = 1.077
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.223

Table 1 - Individual Data on the 21 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	9.3	0.0	5.4	0.0	0.0	1.4	0.0	0.0
2	8.9	2711.6	0.0	1582.4	0.0	0.0	406.7	0.0	0.0
3	6.3	5628.2	0.0	3126.3	0.0	0.0	844.2	0.0	0.0
4	16.0	32928.4	0.0	18099.8	0.0	0.0	4939.3	0.0	0.0
5	0.7	2028.2	0.0	1008.3	0.0	0.0	304.2	0.0	0.0
6	7.0	20775.7	0.0	10392.2	0.0	0.0	3116.4	0.0	0.0
7	3.0	9236.6	0.0	4258.9	0.0	0.0	1385.5	0.0	0.0
8	6.3	20378.7	0.0	8527.0	0.0	0.0	3056.8	0.0	0.0
9	8.4	29662.4	0.0	10650.9	0.0	0.0	4449.4	0.0	0.0
10	6.3	23885.3	0.0	7359.4	0.0	0.0	3582.8	0.0	0.0
11	16.0	67148.2	0.0	16372.3	0.0	0.0	10072.2	0.0	0.0
12	26.0	126118.5	0.0	19509.4	0.0	0.0	18917.8	0.0	0.0
13	31.0	175517.4	0.0	11779.8	0.0	0.0	26327.6	0.0	0.0
14	1.6	10025.6	0.0	274.7	0.0	0.0	1503.8	0.0	0.0
15	2.2	13008.6	0.0	252.4	0.0	0.0	1951.3	0.0	0.0
16	13.2	70363.4	0.0	0.0	0.0	0.0	10554.5	0.0	0.0
17	5.0	22194.3	0.0	0.0	0.0	0.0	3329.1	0.0	0.0
18	0.5	2102.5	0.0	0.0	0.0	0.0	315.4	0.0	0.0
19	2.1	8494.2	0.0	0.0	0.0	0.0	1274.1	0.0	0.0
20	21.9	59314.4	0.0	0.0	0.0	0.0	8897.2	0.0	0.0

21 4.3 3253.8 0.0 0.0 0.0 0.0 488.1 0.0 0.0

Table 2 - Base Stress Data on the 21 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-26.94	233.84	0.62	294.12	-5.36
2	-27.00	238.56	9.97	400.58	-97.74
3	-27.00	246.14	7.06	634.69	-286.59
4	-27.00	257.30	17.97	1884.94	-658.63
5	11.53	265.65	0.71	902.43	1008.00
6	11.53	269.50	7.14	913.45	1029.60
7	11.53	274.50	3.06	997.11	1068.08
8	11.53	279.14	6.40	1106.85	1127.02
9	11.53	286.49	8.60	1281.60	1221.04
10	11.53	293.85	6.43	1456.68	1315.24
11	11.53	305.00	16.33	1719.04	1455.88
12	11.53	326.00	26.54	2160.63	1682.74
13	11.53	354.50	31.64	2723.33	1964.13
14	11.53	370.82	1.67	3046.35	2125.86
15	48.94	372.71	3.28	4220.18	5155.43
16	48.94	380.39	20.12	3815.05	4540.44
17	48.94	389.50	7.61	3257.52	3784.54
18	48.94	392.25	0.77	3072.64	3533.88
19	48.94	393.57	3.22	2691.32	3421.37
20	51.18	405.59	35.00	1896.27	2360.42
21	72.65	418.74	14.57	831.05	748.45

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 455616.69 (lbs)

Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 1992.09(psf)

Sum of the Driving Forces = 401113.22 (lbs)

Average Mobilized Shear Stress = 1753.78(psf)

Total length of the failure surface = 228.71(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)

Seismic Yield Coefficient (ky) = 0.2521(g)

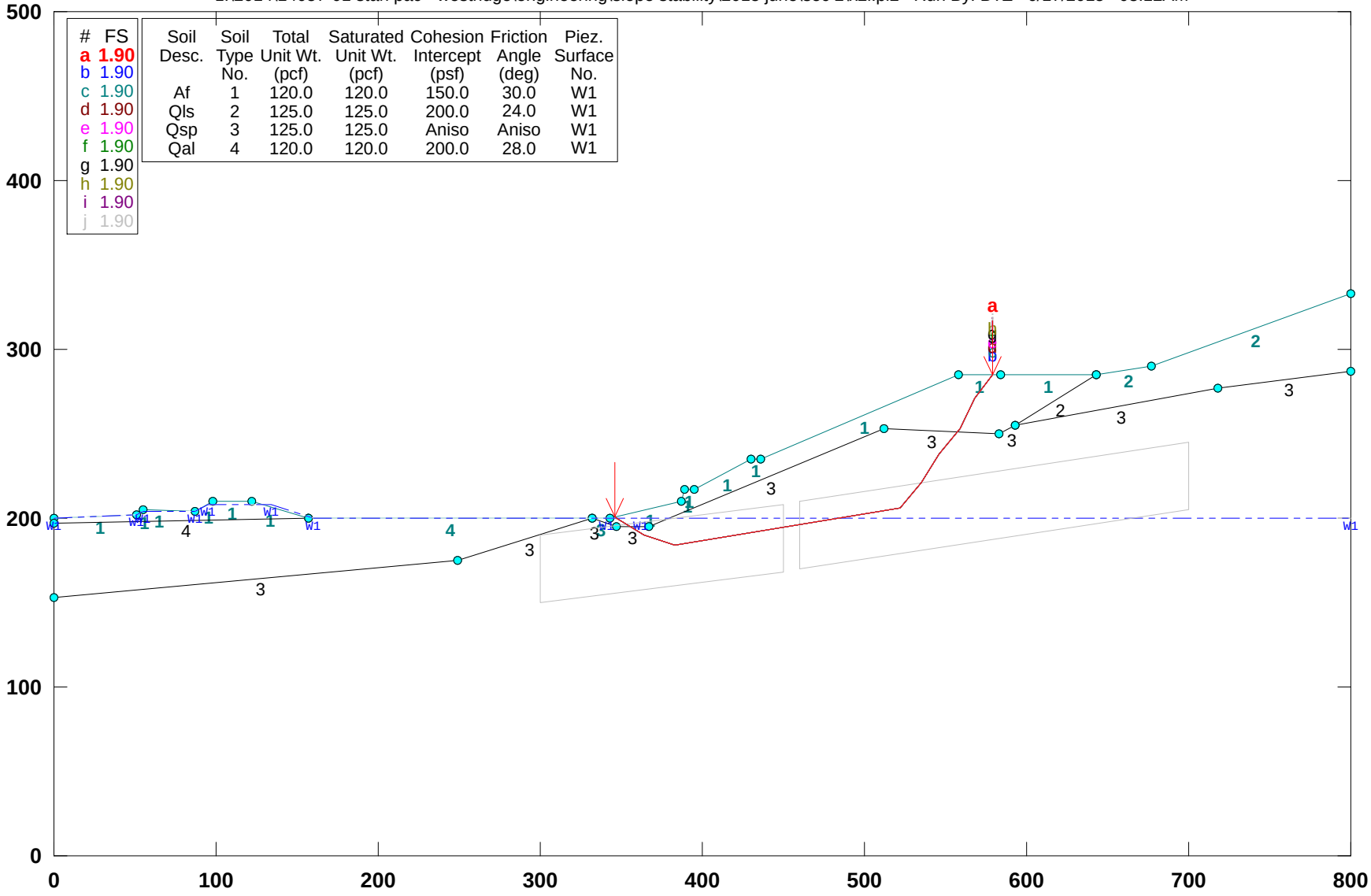
Calculated Newmark Seismic Displacement = 0.670(ft)

Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 2-2' - 6/11 Design - Lower Basin Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 2\x2l.pl2 Run By: BTZ 6/17/2015 08:12AM



GSTABL7 v.2 FSmin=1.90

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 08:12AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2l.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2l.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2l.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 2-2' -
6/11 Design - Lower Basin Slope - Static

BOUNDARY COORDINATES
18 Top Boundaries
29 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	200.00	51.00	202.00	1
2	51.00	202.00	55.00	205.00	1
3	55.00	205.00	87.00	204.00	1
4	87.00	204.00	98.00	210.00	1
5	98.00	210.00	122.00	210.00	1
6	122.00	210.00	157.00	200.00	1
7	157.00	200.00	332.00	200.00	4
8	332.00	200.00	343.00	200.00	3
9	343.00	200.00	387.00	210.00	1
10	387.00	210.00	388.75	217.00	1
11	388.75	217.00	395.00	217.00	1
12	395.00	217.00	430.00	235.00	1
13	430.00	235.00	436.00	235.00	1
14	436.00	235.00	558.00	285.00	1
15	558.00	285.00	584.00	285.00	1
16	584.00	285.00	643.00	285.00	1
17	643.00	285.00	677.00	290.00	2
18	677.00	290.00	800.00	333.00	2
19	0.00	197.00	157.00	200.00	4
20	0.00	153.00	249.00	175.00	3
21	249.00	175.00	332.00	200.00	3
22	332.00	200.00	347.00	195.00	3
23	347.00	195.00	367.00	195.00	3
24	367.00	195.00	512.00	253.00	3
25	512.00	253.00	583.00	250.00	3
26	583.00	250.00	593.00	255.00	3
27	593.00	255.00	643.00	285.00	2
28	593.00	255.00	718.00	277.00	3
29	718.00	277.00	800.00	287.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	1

4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 10 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	51.00	202.00
3	55.00	204.00
4	87.00	204.00
5	95.00	208.00
6	134.00	208.00
7	160.00	200.00
8	341.00	200.00
9	362.00	200.00
10	800.00	200.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	300.00	170.00	450.00	188.00	40.00
2	460.00	190.00	700.00	225.00	40.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.805	200.637
2	346.513	199.930
3	363.683	189.674
4	382.901	184.135
5	521.743	206.453
6	535.448	221.019
7	546.080	237.959
8	559.089	253.151
9	567.638	271.231
10	578.596	285.000

Factor of Safety
*** 1.897 ***

Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	30.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.1	6.9	0.0	0.2	0.	0.	0.0	0.0	0.0
3	8.3	4230.4	0.0	1520.7	0.	0.	0.0	0.0	0.0
4	7.2	9327.8	0.0	3764.5	0.	0.	0.0	0.0	0.0
5	1.7	2935.7	0.0	1201.9	0.	0.	0.0	0.0	0.0
6	3.3	6417.3	0.0	2327.1	0.	0.	0.0	0.0	0.0
7	12.5	30598.9	0.0	10620.4	0.	0.	0.0	0.0	0.0
8	3.4	10091.0	0.0	3395.7	0.	0.	0.0	0.0	0.0
9	4.1	12694.3	0.0	4024.6	0.	0.	0.0	0.0	0.0
10	1.8	6159.9	0.0	1666.3	0.	0.	0.0	0.0	0.0
11	6.2	24172.2	0.0	5696.9	0.	0.	0.0	0.0	0.0
12	35.0	160103.4	0.0	24569.2	0.	0.	0.0	0.0	0.0
13	6.0	31700.9	0.0	2962.3	0.	0.	0.0	0.0	0.0
14	45.6	270762.8	0.0	10561.5	0.	0.	0.0	0.0	0.0
15	30.4	216437.3	0.0	0.0	0.	0.	0.0	0.0	0.0
16	9.7	75339.3	0.0	0.0	0.	0.	0.0	0.0	0.0
17	13.7	100022.3	0.0	0.0	0.	0.	0.0	0.0	0.0
18	10.6	62998.9	0.0	0.0	0.	0.	0.0	0.0	0.0
19	11.2	51495.0	0.0	0.0	0.	0.	0.0	0.0	0.0
20	0.7	2723.2	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.1	4244.2	0.0	0.0	0.	0.	0.0	0.0	0.0
22	8.5	23398.8	0.0	0.0	0.	0.	0.0	0.0	0.0
23	11.0	9053.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.805	200.637
2	346.513	199.930
3	363.683	189.674
4	382.901	184.135
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Factor of Safety
*** 1.897 ***

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Failure Surface Specified By 10 Coordinate Points

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Factor of Safety

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Factor of Safety

*** 1.897 ***

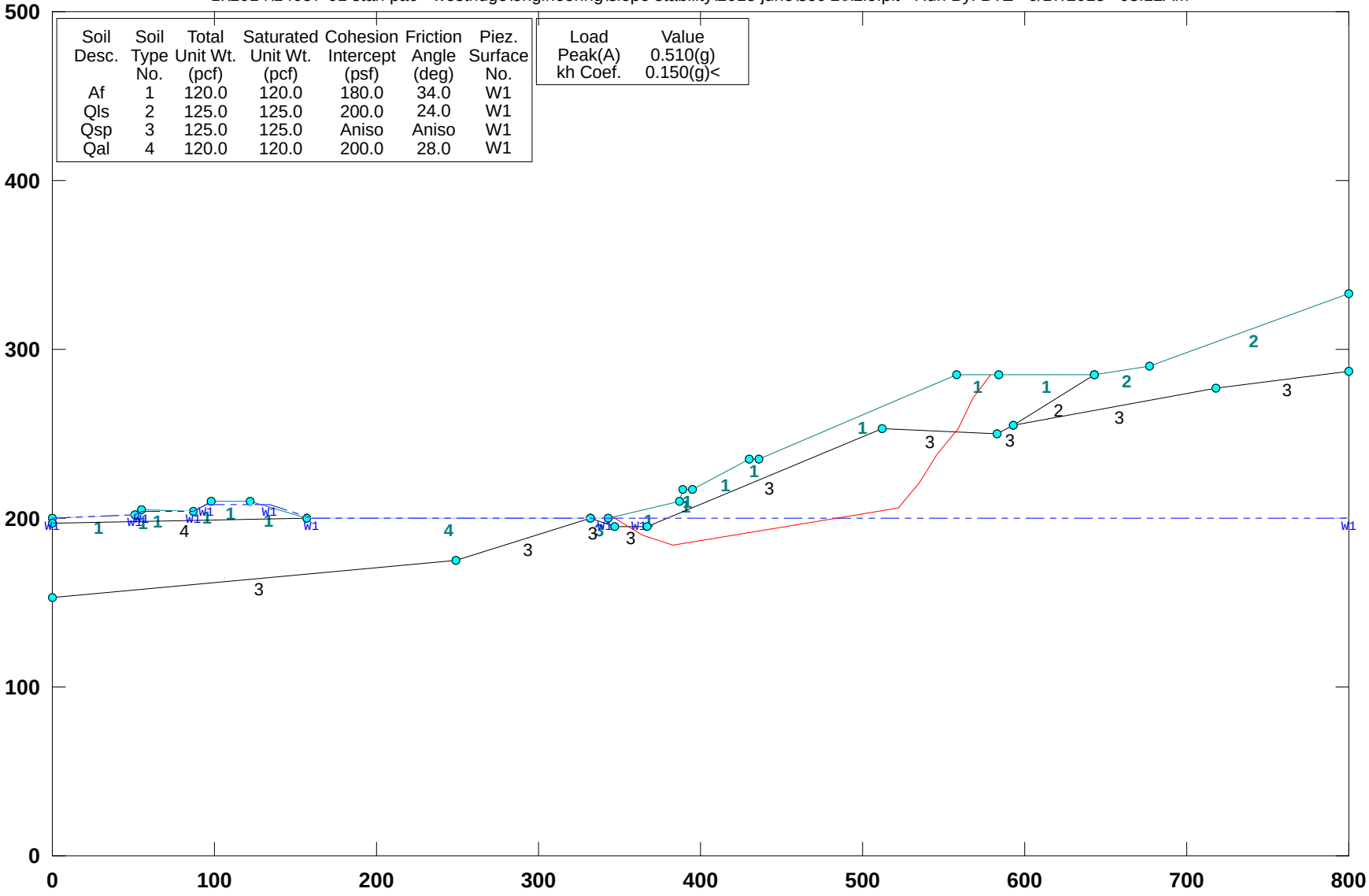
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 2-2' - 6/11 Design - Lower Basin Slope -Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 2\x2le.plt Run By: BTZ 6/17/2015 08:12AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.38

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 08:12AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2le.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2le.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 2\x2le.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 2-2' -
6/11 Design - Lower Basin Slope -Seismic

BOUNDARY COORDINATES
18 Top Boundaries
29 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	200.00	51.00	202.00	1
2	51.00	202.00	55.00	205.00	1
3	55.00	205.00	87.00	204.00	1
4	87.00	204.00	98.00	210.00	1
5	98.00	210.00	122.00	210.00	1
6	122.00	210.00	157.00	200.00	1
7	157.00	200.00	332.00	200.00	4
8	332.00	200.00	343.00	200.00	3
9	343.00	200.00	387.00	210.00	1
10	387.00	210.00	388.75	217.00	1
11	388.75	217.00	395.00	217.00	1
12	395.00	217.00	430.00	235.00	1
13	430.00	235.00	436.00	235.00	1
14	436.00	235.00	558.00	285.00	1
15	558.00	285.00	584.00	285.00	1
16	584.00	285.00	643.00	285.00	1
17	643.00	285.00	677.00	290.00	2
18	677.00	290.00	800.00	333.00	2
19	0.00	197.00	157.00	200.00	4
20	0.00	153.00	249.00	175.00	3
21	249.00	175.00	332.00	200.00	3
22	332.00	200.00	347.00	195.00	3
23	347.00	195.00	367.00	195.00	3
24	367.00	195.00	512.00	253.00	3
25	512.00	253.00	583.00	250.00	3
26	583.00	250.00	593.00	255.00	3
27	593.00	255.00	643.00	285.00	2
28	593.00	255.00	718.00	277.00	3
29	718.00	277.00	800.00	287.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1

4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 10 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	51.00	202.00
3	55.00	204.00
4	87.00	204.00
5	95.00	208.00
6	134.00	208.00
7	160.00	200.00
8	341.00	200.00
9	362.00	200.00
10	800.00	200.00

Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.805	200.637
2	346.513	199.930
3	363.683	189.674
4	382.901	184.135
5	521.743	206.453
6	535.448	221.019
7	546.080	237.959
8	559.089	253.151
9	567.638	271.231
10	578.596	285.000

Janbu's Empirical Coefficient (fo) = 1.076
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.378

Table 1 - Individual Data on the 23 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	30.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
2	0.1	6.9	0.0	0.2	0.0	0.0	1.0	0.0	0.0
3	8.3	4230.4	0.0	1520.8	0.0	0.0	634.6	0.0	0.0
4	7.2	9328.2	0.0	3764.6	0.0	0.0	1399.2	0.0	0.0
5	1.7	2935.2	0.0	1201.7	0.0	0.0	440.3	0.0	0.0
6	3.3	6417.8	0.0	2327.3	0.0	0.0	962.7	0.0	0.0
7	12.5	30599.0	0.0	10620.5	0.0	0.0	4589.9	0.0	0.0
8	3.4	10091.1	0.0	3395.7	0.0	0.0	1513.7	0.0	0.0
9	4.1	12694.4	0.0	4024.7	0.0	0.0	1904.2	0.0	0.0
10	1.8	6159.9	0.0	1666.3	0.0	0.0	924.0	0.0	0.0

11	6.2	24172.2	0.0	5697.0	0.0	0.0	3625.8	0.0	0.0
12	35.0	160103.7	0.0	24569.4	0.0	0.0	24015.6	0.0	0.0
13	6.0	31700.9	0.0	2962.3	0.0	0.0	4755.1	0.0	0.0
14	45.6	270761.8	0.0	10561.5	0.0	0.0	40614.3	0.0	0.0
15	30.4	216438.2	0.0	0.0	0.0	0.0	32465.7	0.0	0.0
16	9.7	75337.7	0.0	0.0	0.0	0.0	11300.7	0.0	0.0
17	13.7	100024.3	0.0	0.0	0.0	0.0	15003.6	0.0	0.0
18	10.6	62996.0	0.0	0.0	0.0	0.0	9449.4	0.0	0.0
19	11.2	51496.0	0.0	0.0	0.0	0.0	7724.4	0.0	0.0
20	0.7	2723.9	0.0	0.0	0.0	0.0	408.6	0.0	0.0
21	1.1	4245.1	0.0	0.0	0.0	0.0	636.8	0.0	0.0
22	8.5	23399.3	0.0	0.0	0.0	0.0	3509.9	0.0	0.0
23	11.0	9052.8	0.0	0.0	0.0	0.0	1357.9	0.0	0.0

Table 2 - Base Stress Data on the 23 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-44.98	346.12	0.90	585.85	-28.20
2	-44.98	346.48	0.10	679.05	-59.51
3	-30.85	350.64	9.61	689.82	-196.84
4	-30.85	358.38	8.43	1758.93	-495.24
5	-30.85	362.84	1.96	2079.05	-669.76
6	-16.08	365.34	3.45	1636.15	-256.97
7	-16.08	373.25	13.01	1939.27	-325.12
8	-16.08	381.20	3.54	2246.71	-394.07
9	9.13	384.95	4.15	1227.54	950.16
10	9.13	387.88	1.77	1447.87	1079.93
11	9.13	391.88	6.33	1636.74	1186.59
12	9.13	412.50	35.45	2081.82	1403.45
13	9.13	433.00	6.08	2527.39	1621.00
14	9.13	458.80	46.18	2972.24	1821.80
15	9.13	496.80	30.79	3659.07	2184.24
16	9.13	516.87	9.87	3957.78	2372.38
17	46.74	528.60	20.00	5205.15	6065.62
18	57.89	540.76	20.00	4751.86	5491.03
19	49.43	551.70	17.28	3511.98	3926.98
20	49.43	557.66	1.05	2818.84	3433.18
21	49.43	558.54	1.67	2748.09	3341.27
22	64.69	563.36	20.00	2328.78	2649.90
23	51.49	573.12	17.60	733.00	723.58

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 778104.88 (lbs)

Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 2786.68(psf)

Sum of the Driving Forces = 607764.44 (lbs)

Average Mobilized Shear Stress = 2176.63(psf)

Total length of the failure surface = 279.22(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)

Seismic Yield Coefficient (ky) = 0.3150(g)

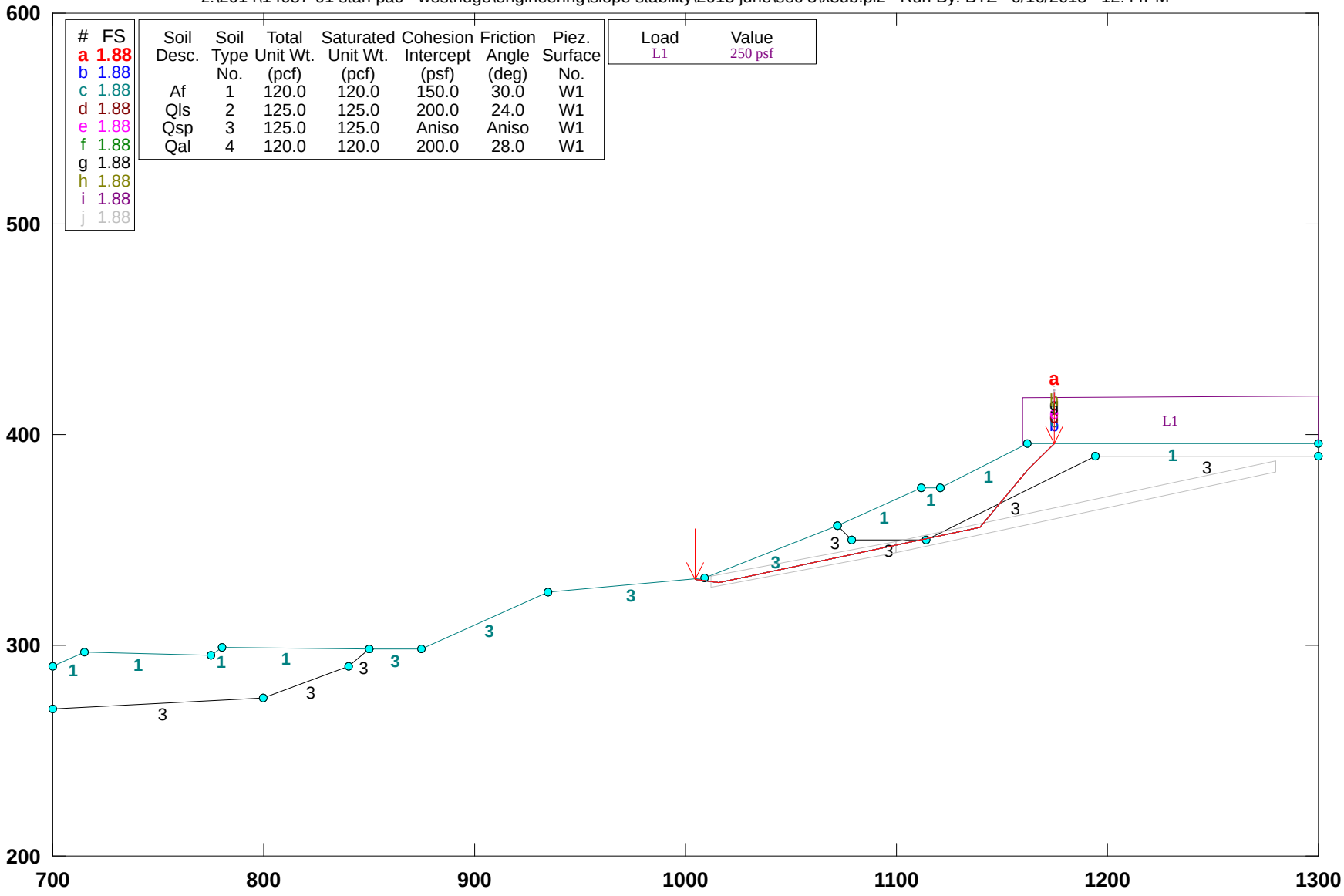
Calculated Newmark Seismic Displacement = 0.130(ft)

Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 3-3' - 6/11 Design - Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3\x3ub.pl2 Run By: BTZ 6/16/2015 12:44PM



#	FS
a	1.88
b	1.88
c	1.88
d	1.88
e	1.88
f	1.88
g	1.88
h	1.88
i	1.88
j	1.88

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf

GSTABL7 v.2 FSmin=1.88

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 12:44PM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ub.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ub.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ub.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 3-3' - 6/11
Design - Upper Slope - Static

BOUNDARY COORDINATES
12 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	290.00	715.00	297.00	1
2	715.00	297.00	775.00	295.00	1
3	775.00	295.00	780.00	299.00	1
4	780.00	299.00	850.00	298.00	1
5	850.00	298.00	875.00	298.00	3
6	875.00	298.00	935.00	325.00	3
7	935.00	325.00	1009.00	332.00	3
8	1009.00	332.00	1072.00	357.00	3
9	1072.00	357.00	1112.00	375.00	1
10	1112.00	375.00	1121.00	375.00	1
11	1121.00	375.00	1162.00	396.00	1
12	1162.00	396.00	1300.00	396.00	1
13	1072.00	357.00	1079.00	350.00	3
14	1079.00	350.00	1114.00	350.00	3
15	1114.00	350.00	1194.00	390.00	3
16	1194.00	390.00	1300.00	390.00	3
17	700.00	270.00	800.00	275.00	3
18	800.00	275.00	840.00	290.00	3
19	840.00	290.00	850.00	298.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	300.00	32.00
2	12.0	200.00	27.00

3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1160.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 35.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	1012.00	330.00	1100.00	346.70	5.00
2	1100.10	346.70	1280.00	385.00	5.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.545	331.579
2	1015.819	329.786
3	1139.793	355.967
4	1162.217	382.840
5	1174.875	396.000

Factor of Safety
*** 1.877 ***

Individual data on the 14 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.5	314.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.8	2578.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	56.2	71174.6	0.0	0.0	0.	0.	0.0	0.0	0.0
4	7.0	13984.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	32.5	82193.0	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.5	1375.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	3.8	11172.0	0.0	0.0	0.	0.	0.0	0.0	0.0
8	5.2	14715.9	0.0	0.0	0.	0.	0.0	0.0	0.0
9	18.8	58649.4	0.0	0.0	0.	0.	0.0	0.0	0.0
10	9.9	30239.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	10.3	22612.1	0.0	0.0	0.	0.	0.0	0.0	0.0
12	2.0	3385.4	0.0	0.0	0.	0.	0.0	0.0	500.0
13	0.2	345.9	0.0	0.0	0.	0.	0.0	0.0	54.2
14	12.7	9995.0	0.0	0.0	0.	0.	0.0	0.0	3164.6

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.545	331.579
2	1015.819	329.786

3	1139.793	355.967
4	1162.217	382.840
5	1174.875	396.000

Factor of Safety
*** 1.877 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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Factor of Safety
*** 1.877 ***

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Factor of Safety
*** 1.877 ***

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Factor of Safety
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Factor of Safety
*** 1.877 ***

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Factor of Safety
*** 1.877 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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2	1015.819	329.786

3	1139.793	355.967
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5	1174.875	396.000

Factor of Safety
*** 1.877 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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2	1015.819	329.786
3	1139.793	355.967
4	1162.217	382.840
5	1174.875	396.000

Factor of Safety
*** 1.877 ***

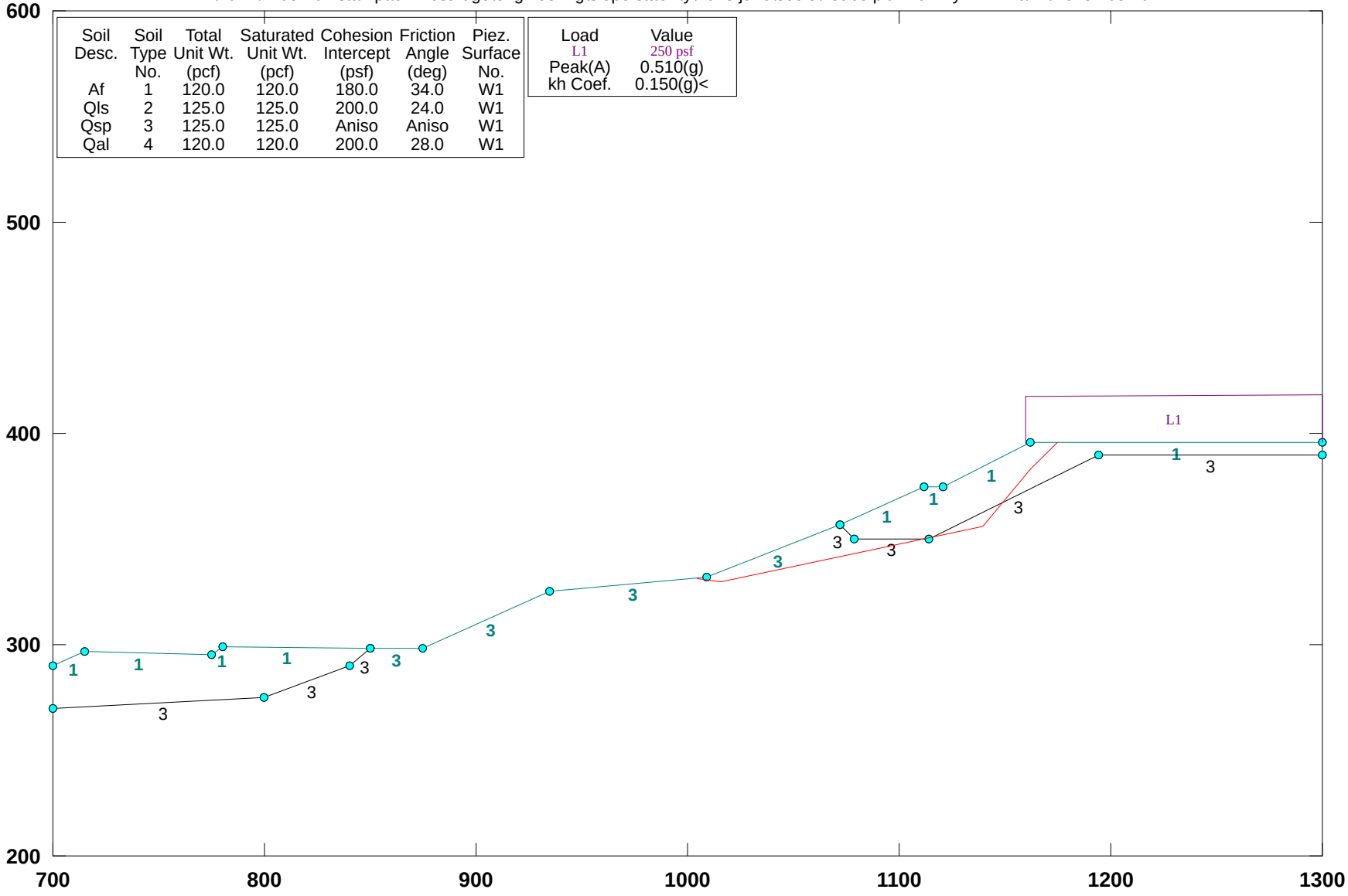
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 3-3' - 6/11 Design - Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3\x3ube.plt Run By: BTZ 6/17/2015 08:16AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.40

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 08:16AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ube.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ube.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ube.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 3-3' - 6/11
Design - Upper Slope - Seismic

BOUNDARY COORDINATES
12 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	290.00	715.00	297.00	1
2	715.00	297.00	775.00	295.00	1
3	775.00	295.00	780.00	299.00	1
4	780.00	299.00	850.00	298.00	1
5	850.00	298.00	875.00	298.00	3
6	875.00	298.00	935.00	325.00	3
7	935.00	325.00	1009.00	332.00	3
8	1009.00	332.00	1072.00	357.00	3
9	1072.00	357.00	1112.00	375.00	1
10	1112.00	375.00	1121.00	375.00	1
11	1121.00	375.00	1162.00	396.00	1
12	1162.00	396.00	1300.00	396.00	1
13	1072.00	357.00	1079.00	350.00	3
14	1079.00	350.00	1114.00	350.00	3
15	1114.00	350.00	1194.00	390.00	3
16	1194.00	390.00	1300.00	390.00	3
17	700.00	270.00	800.00	275.00	3
18	800.00	275.00	840.00	290.00	3
19	840.00	290.00	850.00	298.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	12.0	200.00	27.00

3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1160.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.545	331.579
2	1015.819	329.786
3	1139.793	355.967
4	1162.217	382.840
5	1174.875	396.000

Janbu's Empirical Coefficient (fo) = 1.056
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.399

Table 1 - Individual Data on the 14 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.5	314.6	0.0	0.0	0.0	0.0	47.2	0.0	0.0
2	6.8	2578.3	0.0	0.0	0.0	0.0	386.7	0.0	0.0
3	56.2	71172.7	0.0	0.0	0.0	0.0	10675.9	0.0	0.0
4	7.0	13984.7	0.0	0.0	0.0	0.0	2097.7	0.0	0.0
5	32.5	82189.5	0.0	0.0	0.0	0.0	12328.4	0.0	0.0
6	0.5	1378.4	0.0	0.0	0.0	0.0	206.8	0.0	0.0
7	3.8	11173.7	0.0	0.0	0.0	0.0	1676.1	0.0	0.0
8	5.2	14714.0	0.0	0.0	0.0	0.0	2207.1	0.0	0.0
9	18.8	58647.3	0.0	0.0	0.0	0.0	8797.1	0.0	0.0
10	9.9	30240.4	0.0	0.0	0.0	0.0	4536.1	0.0	0.0
11	10.3	22612.5	0.0	0.0	0.0	0.0	3391.9	0.0	0.0
12	2.0	3385.5	0.0	0.0	0.0	0.0	507.8	0.0	500.0
13	0.2	345.9	0.0	0.0	0.0	0.0	51.9	0.0	54.2
14	12.7	9994.9	0.0	0.0	0.0	0.0	1499.2	0.0	3164.5

Table 2 - Base Stress Data on the 14 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-9.03	1006.77	4.51	600.54	-0.63
2	-9.03	1012.41	6.90	827.99	-3.36
3	11.92	1043.91	57.42	802.42	447.69
4	11.92	1075.50	7.15	1155.90	706.00
5	11.92	1095.27	33.26	1411.30	892.65
6	11.92	1111.77	0.47	2032.54	1053.68
7	11.92	1113.90	3.88	2006.56	1039.00
8	11.92	1118.40	5.31	1558.25	1000.03
9	11.92	1130.40	19.21	1698.90	1102.82
10	50.16	1144.75	15.49	2528.35	2633.06
11	50.16	1154.86	16.05	1645.08	1899.34
12	50.16	1161.00	3.12	1474.39	1654.32
13	50.16	1162.11	0.34	1409.04	1569.71
14	46.11	1168.55	18.26	846.76	831.37

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 243345.72 (lbs)

```
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   1271.51(psf)
Sum of the Driving Forces =   183590.20 (lbs)
Average Mobilized Shear Stress =     959.28(psf)
Total length of the failure surface =     191.38(ft)
       *** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) =  0.3276(g)
Calculated Newmark Seismic Displacement =   0.120(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
              **** END OF GSTABL7 OUTPUT ****
```

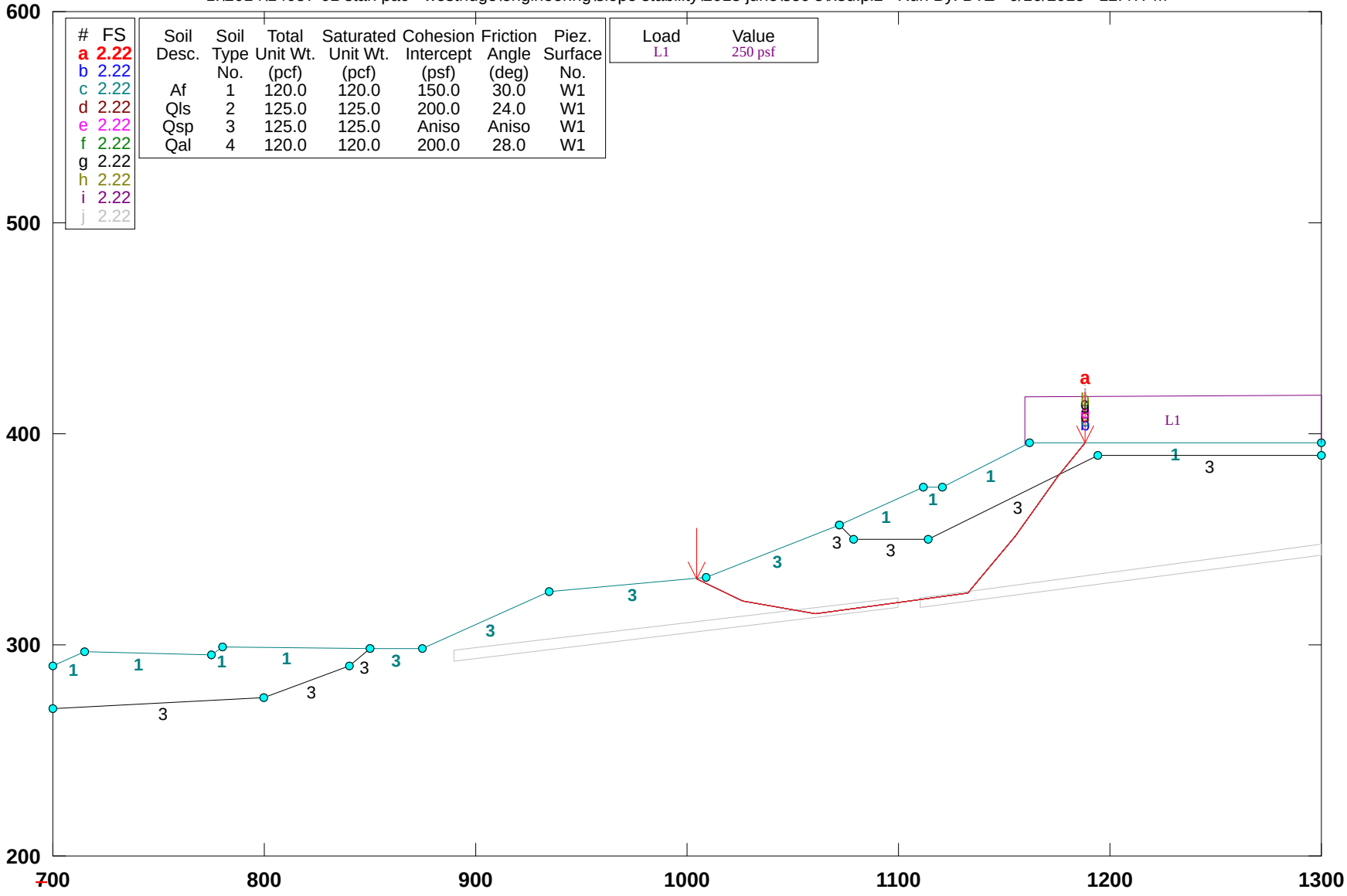
Westridge/14057-01/Sec 3-3' - 6/11 Design - Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3\x3u.pl2 Run By: BTZ 6/16/2015 12:47PM

#	FS
a	2.22
b	2.22
c	2.22
d	2.22
e	2.22
f	2.22
g	2.22
h	2.22
i	2.22
j	2.22

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=2.22

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 12:47PM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3u.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3u.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3u.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 3-3' - 6/11
Design - Upper Slope - Static

BOUNDARY COORDINATES
12 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	290.00	715.00	297.00	1
2	715.00	297.00	775.00	295.00	1
3	775.00	295.00	780.00	299.00	1
4	780.00	299.00	850.00	298.00	1
5	850.00	298.00	875.00	298.00	3
6	875.00	298.00	935.00	325.00	3
7	935.00	325.00	1009.00	332.00	3
8	1009.00	332.00	1072.00	357.00	3
9	1072.00	357.00	1112.00	375.00	1
10	1112.00	375.00	1121.00	375.00	1
11	1121.00	375.00	1162.00	396.00	1
12	1162.00	396.00	1300.00	396.00	1
13	1072.00	357.00	1079.00	350.00	3
14	1079.00	350.00	1114.00	350.00	3
15	1114.00	350.00	1194.00	390.00	3
16	1194.00	390.00	1300.00	390.00	3
17	700.00	270.00	800.00	275.00	3
18	800.00	275.00	840.00	290.00	3
19	840.00	290.00	850.00	298.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1160.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 35.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	890.00	295.00	1100.00	320.00	5.00
2	1110.00	320.00	1300.00	345.00	5.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***
Individual data on the 15 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.3	672.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	17.6	22564.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	34.4	120871.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	11.0	54609.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	7.0	36625.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	33.0	195699.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.0	13004.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	7.0	45004.2	0.0	0.0	0.	0.	0.0	0.0	0.0
9	11.5	76230.4	0.0	0.0	0.	0.	0.0	0.0	0.0
10	23.0	137868.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	4.5	21593.8	0.0	0.0	0.	0.	0.0	0.0	0.0
12	2.0	8840.5	0.0	0.0	0.	0.	0.0	0.0	500.0
13	13.2	41009.7	0.0	0.0	0.	0.	0.0	0.0	3302.1
14	0.7	1276.9	0.0	0.0	0.	0.	0.0	0.0	171.8
15	12.4	11185.2	0.0	0.0	0.	0.	0.0	0.0	3096.3

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
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Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Factor of Safety
*** 2.222 ***

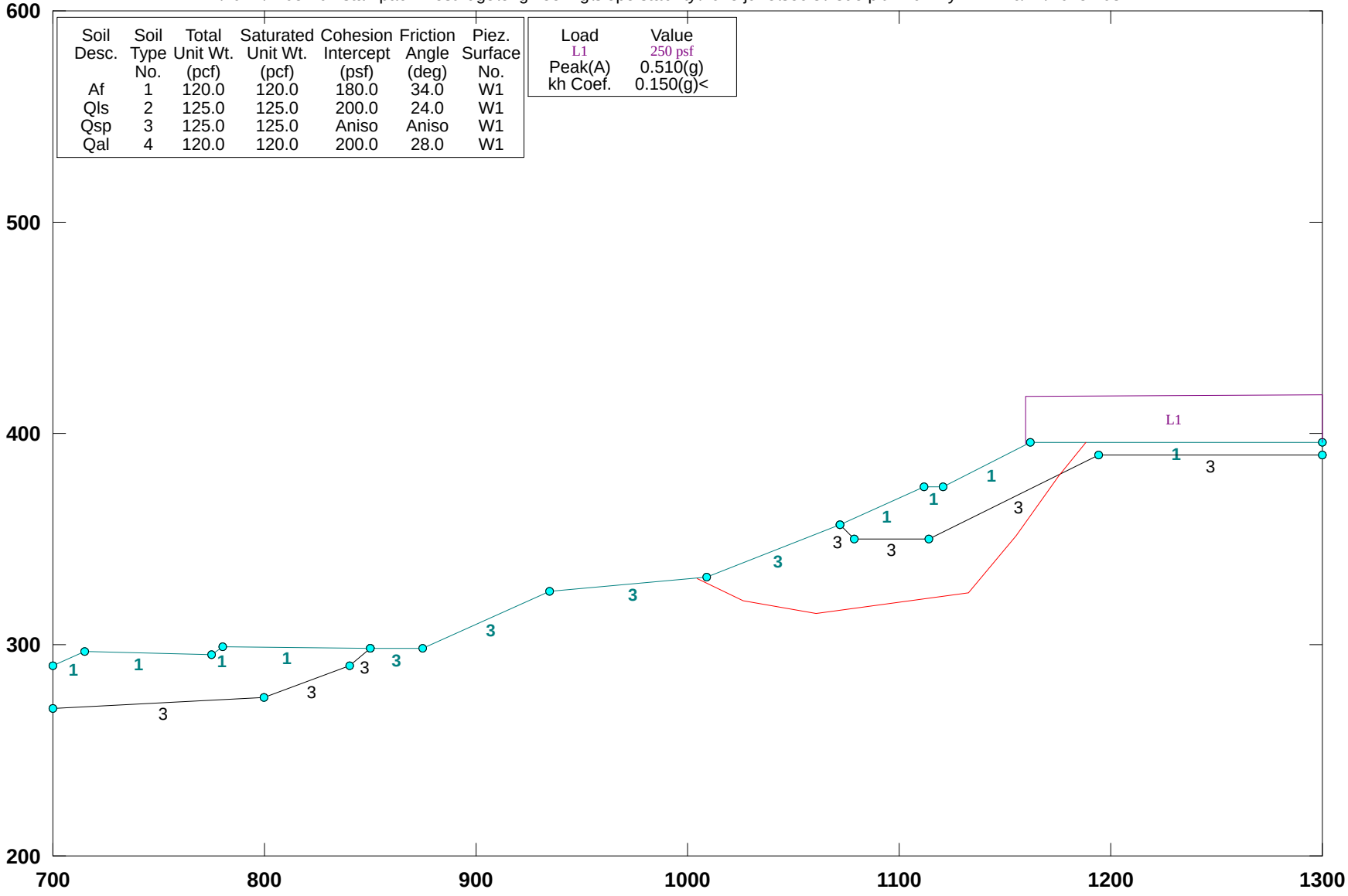
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 3-3' - 6/11 Design - Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3\x3ue.plt Run By: BTZ 6/17/2015 08:17AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.69

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 08:17AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ue.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ue.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3\x3ue.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 3-3' - 6/11
Design - Upper Slope - Seismic

BOUNDARY COORDINATES
12 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	290.00	715.00	297.00	1
2	715.00	297.00	775.00	295.00	1
3	775.00	295.00	780.00	299.00	1
4	780.00	299.00	850.00	298.00	1
5	850.00	298.00	875.00	298.00	3
6	875.00	298.00	935.00	325.00	3
7	935.00	325.00	1009.00	332.00	3
8	1009.00	332.00	1072.00	357.00	3
9	1072.00	357.00	1112.00	375.00	1
10	1112.00	375.00	1121.00	375.00	1
11	1121.00	375.00	1162.00	396.00	1
12	1162.00	396.00	1300.00	396.00	1
13	1072.00	357.00	1079.00	350.00	3
14	1079.00	350.00	1114.00	350.00	3
15	1114.00	350.00	1194.00	390.00	3
16	1194.00	390.00	1300.00	390.00	3
17	700.00	270.00	800.00	275.00	3
18	800.00	275.00	840.00	290.00	3
19	840.00	290.00	850.00	298.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	12.0	200.00	27.00

3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1160.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1004.695	331.593
2	1026.591	320.955
3	1060.971	314.396
4	1132.486	324.821
5	1155.509	351.183
6	1175.208	380.113
7	1188.281	396.000

Janbu's Empirical Coefficient (fo) = 1.081
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.691

Table 1 - Individual Data on the 15 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.3	672.3	0.0	0.0	0.0	0.0	100.8	0.0	0.0
2	17.6	22565.1	0.0	0.0	0.0	0.0	3384.8	0.0	0.0
3	34.4	120873.6	0.0	0.0	0.0	0.0	18131.0	0.0	0.0
4	11.0	54610.1	0.0	0.0	0.0	0.0	8191.5	0.0	0.0
5	7.0	36625.8	0.0	0.0	0.0	0.0	5493.9	0.0	0.0
6	33.0	195700.7	0.0	0.0	0.0	0.0	29355.1	0.0	0.0
7	2.0	13004.9	0.0	0.0	0.0	0.0	1950.7	0.0	0.0
8	7.0	45004.4	0.0	0.0	0.0	0.0	6750.7	0.0	0.0
9	11.5	76230.8	0.0	0.0	0.0	0.0	11434.6	0.0	0.0
10	23.0	137867.8	0.0	0.0	0.0	0.0	20680.2	0.0	0.0
11	4.5	21594.2	0.0	0.0	0.0	0.0	3239.1	0.0	0.0
12	2.0	8840.3	0.0	0.0	0.0	0.0	1326.0	0.0	500.0
13	13.2	41007.1	0.0	0.0	0.0	0.0	6151.1	0.0	3302.0
14	0.7	1275.1	0.0	0.0	0.0	0.0	191.3	0.0	171.6
15	12.4	11187.1	0.0	0.0	0.0	0.0	1678.1	0.0	3096.6

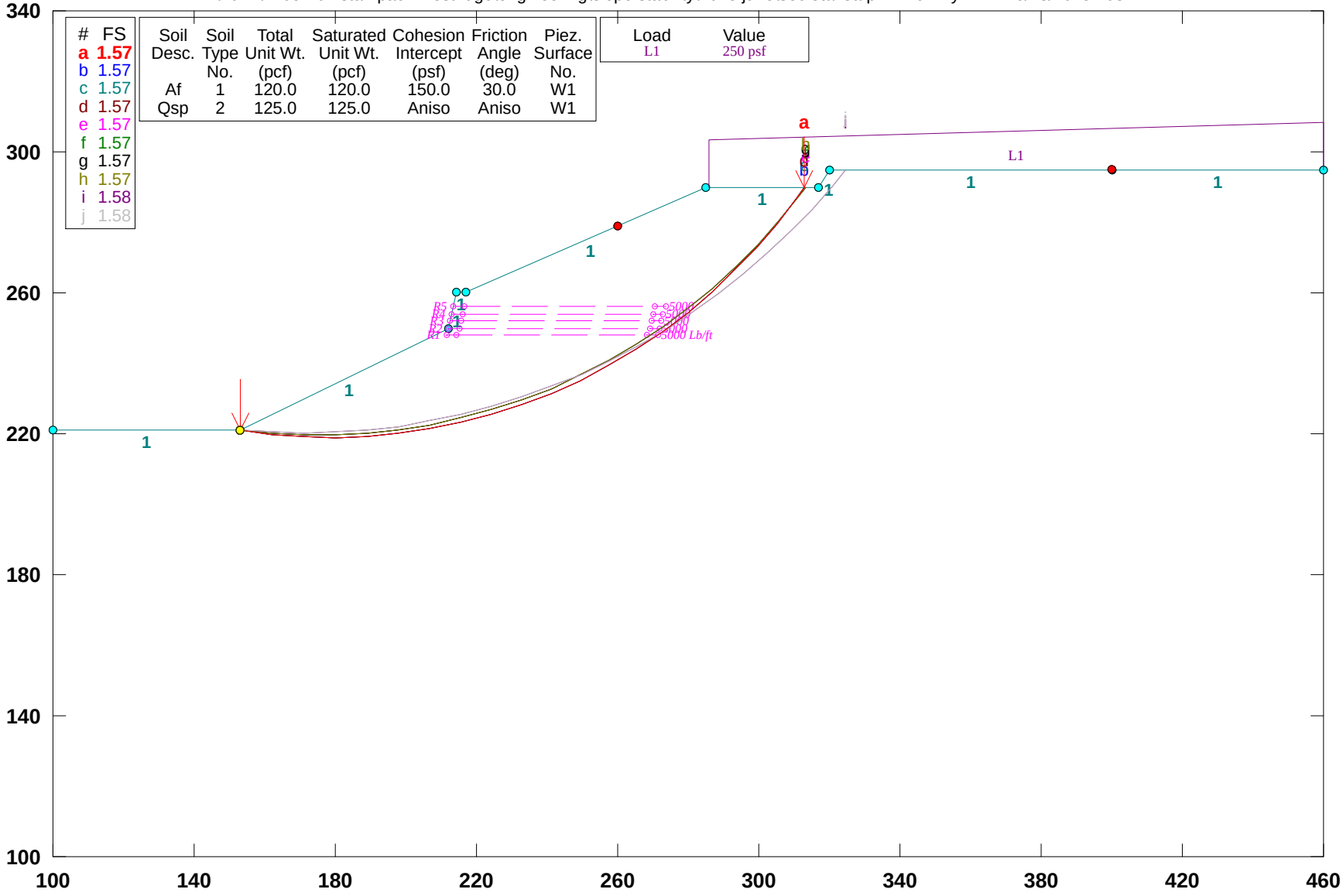
Table 2 - Base Stress Data on the 15 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-25.91	1006.85	4.79	834.80	-47.18
2	-25.91	1017.80	19.56	1882.73	-387.49
3	-10.80	1043.78	35.00	3164.04	-140.83
4	8.29	1066.49	11.15	2635.89	1449.20
5	8.29	1075.50	7.07	2774.38	1531.38
6	8.29	1095.50	33.35	3118.70	1735.69
7	8.29	1113.00	2.02	3400.89	1903.14
8	8.29	1117.50	7.07	3364.76	1881.70
9	8.29	1126.74	11.61	3467.19	1942.48
10	48.87	1144.00	35.00	4736.78	5101.17
11	55.75	1157.75	7.98	4193.79	4380.40
12	55.75	1161.00	3.55	4089.35	4233.40
13	55.75	1168.60	23.47	3095.29	3035.03

```
14      50.55     1175.55        1.08           2036.78              1804.51
15      50.55     1182.09       19.49           1015.23               976.54
   Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
   Soil Nail, and Applied Forces if applicable) =  676422.31 (lbs)
   Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
   Soil Nail, and Applied Forces if applicable) =   3044.36(psf)
   Sum of the Driving Forces =   432587.50 (lbs)
   Average Mobilized Shear Stress =    1946.94(psf)
   Total length of the failure surface =     222.19(ft)
          *** SEISMIC SLOPE DISPLACEMENT DATA ***
   (Note: kv is set = zero for displacement calculations)
   Seismic Yield Coefficient (ky) =  0.4626(g)
   Calculated Newmark Seismic Displacement =   0.060(ft)
   Non-Symmetrical Sliding Resistance Has Been Specified
   for Downhill Sliding.
                **** END OF GSTABL7 OUTPUT ****
```

Westridge/14057-01/Sec 3A-3A' - 6/11 Design / Lower Slope MSE - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3a\x3a.pl2 Run By: BTZ 6/18/2015 08:27AM



GSTABL7 v.2 FSmin=1.57

Safety Factors Are Calculated By The Modified Bishop Method

```
                                  ***  GSTABL7  ***
                ** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
        ** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
                    (All Rights Reserved-Unauthorized Use Prohibited)
    ********************************************************************************
                         SLOPE STABILITY ANALYSIS SYSTEM
           Modified Bishop, Simplified Janbu, or GLE Method of Slices.
           (Includes Spencer & Morgenstern-Price Type Analysis)
           Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
           Nonlinear Undrained Shear Strength, Curved Phi Envelope,
           Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
           Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
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    Time of Run:              08:27AM
    Run By:                   BTZ
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    Output Filename:          Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stab
ility\2015 June\Sec 3A\x3a.OUT
    Unit System:               English
    Plotted Output Filename:  Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stab
ility\2015 June\Sec 3A\x3a.PLT
    PROBLEM DESCRIPTION:  Westridge/14057-01/Sec 3A-3A' - 6/11
                          Design / Lower Slope MSE - Static
    BOUNDARY COORDINATES
        9 Top   Boundaries
        9 Total Boundaries
    Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
       No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
        1        100.00     221.00     153.00     221.00        1
        2        153.00     221.00     212.00     250.00        1
        3        212.00     250.00     214.50     260.00        1
        4        214.50     260.00     217.00     260.00        1
        5        217.00     260.00     285.00     290.00        1
        6        285.00     290.00     317.00     290.00        1
        7        317.00     290.00     320.00     295.00        1
        8        320.00     295.00     400.00     295.00        1
        9        400.00     295.00     460.00     295.00        1
    User Specified Y-Origin =       100.00(ft)
    Default X-Plus Value = 0.00(ft)
    Default Y-Plus Value = 0.00(ft)
   ISOTROPIC SOIL PARAMETERS
     2 Type(s) of Soil
    Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
    Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
     No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
       1   120.0    120.0     150.0     30.0    0.00       0.0      1
       2   125.0    125.0     300.0     32.0    0.00       0.0      1
   ANISOTROPIC STRENGTH PARAMETERS
       1 soil type(s)
    Soil Type  2 Is Anisotropic
    Number Of Direction Ranges Specified =  3
    Direction    Counterclockwise     Cohesion     Friction
      Range       Direction Limit    Intercept       Angle
       No.           (deg)            (psf)         (deg)
        1              7.0             300.00         32.00
        2             12.0             200.00         27.00
        3             90.0             300.00         32.00
    ANISOTROPIC SOIL NOTES:
       (1) An input value of 0.01 for C and/or Phi will cause Aniso
           C and/or Phi to be ignored in that range.
       (2) An input value of 0.02 for Phi will set both Phi and
           C equal to zero, with no water weight in the tension crack.
       (3) An input value of 0.03 for Phi will set both Phi and
           C equal to zero, with water weight in the tension crack.
   BOUNDARY LOAD(S)
       1 Load(s) Specified
    Load        X-Left      X-Right     Intensity     Deflection
     No.         (ft)         (ft)        (psf)          (deg)
```



```
      1        286.00       460.00        250.0          0.0
    NOTE - Intensity Is Specified As A Uniformly Distributed
           Force Acting On A Horizontally Projected Surface.
   REINFORCING LAYER(S)
       5 REINFORCING LAYER(S) SPECIFIED
    REINFORCING LAYER NO.   1
      4 POINTS DEFINE THIS LAYER
         POINT     X-COORD   Y-COORD   FORCE   INCLINATION
          NO.                                    FACTOR
           1       211.50    248.00      0.00     0.000
           2       214.50    248.00   5000.00     0.000
           3       268.50    248.00   5000.00     0.000
           4       271.50    248.00      0.00     0.000
    REINFORCING LAYER NO.   2
      4 POINTS DEFINE THIS LAYER
         POINT     X-COORD   Y-COORD   FORCE   INCLINATION
          NO.                                    FACTOR
           1       212.00    250.00      0.00     0.000
           2       215.00    250.00   5000.00     0.000
           3       269.00    250.00   5000.00     0.000
           4       272.00    250.00      0.00     0.000
    REINFORCING LAYER NO.   3
      4 POINTS DEFINE THIS LAYER
         POINT     X-COORD   Y-COORD   FORCE   INCLINATION
          NO.                                    FACTOR
           1       212.50    252.00      0.00     0.000
           2       215.50    252.00   5000.00     0.000
           3       269.50    252.00   5000.00     0.000
           4       272.50    252.00      0.00     0.000
    REINFORCING LAYER NO.   4
      4 POINTS DEFINE THIS LAYER
         POINT     X-COORD   Y-COORD   FORCE   INCLINATION
          NO.                                    FACTOR
           1       213.00    254.00      0.00     0.000
           2       216.00    254.00   5000.00     0.000
           3       270.00    254.00   5000.00     0.000
           4       273.00    254.00      0.00     0.000
    REINFORCING LAYER NO.   5
      4 POINTS DEFINE THIS LAYER
         POINT     X-COORD   Y-COORD   FORCE   INCLINATION
          NO.                                    FACTOR
           1       213.50    256.00      0.00     0.000
           2       216.50    256.00   5000.00     0.000
           3       270.50    256.00   5000.00     0.000
           4       273.50    256.00      0.00     0.000
    A Critical Failure Surface Searching Method, Using A Random
    Technique For Generating Circular Surfaces, Has Been Specified.
   37500 Trial Surfaces Have Been Generated.
    2500 Surface(s) Initiate(s) From Each Of    15 Points Equally Spaced
    Along The Ground Surface Between  X = 153.00(ft)
                                  and  X = 153.00(ft)
    Each Surface Terminates Between   X = 260.00(ft)
                                  and   X = 400.00(ft)
    Unless Further Limitations Were Imposed, The Minimum Elevation
    At Which A Surface Extends Is  Y =      0.00(ft)
     9.00(ft) Line Segments Define Each Trial Failure Surface.
    Following Are Displayed The Ten Most Critical Of The Trial
          Failure Surfaces Evaluated. They Are
          Ordered - Most Critical First.
          * * Safety Factors Are Calculated By The Modified Bishop Method * *
          Total Number of Trial Surfaces Attempted =     0
          Number of Trial Surfaces With Valid FS =    0
          Statistical Data On All Valid FS Values:
             FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
             Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
          Failure Surface Specified By 22 Coordinate Points
            Point      X-Surf      Y-Surf
             No.         (ft)        (ft)
              1       153.000     221.000
              2       161.922     219.815
```

3	170.895	219.128	
4	179.893	218.940	
5	188.888	219.253	
6	197.851	220.064	
7	206.756	221.373	
8	215.574	223.174	
9	224.278	225.462	
10	232.842	228.230	
11	241.239	231.469	
12	249.442	235.170	
13	257.428	239.321	
14	265.171	243.909	
15	272.647	248.920	
16	279.832	254.339	
17	286.706	260.149	
18	293.247	266.331	
19	299.434	272.867	
20	305.248	279.737	
21	310.671	286.919	
22	312.739	290.000	

Circle Center At X = 178.794 ; Y = 380.689 ; and Radius = 161.759

Factor of Safety

*** 1.573 ***

Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2981.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.0	8742.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.0	14008.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	9.0	18708.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	9.0	22785.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	8.9	26195.4	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.2	16867.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	2.5	9690.3	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.1	4759.2	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.4	6270.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	7.3	32402.3	0.0	0.0	0.	0.	0.0	0.0	0.0
12	8.6	39312.1	0.0	0.0	0.	0.	0.0	0.0	0.0
13	8.4	39288.7	0.0	0.0	0.	0.	0.0	0.0	0.0
14	8.2	38574.7	0.0	0.0	0.	0.	0.0	0.0	0.0
15	8.0	37208.6	0.0	0.0	0.	0.	0.0	0.0	0.0
16	7.7	35240.4	0.0	0.0	0.	0.	0.0	0.0	0.0
17	7.5	32731.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	7.2	29754.3	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.2	20052.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	1.0	3704.5	0.0	0.0	0.	0.	0.0	0.0	0.0
21	0.7	2555.1	0.0	0.0	0.	0.	0.0	0.0	176.6
22	6.5	21002.7	0.0	0.0	0.	0.	0.0	0.0	1635.1
23	6.2	15146.1	0.0	0.0	0.	0.	0.0	0.0	1546.7
24	5.8	9557.0	0.0	0.0	0.	0.	0.0	0.0	1453.6
25	5.4	4342.2	0.0	0.0	0.	0.	0.0	0.0	1355.9
26	2.1	382.2	0.0	0.0	0.	0.	0.0	0.0	517.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.922	219.815
3	170.895	219.128
4	179.893	218.940
5	188.888	219.253
6	197.851	220.064
7	206.756	221.373
8	215.574	223.174
9	224.278	225.462
10	232.842	228.230
11	241.239	231.469
12	249.442	235.170
13	257.428	239.321

14	265.171	243.909
15	272.647	248.920
16	279.832	254.339
17	286.706	260.149
18	293.247	266.331
19	299.434	272.867
20	305.248	279.737
21	310.671	286.919
22	312.739	290.000

Circle Center At X = 178.794 ; Y = 380.689 ; and Radius = 161.759

Factor of Safety

*** 1.573 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.922	219.815
3	170.895	219.128
4	179.893	218.940
5	188.888	219.253
6	197.851	220.064
7	206.756	221.373
8	215.574	223.174
9	224.278	225.462
10	232.842	228.230
11	241.239	231.469
12	249.442	235.170
13	257.428	239.321
14	265.171	243.909
15	272.647	248.920
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17	286.706	260.149
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20	305.248	279.737
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22	312.739	290.000

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19	299.434	272.867
20	305.248	279.737
21	310.671	286.919
22	312.739	290.000

Circle Center At X = 178.794 ; Y = 380.689 ; and Radius = 161.759

Factor of Safety

*** 1.573 ***

Failure Surface Specified By 22 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	153.000	221.000
2	161.952	220.076
3	170.941	219.625
4	179.941	219.648
5	188.927	220.146
6	197.875	221.117
7	206.759	222.557
8	215.554	224.464
9	224.237	226.832
10	232.783	229.655
11	241.169	232.923
12	249.370	236.629
13	257.365	240.762
14	265.131	245.311
15	272.646	250.263
16	279.890	255.604
17	286.843	261.319
18	293.484	267.393
19	299.796	273.808
20	305.762	280.547
21	311.363	287.592
22	313.080	290.000

Circle Center At X = 175.023 ; Y = 390.098 ; and Radius = 170.526

Factor of Safety

*** 1.574 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.952	220.076
3	170.941	219.625
4	179.941	219.648
5	188.927	220.146
6	197.875	221.117
7	206.759	222.557
8	215.554	224.464
9	224.237	226.832
10	232.783	229.655
11	241.169	232.923
12	249.370	236.629
13	257.365	240.762
14	265.131	245.311
15	272.646	250.263
16	279.890	255.604
17	286.843	261.319
18	293.484	267.393
19	299.796	273.808
20	305.762	280.547
21	311.363	287.592
22	313.080	290.000

Circle Center At X = 175.023 ; Y = 390.098 ; and Radius = 170.526

Factor of Safety

*** 1.574 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.952	220.076
3	170.941	219.625
4	179.941	219.648
5	188.927	220.146
6	197.875	221.117
7	206.759	222.557
8	215.554	224.464
9	224.237	226.832
10	232.783	229.655
11	241.169	232.923
12	249.370	236.629
13	257.365	240.762

14	265.131	245.311
15	272.646	250.263
16	279.890	255.604
17	286.843	261.319
18	293.484	267.393
19	299.796	273.808
20	305.762	280.547
21	311.363	287.592
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Circle Center At X = 175.023 ; Y = 390.098 ; and Radius = 170.526

Factor of Safety

*** 1.574 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.952	220.076
3	170.941	219.625
4	179.941	219.648
5	188.927	220.146
6	197.875	221.117
7	206.759	222.557
8	215.554	224.464
9	224.237	226.832
10	232.783	229.655
11	241.169	232.923
12	249.370	236.629
13	257.365	240.762
14	265.131	245.311
15	272.646	250.263
16	279.890	255.604
17	286.843	261.319
18	293.484	267.393
19	299.796	273.808
20	305.762	280.547
21	311.363	287.592
22	313.080	290.000

Circle Center At X = 175.023 ; Y = 390.098 ; and Radius = 170.526

Factor of Safety

*** 1.574 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.980	220.395
3	170.978	220.203
4	179.975	220.426
5	188.952	221.062
6	197.891	222.110
7	206.772	223.568
8	215.577	225.433
9	224.286	227.701
10	232.882	230.367
11	241.347	233.426
12	249.661	236.871
13	257.809	240.694
14	265.772	244.888
15	273.534	249.444
16	281.078	254.352
17	288.388	259.602
18	295.449	265.182
19	302.246	271.081
20	308.765	277.287
21	314.991	283.786
22	320.912	290.564
23	324.440	295.000

Circle Center At X = 170.641 ; Y = 415.851 ; and Radius = 195.648

Factor of Safety

*** 1.578 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.980	220.395
3	170.978	220.203
4	179.975	220.426
5	188.952	221.062
6	197.891	222.110
7	206.772	223.568
8	215.577	225.433
9	224.286	227.701
10	232.882	230.367
11	241.347	233.426
12	249.661	236.871
13	257.809	240.694
14	265.772	244.888
15	273.534	249.444
16	281.078	254.352
17	288.388	259.602
18	295.449	265.182
19	302.246	271.081
20	308.765	277.287
21	314.991	283.786
22	320.912	290.564
23	324.440	295.000

Circle Center At X = 170.641 ; Y = 415.851 ; and Radius = 195.648

Factor of Safety

*** 1.578 ***

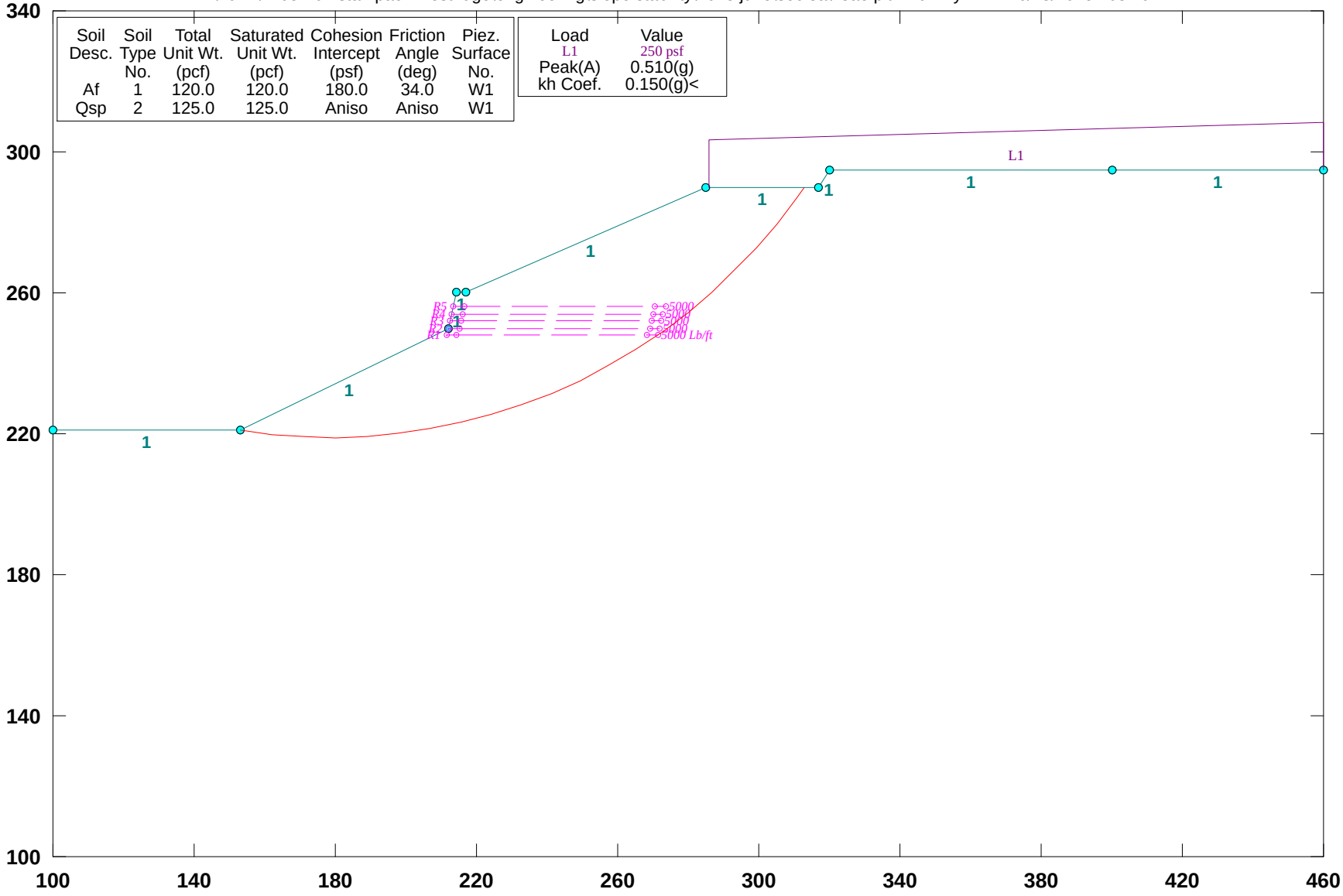
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 3A-3A' - 6/11 Design / Lower Slope MSE - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 3a\x3ae.plt Run By: BTZ 6/18/2015 08:29AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qsp	2	125.0	125.0	Aniso	Aniso	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.35

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/18/2015
Time of Run: 08:29AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3A\x3ae.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3A\x3ae.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 3A\x3ae.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 3A-3A' - 6/11
Design / Lower Slope MSE - Seismic

BOUNDARY COORDINATES
9 Top Boundaries
9 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	221.00	153.00	221.00	1
2	153.00	221.00	212.00	250.00	1
3	212.00	250.00	214.50	260.00	1
4	214.50	260.00	217.00	260.00	1
5	217.00	260.00	285.00	290.00	1
6	285.00	290.00	317.00	290.00	1
7	317.00	290.00	320.00	295.00	1
8	320.00	295.00	400.00	295.00	1
9	400.00	295.00	460.00	295.00	1

User Specified Y-Origin = 100.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	286.00	460.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000

REINFORCING LAYER(S)
5 REINFORCING LAYER(S) SPECIFIED

REINFORCING LAYER NO. 1
4 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	211.50	248.00	0.00	0.000
2	214.50	248.00	5000.00	0.000
3	268.50	248.00	5000.00	0.000
4	271.50	248.00	0.00	0.000

REINFORCING LAYER NO. 2
4 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	212.00	250.00	0.00	0.000
2	215.00	250.00	5000.00	0.000
3	269.00	250.00	5000.00	0.000
4	272.00	250.00	0.00	0.000

REINFORCING LAYER NO. 3
4 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	212.50	252.00	0.00	0.000
2	215.50	252.00	5000.00	0.000
3	269.50	252.00	5000.00	0.000
4	272.50	252.00	0.00	0.000

REINFORCING LAYER NO. 4
4 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	213.00	254.00	0.00	0.000
2	216.00	254.00	5000.00	0.000
3	270.00	254.00	5000.00	0.000
4	273.00	254.00	0.00	0.000

REINFORCING LAYER NO. 5
4 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	213.50	256.00	0.00	0.000
2	216.50	256.00	5000.00	0.000
3	270.50	256.00	5000.00	0.000
4	273.50	256.00	0.00	0.000

Trial Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.000	221.000
2	161.922	219.815
3	170.895	219.128
4	179.893	218.940
5	188.888	219.253
6	197.851	220.064
7	206.756	221.373
8	215.574	223.174
9	224.278	225.462
10	232.842	228.230
11	241.239	231.469
12	249.442	235.170
13	257.428	239.321
14	265.171	243.909
15	272.647	248.920
16	279.832	254.339
17	286.706	260.149
18	293.247	266.331

19	299.434	272.867
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21	310.671	286.919
22	312.739	290.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	3.19	9.00
2	3.18	9.00
3	3.19	9.00
4	3.18	9.00
5	3.19	9.00
6	3.18	9.00
7	3.18	9.00
8	3.18	9.00
9	3.18	9.00
10	3.19	9.00
11	3.18	9.00
12	3.18	9.00
13	3.19	9.00
14	3.19	9.00
15	3.18	9.00
16	3.18	9.00
17	3.19	9.00
18	3.19	9.00
19	3.19	9.00

Circle Center At X = 178.795(ft) ; Y = 380.686(ft); and Radius = 161.756(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Sum of Reinforcing Forces on Failure Surface = 312.27 (lbs)
Factor Of Safety For The Preceding Specified Surface = 1.346
The calculated factor of safety for the specified surface without piers/piles, reinforcement, soil nails, or applied forces = 1.344

Table 1 - Individual Data on the 26 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2981.9	0.0	0.0	0.0	0.0	447.3	0.0	0.0
2	9.0	8742.4	0.0	0.0	0.0	0.0	1311.4	0.0	0.0
3	9.0	14008.0	0.0	0.0	0.0	0.0	2101.2	0.0	0.0
4	9.0	18708.9	0.0	0.0	0.0	0.0	2806.3	0.0	0.0
5	9.0	22784.8	0.0	0.0	0.0	0.0	3417.7	0.0	0.0
6	8.9	26197.1	0.0	0.0	0.0	0.0	3929.6	0.0	0.0
7	5.2	16866.4	0.0	0.0	0.0	0.0	2530.0	0.0	0.0
8	2.5	9690.2	0.0	0.0	0.0	0.0	1453.5	0.0	0.0
9	1.1	4760.3	0.0	0.0	0.0	0.0	714.0	0.0	0.0
10	1.4	6269.6	0.0	0.0	0.0	0.0	940.4	0.0	0.0
11	7.3	32401.7	0.0	0.0	0.0	0.0	4860.2	0.0	0.0
12	8.6	39312.9	0.0	0.0	0.0	0.0	5896.9	0.0	0.0
13	8.4	39289.8	0.0	0.0	0.0	0.0	5893.5	0.0	0.0
14	8.2	38570.8	0.0	0.0	0.0	0.0	5785.6	0.0	0.0
15	8.0	37210.3	0.0	0.0	0.0	0.0	5581.5	0.0	0.0
16	7.7	35242.2	0.0	0.0	0.0	0.0	5286.3	0.0	0.0
17	7.5	32732.7	0.0	0.0	0.0	0.0	4909.9	0.0	0.0
18	7.2	29750.7	0.0	0.0	0.0	0.0	4462.6	0.0	0.0
19	5.2	20054.1	0.0	0.0	0.0	0.0	3008.1	0.0	0.0
20	1.0	3704.4	0.0	0.0	0.0	0.0	555.7	0.0	0.0
21	0.7	2554.3	0.0	0.0	0.0	0.0	383.2	0.0	176.5
22	6.5	21004.4	0.0	0.0	0.0	0.0	3150.7	0.0	1635.2
23	6.2	15146.5	0.0	0.0	0.0	0.0	2272.0	0.0	1546.7
24	5.8	9556.9	0.0	0.0	0.0	0.0	1433.5	0.0	1453.5
25	5.4	4341.9	0.0	0.0	0.0	0.0	651.3	0.0	1355.8
26	2.1	382.3	0.0	0.0	0.0	0.0	57.3	0.0	517.0

Table 2 - Base Stress Data on the 26 Slices

Slice No.	Alpha (deg) *	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-7.57	157.46	9.00	434.87	5.22
2	-4.38	166.41	9.00	871.58	67.48
3	-1.20	175.39	9.00	1244.46	191.54
4	1.99	184.39	9.00	1557.46	367.20

5	5.17	193.37	9.00	1814.36	581.50
6	8.36	202.30	9.00	2017.82	822.16
7	11.54	209.38	5.35	2133.35	1054.57
8	11.54	213.25	2.55	2537.43	1261.20
9	11.54	215.04	1.10	2878.09	1432.85
10	14.73	216.29	1.47	2782.02	1625.66
11	14.73	220.64	7.53	2815.05	1645.21
12	17.91	228.56	9.00	2822.15	1889.34
13	21.09	237.04	9.00	2798.07	2103.12
14	24.28	245.34	9.00	2735.80	2270.80
15	27.46	253.43	9.00	2638.29	2382.57
16	30.65	261.30	9.00	2507.85	2432.52
17	33.83	268.91	9.00	2347.17	2416.61
18	37.02	276.24	9.00	2159.01	2333.62
19	40.20	282.42	6.77	1966.39	2208.19
20	40.20	285.50	1.31	1882.94	2109.96
21	40.20	286.35	0.92	1960.46	2184.86
22	43.38	289.98	9.00	1707.51	1953.31
23	46.57	296.34	9.00	1308.44	1504.66
24	49.76	302.34	9.00	915.86	1030.00
25	52.94	307.96	9.00	534.44	547.37
26	56.13	311.71	3.71	271.13	209.76

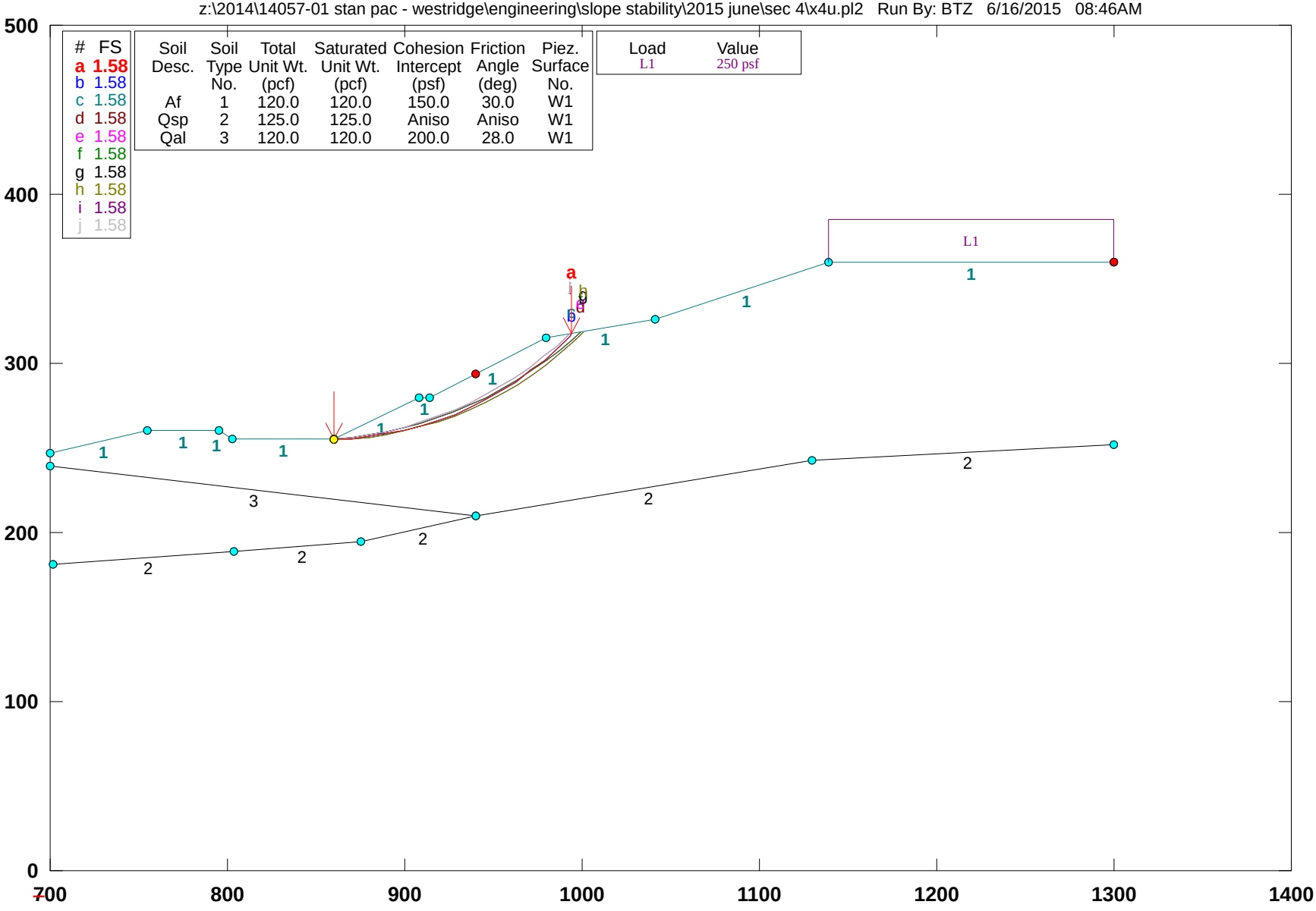
NOTE: Pier/Pile, reinforcement, soil nail, and applied forces (if applicable) are included in the Available Shear values in Table 2 by uniform distribution on each slice base, based upon the converged factor of safety.
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 338815.09 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 1844.29(psf)
Sum of the Driving Forces = 251803.61 (lbs)
Average Mobilized Shear Stress = 1370.66(psf)
Total length of the failure surface = 183.71(ft)
CAUTION - Factor Of Safety Is Calculated By The Modified Bishop Method. This Method Is Valid Only If The Failure Surface Approximates A Circular Arc.

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.3241(g)
Calculated Newmark Seismic Displacement = 0.123(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 4-4'/ 6/11 Design- Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 4\x4u.pl2 Run By: BTZ 6/16/2015 08:46AM



GSTABL7 v.2 FSmin=1.58

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 08:46AM
Run By: BTZ
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Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 4\x4u.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 4\x4u.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 4-4'/ 6/11 Design
- Upper Slope - Static

BOUNDARY COORDINATES
10 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	247.00	755.00	260.00	1
2	755.00	260.00	795.00	260.00	1
3	795.00	260.00	803.00	255.00	1
4	803.00	255.00	860.00	255.00	1
5	860.00	255.00	908.00	280.00	1
6	908.00	280.00	914.00	280.00	1
7	914.00	280.00	980.00	315.00	1
8	980.00	315.00	1041.00	326.00	1
9	1041.00	326.00	1139.00	360.00	1
10	1139.00	360.00	1300.00	360.00	1
11	700.00	239.00	940.00	210.00	3
12	940.00	210.00	1130.00	243.00	2
13	1130.00	243.00	1300.00	252.00	2
14	702.00	181.00	804.00	189.00	2
15	804.00	189.00	875.00	195.00	2
16	875.00	195.00	940.00	210.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	300.00	32.00
2	14.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1139.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced Along The Ground Surface Between X = 860.00(ft)
and X = 860.00(ft)
Each Surface Terminates Between X = 940.00(ft)
and X =1300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.984	255.567
3	879.924	256.664
4	889.791	258.288
5	899.558	260.434
6	909.197	263.096
7	918.681	266.267
8	927.983	269.937
9	937.077	274.097
10	945.937	278.734
11	954.537	283.836
12	962.855	289.387
13	970.865	295.373
14	978.546	301.777
15	985.876	308.579
16	992.834	315.762
17	994.437	317.603

Circle Center At X = 854.332 ; Y = 442.968 ; and Radius = 188.054
Factor of Safety
*** 1.576 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.984	255.567
3	879.924	256.664
4	889.791	258.288
5	899.558	260.434
6	909.197	263.096
7	918.681	266.267
8	927.983	269.937

9	937.077	274.097
10	945.937	278.734
11	954.537	283.836
12	962.855	289.387
13	970.865	295.373
14	978.546	301.777
15	985.876	308.579
16	992.834	315.762
17	994.437	317.603

Circle Center At X = 854.332 ; Y = 442.968 ; and Radius = 188.054

Factor of Safety

*** 1.576 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.984	255.567
3	879.924	256.664
4	889.791	258.288
5	899.558	260.434
6	909.197	263.096
7	918.681	266.267
8	927.983	269.937
9	937.077	274.097
10	945.937	278.734
11	954.537	283.836
12	962.855	289.387
13	970.865	295.373
14	978.546	301.777
15	985.876	308.579
16	992.834	315.762
17	994.437	317.603

Circle Center At X = 854.332 ; Y = 442.968 ; and Radius = 188.054

Factor of Safety

*** 1.576 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.946	256.034
3	879.837	257.510
4	889.652	259.425
5	899.372	261.775
6	908.977	264.555
7	918.450	267.761
8	927.770	271.385
9	936.919	275.421
10	945.880	279.861
11	954.634	284.695
12	963.164	289.914
13	971.453	295.507
14	979.485	301.465
15	987.243	307.774
16	994.713	314.423
17	998.787	318.388

Circle Center At X = 841.770 ; Y = 478.740 ; and Radius = 224.481

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.946	256.034
3	879.837	257.510
4	889.652	259.425
5	899.372	261.775
6	908.977	264.555
7	918.450	267.761
8	927.770	271.385
9	936.919	275.421

10	945.880	279.861
11	954.634	284.695
12	963.164	289.914
13	971.453	295.507
14	979.485	301.465
15	987.243	307.774
16	994.713	314.423
17	998.787	318.388

Circle Center At X = 841.770 ; Y = 478.740 ; and Radius = 224.481

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.946	256.034
3	879.837	257.510
4	889.652	259.425
5	899.372	261.775
6	908.977	264.555
7	918.450	267.761
8	927.770	271.385
9	936.919	275.421
10	945.880	279.861
11	954.634	284.695
12	963.164	289.914
13	971.453	295.507
14	979.485	301.465
15	987.243	307.774
16	994.713	314.423
17	998.787	318.388

Circle Center At X = 841.770 ; Y = 478.740 ; and Radius = 224.481

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.988	255.499
3	879.937	256.502
4	889.823	258.005
5	899.621	260.006
6	909.306	262.499
7	918.852	265.477
8	928.236	268.933
9	937.433	272.859
10	946.420	277.244
11	955.175	282.076
12	963.674	287.345
13	971.897	293.036
14	979.822	299.134
15	987.430	305.625
16	994.699	312.492
17	1000.667	318.727

Circle Center At X = 855.110 ; Y = 452.999 ; and Radius = 198.060

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.988	255.499
3	879.937	256.502
4	889.823	258.005
5	899.621	260.006
6	909.306	262.499
7	918.852	265.477
8	928.236	268.933
9	937.433	272.859
10	946.420	277.244

11	955.175	282.076
12	963.674	287.345
13	971.897	293.036
14	979.822	299.134
15	987.430	305.625
16	994.699	312.492
17	1000.667	318.727

Circle Center At X = 855.110 ; Y = 452.999 ; and Radius = 198.060

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.939	256.104
3	879.815	257.671
4	889.608	259.699
5	899.294	262.183
6	908.854	265.117
7	918.266	268.496
8	927.509	272.311
9	936.564	276.555
10	945.411	281.218
11	954.029	286.289
12	962.401	291.759
13	970.508	297.614
14	978.331	303.842
15	985.855	310.429
16	993.055	317.354

Circle Center At X = 841.398 ; Y = 467.831 ; and Radius = 213.642

Factor of Safety

*** 1.582 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.939	256.104
3	879.815	257.671
4	889.608	259.699
5	899.294	262.183
6	908.854	265.117
7	918.266	268.496
8	927.509	272.311
9	936.564	276.555
10	945.411	281.218
11	954.029	286.289
12	962.401	291.759
13	970.508	297.614
14	978.331	303.842
15	985.855	310.429
16	993.055	317.354

Circle Center At X = 841.398 ; Y = 467.831 ; and Radius = 213.642

Factor of Safety

*** 1.582 ***

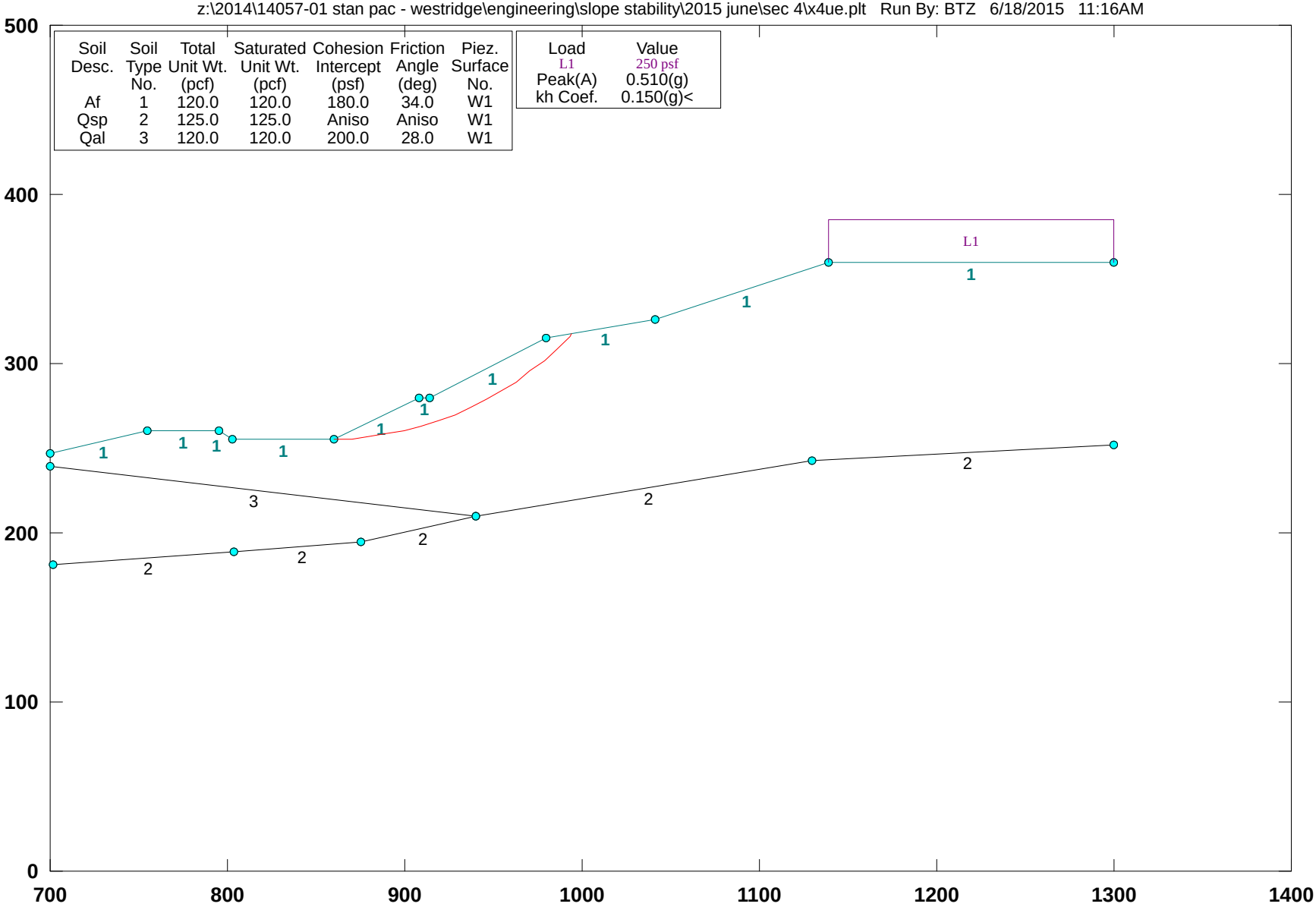
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 4-4'/ 6/11 Design- Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 4\x4ue.plt Run By: BTZ 6/18/2015 11:16AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qsp	2	125.0	125.0	Aniso	Aniso	W1
Qal	3	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.34

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/18/2015
Time of Run: 11:16AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 4\x4ue.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 4\x4ue.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 4\x4ue.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 4-4'/ 6/11 Design
- Upper Slope - Seismic

BOUNDARY COORDINATES
10 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	700.00	247.00	755.00	260.00	1
2	755.00	260.00	795.00	260.00	1
3	795.00	260.00	803.00	255.00	1
4	803.00	255.00	860.00	255.00	1
5	860.00	255.00	908.00	280.00	1
6	908.00	280.00	914.00	280.00	1
7	914.00	280.00	980.00	315.00	1
8	980.00	315.00	1041.00	326.00	1
9	1041.00	326.00	1139.00	360.00	1
10	1139.00	360.00	1300.00	360.00	1
11	700.00	239.00	940.00	210.00	3
12	940.00	210.00	1130.00	243.00	2
13	1130.00	243.00	1300.00	252.00	2
14	702.00	181.00	804.00	189.00	2
15	804.00	189.00	875.00	195.00	2
16	875.00	195.00	940.00	210.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	14.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1139.00	1300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	860.000	255.000
2	869.984	255.567
3	879.924	256.664
4	889.791	258.288
5	899.558	260.434
6	909.197	263.096
7	918.681	266.267
8	927.983	269.937
9	937.077	274.097
10	945.937	278.734
11	954.537	283.836
12	962.855	289.387
13	970.865	295.373
14	978.546	301.777
15	985.876	308.579
16	992.834	315.762
17	994.437	317.603

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	3.05	10.00
2	3.05	10.00
3	3.05	10.00
4	3.05	10.00
5	3.05	10.00
6	3.04	10.00
7	3.05	10.00
8	3.04	10.00
9	3.05	10.00
10	3.04	10.00
11	3.05	10.00
12	3.05	10.00
13	3.04	10.00
14	3.05	10.00

Circle Center At X = 854.333(ft) ; Y = 442.966(ft); and Radius = 188.051(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Factor Of Safety For The Preceding Specified Surface = 1.337
Table 1 - Individual Data on the 19 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	2775.4	0.0	0.0	0.0	0.0	416.3	0.0	0.0
2	9.9	7959.7	0.0	0.0	0.0	0.0	1194.0	0.0	0.0
3	9.9	12397.6	0.0	0.0	0.0	0.0	1859.6	0.0	0.0
4	9.8	16055.3	0.0	0.0	0.0	0.0	2408.3	0.0	0.0
5	8.4	16413.1	0.0	0.0	0.0	0.0	2462.0	0.0	0.0
6	1.2	2451.9	0.0	0.0	0.0	0.0	367.8	0.0	0.0
7	4.8	9280.0	0.0	0.0	0.0	0.0	1392.0	0.0	0.0
8	4.7	8850.8	0.0	0.0	0.0	0.0	1327.6	0.0	0.0
9	9.3	18805.2	0.0	0.0	0.0	0.0	2820.8	0.0	0.0
10	9.1	19435.2	0.0	0.0	0.0	0.0	2915.3	0.0	0.0
11	8.9	19320.1	0.0	0.0	0.0	0.0	2898.0	0.0	0.0

12	8.6	18505.4	0.0	0.0	0.0	0.0	2775.8	0.0	0.0
13	8.3	17059.4	0.0	0.0	0.0	0.0	2558.9	0.0	0.0
14	8.0	15044.6	0.0	0.0	0.0	0.0	2256.7	0.0	0.0
15	7.7	12551.3	0.0	0.0	0.0	0.0	1882.7	0.0	0.0
16	1.5	2122.2	0.0	0.0	0.0	0.0	318.3	0.0	0.0
17	5.9	6823.5	0.0	0.0	0.0	0.0	1023.5	0.0	0.0
18	7.0	3771.1	0.0	0.0	0.0	0.0	565.7	0.0	0.0
19	1.6	149.3	0.0	0.0	0.0	0.0	22.4	0.0	0.0

Table 2 - Base Stress Data on the 19 Slices

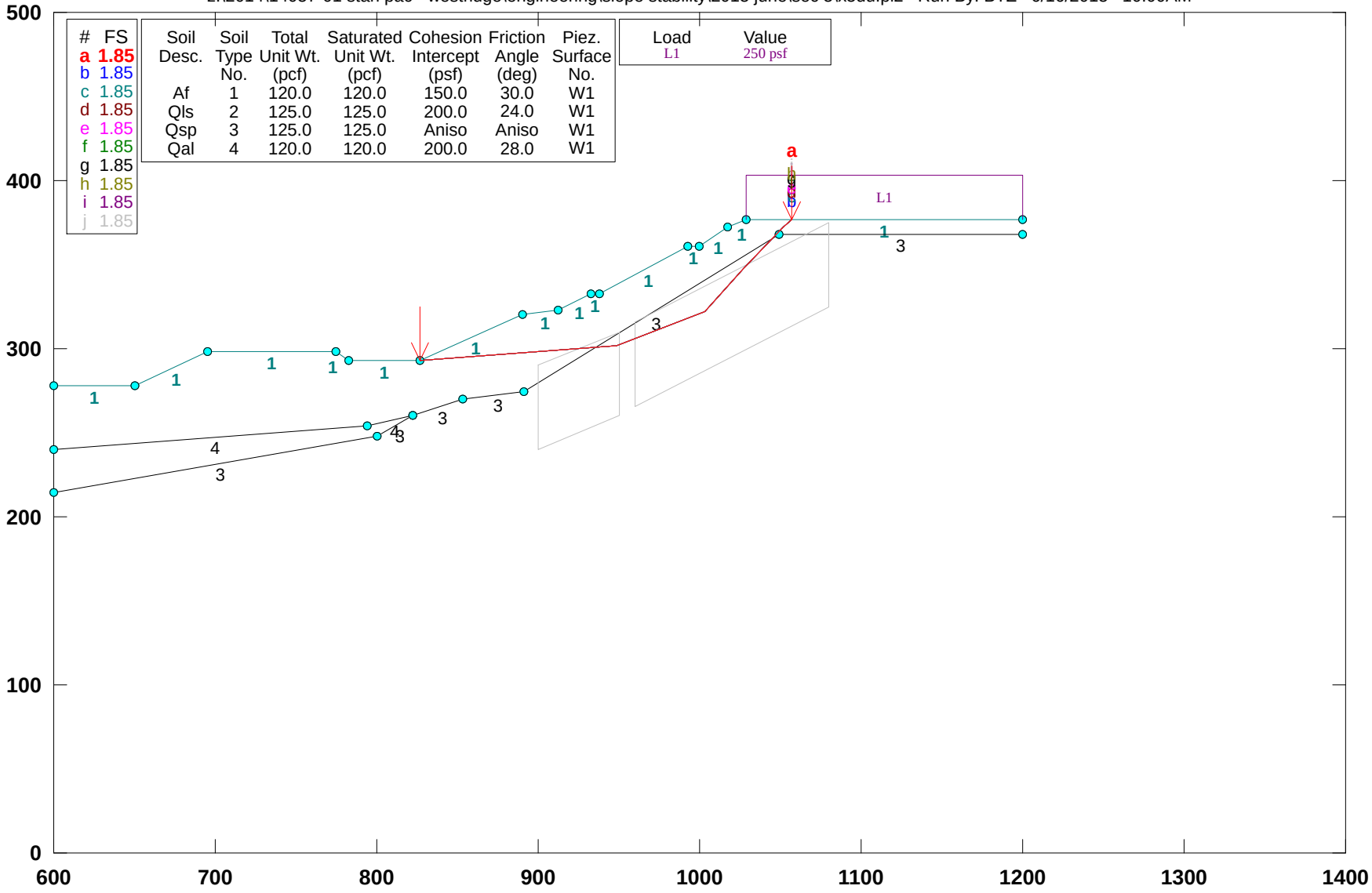
Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	3.25	864.99	10.00	357.27	57.04
2	6.30	874.95	10.00	682.16	203.86
3	9.35	884.86	10.00	948.75	379.67
4	12.39	894.67	10.00	1160.22	571.00
5	15.44	903.78	8.76	1309.07	757.74
6	15.44	908.60	1.24	1370.69	797.63
7	18.49	911.60	5.06	1269.22	829.97
8	18.49	916.34	4.94	1245.37	812.46
9	21.53	923.33	10.00	1287.43	939.93
10	24.58	932.53	10.00	1317.56	1059.75
11	27.63	941.51	10.00	1306.09	1138.61
12	30.68	950.24	10.00	1255.70	1169.75
13	33.72	958.70	10.00	1169.69	1148.16
14	36.77	966.86	10.00	1050.83	1072.02
15	39.82	974.71	10.00	902.65	941.50
16	42.86	979.27	1.98	793.24	840.18
17	42.86	982.94	8.02	656.19	669.32
18	45.91	989.35	10.00	358.78	309.53
19	48.96	993.64	2.44	153.75	52.13

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 151008.19 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 990.60(psf)
Sum of the Driving Forces = 112907.55 (lbs)
Average Mobilized Shear Stress = 740.66(psf)
Total length of the failure surface = 152.44(ft)
CAUTION - Factor Of Safety Is Calculated By The Modified Bishop
Method. This Method Is Valid Only If The Failure Surface
Approximates A Circular Arc.
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.3136(g)
Calculated Newmark Seismic Displacement = 0.131(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 5-5'/ 6/11 Design- Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 5\x5du.pl2 Run By: BTZ 6/16/2015 10:00AM



#	FS
a	1.85
b	1.85
c	1.85
d	1.85
e	1.85
f	1.85
g	1.85
h	1.85
i	1.85
j	1.85

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf

GSTABL7 v.2 FSmin=1.85

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 10:00AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5du.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5du.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5du.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 5-5'/ 6/11 Design
- Upper Slope - Static

BOUNDARY COORDINATES
14 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	600.00	278.00	650.00	278.00	1
2	650.00	278.00	695.00	298.00	1
3	695.00	298.00	775.00	298.00	1
4	775.00	298.00	783.00	293.00	1
5	783.00	293.00	827.00	293.00	1
6	827.00	293.00	890.00	320.00	1
7	890.00	320.00	912.00	323.00	1
8	912.00	323.00	933.00	333.00	1
9	933.00	333.00	938.00	333.00	1
10	938.00	333.00	993.00	361.00	1
11	993.00	361.00	1000.00	361.00	1
12	1000.00	361.00	1017.00	372.00	1
13	1017.00	372.00	1029.00	377.00	1
14	1029.00	377.00	1200.00	377.00	1
15	600.00	240.00	794.00	254.00	4
16	794.00	254.00	822.00	260.00	4
17	822.00	260.00	853.00	270.00	3
18	853.00	270.00	891.00	274.00	3
19	891.00	274.00	1049.00	368.00	3
20	1049.00	368.00	1200.00	368.00	3
21	600.00	214.00	800.00	248.00	3
22	800.00	248.00	822.00	260.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)

No.	(deg)	(psf)	(deg)
1	7.0	300.00	32.00
2	22.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1029.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 35.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	827.00	293.00	827.00	293.00	0.00
2	900.00	265.00	950.00	285.00	50.00
3	960.00	291.00	1080.00	350.00	50.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Individual data on the 15 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	63.0	84138.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	22.0	60538.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	21.0	70089.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.8	14646.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.2	4455.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.6	43380.9	0.0	0.0	0.	0.	0.0	0.0	0.0
7	44.4	212548.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	7.0	35318.5	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.2	16020.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	13.8	64109.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	10.3	40284.3	0.0	0.0	0.	0.	0.0	0.0	0.0
12	1.7	5728.7	0.0	0.0	0.	0.	0.0	0.0	0.0
13	16.9	39453.3	0.0	0.0	0.	0.	0.0	0.0	4220.1
14	6.1	5730.0	0.0	0.0	0.	0.	0.0	0.0	1536.4

15 4.7 1314.2 0.0 0.0 0. 0. 0.0 0.0 1169.1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Factor of Safety
*** 1.854 ***

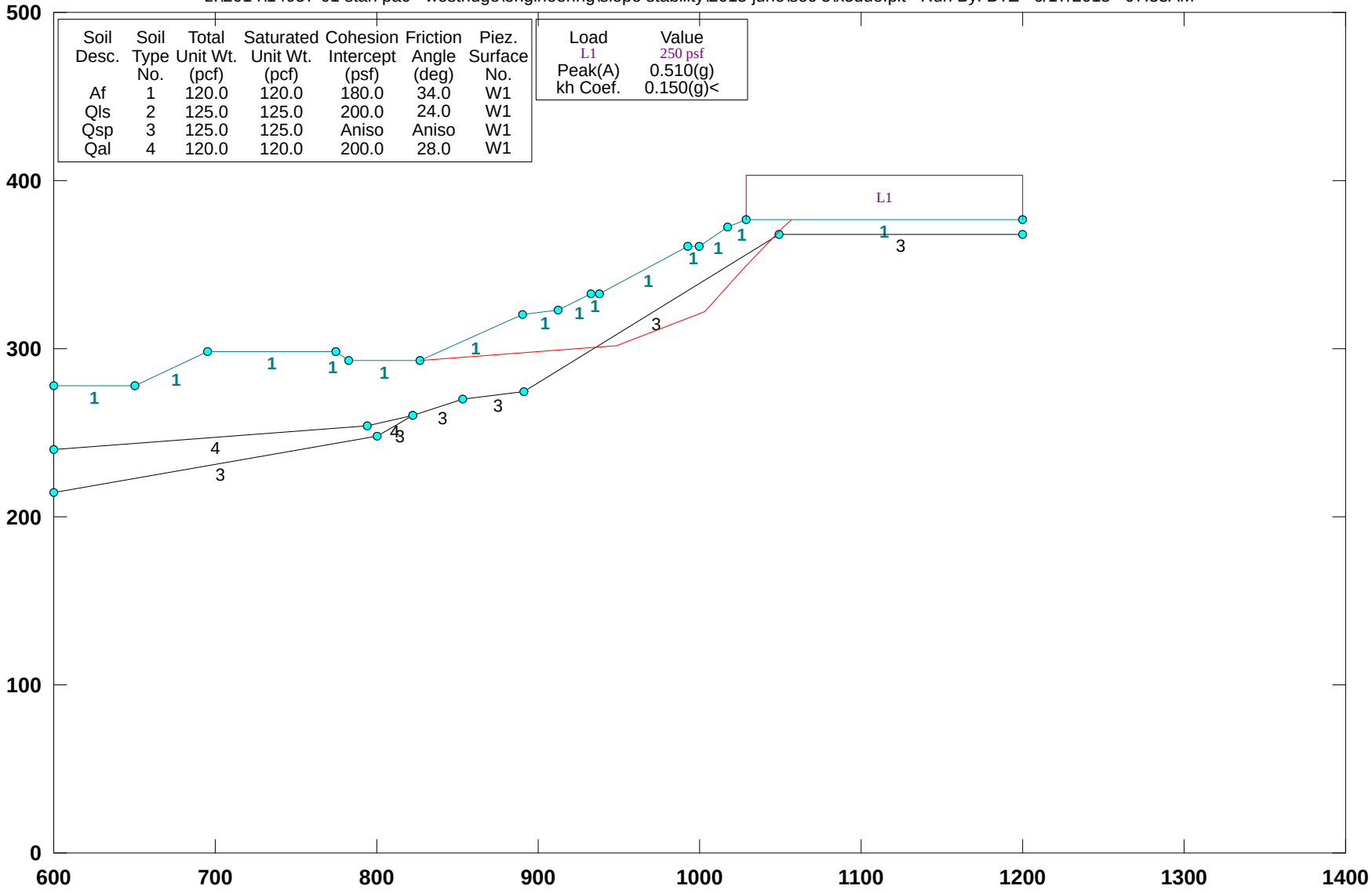
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 5-5'/ 6/11 Design- Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 5\x5due.plt Run By: BTZ 6/17/2015 07:33AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	200.0	24.0	W1
Qsp	3	125.0	125.0	Aniso	Aniso	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.44

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 07:33AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5due.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5due.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 5\x5due.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 5-5'/ 6/11 Design
- Upper Slope - Seismic

BOUNDARY COORDINATES
14 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	600.00	278.00	650.00	278.00	1
2	650.00	278.00	695.00	298.00	1
3	695.00	298.00	775.00	298.00	1
4	775.00	298.00	783.00	293.00	1
5	783.00	293.00	827.00	293.00	1
6	827.00	293.00	890.00	320.00	1
7	890.00	320.00	912.00	323.00	1
8	912.00	323.00	933.00	333.00	1
9	933.00	333.00	938.00	333.00	1
10	938.00	333.00	993.00	361.00	1
11	993.00	361.00	1000.00	361.00	1
12	1000.00	361.00	1017.00	372.00	1
13	1017.00	372.00	1029.00	377.00	1
14	1029.00	377.00	1200.00	377.00	1
15	600.00	240.00	794.00	254.00	4
16	794.00	254.00	822.00	260.00	4
17	822.00	260.00	853.00	270.00	3
18	853.00	270.00	891.00	274.00	3
19	891.00	274.00	1049.00	368.00	3
20	1049.00	368.00	1200.00	368.00	3
21	600.00	214.00	800.00	248.00	3
22	800.00	248.00	822.00	260.00	3

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 3 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	7.0	500.00	34.00
2	22.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1029.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	827.000	293.000
2	948.605	302.151
3	1003.235	322.130
4	1027.331	347.514
5	1052.026	372.316
6	1056.703	377.000

Janbu's Empirical Coefficient (fo) = 1.055
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.441

Table 1 - Individual Data on the 15 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	63.0	84139.6	0.0	0.0	0.0	0.0	12620.9	0.0	0.0
2	22.0	60538.8	0.0	0.0	0.0	0.0	9080.8	0.0	0.0
3	21.0	70089.9	0.0	0.0	0.0	0.0	10513.5	0.0	0.0
4	3.8	14644.1	0.0	0.0	0.0	0.0	2196.6	0.0	0.0
5	1.2	4458.8	0.0	0.0	0.0	0.0	668.8	0.0	0.0
6	10.6	43379.9	0.0	0.0	0.0	0.0	6507.0	0.0	0.0
7	44.4	212550.2	0.0	0.0	0.0	0.0	31882.5	0.0	0.0
8	7.0	35318.3	0.0	0.0	0.0	0.0	5297.7	0.0	0.0
9	3.2	16021.1	0.0	0.0	0.0	0.0	2403.2	0.0	0.0
10	13.8	64108.7	0.0	0.0	0.0	0.0	9616.3	0.0	0.0
11	10.3	40285.0	0.0	0.0	0.0	0.0	6042.8	0.0	0.0
12	1.7	5728.3	0.0	0.0	0.0	0.0	859.2	0.0	0.0
13	16.9	39454.5	0.0	0.0	0.0	0.0	5918.2	0.0	4220.3
14	6.1	5729.3	0.0	0.0	0.0	0.0	859.4	0.0	1536.2
15	4.7	1314.4	0.0	0.0	0.0	0.0	197.2	0.0	1169.3

Table 2 - Base Stress Data on the 15 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	4.30	858.50	63.18	1047.00	299.99
2	4.30	901.00	22.06	1972.35	618.09
3	4.30	922.50	21.06	2355.14	749.68
4	4.30	934.91	3.84	2673.93	859.27
5	4.30	937.41	1.18	2970.15	854.55
6	4.30	943.30	10.63	3157.07	918.80
7	20.09	970.80	47.27	2488.52	2318.88
8	20.09	996.50	7.45	2612.35	2443.73
9	20.09	1001.62	3.44	2567.62	2398.62
10	46.49	1010.12	19.99	3542.04	3858.82
11	46.49	1022.17	15.01	3044.74	3230.81

12	45.12	1028.17	2.37	2713.66	2795.50
13	45.12	1037.44	23.93	2164.18	2080.74
14	45.12	1048.95	8.71	942.29	936.54
15	45.04	1054.36	6.62	518.53	405.57

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 534477.69 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   2081.82(psf)
Sum of the Driving Forces =   391411.41 (lbs)
Average Mobilized Shear Stress =   1524.57(psf)
Total length of the failure surface =   256.74(ft)
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.3460(g)
Calculated Newmark Seismic Displacement =   0.108(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 6-6'/3/13 Design - Upper Slope - Rotational - Static

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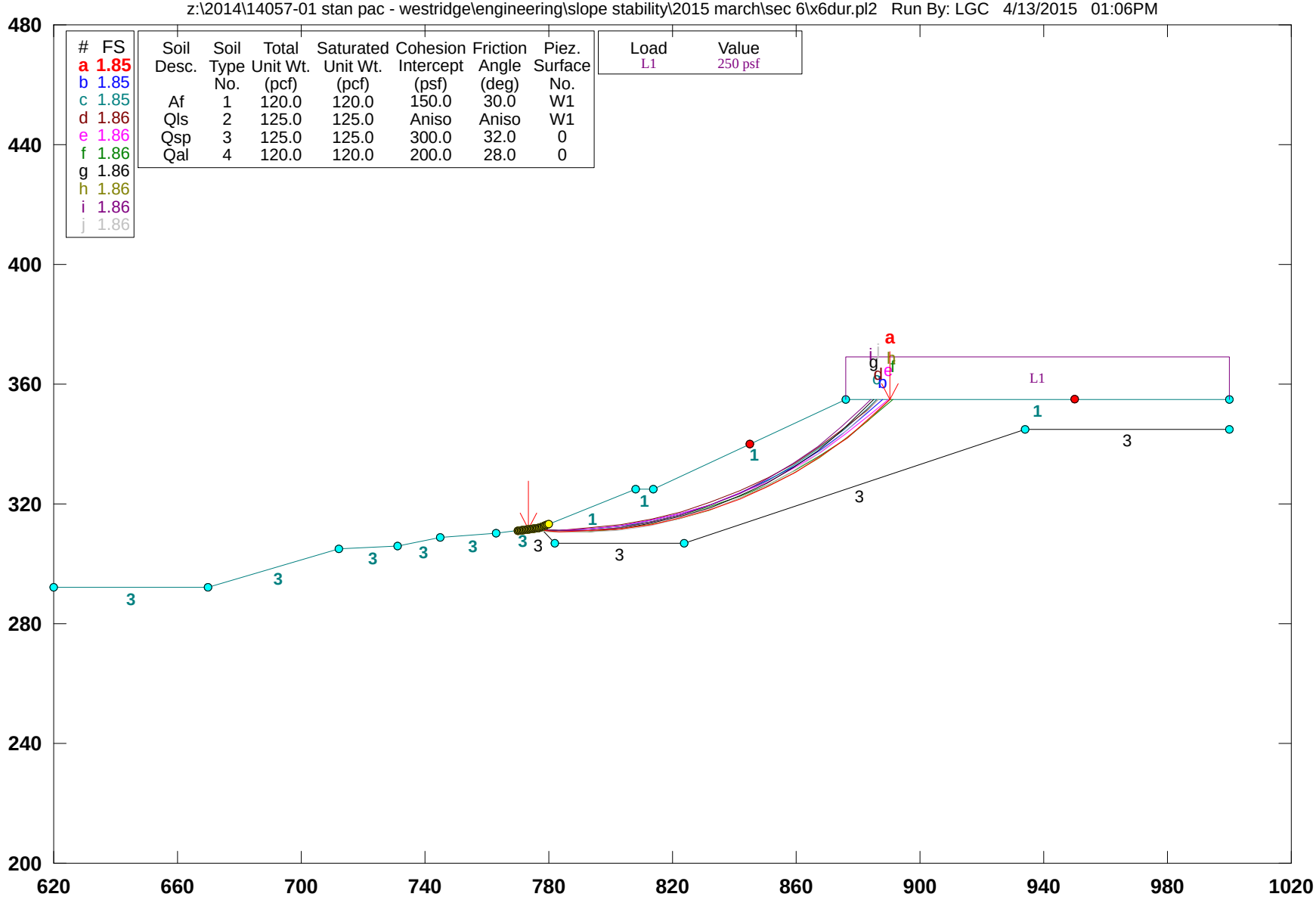

GSTABL7 v.2 FSmin=1.85

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 01:06PM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dur.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dur.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dur.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 6-6'/3/13 Design
- Upper Slope - Rotational - Static

BOUNDARY COORDINATES
10 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	620.00	292.00	670.00	292.00	3
2	670.00	292.00	712.00	305.00	3
3	712.00	305.00	731.00	306.00	3
4	731.00	306.00	745.00	309.00	3
5	745.00	309.00	763.00	310.00	3
6	763.00	310.00	777.00	312.00	3
7	777.00	312.00	808.00	325.00	1
8	808.00	325.00	814.00	325.00	1
9	814.00	325.00	876.00	355.00	1
10	876.00	355.00	1000.00	355.00	1
11	777.00	312.00	782.00	307.00	3
12	782.00	307.00	824.00	307.00	3
13	824.00	307.00	934.00	345.00	3
14	934.00	345.00	1000.00	345.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	2.0	300.00	32.00
2	13.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	876.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 770.00(ft)
and X = 780.00(ft)
Each Surface Terminates Between X = 845.00(ft)
and X = 950.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.448	311.493
2	783.429	310.876
3	793.429	310.961
4	803.398	311.749
5	813.287	313.235
6	823.047	315.412
7	832.630	318.269
8	841.989	321.792
9	851.078	325.964
10	859.850	330.764
11	868.264	336.168
12	876.278	342.149
13	883.852	348.679
14	890.219	355.000

Circle Center At X = 787.229 ; Y = 452.962 ; and Radius = 142.139
Factor of Safety
*** 1.853 ***
Individual data on the 18 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.6	161.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.8	86.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.7	1669.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	10.0	7048.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	10.0	11513.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	4.6	6593.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.3	7716.1	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.7	999.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	9.0	13880.9	0.0	0.0	0.	0.	0.0	0.0	0.0
10	9.6	17083.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	9.4	18247.7	0.0	0.0	0.	0.	0.0	0.0	0.0
12	9.1	18391.7	0.0	0.0	0.	0.	0.0	0.0	0.0
13	8.8	17580.1	0.0	0.0	0.	0.	0.0	0.0	0.0
14	8.4	15908.3	0.0	0.0	0.	0.	0.0	0.0	0.0
15	7.7	13064.3	0.0	0.0	0.	0.	0.0	0.0	0.0

16	0.3	432.4	0.0	0.0	0.	0.	0.0	0.0	69.5
17	7.6	8712.1	0.0	0.0	0.	0.	0.0	0.0	1893.4
18	6.4	2414.6	0.0	0.0	0.	0.	0.0	0.0	1591.7

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.104	311.443
2	783.099	311.142
3	793.092	311.514
4	803.038	312.558
5	812.890	314.269
6	822.605	316.640
7	832.138	319.660
8	841.446	323.314
9	850.487	327.587
10	859.220	332.459
11	867.605	337.908
12	875.604	343.910
13	883.181	350.436
14	887.809	355.000

Circle Center At X = 782.634 ; Y = 459.161 ; and Radius = 148.025

Factor of Safety
*** 1.853 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.448	311.493
2	783.440	311.086
3	793.435	311.395
4	803.383	312.416
5	813.233	314.145
6	822.933	316.573
7	832.436	319.687
8	841.692	323.472
9	850.654	327.908
10	859.277	332.973
11	867.516	338.640
12	875.329	344.882
13	882.676	351.665
14	885.807	355.000

Circle Center At X = 784.188 ; Y = 450.594 ; and Radius = 139.515

Factor of Safety
*** 1.853 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.448	311.493
2	783.448	311.351
3	793.434	311.873
4	803.364	313.057
5	813.193	314.897
6	822.878	317.385
7	832.378	320.510
8	841.649	324.258
9	850.650	328.613
10	859.343	333.556
11	867.689	339.064
12	875.652	345.115
13	883.195	351.680
14	886.534	355.000

Circle Center At X = 780.650 ; Y = 461.495 ; and Radius = 150.176

Factor of Safety
*** 1.855 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.104	311.443
2	783.102	311.247
3	793.092	311.689
4	803.034	312.767

5	812.886	314.477
6	822.610	316.811
7	832.165	319.761
8	841.512	323.315
9	850.614	327.458
10	859.433	332.172
11	867.933	337.439
12	876.080	343.238
13	883.841	349.545
14	889.741	355.000

Circle Center At X = 781.219 ; Y = 467.657 ; and Radius = 156.425

Factor of Safety
*** 1.855 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.104	311.443
2	783.097	311.087
3	793.093	311.383
4	803.048	312.329
5	812.920	313.921
6	822.668	316.153
7	832.250	319.015
8	841.625	322.495
9	850.753	326.578
10	859.597	331.246
11	868.117	336.481
12	876.278	342.260
13	884.046	348.558
14	891.011	355.000

Circle Center At X = 783.572 ; Y = 464.471 ; and Radius = 153.386

Factor of Safety
*** 1.856 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.104	311.443
2	783.081	310.777
3	793.081	310.870
4	803.045	311.722
5	812.915	313.327
6	822.635	315.677
7	832.148	318.758
8	841.401	322.552
9	850.339	327.038
10	858.910	332.188
11	867.066	337.975
12	874.759	344.363
13	881.945	351.318
14	885.213	355.000

Circle Center At X = 786.909 ; Y = 441.964 ; and Radius = 131.249

Factor of Safety
*** 1.858 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	772.414	311.345
2	782.395	310.728
3	792.395	310.802
4	802.365	311.565
5	812.260	313.016
6	822.030	315.146
7	831.630	317.945
8	841.014	321.401
9	850.137	325.496
10	858.956	330.211
11	867.428	335.524
12	875.513	341.409
13	883.172	347.838
14	890.370	354.780

```
   15        890.568      355.000
Circle Center At X =   786.329 ; Y =   455.437 ; and Radius =   144.762
      Factor of Safety
     ***    1.859   ***
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        773.448      311.493
    2        783.435      310.983
    3        793.433      311.225
    4        803.383      312.217
    5        813.231      313.955
    6        822.921      316.427
    7        832.397      319.621
    8        841.606      323.518
    9        850.497      328.097
   10        859.018      333.330
   11        867.122      339.189
   12        874.762      345.641
   13        881.896      352.648
   14        883.956      355.000
Circle Center At X =   785.272 ; Y =   443.558 ; and Radius =   132.593
      Factor of Safety
     ***    1.860   ***
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        772.414      311.345
    2        782.380      310.524
    3        792.380      310.465
    4        802.355      311.167
    5        812.248      312.626
    6        822.002      314.834
    7        831.559      317.777
    8        840.864      321.440
    9        849.863      325.800
   10        858.504      330.833
   11        866.737      336.509
   12        874.515      342.795
   13        881.791      349.655
   14        886.659      355.000
Circle Center At X =   788.196 ; Y =   441.360 ; and Radius =   130.970
      Factor of Safety
     ***    1.860   ***
         **** END OF GSTABL7 OUTPUT ****
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Westridge/14057-01/Sec 6-6'/3/13 Design - Upper Slope - Rotational - Seismic

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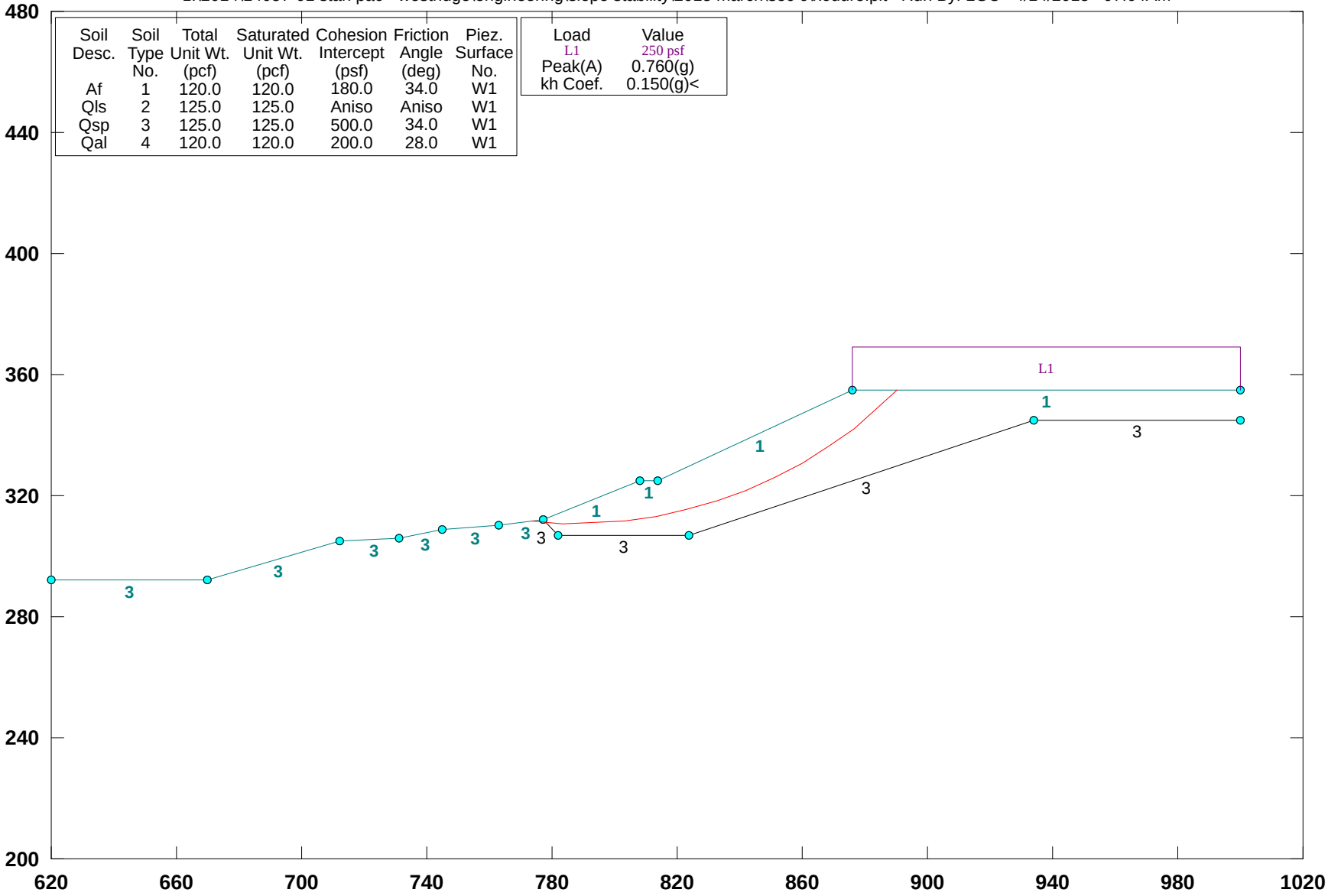
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	Aniso	Aniso	W1
Qsp	3	125.0	125.0	500.0	34.0	W1
Qal	4	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.760(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.56

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 07:04AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dure.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dure.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6dure.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 6-6'/3/13 Design
- Upper Slope - Rotational - Seismic

BOUNDARY COORDINATES
10 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	620.00	292.00	670.00	292.00	3
2	670.00	292.00	712.00	305.00	3
3	712.00	305.00	731.00	306.00	3
4	731.00	306.00	745.00	309.00	3
5	745.00	309.00	763.00	310.00	3
6	763.00	310.00	777.00	312.00	3
7	777.00	312.00	808.00	325.00	1
8	808.00	325.00	814.00	325.00	1
9	814.00	325.00	876.00	355.00	1
10	876.00	355.00	1000.00	355.00	1
11	777.00	312.00	782.00	307.00	3
12	782.00	307.00	824.00	307.00	3
13	824.00	307.00	934.00	345.00	3
14	934.00	345.00	1000.00	345.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	1
4	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	2.0	500.00	34.00
2	13.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	876.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	773.448	311.493
2	783.429	310.876
3	793.429	310.961
4	803.398	311.749
5	813.287	313.235
6	823.047	315.412
7	832.630	318.269
8	841.989	321.792
9	851.078	325.964
10	859.850	330.764
11	868.264	336.168
12	876.278	342.149
13	883.852	348.679
14	890.219	355.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	4.02	10.00
2	4.03	10.00
3	4.03	10.00
4	4.03	10.00
5	4.03	10.00
6	4.03	10.00
7	4.03	10.00
8	4.03	10.00
9	4.02	10.00
10	4.02	10.00
11	4.03	10.00

Circle Center At X = 787.228(ft) ; Y = 452.964(ft); and Radius = 142.141(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Factor Of Safety For The Preceding Specified Surface = 1.555
Table 1 - Individual Data on the 18 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.6	161.4	0.0	0.0	0.0	0.0	24.2	0.0	0.0
2	0.8	86.3	0.0	0.0	0.0	0.0	12.9	0.0	0.0
3	5.7	1669.0	0.0	0.0	0.0	0.0	250.4	0.0	0.0
4	10.0	7049.2	0.0	0.0	0.0	0.0	1057.4	0.0	0.0
5	10.0	11514.0	0.0	0.0	0.0	0.0	1727.1	0.0	0.0
6	4.6	6593.9	0.0	0.0	0.0	0.0	989.1	0.0	0.0
7	5.3	7716.3	0.0	0.0	0.0	0.0	1157.4	0.0	0.0
8	0.7	999.7	0.0	0.0	0.0	0.0	150.0	0.0	0.0
9	9.0	13880.7	0.0	0.0	0.0	0.0	2082.1	0.0	0.0
10	9.6	17083.3	0.0	0.0	0.0	0.0	2562.5	0.0	0.0
11	9.4	18248.1	0.0	0.0	0.0	0.0	2737.2	0.0	0.0
12	9.1	18393.3	0.0	0.0	0.0	0.0	2759.0	0.0	0.0
13	8.8	17578.2	0.0	0.0	0.0	0.0	2636.7	0.0	0.0
14	8.4	15907.8	0.0	0.0	0.0	0.0	2386.2	0.0	0.0
15	7.7	13064.8	0.0	0.0	0.0	0.0	1959.7	0.0	0.0
16	0.3	432.2	0.0	0.0	0.0	0.0	64.8	0.0	69.5
17	7.6	8712.5	0.0	0.0	0.0	0.0	1306.9	0.0	1893.5
18	6.4	2414.7	0.0	0.0	0.0	0.0	362.2	0.0	1591.8

Table 2 - Base Stress Data on the 18 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-3.53	775.22	3.56	545.25	3.98
2	-3.53	777.39	0.78	590.98	9.74
3	-3.53	780.60	5.67	389.54	25.56
4	0.49	788.43	10.00	653.06	109.54
5	4.52	798.41	10.00	927.25	257.06
6	8.55	805.70	4.65	1076.30	411.80
7	8.55	810.64	5.35	1093.16	419.29
8	12.57	813.64	0.73	1026.51	489.89
9	12.57	818.52	9.27	1107.71	535.14
10	16.60	827.84	10.00	1224.11	720.27
11	20.63	837.31	10.00	1285.27	883.39
12	24.66	846.53	10.00	1288.44	1001.61
13	28.69	855.46	10.00	1237.82	1059.69
14	32.71	864.06	10.00	1138.14	1047.21
15	36.73	872.13	9.65	996.51	962.17
16	36.73	876.14	0.35	1055.48	1006.24
17	40.77	880.07	10.00	818.43	787.10
18	44.79	887.04	8.97	422.49	342.82

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 125967.10 (lbs)

Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 976.70(psf)

Sum of the Driving Forces = 81014.35 (lbs)

Average Mobilized Shear Stress = 628.15(psf)

Total length of the failure surface = 128.97(ft)

CAUTION - Factor Of Safety Is Calculated By The Modified Bishop Method. This Method Is Valid Only If The Failure Surface Approximates A Circular Arc.

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)

Seismic Yield Coefficient (ky) = 0.4091(g)

Calculated Newmark Seismic Displacement = 0.255(ft)

Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

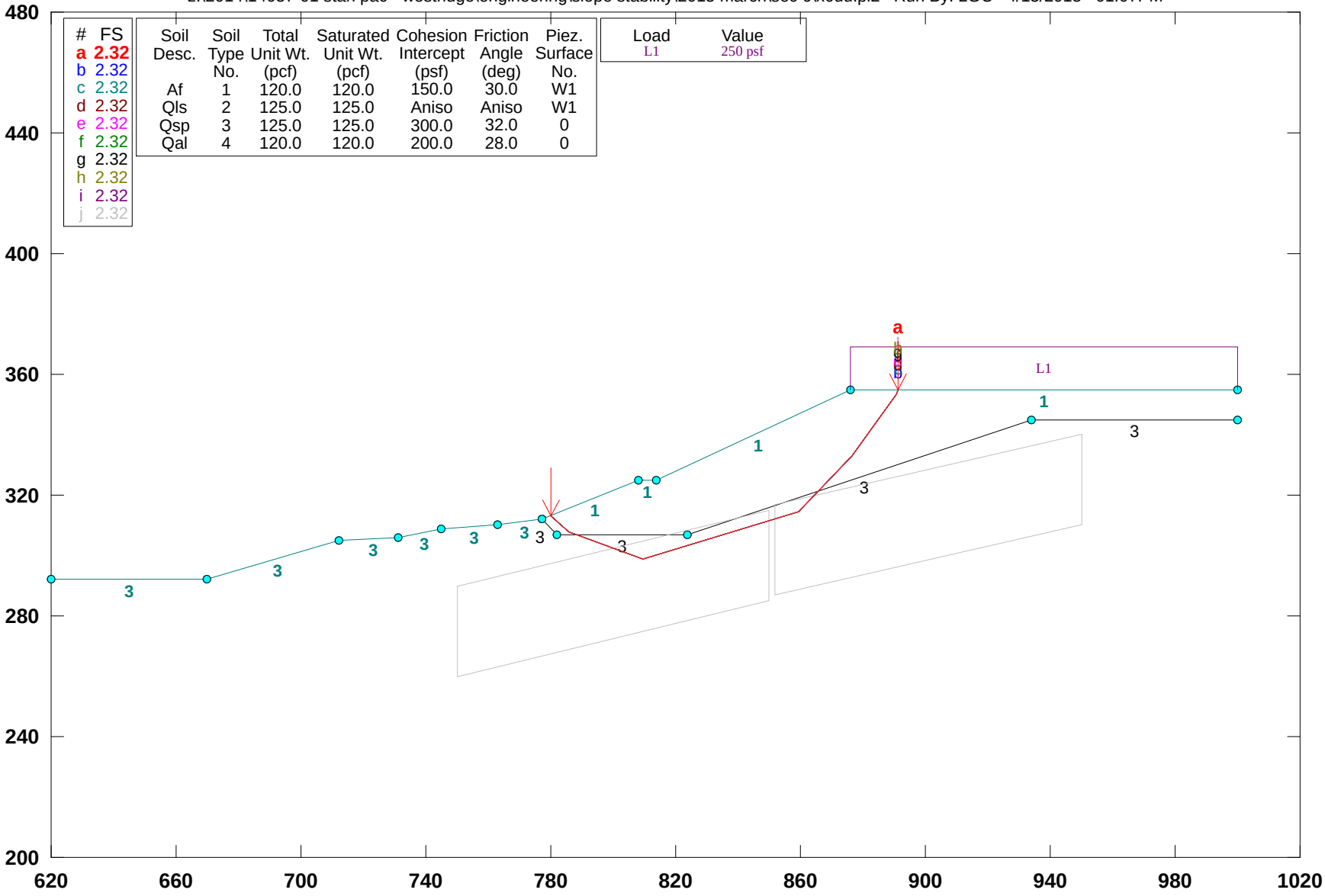
Westridge/14057-01/Sec 6-6'/3/13 Design - Upper Slope - Block - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 6\x6du.pl2 Run By: LGC 4/13/2015 01:07PM

#	FS
a	2.32
b	2.32
c	2.32
d	2.32
e	2.32
f	2.32
g	2.32
h	2.32
i	2.32
j	2.32

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qls	2	125.0	125.0	Aniso	Aniso	W1
Qsp	3	125.0	125.0	300.0	32.0	0
Qal	4	120.0	120.0	200.0	28.0	0

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=2.32

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 01:07PM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6du.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6du.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6du.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 6-6'/3/13 Design
- Upper Slope - Block - Static

BOUNDARY COORDINATES
10 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	620.00	292.00	670.00	292.00	3
2	670.00	292.00	712.00	305.00	3
3	712.00	305.00	731.00	306.00	3
4	731.00	306.00	745.00	309.00	3
5	745.00	309.00	763.00	310.00	3
6	763.00	310.00	777.00	312.00	3
7	777.00	312.00	808.00	325.00	1
8	808.00	325.00	814.00	325.00	1
9	814.00	325.00	876.00	355.00	1
10	876.00	355.00	1000.00	355.00	1
11	777.00	312.00	782.00	307.00	3
12	782.00	307.00	824.00	307.00	3
13	824.00	307.00	934.00	345.00	3
14	934.00	345.00	1000.00	345.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	2.0	300.00	32.00
2	13.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	876.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	750.00	275.00	850.00	300.00	30.00
2	852.00	302.00	950.00	325.00	30.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	779.932	313.229
2	785.875	307.611
3	809.320	298.932
4	859.363	314.691
5	876.567	332.830
6	890.564	353.544
7	891.090	355.000

Factor of Safety
*** 2.315 ***

Individual data on the 12 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.9	2892.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	1.7	1736.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	20.5	43374.7	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.3	4142.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.7	14397.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	30777.7	0.0	0.0	0.	0.	0.0	0.0	0.0
7	35.4	124920.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	6.4	23390.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	10.3	31610.4	0.0	0.0	0.	0.	0.0	0.0	0.0
10	0.6	1528.8	0.0	0.0	0.	0.	0.0	0.0	141.8
11	14.0	19841.7	0.0	0.0	0.	0.	0.0	0.0	3499.2
12	0.5	45.9	0.0	0.0	0.	0.	0.0	0.0	131.4

Failure Surface Specified By 7 Coordinate Points

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Factor of Safety
*** 2.315 ***

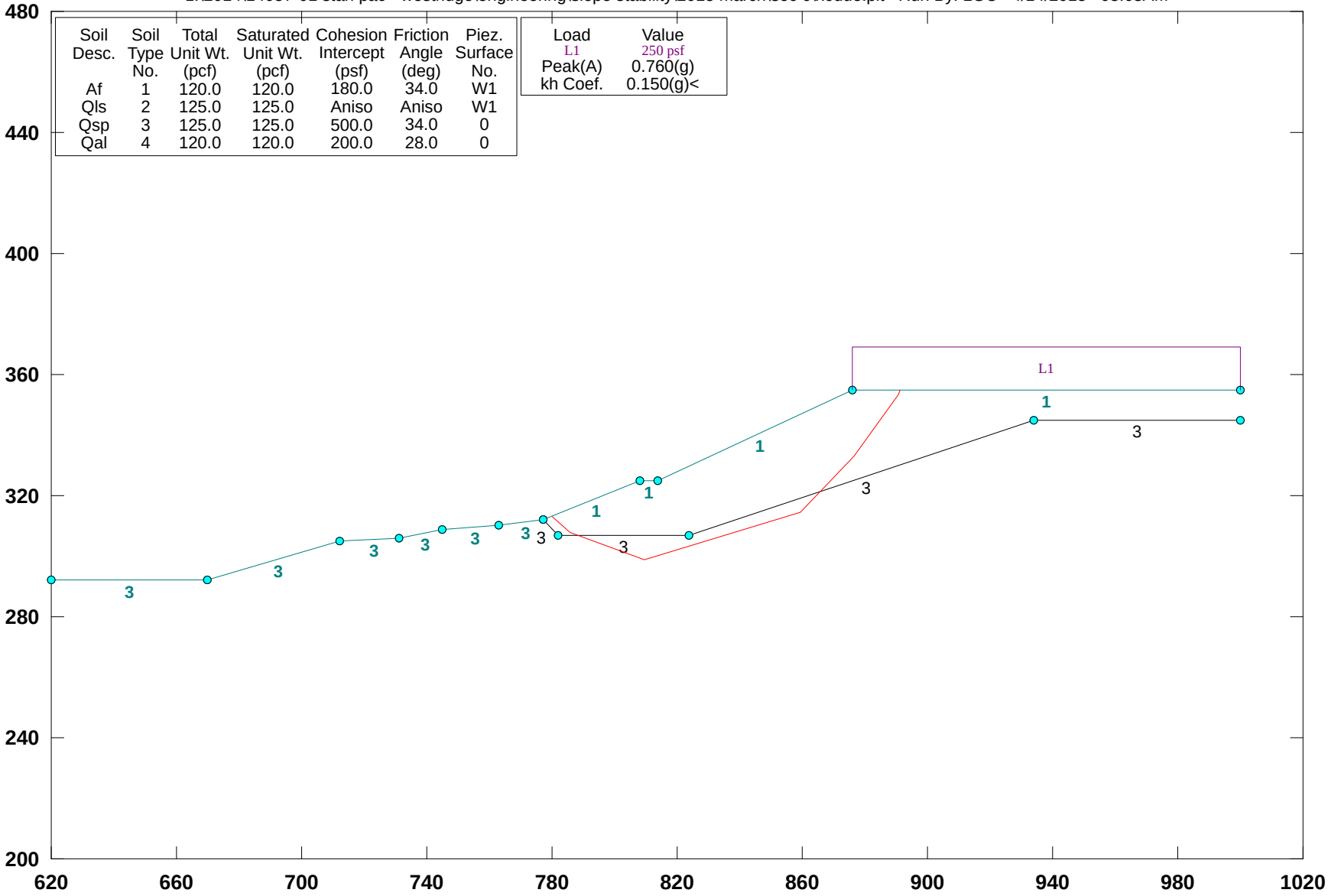
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 6-6'/3/13 Design - Upper Slope - Block - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 6\x6due.plt Run By: LGC 4/14/2015 08:03AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	Aniso	Aniso	W1
Qsp	3	125.0	125.0	500.0	34.0	0
Qal	4	120.0	120.0	200.0	28.0	0

Load	Value
L1	250 psf
Peak(A)	0.760(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.93

Factor Of Safety Is Calculated By The Simplified Janbu Method

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Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Analysis Run Date: 4/14/2015
Time of Run: 08:03AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6due.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6due.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 6\x6due.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 6-6'/3/13 Design
- Upper Slope - Block - Seismic

BOUNDARY COORDINATES
10 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	620.00	292.00	670.00	292.00	3
2	670.00	292.00	712.00	305.00	3
3	712.00	305.00	731.00	306.00	3
4	731.00	306.00	745.00	309.00	3
5	745.00	309.00	763.00	310.00	3
6	763.00	310.00	777.00	312.00	3
7	777.00	312.00	808.00	325.00	1
8	808.00	325.00	814.00	325.00	1
9	814.00	325.00	876.00	355.00	1
10	876.00	355.00	1000.00	355.00	1
11	777.00	312.00	782.00	307.00	3
12	782.00	307.00	824.00	307.00	3
13	824.00	307.00	934.00	345.00	3
14	934.00	345.00	1000.00	345.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	2.0	500.00	34.00
2	13.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso
C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and

C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and
C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	876.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	779.932	313.230
2	785.875	307.611
3	809.320	298.932
4	859.363	314.691
5	876.567	332.830
6	890.564	353.544
7	891.090	355.000

Janbu's Empirical Coefficient (fo) = 1.077
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.931

Table 1 - Individual Data on the 12 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	5.9	2892.1	0.0	0.0	0.0	0.0	433.8	0.0	0.0
2	1.7	1735.6	0.0	0.0	0.0	0.0	260.3	0.0	0.0
3	20.5	43376.1	0.0	0.0	0.0	0.0	6506.4	0.0	0.0
4	1.3	4142.1	0.0	0.0	0.0	0.0	621.3	0.0	0.0
5	4.7	14397.5	0.0	0.0	0.0	0.0	2159.6	0.0	0.0
6	10.0	30777.8	0.0	0.0	0.0	0.0	4616.7	0.0	0.0
7	35.4	124919.2	0.0	0.0	0.0	0.0	18737.9	0.0	0.0
8	6.4	23388.7	0.0	0.0	0.0	0.0	3508.3	0.0	0.0
9	10.3	31612.3	0.0	0.0	0.0	0.0	4741.8	0.0	0.0
10	0.6	1528.8	0.0	0.0	0.0	0.0	229.3	0.0	141.8
11	14.0	19841.5	0.0	0.0	0.0	0.0	2976.2	0.0	3499.3
12	0.5	46.0	0.0	0.0	0.0	0.0	6.9	0.0	131.5

Table 2 - Base Stress Data on the 12 Slices

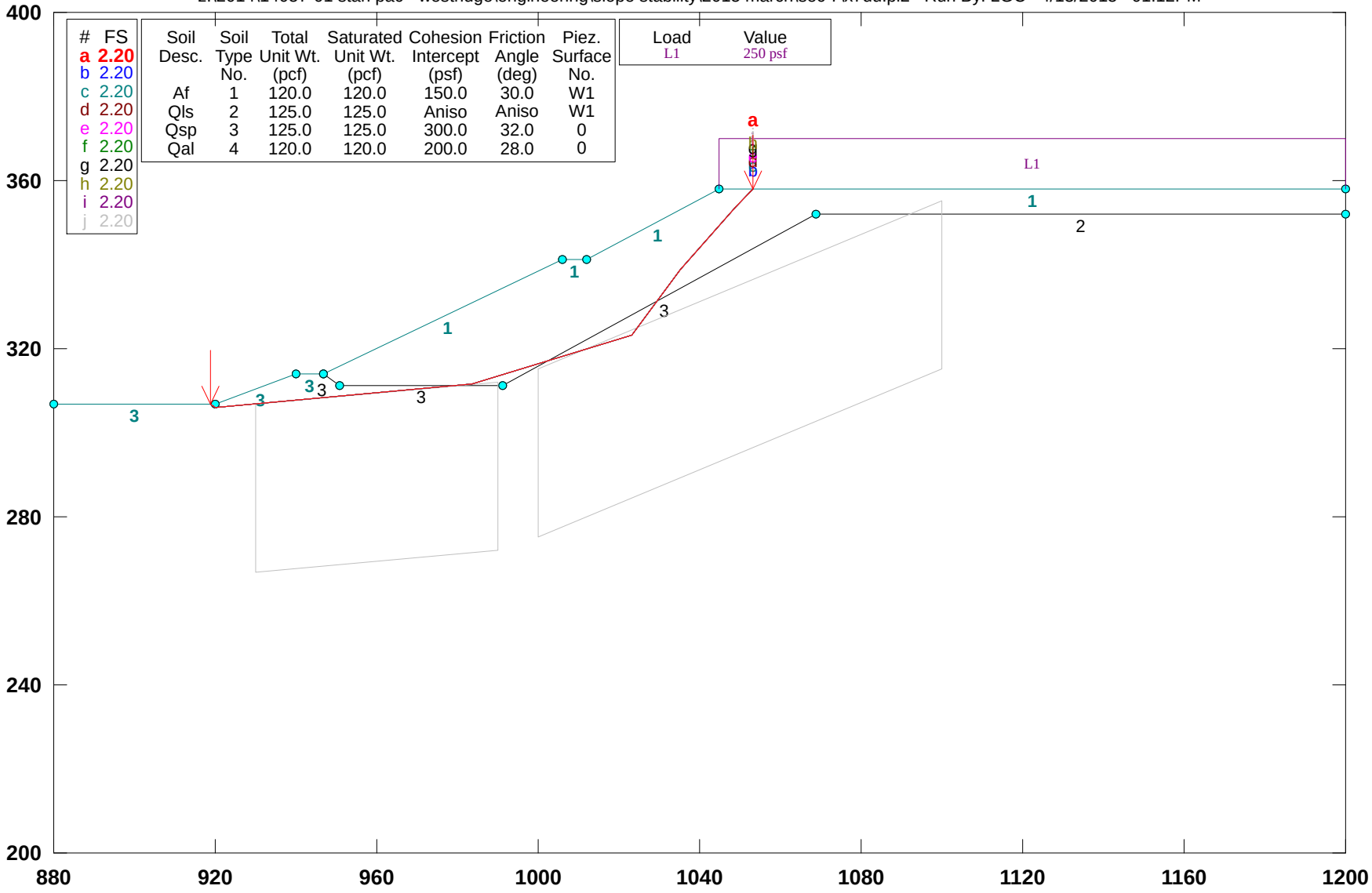
Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-43.39	782.90	8.18	1044.33	-281.28
2	-20.31	786.70	1.76	1089.04	-217.12
3	-20.31	797.76	21.83	2362.41	-437.46
4	-20.31	808.66	1.41	3204.51	-647.96
5	17.48	811.66	4.91	2432.16	1364.20
6	17.48	819.00	10.48	2433.05	1364.82
7	17.48	841.68	37.07	2722.73	1566.45
8	46.52	862.55	9.28	3155.53	3036.55
9	46.52	870.87	14.90	2399.67	2555.22
10	46.52	876.28	0.82	2301.66	2416.01
11	55.95	883.57	25.00	1536.25	1500.74
12	70.14	890.83	1.55	609.82	321.74

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 308736.12 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 2250.40(psf)
Sum of the Driving Forces = 172180.03 (lbs)
Average Mobilized Shear Stress = 1255.03(psf)
Total length of the failure surface = 137.19(ft)
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)

Seismic Yield Coefficient (ky) = 0.6300(g)
Calculated Newmark Seismic Displacement =   0.107(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 7-7'/ 3/13 Design - Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 7\x7du.pl2 Run By: LGC 4/13/2015 01:12PM



GSTABL7 v.2 FSmin=2.20

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 01:12PM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7du.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7du.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7du.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 7-7'/ 3/13
Design - Upper Slope - Static

BOUNDARY COORDINATES
7 Top Boundaries
17 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	880.00	307.00	920.00	307.00	3
2	920.00	307.00	940.00	314.00	3
3	940.00	314.00	947.00	314.00	3
4	947.00	314.00	1006.00	341.00	1
5	1006.00	341.00	1012.00	341.00	1
6	1012.00	341.00	1045.00	358.00	1
7	1045.00	358.00	1200.00	358.00	1
8	947.00	314.00	951.00	311.00	3
9	951.00	311.00	991.00	311.00	3
10	991.00	311.00	1069.00	352.00	3
11	1069.00	352.00	1200.00	352.00	2
12	0.00	196.00	176.00	220.00	3
13	176.00	220.00	192.00	224.00	2
14	192.00	224.00	207.00	234.00	2
15	176.00	220.00	331.00	230.00	3
16	331.00	230.00	373.00	236.00	3
17	373.00	236.00	474.00	259.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1045.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	920.00	306.00	920.00	306.00	0.00
2	930.00	287.00	990.00	292.00	40.00
3	1000.00	295.00	1100.00	335.00	40.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***
Individual data on the 15 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.1	69.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	20.0	9102.2	0.0	0.0	0.	0.	0.0	0.0	0.0
3	7.0	5233.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	4.0	3163.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	27.2	40056.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	5.6	12239.4	0.0	0.0	0.	0.	0.0	0.0	0.0
7	18.5	46291.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.7	10172.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	6.0	15956.4	0.0	0.0	0.	0.	0.0	0.0	0.0
10	11.2	30265.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	6.3	16022.3	0.0	0.0	0.	0.	0.0	0.0	0.0
12	5.9	11738.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	9.6	13189.4	0.0	0.0	0.	0.	0.0	0.0	0.0
14	4.0	3124.3	0.0	0.0	0.	0.	0.0	0.0	992.2
15	4.3	1132.5	0.0	0.0	0.	0.	0.0	0.0	1067.4

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
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7	1053.238	358.000

Factor of Safety
*** 2.202 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Factor of Safety
*** 2.202 ***

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 7-7'/ 3/13 Design - Upper Slope - Seismic

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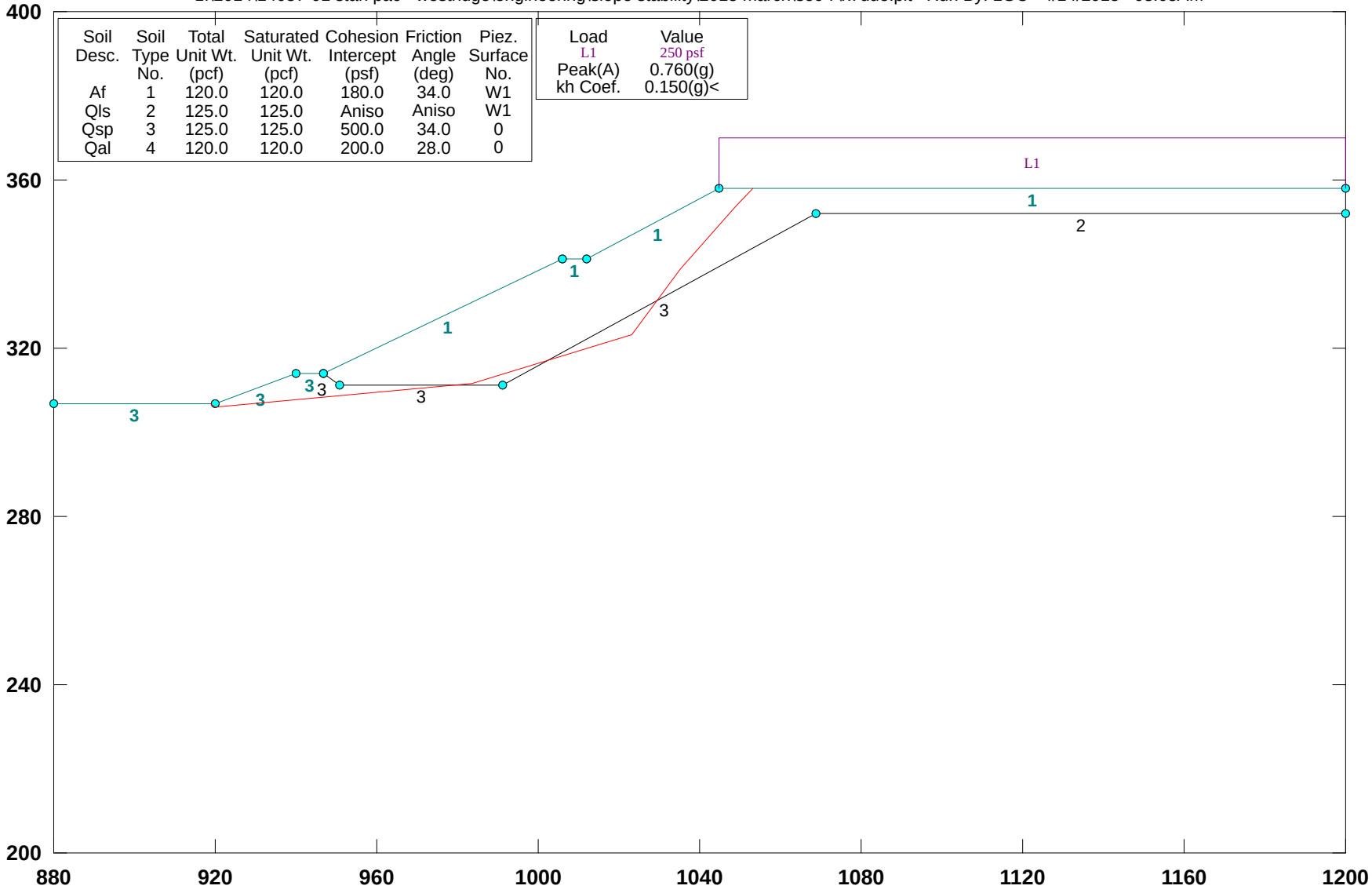

GSTABL7 v.2 FSmin=1.89

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 08:05AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7due.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7due.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 7\x7due.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 7-7'/ 3/13
Design - Upper Slope - Seismic

BOUNDARY COORDINATES
7 Top Boundaries
17 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	880.00	307.00	920.00	307.00	3
2	920.00	307.00	940.00	314.00	3
3	940.00	314.00	947.00	314.00	3
4	947.00	314.00	1006.00	341.00	1
5	1006.00	341.00	1012.00	341.00	1
6	1012.00	341.00	1045.00	358.00	1
7	1045.00	358.00	1200.00	358.00	1
8	947.00	314.00	951.00	311.00	3
9	951.00	311.00	991.00	311.00	3
10	991.00	311.00	1069.00	352.00	3
11	1069.00	352.00	1200.00	352.00	2
12	0.00	196.00	176.00	220.00	3
13	176.00	220.00	192.00	224.00	2
14	192.00	224.00	207.00	234.00	2
15	176.00	220.00	331.00	230.00	3
16	331.00	230.00	373.00	236.00	3
17	373.00	236.00	474.00	259.00	3

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:

(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	1045.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	918.882	307.000
2	920.000	306.000
3	983.771	311.478
4	1023.163	323.071
5	1035.369	338.915
6	1048.969	353.579
7	1053.238	358.000

Janbu's Empirical Coefficient (fo) = 1.060
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.892

Table 1 - Individual Data on the 15 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.1	69.9	0.0	0.0	0.0	0.0	10.5	0.0	0.0
2	20.0	9102.5	0.0	0.0	0.0	0.0	1365.4	0.0	0.0
3	7.0	5233.7	0.0	0.0	0.0	0.0	785.0	0.0	0.0
4	4.0	3163.8	0.0	0.0	0.0	0.0	474.6	0.0	0.0
5	27.2	40068.4	0.0	0.0	0.0	0.0	6010.3	0.0	0.0
6	5.6	12229.8	0.0	0.0	0.0	0.0	1834.5	0.0	0.0
7	18.5	46286.8	0.0	0.0	0.0	0.0	6943.0	0.0	0.0
8	3.7	10177.7	0.0	0.0	0.0	0.0	1526.7	0.0	0.0
9	6.0	15956.7	0.0	0.0	0.0	0.0	2393.5	0.0	0.0
10	11.2	30266.7	0.0	0.0	0.0	0.0	4540.0	0.0	0.0
11	6.3	16023.1	0.0	0.0	0.0	0.0	2403.5	0.0	0.0
12	5.9	11738.6	0.0	0.0	0.0	0.0	1760.8	0.0	0.0
13	9.6	13189.0	0.0	0.0	0.0	0.0	1978.4	0.0	0.0
14	4.0	3124.9	0.0	0.0	0.0	0.0	468.7	0.0	992.3
15	4.3	1132.4	0.0	0.0	0.0	0.0	169.9	0.0	1067.2

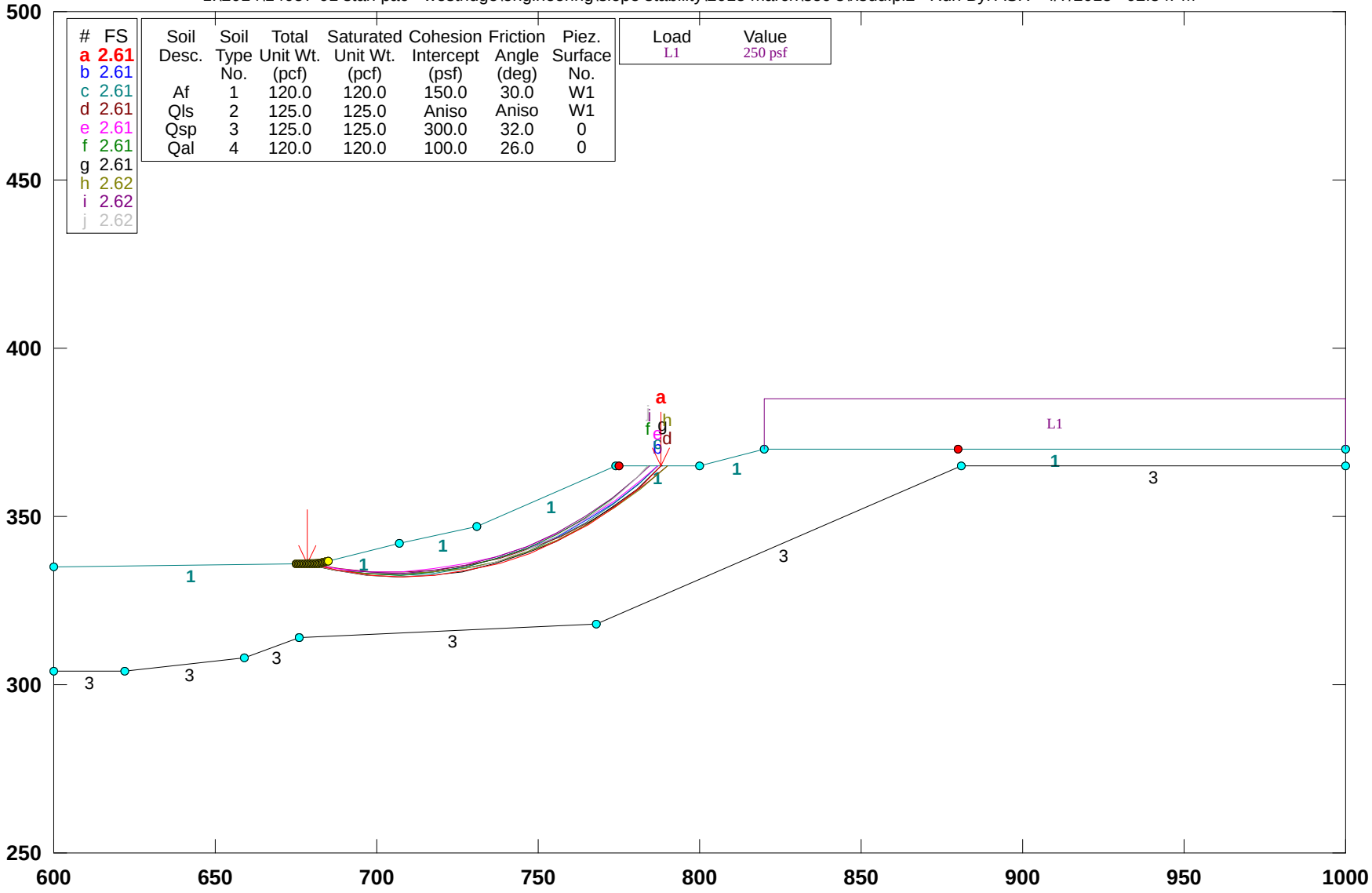
Table 2 - Base Stress Data on the 15 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-41.81	919.44	1.50	1067.98	-34.68
2	4.91	930.00	20.07	785.89	106.97
3	4.91	943.50	7.03	978.05	175.73
4	4.91	949.00	4.01	1006.48	185.90
5	4.91	964.60	27.31	1454.34	346.15
6	4.91	980.99	5.59	1618.99	516.57
7	16.40	993.02	19.28	1762.67	1066.90
8	16.40	1004.13	3.90	2204.56	1160.67
9	16.40	1009.00	6.25	2164.03	1133.52
10	16.40	1017.58	11.64	2197.06	1155.64
11	52.39	1026.29	10.26	2494.02	2261.96
12	52.39	1032.40	9.74	1693.22	1744.60
13	47.16	1040.18	14.16	1172.40	1143.78
14	47.16	1046.98	5.84	934.41	840.85
15	46.00	1051.10	6.15	554.68	398.31

```
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) =  224492.95 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   1470.02(psf)
Sum of the Driving Forces =   125792.45 (lbs)
Average Mobilized Shear Stress =     823.71(psf)
Total length of the failure surface =     152.71(ft)
       *** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) =  0.5601(g)
Calculated Newmark Seismic Displacement =   0.136(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
              **** END OF GSTABL7 OUTPUT ****
```

Westridge/14057-01/Sec 8-8'/3/13- Design- Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 8\x8du.pl2 Run By: ASR 4/7/2015 02:54PM



GSTABL7 v.2 FSmin=2.61

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/7/2015
Time of Run: 02:54PM
Run By: ASR
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8du.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8du.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8du.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 8-8'/3/13- Design - Upper Slope - Static

BOUNDARY COORDINATES
7 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	600.00	335.00	682.00	336.00	1
2	682.00	336.00	707.00	342.00	1
3	707.00	342.00	731.00	347.00	1
4	731.00	347.00	774.00	365.00	1
5	774.00	365.00	800.00	365.00	1
6	800.00	365.00	820.00	370.00	1
7	820.00	370.00	1000.00	370.00	1
8	676.00	314.00	768.00	318.00	3
9	768.00	318.00	881.00	365.00	3
10	881.00	365.00	1000.00	365.00	3
11	600.00	304.00	622.00	304.00	3
12	622.00	304.00	659.00	308.00	3
13	659.00	308.00	676.00	314.00	3

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	0
4	120.0	120.0	100.0	26.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	820.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 675.00(ft)
and X = 685.00(ft)
Each Surface Terminates Between X = 775.00(ft)
and X = 880.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	678.448	335.957
2	688.217	333.818
3	698.135	332.538
4	708.126	332.127
5	718.116	332.587
6	728.027	333.915
7	737.785	336.101
8	747.316	339.129
9	756.547	342.974
10	765.408	347.609
11	773.832	352.998
12	781.754	359.100
13	788.170	365.000

Circle Center At X = 707.847 ; Y = 446.862 ; and Radius = 114.735
Factor of Safety
*** 2.606 ***
Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.6	174.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	6.2	1676.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.9	6550.6	0.0	0.0	0.	0.	0.0	0.0	0.0
4	8.9	9128.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.1	1347.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	13088.5	0.0	0.0	0.	0.	0.0	0.0	0.0
7	9.9	14388.4	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.0	4438.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	6.8	10649.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	9.5	16263.7	0.0	0.0	0.	0.	0.0	0.0	0.0
11	9.2	16295.0	0.0	0.0	0.	0.	0.0	0.0	0.0
12	8.9	15159.4	0.0	0.0	0.	0.	0.0	0.0	0.0
13	8.4	13001.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	0.2	240.5	0.0	0.0	0.	0.	0.0	0.0	0.0
15	7.8	8268.0	0.0	0.0	0.	0.	0.0	0.0	0.0
16	6.4	2271.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.759	335.948
2	687.595	334.147
3	697.546	333.156
4	707.544	332.982
5	717.524	333.627
6	727.417	335.087
7	737.157	337.351
8	746.679	340.405
9	755.920	344.227
10	764.817	348.793
11	773.310	354.071
12	781.343	360.027
13	787.015	365.000

Circle Center At X = 704.661 ; Y = 455.065 ; and Radius = 122.116

Factor of Safety

*** 2.608 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.414	335.944
2	687.209	333.931
3	697.140	332.759
4	707.135	332.439
5	717.121	332.971
6	727.025	334.352
7	736.776	336.573
8	746.301	339.616
9	755.533	343.460
10	764.403	348.077
11	772.848	353.433
12	780.806	359.489
13	786.892	365.000

Circle Center At X = 705.894 ; Y = 449.667 ; and Radius = 117.235

Factor of Safety

*** 2.609 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	678.448	335.957
2	688.315	334.326
3	698.277	333.455
4	708.276	333.347
5	718.255	334.004
6	728.154	335.422
7	737.915	337.592
8	747.482	340.502
9	756.799	344.135
10	765.811	348.469
11	774.466	353.479
12	782.712	359.137
13	789.995	365.000

Circle Center At X = 704.682 ; Y = 464.038 ; and Radius = 130.740

Factor of Safety

*** 2.612 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.759	335.948
2	687.632	334.363
3	697.599	333.551
4	707.599	333.519
5	717.571	334.266
6	727.455	335.787
7	737.190	338.073
8	746.717	341.111
9	755.979	344.883
10	764.919	349.364
11	773.482	354.528

12	781.618	360.343
13	787.162	365.000

Circle Center At X = 703.016 ; Y = 461.701 ; and Radius = 128.264

Factor of Safety

*** 2.612 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.759	335.948
2	687.563	333.978
3	697.502	332.880
4	707.500	332.664
5	717.478	333.329
6	727.358	334.873
7	737.064	337.282
8	746.519	340.537
9	755.650	344.614
10	764.386	349.480
11	772.659	355.098
12	780.404	361.424
13	784.069	365.000

Circle Center At X = 704.954 ; Y = 445.899 ; and Radius = 113.264

Factor of Safety

*** 2.613 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.069	335.940
2	686.838	333.801
3	696.753	332.505
4	706.743	332.060
5	716.735	332.469
6	726.655	333.731
7	736.431	335.835
8	745.992	338.766
9	755.267	342.503
10	764.190	347.019
11	772.694	352.280
12	780.718	358.248
13	788.203	364.880
14	788.317	365.000

Circle Center At X = 706.950 ; Y = 449.019 ; and Radius = 116.960

Factor of Safety

*** 2.614 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.414	335.944
2	687.242	334.098
3	697.185	333.035
4	707.182	332.762
5	717.168	333.280
6	727.083	334.585
7	736.863	336.670
8	746.448	339.522
9	755.777	343.123
10	764.792	347.450
11	773.437	352.477
12	781.658	358.171
13	789.402	364.497
14	789.928	365.000

Circle Center At X = 705.639 ; Y = 459.020 ; and Radius = 126.271

Factor of Safety

*** 2.615 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.759	335.948
2	687.603	334.191
3	697.560	333.269

4	707.560	333.189
5	717.531	333.952
6	727.402	335.552
7	737.103	337.978
8	746.566	341.213
9	755.722	345.234
10	764.506	350.012
11	772.858	355.513
12	780.715	361.698
13	784.252	365.000

Circle Center At X = 703.506 ; Y = 451.708 ; and Radius = 118.589

Factor of Safety

*** 2.615 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	677.759	335.948
2	687.519	333.770
3	697.438	332.500
4	707.432	332.148
5	717.415	332.718
6	727.304	334.204
7	737.014	336.595
8	746.463	339.869
9	755.570	343.999
10	764.259	348.950
11	772.454	354.680
12	780.088	361.140
13	783.878	365.000

Circle Center At X = 706.247 ; Y = 440.653 ; and Radius = 108.511

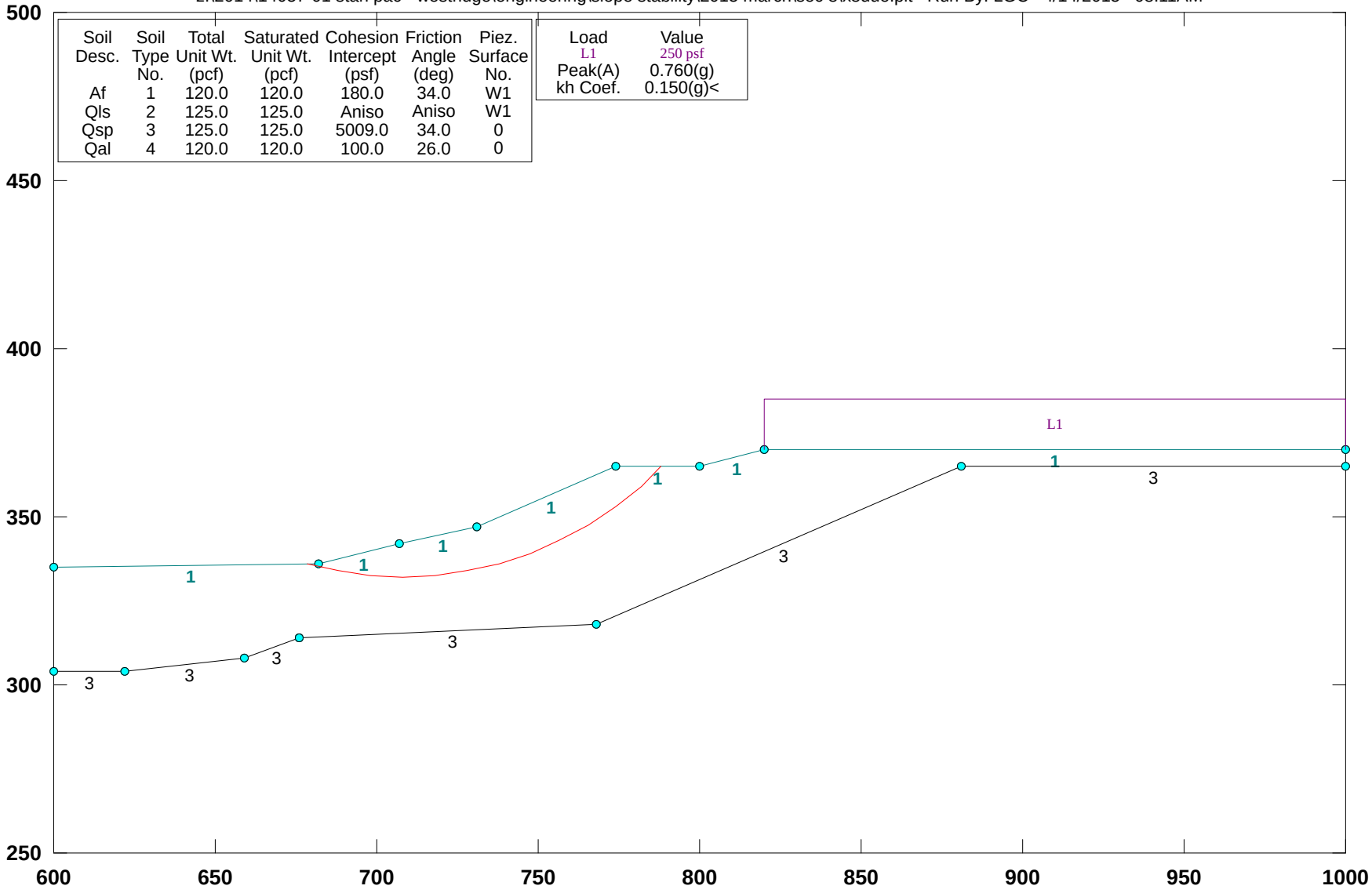
Factor of Safety

*** 2.615 ***

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 8-8'/3/13- Design- Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 8\x8due.plt Run By: LGC 4/14/2015 08:11AM



GSTABL7 v.2 FSmin=1.88

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 08:11AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8due.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8due.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8due.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 8-8'/3/13- Design
- Upper Slope - Seismic

BOUNDARY COORDINATES
7 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	600.00	335.00	682.00	336.00	1
2	682.00	336.00	707.00	342.00	1
3	707.00	342.00	731.00	347.00	1
4	731.00	347.00	774.00	365.00	1
5	774.00	365.00	800.00	365.00	1
6	800.00	365.00	820.00	370.00	1
7	820.00	370.00	1000.00	370.00	1
8	676.00	314.00	768.00	318.00	3
9	768.00	318.00	881.00	365.00	3
10	881.00	365.00	1000.00	365.00	3
11	600.00	304.00	622.00	304.00	3
12	622.00	304.00	659.00	308.00	3
13	659.00	308.00	676.00	314.00	3

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	5009.0	34.0	0.00	0.0	0
4	120.0	120.0	100.0	26.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	820.00	1000.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	678.448	335.957
2	688.217	333.818
3	698.135	332.538
4	708.126	332.127
5	718.116	332.587
6	728.027	333.915
7	737.785	336.101
8	747.316	339.129
9	756.547	342.974
10	765.408	347.609
11	773.832	352.998
12	781.754	359.100
13	788.170	365.000

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.883

Table 1 - Individual Data on the 16 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.6	175.0	0.0	0.0	0.0	0.0	26.2	0.0	0.0
2	6.2	1676.7	0.0	0.0	0.0	0.0	251.5	0.0	0.0
3	9.9	6550.9	0.0	0.0	0.0	0.0	982.6	0.0	0.0
4	8.9	9128.0	0.0	0.0	0.0	0.0	1369.2	0.0	0.0
5	1.1	1346.7	0.0	0.0	0.0	0.0	202.0	0.0	0.0
6	10.0	13088.7	0.0	0.0	0.0	0.0	1963.3	0.0	0.0
7	9.9	14387.6	0.0	0.0	0.0	0.0	2158.1	0.0	0.0
8	3.0	4438.9	0.0	0.0	0.0	0.0	665.8	0.0	0.0
9	6.8	10649.1	0.0	0.0	0.0	0.0	1597.4	0.0	0.0
10	9.5	16263.7	0.0	0.0	0.0	0.0	2439.6	0.0	0.0
11	9.2	16295.2	0.0	0.0	0.0	0.0	2444.3	0.0	0.0
12	8.9	15160.0	0.0	0.0	0.0	0.0	2274.0	0.0	0.0
13	8.4	13003.0	0.0	0.0	0.0	0.0	1950.5	0.0	0.0
14	0.2	239.9	0.0	0.0	0.0	0.0	36.0	0.0	0.0
15	7.8	8268.6	0.0	0.0	0.0	0.0	1240.3	0.0	0.0
16	6.4	2271.2	0.0	0.0	0.0	0.0	340.7	0.0	0.0

Table 2 - Base Stress Data on the 16 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-12.35	680.22	3.64	236.85	-3.32
2	-12.35	685.11	6.36	402.02	-18.16
3	-7.35	693.18	10.00	661.29	13.72
4	-2.36	702.57	8.87	888.35	112.00
5	-2.36	707.56	1.13	1002.36	130.09
6	2.64	713.12	10.00	1047.58	256.58
7	7.63	723.07	10.00	1115.95	408.61
8	12.63	729.51	3.05	1126.13	544.94
9	12.63	734.39	6.95	1175.03	572.83
10	17.63	742.55	10.00	1253.83	760.63
11	22.61	751.93	10.00	1292.02	923.19
12	27.61	760.98	10.00	1267.86	1020.38
13	32.61	769.62	10.00	1179.33	1026.84
14	37.61	773.92	0.21	1131.09	1041.28

15	37.61	777.88	9.79	889.60	777.44
16	42.60	784.96	8.72	427.93	278.70

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 114866.97 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   967.57(psf)
Sum of the Driving Forces =   61015.16 (lbs)
Average Mobilized Shear Stress =   513.96(psf)
Total length of the failure surface =   118.72(ft)
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.4929(g)
Calculated Newmark Seismic Displacement =   0.175(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

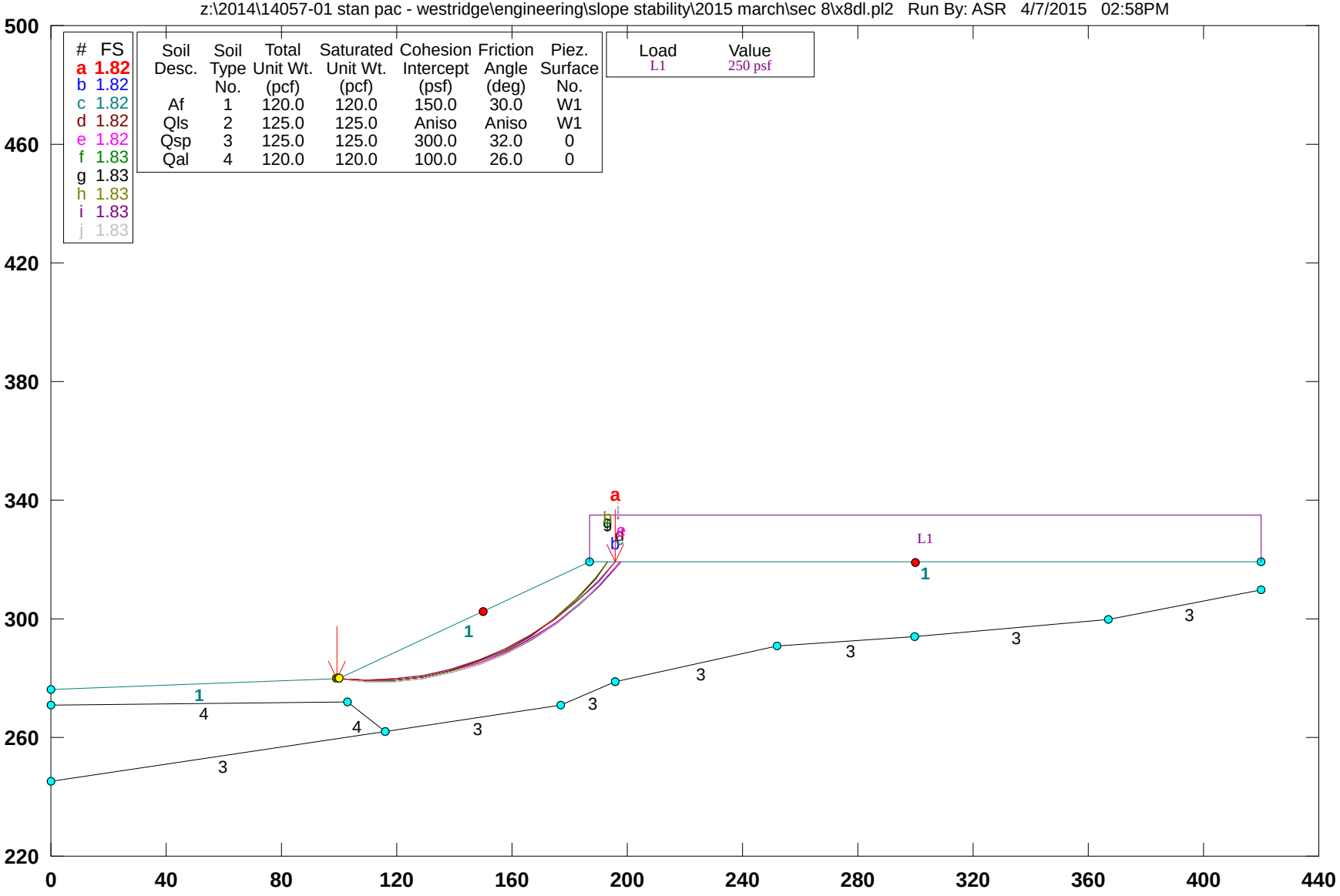
Westridge/14057-01/Sec 8-8'/3/13 Design - Lower Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 8\x8dl.pl2 Run By: ASR 4/7/2015 02:58PM

#	FS
a	1.82
b	1.82
c	1.82
d	1.82
e	1.82
f	1.83
g	1.83
h	1.83
i	1.83
j	1.83

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qls	2	125.0	125.0	Aniso	Aniso	W1
Qsp	3	125.0	125.0	300.0	32.0	0
Qal	4	120.0	120.0	100.0	26.0	0

Load	Value
L1	250 psf



GSTABL7 v.2 FSmin=1.82

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/13/2015
Time of Run: 02:12PM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dl.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dl.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dl.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 8-8'/3/13 Design - Lower Slope - Static

BOUNDARY COORDINATES
3 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	276.00	100.00	280.00	1
2	100.00	280.00	187.00	319.00	1
3	187.00	319.00	420.00	319.00	1
4	0.00	271.00	103.00	272.00	4
5	103.00	272.00	116.00	262.00	4
6	196.00	279.00	252.00	291.00	3
7	252.00	291.00	300.00	294.00	3
8	300.00	294.00	367.00	300.00	3
9	367.00	300.00	420.00	310.00	3
10	0.00	245.00	116.00	262.00	3
11	116.00	262.00	177.00	271.00	3
12	177.00	271.00	196.00	279.00	3

User Specified Y-Origin = 220.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	300.0	32.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	300.00	32.00
2	12.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	187.00	420.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 99.00(ft)
and X = 100.00(ft)
Each Surface Terminates Between X = 150.00(ft)
and X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.207	279.968
2	109.192	279.416
3	119.186	279.753
4	129.111	280.978
5	138.887	283.081
6	148.438	286.046
7	157.687	289.847
8	166.561	294.457
9	174.990	299.837
10	182.908	305.946
11	190.250	312.734
12	195.920	319.000

Circle Center At X = 110.430 ; Y = 391.495 ; and Radius = 112.090
Factor of Safety
*** 1.816 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Top (lbs)	Water Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Surcharge Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.103	279.964
2	109.088	279.412
3	119.083	279.747
4	129.008	280.967
5	138.786	283.062
6	148.339	286.017
7	157.593	289.806
8	166.475	294.402
9	174.914	299.767
10	182.844	305.860
11	190.202	312.631
12	195.995	319.000

Circle Center At X = 110.342 ; Y = 391.835 ; and Radius = 112.434
Factor of Safety
*** 1.816 ***
Failure Surface Specified By 13 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	99.345	279.974
2	109.320	279.275
3	119.318	279.472
4	129.259	280.561
5	139.062	282.535
6	148.650	285.378
7	157.944	289.067
8	166.872	293.573
9	175.361	298.858
10	183.343	304.882
11	190.755	311.595
12	197.536	318.944
13	197.579	319.000

Circle Center At X = 112.128 ; Y = 390.954 ; and Radius = 111.714

Factor of Safety

*** 1.822 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.207	279.968
2	109.182	279.270
3	119.181	279.463
4	129.122	280.546
5	138.927	282.510
6	148.518	285.340
7	157.819	289.014
8	166.756	293.501
9	175.257	298.767
10	183.255	304.769
11	190.687	311.460
12	197.493	318.786
13	197.659	319.000

Circle Center At X = 112.019 ; Y = 391.366 ; and Radius = 112.132

Factor of Safety

*** 1.822 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.069	279.963
2	109.045	279.264
3	119.043	279.454
4	128.985	280.530
5	138.792	282.485
6	148.387	285.302
7	157.694	288.960
8	166.639	293.430
9	175.153	298.676
10	183.167	304.657
11	190.619	311.325
12	197.449	318.629
13	197.739	319.000

Circle Center At X = 111.911 ; Y = 391.779 ; and Radius = 112.551

Factor of Safety

*** 1.822 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.000	279.960
2	108.960	279.072
3	118.960	279.175
4	128.900	280.268
5	138.683	282.341
6	148.212	285.373
7	157.394	289.334
8	166.138	294.186
9	174.359	299.880
10	181.975	306.361
11	188.911	313.564
12	193.193	319.000

Circle Center At X = 112.963 ; Y = 379.422 ; and Radius = 100.437

Factor of Safety

*** 1.828 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.103	279.964
2	109.064	279.076
3	119.063	279.182
4	129.003	280.281
5	138.784	282.362
6	148.310	285.404
7	157.486	289.378
8	166.222	294.244
9	174.432	299.954
10	182.033	306.452
11	188.952	313.672
12	193.125	319.000

Circle Center At X = 113.043 ; Y = 379.136 ; and Radius = 100.147

Factor of Safety

*** 1.828 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.241	279.970
2	109.202	279.081
3	119.201	279.191
4	129.140	280.297
5	138.919	282.389
6	148.440	285.446
7	157.609	289.437
8	166.334	294.322
9	174.529	300.054
10	182.111	306.574
11	189.005	313.817
12	193.034	319.000

Circle Center At X = 113.150 ; Y = 378.757 ; and Radius = 99.762

Factor of Safety

*** 1.828 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.276	279.971
2	109.232	279.034
3	119.232	279.041
4	129.187	279.993
5	139.007	281.880
6	148.605	284.686
7	157.896	288.385
8	166.795	292.946
9	175.224	298.326
10	183.108	304.478
11	190.376	311.347
12	196.962	318.872
13	197.055	319.000

Circle Center At X = 114.155 ; Y = 384.711 ; and Radius = 105.791

Factor of Safety

*** 1.829 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.138	279.966
2	109.094	279.029
3	119.094	279.032
4	129.049	279.977
5	138.871	281.854
6	148.474	284.647
7	157.770	288.331
8	166.679	292.873
9	175.122	298.233

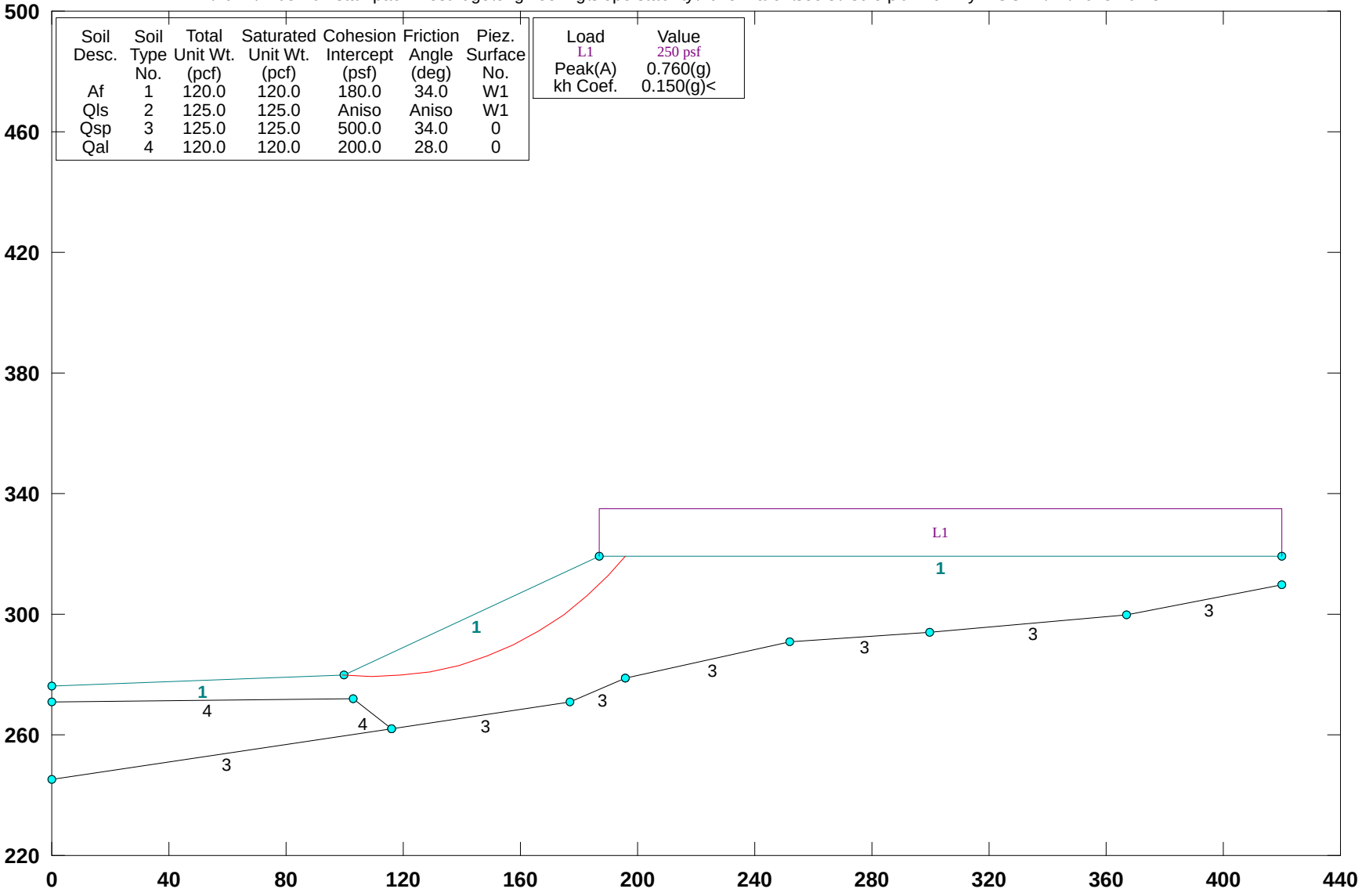
```
   10        183.022      304.363
   11        190.311      311.210
   12        196.923      318.712
   13        197.132      319.000
Circle Center At X =   114.053 ; Y =   385.088 ; and Radius =   106.176
      Factor of Safety
     ***    1.829   ***
         **** END OF GSTABL7 OUTPUT ****
```

Westridge/14057-01/Sec 8-8'/3/13 Design - Lower Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 8\x8dle.plt Run By: LGC 4/14/2015 07:31AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qls	2	125.0	125.0	Aniso	Aniso	W1
Qsp	3	125.0	125.0	500.0	34.0	0
Qal	4	120.0	120.0	200.0	28.0	0

Load	Value
L1	250 psf
Peak(A)	0.760(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.53

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 07:31AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dle.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dle.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 8\x8dle.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 8-8'/3/13 Design
- Lower Slope - Seismic

BOUNDARY COORDINATES
3 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	276.00	100.00	280.00	1
2	100.00	280.00	187.00	319.00	1
3	187.00	319.00	420.00	319.00	1
4	0.00	271.00	103.00	272.00	4
5	103.00	272.00	116.00	262.00	4
6	196.00	279.00	252.00	291.00	3
7	252.00	291.00	300.00	294.00	3
8	300.00	294.00	367.00	300.00	3
9	367.00	300.00	420.00	310.00	3
10	0.00	245.00	116.00	262.00	3
11	116.00	262.00	177.00	271.00	3
12	177.00	271.00	196.00	279.00	3

User Specified Y-Origin = 220.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	200.0	24.0	0.00	0.0	1
3	125.0	125.0	500.0	34.0	0.00	0.0	0
4	120.0	120.0	200.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	34.00
2	12.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and

C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	187.00	420.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.207	279.968
2	109.192	279.416
3	119.186	279.753
4	129.111	280.978
5	138.887	283.081
6	148.438	286.046
7	157.687	289.847
8	166.561	294.457
9	174.990	299.837
10	182.908	305.946
11	190.250	312.734
12	195.920	319.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	5.10	10.00
2	5.11	10.00
3	5.10	10.00
4	5.11	10.00
5	5.09	10.00
6	5.11	10.00
7	5.10	10.00
8	5.10	10.00
9	5.10	10.00

Circle Center At X = 110.429(ft) ; Y = 391.496(ft); and Radius = 112.091(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Factor Of Safety For The Preceding Specified Surface = 1.528

Table 1 - Individual Data on the 13 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.8	3.6	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2	9.2	2636.3	0.0	0.0	0.0	0.0	395.4	0.0	0.0
3	10.0	8126.4	0.0	0.0	0.0	0.0	1219.0	0.0	0.0
4	9.9	12457.5	0.0	0.0	0.0	0.0	1868.6	0.0	0.0
5	9.8	15498.6	0.0	0.0	0.0	0.0	2324.8	0.0	0.0
6	9.6	17202.5	0.0	0.0	0.0	0.0	2580.4	0.0	0.0
7	9.2	17580.7	0.0	0.0	0.0	0.0	2637.1	0.0	0.0
8	8.9	16715.1	0.0	0.0	0.0	0.0	2507.3	0.0	0.0
9	8.4	14747.3	0.0	0.0	0.0	0.0	2212.1	0.0	0.0
10	7.9	11876.5	0.0	0.0	0.0	0.0	1781.5	0.0	0.0
11	4.1	5030.8	0.0	0.0	0.0	0.0	754.6	0.0	0.0
12	3.2	3029.7	0.0	0.0	0.0	0.0	454.4	0.0	812.5
13	5.7	2131.7	0.0	0.0	0.0	0.0	319.8	0.0	1417.5

Table 2 - Base Stress Data on the 13 Slices

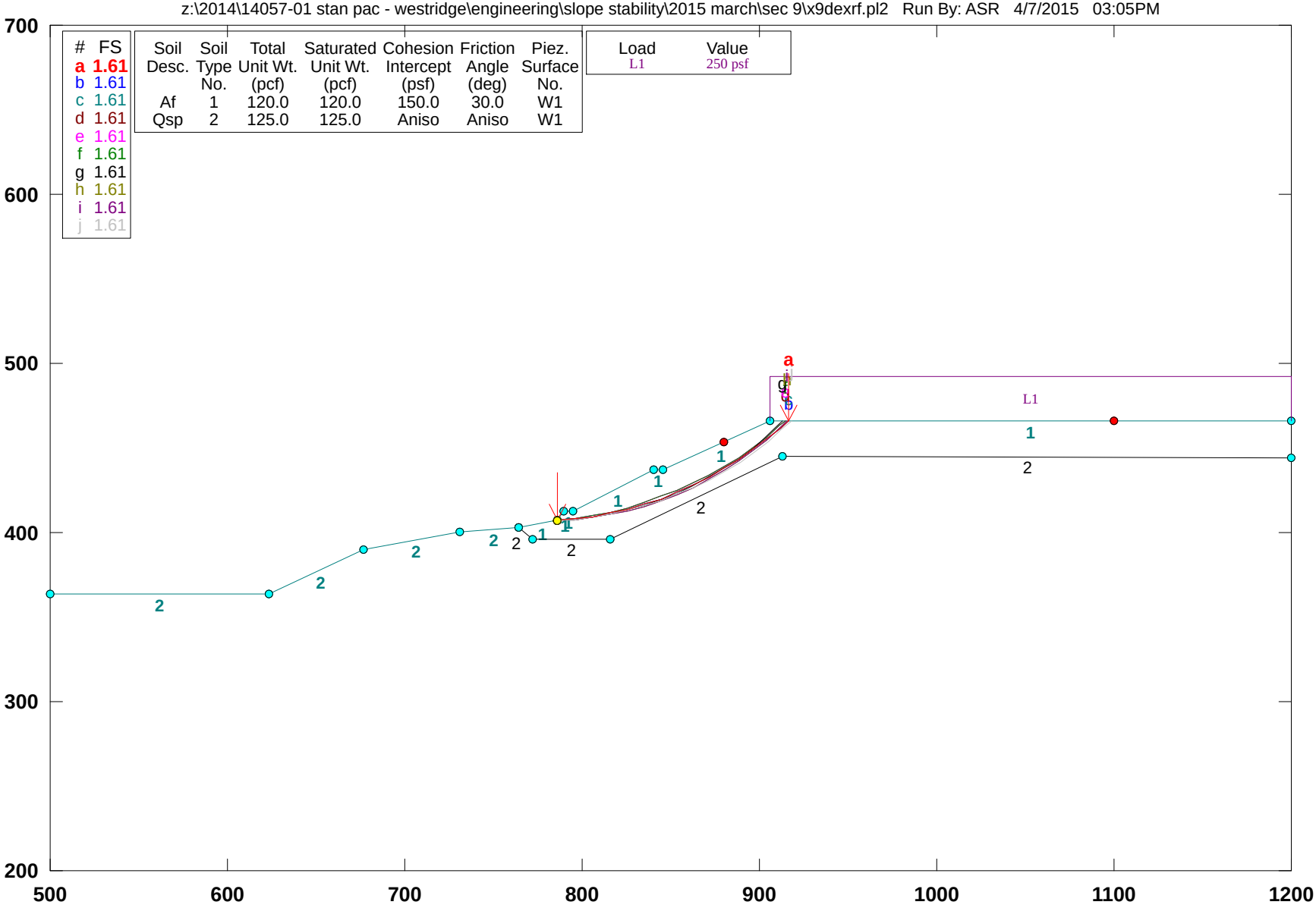
Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-3.17	99.60	0.79	187.64	0.43
2	-3.17	104.60	9.21	382.80	26.62
3	1.93	114.19	10.00	717.78	145.53
4	7.04	124.15	10.00	973.57	329.33
5	12.14	134.00	10.00	1140.99	539.55
6	17.25	143.66	10.00	1226.75	739.14
7	22.34	153.06	10.00	1237.59	893.58

8	27.45	162.12	10.00	1179.91	975.51
9	32.55	170.78	10.00	1061.12	965.55
10	37.65	178.95	10.00	888.94	856.53
11	42.75	184.95	5.57	716.73	706.06
12	42.75	188.62	4.43	694.11	661.12
13	47.86	193.08	8.45	404.75	336.28

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 98390.69 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 907.24(psf)
Sum of the Driving Forces = 64395.62 (lbs)
Average Mobilized Shear Stress = 593.78(psf)
Total length of the failure surface = 108.45(ft)
CAUTION - Factor Of Safety Is Calculated By The Modified Bishop
Method. This Method Is Valid Only If The Failure Surface
Approximates A Circular Arc.
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.4010(g)
Calculated Newmark Seismic Displacement = 0.265(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 9-9'/ 3/13 Design- Upper Slope - Rotational - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 9\x9dexrf.pl2 Run By: ASR 4/7/2015 03:05PM



GSTABL7 v.2 FSmin=1.61

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/7/2015
Time of Run: 03:05PM
Run By: ASR
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrf.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrf.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrf.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 9-9'/ 3/13 Design
- Upper Slope - Rotational - Static

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	500.00	364.00	623.00	364.00	2
2	623.00	364.00	677.00	390.00	2
3	677.00	390.00	731.00	400.00	2
4	731.00	400.00	764.00	403.00	2
5	764.00	403.00	786.00	407.00	1
6	786.00	407.00	790.00	413.00	1
7	790.00	413.00	795.00	413.00	1
8	795.00	413.00	840.00	437.00	1
9	840.00	437.00	846.00	437.00	1
10	846.00	437.00	906.00	466.00	1
11	906.00	466.00	1200.00	466.00	1
12	764.00	403.00	772.00	396.00	2
13	772.00	396.00	816.00	396.00	2
14	816.00	396.00	913.00	445.00	2
15	913.00	445.00	1200.00	444.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	300.00	32.00
2	10.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	906.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 786.00(ft)
and X = 786.00(ft)
Each Surface Terminates Between X = 880.00(ft)
and X =1100.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.949	408.008
3	805.839	409.489
4	815.647	411.440
5	825.351	413.855
6	834.929	416.729
7	844.359	420.056
8	853.620	423.829
9	862.691	428.038
10	871.551	432.674
11	880.181	437.727
12	888.560	443.185
13	896.670	449.036
14	904.491	455.267
15	912.008	461.862
16	916.293	466.000

Circle Center At X = 769.921 ; Y = 615.875 ; and Radius = 209.493
Factor of Safety
*** 1.611 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.949	408.008
3	805.839	409.489
4	815.647	411.440
5	825.351	413.855
6	834.929	416.729
7	844.359	420.056
8	853.620	423.829
9	862.691	428.038
10	871.551	432.674
11	880.181	437.727

12	888.560	443.185
13	896.670	449.036
14	904.491	455.267
15	912.008	461.862
16	916.293	466.000

Circle Center At X = 769.921 ; Y = 615.875 ; and Radius = 209.493

Factor of Safety

*** 1.611 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.949	408.008
3	805.839	409.489
4	815.647	411.440
5	825.351	413.855
6	834.929	416.729
7	844.359	420.056
8	853.620	423.829
9	862.691	428.038
10	871.551	432.674
11	880.181	437.727
12	888.560	443.185
13	896.670	449.036
14	904.491	455.267
15	912.008	461.862
16	916.293	466.000

Circle Center At X = 769.921 ; Y = 615.875 ; and Radius = 209.493

Factor of Safety

*** 1.611 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.926	408.218
3	805.785	409.891
4	815.557	412.014
5	825.221	414.583
6	834.757	417.594
7	844.145	421.038
8	853.365	424.910
9	862.398	429.201
10	871.224	433.902
11	879.825	439.003
12	888.183	444.494
13	896.280	450.362
14	904.099	456.596
15	911.624	463.182
16	914.560	466.000

Circle Center At X = 764.562 ; Y = 623.279 ; and Radius = 217.339

Factor of Safety

*** 1.612 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.926	408.218
3	805.785	409.891
4	815.557	412.014
5	825.221	414.583
6	834.757	417.594
7	844.145	421.038
8	853.365	424.910
9	862.398	429.201
10	871.224	433.902
11	879.825	439.003
12	888.183	444.494
13	896.280	450.362
14	904.099	456.596
15	911.624	463.182

16	914.560	466.000

Circle Center At X = 764.562 ; Y = 623.279 ; and Radius = 217.339

Factor of Safety

*** 1.612 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.926	408.218
3	805.785	409.891
4	815.557	412.014
5	825.221	414.583
6	834.757	417.594
7	844.145	421.038
8	853.365	424.910
9	862.398	429.201
10	871.224	433.902
11	879.825	439.003
12	888.183	444.494
13	896.280	450.362
14	904.099	456.596
15	911.624	463.182
16	914.560	466.000

Circle Center At X = 764.562 ; Y = 623.279 ; and Radius = 217.339

Factor of Safety

*** 1.612 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.968	407.799
3	805.880	409.123
4	815.708	410.968
5	825.426	413.328
6	835.005	416.198
7	844.420	419.569
8	853.643	423.433
9	862.651	427.777
10	871.416	432.590
11	879.915	437.859
12	888.125	443.569
13	896.022	449.704
14	903.584	456.247
15	910.791	463.180
16	913.428	466.000

Circle Center At X = 775.948 ; Y = 595.821 ; and Radius = 189.088

Factor of Safety

*** 1.613 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.976	407.690
3	805.902	408.904
4	815.751	410.637
5	825.495	412.885
6	835.108	415.641
7	844.562	418.899
8	853.832	422.649
9	862.893	426.880
10	871.719	431.582
11	880.286	436.740
12	888.570	442.341
13	896.548	448.370
14	904.199	454.810
15	911.501	461.642
16	915.693	466.000

Circle Center At X = 777.947 ; Y = 596.747 ; and Radius = 189.918

Factor of Safety

*** 1.613 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.977	407.681
3	805.904	408.887
4	815.754	410.613
5	825.499	412.856
6	835.113	415.608
7	844.568	418.864
8	853.839	422.612
9	862.899	426.844
10	871.725	431.546
11	880.290	436.707
12	888.572	442.312
13	896.547	448.345
14	904.193	454.789
15	911.490	461.627
16	915.689	466.000

Circle Center At X = 778.157 ; Y = 596.274 ; and Radius = 189.437

Factor of Safety

*** 1.613 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.968	407.805
3	805.883	409.099
4	815.724	410.878
5	825.465	413.138
6	835.083	415.875
7	844.556	419.080
8	853.859	422.747
9	862.971	426.867
10	871.870	431.429
11	880.534	436.423
12	888.941	441.837
13	897.073	447.657
14	904.909	453.869
15	912.431	460.459
16	918.160	466.000

Circle Center At X = 774.674 ; Y = 609.890 ; and Radius = 203.206

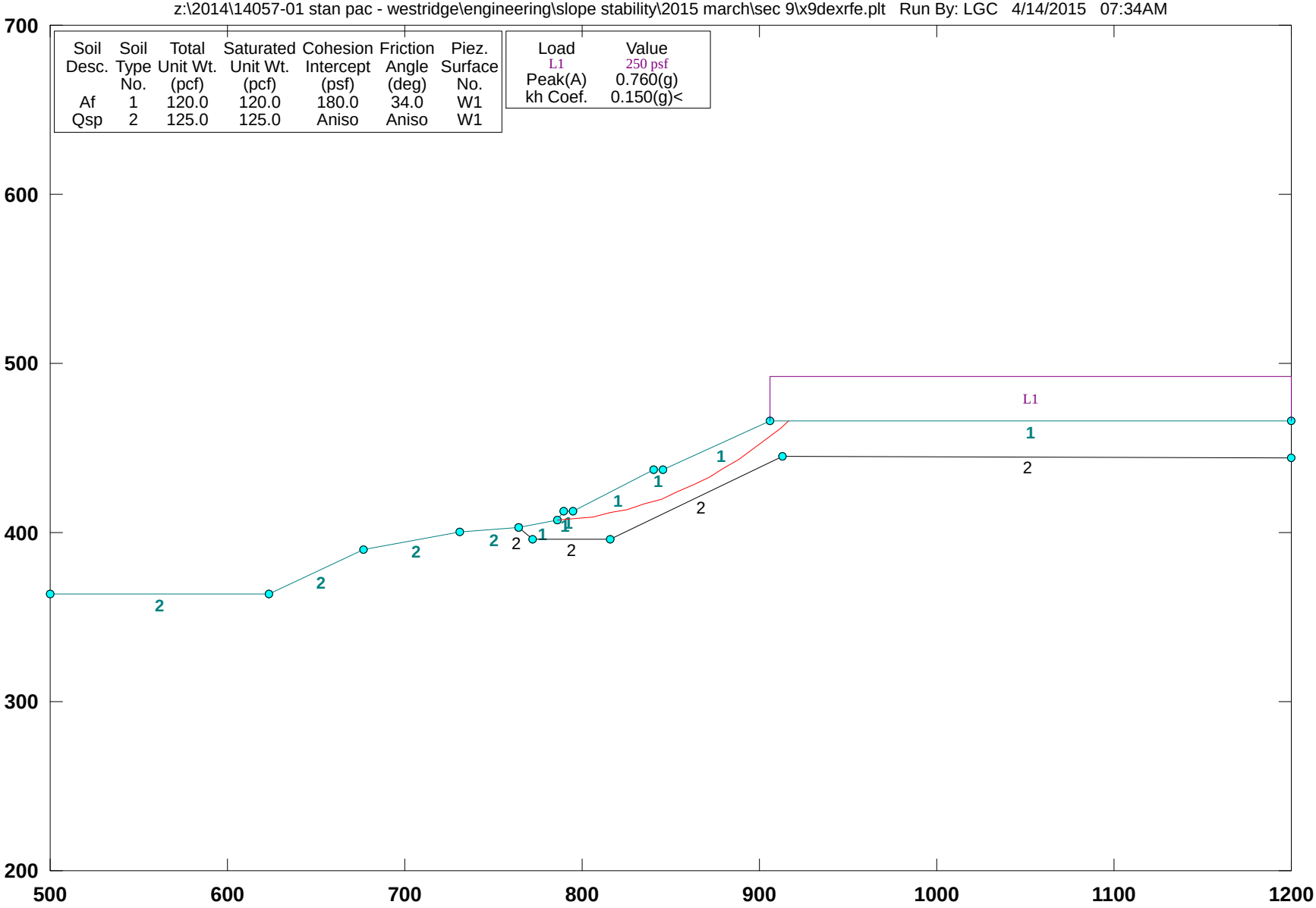
Factor of Safety

*** 1.614 ***

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 9-9'/ 3/13 Design- Upper Slope - Rotational - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 9\x9dexrfe.plt Run By: LGC 4/14/2015 07:34AM



GSTABL7 v.2 FSmin=1.36

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 07:34AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrfe.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrfe.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexrfe.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 9-9'/ 3/13 Design
- Upper Slope - Rotational - Seismic

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	500.00	364.00	623.00	364.00	2
2	623.00	364.00	677.00	390.00	2
3	677.00	390.00	731.00	400.00	2
4	731.00	400.00	764.00	403.00	2
5	764.00	403.00	786.00	407.00	1
6	786.00	407.00	790.00	413.00	1
7	790.00	413.00	795.00	413.00	1
8	795.00	413.00	840.00	437.00	1
9	840.00	437.00	846.00	437.00	1
10	846.00	437.00	906.00	466.00	1
11	906.00	466.00	1200.00	466.00	1
12	764.00	403.00	772.00	396.00	2
13	772.00	396.00	816.00	396.00	2
14	816.00	396.00	913.00	445.00	2
15	913.00	445.00	1200.00	444.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	500.00	34.00
2	10.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	906.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	786.000	407.000
2	795.949	408.008
3	805.839	409.489
4	815.647	411.440
5	825.351	413.855
6	834.929	416.729
7	844.359	420.056
8	853.620	423.829
9	862.691	428.038
10	871.551	432.674
11	880.181	437.727
12	888.560	443.185
13	896.670	449.036
14	904.491	455.267
15	912.008	461.862
16	916.293	466.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	2.73	10.00
2	2.73	10.00
3	2.72	10.00
4	2.73	10.00
5	2.73	10.00
6	2.73	10.00
7	2.73	10.00
8	2.73	10.00
9	2.73	10.00
10	2.73	10.00
11	2.73	10.00
12	2.74	10.00
13	2.72	10.00

Circle Center At X = 769.919(ft) ; Y = 615.879(ft); and Radius = 209.497(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Factor Of Safety For The Preceding Specified Surface = 1.359

Table 1 - Individual Data on the 20 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.0	1342.7	0.0	0.0	0.0	0.0	201.4	0.0	0.0
2	5.0	3204.9	0.0	0.0	0.0	0.0	480.7	0.0	0.0
3	0.9	602.8	0.0	0.0	0.0	0.0	90.4	0.0	0.0
4	9.9	8776.4	0.0	0.0	0.0	0.0	1316.5	0.0	0.0
5	9.8	12866.3	0.0	0.0	0.0	0.0	1929.9	0.0	0.0
6	9.7	16246.8	0.0	0.0	0.0	0.0	2437.0	0.0	0.0
7	9.6	18906.3	0.0	0.0	0.0	0.0	2836.0	0.0	0.0
8	5.1	10968.1	0.0	0.0	0.0	0.0	1645.2	0.0	0.0
9	4.4	9265.2	0.0	0.0	0.0	0.0	1389.8	0.0	0.0
10	1.6	3270.9	0.0	0.0	0.0	0.0	490.6	0.0	0.0
11	7.6	15146.8	0.0	0.0	0.0	0.0	2272.0	0.0	0.0
12	9.1	18441.3	0.0	0.0	0.0	0.0	2766.2	0.0	0.0
13	8.9	17917.5	0.0	0.0	0.0	0.0	2687.6	0.0	0.0
14	8.6	16812.7	0.0	0.0	0.0	0.0	2521.9	0.0	0.0
15	8.4	15172.5	0.0	0.0	0.0	0.0	2275.9	0.0	0.0

16	8.1	13060.4	0.0	0.0	0.0	0.0	1959.1	0.0	0.0
17	7.8	10538.8	0.0	0.0	0.0	0.0	1580.8	0.0	0.0
18	1.5	1757.6	0.0	0.0	0.0	0.0	263.6	0.0	0.0
19	6.0	4883.4	0.0	0.0	0.0	0.0	732.5	0.0	1502.0
20	4.3	1063.9	0.0	0.0	0.0	0.0	159.6	0.0	1071.3

Table 2 - Base Stress Data on the 20 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	5.79	788.00	4.02	386.97	83.17
2	5.79	792.50	5.03	583.03	158.23
3	5.79	795.47	0.95	579.31	156.81
4	8.52	800.89	10.00	724.71	257.84
5	11.25	810.74	10.00	969.17	435.26
6	13.98	820.50	10.00	1165.37	620.73
7	16.70	830.14	10.00	1315.55	803.87
8	19.43	837.46	5.38	1394.72	953.99
9	19.43	842.18	4.62	1373.28	937.74
10	22.17	845.18	1.77	1268.06	941.87
11	22.17	849.81	8.23	1265.03	939.35
12	24.89	858.16	10.00	1260.94	1015.95
13	27.62	867.12	10.00	1225.78	1058.06
14	30.35	875.87	10.00	1157.70	1057.31
15	33.08	884.37	10.00	1059.06	1010.64
16	35.81	892.61	10.00	932.43	916.71
17	38.54	900.58	10.00	780.38	776.12
18	41.26	905.25	2.01	672.76	673.11
19	41.26	909.00	7.99	624.85	594.31
20	44.00	914.15	5.96	348.90	268.13

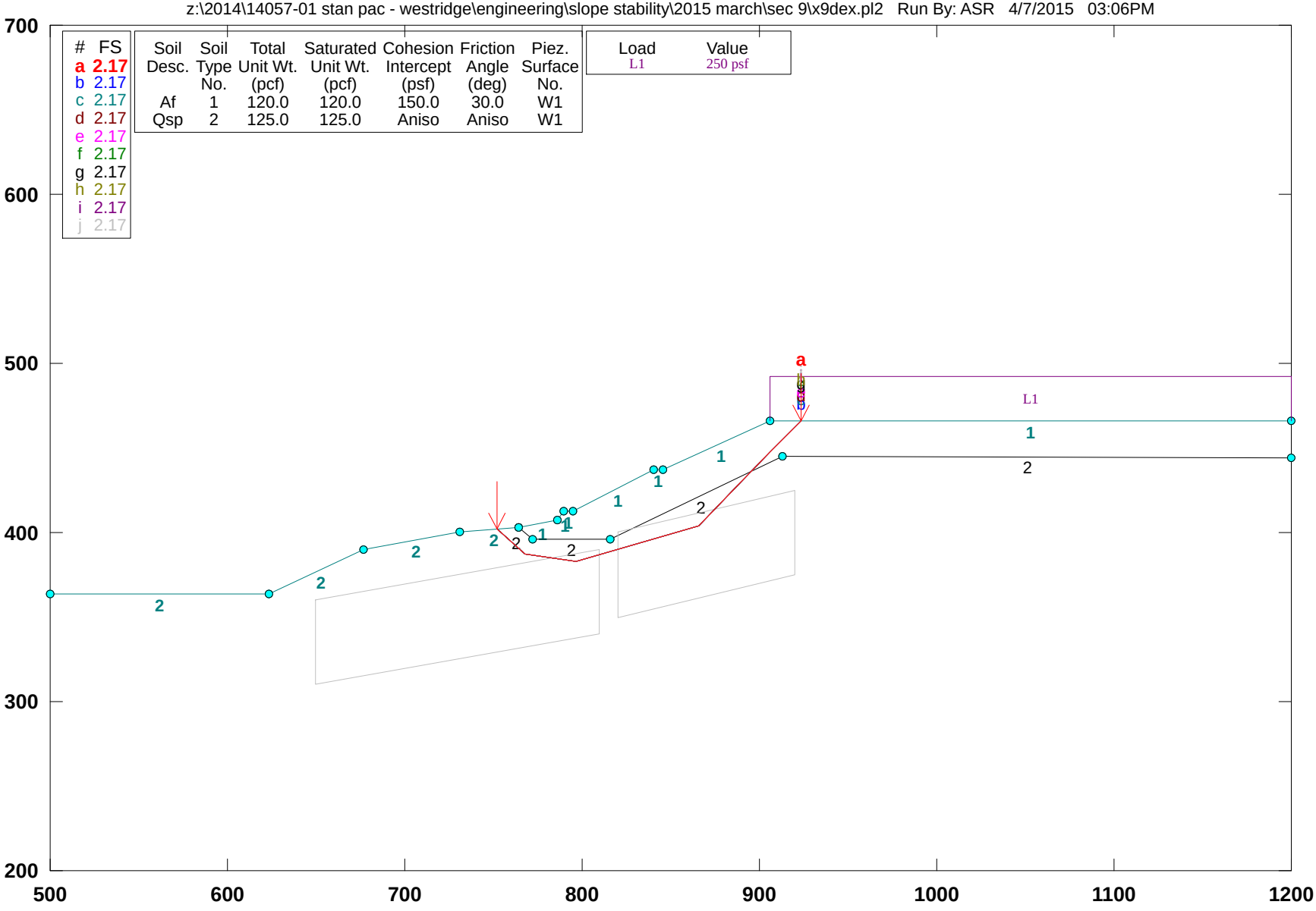
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 145941.08 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 999.89(psf)
Sum of the Driving Forces = 107364.94 (lbs)
Average Mobilized Shear Stress = 735.59(psf)
Total length of the failure surface = 145.96(ft)
CAUTION - Factor Of Safety Is Calculated By The Modified Bishop
Method. This Method Is Valid Only If The Failure Surface
Approximates A Circular Arc.

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.3215(g)
Calculated Newmark Seismic Displacement = 0.412(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 9-9'/ 3/13 Design- Upper Slope - Block - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 9\x9dex.pl2 Run By: ASR 4/7/2015 03:06PM



GSTABL7 v.2 FSmin=2.17

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/7/2015
Time of Run: 03:06PM
Run By: ASR
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dex.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dex.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dex.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 9-9'/ 3/13 Design
- Upper Slope - Block - Static

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	500.00	364.00	623.00	364.00	2
2	623.00	364.00	677.00	390.00	2
3	677.00	390.00	731.00	400.00	2
4	731.00	400.00	764.00	403.00	2
5	764.00	403.00	786.00	407.00	1
6	786.00	407.00	790.00	413.00	1
7	790.00	413.00	795.00	413.00	1
8	795.00	413.00	840.00	437.00	1
9	840.00	437.00	846.00	437.00	1
10	846.00	437.00	906.00	466.00	1
11	906.00	466.00	1200.00	466.00	1
12	764.00	403.00	772.00	396.00	2
13	772.00	396.00	816.00	396.00	2
14	816.00	396.00	913.00	445.00	2
15	913.00	445.00	1200.00	444.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	300.00	32.00
2	10.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	906.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	650.00	335.00	810.00	365.00	50.00
2	820.00	375.00	920.00	400.00	50.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Factor of Safety
*** 2.165 ***

Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.6	9104.8	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.4	6050.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.6	9856.6	0.0	0.0	0.	0.	0.0	0.0	0.0
4	14.0	34710.7	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.0	12602.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	5.0	17950.2	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.1	7661.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	18.9	76757.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	24.0	111621.9	0.0	0.0	0.	0.	0.0	0.0	0.0
10	6.0	29361.1	0.0	0.0	0.	0.	0.0	0.0	0.0
11	19.4	97112.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	20.2	89961.7	0.0	0.0	0.	0.	0.0	0.0	0.0
13	9.4	31157.1	0.0	0.0	0.	0.	0.0	0.0	0.0
14	10.9	28160.1	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.1	309.5	0.0	0.0	0.	0.	0.0	0.0	0.0
16	17.1	18524.4	0.0	0.0	0.	0.	0.0	0.0	4269.1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481

5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
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4	865.380	403.481
5	885.563	425.676
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Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
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4	865.380	403.481
5	885.563	425.676
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Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
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4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
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Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146

3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
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Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Factor of Safety
*** 2.165 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Factor of Safety
*** 2.165 ***

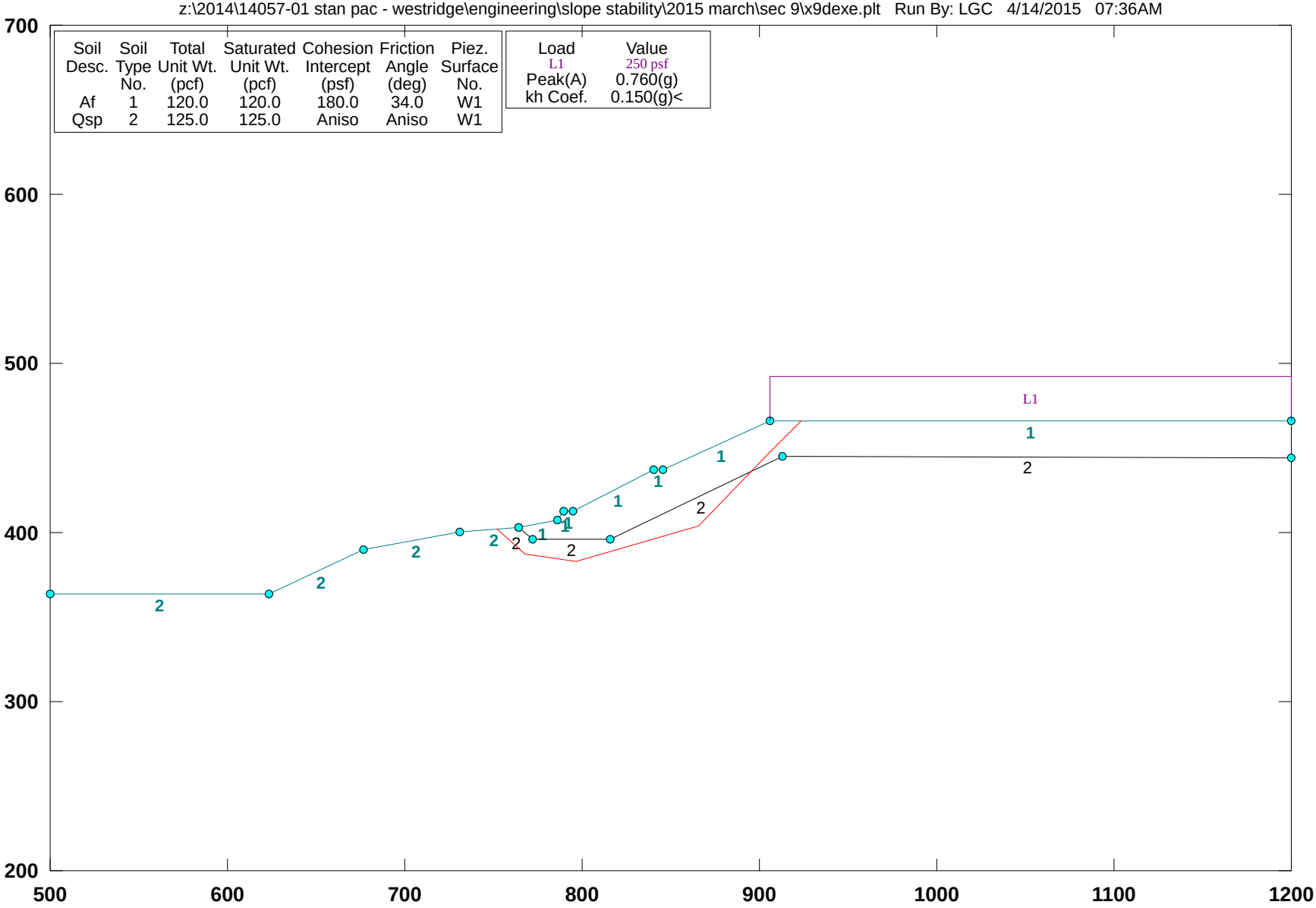
**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 9-9'/ 3/13 Design- Upper Slope - Block - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 march\sec 9\x9dexe.plt Run By: LGC 4/14/2015 07:36AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qsp	2	125.0	125.0	Aniso	Aniso	W1

Load	Value
L1	250 psf
Peak(A)	0.760(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.82

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 4/14/2015
Time of Run: 07:36AM
Run By: LGC
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexe.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexe.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 March\Sec 9\x9dexe.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 9-9'/ 3/13 Design
- Upper Slope - Block - Seismic

BOUNDARY COORDINATES
11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	500.00	364.00	623.00	364.00	2
2	623.00	364.00	677.00	390.00	2
3	677.00	390.00	731.00	400.00	2
4	731.00	400.00	764.00	403.00	2
5	764.00	403.00	786.00	407.00	1
6	786.00	407.00	790.00	413.00	1
7	790.00	413.00	795.00	413.00	1
8	795.00	413.00	840.00	437.00	1
9	840.00	437.00	846.00	437.00	1
10	846.00	437.00	906.00	466.00	1
11	906.00	466.00	1200.00	466.00	1
12	764.00	403.00	772.00	396.00	2
13	772.00	396.00	816.00	396.00	2
14	816.00	396.00	913.00	445.00	2
15	913.00	445.00	1200.00	444.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	500.00	34.00
2	10.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	906.00	1200.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.760(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	752.382	401.944
2	767.354	387.146
3	797.061	382.957
4	865.380	403.481
5	885.563	425.676
6	905.858	447.769
7	923.076	466.000

Janbu's Empirical Coefficient (fo) = 1.074
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.822

Table 1 - Individual Data on the 16 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.6	9104.9	0.0	0.0	0.0	0.0	1365.7	0.0	0.0
2	3.4	6050.0	0.0	0.0	0.0	0.0	907.5	0.0	0.0
3	4.6	9857.5	0.0	0.0	0.0	0.0	1478.6	0.0	0.0
4	14.0	34710.2	0.0	0.0	0.0	0.0	5206.5	0.0	0.0
5	4.0	12602.7	0.0	0.0	0.0	0.0	1890.4	0.0	0.0
6	5.0	17949.9	0.0	0.0	0.0	0.0	2692.5	0.0	0.0
7	2.1	7663.1	0.0	0.0	0.0	0.0	1149.5	0.0	0.0
8	18.9	76754.8	0.0	0.0	0.0	0.0	11513.2	0.0	0.0
9	24.0	111621.0	0.0	0.0	0.0	0.0	16743.1	0.0	0.0
10	6.0	29360.9	0.0	0.0	0.0	0.0	4404.1	0.0	0.0
11	19.4	97113.6	0.0	0.0	0.0	0.0	14567.0	0.0	0.0
12	20.2	89960.6	0.0	0.0	0.0	0.0	13494.1	0.0	0.0
13	9.4	31158.9	0.0	0.0	0.0	0.0	4673.8	0.0	0.0
14	10.9	28159.4	0.0	0.0	0.0	0.0	4223.9	0.0	0.0
15	0.1	308.9	0.0	0.0	0.0	0.0	46.3	0.0	0.0
16	17.1	18524.7	0.0	0.0	0.0	0.0	2778.7	0.0	4269.0

Table 2 - Base Stress Data on the 16 Slices

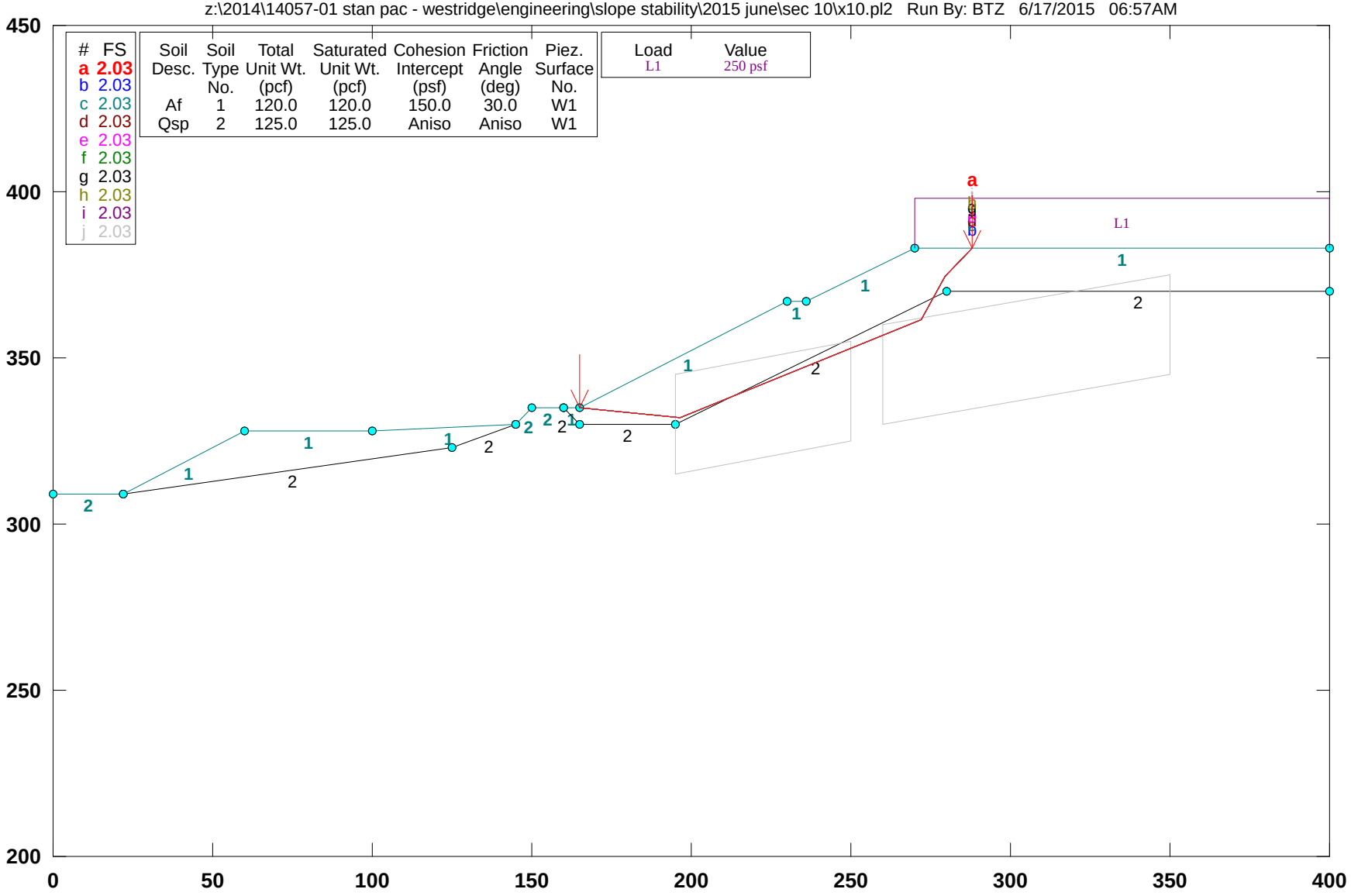
Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-44.66	758.19	16.34	2280.60	-467.29
2	-44.66	765.68	4.72	3806.20	-1075.56
3	-8.03	769.68	4.69	2057.63	18.88
4	-8.03	779.00	14.14	2314.62	22.06
5	-8.03	788.00	4.04	2797.12	28.04
6	-8.03	792.50	5.05	3112.86	31.95
7	-8.03	796.03	2.08	3204.99	33.09
8	16.72	806.53	19.78	3038.48	1748.22
9	16.72	828.00	25.06	3417.59	2006.24
10	16.72	843.00	6.26	3571.35	2110.90
11	16.72	855.69	20.24	3645.85	2161.60
12	47.72	875.47	30.00	3704.11	3747.49
13	47.43	890.25	13.84	2891.30	2787.81
14	47.43	900.39	16.16	2020.64	2158.81
15	46.64	905.93	0.21	1723.04	1804.92
16	46.64	914.54	24.87	1130.40	1082.18

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 581949.75 (lbs)

```
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) =   2805.08(psf)
Sum of the Driving Forces =   343032.72 (lbs)
Average Mobilized Shear Stress =    1653.47(psf)
Total length of the failure surface =     207.46(ft)
       *** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) =  0.6530(g)
Calculated Newmark Seismic Displacement =   0.100(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
              **** END OF GSTABL7 OUTPUT ****
```

Westridge/ 14057-01 / Sec 10-10' / 6/11 Design - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 10\x10.pl2 Run By: BTZ 6/17/2015 06:57AM



#	FS
a	2.03
b	2.03
c	2.03
d	2.03
e	2.03
f	2.03
g	2.03
h	2.03
i	2.03
j	2.03

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	150.0	30.0	W1
Qsp	2	125.0	125.0	Aniso	Aniso	W1

Load	Value
L1	250 psf

GSTABL7 v.2 FSmin=2.03

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 06:57AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10.PLT
PROBLEM DESCRIPTION: Westridge/ 14057-01 / Sec 10-10' / 6/11
Design - Static

BOUNDARY COORDINATES
11 Top Boundaries
17 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	309.00	22.00	309.00	2
2	22.00	309.00	60.00	328.00	1
3	60.00	328.00	100.00	328.00	1
4	100.00	328.00	145.00	330.00	1
5	145.00	330.00	150.00	335.00	2
6	150.00	335.00	160.00	335.00	2
7	160.00	335.00	165.00	335.00	1
8	165.00	335.00	230.00	367.00	1
9	230.00	367.00	236.00	367.00	1
10	236.00	367.00	270.00	383.00	1
11	270.00	383.00	400.00	383.00	1
12	160.00	335.00	165.00	330.00	2
13	165.00	330.00	195.00	330.00	2
14	195.00	330.00	280.00	370.00	2
15	280.00	370.00	400.00	370.00	2
16	22.00	309.00	125.00	323.00	2
17	125.00	323.00	145.00	330.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	300.00	32.00
2	4.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	270.00	400.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 15.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	165.00	335.00	165.00	335.00	0.00
2	195.00	330.00	250.00	340.00	30.00
3	260.00	345.00	350.00	360.00	30.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Individual data on the 9 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	31.7	34934.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	18.0	41703.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	15.3	38490.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	6.0	14860.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	34.0	85238.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	1.9	4954.7	0.0	0.0	0.	0.	0.0	0.0	470.4
7	3.8	8412.2	0.0	0.0	0.	0.	0.0	0.0	957.8
8	3.9	5510.4	0.0	0.0	0.	0.	0.0	0.0	974.9
9	8.5	4369.1	0.0	0.0	0.	0.	0.0	0.0	2133.3

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Factor of Safety
*** 2.032 ***

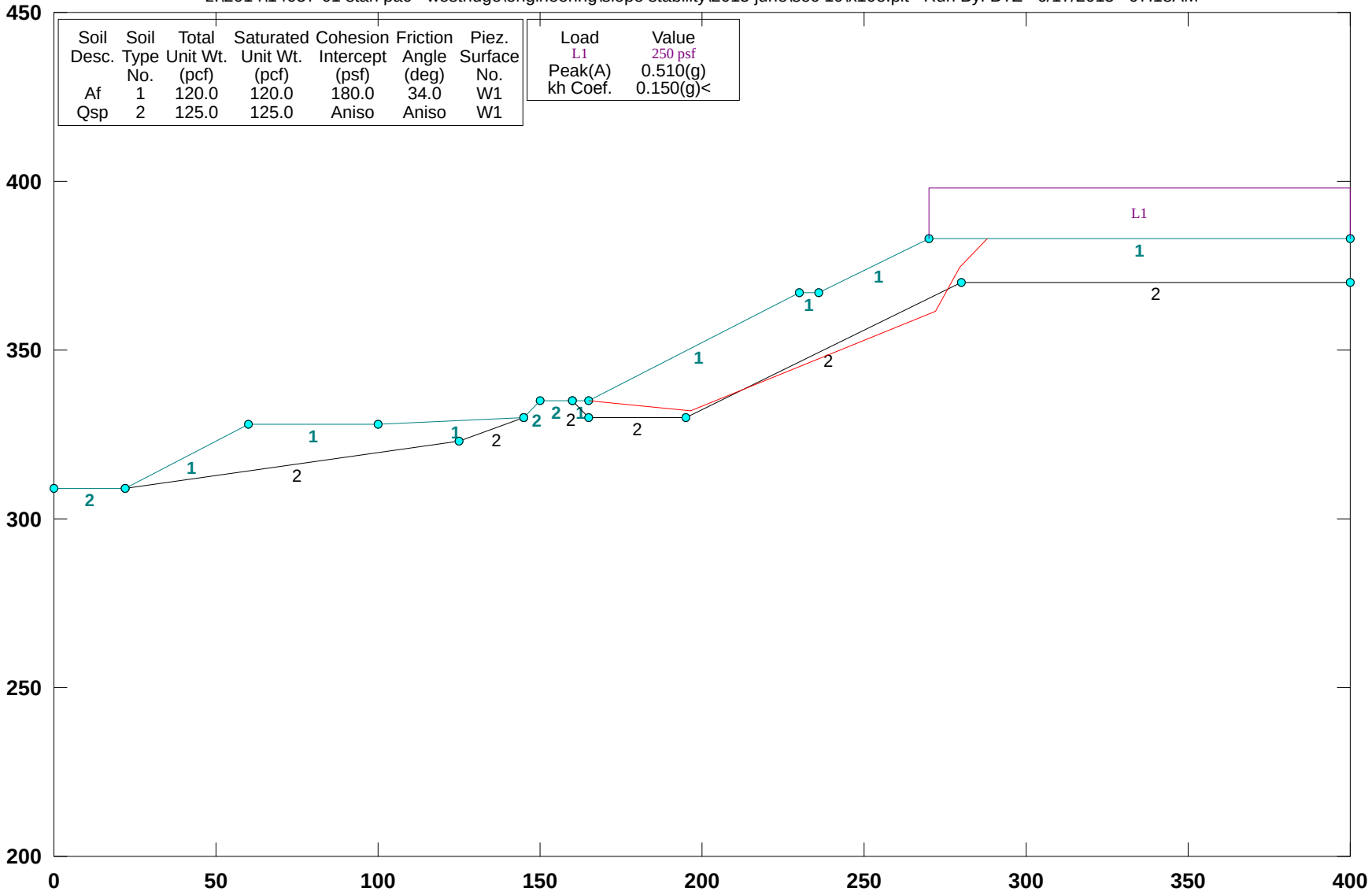
**** END OF GSTABL7 OUTPUT ****

Westridge/ 14057-01 / Sec 10-10' / 6/11 Design - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 10\x10e.plt Run By: BTZ 6/17/2015 07:18AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qsp	2	125.0	125.0	Aniso	Aniso	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.70

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 07:18AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10e.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10e.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 10\x10e.PLT
PROBLEM DESCRIPTION: Westridge/ 14057-01 / Sec 10-10' / 6/11
Design - Seismic

BOUNDARY COORDINATES
11 Top Boundaries
17 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	309.00	22.00	309.00	2
2	22.00	309.00	60.00	328.00	1
3	60.00	328.00	100.00	328.00	1
4	100.00	328.00	145.00	330.00	1
5	145.00	330.00	150.00	335.00	2
6	150.00	335.00	160.00	335.00	2
7	160.00	335.00	165.00	335.00	1
8	165.00	335.00	230.00	367.00	1
9	230.00	367.00	236.00	367.00	1
10	236.00	367.00	270.00	383.00	1
11	270.00	383.00	400.00	383.00	1
12	160.00	335.00	165.00	330.00	2
13	165.00	330.00	195.00	330.00	2
14	195.00	330.00	280.00	370.00	2
15	280.00	370.00	400.00	370.00	2
16	22.00	309.00	125.00	323.00	2
17	125.00	323.00	145.00	330.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-4.0	500.00	34.00
2	4.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.

(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	270.00	400.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.000	335.000
2	196.702	332.241
3	271.882	361.612
4	279.612	374.467
5	288.146	383.000

Janbu's Empirical Coefficient (fo) = 1.045
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.697

Table 1 - Individual Data on the 9 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	31.7	34934.5	0.0	0.0	0.0	0.0	5240.2	0.0	0.0
2	18.0	41697.0	0.0	0.0	0.0	0.0	6254.6	0.0	0.0
3	15.3	38497.3	0.0	0.0	0.0	0.0	5774.6	0.0	0.0
4	6.0	14860.1	0.0	0.0	0.0	0.0	2229.0	0.0	0.0
5	34.0	85240.0	0.0	0.0	0.0	0.0	12786.0	0.0	0.0
6	1.9	4955.5	0.0	0.0	0.0	0.0	743.3	0.0	470.5
7	3.8	8411.3	0.0	0.0	0.0	0.0	1261.7	0.0	957.7
8	3.9	5509.9	0.0	0.0	0.0	0.0	826.5	0.0	974.8
9	8.5	4369.2	0.0	0.0	0.0	0.0	655.4	0.0	2133.5

Table 2 - Base Stress Data on the 9 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-4.97	180.85	31.82	959.97	69.13
2	21.34	205.71	19.35	1617.68	1165.26
3	21.34	222.36	16.40	2044.26	1269.05
4	21.34	233.00	6.44	2017.16	1247.28
5	21.34	253.00	36.50	2036.20	1262.57
6	21.34	270.94	2.02	2271.94	1417.04
7	58.98	273.80	7.43	2511.68	2265.71
8	58.98	277.66	7.57	1520.94	1534.43
9	45.00	283.88	12.07	702.31	593.08

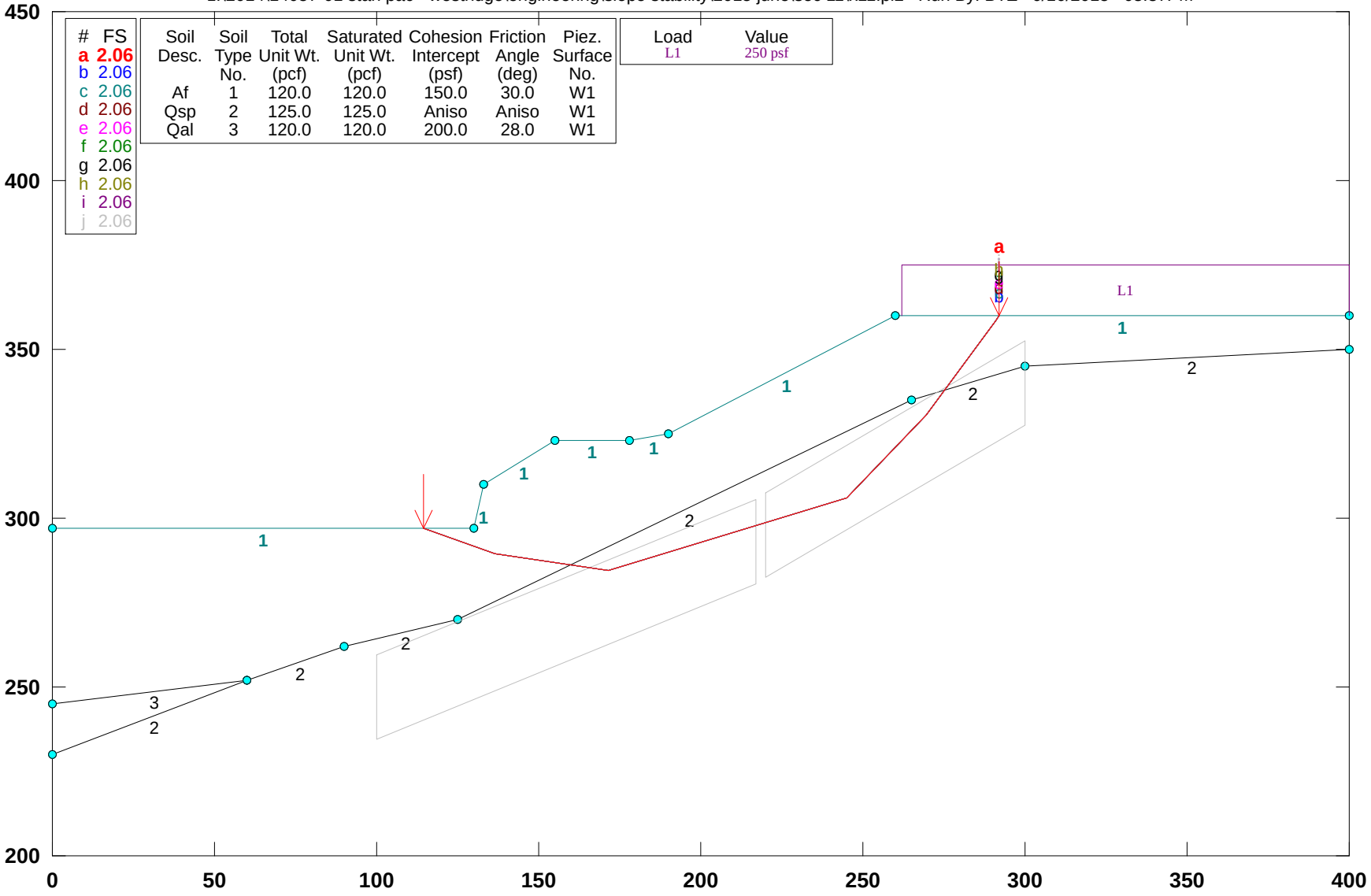
Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 224338.91 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 1606.97(psf)
Sum of the Driving Forces = 138153.91 (lbs)
Average Mobilized Shear Stress = 989.61(psf)
Total length of the failure surface = 139.60(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.4626(g)
Calculated Newmark Seismic Displacement = 0.060(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 11-11' / 6/11 Design - Upper Slope - Static

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 11\x11.pl2 Run By: BTZ 6/16/2015 03:37PM



GSTABL7 v.2 FSmin=2.06

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 03:37PM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 11\x11.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 11\x11.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 11\x11.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 11-11' /
6/11 Design - Upper Slope - Static

BOUNDARY COORDINATES
7 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	297.00	130.00	297.00	1
2	130.00	297.00	133.25	310.00	1
3	133.25	310.00	155.00	323.00	1
4	155.00	323.00	178.00	323.00	1
5	178.00	323.00	190.00	325.00	1
6	190.00	325.00	260.00	360.00	1
7	260.00	360.00	400.00	360.00	1
8	0.00	245.00	60.00	252.00	3
9	60.00	252.00	90.00	262.00	2
10	90.00	262.00	125.00	270.00	2
11	125.00	270.00	265.00	335.00	2
12	265.00	335.00	300.00	345.00	2
13	300.00	345.00	400.00	350.00	2
14	0.00	230.00	60.00	252.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	5.0	300.00	32.00
2	20.0	200.00	27.00
3	90.0	300.00	32.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	262.00	400.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
9999 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 35.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	100.00	247.00	217.00	293.00	25.00
2	220.00	295.00	300.00	340.00	25.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 9999
Number of Trial Failure Surfaces is Greater Than 5000.
Statistical Data on FS Values are Not Generated.
To Generate Stastical Data, Reduce Number of Trial Failure Surfaces to 5000 or less.
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.3	4763.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.2	4775.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.5	8792.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	18.3	64335.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.7	20752.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	11.6	52912.0	0.0	0.0	0.	0.	0.0	0.0	0.0
7	6.6	30167.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	12.0	52296.5	0.0	0.0	0.	0.	0.0	0.0	0.0
9	55.0	274629.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	15.0	78310.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	2.0	9235.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	3.0	12919.2	0.0	0.0	0.	0.	0.0	0.0	750.0
13	4.6	17553.5	0.0	0.0	0.	0.	0.0	0.0	1145.1
14	5.5	17181.9	0.0	0.0	0.	0.	0.0	0.0	1386.1
15	15.8	22462.2	0.0	0.0	0.	0.	0.0	0.0	3951.9
16	1.3	120.5	0.0	0.0	0.	0.	0.0	0.0	318.7

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761

5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515

3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Factor of Safety
*** 2.060 ***

**** END OF GSTABL7 OUTPUT ****

Westridge/14057-01/Sec 11-11' / 6/11 Design - Upper Slope - Seismic

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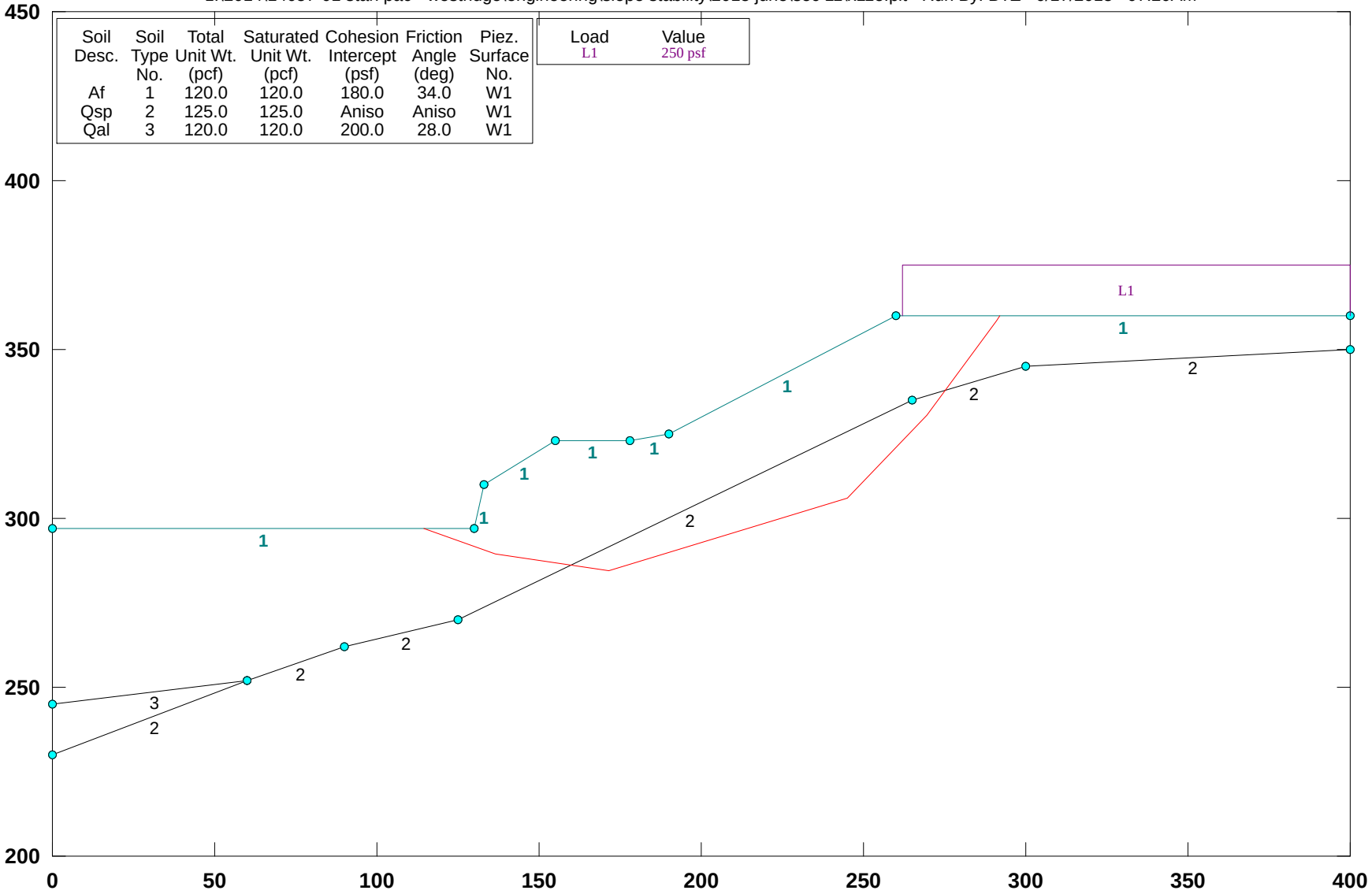

GSTABL7 v.2 FSmin=2.25

Factor Of Safety Is Calculated By The Simplified Janbu Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/17/2015
Time of Run: 07:20AM
Run By: BTZ
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Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 11\x11e.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 11\x11e.PLT
PROBLEM DESCRIPTION: Westridge/14057-01/Sec 11-11' /
6/11 Design - Upper Slope - Seismic

BOUNDARY COORDINATES
7 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	297.00	130.00	297.00	1
2	130.00	297.00	133.25	310.00	1
3	133.25	310.00	155.00	323.00	1
4	155.00	323.00	178.00	323.00	1
5	178.00	323.00	190.00	325.00	1
6	190.00	325.00	260.00	360.00	1
7	260.00	360.00	400.00	360.00	1
8	0.00	245.00	60.00	252.00	3
9	60.00	252.00	90.00	262.00	2
10	90.00	262.00	125.00	270.00	2
11	125.00	270.00	265.00	335.00	2
12	265.00	335.00	300.00	345.00	2
13	300.00	345.00	400.00	350.00	2
14	0.00	230.00	60.00	252.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	5.0	500.00	34.00
2	20.0	200.00	27.00
3	90.0	500.00	34.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.

(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	262.00	400.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.712	297.000
2	136.750	289.515
3	171.375	284.411
4	245.015	305.761
5	269.580	330.692
6	290.932	358.424
7	292.207	360.000

Janbu's Empirical Coefficient (fo) = 1.069
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 2.249

Table 1 - Individual Data on the 16 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.3	4762.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.2	4775.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3.5	8793.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	18.2	64333.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	4.7	20752.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	11.6	52910.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	6.6	30169.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	12.0	52296.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	55.0	274632.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	15.0	78308.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	2.0	9235.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	3.0	12919.0	0.0	0.0	0.0	0.0	0.0	0.0	750.0
13	4.6	17551.8	0.0	0.0	0.0	0.0	0.0	0.0	1145.0
14	5.5	17180.7	0.0	0.0	0.0	0.0	0.0	0.0	1386.0
15	15.8	22463.3	0.0	0.0	0.0	0.0	0.0	0.0	3952.0
16	1.3	120.6	0.0	0.0	0.0	0.0	0.0	0.0	318.7

Table 2 - Base Stress Data on the 16 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-18.76	122.36	16.15	458.75	-100.19
2	-18.76	131.62	3.43	1377.02	-472.53
3	-18.76	135.00	3.70	2204.32	-807.98
4	-8.39	145.88	18.45	2704.94	-514.08
5	-8.39	157.37	4.79	3316.81	-639.17
6	-8.39	165.55	11.77	3771.24	-662.88
7	16.17	174.69	6.90	2462.41	1268.07
8	16.17	184.00	12.49	2364.90	1213.53
9	16.17	217.51	57.28	2680.47	1390.05
10	45.42	252.51	21.35	4396.50	3722.42
11	45.42	261.00	2.85	3948.45	3289.26
12	45.42	263.50	4.27	3903.24	3245.55
13	45.42	267.29	6.53	3553.97	2907.88
14	52.41	272.35	9.09	3254.68	2653.56
15	52.41	283.03	25.91	1541.99	1324.02
16	51.03	291.57	2.03	478.38	267.88

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 541988.44 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 2618.65(psf)
Sum of the Driving Forces = 257625.64 (lbs)
Average Mobilized Shear Stress = 1244.73(psf)

Total length of the failure surface =   206.97(ft)
**** END OF GSTABL7 OUTPUT ****

Westridge /14057-01/Sec 12'-12" / 6/11 Design - Upper Slope - Static

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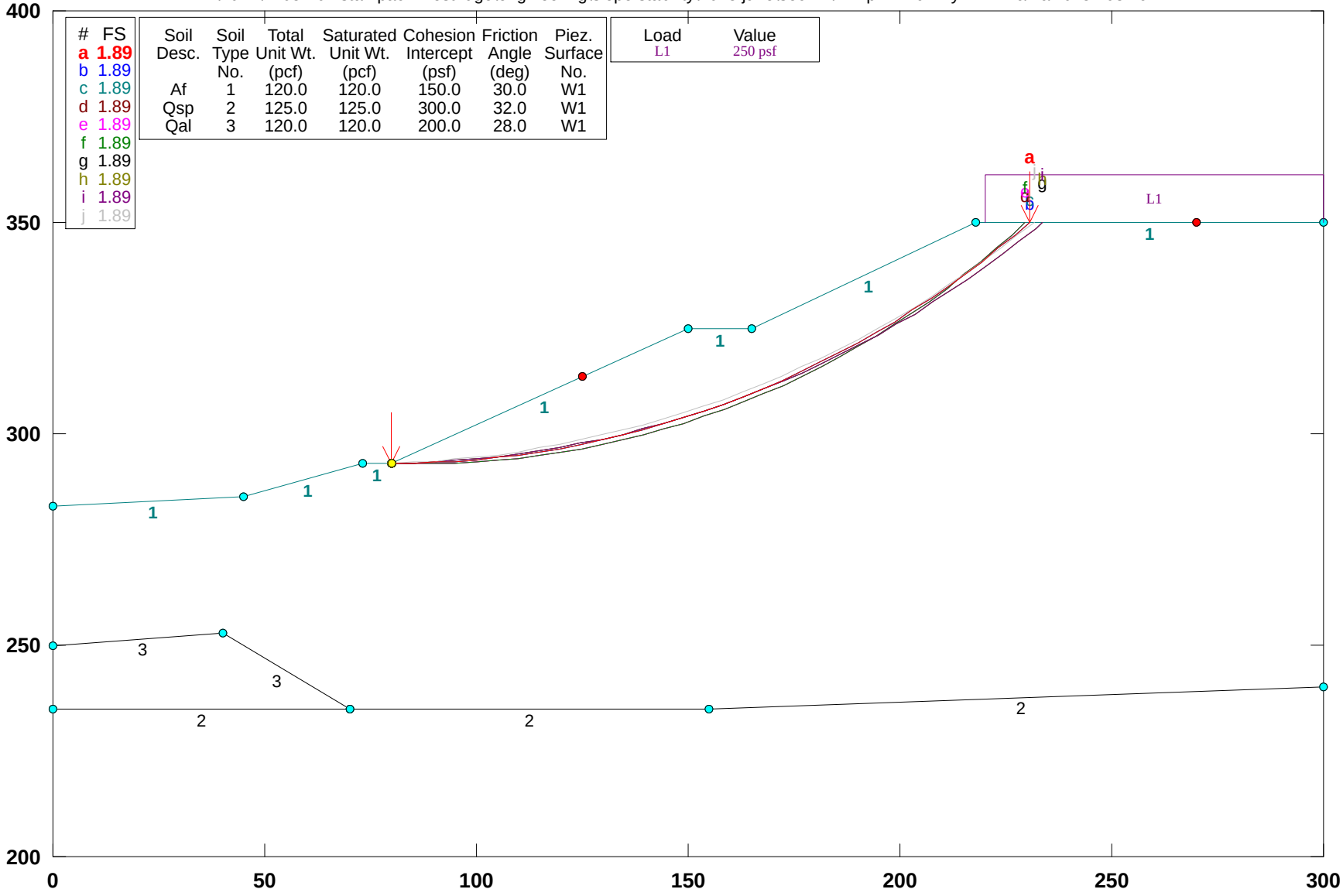

GSTABL7 v.2 FSmin=1.89

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/16/2015
Time of Run: 03:19PM
Run By: BTZ
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Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 12\x12.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 12\x12.PLT
PROBLEM DESCRIPTION: Westridge /14057-01/Sec 12'-12" /
6/11 Design - Upper Slope - Static

BOUNDARY COORDINATES
7 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	283.00	45.00	285.00	1
2	45.00	285.00	73.00	293.00	1
3	73.00	293.00	80.00	293.00	1
4	80.00	293.00	150.00	325.00	1
5	150.00	325.00	165.00	325.00	1
6	165.00	325.00	218.00	350.00	1
7	218.00	350.00	300.00	350.00	1
8	0.00	250.00	40.00	253.00	3
9	40.00	253.00	70.00	235.00	3
10	70.00	235.00	155.00	235.00	2
11	155.00	235.00	300.00	240.00	2
12	0.00	235.00	70.00	235.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	150.0	30.0	0.00	0.0	1
2	125.0	125.0	300.0	32.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	220.00	300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
15000 Trial Surfaces Have Been Generated.
500 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 80.00(ft)
and X = 80.00(ft)
Each Surface Terminates Between X = 125.00(ft)
and X = 270.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)

5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	85.000	293.056
3	89.997	293.222
4	94.989	293.498
5	99.974	293.883
6	104.950	294.378
7	109.913	294.983
8	114.862	295.696
9	119.794	296.518
10	124.707	297.449
11	129.598	298.487
12	134.465	299.632
13	139.305	300.885
14	144.117	302.243
15	148.898	303.707
16	153.646	305.276
17	158.357	306.949
18	163.031	308.725
19	167.665	310.604
20	172.256	312.583
21	176.803	314.664
22	181.303	316.844
23	185.753	319.122
24	190.153	321.498
25	194.499	323.970
26	198.790	326.537
27	203.023	329.198
28	207.197	331.951
29	211.309	334.795
30	215.358	337.729
31	219.341	340.752
32	223.256	343.861
33	227.103	347.056
34	230.493	350.000

Circle Center At X = 79.963 ; Y = 520.264 ; and Radius = 227.264
Factor of Safety
*** 1.887 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	85.000	293.056
3	89.997	293.222
4	94.989	293.498
5	99.974	293.883
6	104.950	294.378
7	109.913	294.983
8	114.862	295.696
9	119.794	296.518
10	124.707	297.449
11	129.598	298.487
12	134.465	299.632

13	139.305	300.885
14	144.117	302.243
15	148.898	303.707
16	153.646	305.276
17	158.357	306.949
18	163.031	308.725
19	167.665	310.604
20	172.256	312.583
21	176.803	314.664
22	181.303	316.844
23	185.753	319.122
24	190.153	321.498
25	194.499	323.970
26	198.790	326.537
27	203.023	329.198
28	207.197	331.951
29	211.309	334.795
30	215.358	337.729
31	219.341	340.752
32	223.256	343.861
33	227.103	347.056
34	230.493	350.000

Circle Center At X = 79.963 ; Y = 520.264 ; and Radius = 227.264

Factor of Safety

*** 1.887 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	85.000	293.056
3	89.997	293.222
4	94.989	293.498
5	99.974	293.883
6	104.950	294.378
7	109.913	294.983
8	114.862	295.696
9	119.794	296.518
10	124.707	297.449
11	129.598	298.487
12	134.465	299.632
13	139.305	300.885
14	144.117	302.243
15	148.898	303.707
16	153.646	305.276
17	158.357	306.949
18	163.031	308.725
19	167.665	310.604
20	172.256	312.583
21	176.803	314.664
22	181.303	316.844
23	185.753	319.122
24	190.153	321.498
25	194.499	323.970
26	198.790	326.537
27	203.023	329.198
28	207.197	331.951
29	211.309	334.795
30	215.358	337.729
31	219.341	340.752
32	223.256	343.861
33	227.103	347.056
34	230.493	350.000

Circle Center At X = 79.963 ; Y = 520.264 ; and Radius = 227.264

Factor of Safety

*** 1.887 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	292.900

3	89.999	292.921
4	94.997	293.063
5	99.990	293.325
6	104.975	293.708
7	109.950	294.211
8	114.911	294.834
9	119.856	295.577
10	124.781	296.439
11	129.684	297.420
12	134.561	298.518
13	139.411	299.735
14	144.230	301.068
15	149.016	302.517
16	153.765	304.081
17	158.475	305.759
18	163.143	307.551
19	167.766	309.454
20	172.342	311.469
21	176.868	313.594
22	181.342	315.828
23	185.760	318.168
24	190.120	320.615
25	194.420	323.167
26	198.657	325.821
27	202.829	328.577
28	206.933	331.433
29	210.967	334.388
30	214.928	337.439
31	218.815	340.584
32	222.624	343.823
33	226.354	347.153
34	229.393	350.000

Circle Center At X = 86.640 ; Y = 499.872 ; and Radius = 206.979

Factor of Safety

*** 1.889 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	292.900
3	89.999	292.921
4	94.997	293.063
5	99.990	293.325
6	104.975	293.708
7	109.950	294.211
8	114.911	294.834
9	119.856	295.577
10	124.781	296.439
11	129.684	297.420
12	134.561	298.518
13	139.411	299.735
14	144.230	301.068
15	149.016	302.517
16	153.765	304.081
17	158.475	305.759
18	163.143	307.551
19	167.766	309.454
20	172.342	311.469
21	176.868	313.594
22	181.342	315.828
23	185.760	318.168
24	190.120	320.615
25	194.420	323.167
26	198.657	325.821
27	202.829	328.577
28	206.933	331.433
29	210.967	334.388
30	214.928	337.439
31	218.815	340.584
32	222.624	343.823

33	226.354	347.153
34	229.393	350.000

Circle Center At X = 86.640 ; Y = 499.872 ; and Radius = 206.979

Factor of Safety

*** 1.889 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	292.900
3	89.999	292.921
4	94.997	293.063
5	99.990	293.325
6	104.975	293.708
7	109.950	294.211
8	114.911	294.834
9	119.856	295.577
10	124.781	296.439
11	129.684	297.420
12	134.561	298.518
13	139.411	299.735
14	144.230	301.068
15	149.016	302.517
16	153.765	304.081
17	158.475	305.759
18	163.143	307.551
19	167.766	309.454
20	172.342	311.469
21	176.868	313.594
22	181.342	315.828
23	185.760	318.168
24	190.120	320.615
25	194.420	323.167
26	198.657	325.821
27	202.829	328.577
28	206.933	331.433
29	210.967	334.388
30	214.928	337.439
31	218.815	340.584
32	222.624	343.823
33	226.354	347.153
34	229.393	350.000

Circle Center At X = 86.640 ; Y = 499.872 ; and Radius = 206.979

Factor of Safety

*** 1.889 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	293.119
3	89.994	293.339
4	94.983	293.662
5	99.965	294.087
6	104.937	294.614
7	109.898	295.242
8	114.844	295.972
9	119.775	296.803
10	124.687	297.734
11	129.580	298.766
12	134.450	299.897
13	139.296	301.128
14	144.116	302.458
15	148.908	303.886
16	153.669	305.411
17	158.399	307.034
18	163.094	308.753
19	167.753	310.568
20	172.374	312.478
21	176.955	314.482
22	181.494	316.579

23	185.989	318.768
24	190.438	321.049
25	194.840	323.421
26	199.192	325.882
27	203.493	328.431
28	207.742	331.068
29	211.935	333.791
30	216.072	336.600
31	220.150	339.492
32	224.168	342.468
33	228.125	345.525
34	232.018	348.662
35	233.611	350.000

Circle Center At X = 76.700 ; Y = 537.433 ; and Radius = 244.455

Factor of Safety

*** 1.890 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	293.119
3	89.994	293.339
4	94.983	293.662
5	99.965	294.087
6	104.937	294.614
7	109.898	295.242
8	114.844	295.972
9	119.775	296.803
10	124.687	297.734
11	129.580	298.766
12	134.450	299.897
13	139.296	301.128
14	144.116	302.458
15	148.908	303.886
16	153.669	305.411
17	158.399	307.034
18	163.094	308.753
19	167.753	310.568
20	172.374	312.478
21	176.955	314.482
22	181.494	316.579
23	185.989	318.768
24	190.438	321.049
25	194.840	323.421
26	199.192	325.882
27	203.493	328.431
28	207.742	331.068
29	211.935	333.791
30	216.072	336.600
31	220.150	339.492
32	224.168	342.468
33	228.125	345.525
34	232.018	348.662
35	233.611	350.000

Circle Center At X = 76.700 ; Y = 537.433 ; and Radius = 244.455

Factor of Safety

*** 1.890 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.999	293.119
3	89.994	293.339
4	94.983	293.662
5	99.965	294.087
6	104.937	294.614
7	109.898	295.242
8	114.844	295.972
9	119.775	296.803
10	124.687	297.734

11	129.580	298.766
12	134.450	299.897
13	139.296	301.128
14	144.116	302.458
15	148.908	303.886
16	153.669	305.411
17	158.399	307.034
18	163.094	308.753
19	167.753	310.568
20	172.374	312.478
21	176.955	314.482
22	181.494	316.579
23	185.989	318.768
24	190.438	321.049
25	194.840	323.421
26	199.192	325.882
27	203.493	328.431
28	207.742	331.068
29	211.935	333.791
30	216.072	336.600
31	220.150	339.492
32	224.168	342.468
33	228.125	345.525
34	232.018	348.662
35	233.611	350.000

Circle Center At X = 76.700 ; Y = 537.433 ; and Radius = 244.455

Factor of Safety

*** 1.890 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	84.995	293.215
3	89.986	293.528
4	94.969	293.941
5	99.942	294.451
6	104.905	295.061
7	109.855	295.768
8	114.790	296.573
9	119.707	297.476
10	124.606	298.476
11	129.485	299.572
12	134.340	300.765
13	139.171	302.054
14	143.976	303.439
15	148.752	304.918
16	153.498	306.491
17	158.212	308.158
18	162.892	309.918
19	167.536	311.770
20	172.143	313.714
21	176.710	315.749
22	181.236	317.874
23	185.719	320.088
24	190.158	322.390
25	194.550	324.779
26	198.894	327.255
27	203.188	329.817
28	207.430	332.463
29	211.619	335.193
30	215.754	338.005
31	219.832	340.898
32	223.851	343.871
33	227.812	346.924
34	231.644	350.000

Circle Center At X = 71.653 ; Y = 545.423 ; and Radius = 252.561

Factor of Safety

*** 1.891 ***

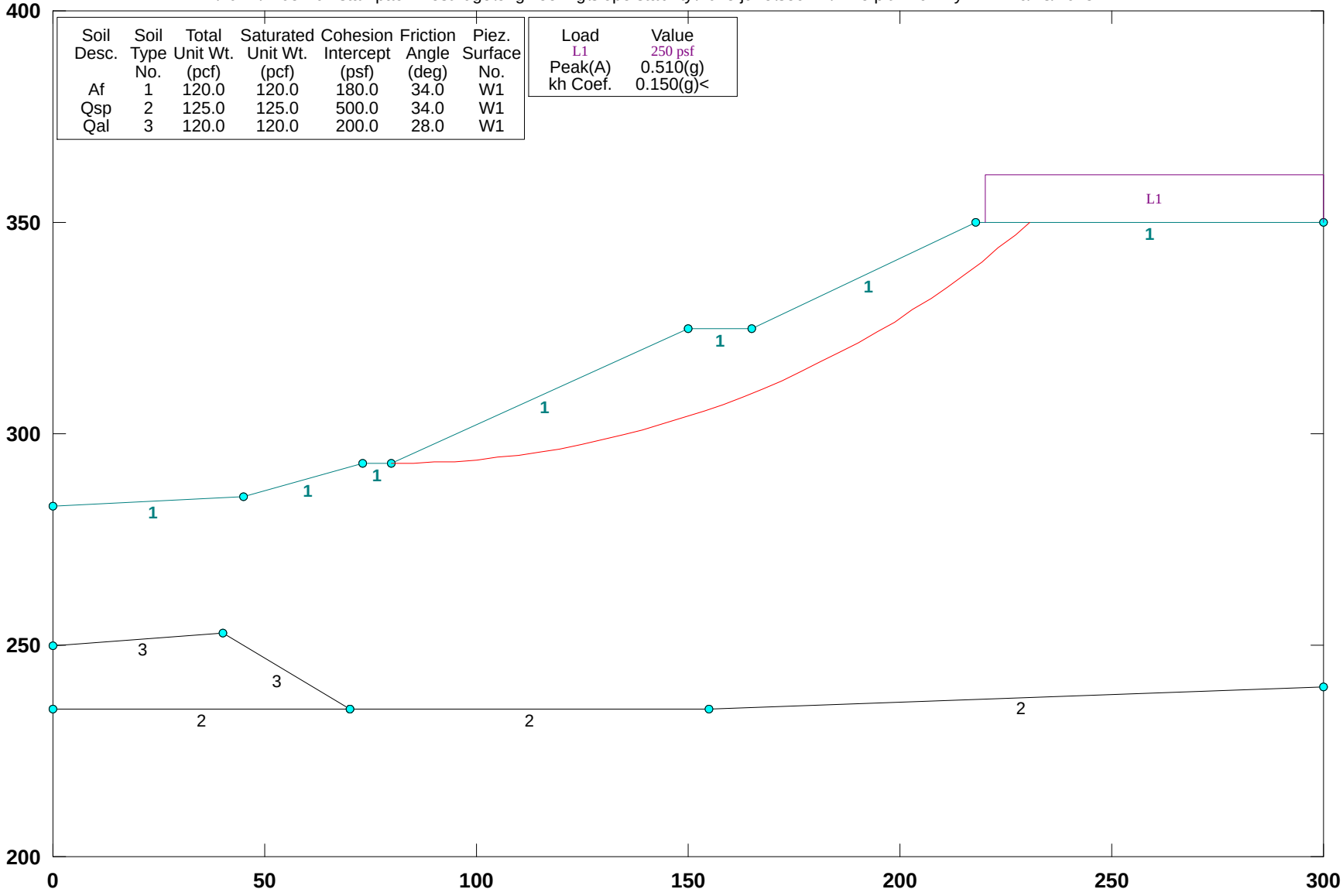
**** END OF GSTABL7 OUTPUT ****

Westridge /14057-01/Sec 12'-12" / 6/11 Design - Upper Slope - Seismic

z:\2014\14057-01 stan pac - westridge\engineering\slope stability\2015 june\sec 12\x12e.plt Run By: BTZ 6/18/2015 11:17AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Af	1	120.0	120.0	180.0	34.0	W1
Qsp	2	125.0	125.0	500.0	34.0	W1
Qal	3	120.0	120.0	200.0	28.0	W1

Load	Value
L1	250 psf
Peak(A)	0.510(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.53

Factor Of Safety Is Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.3, Feb. 2013 **
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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 6/18/2015
Time of Run: 11:17AM
Run By: BTZ
Input Data Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 12\x12e.in
Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 12\x12e.OUT
Unit System: English
Plotted Output Filename: Z:\2014\14057-01 Stan Pac - Westridge\Engineering\Slope Stability\2015 June\Sec 12\x12e.PLT
PROBLEM DESCRIPTION: Westridge /14057-01/Sec 12'-12" /
6/11 Design - Upper Slope - Seismic

BOUNDARY COORDINATES
7 Top Boundaries
12 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	283.00	45.00	285.00	1
2	45.00	285.00	73.00	293.00	1
3	73.00	293.00	80.00	293.00	1
4	80.00	293.00	150.00	325.00	1
5	150.00	325.00	165.00	325.00	1
6	165.00	325.00	218.00	350.00	1
7	218.00	350.00	300.00	350.00	1
8	0.00	250.00	40.00	253.00	3
9	40.00	253.00	70.00	235.00	3
10	70.00	235.00	155.00	235.00	2
11	155.00	235.00	300.00	240.00	2
12	0.00	235.00	70.00	235.00	2

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	180.0	34.0	0.00	0.0	1
2	125.0	125.0	500.0	34.0	0.00	0.0	1
3	120.0	120.0	200.0	28.0	0.00	0.0	1

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	220.00	300.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.
Specified Peak Ground Acceleration Coefficient (A) = 0.510(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.000	293.000
2	85.000	293.056
3	89.997	293.222

4	94.989	293.498
5	99.974	293.883
6	104.950	294.378
7	109.913	294.983
8	114.862	295.696
9	119.794	296.518
10	124.707	297.449
11	129.598	298.487
12	134.465	299.632
13	139.305	300.885
14	144.117	302.243
15	148.898	303.707
16	153.646	305.276
17	158.357	306.949
18	163.031	308.725
19	167.665	310.604
20	172.256	312.583
21	176.803	314.664
22	181.303	316.844
23	185.753	319.122
24	190.153	321.498
25	194.499	323.970
26	198.790	326.537
27	203.023	329.198
28	207.197	331.951
29	211.309	334.795
30	215.358	337.729
31	219.341	340.752
32	223.256	343.861
33	227.103	347.056
34	230.493	350.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	1.26	5.00
2	1.26	5.00
3	1.25	5.00
4	1.27	5.00
5	1.27	5.00
6	1.25	5.00
7	1.26	5.00
8	1.27	5.00
9	1.25	5.00
10	1.26	5.00
11	1.27	5.00
12	1.25	5.00
13	1.27	5.00
14	1.26	5.00
15	1.26	5.00
16	1.25	5.00
17	1.27	5.00
18	1.25	5.00
19	1.27	5.00
20	1.26	5.00
21	1.26	5.00
22	1.26	5.00
23	1.26	5.00
24	1.26	5.00
25	1.27	5.00
26	1.25	5.00
27	1.26	5.00
28	1.26	5.00
29	1.27	5.00
30	1.26	5.00
31	1.26	5.00

Circle Center At X = 79.962(ft) ; Y = 520.268(ft); and Radius = 227.268(ft)
* * Factor Of Safety Is Calculated By The Modified Bishop Method * *
Factor Of Safety For The Preceding Specified Surface = 1.533
Table 1 - Individual Data on the 37 Slices

	Water Force	Water Force	Tie Force	Tie Force	Earthquake Force	Surcharge

Slice No.	Width (ft)	Weight (lbs)	Top (lbs)	Bot (lbs)	Norm (lbs)	Tan (lbs)	Hor (lbs)	Ver (lbs)	Load (lbs)
1	5.0	668.9	0.0	0.0	0.0	0.0	100.3	0.0	0.0
2	5.0	1972.1	0.0	0.0	0.0	0.0	295.8	0.0	0.0
3	5.0	3205.5	0.0	0.0	0.0	0.0	480.8	0.0	0.0
4	5.0	4367.5	0.0	0.0	0.0	0.0	655.1	0.0	0.0
5	5.0	5456.4	0.0	0.0	0.0	0.0	818.5	0.0	0.0
6	5.0	6467.6	0.0	0.0	0.0	0.0	970.1	0.0	0.0
7	4.9	7403.5	0.0	0.0	0.0	0.0	1110.5	0.0	0.0
8	4.9	8260.4	0.0	0.0	0.0	0.0	1239.1	0.0	0.0
9	4.9	9038.6	0.0	0.0	0.0	0.0	1355.8	0.0	0.0
10	4.9	9735.5	0.0	0.0	0.0	0.0	1460.3	0.0	0.0
11	4.9	10352.9	0.0	0.0	0.0	0.0	1552.9	0.0	0.0
12	4.8	10887.7	0.0	0.0	0.0	0.0	1633.2	0.0	0.0
13	4.8	11344.8	0.0	0.0	0.0	0.0	1701.7	0.0	0.0
14	4.8	11720.2	0.0	0.0	0.0	0.0	1758.0	0.0	0.0
15	1.1	2758.4	0.0	0.0	0.0	0.0	413.8	0.0	0.0
16	3.6	8893.2	0.0	0.0	0.0	0.0	1334.0	0.0	0.0
17	4.7	10677.5	0.0	0.0	0.0	0.0	1601.6	0.0	0.0
18	4.7	9626.4	0.0	0.0	0.0	0.0	1444.0	0.0	0.0
19	2.0	3751.1	0.0	0.0	0.0	0.0	562.7	0.0	0.0
20	2.7	4977.7	0.0	0.0	0.0	0.0	746.6	0.0	0.0
21	4.6	8675.0	0.0	0.0	0.0	0.0	1301.2	0.0	0.0
22	4.5	8660.2	0.0	0.0	0.0	0.0	1299.0	0.0	0.0
23	4.5	8572.4	0.0	0.0	0.0	0.0	1285.9	0.0	0.0
24	4.4	8414.0	0.0	0.0	0.0	0.0	1262.1	0.0	0.0
25	4.4	8192.9	0.0	0.0	0.0	0.0	1228.9	0.0	0.0
26	4.3	7903.9	0.0	0.0	0.0	0.0	1185.6	0.0	0.0
27	4.3	7555.5	0.0	0.0	0.0	0.0	1133.3	0.0	0.0
28	4.2	7146.8	0.0	0.0	0.0	0.0	1072.0	0.0	0.0
29	4.2	6684.4	0.0	0.0	0.0	0.0	1002.7	0.0	0.0
30	4.1	6168.5	0.0	0.0	0.0	0.0	925.3	0.0	0.0
31	4.0	5605.5	0.0	0.0	0.0	0.0	840.8	0.0	0.0
32	2.6	3375.0	0.0	0.0	0.0	0.0	506.2	0.0	0.0
33	1.3	1570.1	0.0	0.0	0.0	0.0	235.5	0.0	0.0
34	0.7	710.6	0.0	0.0	0.0	0.0	106.6	0.0	0.0
35	3.3	2903.8	0.0	0.0	0.0	0.0	435.6	0.0	814.0
36	3.8	2096.5	0.0	0.0	0.0	0.0	314.5	0.0	961.8
37	3.4	598.8	0.0	0.0	0.0	0.0	89.8	0.0	847.5

Table 2 - Base Stress Data on the 37 Slices

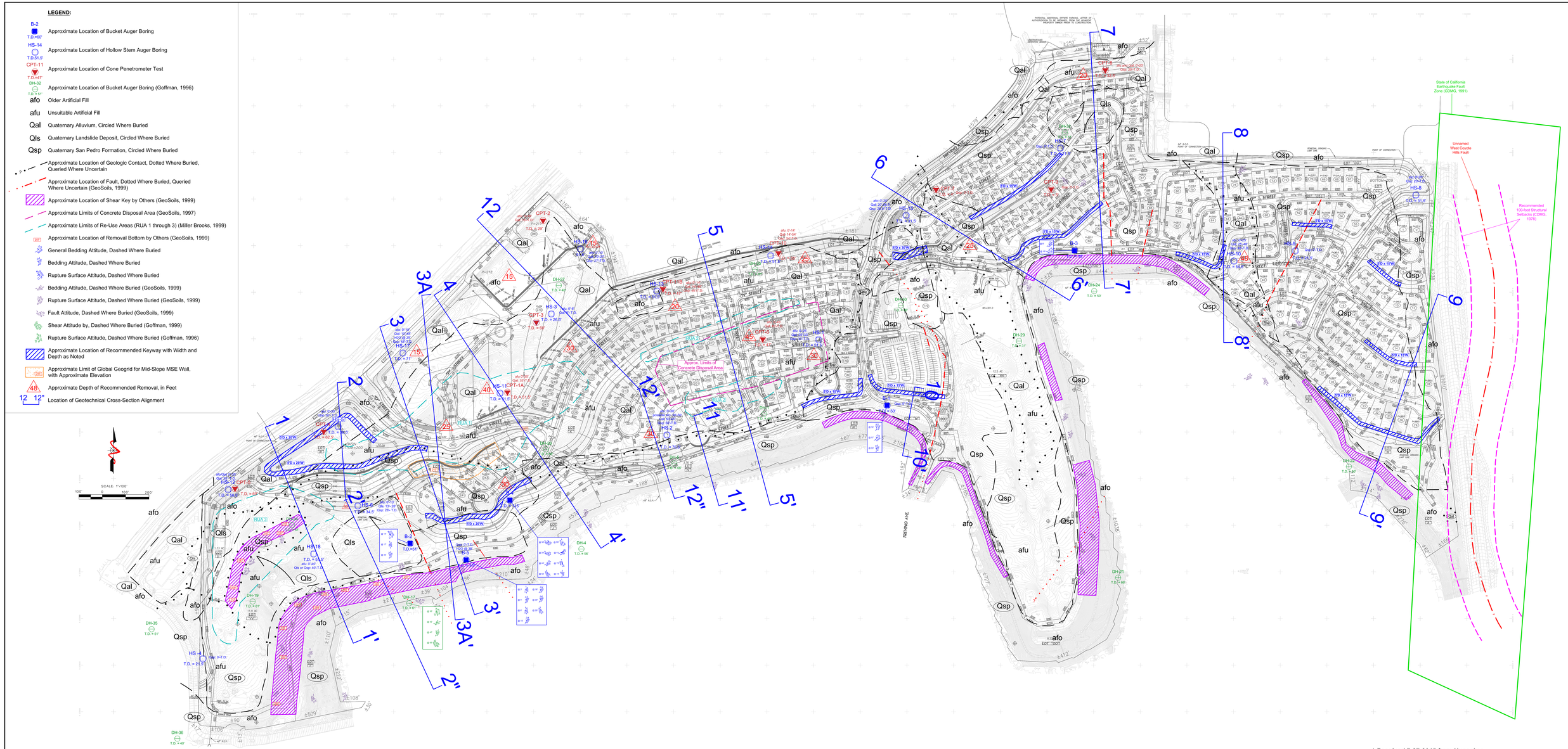
Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	0.64	82.50	5.00	268.91	21.51
2	1.90	87.50	5.00	439.78	71.80
3	3.16	92.49	5.00	598.56	130.28
4	4.42	97.48	5.00	745.62	195.80
5	5.68	102.46	5.00	881.06	267.60
6	6.95	107.43	5.00	1005.08	344.50
7	8.20	112.39	5.00	1118.14	424.89
8	9.46	117.33	5.00	1220.22	508.43
9	10.73	122.25	5.00	1311.54	593.78
10	11.98	127.15	5.00	1392.55	679.26
11	13.24	132.03	5.00	1463.29	764.43
12	14.51	136.89	5.00	1523.74	848.54
13	15.76	141.71	5.00	1574.67	929.12
14	17.03	146.51	5.00	1615.77	1006.68
15	18.29	149.45	1.16	1631.14	1067.87
16	18.29	151.82	3.84	1593.51	1041.01
17	19.55	156.00	5.00	1477.83	1003.33
18	20.81	160.69	5.00	1344.39	942.90
19	22.07	164.02	2.12	1243.18	899.57
20	22.07	166.33	2.88	1221.82	882.13
21	23.32	169.96	5.00	1222.61	916.88
22	24.59	174.53	5.00	1219.13	947.85
23	25.85	179.05	5.00	1207.50	969.89
24	27.11	183.53	5.00	1187.78	982.92
25	28.37	187.95	5.00	1160.24	986.34
26	29.63	192.33	5.00	1125.09	979.80
27	30.89	196.64	5.00	1082.65	962.92

28	32.15	200.91	5.00	1033.03	935.61
29	33.41	205.11	5.00	976.70	897.56
30	34.67	209.25	5.00	913.74	848.94
31	35.93	213.33	5.00	844.51	789.69
32	37.20	216.68	3.32	780.84	733.18
33	37.20	218.67	1.68	726.94	672.27
34	38.45	219.67	0.84	672.39	621.86
35	38.45	221.63	4.16	704.11	636.40
36	39.71	225.18	5.00	524.52	438.48
37	40.97	228.80	4.49	338.43	226.25

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing Soil Nail, and Applied Forces if applicable) = 175320.19 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing, Soil Nail, and Applied Forces if applicable) = 1065.84(psf)
Sum of the Driving Forces = 114381.75 (lbs)
Average Mobilized Shear Stress = 695.37(psf)
Total length of the failure surface = 164.49(ft)
CAUTION - Factor Of Safety Is Calculated By The Modified Bishop Method. This Method Is Valid Only If The Failure Surface Approximates A Circular Arc.

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.3830(g)
Calculated Newmark Seismic Displacement = 0.088(ft)
Non-Symmetrical Sliding Resistance Has Been Specified for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****



* Received 7-27-2015 from Hunsaker

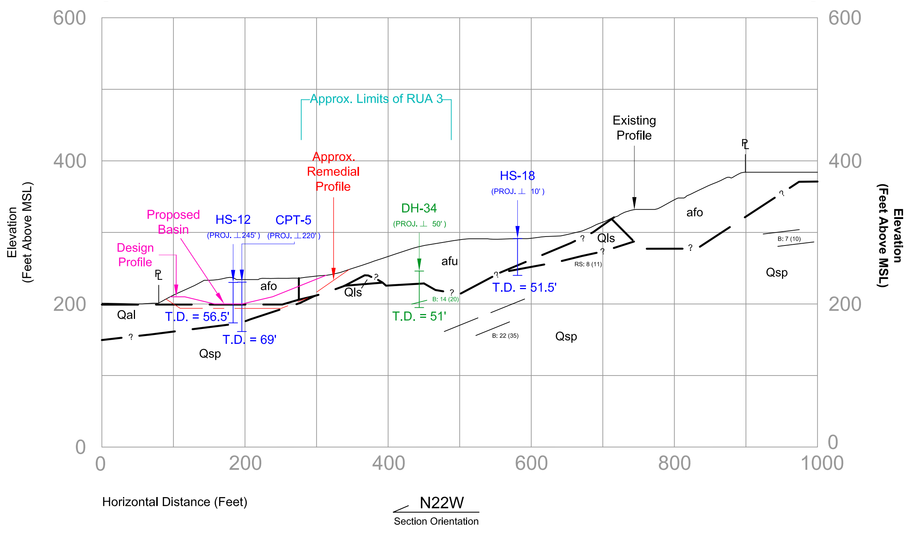
LGC Geotechnical, Inc.
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

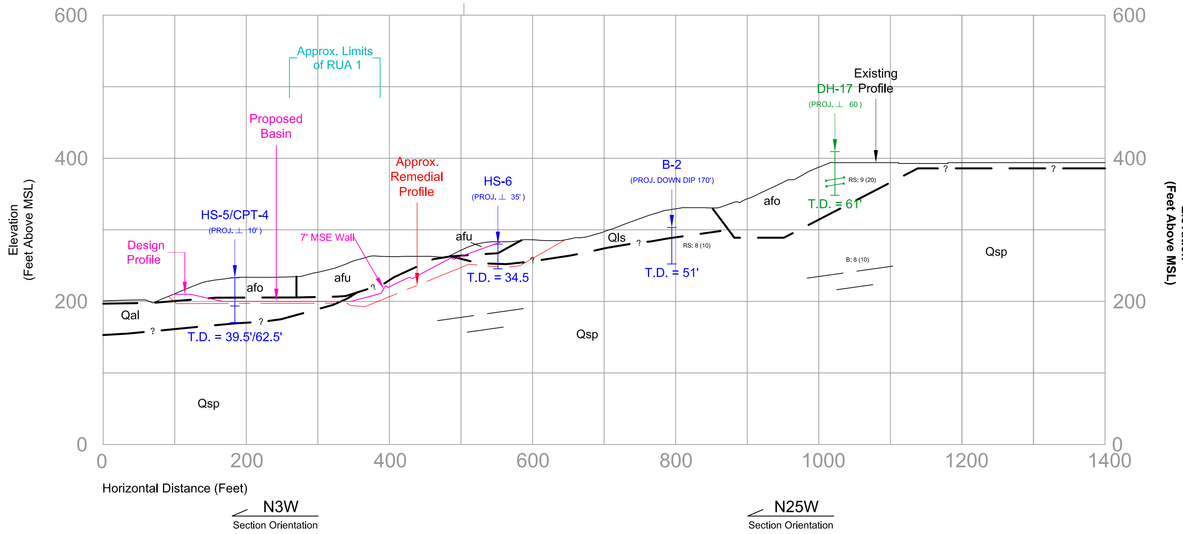
Geotechnical Map

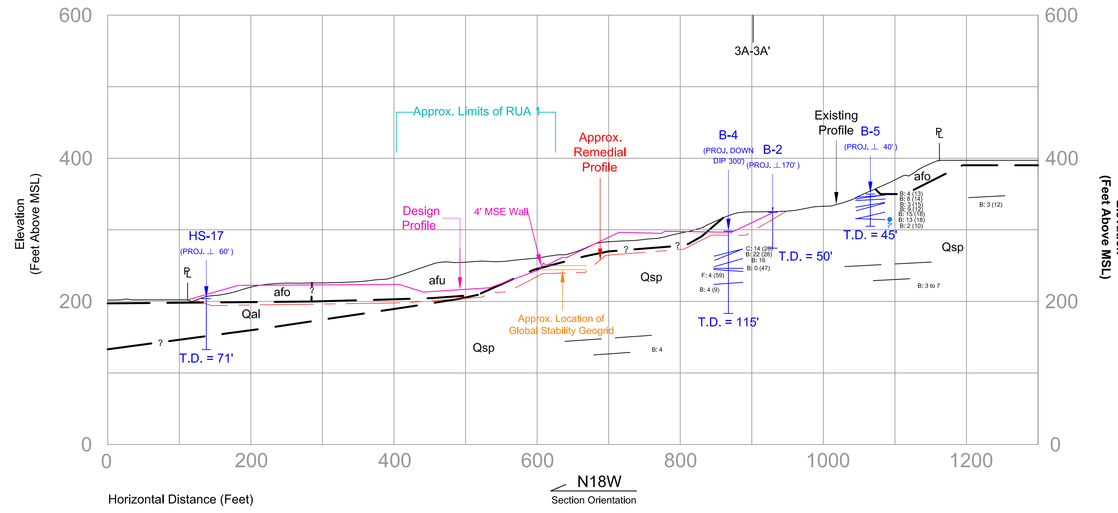
CLIENT:
Standard Pacific Homes
15360 Barranca Parkway
Irvine, CA 92618

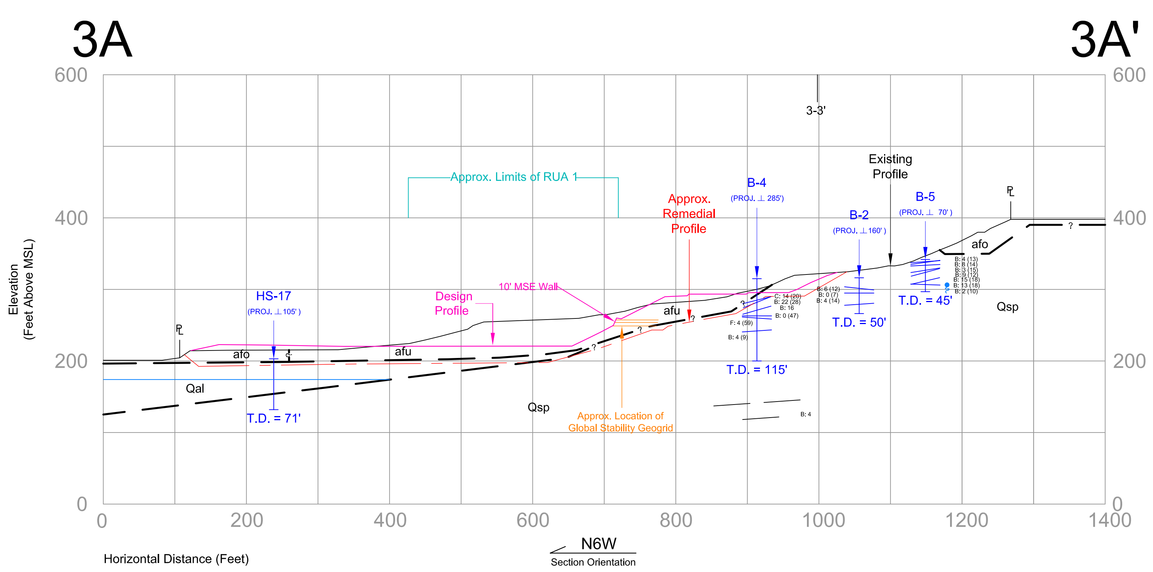
PROJECT NAME	Westridge - VTTM 17845
PROJECT NO.	14057-01
ENG. / GEOL.	DJB / KTM
SCALE	1" = 100'
DATE	August 2015

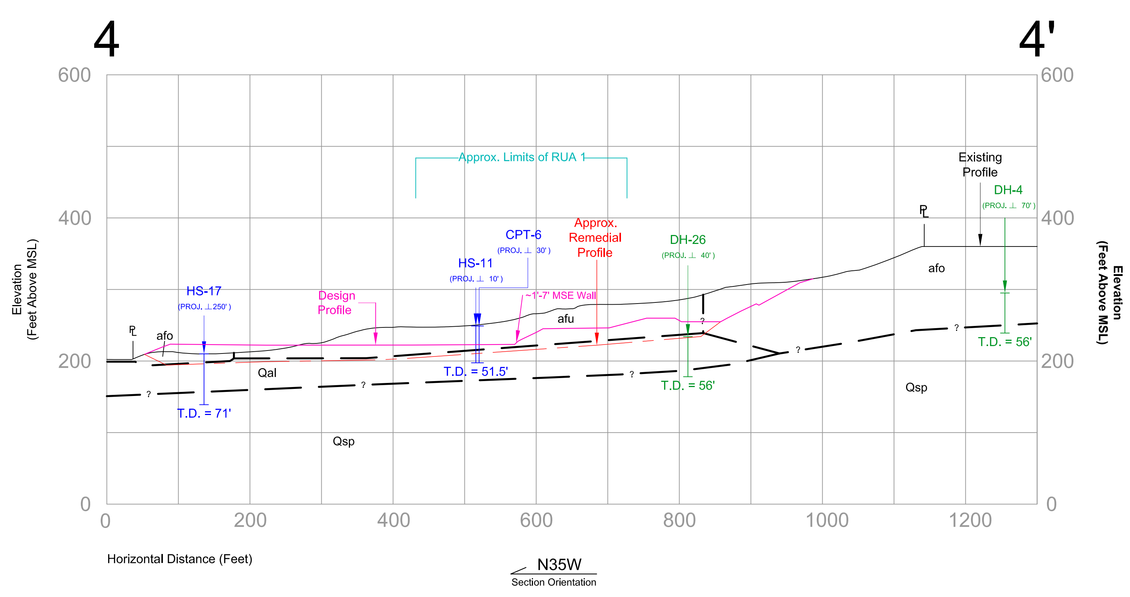
Sheet 1 of 3

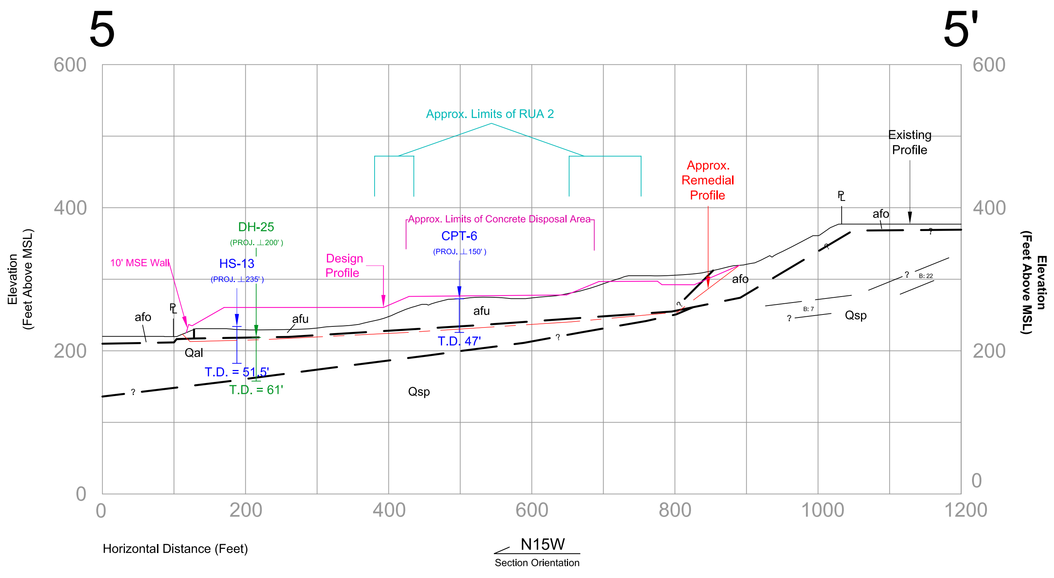


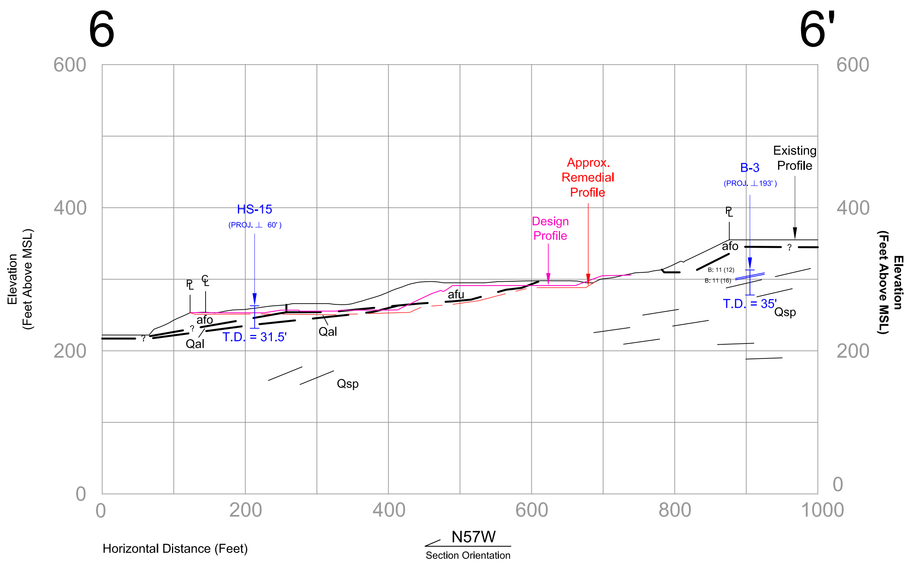


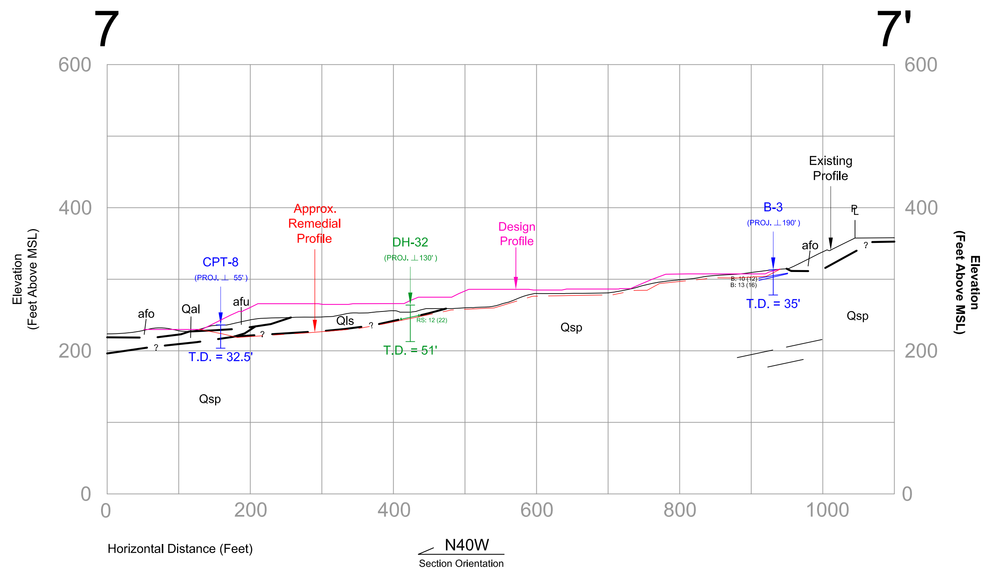










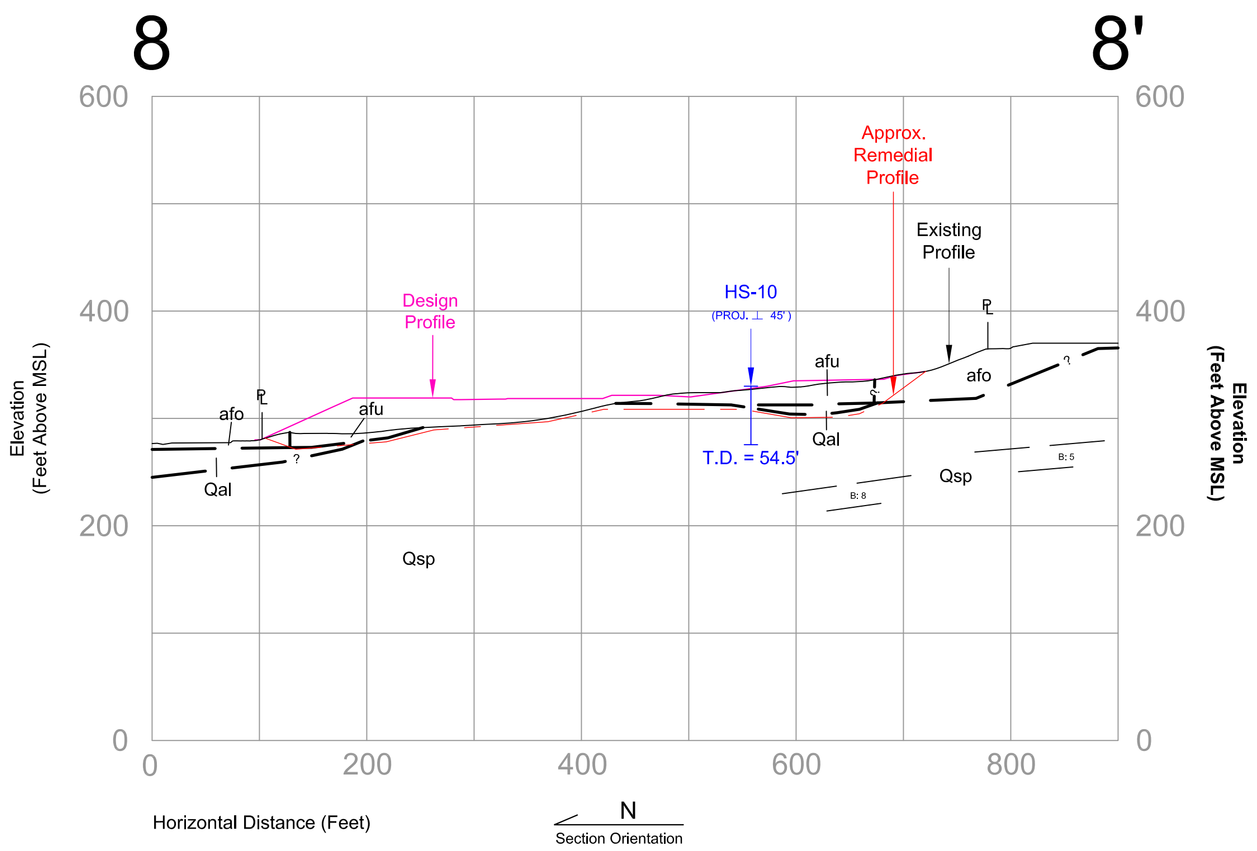


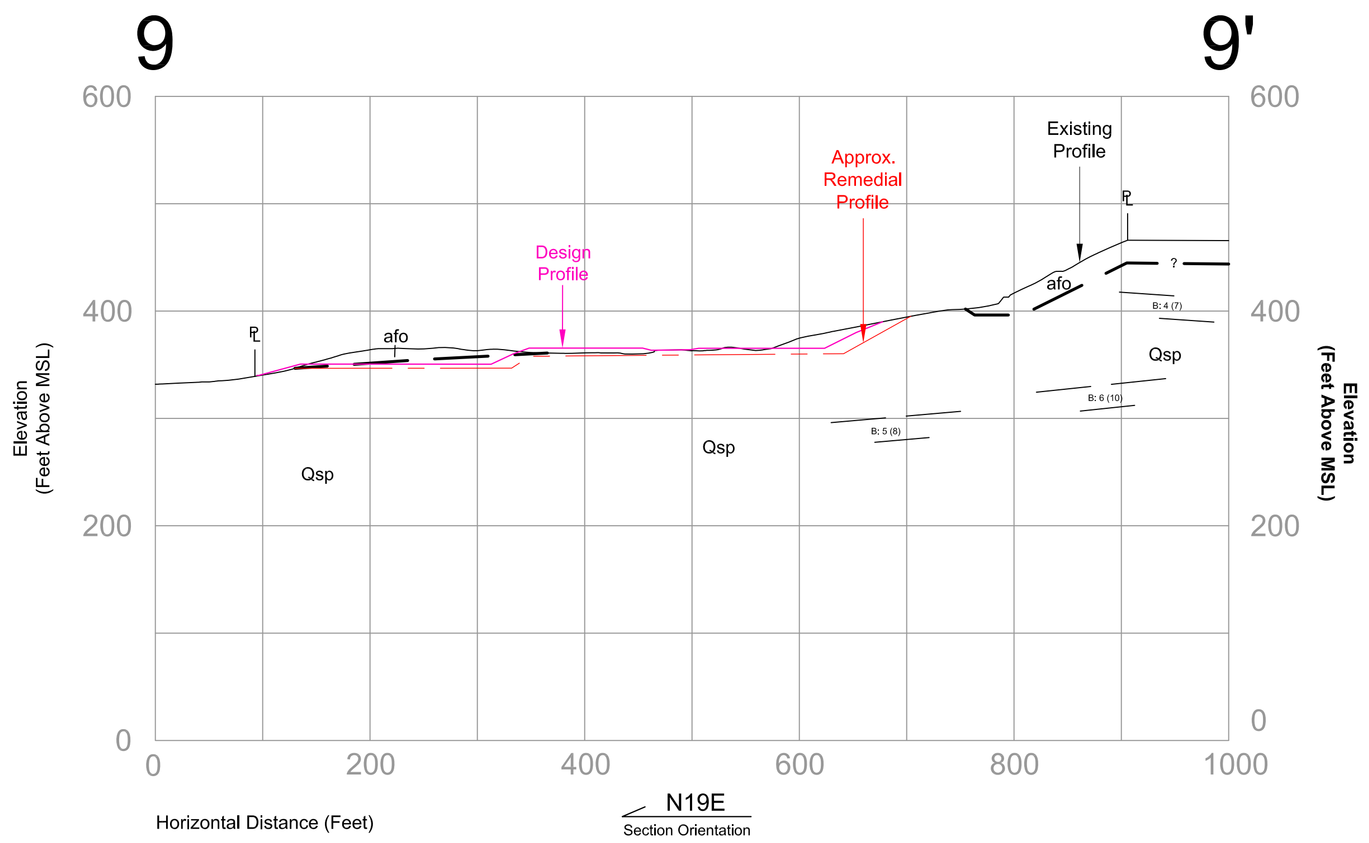
LGC Geotechnical, Inc.
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

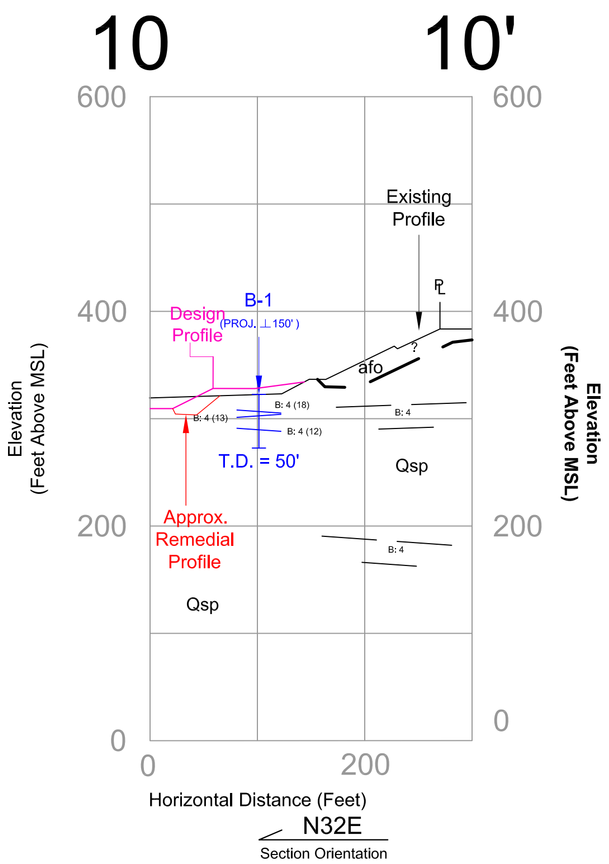
Geotechnical Cross-Sections 1-1' through 7-7'

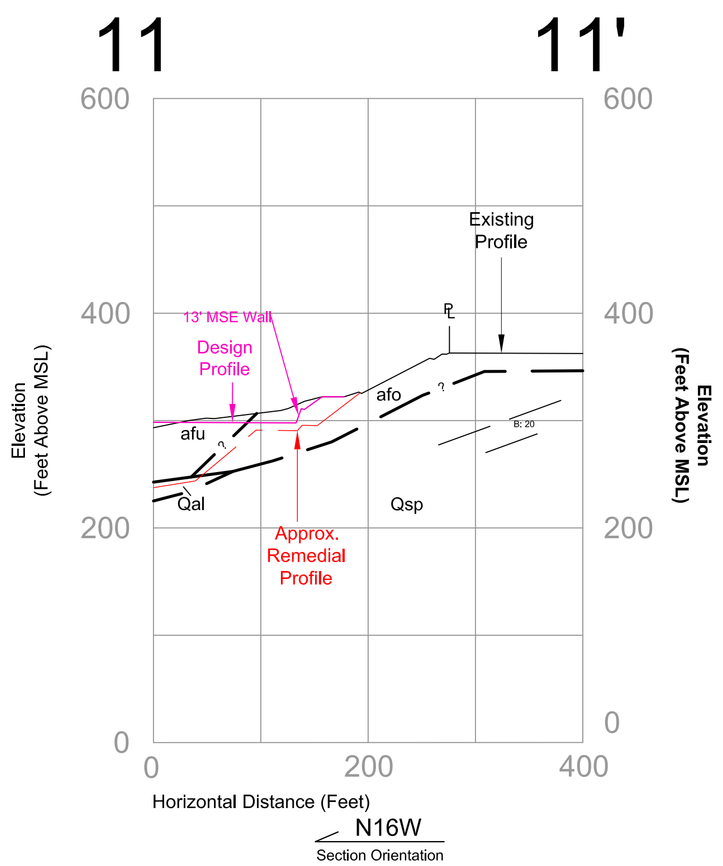
PROJECT NAME	Westridge - VTTM 17845
PROJECT NO.	14057-01
ENG. / GEOL.	DJB / KTM
SCALE	1" = 100'
DATE	August 2015

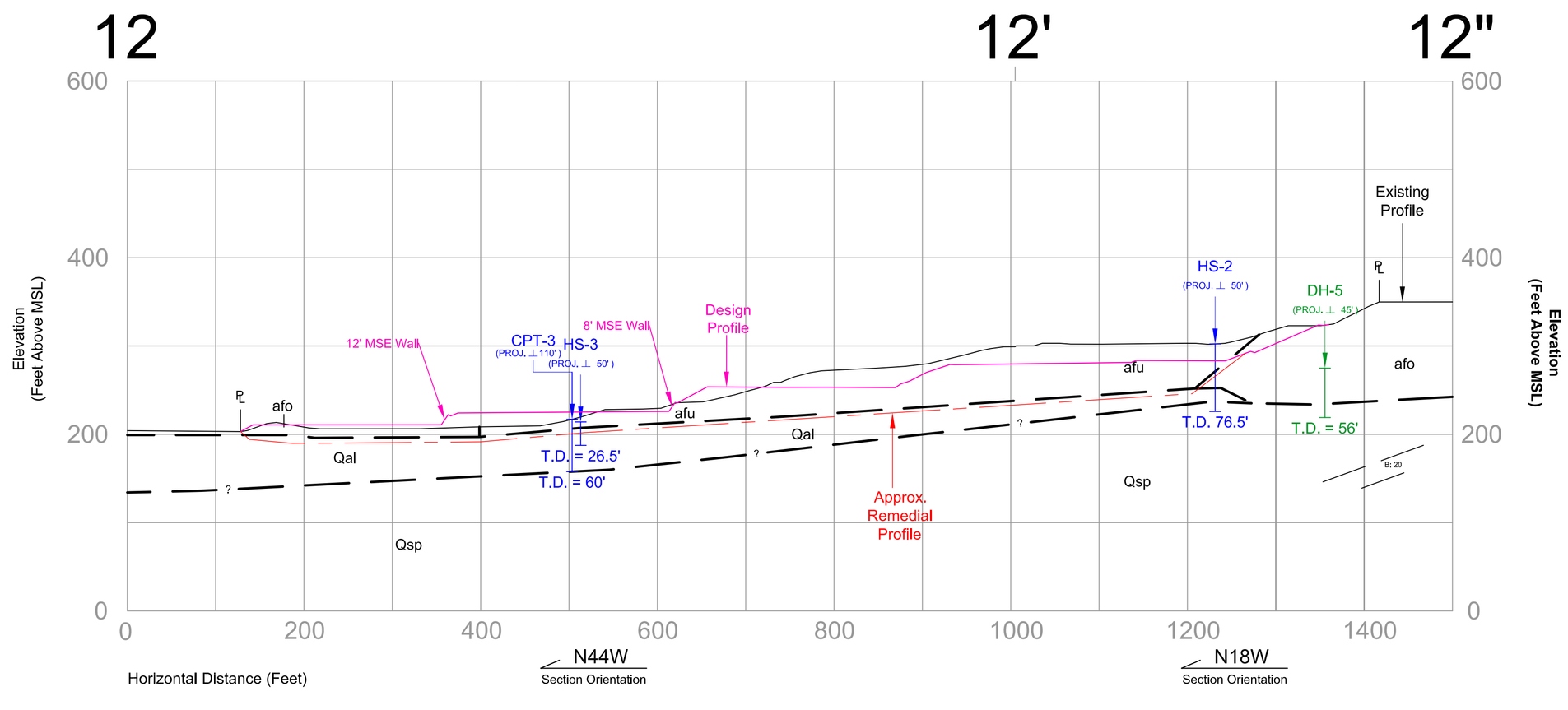
SHEET 2 of 3











LGC Geotechnical, Inc.

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San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

Geotechnical Cross-Sections 8-8' through 12-12'-12"

PROJECT NAME	Westridge - VTTM 17845
PROJECT NO.	14057-01
ENG. / GEOL.	DJB / KTM
SCALE	1" = 100'
DATE	August 2015

SHEET 3 of 3

Attachment F
Hydromodification Analysis

AREA “A”

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 09/29/16 File Name: EXA002.roc

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WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'A' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 1, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 462.000(Ft.)
Bottom (of initial area) elevation = 443.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.06333 s(%)= 6.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.004 min.
Rainfall intensity = 1.369(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.736
Subarea runoff = 0.262(CFS)
Total initial stream area = 0.260(Ac.)

++

Process from Point/Station 101.000 to Point/Station 102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.309(CFS)
Depth of flow = 0.143(Ft.), Average velocity = 3.252(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 3.309(CFS)
' ' flow top width = 14.267(Ft.)

```
  '     '    velocity=    3.252(Ft/s)
  '     '       area =      1.018(Sq.Ft)
  '     '       Froude number =     2.146

Upstream point elevation =   443.000(Ft.)
Downstream point elevation =   341.000(Ft.)
Flow length =   700.000(Ft.)
Travel time  =    3.59 min.
Time of concentration =   15.59 min.
Depth of flow =   0.143(Ft.)
Average velocity =   3.252(Ft/s)
Total irregular channel flow =     3.309(CFS)
Irregular channel normal depth above invert elev. =   0.143(Ft.)
Average velocity of channel(s) =   3.252(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.178(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.709
Subarea runoff =      6.005(CFS) for    7.240(Ac.)
Total runoff =      6.267(CFS)       Total area =        7.50(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.181(Ft.), Average velocity =   3.815(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.069(CFS)
Depth of flow =   0.277(Ft.), Average velocity =   3.140(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.069(CFS)
  '     '       flow top width =     27.726(Ft.)
  '     '    velocity=    3.140(Ft/s)
  '     '       area =      3.844(Sq.Ft)
  '     '       Froude number =     1.486

Upstream point elevation =   341.000(Ft.)
Downstream point elevation =   275.000(Ft.)
Flow length =  1178.000(Ft.)
Travel time  =    6.25 min.
Time of concentration =   21.84 min.
Depth of flow =   0.277(Ft.)
Average velocity =   3.140(Ft/s)
Total irregular channel flow =    12.069(CFS)
Irregular channel normal depth above invert elev. =   0.277(Ft.)
Average velocity of channel(s) =   3.140(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
```

Max Catchment Loss (Fm) = 0.250(In/Hr)
Rainfall intensity = 0.971(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.668
Subarea runoff = 11.508(CFS) for 19.890(Ac.)
Total runoff = 17.775(CFS) Total area = 27.39(Ac.)
Area averaged Fm value = 0.250(In/Hr)
Depth of flow = 0.321(Ft.), Average velocity = 3.459(Ft/s)
End of computations, total study area = 27.39 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) = 79.0

U n i t H y d r o g r a p h A n a l y s i s

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Study date 02/05/18 File Name EXA00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6407

WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'A' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
79.0	27.4	1.00	C	0.250	1.000	0.250

Area-averaged adjusted loss rate Fm (In/Hr) = 0.250

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
27.39	1.000	79.0	61.8	6.18	0.046

Area-averaged catchment yield fraction, Y = 0.046
Area-averaged low loss fraction, Yb = 0.954
++
User entry of time of concentration = 0.364 (hours)
Watershed area = 27.39(Ac.)
Catchment Lag time = 0.291 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 28.6172
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.250(In/Hr)
Average low loss rate fraction (Yb) = 0.954 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 27.39(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)
30-minute factor = 0.999 Adjusted rainfall = 0.399(In)

1-hour factor = 0.999 Adjusted rainfall = 0.529(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 331.25 (CFS))	
1	2.024	6.706
2	8.396	21.105
3	20.394	39.745
4	47.290	89.090
5	64.880	58.269
6	73.600	28.883
7	79.816	20.591
8	84.500	15.515
9	88.166	12.142
10	91.064	9.601
11	93.377	7.663
12	95.168	5.930
13	96.503	4.422
14	97.515	3.355
15	98.079	1.868
16	98.421	1.130
17	98.722	0.998
18	98.992	0.895
19	99.177	0.611
20	99.366	0.627
21	99.593	0.754
22	99.761	0.556
23	99.873	0.371
24	99.945	0.238
25	100.000	0.182

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2531	0.0633
3	0.2995	0.0464
4	0.3376	0.0380
5	0.3703	0.0328
6	0.3995	0.0291
7	0.4253	0.0258
8	0.4490	0.0237
9	0.4710	0.0220
10	0.4916	0.0206
11	0.5109	0.0194
12	0.5293	0.0184
13	0.5497	0.0204
14	0.5693	0.0196
15	0.5882	0.0189
16	0.6064	0.0182
17	0.6241	0.0176
18	0.6412	0.0171
19	0.6578	0.0166
20	0.6739	0.0161
21	0.6897	0.0157
22	0.7050	0.0153
23	0.7200	0.0150
24	0.7346	0.0146
25	0.7489	0.0143
26	0.7629	0.0140
27	0.7767	0.0137
28	0.7902	0.0135
29	0.8034	0.0132
30	0.8164	0.0130

31	0.8291	0.0128
32	0.8417	0.0125
33	0.8540	0.0123
34	0.8661	0.0121
35	0.8781	0.0120
36	0.8899	0.0118
37	0.9010	0.0112
38	0.9120	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9441	0.0106
42	0.9545	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0143	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0611	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1312	0.0085
62	1.1396	0.0084
63	1.1480	0.0083
64	1.1562	0.0083
65	1.1644	0.0082
66	1.1725	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2448	0.0062
77	1.2509	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3586	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051

102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051
105	1.4050	0.0050
106	1.4100	0.0050
107	1.4149	0.0050
108	1.4199	0.0049
109	1.4248	0.0049
110	1.4297	0.0049
111	1.4345	0.0049
112	1.4393	0.0048
113	1.4441	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4677	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4907	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5042	0.0045
127	1.5087	0.0045
128	1.5131	0.0044
129	1.5176	0.0044
130	1.5219	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5521	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5689	0.0042
142	1.5731	0.0042
143	1.5772	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5895	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6411	0.0039
160	1.6450	0.0039
161	1.6488	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6790	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6901	0.0037

173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036
176	1.7047	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7298	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7508	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7646	0.0034
194	1.7680	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7782	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7883	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8016	0.0033
205	1.8049	0.0033
206	1.8082	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8180	0.0033
210	1.8213	0.0033
211	1.8245	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8501	0.0032
220	1.8533	0.0032
221	1.8564	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8658	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8782	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8996	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9176	0.0030
242	1.9206	0.0030
243	1.9236	0.0030

244	1.9266	0.0030
245	1.9295	0.0030
246	1.9324	0.0029
247	1.9354	0.0029
248	1.9383	0.0029
249	1.9412	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9557	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9870	0.0028
266	1.9898	0.0028
267	1.9926	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0120	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0311	0.0027
282	2.0338	0.0027
283	2.0365	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0025	0.0001
2	0.0027	0.0026	0.0001
3	0.0027	0.0026	0.0001
4	0.0027	0.0026	0.0001
5	0.0027	0.0026	0.0001
6	0.0027	0.0026	0.0001
7	0.0027	0.0026	0.0001
8	0.0027	0.0026	0.0001
9	0.0027	0.0026	0.0001
10	0.0027	0.0026	0.0001
11	0.0028	0.0026	0.0001
12	0.0028	0.0026	0.0001
13	0.0028	0.0026	0.0001
14	0.0028	0.0027	0.0001
15	0.0028	0.0027	0.0001
16	0.0028	0.0027	0.0001
17	0.0028	0.0027	0.0001
18	0.0028	0.0027	0.0001
19	0.0028	0.0027	0.0001
20	0.0028	0.0027	0.0001
21	0.0029	0.0027	0.0001

22	0.0029	0.0027	0.0001
23	0.0029	0.0027	0.0001
24	0.0029	0.0028	0.0001
25	0.0029	0.0028	0.0001
26	0.0029	0.0028	0.0001
27	0.0029	0.0028	0.0001
28	0.0029	0.0028	0.0001
29	0.0029	0.0028	0.0001
30	0.0030	0.0028	0.0001
31	0.0030	0.0028	0.0001
32	0.0030	0.0028	0.0001
33	0.0030	0.0029	0.0001
34	0.0030	0.0029	0.0001
35	0.0030	0.0029	0.0001
36	0.0030	0.0029	0.0001
37	0.0030	0.0029	0.0001
38	0.0030	0.0029	0.0001
39	0.0031	0.0029	0.0001
40	0.0031	0.0029	0.0001
41	0.0031	0.0029	0.0001
42	0.0031	0.0030	0.0001
43	0.0031	0.0030	0.0001
44	0.0031	0.0030	0.0001
45	0.0031	0.0030	0.0001
46	0.0031	0.0030	0.0001
47	0.0032	0.0030	0.0001
48	0.0032	0.0030	0.0001
49	0.0032	0.0030	0.0001
50	0.0032	0.0031	0.0001
51	0.0032	0.0031	0.0001
52	0.0032	0.0031	0.0001
53	0.0033	0.0031	0.0002
54	0.0033	0.0031	0.0002
55	0.0033	0.0031	0.0002
56	0.0033	0.0031	0.0002
57	0.0033	0.0032	0.0002
58	0.0033	0.0032	0.0002
59	0.0033	0.0032	0.0002
60	0.0034	0.0032	0.0002
61	0.0034	0.0032	0.0002
62	0.0034	0.0032	0.0002
63	0.0034	0.0032	0.0002
64	0.0034	0.0033	0.0002
65	0.0034	0.0033	0.0002
66	0.0035	0.0033	0.0002
67	0.0035	0.0033	0.0002
68	0.0035	0.0033	0.0002
69	0.0035	0.0033	0.0002
70	0.0035	0.0034	0.0002
71	0.0035	0.0034	0.0002
72	0.0036	0.0034	0.0002
73	0.0036	0.0034	0.0002
74	0.0036	0.0034	0.0002
75	0.0036	0.0035	0.0002
76	0.0036	0.0035	0.0002
77	0.0037	0.0035	0.0002
78	0.0037	0.0035	0.0002
79	0.0037	0.0035	0.0002
80	0.0037	0.0035	0.0002
81	0.0037	0.0036	0.0002
82	0.0038	0.0036	0.0002
83	0.0038	0.0036	0.0002
84	0.0038	0.0036	0.0002
85	0.0038	0.0037	0.0002
86	0.0038	0.0037	0.0002
87	0.0039	0.0037	0.0002
88	0.0039	0.0037	0.0002
89	0.0039	0.0037	0.0002
90	0.0039	0.0038	0.0002
91	0.0040	0.0038	0.0002
92	0.0040	0.0038	0.0002

93	0.0040	0.0038	0.0002
94	0.0040	0.0038	0.0002
95	0.0041	0.0039	0.0002
96	0.0041	0.0039	0.0002
97	0.0041	0.0039	0.0002
98	0.0041	0.0039	0.0002
99	0.0042	0.0040	0.0002
100	0.0042	0.0040	0.0002
101	0.0042	0.0040	0.0002
102	0.0043	0.0041	0.0002
103	0.0043	0.0041	0.0002
104	0.0043	0.0041	0.0002
105	0.0044	0.0042	0.0002
106	0.0044	0.0042	0.0002
107	0.0044	0.0042	0.0002
108	0.0044	0.0042	0.0002
109	0.0045	0.0043	0.0002
110	0.0045	0.0043	0.0002
111	0.0045	0.0043	0.0002
112	0.0046	0.0044	0.0002
113	0.0046	0.0044	0.0002
114	0.0046	0.0044	0.0002
115	0.0047	0.0045	0.0002
116	0.0047	0.0045	0.0002
117	0.0048	0.0046	0.0002
118	0.0048	0.0046	0.0002
119	0.0049	0.0046	0.0002
120	0.0049	0.0047	0.0002
121	0.0049	0.0047	0.0002
122	0.0050	0.0047	0.0002
123	0.0050	0.0048	0.0002
124	0.0051	0.0048	0.0002
125	0.0051	0.0049	0.0002
126	0.0051	0.0049	0.0002
127	0.0052	0.0050	0.0002
128	0.0052	0.0050	0.0002
129	0.0053	0.0051	0.0002
130	0.0054	0.0051	0.0002
131	0.0054	0.0052	0.0003
132	0.0055	0.0052	0.0003
133	0.0055	0.0053	0.0003
134	0.0056	0.0053	0.0003
135	0.0057	0.0054	0.0003
136	0.0057	0.0054	0.0003
137	0.0058	0.0055	0.0003
138	0.0058	0.0056	0.0003
139	0.0059	0.0056	0.0003
140	0.0060	0.0057	0.0003
141	0.0061	0.0058	0.0003
142	0.0061	0.0058	0.0003
143	0.0062	0.0059	0.0003
144	0.0063	0.0060	0.0003
145	0.0077	0.0074	0.0004
146	0.0078	0.0074	0.0004
147	0.0079	0.0076	0.0004
148	0.0080	0.0076	0.0004
149	0.0081	0.0077	0.0004
150	0.0082	0.0078	0.0004
151	0.0083	0.0079	0.0004
152	0.0084	0.0080	0.0004
153	0.0086	0.0082	0.0004
154	0.0086	0.0082	0.0004
155	0.0088	0.0084	0.0004
156	0.0089	0.0085	0.0004
157	0.0091	0.0086	0.0004
158	0.0092	0.0087	0.0004
159	0.0094	0.0089	0.0004
160	0.0095	0.0090	0.0004
161	0.0097	0.0092	0.0004
162	0.0098	0.0093	0.0005
163	0.0100	0.0096	0.0005

164	0.0101	0.0097	0.0005
165	0.0104	0.0099	0.0005
166	0.0106	0.0101	0.0005
167	0.0108	0.0103	0.0005
168	0.0110	0.0105	0.0005
169	0.0118	0.0112	0.0005
170	0.0120	0.0114	0.0006
171	0.0123	0.0118	0.0006
172	0.0125	0.0120	0.0006
173	0.0130	0.0124	0.0006
174	0.0132	0.0126	0.0006
175	0.0137	0.0131	0.0006
176	0.0140	0.0134	0.0006
177	0.0146	0.0140	0.0007
178	0.0150	0.0143	0.0007
179	0.0157	0.0150	0.0007
180	0.0161	0.0154	0.0007
181	0.0171	0.0163	0.0008
182	0.0176	0.0168	0.0008
183	0.0189	0.0180	0.0009
184	0.0196	0.0187	0.0009
185	0.0184	0.0175	0.0008
186	0.0194	0.0185	0.0009
187	0.0220	0.0208	0.0012
188	0.0237	0.0208	0.0029
189	0.0291	0.0208	0.0083
190	0.0328	0.0208	0.0120
191	0.0464	0.0208	0.0256
192	0.0633	0.0208	0.0425
193	0.1898	0.0208	0.1689
194	0.0380	0.0208	0.0172
195	0.0258	0.0208	0.0050
196	0.0206	0.0196	0.0010
197	0.0204	0.0195	0.0009
198	0.0182	0.0174	0.0008
199	0.0166	0.0158	0.0008
200	0.0153	0.0146	0.0007
201	0.0143	0.0137	0.0007
202	0.0135	0.0128	0.0006
203	0.0128	0.0122	0.0006
204	0.0121	0.0116	0.0006
205	0.0112	0.0107	0.0005
206	0.0107	0.0102	0.0005
207	0.0103	0.0098	0.0005
208	0.0099	0.0094	0.0005
209	0.0096	0.0091	0.0004
210	0.0093	0.0088	0.0004
211	0.0090	0.0086	0.0004
212	0.0087	0.0083	0.0004
213	0.0085	0.0081	0.0004
214	0.0083	0.0079	0.0004
215	0.0081	0.0077	0.0004
216	0.0079	0.0075	0.0004
217	0.0063	0.0060	0.0003
218	0.0062	0.0059	0.0003
219	0.0060	0.0057	0.0003
220	0.0059	0.0056	0.0003
221	0.0057	0.0055	0.0003
222	0.0056	0.0054	0.0003
223	0.0055	0.0052	0.0003
224	0.0054	0.0051	0.0002
225	0.0053	0.0050	0.0002
226	0.0052	0.0049	0.0002
227	0.0051	0.0049	0.0002
228	0.0050	0.0048	0.0002
229	0.0049	0.0047	0.0002
230	0.0048	0.0046	0.0002
231	0.0047	0.0045	0.0002
232	0.0047	0.0045	0.0002
233	0.0046	0.0044	0.0002
234	0.0045	0.0043	0.0002

235	0.0045	0.0043	0.0002
236	0.0044	0.0042	0.0002
237	0.0043	0.0041	0.0002
238	0.0043	0.0041	0.0002
239	0.0042	0.0040	0.0002
240	0.0042	0.0040	0.0002
241	0.0041	0.0039	0.0002
242	0.0041	0.0039	0.0002
243	0.0040	0.0038	0.0002
244	0.0040	0.0038	0.0002
245	0.0039	0.0037	0.0002
246	0.0039	0.0037	0.0002
247	0.0038	0.0036	0.0002
248	0.0038	0.0036	0.0002
249	0.0037	0.0036	0.0002
250	0.0037	0.0035	0.0002
251	0.0036	0.0035	0.0002
252	0.0036	0.0034	0.0002
253	0.0036	0.0034	0.0002
254	0.0035	0.0034	0.0002
255	0.0035	0.0033	0.0002
256	0.0035	0.0033	0.0002
257	0.0034	0.0033	0.0002
258	0.0034	0.0032	0.0002
259	0.0034	0.0032	0.0002
260	0.0033	0.0032	0.0002
261	0.0033	0.0031	0.0002
262	0.0033	0.0031	0.0002
263	0.0032	0.0031	0.0001
264	0.0032	0.0031	0.0001
265	0.0032	0.0030	0.0001
266	0.0032	0.0030	0.0001
267	0.0031	0.0030	0.0001
268	0.0031	0.0030	0.0001
269	0.0031	0.0029	0.0001
270	0.0031	0.0029	0.0001
271	0.0030	0.0029	0.0001
272	0.0030	0.0029	0.0001
273	0.0030	0.0028	0.0001
274	0.0030	0.0028	0.0001
275	0.0029	0.0028	0.0001
276	0.0029	0.0028	0.0001
277	0.0029	0.0028	0.0001
278	0.0029	0.0027	0.0001
279	0.0029	0.0027	0.0001
280	0.0028	0.0027	0.0001
281	0.0028	0.0027	0.0001
282	0.0028	0.0027	0.0001
283	0.0028	0.0026	0.0001
284	0.0028	0.0026	0.0001
285	0.0027	0.0026	0.0001
286	0.0027	0.0026	0.0001
287	0.0027	0.0026	0.0001
288	0.0027	0.0026	0.0001

Total soil rain loss = 1.69(In)
Total effective rainfall = 0.36(In)
Peak flow rate in flood hydrograph = 19.51(CFS)

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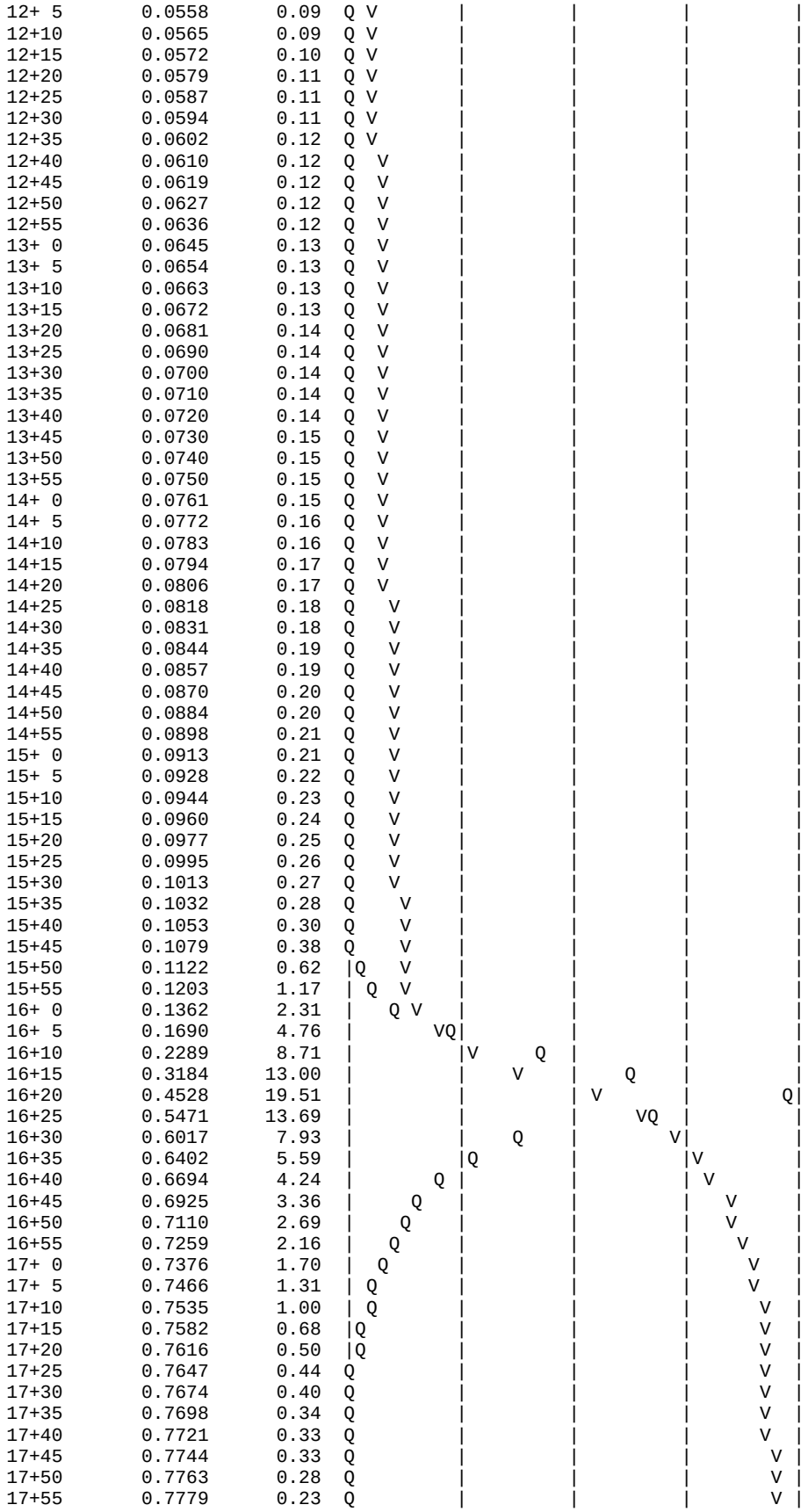
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0000	0.00	Q	|	|	|	|

0+15	0.0001	0.01	Q				
0+20	0.0002	0.02	Q				
0+25	0.0004	0.03	Q				
0+30	0.0006	0.03	Q				
0+35	0.0008	0.03	Q				
0+40	0.0011	0.03	Q				
0+45	0.0013	0.04	Q				
0+50	0.0016	0.04	Q				
0+55	0.0019	0.04	Q				
1+ 0	0.0021	0.04	Q				
1+ 5	0.0024	0.04	Q				
1+10	0.0027	0.04	Q				
1+15	0.0030	0.04	Q				
1+20	0.0033	0.04	Q				
1+25	0.0035	0.04	Q				
1+30	0.0038	0.04	Q				
1+35	0.0041	0.04	Q				
1+40	0.0044	0.04	Q				
1+45	0.0047	0.04	Q				
1+50	0.0050	0.04	Q				
1+55	0.0053	0.04	Q				
2+ 0	0.0056	0.04	Q				
2+ 5	0.0059	0.04	Q				
2+10	0.0062	0.04	Q				
2+15	0.0065	0.04	Q				
2+20	0.0068	0.04	Q				
2+25	0.0071	0.04	Q				
2+30	0.0074	0.04	Q				
2+35	0.0077	0.04	Q				
2+40	0.0080	0.04	Q				
2+45	0.0084	0.04	Q				
2+50	0.0087	0.05	Q				
2+55	0.0090	0.05	Q				
3+ 0	0.0093	0.05	Q				
3+ 5	0.0096	0.05	Q				
3+10	0.0099	0.05	Q				
3+15	0.0102	0.05	Q				
3+20	0.0106	0.05	Q				
3+25	0.0109	0.05	Q				
3+30	0.0112	0.05	Q				
3+35	0.0115	0.05	Q				
3+40	0.0118	0.05	Q				
3+45	0.0122	0.05	Q				
3+50	0.0125	0.05	Q				
3+55	0.0128	0.05	Q				
4+ 0	0.0131	0.05	Q				
4+ 5	0.0135	0.05	Q				
4+10	0.0138	0.05	Q				
4+15	0.0141	0.05	Q				
4+20	0.0145	0.05	Q				
4+25	0.0148	0.05	Q				
4+30	0.0151	0.05	Q				
4+35	0.0155	0.05	Q				
4+40	0.0158	0.05	Q				
4+45	0.0162	0.05	Q				
4+50	0.0165	0.05	Q				
4+55	0.0169	0.05	Q				
5+ 0	0.0172	0.05	Q				
5+ 5	0.0175	0.05	Q				
5+10	0.0179	0.05	Q				
5+15	0.0182	0.05	Q				
5+20	0.0186	0.05	Q				
5+25	0.0190	0.05	Q				
5+30	0.0193	0.05	Q				
5+35	0.0197	0.05	Q				
5+40	0.0200	0.05	Q				
5+45	0.0204	0.05	QV				
5+50	0.0207	0.05	QV				
5+55	0.0211	0.05	QV				
6+ 0	0.0215	0.05	QV				
6+ 5	0.0218	0.05	QV				

6+10	0.0222	0.05	QV				
6+15	0.0226	0.05	QV				
6+20	0.0230	0.05	QV				
6+25	0.0233	0.05	QV				
6+30	0.0237	0.05	QV				
6+35	0.0241	0.06	QV				
6+40	0.0245	0.06	QV				
6+45	0.0249	0.06	QV				
6+50	0.0253	0.06	QV				
6+55	0.0256	0.06	QV				
7+ 0	0.0260	0.06	QV				
7+ 5	0.0264	0.06	QV				
7+10	0.0268	0.06	QV				
7+15	0.0272	0.06	QV				
7+20	0.0276	0.06	QV				
7+25	0.0280	0.06	QV				
7+30	0.0284	0.06	QV				
7+35	0.0288	0.06	QV				
7+40	0.0292	0.06	QV				
7+45	0.0296	0.06	QV				
7+50	0.0301	0.06	QV				
7+55	0.0305	0.06	QV				
8+ 0	0.0309	0.06	QV				
8+ 5	0.0313	0.06	QV				
8+10	0.0317	0.06	QV				
8+15	0.0322	0.06	QV				
8+20	0.0326	0.06	QV				
8+25	0.0330	0.06	QV				
8+30	0.0335	0.06	QV				
8+35	0.0339	0.06	QV				
8+40	0.0343	0.06	QV				
8+45	0.0348	0.06	QV				
8+50	0.0352	0.06	QV				
8+55	0.0357	0.07	QV				
9+ 0	0.0361	0.07	QV				
9+ 5	0.0366	0.07	QV				
9+10	0.0370	0.07	QV				
9+15	0.0375	0.07	QV				
9+20	0.0380	0.07	QV				
9+25	0.0384	0.07	QV				
9+30	0.0389	0.07	QV				
9+35	0.0394	0.07	QV				
9+40	0.0399	0.07	QV				
9+45	0.0404	0.07	QV				
9+50	0.0408	0.07	Q V				
9+55	0.0413	0.07	Q V				
10+ 0	0.0418	0.07	Q V				
10+ 5	0.0423	0.07	Q V				
10+10	0.0428	0.07	Q V				
10+15	0.0433	0.07	Q V				
10+20	0.0439	0.07	Q V				
10+25	0.0444	0.08	Q V				
10+30	0.0449	0.08	Q V				
10+35	0.0454	0.08	Q V				
10+40	0.0460	0.08	Q V				
10+45	0.0465	0.08	Q V				
10+50	0.0470	0.08	Q V				
10+55	0.0476	0.08	Q V				
11+ 0	0.0481	0.08	Q V				
11+ 5	0.0487	0.08	Q V				
11+10	0.0492	0.08	Q V				
11+15	0.0498	0.08	Q V				
11+20	0.0504	0.08	Q V				
11+25	0.0510	0.08	Q V				
11+30	0.0515	0.08	Q V				
11+35	0.0521	0.09	Q V				
11+40	0.0527	0.09	Q V				
11+45	0.0533	0.09	Q V				
11+50	0.0540	0.09	Q V				
11+55	0.0546	0.09	Q V				
12+ 0	0.0552	0.09	Q V				



18+ 0	0.7792	0.19	Q	|	|	|	V |
18+ 5	0.7804	0.17	Q	|	|	|	V |
18+10	0.7813	0.13	Q	|	|	|	V |
18+15	0.7822	0.12	Q	|	|	|	V |
18+20	0.7830	0.11	Q	|	|	|	V |
18+25	0.7837	0.11	Q	|	|	|	V |
18+30	0.7844	0.10	Q	|	|	|	V |
18+35	0.7851	0.10	Q	|	|	|	V |
18+40	0.7857	0.10	Q	|	|	|	V |
18+45	0.7864	0.09	Q	|	|	|	V |
18+50	0.7870	0.09	Q	|	|	|	V |
18+55	0.7876	0.09	Q	|	|	|	V |
19+ 0	0.7882	0.09	Q	|	|	|	V |
19+ 5	0.7888	0.08	Q	|	|	|	V |
19+10	0.7893	0.08	Q	|	|	|	V |
19+15	0.7899	0.08	Q	|	|	|	V |
19+20	0.7904	0.08	Q	|	|	|	V |
19+25	0.7909	0.08	Q	|	|	|	V |
19+30	0.7915	0.08	Q	|	|	|	V |
19+35	0.7920	0.07	Q	|	|	|	V |
19+40	0.7925	0.07	Q	|	|	|	V |
19+45	0.7930	0.07	Q	|	|	|	V|
19+50	0.7934	0.07	Q	|	|	|	V|
19+55	0.7939	0.07	Q	|	|	|	V|
20+ 0	0.7944	0.07	Q	|	|	|	V|
20+ 5	0.7949	0.07	Q	|	|	|	V|
20+10	0.7953	0.07	Q	|	|	|	V|
20+15	0.7958	0.07	Q	|	|	|	V|
20+20	0.7962	0.06	Q	|	|	|	V|
20+25	0.7966	0.06	Q	|	|	|	V|
20+30	0.7971	0.06	Q	|	|	|	V|
20+35	0.7975	0.06	Q	|	|	|	V|
20+40	0.7979	0.06	Q	|	|	|	V|
20+45	0.7983	0.06	Q	|	|	|	V|
20+50	0.7987	0.06	Q	|	|	|	V|
20+55	0.7991	0.06	Q	|	|	|	V|
21+ 0	0.7996	0.06	Q	|	|	|	V|
21+ 5	0.7999	0.06	Q	|	|	|	V|
21+10	0.8003	0.06	Q	|	|	|	V|
21+15	0.8007	0.06	Q	|	|	|	V|
21+20	0.8011	0.06	Q	|	|	|	V|
21+25	0.8015	0.06	Q	|	|	|	V|
21+30	0.8019	0.05	Q	|	|	|	V|
21+35	0.8022	0.05	Q	|	|	|	V|
21+40	0.8026	0.05	Q	|	|	|	V|
21+45	0.8030	0.05	Q	|	|	|	V|
21+50	0.8033	0.05	Q	|	|	|	V|
21+55	0.8037	0.05	Q	|	|	|	V|
22+ 0	0.8040	0.05	Q	|	|	|	V|
22+ 5	0.8044	0.05	Q	|	|	|	V|
22+10	0.8047	0.05	Q	|	|	|	V|
22+15	0.8051	0.05	Q	|	|	|	V|
22+20	0.8054	0.05	Q	|	|	|	V|
22+25	0.8058	0.05	Q	|	|	|	V|
22+30	0.8061	0.05	Q	|	|	|	V|
22+35	0.8064	0.05	Q	|	|	|	V|
22+40	0.8068	0.05	Q	|	|	|	V|
22+45	0.8071	0.05	Q	|	|	|	V|
22+50	0.8074	0.05	Q	|	|	|	V|
22+55	0.8077	0.05	Q	|	|	|	V|
23+ 0	0.8080	0.05	Q	|	|	|	V|
23+ 5	0.8084	0.05	Q	|	|	|	V|
23+10	0.8087	0.05	Q	|	|	|	V|
23+15	0.8090	0.05	Q	|	|	|	V|
23+20	0.8093	0.04	Q	|	|	|	V|
23+25	0.8096	0.04	Q	|	|	|	V|
23+30	0.8099	0.04	Q	|	|	|	V|
23+35	0.8102	0.04	Q	|	|	|	V|
23+40	0.8105	0.04	Q	|	|	|	V|
23+45	0.8108	0.04	Q	|	|	|	V|
23+50	0.8111	0.04	Q	|	|	|	V|

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   23+55       0.8114      0.04  Q         |         |         |        V|
   24+ 0       0.8117      0.04  Q         |         |         |        V|
   24+ 5       0.8120      0.04  Q         |         |         |        V|
   24+10       0.8122      0.04  Q         |         |         |        V|
   24+15       0.8125      0.03  Q         |         |         |        V|
   24+20       0.8126      0.02  Q         |         |         |        V|
   24+25       0.8127      0.01  Q         |         |         |        V|
   24+30       0.8128      0.01  Q         |         |         |        V|
   24+35       0.8129      0.01  Q         |         |         |        V|
   24+40       0.8129      0.01  Q         |         |         |        V|
   24+45       0.8129      0.00  Q         |         |         |        V|
   24+50       0.8130      0.00  Q         |         |         |        V|
   24+55       0.8130      0.00  Q         |         |         |        V|
   25+ 0       0.8130      0.00  Q         |         |         |        V|
   25+ 5       0.8130      0.00  Q         |         |         |        V|
   25+10       0.8130      0.00  Q         |         |         |        V|
   25+15       0.8130      0.00  Q         |         |         |        V|
   25+20       0.8130      0.00  Q         |         |         |        V|
   25+25       0.8130      0.00  Q         |         |         |        V|
   25+30       0.8130      0.00  Q         |         |         |        V|
   25+35       0.8130      0.00  Q         |         |         |        V|
   25+40       0.8130      0.00  Q         |         |         |        V|
   25+45       0.8130      0.00  Q         |         |         |        V|
   25+50       0.8130      0.00  Q         |         |         |        V|
   25+55       0.8130      0.00  Q         |         |         |        V|
   26+ 0       0.8130      0.00  Q         |         |         |         V
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Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/03/16 File Name: pra002.roc

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WESTRIDGE HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'A' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

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Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 470.500(Ft.)
Bottom (of initial area) elevation = 443.000(Ft.)
Difference in elevation = 27.500(Ft.)
Slope = 0.09167 s(%)= 9.17
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.148 min.
Rainfall intensity = 1.429(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.743
Subarea runoff = 0.276(CFS)
Total initial stream area = 0.260(Ac.)

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Process from Point/Station 101.000 to Point/Station 102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.933(CFS)
Depth of flow = 0.107(Ft.), Average velocity = 3.362(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 1.934(CFS)
' ' flow top width = 10.724(Ft.)

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  '     '    velocity=    3.362(Ft/s)
  '     '       area =      0.575(Sq.Ft)
  '     '       Froude number =     2.559

Upstream point elevation =   443.000(Ft.)
Downstream point elevation =   365.500(Ft.)
Flow length =   340.000(Ft.)
Travel time  =    1.69 min.
Time of concentration =   12.83 min.
Depth of flow =   0.107(Ft.)
Average velocity =   3.362(Ft/s)
Total irregular channel flow =     1.933(CFS)
Irregular channel normal depth above invert elev. =   0.107(Ft.)
Average velocity of channel(s) =   3.362(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.318(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.729
Subarea runoff =      3.222(CFS) for    3.380(Ac.)
Total runoff =      3.498(CFS)       Total area =        3.64(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.134(Ft.), Average velocity =   3.899(Ft/s)


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Process from Point/Station      102.000 to Point/Station      103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   365.500(Ft.)
End of street segment elevation =   355.000(Ft.)
Length of street segment  =   614.000(Ft.)
Height of curb above gutter flowline  =    4.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   6.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.021(CFS)
Depth of flow =   0.327(Ft.), Average velocity =   3.234(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.114(Ft.)
Flow velocity =   3.23(Ft/s)
Travel time =    3.16 min.     TC =   16.00  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.161(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.755
Subarea runoff =      2.965(CFS) for    3.730(Ac.)
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Total runoff =      6.463(CFS)        Total area =        7.37(Ac.)
Area averaged Fm value =    0.187(In/Hr)
Street flow at end of street =      6.463(CFS)
Half street flow at end of street =      6.463(CFS)
Depth of flow =   0.357(Ft.), Average velocity =   3.306(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.21(Ft.)
Flow width (from curb towards crown)=  13.622(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   349.000(Ft.)
Downstream point/station elevation =   337.000(Ft.)
Pipe length  =   254.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.463(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     6.463(CFS)
Normal flow depth in pipe =    5.88(In.)
Flow top width inside pipe =   20.64(In.)
Critical Depth =   10.81(In.)
Pipe flow velocity =     10.84(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    16.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.370(Ac.)
Runoff from this stream =      6.463(CFS)
Time of concentration =   16.39 min.
Rainfall intensity =     1.145(In/Hr)
Area averaged loss rate (Fm) =    0.1867(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7469


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Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   365.000(Ft.)
Bottom (of initial area) elevation =   362.500(Ft.)
Difference in elevation =     2.500(Ft.)
Slope =    0.00833  s(%)=       0.83
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.923 min.
Rainfall intensity =      1.527(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff =      1.010(CFS)
Total initial stream area =        0.800(Ac.)


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Process from Point/Station      106.000 to Point/Station      107.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
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Top of street segment elevation =   362.500(Ft.)
End of street segment elevation =   344.000(Ft.)
Length of street segment  =   554.000(Ft.)
Height of curb above gutter flowline  =    4.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   6.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.629(CFS)
Depth of flow =   0.215(Ft.), Average velocity =   3.229(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.476(Ft.)
Flow velocity =   3.23(Ft/s)
Travel time =    2.86 min.     TC =   12.78  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.321(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =      1.143(CFS) for    1.200(Ac.)
Total runoff =      2.152(CFS)       Total area =        2.00(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      2.152(CFS)
Half street flow at end of street =      2.152(CFS)
Depth of flow =   0.232(Ft.), Average velocity =   3.431(Ft/s)
Flow width (from curb towards crown)=   7.364(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   337.500(Ft.)
Downstream point/station elevation =   337.000(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.152(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     2.152(CFS)
Normal flow depth in pipe =    4.14(In.)
Flow top width inside pipe =   15.15(In.)
Critical Depth =    6.64(In.)
Pipe flow velocity =      7.01(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.82 min.


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Process from Point/Station      107.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.000(Ac.)
Runoff from this stream =      2.152(CFS)
Time of concentration =   12.82 min.
Rainfall intensity =     1.319(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
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Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      7.37     6.463     16.39    0.187      1.145
2      2.00     2.152     12.82    0.125      1.319
Qmax(1) =
          1.000 *    1.000 *     6.463) +
          0.855 *    1.000 *     2.152) + =       8.303
Qmax(2) =
          1.181 *    0.782 *     6.463) +
          1.000 *    1.000 *     2.152) + =       8.123

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.463       2.152
Maximum flow rates at confluence using above data:
        8.303        8.123
Area of streams before confluence:
        7.370        2.000
Effective area values after confluence:
        9.370        7.765
Results of confluence:
Total flow rate =      8.303(CFS)
Time of concentration =    16.389 min.
Effective stream area after confluence =      9.370(Ac.)
Study area average Pervious fraction(Ap) =  0.694
Study area average soil loss rate(Fm) =    0.174(In/Hr)
Study area total (this main stream) =       9.37(Ac.)


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Process from Point/Station      104.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   337.000(Ft.)
Downstream point/station elevation =   327.000(Ft.)
Pipe length  =   281.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.303(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     8.303(CFS)
Normal flow depth in pipe =    7.18(In.)
Flow top width inside pipe =   21.98(In.)
Critical Depth =   12.32(In.)
Pipe flow velocity =     10.52(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    16.83 min.


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Process from Point/Station      104.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      9.370(Ac.)
Runoff from this stream =      8.303(CFS)
Time of concentration =   16.83 min.
Rainfall intensity =     1.128(In/Hr)
Area averaged loss rate (Fm) =    0.1736(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6942


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      109.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
```

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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   531.000(Ft.)
Top (of initial area) elevation =   355.000(Ft.)
Bottom (of initial area) elevation =   334.000(Ft.)
Difference in elevation =    21.000(Ft.)
Slope =    0.03955  s(%)=       3.95
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.132 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.602(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff =      4.719(CFS)
Total initial stream area =        3.550(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   328.000(Ft.)
Downstream point/station elevation =   327.000(Ft.)
Pipe length  =    59.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.719(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.719(CFS)
Normal flow depth in pipe =    7.29(In.)
Flow top width inside pipe =   17.67(In.)
Critical Depth =   10.01(In.)
Pipe flow velocity =      7.03(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     9.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.550(Ac.)
Runoff from this stream =      4.719(CFS)
Time of concentration =    9.27 min.
Rainfall intensity =     1.588(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      9.37     8.303     16.83    0.174      1.128
2      3.55     4.719      9.27    0.125      1.588
Qmax(1) =
          1.000 *    1.000 *     8.303) +
          0.685 *    1.000 *     4.719) + =      11.537
Qmax(2) =
          1.482 *    0.551 *     8.303) +
          1.000 *    1.000 *     4.719) + =      11.499

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.303       4.719
Maximum flow rates at confluence using above data:
       11.537       11.499
```

```
Area of streams before confluence:
        9.370        3.550
Effective area values after confluence:
       12.920        8.711
Results of confluence:
Total flow rate =     11.537(CFS)
Time of concentration =    16.834 min.
Effective stream area after confluence =     12.920(Ac.)
Study area average Pervious fraction(Ap) =  0.641
Study area average soil loss rate(Fm) =    0.160(In/Hr)
Study area total (this main stream) =      12.92(Ac.)


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Process from Point/Station      108.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   327.000(Ft.)
Downstream point/station elevation =   310.000(Ft.)
Pipe length  =   212.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.537(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    11.537(CFS)
Normal flow depth in pipe =    6.90(In.)
Flow top width inside pipe =   21.72(In.)
Critical Depth =   14.64(In.)
Pipe flow velocity =     15.45(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    17.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     12.920(Ac.)
Runoff from this stream =     11.537(CFS)
Time of concentration =   17.06 min.
Rainfall intensity =     1.119(In/Hr)
Area averaged loss rate (Fm) =    0.1602(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6409


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      114.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   434.000(Ft.)
Top (of initial area) elevation =   356.000(Ft.)
Bottom (of initial area) elevation =   316.500(Ft.)
Difference in elevation =    39.500(Ft.)
Slope =    0.09101  s(%)=       9.10
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.131 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.846(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      1.177(CFS)
Total initial stream area =        0.760(Ac.)
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Process from Point/Station      114.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   310.500(Ft.)
Downstream point/station elevation =   310.000(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.177(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.177(CFS)
Normal flow depth in pipe =    3.52(In.)
Flow top width inside pipe =   14.29(In.)
Critical Depth =    4.87(In.)
Pipe flow velocity =      4.82(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     7.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.760(Ac.)
Runoff from this stream =      1.177(CFS)
Time of concentration =    7.23 min.
Rainfall intensity =     1.832(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   408.000(Ft.)
Top (of initial area) elevation =   336.000(Ft.)
Bottom (of initial area) elevation =   316.500(Ft.)
Difference in elevation =    19.500(Ft.)
Slope =    0.04779  s(%)=       4.78
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.913 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.739(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
Subarea runoff =      1.090(CFS)
Total initial stream area =        0.750(Ac.)


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Process from Point/Station      112.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   310.500(Ft.)
Downstream point/station elevation =   310.000(Ft.)
Pipe length  =    14.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.090(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.090(CFS)
Normal flow depth in pipe =    2.86(In.)
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Flow top width inside pipe =   13.17(In.)
Critical Depth =    4.67(In.)
Pipe flow velocity =      6.02(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     7.95 min.


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Process from Point/Station      112.000 to Point/Station      110.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.750(Ac.)
Runoff from this stream =      1.090(CFS)
Time of concentration =    7.95 min.
Rainfall intensity =     1.734(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     12.92    11.537     17.06    0.160      1.119
2      0.76     1.177      7.23    0.125      1.832
3      0.75     1.090      7.95    0.125      1.734
Qmax(1) =
          1.000 *    1.000 *    11.537) +
          0.582 *    1.000 *     1.177) +
          0.618 *    1.000 *     1.090) + =      12.896
Qmax(2) =
          1.744 *    0.424 *    11.537) +
          1.000 *    1.000 *     1.177) +
          1.061 *    0.909 *     1.090) + =      10.750
Qmax(3) =
          1.642 *    0.466 *    11.537) +
          0.943 *    1.000 *     1.177) +
          1.000 *    1.000 *     1.090) + =      11.028

Total of 3 streams to confluence:
Flow rates before confluence point:
      11.537       1.177       1.090
Maximum flow rates at confluence using above data:
       12.896       10.750       11.028
Area of streams before confluence:
       12.920        0.760        0.750
Effective area values after confluence:
       14.430        6.914        7.531
Results of confluence:
Total flow rate =     12.896(CFS)
Time of concentration =    17.062 min.
Effective stream area after confluence =     14.430(Ac.)
Study area average Pervious fraction(Ap) =  0.626
Study area average soil loss rate(Fm) =    0.157(In/Hr)
Study area total (this main stream) =      14.43(Ac.)


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Process from Point/Station      110.000 to Point/Station      115.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   310.000(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =   396.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.896(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    12.896(CFS)
Normal flow depth in pipe =   15.49(In.)
Flow top width inside pipe =   35.65(In.)
Critical Depth =   13.70(In.)
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Pipe flow velocity =      4.43(Ft/s)
Travel time through pipe =    1.49 min.
Time of concentration (TC) =    18.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      115.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.430(Ac.)
Runoff from this stream =     12.896(CFS)
Time of concentration =   18.55 min.
Rainfall intensity =     1.067(In/Hr)
Area averaged loss rate (Fm) =    0.1565(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6261
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      117.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   320.000(Ft.)
Bottom (of initial area) elevation =   318.000(Ft.)
Difference in elevation =     2.000(Ft.)
Slope =    0.00667  s(%)=       0.67
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.376 min.
Rainfall intensity =      1.489(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =      2.774(CFS)
Total initial stream area =        2.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      117.000 to Point/Station      115.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   318.000(Ft.)
End of street segment elevation =   309.000(Ft.)
Length of street segment  =   659.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.600(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   2.493(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.922(Ft.)
Flow velocity =   2.49(Ft/s)
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Travel time =    4.41 min.     TC =   14.78  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.215(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      3.544(CFS) for    4.180(Ac.)
Total runoff =      6.318(CFS)        Total area =        6.44(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      6.318(CFS)
Half street flow at end of street =      3.159(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   2.678(Ft/s)
Flow width (from curb towards crown)=  10.261(Ft.)


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Process from Point/Station      117.000 to Point/Station      115.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.440(Ac.)
Runoff from this stream =      6.318(CFS)
Time of concentration =   14.78 min.
Rainfall intensity =     1.215(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Program is now starting with Main Stream No. 3


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Process from Point/Station      118.000 to Point/Station      119.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   349.500(Ft.)
Bottom (of initial area) elevation =   343.000(Ft.)
Difference in elevation =     6.500(Ft.)
Slope =    0.02167  s(%)=       2.17
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.197 min.
Rainfall intensity =      1.705(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.834
Subarea runoff =      3.028(CFS)
Total initial stream area =        2.130(Ac.)


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Process from Point/Station      119.000 to Point/Station      120.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   343.000(Ft.)
End of street segment elevation =   317.000(Ft.)
Length of street segment  =   597.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.735(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   3.959(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.866(Ft.)
Flow velocity =   3.96(Ft/s)
Travel time =    2.51 min.     TC =   10.71  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.462(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      3.265(CFS) for    3.100(Ac.)
Total runoff =      6.293(CFS)       Total area =        5.23(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      6.293(CFS)
Half street flow at end of street =      3.146(CFS)
Depth of flow =   0.284(Ft.), Average velocity =   4.200(Ft/s)
Flow width (from curb towards crown)=   7.890(Ft.)


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Process from Point/Station      120.000 to Point/Station      121.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   311.000(Ft.)
Downstream point/station elevation =   310.000(Ft.)
Pipe length  =    79.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.293(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     6.293(CFS)
Normal flow depth in pipe =    9.34(In.)
Flow top width inside pipe =   17.99(In.)
Critical Depth =   11.63(In.)
Pipe flow velocity =      6.79(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    10.90 min.


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Process from Point/Station      120.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      5.230(Ac.)
Runoff from this stream =      6.293(CFS)
Time of concentration =   10.90 min.
Rainfall intensity =     1.447(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      111.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   491.000(Ft.)
Top (of initial area) elevation =   336.000(Ft.)
Bottom (of initial area) elevation =   316.500(Ft.)
Difference in elevation =    19.500(Ft.)
Slope =    0.03971  s(%)=       3.97
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.843 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.632(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.831
Subarea runoff =      0.692(CFS)
Total initial stream area =        0.510(Ac.)


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Process from Point/Station      111.000 to Point/Station      121.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      0.510(Ac.)
Runoff from this stream =      0.692(CFS)
Time of concentration =    8.84 min.
Rainfall intensity =     1.632(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      5.23     6.293     10.90    0.125      1.447
2      0.51     0.692      8.84    0.125      1.632
Qmax(1) =
          1.000 *    1.000 *     6.293) +
          0.877 *    1.000 *     0.692) + =       6.900
Qmax(2) =
          1.140 *    0.811 *     6.293) +
          1.000 *    1.000 *     0.692) + =       6.509

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.293       0.692
Maximum flow rates at confluence using above data:
        6.900        6.509
Area of streams before confluence:
        5.230        0.510
Effective area values after confluence:
        5.740        4.751
Results of confluence:
Total flow rate =      6.900(CFS)
Time of concentration =    10.904 min.
Effective stream area after confluence =      5.740(Ac.)
Study area average Pervious fraction(Ap) =  0.500
Study area average soil loss rate(Fm) =    0.125(In/Hr)
Study area total (this main stream) =       5.74(Ac.)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      115.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   310.000(Ft.)
Downstream point/station elevation =   309.000(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.900(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     6.900(CFS)
Normal flow depth in pipe =    8.31(In.)
Flow top width inside pipe =   17.95(In.)
Critical Depth =   12.19(In.)
Pipe flow velocity =      8.65(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      121.000 to Point/Station      115.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.740(Ac.)
Runoff from this stream =      6.900(CFS)
Time of concentration =   10.99 min.
Rainfall intensity =     1.441(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     14.43    12.896     18.55    0.157      1.067
2      6.44     6.318     14.78    0.125      1.215
3      5.74     6.900     10.99    0.125      1.441
Qmax(1) =
          1.000 *    1.000 *    12.896) +
          0.864 *    1.000 *     6.318) +
          0.716 *    1.000 *     6.900) + =      23.291
Qmax(2) =
          1.163 *    0.797 *    12.896) +
          1.000 *    1.000 *     6.318) +
          0.829 *    1.000 *     6.900) + =      23.988
Qmax(3) =
          1.411 *    0.592 *    12.896) +
          1.207 *    0.743 *     6.318) +
          1.000 *    1.000 *     6.900) + =      23.346

Total of 3 main streams to confluence:
Flow rates before confluence point:
      13.896       7.318       7.900
Maximum flow rates at confluence using above data:
       23.291       23.988       23.346
Area of streams before confluence:
       14.430        6.440        5.740
Effective area values after confluence:
       26.610       23.678       19.075


Results of confluence:
Total flow rate =     23.988(CFS)
Time of concentration =    14.782 min.
Effective stream area after confluence  =     23.678(Ac.)
Study area average Pervious fraction(Ap) =  0.568
Study area average soil loss rate(Fm) =    0.142(In/Hr)
Study area total =      26.61(Ac.)
```

++
Process from Point/Station 121.000 to Point/Station 115.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q = 23.988(CFS) is being used
Time of concentration = 14.78 min.
Rainfall intensity = 1.215(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.792
Subarea runoff = 0.000(CFS) for 0.790(Ac.)
Total runoff = 23.988(CFS) Total area = 24.47(Ac.)
Area averaged Fm value = 0.146(In/Hr)
End of computations, total study area = 27.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.581
Area averaged SCS curve number (AMC 2) = 70.6

U n i t H y d r o g r a p h A n a l y s i s

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Study date 02/08/18 File Name PRA00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6407

RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'A' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
70.6	27.4	1.00	C	0.250	0.581	0.145

Area-averaged adjusted loss rate Fm (In/Hr) = 0.145

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
15.91	0.581	70.6	51.7	9.33	0.002
11.48	0.419	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.374
Area-averaged low loss fraction, Yb = 0.626

++
User entry of time of concentration = 0.246 (hours)
Watershed area = 27.39(Ac.)
Catchment Lag time = 0.197 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 42.2926
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.145(In/Hr)
Average low loss rate fraction (Yb) = 0.626 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 27.39(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)

30-minute factor = 0.999 Adjusted rainfall = 0.399(In)
1-hour factor = 0.999 Adjusted rainfall = 0.529(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 331.25 (CFS))	
1	3.384	11.210
2	16.590	43.745
3	51.005	113.997
4	70.977	66.157
5	80.535	31.661
6	86.857	20.941
7	91.307	14.739
8	94.464	10.458
9	96.562	6.951
10	97.850	4.267
11	98.423	1.898
12	98.861	1.450
13	99.172	1.030
14	99.468	0.979
15	99.750	0.935
16	99.905	0.514
17	100.000	0.314

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2531	0.0633
3	0.2995	0.0464
4	0.3376	0.0380
5	0.3703	0.0328
6	0.3995	0.0291
7	0.4253	0.0258
8	0.4490	0.0237
9	0.4710	0.0220
10	0.4916	0.0206
11	0.5109	0.0194
12	0.5293	0.0184
13	0.5497	0.0204
14	0.5693	0.0196
15	0.5882	0.0189
16	0.6064	0.0182
17	0.6241	0.0176
18	0.6412	0.0171
19	0.6578	0.0166
20	0.6739	0.0161
21	0.6897	0.0157
22	0.7050	0.0153
23	0.7200	0.0150
24	0.7346	0.0146
25	0.7489	0.0143
26	0.7629	0.0140
27	0.7767	0.0137
28	0.7902	0.0135
29	0.8034	0.0132
30	0.8164	0.0130
31	0.8291	0.0128
32	0.8417	0.0125
33	0.8540	0.0123
34	0.8661	0.0121
35	0.8781	0.0120
36	0.8899	0.0118
37	0.9010	0.0112

38	0.9120	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9441	0.0106
42	0.9545	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0143	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0611	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1312	0.0085
62	1.1396	0.0084
63	1.1480	0.0083
64	1.1562	0.0083
65	1.1644	0.0082
66	1.1725	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2448	0.0062
77	1.2509	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3586	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051
102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051
105	1.4050	0.0050
106	1.4100	0.0050
107	1.4149	0.0050
108	1.4199	0.0049

109	1.4248	0.0049
110	1.4297	0.0049
111	1.4345	0.0049
112	1.4393	0.0048
113	1.4441	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4677	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4907	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5042	0.0045
127	1.5087	0.0045
128	1.5131	0.0044
129	1.5176	0.0044
130	1.5219	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5521	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5689	0.0042
142	1.5731	0.0042
143	1.5772	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5895	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6411	0.0039
160	1.6450	0.0039
161	1.6488	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6790	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6901	0.0037
173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036
176	1.7047	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036

180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7298	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7508	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7646	0.0034
194	1.7680	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7782	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7883	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8016	0.0033
205	1.8049	0.0033
206	1.8082	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8180	0.0033
210	1.8213	0.0033
211	1.8245	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8501	0.0032
220	1.8533	0.0032
221	1.8564	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8658	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8782	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8996	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9176	0.0030
242	1.9206	0.0030
243	1.9236	0.0030
244	1.9266	0.0030
245	1.9295	0.0030
246	1.9324	0.0029
247	1.9354	0.0029
248	1.9383	0.0029
249	1.9412	0.0029
250	1.9442	0.0029

251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9557	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9870	0.0028
266	1.9898	0.0028
267	1.9926	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0120	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0311	0.0027
282	2.0338	0.0027
283	2.0365	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0017	0.0010
2	0.0027	0.0017	0.0010
3	0.0027	0.0017	0.0010
4	0.0027	0.0017	0.0010
5	0.0027	0.0017	0.0010
6	0.0027	0.0017	0.0010
7	0.0027	0.0017	0.0010
8	0.0027	0.0017	0.0010
9	0.0027	0.0017	0.0010
10	0.0027	0.0017	0.0010
11	0.0028	0.0017	0.0010
12	0.0028	0.0017	0.0010
13	0.0028	0.0017	0.0010
14	0.0028	0.0017	0.0010
15	0.0028	0.0018	0.0010
16	0.0028	0.0018	0.0010
17	0.0028	0.0018	0.0011
18	0.0028	0.0018	0.0011
19	0.0028	0.0018	0.0011
20	0.0028	0.0018	0.0011
21	0.0029	0.0018	0.0011
22	0.0029	0.0018	0.0011
23	0.0029	0.0018	0.0011
24	0.0029	0.0018	0.0011
25	0.0029	0.0018	0.0011
26	0.0029	0.0018	0.0011
27	0.0029	0.0018	0.0011
28	0.0029	0.0018	0.0011

29	0.0029	0.0018	0.0011
30	0.0030	0.0018	0.0011
31	0.0030	0.0019	0.0011
32	0.0030	0.0019	0.0011
33	0.0030	0.0019	0.0011
34	0.0030	0.0019	0.0011
35	0.0030	0.0019	0.0011
36	0.0030	0.0019	0.0011
37	0.0030	0.0019	0.0011
38	0.0030	0.0019	0.0011
39	0.0031	0.0019	0.0011
40	0.0031	0.0019	0.0011
41	0.0031	0.0019	0.0012
42	0.0031	0.0019	0.0012
43	0.0031	0.0020	0.0012
44	0.0031	0.0020	0.0012
45	0.0031	0.0020	0.0012
46	0.0031	0.0020	0.0012
47	0.0032	0.0020	0.0012
48	0.0032	0.0020	0.0012
49	0.0032	0.0020	0.0012
50	0.0032	0.0020	0.0012
51	0.0032	0.0020	0.0012
52	0.0032	0.0020	0.0012
53	0.0033	0.0020	0.0012
54	0.0033	0.0020	0.0012
55	0.0033	0.0021	0.0012
56	0.0033	0.0021	0.0012
57	0.0033	0.0021	0.0012
58	0.0033	0.0021	0.0012
59	0.0033	0.0021	0.0012
60	0.0034	0.0021	0.0013
61	0.0034	0.0021	0.0013
62	0.0034	0.0021	0.0013
63	0.0034	0.0021	0.0013
64	0.0034	0.0021	0.0013
65	0.0034	0.0022	0.0013
66	0.0035	0.0022	0.0013
67	0.0035	0.0022	0.0013
68	0.0035	0.0022	0.0013
69	0.0035	0.0022	0.0013
70	0.0035	0.0022	0.0013
71	0.0035	0.0022	0.0013
72	0.0036	0.0022	0.0013
73	0.0036	0.0022	0.0013
74	0.0036	0.0023	0.0013
75	0.0036	0.0023	0.0014
76	0.0036	0.0023	0.0014
77	0.0037	0.0023	0.0014
78	0.0037	0.0023	0.0014
79	0.0037	0.0023	0.0014
80	0.0037	0.0023	0.0014
81	0.0037	0.0023	0.0014
82	0.0038	0.0024	0.0014
83	0.0038	0.0024	0.0014
84	0.0038	0.0024	0.0014
85	0.0038	0.0024	0.0014
86	0.0038	0.0024	0.0014
87	0.0039	0.0024	0.0014
88	0.0039	0.0024	0.0015
89	0.0039	0.0025	0.0015
90	0.0039	0.0025	0.0015
91	0.0040	0.0025	0.0015
92	0.0040	0.0025	0.0015
93	0.0040	0.0025	0.0015
94	0.0040	0.0025	0.0015
95	0.0041	0.0025	0.0015
96	0.0041	0.0026	0.0015
97	0.0041	0.0026	0.0015
98	0.0041	0.0026	0.0015
99	0.0042	0.0026	0.0016

100	0.0042	0.0026	0.0016
101	0.0042	0.0027	0.0016
102	0.0043	0.0027	0.0016
103	0.0043	0.0027	0.0016
104	0.0043	0.0027	0.0016
105	0.0044	0.0027	0.0016
106	0.0044	0.0027	0.0016
107	0.0044	0.0028	0.0017
108	0.0044	0.0028	0.0017
109	0.0045	0.0028	0.0017
110	0.0045	0.0028	0.0017
111	0.0045	0.0028	0.0017
112	0.0046	0.0029	0.0017
113	0.0046	0.0029	0.0017
114	0.0046	0.0029	0.0017
115	0.0047	0.0029	0.0018
116	0.0047	0.0030	0.0018
117	0.0048	0.0030	0.0018
118	0.0048	0.0030	0.0018
119	0.0049	0.0030	0.0018
120	0.0049	0.0031	0.0018
121	0.0049	0.0031	0.0018
122	0.0050	0.0031	0.0019
123	0.0050	0.0031	0.0019
124	0.0051	0.0032	0.0019
125	0.0051	0.0032	0.0019
126	0.0051	0.0032	0.0019
127	0.0052	0.0033	0.0019
128	0.0052	0.0033	0.0020
129	0.0053	0.0033	0.0020
130	0.0054	0.0034	0.0020
131	0.0054	0.0034	0.0020
132	0.0055	0.0034	0.0020
133	0.0055	0.0035	0.0021
134	0.0056	0.0035	0.0021
135	0.0057	0.0035	0.0021
136	0.0057	0.0036	0.0021
137	0.0058	0.0036	0.0022
138	0.0058	0.0036	0.0022
139	0.0059	0.0037	0.0022
140	0.0060	0.0037	0.0022
141	0.0061	0.0038	0.0023
142	0.0061	0.0038	0.0023
143	0.0062	0.0039	0.0023
144	0.0063	0.0039	0.0023
145	0.0077	0.0048	0.0029
146	0.0078	0.0049	0.0029
147	0.0079	0.0050	0.0030
148	0.0080	0.0050	0.0030
149	0.0081	0.0051	0.0030
150	0.0082	0.0051	0.0031
151	0.0083	0.0052	0.0031
152	0.0084	0.0053	0.0031
153	0.0086	0.0054	0.0032
154	0.0086	0.0054	0.0032
155	0.0088	0.0055	0.0033
156	0.0089	0.0056	0.0033
157	0.0091	0.0057	0.0034
158	0.0092	0.0057	0.0034
159	0.0094	0.0059	0.0035
160	0.0095	0.0059	0.0035
161	0.0097	0.0061	0.0036
162	0.0098	0.0061	0.0037
163	0.0100	0.0063	0.0037
164	0.0101	0.0064	0.0038
165	0.0104	0.0065	0.0039
166	0.0106	0.0066	0.0039
167	0.0108	0.0068	0.0041
168	0.0110	0.0069	0.0041
169	0.0118	0.0074	0.0044
170	0.0120	0.0075	0.0045

171	0.0123	0.0077	0.0046
172	0.0125	0.0079	0.0047
173	0.0130	0.0081	0.0049
174	0.0132	0.0083	0.0049
175	0.0137	0.0086	0.0051
176	0.0140	0.0088	0.0052
177	0.0146	0.0092	0.0055
178	0.0150	0.0094	0.0056
179	0.0157	0.0098	0.0059
180	0.0161	0.0101	0.0060
181	0.0171	0.0107	0.0064
182	0.0176	0.0110	0.0066
183	0.0189	0.0118	0.0071
184	0.0196	0.0121	0.0075
185	0.0184	0.0115	0.0069
186	0.0194	0.0121	0.0073
187	0.0220	0.0121	0.0099
188	0.0237	0.0121	0.0116
189	0.0291	0.0121	0.0170
190	0.0328	0.0121	0.0207
191	0.0464	0.0121	0.0343
192	0.0633	0.0121	0.0512
193	0.1898	0.0121	0.1777
194	0.0380	0.0121	0.0259
195	0.0258	0.0121	0.0137
196	0.0206	0.0121	0.0085
197	0.0204	0.0121	0.0083
198	0.0182	0.0114	0.0068
199	0.0166	0.0104	0.0062
200	0.0153	0.0096	0.0057
201	0.0143	0.0090	0.0054
202	0.0135	0.0084	0.0050
203	0.0128	0.0080	0.0048
204	0.0121	0.0076	0.0045
205	0.0112	0.0070	0.0042
206	0.0107	0.0067	0.0040
207	0.0103	0.0064	0.0038
208	0.0099	0.0062	0.0037
209	0.0096	0.0060	0.0036
210	0.0093	0.0058	0.0035
211	0.0090	0.0056	0.0034
212	0.0087	0.0055	0.0033
213	0.0085	0.0053	0.0032
214	0.0083	0.0052	0.0031
215	0.0081	0.0050	0.0030
216	0.0079	0.0049	0.0029
217	0.0063	0.0040	0.0024
218	0.0062	0.0039	0.0023
219	0.0060	0.0038	0.0022
220	0.0059	0.0037	0.0022
221	0.0057	0.0036	0.0021
222	0.0056	0.0035	0.0021
223	0.0055	0.0034	0.0021
224	0.0054	0.0034	0.0020
225	0.0053	0.0033	0.0020
226	0.0052	0.0032	0.0019
227	0.0051	0.0032	0.0019
228	0.0050	0.0031	0.0019
229	0.0049	0.0031	0.0018
230	0.0048	0.0030	0.0018
231	0.0047	0.0030	0.0018
232	0.0047	0.0029	0.0017
233	0.0046	0.0029	0.0017
234	0.0045	0.0028	0.0017
235	0.0045	0.0028	0.0017
236	0.0044	0.0028	0.0016
237	0.0043	0.0027	0.0016
238	0.0043	0.0027	0.0016
239	0.0042	0.0026	0.0016
240	0.0042	0.0026	0.0016
241	0.0041	0.0026	0.0015

242	0.0041	0.0025	0.0015
243	0.0040	0.0025	0.0015
244	0.0040	0.0025	0.0015
245	0.0039	0.0024	0.0015
246	0.0039	0.0024	0.0014
247	0.0038	0.0024	0.0014
248	0.0038	0.0024	0.0014
249	0.0037	0.0023	0.0014
250	0.0037	0.0023	0.0014
251	0.0036	0.0023	0.0014
252	0.0036	0.0023	0.0013
253	0.0036	0.0022	0.0013
254	0.0035	0.0022	0.0013
255	0.0035	0.0022	0.0013
256	0.0035	0.0022	0.0013
257	0.0034	0.0021	0.0013
258	0.0034	0.0021	0.0013
259	0.0034	0.0021	0.0013
260	0.0033	0.0021	0.0012
261	0.0033	0.0021	0.0012
262	0.0033	0.0020	0.0012
263	0.0032	0.0020	0.0012
264	0.0032	0.0020	0.0012
265	0.0032	0.0020	0.0012
266	0.0032	0.0020	0.0012
267	0.0031	0.0020	0.0012
268	0.0031	0.0019	0.0012
269	0.0031	0.0019	0.0012
270	0.0031	0.0019	0.0011
271	0.0030	0.0019	0.0011
272	0.0030	0.0019	0.0011
273	0.0030	0.0019	0.0011
274	0.0030	0.0019	0.0011
275	0.0029	0.0018	0.0011
276	0.0029	0.0018	0.0011
277	0.0029	0.0018	0.0011
278	0.0029	0.0018	0.0011
279	0.0029	0.0018	0.0011
280	0.0028	0.0018	0.0011
281	0.0028	0.0018	0.0011
282	0.0028	0.0017	0.0010
283	0.0028	0.0017	0.0010
284	0.0028	0.0017	0.0010
285	0.0027	0.0017	0.0010
286	0.0027	0.0017	0.0010
287	0.0027	0.0017	0.0010
288	0.0027	0.0017	0.0010

Total soil rain loss = 1.10(In)
Total effective rainfall = 0.95(In)
Peak flow rate in flood hydrograph = 26.97(CFS)

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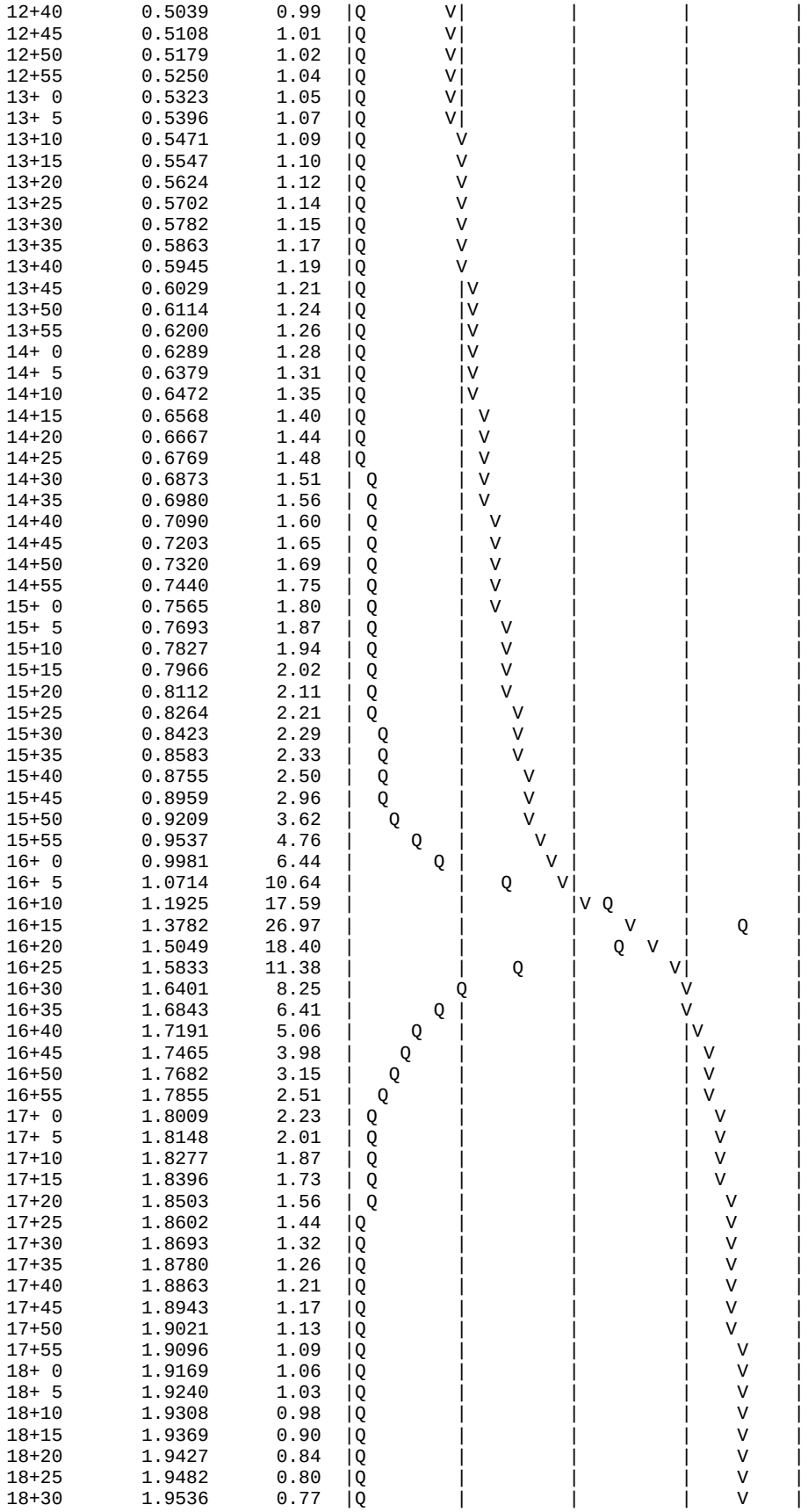
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0005	0.05	Q	|	|	|	|
0+15	0.0016	0.17	Q	|	|	|	|
0+20	0.0032	0.24	Q	|	|	|	|
0+25	0.0051	0.27	Q	|	|	|	|
0+30	0.0071	0.29	Q	|	|	|	|
0+35	0.0092	0.30	Q	|	|	|	|
0+40	0.0113	0.32	Q	|	|	|	|
0+45	0.0136	0.32	Q	|	|	|	|

0+50	0.0158	0.33	Q	|	|	|	|
0+55	0.0181	0.33	Q	|	|	|	|
1+ 0	0.0204	0.34	Q	|	|	|	|
1+ 5	0.0228	0.34	Q	|	|	|	|
1+10	0.0251	0.34	Q	|	|	|	|
1+15	0.0275	0.34	Q	|	|	|	|
1+20	0.0298	0.34	Q	|	|	|	|
1+25	0.0322	0.34	Q	|	|	|	|
1+30	0.0346	0.35	Q	|	|	|	|
1+35	0.0370	0.35	Q	|	|	|	|
1+40	0.0394	0.35	Q	|	|	|	|
1+45	0.0418	0.35	Q	|	|	|	|
1+50	0.0442	0.35	Q	|	|	|	|
1+55	0.0466	0.35	Q	|	|	|	|
2+ 0	0.0491	0.35	Q	|	|	|	|
2+ 5	0.0515	0.35	Q	|	|	|	|
2+10	0.0540	0.36	Q	|	|	|	|
2+15	0.0564	0.36	QV	|	|	|	|
2+20	0.0589	0.36	QV	|	|	|	|
2+25	0.0614	0.36	QV	|	|	|	|
2+30	0.0639	0.36	QV	|	|	|	|
2+35	0.0664	0.36	QV	|	|	|	|
2+40	0.0689	0.36	QV	|	|	|	|
2+45	0.0714	0.37	QV	|	|	|	|
2+50	0.0739	0.37	QV	|	|	|	|
2+55	0.0765	0.37	QV	|	|	|	|
3+ 0	0.0790	0.37	QV	|	|	|	|
3+ 5	0.0816	0.37	QV	|	|	|	|
3+10	0.0841	0.37	QV	|	|	|	|
3+15	0.0867	0.37	QV	|	|	|	|
3+20	0.0893	0.38	QV	|	|	|	|
3+25	0.0919	0.38	QV	|	|	|	|
3+30	0.0945	0.38	QV	|	|	|	|
3+35	0.0971	0.38	QV	|	|	|	|
3+40	0.0997	0.38	QV	|	|	|	|
3+45	0.1024	0.38	QV	|	|	|	|
3+50	0.1050	0.39	QV	|	|	|	|
3+55	0.1077	0.39	QV	|	|	|	|
4+ 0	0.1104	0.39	Q V	|	|	|	|
4+ 5	0.1131	0.39	Q V	|	|	|	|
4+10	0.1158	0.39	Q V	|	|	|	|
4+15	0.1185	0.39	Q V	|	|	|	|
4+20	0.1212	0.40	Q V	|	|	|	|
4+25	0.1239	0.40	Q V	|	|	|	|
4+30	0.1267	0.40	Q V	|	|	|	|
4+35	0.1294	0.40	Q V	|	|	|	|
4+40	0.1322	0.40	Q V	|	|	|	|
4+45	0.1350	0.40	Q V	|	|	|	|
4+50	0.1378	0.41	Q V	|	|	|	|
4+55	0.1406	0.41	Q V	|	|	|	|
5+ 0	0.1434	0.41	Q V	|	|	|	|
5+ 5	0.1462	0.41	Q V	|	|	|	|
5+10	0.1491	0.41	Q V	|	|	|	|
5+15	0.1519	0.42	Q V	|	|	|	|
5+20	0.1548	0.42	Q V	|	|	|	|
5+25	0.1577	0.42	Q V	|	|	|	|
5+30	0.1606	0.42	Q V	|	|	|	|
5+35	0.1635	0.42	Q V	|	|	|	|
5+40	0.1665	0.43	Q V	|	|	|	|
5+45	0.1694	0.43	Q V	|	|	|	|
5+50	0.1724	0.43	Q V	|	|	|	|
5+55	0.1753	0.43	Q V	|	|	|	|
6+ 0	0.1783	0.43	Q V	|	|	|	|
6+ 5	0.1813	0.44	Q V	|	|	|	|
6+10	0.1843	0.44	Q V	|	|	|	|
6+15	0.1874	0.44	Q V	|	|	|	|
6+20	0.1904	0.44	Q V	|	|	|	|
6+25	0.1935	0.45	Q V	|	|	|	|
6+30	0.1966	0.45	Q V	|	|	|	|
6+35	0.1997	0.45	Q V	|	|	|	|
6+40	0.2028	0.45	Q V	|	|	|	|

6+45	0.2059	0.45	Q V	|	|	|	|
6+50	0.2091	0.46	Q V	|	|	|	|
6+55	0.2122	0.46	Q V	|	|	|	|
7+ 0	0.2154	0.46	Q V	|	|	|	|
7+ 5	0.2186	0.47	Q V	|	|	|	|
7+10	0.2218	0.47	Q V	|	|	|	|
7+15	0.2251	0.47	Q V	|	|	|	|
7+20	0.2283	0.47	Q V	|	|	|	|
7+25	0.2316	0.48	Q V	|	|	|	|
7+30	0.2349	0.48	Q V	|	|	|	|
7+35	0.2382	0.48	Q V	|	|	|	|
7+40	0.2416	0.48	Q V	|	|	|	|
7+45	0.2449	0.49	Q V	|	|	|	|
7+50	0.2483	0.49	Q V	|	|	|	|
7+55	0.2517	0.49	Q V	|	|	|	|
8+ 0	0.2551	0.50	Q V	|	|	|	|
8+ 5	0.2586	0.50	Q V	|	|	|	|
8+10	0.2620	0.50	Q V	|	|	|	|
8+15	0.2655	0.51	Q V	|	|	|	|
8+20	0.2690	0.51	Q V	|	|	|	|
8+25	0.2725	0.51	Q V	|	|	|	|
8+30	0.2761	0.52	Q V	|	|	|	|
8+35	0.2797	0.52	Q V	|	|	|	|
8+40	0.2833	0.52	Q V	|	|	|	|
8+45	0.2869	0.53	Q V	|	|	|	|
8+50	0.2906	0.53	Q V	|	|	|	|
8+55	0.2942	0.53	Q V	|	|	|	|
9+ 0	0.2979	0.54	Q V	|	|	|	|
9+ 5	0.3017	0.54	Q V	|	|	|	|
9+10	0.3054	0.55	Q V	|	|	|	|
9+15	0.3092	0.55	Q V	|	|	|	|
9+20	0.3130	0.55	Q V	|	|	|	|
9+25	0.3169	0.56	Q V	|	|	|	|
9+30	0.3207	0.56	Q V	|	|	|	|
9+35	0.3246	0.57	Q V	|	|	|	|
9+40	0.3286	0.57	Q V	|	|	|	|
9+45	0.3325	0.58	Q V	|	|	|	|
9+50	0.3365	0.58	Q V	|	|	|	|
9+55	0.3406	0.58	Q V	|	|	|	|
10+ 0	0.3446	0.59	Q V	|	|	|	|
10+ 5	0.3487	0.59	Q V	|	|	|	|
10+10	0.3528	0.60	Q V	|	|	|	|
10+15	0.3570	0.60	Q V	|	|	|	|
10+20	0.3612	0.61	Q V	|	|	|	|
10+25	0.3654	0.62	Q V	|	|	|	|
10+30	0.3697	0.62	Q V	|	|	|	|
10+35	0.3740	0.63	Q V	|	|	|	|
10+40	0.3784	0.63	Q V	|	|	|	|
10+45	0.3828	0.64	Q V	|	|	|	|
10+50	0.3872	0.64	Q V	|	|	|	|
10+55	0.3917	0.65	Q V	|	|	|	|
11+ 0	0.3962	0.66	Q V	|	|	|	|
11+ 5	0.4008	0.66	Q V	|	|	|	|
11+10	0.4054	0.67	Q V	|	|	|	|
11+15	0.4101	0.68	Q V	|	|	|	|
11+20	0.4148	0.68	Q V	|	|	|	|
11+25	0.4195	0.69	Q V	|	|	|	|
11+30	0.4243	0.70	Q V	|	|	|	|
11+35	0.4292	0.71	Q V	|	|	|	|
11+40	0.4341	0.71	Q V	|	|	|	|
11+45	0.4391	0.72	Q V	|	|	|	|
11+50	0.4441	0.73	Q V	|	|	|	|
11+55	0.4492	0.74	Q V	|	|	|	|
12+ 0	0.4544	0.75	Q V	|	|	|	|
12+ 5	0.4596	0.76	|Q V	|	|	|	|
12+10	0.4651	0.79	|Q V	|	|	|	|
12+15	0.4710	0.86	|Q V	|	|	|	|
12+20	0.4773	0.91	|Q V	|	|	|	|
12+25	0.4837	0.93	|Q V	|	|	|	|
12+30	0.4903	0.96	|Q V	|	|	|	|
12+35	0.4970	0.98	|Q V	|	|	|	|



18+35	1.9587	0.75	Q	|	|	|	V |
18+40	1.9637	0.73	Q	|	|	|	V |
18+45	1.9686	0.71	Q	|	|	|	V |
18+50	1.9733	0.69	Q	|	|	|	V |
18+55	1.9780	0.67	Q	|	|	|	V |
19+ 0	1.9825	0.66	Q	|	|	|	V |
19+ 5	1.9870	0.65	Q	|	|	|	V |
19+10	1.9913	0.63	Q	|	|	|	V |
19+15	1.9956	0.62	Q	|	|	|	V |
19+20	1.9998	0.61	Q	|	|	|	V |
19+25	2.0039	0.60	Q	|	|	|	V |
19+30	2.0080	0.59	Q	|	|	|	V |
19+35	2.0120	0.58	Q	|	|	|	V |
19+40	2.0159	0.57	Q	|	|	|	V |
19+45	2.0198	0.56	Q	|	|	|	V |
19+50	2.0236	0.55	Q	|	|	|	V |
19+55	2.0274	0.55	Q	|	|	|	V |
20+ 0	2.0311	0.54	Q	|	|	|	V |
20+ 5	2.0348	0.53	Q	|	|	|	V |
20+10	2.0384	0.52	Q	|	|	|	V |
20+15	2.0419	0.52	Q	|	|	|	V |
20+20	2.0454	0.51	Q	|	|	|	V |
20+25	2.0489	0.50	Q	|	|	|	V |
20+30	2.0523	0.50	Q	|	|	|	V |
20+35	2.0557	0.49	Q	|	|	|	V |
20+40	2.0590	0.48	Q	|	|	|	V |
20+45	2.0623	0.48	Q	|	|	|	V |
20+50	2.0656	0.47	Q	|	|	|	V |
20+55	2.0688	0.47	Q	|	|	|	V |
21+ 0	2.0720	0.46	Q	|	|	|	V |
21+ 5	2.0752	0.46	Q	|	|	|	V |
21+10	2.0783	0.45	Q	|	|	|	V |
21+15	2.0814	0.45	Q	|	|	|	V |
21+20	2.0844	0.44	Q	|	|	|	V |
21+25	2.0874	0.44	Q	|	|	|	V |
21+30	2.0904	0.43	Q	|	|	|	V |
21+35	2.0934	0.43	Q	|	|	|	V |
21+40	2.0963	0.43	Q	|	|	|	V |
21+45	2.0992	0.42	Q	|	|	|	V |
21+50	2.1021	0.42	Q	|	|	|	V |
21+55	2.1049	0.41	Q	|	|	|	V |
22+ 0	2.1077	0.41	Q	|	|	|	V |
22+ 5	2.1105	0.41	Q	|	|	|	V |
22+10	2.1133	0.40	Q	|	|	|	V |
22+15	2.1161	0.40	Q	|	|	|	V |
22+20	2.1188	0.40	Q	|	|	|	V |
22+25	2.1215	0.39	Q	|	|	|	V |
22+30	2.1242	0.39	Q	|	|	|	V|
22+35	2.1268	0.39	Q	|	|	|	V|
22+40	2.1294	0.38	Q	|	|	|	V|
22+45	2.1320	0.38	Q	|	|	|	V|
22+50	2.1346	0.38	Q	|	|	|	V|
22+55	2.1372	0.37	Q	|	|	|	V|
23+ 0	2.1397	0.37	Q	|	|	|	V|
23+ 5	2.1423	0.37	Q	|	|	|	V|
23+10	2.1448	0.36	Q	|	|	|	V|
23+15	2.1473	0.36	Q	|	|	|	V|
23+20	2.1497	0.36	Q	|	|	|	V|
23+25	2.1522	0.36	Q	|	|	|	V|
23+30	2.1546	0.35	Q	|	|	|	V|
23+35	2.1571	0.35	Q	|	|	|	V|
23+40	2.1595	0.35	Q	|	|	|	V|
23+45	2.1618	0.35	Q	|	|	|	V|
23+50	2.1642	0.34	Q	|	|	|	V|
23+55	2.1666	0.34	Q	|	|	|	V|
24+ 0	2.1689	0.34	Q	|	|	|	V|
24+ 5	2.1711	0.33	Q	|	|	|	V|
24+10	2.1731	0.28	Q	|	|	|	V|
24+15	2.1742	0.16	Q	|	|	|	V|
24+20	2.1749	0.10	Q	|	|	|	V|
24+25	2.1753	0.07	Q	|	|	|	V|

24+30	2.1756	0.04	Q	|	|	|	V|
24+35	2.1758	0.03	Q	|	|	|	V|
24+40	2.1759	0.02	Q	|	|	|	V|
24+45	2.1760	0.01	Q	|	|	|	V|
24+50	2.1761	0.01	Q	|	|	|	V|
24+55	2.1761	0.01	Q	|	|	|	V|
25+ 0	2.1761	0.00	Q	|	|	|	V|
25+ 5	2.1762	0.00	Q	|	|	|	V|
25+10	2.1762	0.00	Q	|	|	|	V|
25+15	2.1762	0.00	Q	|	|	|	V|
25+20	2.1762	0.00	Q	|	|	|	V|

FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 02/08/18

RANCHO LA HABRA HYDROLOGY STUDY
BASIN 'A' ROUTING - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Program License Serial Number 6407

********** HYDROGRAPH INFORMATION **********

From study/file name: pra00224.rte
**********HYDROGRAPH DATA**********
Number of intervals = 304
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 26.969 (CFS)
Total volume = 2.176 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 101.000 to Point/Station 100.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 304
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.500	0.066	0.924	0.063	0.069
1.000	0.176	0.924	0.173	0.179
2.000	0.459	0.924	0.456	0.462
3.000	0.781	0.924	0.778	0.784
3.400	0.925	0.924	0.922	0.928
3.500	0.980	9.451	0.947	1.013
3.750	1.052	16.877	0.994	1.110
4.000	1.142	21.811	1.067	1.217
5.000	1.546	40.920	1.405	1.687
6.000	1.992	56.186	1.799	2.185

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	6.7	13.48	20.23	26.97	Depth (Ft.)
0.083	0.01	0.00	0.000	O					0.00
0.167	0.05	0.00	0.000	O					0.00
0.250	0.17	0.01	0.001	O					0.01
0.333	0.24	0.03	0.002	O					0.02
0.417	0.27	0.05	0.004	O					0.03
0.500	0.29	0.07	0.005	O					0.04
0.583	0.30	0.09	0.007	O					0.05
0.667	0.32	0.11	0.008	O					0.06
0.750	0.32	0.13	0.009	O					0.07
0.833	0.33	0.15	0.011	O					0.08
0.917	0.33	0.17	0.012	O					0.09
1.000	0.34	0.18	0.013	O					0.10
1.083	0.34	0.20	0.014	O					0.11
1.167	0.34	0.21	0.015	O					0.11
1.250	0.34	0.22	0.016	O					0.12
1.333	0.34	0.23	0.017	O					0.13
1.417	0.34	0.24	0.017	O					0.13
1.500	0.35	0.25	0.018	O					0.14
1.583	0.35	0.26	0.019	O					0.14
1.667	0.35	0.27	0.019	O					0.15
1.750	0.35	0.28	0.020	O					0.15
1.833	0.35	0.28	0.020	O					0.15
1.917	0.35	0.29	0.021	O					0.16
2.000	0.35	0.30	0.021	O					0.16
2.083	0.35	0.30	0.021	O					0.16
2.167	0.36	0.31	0.022	O					0.17
2.250	0.36	0.31	0.022	O					0.17
2.333	0.36	0.31	0.022	O					0.17
2.417	0.36	0.32	0.023	O					0.17
2.500	0.36	0.32	0.023	O					0.17
2.583	0.36	0.33	0.023	O					0.18
2.667	0.36	0.33	0.024	O					0.18
2.750	0.37	0.33	0.024	O					0.18
2.833	0.37	0.34	0.024	O					0.18
2.917	0.37	0.34	0.024	O					0.18
3.000	0.37	0.34	0.024	O					0.18
3.083	0.37	0.34	0.025	O					0.19
3.167	0.37	0.35	0.025	O					0.19
3.250	0.37	0.35	0.025	O					0.19
3.333	0.38	0.35	0.025	O					0.19
3.417	0.38	0.35	0.025	O					0.19
3.500	0.38	0.36	0.025	O					0.19
3.583	0.38	0.36	0.026	O					0.19
3.667	0.38	0.36	0.026	O					0.20
3.750	0.38	0.36	0.026	O					0.20
3.833	0.39	0.36	0.026	O					0.20
3.917	0.39	0.37	0.026	O					0.20
4.000	0.39	0.37	0.026	O					0.20
4.083	0.39	0.37	0.026	O					0.20
4.167	0.39	0.37	0.027	O					0.20
4.250	0.39	0.37	0.027	O					0.20
4.333	0.40	0.38	0.027	O					0.20
4.417	0.40	0.38	0.027	O					0.20
4.500	0.40	0.38	0.027	O					0.21
4.583	0.40	0.38	0.027	O					0.21
4.667	0.40	0.38	0.027	O					0.21
4.750	0.40	0.39	0.028	O					0.21
4.833	0.41	0.39	0.028	O					0.21
4.917	0.41	0.39	0.028	O					0.21
5.000	0.41	0.39	0.028	O					0.21
5.083	0.41	0.39	0.028	O					0.21
5.167	0.41	0.39	0.028	O					0.21
5.250	0.42	0.40	0.028	O					0.21
5.333	0.42	0.40	0.028	O					0.22
5.417	0.42	0.40	0.029	O					0.22
5.500	0.42	0.40	0.029	O					0.22
5.583	0.42	0.40	0.029	O					0.22

5.667	0.43	0.41	0.029	O				0.22
5.750	0.43	0.41	0.029	O				0.22
5.833	0.43	0.41	0.029	O				0.22
5.917	0.43	0.41	0.029	O				0.22
6.000	0.43	0.41	0.030	O				0.22
6.083	0.44	0.42	0.030	O				0.22
6.167	0.44	0.42	0.030	O				0.23
6.250	0.44	0.42	0.030	O				0.23
6.333	0.44	0.42	0.030	O				0.23
6.417	0.45	0.42	0.030	O				0.23
6.500	0.45	0.43	0.030	O				0.23
6.583	0.45	0.43	0.031	O				0.23
6.667	0.45	0.43	0.031	O				0.23
6.750	0.45	0.43	0.031	O				0.23
6.833	0.46	0.43	0.031	O				0.23
6.917	0.46	0.44	0.031	O				0.24
7.000	0.46	0.44	0.031	O				0.24
7.083	0.47	0.44	0.032	O				0.24
7.167	0.47	0.44	0.032	O				0.24
7.250	0.47	0.45	0.032	O				0.24
7.333	0.47	0.45	0.032	O				0.24
7.417	0.48	0.45	0.032	O				0.24
7.500	0.48	0.45	0.032	O				0.25
7.583	0.48	0.46	0.033	O				0.25
7.667	0.48	0.46	0.033	O				0.25
7.750	0.49	0.46	0.033	O				0.25
7.833	0.49	0.46	0.033	O				0.25
7.917	0.49	0.47	0.033	O				0.25
8.000	0.50	0.47	0.033	O				0.25
8.083	0.50	0.47	0.034	O				0.25
8.167	0.50	0.47	0.034	O				0.26
8.250	0.51	0.48	0.034	O				0.26
8.333	0.51	0.48	0.034	O				0.26
8.417	0.51	0.48	0.034	O				0.26
8.500	0.52	0.49	0.035	O				0.26
8.583	0.52	0.49	0.035	O				0.26
8.667	0.52	0.49	0.035	O				0.27
8.750	0.53	0.49	0.035	O				0.27
8.833	0.53	0.50	0.036	O				0.27
8.917	0.53	0.50	0.036	O				0.27
9.000	0.54	0.50	0.036	O				0.27
9.083	0.54	0.51	0.036	O				0.27
9.167	0.55	0.51	0.036	O				0.28
9.250	0.55	0.51	0.037	O				0.28
9.333	0.55	0.52	0.037	O				0.28
9.417	0.56	0.52	0.037	O				0.28
9.500	0.56	0.52	0.037	O				0.28
9.583	0.57	0.53	0.038	O				0.29
9.667	0.57	0.53	0.038	O				0.29
9.750	0.58	0.54	0.038	O				0.29
9.833	0.58	0.54	0.039	O				0.29
9.917	0.58	0.54	0.039	O				0.29
10.000	0.59	0.55	0.039	O				0.30
10.083	0.59	0.55	0.039	O				0.30
10.167	0.60	0.56	0.040	O				0.30
10.250	0.60	0.56	0.040	O				0.30
10.333	0.61	0.56	0.040	O				0.31
10.417	0.62	0.57	0.041	O				0.31
10.500	0.62	0.57	0.041	O				0.31
10.583	0.63	0.58	0.041	O				0.31
10.667	0.63	0.58	0.042	O				0.32
10.750	0.64	0.59	0.042	O				0.32
10.833	0.64	0.59	0.042	O				0.32
10.917	0.65	0.60	0.043	O				0.32
11.000	0.66	0.60	0.043	O				0.33
11.083	0.66	0.61	0.043	O				0.33
11.167	0.67	0.61	0.044	O				0.33
11.250	0.68	0.62	0.044	O				0.33
11.333	0.68	0.62	0.045	O				0.34
11.417	0.69	0.63	0.045	O				0.34
11.500	0.70	0.64	0.045	O				0.34

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11.583    0.71    0.64      0.046  O       |       |       |       |     0.35
11.667    0.71    0.65      0.046  O       |       |       |       |     0.35
11.750    0.72    0.65      0.047  O       |       |       |       |     0.35
11.833    0.73    0.66      0.047  O       |       |       |       |     0.36
11.917    0.74    0.67      0.048  O       |       |       |       |     0.36
12.000    0.75    0.68      0.048  O       |       |       |       |     0.37
12.083    0.76    0.68      0.049  O       |       |       |       |     0.37
12.167    0.79    0.69      0.049  O       |       |       |       |     0.37
12.250    0.86    0.70      0.050  OI      |       |       |       |     0.38
12.333    0.91    0.72      0.051  OI      |       |       |       |     0.39
12.417    0.93    0.74      0.053  OI      |       |       |       |     0.40
12.500    0.96    0.76      0.054  OI      |       |       |       |     0.41
12.583    0.98    0.78      0.056  OI      |       |       |       |     0.42
12.667    0.99    0.80      0.057  OI      |       |       |       |     0.43
12.750    1.01    0.82      0.058  OI      |       |       |       |     0.44
12.833    1.02    0.83      0.060  OI      |       |       |       |     0.45
12.917    1.04    0.85      0.061  |O      |       |       |       |     0.46
13.000    1.05    0.87      0.062  |O      |       |       |       |     0.47
13.083    1.07    0.89      0.063  |O      |       |       |       |     0.48
13.167    1.09    0.90      0.065  |O      |       |       |       |     0.49
13.250    1.10    0.92      0.066  |O      |       |       |       |     0.50
13.333    1.12    0.92      0.067  |O      |       |       |       |     0.51
13.417    1.14    0.92      0.069  |O      |       |       |       |     0.51
13.500    1.15    0.92      0.070  |O      |       |       |       |     0.52
13.583    1.17    0.92      0.072  |O      |       |       |       |     0.53
13.667    1.19    0.92      0.074  |O      |       |       |       |     0.53
13.750    1.21    0.92      0.075  |O      |       |       |       |     0.54
13.833    1.24    0.92      0.078  |O      |       |       |       |     0.55
13.917    1.26    0.92      0.080  |O      |       |       |       |     0.56
14.000    1.28    0.92      0.082  |O      |       |       |       |     0.57
14.083    1.31    0.92      0.085  |O      |       |       |       |     0.59
14.167    1.35    0.92      0.088  |O      |       |       |       |     0.60
14.250    1.40    0.92      0.091  |O      |       |       |       |     0.61
14.333    1.44    0.92      0.094  |O      |       |       |       |     0.63
14.417    1.48    0.92      0.098  |O      |       |       |       |     0.64
14.500    1.51    0.92      0.102  |O      |       |       |       |     0.66
14.583    1.56    0.92      0.106  |O      |       |       |       |     0.68
14.667    1.60    0.92      0.110  |O      |       |       |       |     0.70
14.750    1.65    0.92      0.115  |O      |       |       |       |     0.72
14.833    1.69    0.92      0.120  |OI     |       |       |       |     0.75
14.917    1.75    0.92      0.126  |OI     |       |       |       |     0.77
15.000    1.80    0.92      0.132  |OI     |       |       |       |     0.80
15.083    1.87    0.92      0.138  |OI     |       |       |       |     0.83
15.167    1.94    0.92      0.145  |OI     |       |       |       |     0.86
15.250    2.02    0.92      0.152  |OI     |       |       |       |     0.89
15.333    2.11    0.92      0.160  |OI     |       |       |       |     0.93
15.417    2.21    0.92      0.168  |OI     |       |       |       |     0.97
15.500    2.29    0.92      0.178  |OI     |       |       |       |     1.01
15.583    2.33    0.92      0.187  |OI     |       |       |       |     1.04
15.667    2.50    0.92      0.197  |OI     |       |       |       |     1.08
15.750    2.96    0.92      0.210  |O I    |       |       |       |     1.12
15.833    3.62    0.92      0.226  |O  I   |       |       |       |     1.18
15.917    4.76    0.92      0.249  |O   I  |       |       |       |     1.26
16.000    6.44    0.92      0.281  |O    I|       |       |       |     1.37
16.083   10.64    0.92      0.333  |O      |   I   |       |       |     1.56
16.167   17.59    0.92      0.424  |O      |       |   I   |       |     1.88
16.250   26.97    0.92      0.571  |O      |       |       |      I|     2.35
16.333   18.40    0.92      0.721  |O      |       |    I  |       |     2.81
16.417   11.38    0.92      0.817  |O      |    I  |       |       |     3.10
16.500    8.25    0.92      0.879  |O     |I       |       |       |     3.27
16.583    6.41    0.92      0.923  |O    I|       |       |       |     3.39
16.667    5.06    4.04      0.945  |   O I |       |       |       |     3.44
16.750    3.98    4.37      0.947  |   IO  |       |       |       |     3.44
16.833    3.15    3.81      0.944  |  IO   |       |       |       |     3.43
16.917    2.51    3.13      0.939  | IO    |       |       |       |     3.43
17.000    2.23    2.60      0.936  | IO    |       |       |       |     3.42
17.083    2.01    2.27      0.934  | O     |       |       |       |     3.42
17.167    1.87    2.04      0.932  | O     |       |       |       |     3.41
17.250    1.73    1.87      0.931  | O     |       |       |       |     3.41
17.333    1.56    1.72      0.930  |IO     |       |       |       |     3.41
17.417    1.44    1.56      0.929  |O      |       |       |       |     3.41
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17.500	1.32	1.43	0.928	|O	|	|	|	3.41
17.583	1.26	1.33	0.928	|O	|	|	|	3.40
17.667	1.21	1.26	0.927	|O	|	|	|	3.40
17.750	1.17	1.21	0.927	|O	|	|	|	3.40
17.833	1.13	1.17	0.927	|O	|	|	|	3.40
17.917	1.09	1.13	0.926	|O	|	|	|	3.40
18.000	1.06	1.09	0.926	|O	|	|	|	3.40
18.083	1.03	1.06	0.926	|O	|	|	|	3.40
18.167	0.98	1.02	0.926	|O	|	|	|	3.40
18.250	0.90	0.96	0.925	|O	|	|	|	3.40
18.333	0.84	0.92	0.925	IO	|	|	|	3.40
18.417	0.80	0.92	0.924	IO	|	|	|	3.40
18.500	0.77	0.92	0.923	IO	|	|	|	3.39
18.583	0.75	0.92	0.922	IO	|	|	|	3.39
18.667	0.73	0.92	0.921	IO	|	|	|	3.39
18.750	0.71	0.92	0.919	IO	|	|	|	3.38
18.833	0.69	0.92	0.918	IO	|	|	|	3.38
18.917	0.67	0.92	0.916	IO	|	|	|	3.38
19.000	0.66	0.92	0.914	IO	|	|	|	3.37
19.083	0.65	0.92	0.912	IO	|	|	|	3.36
19.167	0.63	0.92	0.910	IO	|	|	|	3.36
19.250	0.62	0.92	0.908	IO	|	|	|	3.35
19.333	0.61	0.92	0.906	IO	|	|	|	3.35
19.417	0.60	0.92	0.904	IO	|	|	|	3.34
19.500	0.59	0.92	0.902	IO	|	|	|	3.34
19.583	0.58	0.92	0.899	IO	|	|	|	3.33
19.667	0.57	0.92	0.897	IO	|	|	|	3.32
19.750	0.56	0.92	0.895	IO	|	|	|	3.32
19.833	0.55	0.92	0.892	IO	|	|	|	3.31
19.917	0.55	0.92	0.890	IO	|	|	|	3.30
20.000	0.54	0.92	0.887	IO	|	|	|	3.29
20.083	0.53	0.92	0.884	IO	|	|	|	3.29
20.167	0.52	0.92	0.881	IO	|	|	|	3.28
20.250	0.52	0.92	0.879	IO	|	|	|	3.27
20.333	0.51	0.92	0.876	IO	|	|	|	3.26
20.417	0.50	0.92	0.873	IO	|	|	|	3.26
20.500	0.50	0.92	0.870	IO	|	|	|	3.25
20.583	0.49	0.92	0.867	IO	|	|	|	3.24
20.667	0.48	0.92	0.864	IO	|	|	|	3.23
20.750	0.48	0.92	0.861	IO	|	|	|	3.22
20.833	0.47	0.92	0.858	IO	|	|	|	3.21
20.917	0.47	0.92	0.855	IO	|	|	|	3.21
21.000	0.46	0.92	0.852	IO	|	|	|	3.20
21.083	0.46	0.92	0.848	IO	|	|	|	3.19
21.167	0.45	0.92	0.845	IO	|	|	|	3.18
21.250	0.45	0.92	0.842	IO	|	|	|	3.17
21.333	0.44	0.92	0.839	IO	|	|	|	3.16
21.417	0.44	0.92	0.835	IO	|	|	|	3.15
21.500	0.43	0.92	0.832	IO	|	|	|	3.14
21.583	0.43	0.92	0.829	IO	|	|	|	3.13
21.667	0.43	0.92	0.825	IO	|	|	|	3.12
21.750	0.42	0.92	0.822	IO	|	|	|	3.11
21.833	0.42	0.92	0.818	IO	|	|	|	3.10
21.917	0.41	0.92	0.815	IO	|	|	|	3.09
22.000	0.41	0.92	0.811	IO	|	|	|	3.08
22.083	0.41	0.92	0.808	IO	|	|	|	3.07
22.167	0.40	0.92	0.804	IO	|	|	|	3.06
22.250	0.40	0.92	0.801	IO	|	|	|	3.05
22.333	0.40	0.92	0.797	IO	|	|	|	3.04
22.417	0.39	0.92	0.793	IO	|	|	|	3.03
22.500	0.39	0.92	0.790	IO	|	|	|	3.02
22.583	0.39	0.92	0.786	IO	|	|	|	3.01
22.667	0.38	0.92	0.782	IO	|	|	|	3.00
22.750	0.38	0.92	0.778	IO	|	|	|	2.99
22.833	0.38	0.92	0.775	IO	|	|	|	2.98
22.917	0.37	0.92	0.771	IO	|	|	|	2.97
23.000	0.37	0.92	0.767	IO	|	|	|	2.96
23.083	0.37	0.92	0.763	IO	|	|	|	2.94
23.167	0.36	0.92	0.759	IO	|	|	|	2.93
23.250	0.36	0.92	0.755	IO	|	|	|	2.92
23.333	0.36	0.92	0.752	IO	|	|	|	2.91

23.417	0.36	0.92	0.748	IO				2.90
23.500	0.35	0.92	0.744	IO				2.88
23.583	0.35	0.92	0.740	IO				2.87
23.667	0.35	0.92	0.736	IO				2.86
23.750	0.35	0.92	0.732	IO				2.85
23.833	0.34	0.92	0.728	IO				2.84
23.917	0.34	0.92	0.724	IO				2.82
24.000	0.34	0.92	0.720	IO				2.81
24.083	0.33	0.92	0.716	IO				2.80
24.167	0.28	0.92	0.712	IO				2.78
24.250	0.16	0.92	0.707	IO				2.77
24.333	0.10	0.92	0.701	IO				2.75
24.417	0.07	0.92	0.695	IO				2.73
24.500	0.04	0.92	0.689	IO				2.72
24.583	0.03	0.92	0.683	IO				2.70
24.667	0.02	0.92	0.677	IO				2.68
24.750	0.01	0.92	0.671	IO				2.66
24.833	0.01	0.92	0.665	IO				2.64
24.917	0.01	0.92	0.658	IO				2.62
25.000	0.00	0.92	0.652	IO				2.60
25.083	0.00	0.92	0.646	IO				2.58
25.167	0.00	0.92	0.639	IO				2.56
25.250	0.00	0.92	0.633	IO				2.54
25.333	0.00	0.92	0.627	IO				2.52
25.417	0.00	0.92	0.620	IO				2.50
25.500	0.00	0.92	0.614	IO				2.48
25.583	0.00	0.92	0.607	IO				2.46
25.667	0.00	0.92	0.601	IO				2.44
25.750	0.00	0.92	0.595	IO				2.42
25.833	0.00	0.92	0.588	IO				2.40
25.917	0.00	0.92	0.582	IO				2.38
26.000	0.00	0.92	0.576	IO				2.36
26.083	0.00	0.92	0.569	IO				2.34
26.167	0.00	0.92	0.563	IO				2.32
26.250	0.00	0.92	0.557	IO				2.30
26.333	0.00	0.92	0.550	IO				2.28
26.417	0.00	0.92	0.544	IO				2.26
26.500	0.00	0.92	0.537	IO				2.24
26.583	0.00	0.92	0.531	IO				2.22
26.667	0.00	0.92	0.525	IO				2.20
26.750	0.00	0.92	0.518	IO				2.18
26.833	0.00	0.92	0.512	IO				2.16
26.917	0.00	0.92	0.506	IO				2.14
27.000	0.00	0.92	0.499	IO				2.13
27.083	0.00	0.92	0.493	IO				2.11
27.167	0.00	0.92	0.487	IO				2.09
27.250	0.00	0.92	0.480	IO				2.07
27.333	0.00	0.92	0.474	IO				2.05
27.417	0.00	0.92	0.467	IO				2.03
27.500	0.00	0.92	0.461	IO				2.01
27.583	0.00	0.92	0.455	IO				1.98
27.667	0.00	0.92	0.448	IO				1.96
27.750	0.00	0.92	0.442	IO				1.94
27.833	0.00	0.92	0.436	IO				1.92
27.917	0.00	0.92	0.429	IO				1.89
28.000	0.00	0.92	0.423	IO				1.87
28.083	0.00	0.92	0.417	IO				1.85
28.167	0.00	0.92	0.410	IO				1.83
28.250	0.00	0.92	0.404	IO				1.80
28.333	0.00	0.92	0.397	IO				1.78
28.417	0.00	0.92	0.391	IO				1.76
28.500	0.00	0.92	0.385	IO				1.74
28.583	0.00	0.92	0.378	IO				1.72
28.667	0.00	0.92	0.372	IO				1.69
28.750	0.00	0.92	0.366	IO				1.67
28.833	0.00	0.92	0.359	IO				1.65
28.917	0.00	0.92	0.353	IO				1.63
29.000	0.00	0.92	0.347	IO				1.60
29.083	0.00	0.92	0.340	IO				1.58
29.167	0.00	0.92	0.334	IO				1.56
29.250	0.00	0.92	0.327	IO				1.54

29.333	0.00	0.92	0.321	IO				1.51
29.417	0.00	0.92	0.315	IO				1.49
29.500	0.00	0.92	0.308	IO				1.47
29.583	0.00	0.92	0.302	IO				1.45
29.667	0.00	0.92	0.296	IO				1.42
29.750	0.00	0.92	0.289	IO				1.40
29.833	0.00	0.92	0.283	IO				1.38
29.917	0.00	0.92	0.277	IO				1.36
30.000	0.00	0.92	0.270	IO				1.33
30.083	0.00	0.92	0.264	IO				1.31
30.167	0.00	0.92	0.257	IO				1.29
30.250	0.00	0.92	0.251	IO				1.27
30.333	0.00	0.92	0.245	IO				1.24
30.417	0.00	0.92	0.238	IO				1.22
30.500	0.00	0.92	0.232	IO				1.20
30.583	0.00	0.92	0.226	IO				1.18
30.667	0.00	0.92	0.219	IO				1.15
30.750	0.00	0.92	0.213	IO				1.13
30.833	0.00	0.92	0.207	IO				1.11
30.917	0.00	0.92	0.200	IO				1.09
31.000	0.00	0.92	0.194	IO				1.06
31.083	0.00	0.92	0.187	IO				1.04
31.167	0.00	0.92	0.181	IO				1.02
31.250	0.00	0.92	0.175	IO				0.99
31.333	0.00	0.92	0.168	IO				0.97
31.417	0.00	0.92	0.162	IO				0.94
31.500	0.00	0.92	0.156	IO				0.91
31.583	0.00	0.92	0.149	IO				0.88
31.667	0.00	0.92	0.143	IO				0.85
31.750	0.00	0.92	0.137	IO				0.82
31.833	0.00	0.92	0.130	IO				0.79
31.917	0.00	0.92	0.124	IO				0.76
32.000	0.00	0.92	0.117	IO				0.73
32.083	0.00	0.92	0.111	IO				0.70
32.167	0.00	0.92	0.105	IO				0.68
32.250	0.00	0.92	0.098	IO				0.65
32.333	0.00	0.92	0.092	IO				0.62
32.417	0.00	0.92	0.086	IO				0.59
32.500	0.00	0.92	0.079	IO				0.56
32.583	0.00	0.92	0.073	IO				0.53
32.667	0.00	0.92	0.067	IO				0.50
32.750	0.00	0.85	0.060	IO				0.46
32.833	0.00	0.77	0.055	O				0.42
32.917	0.00	0.70	0.050	O				0.38
33.000	0.00	0.63	0.045	O				0.34
33.083	0.00	0.58	0.041	O				0.31
33.167	0.00	0.52	0.037	O				0.28
33.250	0.00	0.47	0.034	O				0.26
33.333	0.00	0.43	0.031	O				0.23
33.417	0.00	0.39	0.028	O				0.21
33.500	0.00	0.36	0.025	O				0.19
33.583	0.00	0.32	0.023	O				0.17
33.667	0.00	0.29	0.021	O				0.16
33.750	0.00	0.27	0.019	O				0.14
33.833	0.00	0.24	0.017	O				0.13
33.917	0.00	0.22	0.016	O				0.12
34.000	0.00	0.20	0.014	O				0.11
34.083	0.00	0.18	0.013	O				0.10
34.167	0.00	0.16	0.012	O				0.09
34.250	0.00	0.15	0.011	O				0.08
34.333	0.00	0.14	0.010	O				0.07
34.417	0.00	0.12	0.009	O				0.07
34.500	0.00	0.11	0.008	O				0.06
34.583	0.00	0.10	0.007	O				0.05
34.667	0.00	0.09	0.007	O				0.05
34.750	0.00	0.08	0.006	O				0.05
34.833	0.00	0.08	0.005	O				0.04
34.917	0.00	0.07	0.005	O				0.04
35.000	0.00	0.06	0.004	O				0.03
35.083	0.00	0.06	0.004	O				0.03
35.167	0.00	0.05	0.004	O				0.03

35.250	0.00	0.05	0.003	O	|	|	|	|	0.03
35.333	0.00	0.04	0.003	O	|	|	|	|	0.02
35.417	0.00	0.04	0.003	O	|	|	|	|	0.02
35.500	0.00	0.04	0.003	O	|	|	|	|	0.02
35.583	0.00	0.03	0.002	O	|	|	|	|	0.02
35.667	0.00	0.03	0.002	O	|	|	|	|	0.02
35.750	0.00	0.03	0.002	O	|	|	|	|	0.01
35.833	0.00	0.02	0.002	O	|	|	|	|	0.01
35.917	0.00	0.02	0.002	O	|	|	|	|	0.01
36.000	0.00	0.02	0.001	O	|	|	|	|	0.01
36.083	0.00	0.02	0.001	O	|	|	|	|	0.01
36.167	0.00	0.02	0.001	O	|	|	|	|	0.01
36.250	0.00	0.01	0.001	O	|	|	|	|	0.01
36.333	0.00	0.01	0.001	O	|	|	|	|	0.01
36.417	0.00	0.01	0.001	O	|	|	|	|	0.01
36.500	0.00	0.01	0.001	O	|	|	|	|	0.01
36.583	0.00	0.01	0.001	O	|	|	|	|	0.01
36.667	0.00	0.01	0.001	O	|	|	|	|	0.00
36.750	0.00	0.01	0.001	O	|	|	|	|	0.00
36.833	0.00	0.01	0.001	O	|	|	|	|	0.00
36.917	0.00	0.01	0.000	O	|	|	|	|	0.00
37.000	0.00	0.01	0.000	O	|	|	|	|	0.00
37.083	0.00	0.01	0.000	O	|	|	|	|	0.00
37.167	0.00	0.01	0.000	O	|	|	|	|	0.00
37.250	0.00	0.00	0.000	O	|	|	|	|	0.00
37.333	0.00	0.00	0.000	O	|	|	|	|	0.00
37.417	0.00	0.00	0.000	O	|	|	|	|	0.00
37.500	0.00	0.00	0.000	O	|	|	|	|	0.00
37.583	0.00	0.00	0.000	O	|	|	|	|	0.00
37.667	0.00	0.00	0.000	O	|	|	|	|	0.00
37.750	0.00	0.00	0.000	O	|	|	|	|	0.00
37.833	0.00	0.00	0.000	O	|	|	|	|	0.00
37.917	0.00	0.00	0.000	O	|	|	|	|	0.00
38.000	0.00	0.00	0.000	O	|	|	|	|	0.00
38.083	0.00	0.00	0.000	O	|	|	|	|	0.00

**********HYDROGRAPH DATA**********

Number of intervals = 457
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 4.371 (CFS)
Total volume = 2.176 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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AREA “B”

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/04/16 File Name: exb002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'B' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

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Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 221.000(Ft.)
Top (of initial area) elevation = 355.000(Ft.)
Bottom (of initial area) elevation = 306.000(Ft.)
Difference in elevation = 49.000(Ft.)
Slope = 0.22172 s(%)= 22.17
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.268 min.
Rainfall intensity = 1.696(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.767
Subarea runoff = 2.590(CFS)
Total initial stream area = 1.990(Ac.)

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Process from Point/Station 201.000 to Point/Station 202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.765(CFS)
Depth of flow = 0.162(Ft.), Average velocity = 2.869(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 3.765(CFS)
' ' flow top width = 16.200(Ft.)

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  '     '    velocity=    2.869(Ft/s)
  '     '       area =      1.312(Sq.Ft)
  '     '       Froude number =     1.776

Upstream point elevation =   306.000(Ft.)
Downstream point elevation =   279.000(Ft.)
Flow length =   282.000(Ft.)
Travel time  =    1.64 min.
Time of concentration =    9.91 min.
Depth of flow =   0.162(Ft.)
Average velocity =   2.869(Ft/s)
Total irregular channel flow =     3.765(CFS)
Irregular channel normal depth above invert elev. =   0.162(Ft.)
Average velocity of channel(s) =   2.869(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.529(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.753
Subarea runoff =      2.267(CFS) for    2.230(Ac.)
Total runoff =      4.857(CFS)       Total area =        4.22(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.178(Ft.), Average velocity =   3.058(Ft/s)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.007(CFS)
Depth of flow =   0.201(Ft.), Average velocity =   2.978(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.007(CFS)
  '     '       flow top width =     20.086(Ft.)
  '     '    velocity=    2.978(Ft/s)
  '     '       area =      2.017(Sq.Ft)
  '     '       Froude number =     1.656

Upstream point elevation =   279.000(Ft.)
Downstream point elevation =   223.000(Ft.)
Flow length =   723.000(Ft.)
Travel time  =    4.05 min.
Time of concentration =   13.95 min.
Depth of flow =   0.201(Ft.)
Average velocity =   2.978(Ft/s)
Total irregular channel flow =     6.007(CFS)
Irregular channel normal depth above invert elev. =   0.201(Ft.)
Average velocity of channel(s) =   2.978(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
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Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.256(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.721
Subarea runoff =      2.232(CFS) for    3.610(Ac.)
Total runoff =      7.089(CFS)        Total area =        7.83(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.214(Ft.), Average velocity =   3.104(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.830(Ac.)
Runoff from this stream =      7.089(CFS)
Time of concentration =   13.95 min.
Rainfall intensity =     1.256(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.900
SCS curve number for soil(AMC 2)  = 83.50
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.205(In/Hr)
Max Catchment Loss (Fm) =     0.205(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   295.000(Ft.)
Bottom (of initial area) elevation =   258.000(Ft.)
Difference in elevation =    37.000(Ft.)
Slope =    0.12333  s(%)=      12.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.506 min.
Rainfall intensity =      1.478(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.775
Subarea runoff =      1.604(CFS)
Total initial stream area =        1.400(Ac.)


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Process from Point/Station      205.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.033(CFS)
Depth of flow =   0.175(Ft.), Average velocity =   2.638(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              1.00
       2            50.00              0.00
       3           100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.033(CFS)
  '     '       flow top width =     17.487(Ft.)
  '     '    velocity=    2.638(Ft/s)
  '     '       area =      1.529(Sq.Ft)
  '     '       Froude number =     1.572

Upstream point elevation =   258.000(Ft.)
```

```
Downstream point elevation =   233.000(Ft.)
Flow length =   342.000(Ft.)
Travel time  =    2.16 min.
Time of concentration =   12.67 min.
Depth of flow =   0.175(Ft.)
Average velocity =   2.638(Ft/s)
Total irregular channel flow =     4.033(CFS)
Irregular channel normal depth above invert elev. =   0.175(Ft.)
Average velocity of channel(s) =   2.638(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.700
SCS curve number for soil(AMC 2)  = 82.50
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.215(In/Hr)
Max Catchment Loss (Fm) =     0.215(In/Hr)
Rainfall intensity =      1.328(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.756
Subarea runoff =      4.797(CFS) for    4.980(Ac.)
Total runoff =      6.402(CFS)       Total area =        6.38(Ac.)
Area averaged Fm value =    0.213(In/Hr)
Depth of flow =   0.208(Ft.), Average velocity =   2.961(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.107(CFS)
Depth of flow =   0.283(Ft.), Average velocity =   2.027(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      8.107(CFS)
  '     '       flow top width =     28.284(Ft.)
  '     '    velocity=    2.027(Ft/s)
  '     '       area =      4.000(Sq.Ft)
  '     '       Froude number =     0.950

Upstream point elevation =   233.000(Ft.)
Downstream point elevation =   223.000(Ft.)
Flow length =   440.000(Ft.)
Travel time  =    3.62 min.
Time of concentration =   16.29 min.
Depth of flow =   0.283(Ft.)
Average velocity =   2.027(Ft/s)
Total irregular channel flow =     8.107(CFS)
Irregular channel normal depth above invert elev. =   0.283(Ft.)
Average velocity of channel(s) =   2.027(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.149(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.720
Subarea runoff =      3.339(CFS) for    5.390(Ac.)
```

```
Total runoff =      9.741(CFS)        Total area =       11.77(Ac.)
Area averaged Fm value =    0.230(In/Hr)
Depth of flow =   0.303(Ft.), Average velocity =   2.122(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.770(Ac.)
Runoff from this stream =      9.741(CFS)
Time of concentration =   16.29 min.
Rainfall intensity =     1.149(In/Hr)
Area averaged loss rate (Fm) =    0.2298(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      7.83     7.089     13.95    0.250      1.256
2     11.77     9.741     16.29    0.230      1.149
Qmax(1) =
          1.000 *    1.000 *     7.089) +
          1.116 *    0.857 *     9.741) + =      16.403
Qmax(2) =
          0.894 *    1.000 *     7.089) +
          1.000 *    1.000 *     9.741) + =      16.078

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.089       9.741
Maximum flow rates at confluence using above data:
       16.403       16.078
Area of streams before confluence:
        7.830       11.770
Effective area values after confluence:
       17.914       19.600
Results of confluence:
Total flow rate =     16.403(CFS)
Time of concentration =    13.953 min.
Effective stream area after confluence =     17.914(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.238(In/Hr)
Study area total (this main stream) =      19.60(Ac.)
End of computations, total study area =           19.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) =  80.2
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 02/05/18 File Name EXB00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6407

RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'B' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
80.2	4.8	0.24	D	0.200	1.000	0.200
80.2	14.9	0.76	C	0.250	1.000	0.250

Area-averaged adjusted loss rate Fm (In/Hr) = 0.238

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
4.75	0.242	80.2	63.3	5.80	0.058
14.85	0.758	80.2	63.3	5.80	0.058

Area-averaged catchment yield fraction, Y = 0.058
Area-averaged low loss fraction, Yb = 0.942

++
User entry of time of concentration = 0.233 (hours)
Watershed area = 19.60(Ac.)
Catchment Lag time = 0.186 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 44.7932
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.238(In/Hr)
Average low loss rate fraction (Yb) = 0.942 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 19.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)
30-minute factor = 0.999 Adjusted rainfall = 0.400(In)
1-hour factor = 0.999 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 237.04 (CFS))	
1	3.667	8.692
2	18.673	35.571
3	55.689	87.740
4	73.322	41.798
5	82.432	21.595
6	88.469	14.309
7	92.653	9.917
8	95.496	6.739
9	97.322	4.328
10	98.206	2.097
11	98.703	1.178
12	99.088	0.913
13	99.383	0.698
14	99.705	0.763
15	99.887	0.432
16	100.000	0.267

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2532	0.0634
3	0.2996	0.0465
4	0.3377	0.0380
5	0.3705	0.0328
6	0.3996	0.0292
7	0.4254	0.0258
8	0.4491	0.0237
9	0.4711	0.0220
10	0.4917	0.0206
11	0.5111	0.0194
12	0.5295	0.0184
13	0.5499	0.0204
14	0.5695	0.0196
15	0.5884	0.0189
16	0.6066	0.0182
17	0.6242	0.0176
18	0.6413	0.0171
19	0.6579	0.0166
20	0.6741	0.0161
21	0.6898	0.0157
22	0.7051	0.0153
23	0.7201	0.0150
24	0.7347	0.0146
25	0.7490	0.0143
26	0.7631	0.0140
27	0.7768	0.0137
28	0.7902	0.0135
29	0.8035	0.0132
30	0.8164	0.0130
31	0.8292	0.0127
32	0.8417	0.0125
33	0.8540	0.0123
34	0.8662	0.0121
35	0.8781	0.0119
36	0.8899	0.0118

37	0.9011	0.0112
38	0.9121	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9442	0.0106
42	0.9546	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0144	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0612	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1480	0.0083
64	1.1563	0.0083
65	1.1644	0.0082
66	1.1726	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3587	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051
102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051
105	1.4050	0.0050
106	1.4100	0.0050
107	1.4150	0.0050

108	1.4199	0.0049
109	1.4248	0.0049
110	1.4297	0.0049
111	1.4346	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4678	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5087	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5731	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6450	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036
176	1.7048	0.0036
177	1.7084	0.0036
178	1.7120	0.0036

179	1.7156	0.0036
180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7299	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8213	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8533	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9206	0.0030
243	1.9236	0.0030
244	1.9266	0.0030
245	1.9295	0.0030
246	1.9325	0.0029
247	1.9354	0.0029
248	1.9383	0.0029
249	1.9413	0.0029

250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0025	0.0002
2	0.0027	0.0025	0.0002
3	0.0027	0.0025	0.0002
4	0.0027	0.0025	0.0002
5	0.0027	0.0025	0.0002
6	0.0027	0.0026	0.0002
7	0.0027	0.0026	0.0002
8	0.0027	0.0026	0.0002
9	0.0027	0.0026	0.0002
10	0.0027	0.0026	0.0002
11	0.0028	0.0026	0.0002
12	0.0028	0.0026	0.0002
13	0.0028	0.0026	0.0002
14	0.0028	0.0026	0.0002
15	0.0028	0.0026	0.0002
16	0.0028	0.0026	0.0002
17	0.0028	0.0027	0.0002
18	0.0028	0.0027	0.0002
19	0.0028	0.0027	0.0002
20	0.0028	0.0027	0.0002
21	0.0029	0.0027	0.0002
22	0.0029	0.0027	0.0002
23	0.0029	0.0027	0.0002
24	0.0029	0.0027	0.0002
25	0.0029	0.0027	0.0002
26	0.0029	0.0027	0.0002
27	0.0029	0.0028	0.0002

28	0.0029	0.0028	0.0002
29	0.0029	0.0028	0.0002
30	0.0030	0.0028	0.0002
31	0.0030	0.0028	0.0002
32	0.0030	0.0028	0.0002
33	0.0030	0.0028	0.0002
34	0.0030	0.0028	0.0002
35	0.0030	0.0028	0.0002
36	0.0030	0.0028	0.0002
37	0.0030	0.0029	0.0002
38	0.0030	0.0029	0.0002
39	0.0031	0.0029	0.0002
40	0.0031	0.0029	0.0002
41	0.0031	0.0029	0.0002
42	0.0031	0.0029	0.0002
43	0.0031	0.0029	0.0002
44	0.0031	0.0029	0.0002
45	0.0031	0.0030	0.0002
46	0.0031	0.0030	0.0002
47	0.0032	0.0030	0.0002
48	0.0032	0.0030	0.0002
49	0.0032	0.0030	0.0002
50	0.0032	0.0030	0.0002
51	0.0032	0.0030	0.0002
52	0.0032	0.0030	0.0002
53	0.0033	0.0031	0.0002
54	0.0033	0.0031	0.0002
55	0.0033	0.0031	0.0002
56	0.0033	0.0031	0.0002
57	0.0033	0.0031	0.0002
58	0.0033	0.0031	0.0002
59	0.0033	0.0031	0.0002
60	0.0034	0.0032	0.0002
61	0.0034	0.0032	0.0002
62	0.0034	0.0032	0.0002
63	0.0034	0.0032	0.0002
64	0.0034	0.0032	0.0002
65	0.0034	0.0032	0.0002
66	0.0035	0.0033	0.0002
67	0.0035	0.0033	0.0002
68	0.0035	0.0033	0.0002
69	0.0035	0.0033	0.0002
70	0.0035	0.0033	0.0002
71	0.0035	0.0033	0.0002
72	0.0036	0.0034	0.0002
73	0.0036	0.0034	0.0002
74	0.0036	0.0034	0.0002
75	0.0036	0.0034	0.0002
76	0.0036	0.0034	0.0002
77	0.0037	0.0034	0.0002
78	0.0037	0.0035	0.0002
79	0.0037	0.0035	0.0002
80	0.0037	0.0035	0.0002
81	0.0037	0.0035	0.0002
82	0.0038	0.0035	0.0002
83	0.0038	0.0036	0.0002
84	0.0038	0.0036	0.0002
85	0.0038	0.0036	0.0002
86	0.0038	0.0036	0.0002
87	0.0039	0.0036	0.0002
88	0.0039	0.0037	0.0002
89	0.0039	0.0037	0.0002
90	0.0039	0.0037	0.0002
91	0.0040	0.0037	0.0002
92	0.0040	0.0038	0.0002
93	0.0040	0.0038	0.0002
94	0.0040	0.0038	0.0002
95	0.0041	0.0038	0.0002
96	0.0041	0.0038	0.0002
97	0.0041	0.0039	0.0002
98	0.0041	0.0039	0.0002

99	0.0042	0.0039	0.0002
100	0.0042	0.0040	0.0002
101	0.0042	0.0040	0.0002
102	0.0043	0.0040	0.0002
103	0.0043	0.0040	0.0002
104	0.0043	0.0041	0.0002
105	0.0044	0.0041	0.0003
106	0.0044	0.0041	0.0003
107	0.0044	0.0042	0.0003
108	0.0044	0.0042	0.0003
109	0.0045	0.0042	0.0003
110	0.0045	0.0042	0.0003
111	0.0045	0.0043	0.0003
112	0.0046	0.0043	0.0003
113	0.0046	0.0044	0.0003
114	0.0046	0.0044	0.0003
115	0.0047	0.0044	0.0003
116	0.0047	0.0044	0.0003
117	0.0048	0.0045	0.0003
118	0.0048	0.0045	0.0003
119	0.0049	0.0046	0.0003
120	0.0049	0.0046	0.0003
121	0.0049	0.0047	0.0003
122	0.0050	0.0047	0.0003
123	0.0050	0.0047	0.0003
124	0.0051	0.0048	0.0003
125	0.0051	0.0048	0.0003
126	0.0051	0.0049	0.0003
127	0.0052	0.0049	0.0003
128	0.0052	0.0049	0.0003
129	0.0053	0.0050	0.0003
130	0.0054	0.0050	0.0003
131	0.0054	0.0051	0.0003
132	0.0055	0.0051	0.0003
133	0.0055	0.0052	0.0003
134	0.0056	0.0053	0.0003
135	0.0057	0.0053	0.0003
136	0.0057	0.0054	0.0003
137	0.0058	0.0054	0.0003
138	0.0058	0.0055	0.0003
139	0.0059	0.0056	0.0003
140	0.0060	0.0056	0.0003
141	0.0061	0.0057	0.0003
142	0.0061	0.0058	0.0004
143	0.0062	0.0059	0.0004
144	0.0063	0.0059	0.0004
145	0.0077	0.0073	0.0004
146	0.0078	0.0073	0.0004
147	0.0079	0.0075	0.0005
148	0.0080	0.0075	0.0005
149	0.0081	0.0077	0.0005
150	0.0082	0.0077	0.0005
151	0.0083	0.0078	0.0005
152	0.0084	0.0079	0.0005
153	0.0086	0.0081	0.0005
154	0.0086	0.0081	0.0005
155	0.0088	0.0083	0.0005
156	0.0089	0.0084	0.0005
157	0.0091	0.0085	0.0005
158	0.0092	0.0086	0.0005
159	0.0094	0.0088	0.0005
160	0.0095	0.0089	0.0005
161	0.0097	0.0091	0.0006
162	0.0098	0.0092	0.0006
163	0.0100	0.0094	0.0006
164	0.0101	0.0096	0.0006
165	0.0104	0.0098	0.0006
166	0.0106	0.0099	0.0006
167	0.0108	0.0102	0.0006
168	0.0110	0.0104	0.0006
169	0.0118	0.0111	0.0007

170	0.0119	0.0113	0.0007
171	0.0123	0.0116	0.0007
172	0.0125	0.0118	0.0007
173	0.0130	0.0122	0.0007
174	0.0132	0.0125	0.0008
175	0.0137	0.0129	0.0008
176	0.0140	0.0132	0.0008
177	0.0146	0.0138	0.0008
178	0.0150	0.0141	0.0009
179	0.0157	0.0148	0.0009
180	0.0161	0.0152	0.0009
181	0.0171	0.0161	0.0010
182	0.0176	0.0166	0.0010
183	0.0189	0.0178	0.0011
184	0.0196	0.0185	0.0011
185	0.0184	0.0173	0.0011
186	0.0194	0.0183	0.0011
187	0.0220	0.0198	0.0022
188	0.0237	0.0198	0.0039
189	0.0292	0.0198	0.0093
190	0.0328	0.0198	0.0130
191	0.0465	0.0198	0.0266
192	0.0634	0.0198	0.0435
193	0.1898	0.0198	0.1700
194	0.0380	0.0198	0.0182
195	0.0258	0.0198	0.0060
196	0.0206	0.0194	0.0012
197	0.0204	0.0192	0.0012
198	0.0182	0.0172	0.0011
199	0.0166	0.0156	0.0010
200	0.0153	0.0144	0.0009
201	0.0143	0.0135	0.0008
202	0.0135	0.0127	0.0008
203	0.0127	0.0120	0.0007
204	0.0121	0.0114	0.0007
205	0.0112	0.0105	0.0006
206	0.0107	0.0101	0.0006
207	0.0103	0.0097	0.0006
208	0.0099	0.0093	0.0006
209	0.0096	0.0090	0.0006
210	0.0093	0.0087	0.0005
211	0.0090	0.0085	0.0005
212	0.0087	0.0082	0.0005
213	0.0085	0.0080	0.0005
214	0.0083	0.0078	0.0005
215	0.0081	0.0076	0.0005
216	0.0079	0.0074	0.0005
217	0.0063	0.0060	0.0004
218	0.0062	0.0058	0.0004
219	0.0060	0.0057	0.0003
220	0.0059	0.0055	0.0003
221	0.0057	0.0054	0.0003
222	0.0056	0.0053	0.0003
223	0.0055	0.0052	0.0003
224	0.0054	0.0051	0.0003
225	0.0053	0.0050	0.0003
226	0.0052	0.0049	0.0003
227	0.0051	0.0048	0.0003
228	0.0050	0.0047	0.0003
229	0.0049	0.0046	0.0003
230	0.0048	0.0045	0.0003
231	0.0047	0.0045	0.0003
232	0.0047	0.0044	0.0003
233	0.0046	0.0043	0.0003
234	0.0045	0.0043	0.0003
235	0.0045	0.0042	0.0003
236	0.0044	0.0041	0.0003
237	0.0043	0.0041	0.0002
238	0.0043	0.0040	0.0002
239	0.0042	0.0040	0.0002
240	0.0042	0.0039	0.0002

241	0.0041	0.0039	0.0002
242	0.0041	0.0038	0.0002
243	0.0040	0.0038	0.0002
244	0.0040	0.0037	0.0002
245	0.0039	0.0037	0.0002
246	0.0039	0.0036	0.0002
247	0.0038	0.0036	0.0002
248	0.0038	0.0036	0.0002
249	0.0037	0.0035	0.0002
250	0.0037	0.0035	0.0002
251	0.0036	0.0034	0.0002
252	0.0036	0.0034	0.0002
253	0.0036	0.0034	0.0002
254	0.0035	0.0033	0.0002
255	0.0035	0.0033	0.0002
256	0.0035	0.0033	0.0002
257	0.0034	0.0032	0.0002
258	0.0034	0.0032	0.0002
259	0.0034	0.0032	0.0002
260	0.0033	0.0031	0.0002
261	0.0033	0.0031	0.0002
262	0.0033	0.0031	0.0002
263	0.0032	0.0031	0.0002
264	0.0032	0.0030	0.0002
265	0.0032	0.0030	0.0002
266	0.0032	0.0030	0.0002
267	0.0031	0.0030	0.0002
268	0.0031	0.0029	0.0002
269	0.0031	0.0029	0.0002
270	0.0031	0.0029	0.0002
271	0.0030	0.0029	0.0002
272	0.0030	0.0028	0.0002
273	0.0030	0.0028	0.0002
274	0.0030	0.0028	0.0002
275	0.0029	0.0028	0.0002
276	0.0029	0.0027	0.0002
277	0.0029	0.0027	0.0002
278	0.0029	0.0027	0.0002
279	0.0029	0.0027	0.0002
280	0.0028	0.0027	0.0002
281	0.0028	0.0026	0.0002
282	0.0028	0.0026	0.0002
283	0.0028	0.0026	0.0002
284	0.0028	0.0026	0.0002
285	0.0027	0.0026	0.0002
286	0.0027	0.0026	0.0002
287	0.0027	0.0025	0.0002
288	0.0027	0.0025	0.0002

Total soil rain loss = 1.67(In)
Total effective rainfall = 0.38(In)
Peak flow rate in flood hydrograph = 18.33(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0002	0.02	Q	|	|	|	|
0+20	0.0004	0.03	Q	|	|	|	|
0+25	0.0006	0.03	Q	|	|	|	|
0+30	0.0008	0.03	Q	|	|	|	|
0+35	0.0010	0.03	Q	|	|	|	|
0+40	0.0013	0.04	Q	|	|	|	|

0+45	0.0015	0.04	Q				
0+50	0.0018	0.04	Q				
0+55	0.0020	0.04	Q				
1+ 0	0.0023	0.04	Q				
1+ 5	0.0026	0.04	Q				
1+10	0.0028	0.04	Q				
1+15	0.0031	0.04	Q				
1+20	0.0033	0.04	Q				
1+25	0.0036	0.04	Q				
1+30	0.0039	0.04	Q				
1+35	0.0041	0.04	Q				
1+40	0.0044	0.04	Q				
1+45	0.0047	0.04	Q				
1+50	0.0049	0.04	Q				
1+55	0.0052	0.04	Q				
2+ 0	0.0055	0.04	Q				
2+ 5	0.0057	0.04	Q				
2+10	0.0060	0.04	Q				
2+15	0.0063	0.04	Q				
2+20	0.0065	0.04	Q				
2+25	0.0068	0.04	Q				
2+30	0.0071	0.04	Q				
2+35	0.0074	0.04	Q				
2+40	0.0077	0.04	Q				
2+45	0.0079	0.04	Q				
2+50	0.0082	0.04	Q				
2+55	0.0085	0.04	Q				
3+ 0	0.0088	0.04	Q				
3+ 5	0.0091	0.04	Q				
3+10	0.0093	0.04	Q				
3+15	0.0096	0.04	Q				
3+20	0.0099	0.04	Q				
3+25	0.0102	0.04	Q				
3+30	0.0105	0.04	Q				
3+35	0.0108	0.04	Q				
3+40	0.0111	0.04	Q				
3+45	0.0114	0.04	Q				
3+50	0.0116	0.04	Q				
3+55	0.0119	0.04	Q				
4+ 0	0.0122	0.04	Q				
4+ 5	0.0125	0.04	Q				
4+10	0.0128	0.04	Q				
4+15	0.0131	0.04	Q				
4+20	0.0134	0.04	Q				
4+25	0.0137	0.04	Q				
4+30	0.0140	0.04	Q				
4+35	0.0143	0.04	Q				
4+40	0.0146	0.04	Q				
4+45	0.0150	0.04	Q				
4+50	0.0153	0.04	Q				
4+55	0.0156	0.05	Q				
5+ 0	0.0159	0.05	QV				
5+ 5	0.0162	0.05	QV				
5+10	0.0165	0.05	QV				
5+15	0.0168	0.05	QV				
5+20	0.0171	0.05	QV				
5+25	0.0175	0.05	QV				
5+30	0.0178	0.05	QV				
5+35	0.0181	0.05	QV				
5+40	0.0184	0.05	QV				
5+45	0.0188	0.05	QV				
5+50	0.0191	0.05	QV				
5+55	0.0194	0.05	QV				
6+ 0	0.0197	0.05	QV				
6+ 5	0.0201	0.05	QV				
6+10	0.0204	0.05	QV				
6+15	0.0207	0.05	QV				
6+20	0.0211	0.05	QV				
6+25	0.0214	0.05	QV				
6+30	0.0218	0.05	QV				
6+35	0.0221	0.05	QV				

6+40	0.0224	0.05	QV	|	|	|	|
6+45	0.0228	0.05	QV	|	|	|	|
6+50	0.0231	0.05	QV	|	|	|	|
6+55	0.0235	0.05	QV	|	|	|	|
7+ 0	0.0238	0.05	QV	|	|	|	|
7+ 5	0.0242	0.05	QV	|	|	|	|
7+10	0.0246	0.05	QV	|	|	|	|
7+15	0.0249	0.05	QV	|	|	|	|
7+20	0.0253	0.05	QV	|	|	|	|
7+25	0.0256	0.05	QV	|	|	|	|
7+30	0.0260	0.05	QV	|	|	|	|
7+35	0.0264	0.05	QV	|	|	|	|
7+40	0.0267	0.05	QV	|	|	|	|
7+45	0.0271	0.05	QV	|	|	|	|
7+50	0.0275	0.05	QV	|	|	|	|
7+55	0.0279	0.05	QV	|	|	|	|
8+ 0	0.0282	0.05	QV	|	|	|	|
8+ 5	0.0286	0.06	QV	|	|	|	|
8+10	0.0290	0.06	QV	|	|	|	|
8+15	0.0294	0.06	QV	|	|	|	|
8+20	0.0298	0.06	QV	|	|	|	|
8+25	0.0302	0.06	QV	|	|	|	|
8+30	0.0305	0.06	QV	|	|	|	|
8+35	0.0309	0.06	QV	|	|	|	|
8+40	0.0313	0.06	Q V	|	|	|	|
8+45	0.0317	0.06	Q V	|	|	|	|
8+50	0.0321	0.06	Q V	|	|	|	|
8+55	0.0326	0.06	Q V	|	|	|	|
9+ 0	0.0330	0.06	Q V	|	|	|	|
9+ 5	0.0334	0.06	Q V	|	|	|	|
9+10	0.0338	0.06	Q V	|	|	|	|
9+15	0.0342	0.06	Q V	|	|	|	|
9+20	0.0346	0.06	Q V	|	|	|	|
9+25	0.0351	0.06	Q V	|	|	|	|
9+30	0.0355	0.06	Q V	|	|	|	|
9+35	0.0359	0.06	Q V	|	|	|	|
9+40	0.0363	0.06	Q V	|	|	|	|
9+45	0.0368	0.06	Q V	|	|	|	|
9+50	0.0372	0.06	Q V	|	|	|	|
9+55	0.0377	0.06	Q V	|	|	|	|
10+ 0	0.0381	0.07	Q V	|	|	|	|
10+ 5	0.0386	0.07	Q V	|	|	|	|
10+10	0.0390	0.07	Q V	|	|	|	|
10+15	0.0395	0.07	Q V	|	|	|	|
10+20	0.0400	0.07	Q V	|	|	|	|
10+25	0.0404	0.07	Q V	|	|	|	|
10+30	0.0409	0.07	Q V	|	|	|	|
10+35	0.0414	0.07	Q V	|	|	|	|
10+40	0.0419	0.07	Q V	|	|	|	|
10+45	0.0423	0.07	Q V	|	|	|	|
10+50	0.0428	0.07	Q V	|	|	|	|
10+55	0.0433	0.07	Q V	|	|	|	|
11+ 0	0.0438	0.07	Q V	|	|	|	|
11+ 5	0.0443	0.07	Q V	|	|	|	|
11+10	0.0448	0.07	Q V	|	|	|	|
11+15	0.0454	0.07	Q V	|	|	|	|
11+20	0.0459	0.08	Q V	|	|	|	|
11+25	0.0464	0.08	Q V	|	|	|	|
11+30	0.0469	0.08	Q V	|	|	|	|
11+35	0.0475	0.08	Q V	|	|	|	|
11+40	0.0480	0.08	Q V	|	|	|	|
11+45	0.0486	0.08	Q V	|	|	|	|
11+50	0.0491	0.08	Q V	|	|	|	|
11+55	0.0497	0.08	Q V	|	|	|	|
12+ 0	0.0503	0.08	Q V	|	|	|	|
12+ 5	0.0508	0.08	Q V	|	|	|	|
12+10	0.0514	0.09	Q V	|	|	|	|
12+15	0.0521	0.10	Q V	|	|	|	|
12+20	0.0528	0.10	Q V	|	|	|	|
12+25	0.0535	0.10	Q V	|	|	|	|
12+30	0.0542	0.11	Q V	|	|	|	|

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12+35       0.0550      0.11  Q  V      |          |          |          |
12+40       0.0558      0.11  Q  V      |          |          |          |
12+45       0.0565      0.11  Q  V      |          |          |          |
12+50       0.0573      0.11  Q  V      |          |          |          |
12+55       0.0581      0.12  Q  V      |          |          |          |
13+ 0       0.0589      0.12  Q  V      |          |          |          |
13+ 5       0.0597      0.12  Q  V      |          |          |          |
13+10       0.0605      0.12  Q  V      |          |          |          |
13+15       0.0614      0.12  Q  V      |          |          |          |
13+20       0.0622      0.12  Q  V      |          |          |          |
13+25       0.0631      0.13  Q   V     |          |          |          |
13+30       0.0640      0.13  Q   V     |          |          |          |
13+35       0.0649      0.13  Q   V     |          |          |          |
13+40       0.0658      0.13  Q   V     |          |          |          |
13+45       0.0667      0.13  Q   V     |          |          |          |
13+50       0.0677      0.14  Q   V     |          |          |          |
13+55       0.0686      0.14  Q   V     |          |          |          |
14+ 0       0.0696      0.14  Q   V     |          |          |          |
14+ 5       0.0706      0.15  Q   V     |          |          |          |
14+10       0.0716      0.15  Q   V     |          |          |          |
14+15       0.0727      0.15  Q   V     |          |          |          |
14+20       0.0738      0.16  Q   V     |          |          |          |
14+25       0.0749      0.16  Q   V     |          |          |          |
14+30       0.0761      0.17  Q   V     |          |          |          |
14+35       0.0773      0.17  Q   V     |          |          |          |
14+40       0.0785      0.18  Q    V    |          |          |          |
14+45       0.0797      0.18  Q    V    |          |          |          |
14+50       0.0810      0.19  Q    V    |          |          |          |
14+55       0.0824      0.19  Q    V    |          |          |          |
15+ 0       0.0837      0.20  Q    V    |          |          |          |
15+ 5       0.0852      0.21  Q    V    |          |          |          |
15+10       0.0867      0.22  Q    V    |          |          |          |
15+15       0.0882      0.22  Q    V    |          |          |          |
15+20       0.0898      0.23  Q    V    |          |          |          |
15+25       0.0915      0.25  Q    V    |          |          |          |
15+30       0.0932      0.25  Q    V    |          |          |          |
15+35       0.0950      0.26  Q     V   |          |          |          |
15+40       0.0972      0.32  Q     V   |          |          |          |
15+45       0.1009      0.52  |Q    V   |          |          |          |
15+50       0.1074      0.94  |Q    V   |          |          |          |
15+55       0.1195      1.77  |  Q   V  |          |          |          |
16+ 0       0.1402      3.00  |    Q  V |          |          |          |
16+ 5       0.1829      6.20  |         |VQ        |          |          |
16+10       0.2629     11.62  |         |     V    |  Q       |          |
16+15       0.3891     18.33  |         |          |   V      |     Q    |
16+20       0.4612     10.47  |         |          Q          V|          |
16+25       0.5028      6.04  |         | Q        |          | V        |
16+30       0.5299      3.93  |      Q  |          |          |  V       |
16+35       0.5486      2.73  |    Q    |          |          |    V     |
16+40       0.5617      1.89  |  Q      |          |          |    V     |
16+45       0.5704      1.27  | Q       |          |          |     V    |
16+50       0.5758      0.77  |Q        |          |          |     V    |
16+55       0.5795      0.54  |Q        |          |          |     V    |
17+ 0       0.5825      0.44  Q         |          |          |      V   |
17+ 5       0.5851      0.37  Q         |          |          |      V   |
17+10       0.5875      0.35  Q         |          |          |      V   |
17+15       0.5893      0.27  Q         |          |          |      V   |
17+20       0.5907      0.21  Q         |          |          |      V   |
17+25       0.5918      0.16  Q         |          |          |      V   |
17+30       0.5928      0.14  Q         |          |          |      V   |
17+35       0.5938      0.14  Q         |          |          |      V   |
17+40       0.5947      0.13  Q         |          |          |      V   |
17+45       0.5956      0.13  Q         |          |          |       V  |
17+50       0.5964      0.12  Q         |          |          |       V  |
17+55       0.5972      0.12  Q         |          |          |       V  |
18+ 0       0.5980      0.12  Q         |          |          |       V  |
18+ 5       0.5988      0.11  Q         |          |          |       V  |
18+10       0.5995      0.11  Q         |          |          |       V  |
18+15       0.6002      0.10  Q         |          |          |       V  |
18+20       0.6009      0.09  Q         |          |          |       V  |
18+25       0.6015      0.09  Q         |          |          |       V  |
```

18+30	0.6020	0.08	Q	|	|	|	V |
18+35	0.6026	0.08	Q	|	|	|	V |
18+40	0.6032	0.08	Q	|	|	|	V |
18+45	0.6037	0.08	Q	|	|	|	V |
18+50	0.6042	0.08	Q	|	|	|	V |
18+55	0.6047	0.07	Q	|	|	|	V |
19+ 0	0.6052	0.07	Q	|	|	|	V |
19+ 5	0.6057	0.07	Q	|	|	|	V |
19+10	0.6062	0.07	Q	|	|	|	V |
19+15	0.6067	0.07	Q	|	|	|	V |
19+20	0.6071	0.07	Q	|	|	|	V |
19+25	0.6076	0.07	Q	|	|	|	V |
19+30	0.6080	0.06	Q	|	|	|	V |
19+35	0.6085	0.06	Q	|	|	|	V |
19+40	0.6089	0.06	Q	|	|	|	V |
19+45	0.6093	0.06	Q	|	|	|	V |
19+50	0.6097	0.06	Q	|	|	|	V |
19+55	0.6102	0.06	Q	|	|	|	V |
20+ 0	0.6106	0.06	Q	|	|	|	V |
20+ 5	0.6110	0.06	Q	|	|	|	V|
20+10	0.6114	0.06	Q	|	|	|	V|
20+15	0.6118	0.06	Q	|	|	|	V|
20+20	0.6121	0.06	Q	|	|	|	V|
20+25	0.6125	0.06	Q	|	|	|	V|
20+30	0.6129	0.05	Q	|	|	|	V|
20+35	0.6133	0.05	Q	|	|	|	V|
20+40	0.6136	0.05	Q	|	|	|	V|
20+45	0.6140	0.05	Q	|	|	|	V|
20+50	0.6144	0.05	Q	|	|	|	V|
20+55	0.6147	0.05	Q	|	|	|	V|
21+ 0	0.6151	0.05	Q	|	|	|	V|
21+ 5	0.6154	0.05	Q	|	|	|	V|
21+10	0.6158	0.05	Q	|	|	|	V|
21+15	0.6161	0.05	Q	|	|	|	V|
21+20	0.6164	0.05	Q	|	|	|	V|
21+25	0.6168	0.05	Q	|	|	|	V|
21+30	0.6171	0.05	Q	|	|	|	V|
21+35	0.6174	0.05	Q	|	|	|	V|
21+40	0.6177	0.05	Q	|	|	|	V|
21+45	0.6181	0.05	Q	|	|	|	V|
21+50	0.6184	0.05	Q	|	|	|	V|
21+55	0.6187	0.05	Q	|	|	|	V|
22+ 0	0.6190	0.05	Q	|	|	|	V|
22+ 5	0.6193	0.04	Q	|	|	|	V|
22+10	0.6196	0.04	Q	|	|	|	V|
22+15	0.6199	0.04	Q	|	|	|	V|
22+20	0.6202	0.04	Q	|	|	|	V|
22+25	0.6205	0.04	Q	|	|	|	V|
22+30	0.6208	0.04	Q	|	|	|	V|
22+35	0.6211	0.04	Q	|	|	|	V|
22+40	0.6214	0.04	Q	|	|	|	V|
22+45	0.6217	0.04	Q	|	|	|	V|
22+50	0.6220	0.04	Q	|	|	|	V|
22+55	0.6223	0.04	Q	|	|	|	V|
23+ 0	0.6225	0.04	Q	|	|	|	V|
23+ 5	0.6228	0.04	Q	|	|	|	V|
23+10	0.6231	0.04	Q	|	|	|	V|
23+15	0.6234	0.04	Q	|	|	|	V|
23+20	0.6236	0.04	Q	|	|	|	V|
23+25	0.6239	0.04	Q	|	|	|	V|
23+30	0.6242	0.04	Q	|	|	|	V|
23+35	0.6244	0.04	Q	|	|	|	V|
23+40	0.6247	0.04	Q	|	|	|	V|
23+45	0.6250	0.04	Q	|	|	|	V|
23+50	0.6252	0.04	Q	|	|	|	V|
23+55	0.6255	0.04	Q	|	|	|	V|
24+ 0	0.6257	0.04	Q	|	|	|	V|
24+ 5	0.6260	0.04	Q	|	|	|	V|
24+10	0.6262	0.03	Q	|	|	|	V|
24+15	0.6263	0.02	Q	|	|	|	V|
24+20	0.6264	0.01	Q	|	|	|	V|

24+25	0.6264	0.01	Q	|	|	|	V|
24+30	0.6265	0.00	Q	|	|	|	V|
24+35	0.6265	0.00	Q	|	|	|	V|
24+40	0.6265	0.00	Q	|	|	|	V|
24+45	0.6265	0.00	Q	|	|	|	V|
24+50	0.6265	0.00	Q	|	|	|	V|
24+55	0.6265	0.00	Q	|	|	|	V|
25+ 0	0.6265	0.00	Q	|	|	|	V|
25+ 5	0.6265	0.00	Q	|	|	|	V|
25+10	0.6265	0.00	Q	|	|	|	V|
25+15	0.6265	0.00	Q	|	|	|	V|

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study, Date: 02/05/18 File Name: PRB002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'B' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Program License Serial Number 6407

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Pervious ratio(Ap) = 0.6000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.150(In/Hr)
Initial subarea data:
Initial area flow distance = 240.000(Ft.)
Top (of initial area) elevation = 335.000(Ft.)
Bottom (of initial area) elevation = 305.200(Ft.)
Difference in elevation = 29.800(Ft.)
Slope = 0.12417 s(%)= 12.42
TC = k(0.412)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.600 min.
Rainfall intensity = 2.121(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.836
Subarea runoff = 1.810(CFS)
Total initial stream area = 1.020(Ac.)

++
Process from Point/Station 201.000 to Point/Station 202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 305.200(Ft.)
End of street segment elevation = 282.000(Ft.)
Length of street segment = 224.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 9.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)

```
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.915(CFS)
Depth of flow =   0.221(Ft.), Average velocity =   5.452(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.740(Ft.)
Flow velocity =   5.45(Ft/s)
Travel time =    0.68 min.     TC =    6.28  min.
 Adding area flow to street
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.6000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.150(In/Hr)
Rainfall intensity =      1.985(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      0.139(CFS) for    0.160(Ac.)
Total runoff =      1.949(CFS)       Total area =        1.18(Ac.)
Area averaged Fm value =    0.150(In/Hr)
Street flow at end of street =      1.949(CFS)
Half street flow at end of street =      1.949(CFS)
Depth of flow =   0.223(Ft.), Average velocity =   5.465(Ft/s)
Flow width (from curb towards crown)=   4.796(Ft.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.180(Ac.)
Runoff from this stream =      1.949(CFS)
Time of concentration =    6.28 min.
Rainfall intensity =     1.985(In/Hr)
Area averaged loss rate (Fm) =    0.1500(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000


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Process from Point/Station      203.000 to Point/Station      204.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.850
SCS curve number for soil(AMC 2)  = 74.10
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.208(In/Hr)
Max Catchment Loss (Fm) =     0.104(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   302.500(Ft.)
Bottom (of initial area) elevation =   288.300(Ft.)
Difference in elevation =    14.200(Ft.)
Slope =    0.04733  s(%)=       4.73
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.011 min.
Rainfall intensity =      1.864(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      3.074(CFS)
Total initial stream area =        1.940(Ac.)


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Process from Point/Station      204.000 to Point/Station      202.000
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**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =   288.300(Ft.)
End of street segment elevation =   282.000(Ft.)
Length of street segment  =   422.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.591(CFS)
Depth of flow =   0.301(Ft.), Average velocity =   2.580(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.737(Ft.)
Flow velocity =   2.58(Ft/s)
Travel time =    2.73 min.     TC =    9.74  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.050
SCS curve number for soil(AMC 2)  = 69.30
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.124(In/Hr)
Rainfall intensity =      1.544(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.833
Subarea runoff =      2.854(CFS) for    2.670(Ac.)
Total runoff =      5.928(CFS)       Total area =        4.61(Ac.)
Area averaged Fm value =    0.115(In/Hr)
Street flow at end of street =      5.928(CFS)
Half street flow at end of street =      2.964(CFS)
Depth of flow =   0.322(Ft.), Average velocity =   2.732(Ft/s)
Flow width (from curb towards crown)=   9.789(Ft.)


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Process from Point/Station      204.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.610(Ac.)
Runoff from this stream =      5.928(CFS)
Time of concentration =    9.74 min.
Rainfall intensity =     1.544(In/Hr)
Area averaged loss rate (Fm) =    0.1153(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      1.18     1.949      6.28    0.150      1.985
2      4.61     5.928      9.74    0.115      1.544
Qmax(1) =
          1.000 *    1.000 *     1.949) +
          1.309 *    0.645 *     5.928) + =       6.956
Qmax(2) =
          0.760 *    1.000 *     1.949) +
          1.000 *    1.000 *     5.928) + =       7.408
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       1.949       5.928
Maximum flow rates at confluence using above data:
        6.956        7.408
Area of streams before confluence:
        1.180        4.610
Effective area values after confluence:
        4.155        5.790
Results of confluence:
Total flow rate =      7.408(CFS)
Time of concentration =     9.737 min.
Effective stream area after confluence =      5.790(Ac.)
Study area average Pervious fraction(Ap) =  0.520
Study area average soil loss rate(Fm) =    0.122(In/Hr)
Study area total (this main stream) =       5.79(Ac.)


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Process from Point/Station      202.000 to Point/Station      205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   282.000(Ft.)
End of street segment elevation =   269.000(Ft.)
Length of street segment  =   176.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      7.610(CFS)
Depth of flow =   0.335(Ft.), Average velocity =   6.279(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.417(Ft.)
Flow velocity =   6.28(Ft/s)
Travel time =    0.47 min.     TC =   10.20  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.503(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =      0.345(CFS) for    0.450(Ac.)
Total runoff =      7.753(CFS)        Total area =        6.24(Ac.)
Area averaged Fm value =    0.123(In/Hr)
Street flow at end of street =      7.753(CFS)
Half street flow at end of street =      7.753(CFS)
Depth of flow =   0.337(Ft.), Average velocity =   6.306(Ft/s)
Flow width (from curb towards crown)=  10.501(Ft.)


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Process from Point/Station      205.000 to Point/Station      206.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   263.000(Ft.)
Downstream point/station elevation =   262.000(Ft.)
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Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.753(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     7.753(CFS)
Normal flow depth in pipe =    7.73(In.)
Flow top width inside pipe =   17.82(In.)
Critical Depth =   12.95(In.)
Pipe flow velocity =     10.68(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.25 min.


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Process from Point/Station      205.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      6.240(Ac.)
Runoff from this stream =      7.753(CFS)
Time of concentration =   10.25 min.
Rainfall intensity =     1.500(In/Hr)
Area averaged loss rate (Fm) =    0.1226(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5189


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Process from Point/Station      207.000 to Point/Station      208.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   356.000(Ft.)
Bottom (of initial area) elevation =   304.000(Ft.)
Difference in elevation =    52.000(Ft.)
Slope =    0.17333  s(%)=      17.33
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.408 min.
Rainfall intensity =      2.164(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.848
Subarea runoff =      2.257(CFS)
Total initial stream area =        1.230(Ac.)


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Process from Point/Station      208.000 to Point/Station      209.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   304.000(Ft.)
End of street segment elevation =   269.000(Ft.)
Length of street segment  =   374.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      3.025(CFS)
Depth of flow =   0.255(Ft.), Average velocity =   5.648(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.395(Ft.)
Flow velocity =   5.65(Ft/s)
Travel time =    1.10 min.     TC =    6.51  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.945(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =      1.478(CFS) for    1.050(Ac.)
Total runoff =      3.735(CFS)        Total area =        2.28(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      3.735(CFS)
Half street flow at end of street =      3.735(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   5.890(Ft/s)
Flow width (from curb towards crown)=   7.124(Ft.)


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Process from Point/Station      209.000 to Point/Station      206.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   263.000(Ft.)
Downstream point/station elevation =   262.000(Ft.)
Pipe length  =    17.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.735(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.735(CFS)
Normal flow depth in pipe =    4.66(In.)
Flow top width inside pipe =   15.77(In.)
Critical Depth =    8.86(In.)
Pipe flow velocity =     10.30(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     6.54 min.


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Process from Point/Station      209.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.280(Ac.)
Runoff from this stream =      3.735(CFS)
Time of concentration =    6.54 min.
Rainfall intensity =     1.941(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      6.24     7.753     10.25    0.123      1.500
2      2.28     3.735      6.54    0.125      1.941
Qmax(1) =
          1.000 *    1.000 *     7.753) +
          0.757 *    1.000 *     3.735) + =      10.581
Qmax(2) =
          1.320 *    0.638 *     7.753) +
          1.000 *    1.000 *     3.735) + =      10.267
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       7.753       3.735
Maximum flow rates at confluence using above data:
       10.581       10.267
Area of streams before confluence:
        6.240        2.280
Effective area values after confluence:
        8.520        6.262
Results of confluence:
Total flow rate =     10.581(CFS)
Time of concentration =    10.247 min.
Effective stream area after confluence =      8.520(Ac.)
Study area average Pervious fraction(Ap) =  0.514
Study area average soil loss rate(Fm) =    0.123(In/Hr)
Study area total (this main stream) =       8.52(Ac.)


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Process from Point/Station      206.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   262.000(Ft.)
Downstream point/station elevation =   250.000(Ft.)
Pipe length  =  1017.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.581(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    10.581(CFS)
Normal flow depth in pipe =    9.30(In.)
Flow top width inside pipe =   31.51(In.)
Critical Depth =   12.35(In.)
Pipe flow velocity =      7.32(Ft/s)
Travel time through pipe =    2.32 min.
Time of concentration (TC) =    12.56 min.


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Process from Point/Station      206.000 to Point/Station      210.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.520(Ac.)
Runoff from this stream =     10.581(CFS)
Time of concentration =   12.56 min.
Rainfall intensity =     1.334(In/Hr)
Area averaged loss rate (Fm) =    0.1232(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5138


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Process from Point/Station      209.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   269.000(Ft.)
Bottom (of initial area) elevation =   263.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.02000  s(%)=       2.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.329 min.
Rainfall intensity =      1.689(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
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Subarea runoff =      1.422(CFS)
Total initial stream area =        1.010(Ac.)


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Process from Point/Station      211.000 to Point/Station      212.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =   263.000(Ft.)
End of street segment elevation =   261.000(Ft.)
Length of street segment  =   313.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.756(CFS)
Depth of flow =   0.314(Ft.), Average velocity =   1.747(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.371(Ft.)
Flow velocity =   1.75(Ft/s)
Travel time =    2.99 min.     TC =   11.31  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.417(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =      0.613(CFS) for    0.740(Ac.)
Total runoff =      2.034(CFS)       Total area =        1.75(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      2.034(CFS)
Half street flow at end of street =      2.034(CFS)
Depth of flow =   0.327(Ft.), Average velocity =   1.807(Ft/s)
Flow width (from curb towards crown)=   9.996(Ft.)


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Process from Point/Station      212.000 to Point/Station      213.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =   260.000(Ft.)
End of street segment elevation =   256.000(Ft.)
Length of street segment  =   458.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      2.629(CFS)
Depth of flow =   0.335(Ft.), Average velocity =   2.161(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.439(Ft.)
Flow velocity =   2.16(Ft/s)
Travel time =    3.53 min.     TC =   14.85  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
SCS curve number for soil(AMC 2)  = 72.60
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.110(In/Hr)
Rainfall intensity =      1.212(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =      1.116(CFS) for    1.450(Ac.)
Total runoff =      3.150(CFS)        Total area =        3.20(Ac.)
Area averaged Fm value =    0.118(In/Hr)
Street flow at end of street =      3.150(CFS)
Half street flow at end of street =      3.150(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   2.254(Ft/s)
Flow width (from curb towards crown)=  11.274(Ft.)


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Process from Point/Station      213.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   251.000(Ft.)
Downstream point/station elevation =   250.000(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.150(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.150(CFS)
Normal flow depth in pipe =    3.74(In.)
Flow top width inside pipe =   14.61(In.)
Critical Depth =    8.11(In.)
Pipe flow velocity =     11.83(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    14.86 min.


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Process from Point/Station      213.000 to Point/Station      210.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.200(Ac.)
Runoff from this stream =      3.150(CFS)
Time of concentration =   14.86 min.
Rainfall intensity =     1.211(In/Hr)
Area averaged loss rate (Fm) =    0.1182(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      205.000 to Point/Station      214.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
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Initial area flow distance =   205.000(Ft.)
Top (of initial area) elevation =   269.000(Ft.)
Bottom (of initial area) elevation =   263.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.02927  s(%)=       2.93
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.628 min.
Rainfall intensity =      1.926(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.842
Subarea runoff =      0.600(CFS)
Total initial stream area =        0.370(Ac.)


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Process from Point/Station      214.000 to Point/Station      215.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   263.000(Ft.)
End of street segment elevation =   261.000(Ft.)
Length of street segment  =   303.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.179(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   1.622(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.749(Ft.)
Flow velocity =   1.62(Ft/s)
Travel time =    3.11 min.     TC =    9.74  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.544(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =      1.099(CFS) for    0.960(Ac.)
Total runoff =      1.698(CFS)       Total area =        1.33(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      1.698(CFS)
Half street flow at end of street =      1.698(CFS)
Depth of flow =   0.310(Ft.), Average velocity =   1.756(Ft/s)
Flow width (from curb towards crown)=   9.166(Ft.)


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Process from Point/Station      215.000 to Point/Station      216.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   261.000(Ft.)
End of street segment elevation =   256.000(Ft.)
Length of street segment  =   459.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
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Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.136(CFS)
Depth of flow =   0.341(Ft.), Average velocity =   2.451(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.737(Ft.)
Flow velocity =   2.45(Ft/s)
Travel time =    3.12 min.     TC =   12.86  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.600
SCS curve number for soil(AMC 2)  = 72.60
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.220(In/Hr)
Max Catchment Loss (Fm) =     0.110(In/Hr)
Rainfall intensity =      1.316(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =      2.821(CFS) for    2.850(Ac.)
Total runoff =      4.519(CFS)       Total area =        4.18(Ac.)
Area averaged Fm value =    0.115(In/Hr)
Street flow at end of street =      4.519(CFS)
Half street flow at end of street =      4.519(CFS)
Depth of flow =   0.377(Ft.), Average velocity =   2.670(Ft/s)
Flow width (from curb towards crown)=  12.514(Ft.)


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Process from Point/Station      216.000 to Point/Station      210.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   251.000(Ft.)
Downstream point/station elevation =   250.000(Ft.)
Pipe length  =    31.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.519(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.519(CFS)
Normal flow depth in pipe =    6.00(In.)
Flow top width inside pipe =   16.97(In.)
Critical Depth =    9.80(In.)
Pipe flow velocity =      8.77(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.92 min.


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Process from Point/Station      216.000 to Point/Station      210.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.180(Ac.)
Runoff from this stream =      4.519(CFS)
Time of concentration =   12.92 min.
Rainfall intensity =     1.313(In/Hr)
Area averaged loss rate (Fm) =    0.1148(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)
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1      8.52    10.581     12.56    0.123      1.334
2      3.20     3.150     14.86    0.118      1.211
3      4.18     4.519     12.92    0.115      1.313
Qmax(1) =
          1.000 *    1.000 *    10.581) +
          1.112 *    0.845 *     3.150) +
          1.018 *    0.972 *     4.519) + =      18.015
Qmax(2) =
          0.899 *    1.000 *    10.581) +
          1.000 *    1.000 *     3.150) +
          0.916 *    1.000 *     4.519) + =      16.798
Qmax(3) =
          0.982 *    1.000 *    10.581) +
          1.093 *    0.870 *     3.150) +
          1.000 *    1.000 *     4.519) + =      17.906

Total of 3 streams to confluence:
Flow rates before confluence point:
      10.581       3.150       4.519
Maximum flow rates at confluence using above data:
       18.015       16.798       17.906
Area of streams before confluence:
        8.520        3.200        4.180
Effective area values after confluence:
       15.290       15.900       15.483
Results of confluence:
Total flow rate =     18.015(CFS)
Time of concentration =    12.564 min.
Effective stream area after confluence =     15.290(Ac.)
Study area average Pervious fraction(Ap) =  0.507
Study area average soil loss rate(Fm) =    0.120(In/Hr)
Study area total (this main stream) =      15.90(Ac.)


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Process from Point/Station      210.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   250.000(Ft.)
Downstream point/station elevation =   214.000(Ft.)
Pipe length  =   878.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.015(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    18.015(CFS)
Normal flow depth in pipe =    8.88(In.)
Flow top width inside pipe =   31.04(In.)
Critical Depth =   16.28(In.)
Pipe flow velocity =     13.29(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =    13.67 min.


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Process from Point/Station      210.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.290(Ac.)
Runoff from this stream =     18.015(CFS)
Time of concentration =   13.67 min.
Rainfall intensity =     1.271(In/Hr)
Area averaged loss rate (Fm) =    0.1200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5074


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Process from Point/Station      508.000 to Point/Station      218.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.100(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   255.000(Ft.)
Bottom (of initial area) elevation =   237.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.06000  s(%)=       6.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.686 min.
Rainfall intensity =      1.916(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =      0.637(CFS)
Total initial stream area =        0.390(Ac.)


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Process from Point/Station      218.000 to Point/Station      219.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   237.000(Ft.)
End of street segment elevation =   223.000(Ft.)
Length of street segment  =   494.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.491(CFS)
Depth of flow =   0.283(Ft.), Average velocity =   3.374(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.819(Ft.)
Flow velocity =   3.37(Ft/s)
Travel time =    2.44 min.     TC =    9.13  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.603(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      3.640(CFS) for    2.820(Ac.)
Total runoff =      4.278(CFS)       Total area =        3.21(Ac.)
Area averaged Fm value =    0.122(In/Hr)
Street flow at end of street =      4.278(CFS)
Half street flow at end of street =      4.278(CFS)
Depth of flow =   0.326(Ft.), Average velocity =   3.804(Ft/s)
Flow width (from curb towards crown)=   9.989(Ft.)


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Process from Point/Station      219.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
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Upstream point/station elevation =   215.000(Ft.)
Downstream point/station elevation =   214.000(Ft.)
Pipe length  =    22.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.278(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.278(CFS)
Normal flow depth in pipe =    5.33(In.)
Flow top width inside pipe =   16.44(In.)
Critical Depth =    9.52(In.)
Pipe flow velocity =      9.77(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.16 min.


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Process from Point/Station      219.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.210(Ac.)
Runoff from this stream =      4.278(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     1.599(In/Hr)
Area averaged loss rate (Fm) =    0.1220(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      220.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.200(In/Hr)
Max Catchment Loss (Fm) =     0.100(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   256.000(Ft.)
Bottom (of initial area) elevation =   237.000(Ft.)
Difference in elevation =    19.000(Ft.)
Slope =    0.06333  s(%)=       6.33
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.614 min.
Rainfall intensity =      1.928(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.853
Subarea runoff =      0.345(CFS)
Total initial stream area =        0.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   237.000(Ft.)
End of street segment elevation =   223.000(Ft.)
Length of street segment  =   472.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
```

```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.580(CFS)
Depth of flow =   0.182(Ft.), Average velocity =   2.866(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.751(Ft.)
Flow velocity =   2.87(Ft/s)
Travel time =    2.75 min.     TC =    9.36  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.050
SCS curve number for soil(AMC 2)  = 69.30
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.124(In/Hr)
Rainfall intensity =      1.580(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =      0.380(CFS) for    0.340(Ac.)
Total runoff =      0.725(CFS)        Total area =        0.55(Ac.)
Area averaged Fm value =    0.115(In/Hr)
Street flow at end of street =      0.725(CFS)
Half street flow at end of street =      0.725(CFS)
Depth of flow =   0.199(Ft.), Average velocity =   2.824(Ft/s)
Flow width (from curb towards crown)=   3.607(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   215.000(Ft.)
Downstream point/station elevation =   214.000(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.725(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     0.725(CFS)
Normal flow depth in pipe =    2.45(In.)
Flow top width inside pipe =   12.34(In.)
Critical Depth =    3.78(In.)
Pipe flow velocity =      5.03(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.47 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.550(Ac.)
Runoff from this stream =      0.725(CFS)
Time of concentration =    9.47 min.
Rainfall intensity =     1.569(In/Hr)
Area averaged loss rate (Fm) =    0.1147(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     15.29    18.015     13.67    0.120      1.271
2      3.21     4.278      9.16    0.122      1.599
3      0.55     0.725      9.47    0.115      1.569
Qmax(1) =
          1.000 *    1.000 *    18.015) +
          0.778 *    1.000 *     4.278) +
          0.795 *    1.000 *     0.725) + =      21.920
```

```
Qmax(2) =
          1.285 *    0.671 *    18.015) +
          1.000 *    1.000 *     4.278) +
          1.020 *    0.968 *     0.725) + =      20.513
Qmax(3) =
          1.259 *    0.693 *    18.015) +
          0.980 *    1.000 *     4.278) +
          1.000 *    1.000 *     0.725) + =      20.630

Total of 3 streams to confluence:
Flow rates before confluence point:
      18.015       4.278       0.725
Maximum flow rates at confluence using above data:
       21.920       20.513       20.630
Area of streams before confluence:
       15.290        3.210        0.550
Effective area values after confluence:
       19.050       13.995       14.354
Results of confluence:
Total flow rate =     21.920(CFS)
Time of concentration =    13.665 min.
Effective stream area after confluence =     19.050(Ac.)
Study area average Pervious fraction(Ap) =  0.506
Study area average soil loss rate(Fm) =    0.120(In/Hr)
Study area total (this main stream) =      19.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      222.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   214.000(Ft.)
Downstream point/station elevation =   212.000(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.920(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    21.920(CFS)
Normal flow depth in pipe =    9.97(In.)
Flow top width inside pipe =   32.22(In.)
Critical Depth =   18.08(In.)
Pipe flow velocity =     13.74(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    13.73 min.
End of computations, total study area =           19.66 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.506
Area averaged SCS curve number (AMC 2) =  70.5
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 02/05/18 File Name PRB00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6407

RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'B' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
70.5	5.0	0.25	D	0.200	0.506	0.101
70.5	14.7	0.75	C	0.250	0.506	0.127

Area-averaged adjusted loss rate Fm (In/Hr) = 0.120

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
2.52	0.128	70.5	51.6	9.38	0.002
2.46	0.125	98.0	98.0	0.20	0.890
7.43	0.378	70.5	51.6	9.38	0.002
7.25	0.369	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.440
Area-averaged low loss fraction, Yb = 0.560

++
User entry of time of concentration = 0.229 (hours)
Watershed area = 19.66(Ac.)
Catchment Lag time = 0.183 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 45.5274
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.120(In/Hr)
Average low loss rate fraction (Yb) = 0.560 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 19.66(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)
30-minute factor = 0.999 Adjusted rainfall = 0.400(In)
1-hour factor = 0.999 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 237.76 (CFS))	
1	3.752	8.920
2	19.352	37.092
3	56.930	89.346
4	73.963	40.498
5	82.959	21.391
6	88.907	14.141
7	93.012	9.762
8	95.765	6.545
9	97.504	4.133
10	98.290	1.869
11	98.780	1.167
12	99.141	0.858
13	99.453	0.741
14	99.756	0.719
15	99.917	0.383
16	100.000	0.198

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2532	0.0634
3	0.2996	0.0465
4	0.3377	0.0380
5	0.3705	0.0328
6	0.3996	0.0292
7	0.4254	0.0258
8	0.4491	0.0237
9	0.4711	0.0220
10	0.4917	0.0206
11	0.5111	0.0194
12	0.5295	0.0184
13	0.5499	0.0204
14	0.5695	0.0196
15	0.5884	0.0189
16	0.6066	0.0182
17	0.6242	0.0176
18	0.6413	0.0171
19	0.6579	0.0166
20	0.6741	0.0161
21	0.6898	0.0157
22	0.7051	0.0153
23	0.7201	0.0150
24	0.7347	0.0146
25	0.7490	0.0143
26	0.7631	0.0140
27	0.7768	0.0137
28	0.7902	0.0135
29	0.8035	0.0132
30	0.8164	0.0130
31	0.8292	0.0127
32	0.8417	0.0125
33	0.8540	0.0123
34	0.8662	0.0121

35	0.8781	0.0119
36	0.8899	0.0118
37	0.9011	0.0112
38	0.9121	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9442	0.0106
42	0.9546	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0144	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0612	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1480	0.0083
64	1.1563	0.0083
65	1.1644	0.0082
66	1.1726	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3587	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051
102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051
105	1.4050	0.0050

106	1.4100	0.0050
107	1.4150	0.0050
108	1.4199	0.0049
109	1.4248	0.0049
110	1.4297	0.0049
111	1.4346	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4678	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5087	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5731	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6450	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036
176	1.7048	0.0036

177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7299	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8213	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8533	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9206	0.0030
243	1.9236	0.0030
244	1.9266	0.0030
245	1.9295	0.0030
246	1.9325	0.0029
247	1.9354	0.0029

248	1.9383	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0015	0.0012
2	0.0027	0.0015	0.0012
3	0.0027	0.0015	0.0012
4	0.0027	0.0015	0.0012
5	0.0027	0.0015	0.0012
6	0.0027	0.0015	0.0012
7	0.0027	0.0015	0.0012
8	0.0027	0.0015	0.0012
9	0.0027	0.0015	0.0012
10	0.0027	0.0015	0.0012
11	0.0028	0.0015	0.0012
12	0.0028	0.0015	0.0012
13	0.0028	0.0016	0.0012
14	0.0028	0.0016	0.0012
15	0.0028	0.0016	0.0012
16	0.0028	0.0016	0.0012
17	0.0028	0.0016	0.0012
18	0.0028	0.0016	0.0012
19	0.0028	0.0016	0.0012
20	0.0028	0.0016	0.0013
21	0.0029	0.0016	0.0013
22	0.0029	0.0016	0.0013
23	0.0029	0.0016	0.0013
24	0.0029	0.0016	0.0013
25	0.0029	0.0016	0.0013

26	0.0029	0.0016	0.0013
27	0.0029	0.0016	0.0013
28	0.0029	0.0016	0.0013
29	0.0029	0.0016	0.0013
30	0.0030	0.0017	0.0013
31	0.0030	0.0017	0.0013
32	0.0030	0.0017	0.0013
33	0.0030	0.0017	0.0013
34	0.0030	0.0017	0.0013
35	0.0030	0.0017	0.0013
36	0.0030	0.0017	0.0013
37	0.0030	0.0017	0.0013
38	0.0030	0.0017	0.0013
39	0.0031	0.0017	0.0013
40	0.0031	0.0017	0.0014
41	0.0031	0.0017	0.0014
42	0.0031	0.0017	0.0014
43	0.0031	0.0017	0.0014
44	0.0031	0.0017	0.0014
45	0.0031	0.0018	0.0014
46	0.0031	0.0018	0.0014
47	0.0032	0.0018	0.0014
48	0.0032	0.0018	0.0014
49	0.0032	0.0018	0.0014
50	0.0032	0.0018	0.0014
51	0.0032	0.0018	0.0014
52	0.0032	0.0018	0.0014
53	0.0033	0.0018	0.0014
54	0.0033	0.0018	0.0014
55	0.0033	0.0018	0.0014
56	0.0033	0.0018	0.0014
57	0.0033	0.0019	0.0015
58	0.0033	0.0019	0.0015
59	0.0033	0.0019	0.0015
60	0.0034	0.0019	0.0015
61	0.0034	0.0019	0.0015
62	0.0034	0.0019	0.0015
63	0.0034	0.0019	0.0015
64	0.0034	0.0019	0.0015
65	0.0034	0.0019	0.0015
66	0.0035	0.0019	0.0015
67	0.0035	0.0019	0.0015
68	0.0035	0.0020	0.0015
69	0.0035	0.0020	0.0015
70	0.0035	0.0020	0.0016
71	0.0035	0.0020	0.0016
72	0.0036	0.0020	0.0016
73	0.0036	0.0020	0.0016
74	0.0036	0.0020	0.0016
75	0.0036	0.0020	0.0016
76	0.0036	0.0020	0.0016
77	0.0037	0.0020	0.0016
78	0.0037	0.0021	0.0016
79	0.0037	0.0021	0.0016
80	0.0037	0.0021	0.0016
81	0.0037	0.0021	0.0016
82	0.0038	0.0021	0.0017
83	0.0038	0.0021	0.0017
84	0.0038	0.0021	0.0017
85	0.0038	0.0021	0.0017
86	0.0038	0.0022	0.0017
87	0.0039	0.0022	0.0017
88	0.0039	0.0022	0.0017
89	0.0039	0.0022	0.0017
90	0.0039	0.0022	0.0017
91	0.0040	0.0022	0.0017
92	0.0040	0.0022	0.0018
93	0.0040	0.0022	0.0018
94	0.0040	0.0023	0.0018
95	0.0041	0.0023	0.0018
96	0.0041	0.0023	0.0018

97	0.0041	0.0023	0.0018
98	0.0041	0.0023	0.0018
99	0.0042	0.0023	0.0018
100	0.0042	0.0023	0.0018
101	0.0042	0.0024	0.0019
102	0.0043	0.0024	0.0019
103	0.0043	0.0024	0.0019
104	0.0043	0.0024	0.0019
105	0.0044	0.0024	0.0019
106	0.0044	0.0024	0.0019
107	0.0044	0.0025	0.0019
108	0.0044	0.0025	0.0020
109	0.0045	0.0025	0.0020
110	0.0045	0.0025	0.0020
111	0.0045	0.0025	0.0020
112	0.0046	0.0026	0.0020
113	0.0046	0.0026	0.0020
114	0.0046	0.0026	0.0020
115	0.0047	0.0026	0.0021
116	0.0047	0.0026	0.0021
117	0.0048	0.0027	0.0021
118	0.0048	0.0027	0.0021
119	0.0049	0.0027	0.0021
120	0.0049	0.0027	0.0021
121	0.0049	0.0028	0.0022
122	0.0050	0.0028	0.0022
123	0.0050	0.0028	0.0022
124	0.0051	0.0028	0.0022
125	0.0051	0.0029	0.0023
126	0.0051	0.0029	0.0023
127	0.0052	0.0029	0.0023
128	0.0052	0.0029	0.0023
129	0.0053	0.0030	0.0023
130	0.0054	0.0030	0.0024
131	0.0054	0.0030	0.0024
132	0.0055	0.0031	0.0024
133	0.0055	0.0031	0.0024
134	0.0056	0.0031	0.0025
135	0.0057	0.0032	0.0025
136	0.0057	0.0032	0.0025
137	0.0058	0.0032	0.0025
138	0.0058	0.0033	0.0026
139	0.0059	0.0033	0.0026
140	0.0060	0.0033	0.0026
141	0.0061	0.0034	0.0027
142	0.0061	0.0034	0.0027
143	0.0062	0.0035	0.0027
144	0.0063	0.0035	0.0028
145	0.0077	0.0043	0.0034
146	0.0078	0.0044	0.0034
147	0.0079	0.0044	0.0035
148	0.0080	0.0045	0.0035
149	0.0081	0.0045	0.0036
150	0.0082	0.0046	0.0036
151	0.0083	0.0047	0.0037
152	0.0084	0.0047	0.0037
153	0.0086	0.0048	0.0038
154	0.0086	0.0048	0.0038
155	0.0088	0.0049	0.0039
156	0.0089	0.0050	0.0039
157	0.0091	0.0051	0.0040
158	0.0092	0.0051	0.0040
159	0.0094	0.0052	0.0041
160	0.0095	0.0053	0.0042
161	0.0097	0.0054	0.0043
162	0.0098	0.0055	0.0043
163	0.0100	0.0056	0.0044
164	0.0101	0.0057	0.0045
165	0.0104	0.0058	0.0046
166	0.0106	0.0059	0.0046
167	0.0108	0.0061	0.0048

168	0.0110	0.0062	0.0048
169	0.0118	0.0066	0.0052
170	0.0119	0.0067	0.0053
171	0.0123	0.0069	0.0054
172	0.0125	0.0070	0.0055
173	0.0130	0.0073	0.0057
174	0.0132	0.0074	0.0058
175	0.0137	0.0077	0.0060
176	0.0140	0.0078	0.0062
177	0.0146	0.0082	0.0064
178	0.0150	0.0084	0.0066
179	0.0157	0.0088	0.0069
180	0.0161	0.0090	0.0071
181	0.0171	0.0096	0.0075
182	0.0176	0.0099	0.0078
183	0.0189	0.0100	0.0089
184	0.0196	0.0100	0.0096
185	0.0184	0.0100	0.0084
186	0.0194	0.0100	0.0094
187	0.0220	0.0100	0.0120
188	0.0237	0.0100	0.0137
189	0.0292	0.0100	0.0191
190	0.0328	0.0100	0.0228
191	0.0465	0.0100	0.0364
192	0.0634	0.0100	0.0533
193	0.1898	0.0100	0.1798
194	0.0380	0.0100	0.0280
195	0.0258	0.0100	0.0158
196	0.0206	0.0100	0.0106
197	0.0204	0.0100	0.0104
198	0.0182	0.0100	0.0082
199	0.0166	0.0093	0.0073
200	0.0153	0.0086	0.0068
201	0.0143	0.0080	0.0063
202	0.0135	0.0075	0.0059
203	0.0127	0.0071	0.0056
204	0.0121	0.0068	0.0053
205	0.0112	0.0062	0.0049
206	0.0107	0.0060	0.0047
207	0.0103	0.0058	0.0045
208	0.0099	0.0055	0.0044
209	0.0096	0.0054	0.0042
210	0.0093	0.0052	0.0041
211	0.0090	0.0050	0.0040
212	0.0087	0.0049	0.0038
213	0.0085	0.0047	0.0037
214	0.0083	0.0046	0.0036
215	0.0081	0.0045	0.0035
216	0.0079	0.0044	0.0035
217	0.0063	0.0035	0.0028
218	0.0062	0.0034	0.0027
219	0.0060	0.0034	0.0026
220	0.0059	0.0033	0.0026
221	0.0057	0.0032	0.0025
222	0.0056	0.0031	0.0025
223	0.0055	0.0031	0.0024
224	0.0054	0.0030	0.0024
225	0.0053	0.0030	0.0023
226	0.0052	0.0029	0.0023
227	0.0051	0.0028	0.0022
228	0.0050	0.0028	0.0022
229	0.0049	0.0027	0.0022
230	0.0048	0.0027	0.0021
231	0.0047	0.0027	0.0021
232	0.0047	0.0026	0.0021
233	0.0046	0.0026	0.0020
234	0.0045	0.0025	0.0020
235	0.0045	0.0025	0.0020
236	0.0044	0.0025	0.0019
237	0.0043	0.0024	0.0019
238	0.0043	0.0024	0.0019

239	0.0042	0.0024	0.0019
240	0.0042	0.0023	0.0018
241	0.0041	0.0023	0.0018
242	0.0041	0.0023	0.0018
243	0.0040	0.0022	0.0018
244	0.0040	0.0022	0.0017
245	0.0039	0.0022	0.0017
246	0.0039	0.0022	0.0017
247	0.0038	0.0021	0.0017
248	0.0038	0.0021	0.0017
249	0.0037	0.0021	0.0016
250	0.0037	0.0021	0.0016
251	0.0036	0.0020	0.0016
252	0.0036	0.0020	0.0016
253	0.0036	0.0020	0.0016
254	0.0035	0.0020	0.0016
255	0.0035	0.0020	0.0015
256	0.0035	0.0019	0.0015
257	0.0034	0.0019	0.0015
258	0.0034	0.0019	0.0015
259	0.0034	0.0019	0.0015
260	0.0033	0.0019	0.0015
261	0.0033	0.0018	0.0015
262	0.0033	0.0018	0.0014
263	0.0032	0.0018	0.0014
264	0.0032	0.0018	0.0014
265	0.0032	0.0018	0.0014
266	0.0032	0.0018	0.0014
267	0.0031	0.0018	0.0014
268	0.0031	0.0017	0.0014
269	0.0031	0.0017	0.0014
270	0.0031	0.0017	0.0013
271	0.0030	0.0017	0.0013
272	0.0030	0.0017	0.0013
273	0.0030	0.0017	0.0013
274	0.0030	0.0017	0.0013
275	0.0029	0.0016	0.0013
276	0.0029	0.0016	0.0013
277	0.0029	0.0016	0.0013
278	0.0029	0.0016	0.0013
279	0.0029	0.0016	0.0013
280	0.0028	0.0016	0.0012
281	0.0028	0.0016	0.0012
282	0.0028	0.0016	0.0012
283	0.0028	0.0016	0.0012
284	0.0028	0.0015	0.0012
285	0.0027	0.0015	0.0012
286	0.0027	0.0015	0.0012
287	0.0027	0.0015	0.0012
288	0.0027	0.0015	0.0012

Total soil rain loss = 0.97(In)
Total effective rainfall = 1.08(In)
Peak flow rate in flood hydrograph = 20.89(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0004	0.05	Q	|	|	|	|
0+15	0.0015	0.16	Q	|	|	|	|
0+20	0.0030	0.21	Q	|	|	|	|
0+25	0.0046	0.23	Q	|	|	|	|
0+30	0.0063	0.25	Q	|	|	|	|

0+35	0.0081	0.26	Q				
0+40	0.0100	0.27	Q				
0+45	0.0119	0.28	Q				
0+50	0.0138	0.28	Q				
0+55	0.0158	0.28	Q				
1+ 0	0.0177	0.28	Q				
1+ 5	0.0197	0.29	Q				
1+10	0.0217	0.29	Q				
1+15	0.0237	0.29	Q				
1+20	0.0257	0.29	Q				
1+25	0.0277	0.29	Q				
1+30	0.0297	0.29	Q				
1+35	0.0317	0.29	Q				
1+40	0.0337	0.29	Q				
1+45	0.0358	0.30	Q				
1+50	0.0378	0.30	Q				
1+55	0.0399	0.30	Q				
2+ 0	0.0419	0.30	Q				
2+ 5	0.0440	0.30	Q				
2+10	0.0461	0.30	QV				
2+15	0.0482	0.30	QV				
2+20	0.0503	0.30	QV				
2+25	0.0524	0.30	QV				
2+30	0.0545	0.31	QV				
2+35	0.0566	0.31	QV				
2+40	0.0587	0.31	QV				
2+45	0.0608	0.31	QV				
2+50	0.0630	0.31	QV				
2+55	0.0651	0.31	QV				
3+ 0	0.0673	0.31	QV				
3+ 5	0.0694	0.31	QV				
3+10	0.0716	0.32	QV				
3+15	0.0738	0.32	QV				
3+20	0.0760	0.32	QV				
3+25	0.0782	0.32	QV				
3+30	0.0804	0.32	QV				
3+35	0.0826	0.32	QV				
3+40	0.0848	0.32	QV				
3+45	0.0871	0.32	QV				
3+50	0.0893	0.33	Q V				
3+55	0.0916	0.33	Q V				
4+ 0	0.0938	0.33	Q V				
4+ 5	0.0961	0.33	Q V				
4+10	0.0984	0.33	Q V				
4+15	0.1007	0.33	Q V				
4+20	0.1030	0.33	Q V				
4+25	0.1053	0.34	Q V				
4+30	0.1076	0.34	Q V				
4+35	0.1100	0.34	Q V				
4+40	0.1123	0.34	Q V				
4+45	0.1147	0.34	Q V				
4+50	0.1170	0.34	Q V				
4+55	0.1194	0.35	Q V				
5+ 0	0.1218	0.35	Q V				
5+ 5	0.1242	0.35	Q V				
5+10	0.1266	0.35	Q V				
5+15	0.1290	0.35	Q V				
5+20	0.1314	0.35	Q V				
5+25	0.1339	0.35	Q V				
5+30	0.1363	0.36	Q V				
5+35	0.1388	0.36	Q V				
5+40	0.1413	0.36	Q V				
5+45	0.1438	0.36	Q V				
5+50	0.1463	0.36	Q V				
5+55	0.1488	0.37	Q V				
6+ 0	0.1513	0.37	Q V				
6+ 5	0.1539	0.37	Q V				
6+10	0.1564	0.37	Q V				
6+15	0.1590	0.37	Q V				
6+20	0.1616	0.37	Q V				
6+25	0.1642	0.38	Q V				

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 6+30      0.1668      0.38  Q  V      |         |         |         |
 6+35      0.1694      0.38  Q  V      |         |         |         |
 6+40      0.1720      0.38  Q  V      |         |         |         |
 6+45      0.1747      0.39  Q  V      |         |         |         |
 6+50      0.1774      0.39  Q   V     |         |         |         |
 6+55      0.1800      0.39  Q   V     |         |         |         |
 7+ 0      0.1827      0.39  Q   V     |         |         |         |
 7+ 5      0.1854      0.39  Q   V     |         |         |         |
 7+10      0.1882      0.40  Q   V     |         |         |         |
 7+15      0.1909      0.40  Q   V     |         |         |         |
 7+20      0.1937      0.40  Q   V     |         |         |         |
 7+25      0.1964      0.40  Q   V     |         |         |         |
 7+30      0.1992      0.41  Q   V     |         |         |         |
 7+35      0.2020      0.41  Q   V     |         |         |         |
 7+40      0.2049      0.41  Q   V     |         |         |         |
 7+45      0.2077      0.41  Q   V     |         |         |         |
 7+50      0.2106      0.42  Q   V     |         |         |         |
 7+55      0.2134      0.42  Q   V     |         |         |         |
 8+ 0      0.2163      0.42  Q   V     |         |         |         |
 8+ 5      0.2193      0.42  Q   V     |         |         |         |
 8+10      0.2222      0.43  Q    V    |         |         |         |
 8+15      0.2251      0.43  Q    V    |         |         |         |
 8+20      0.2281      0.43  Q    V    |         |         |         |
 8+25      0.2311      0.43  Q    V    |         |         |         |
 8+30      0.2341      0.44  Q    V    |         |         |         |
 8+35      0.2371      0.44  Q    V    |         |         |         |
 8+40      0.2402      0.44  Q    V    |         |         |         |
 8+45      0.2433      0.45  Q    V    |         |         |         |
 8+50      0.2463      0.45  Q    V    |         |         |         |
 8+55      0.2495      0.45  Q    V    |         |         |         |
 9+ 0      0.2526      0.46  Q    V    |         |         |         |
 9+ 5      0.2558      0.46  Q    V    |         |         |         |
 9+10      0.2589      0.46  Q    V    |         |         |         |
 9+15      0.2621      0.47  Q    V    |         |         |         |
 9+20      0.2654      0.47  Q    V    |         |         |         |
 9+25      0.2686      0.47  Q     V   |         |         |         |
 9+30      0.2719      0.48  Q     V   |         |         |         |
 9+35      0.2752      0.48  Q     V   |         |         |         |
 9+40      0.2785      0.48  Q     V   |         |         |         |
 9+45      0.2819      0.49  Q     V   |         |         |         |
 9+50      0.2853      0.49  Q     V   |         |         |         |
 9+55      0.2887      0.50  Q     V   |         |         |         |
10+ 0      0.2921      0.50  Q     V   |         |         |         |
10+ 5      0.2956      0.50  Q     V   |         |         |         |
10+10      0.2991      0.51  Q     V   |         |         |         |
10+15      0.3026      0.51  Q     V   |         |         |         |
10+20      0.3062      0.52  Q     V   |         |         |         |
10+25      0.3098      0.52  Q     V   |         |         |         |
10+30      0.3134      0.53  Q      V  |         |         |         |
10+35      0.3170      0.53  Q      V  |         |         |         |
10+40      0.3207      0.54  Q      V  |         |         |         |
10+45      0.3245      0.54  Q      V  |         |         |         |
10+50      0.3282      0.55  Q      V  |         |         |         |
10+55      0.3320      0.55  Q      V  |         |         |         |
11+ 0      0.3358      0.56  Q      V  |         |         |         |
11+ 5      0.3397      0.56  Q      V  |         |         |         |
11+10      0.3436      0.57  Q      V  |         |         |         |
11+15      0.3476      0.57  Q      V  |         |         |         |
11+20      0.3516      0.58  Q      V  |         |         |         |
11+25      0.3556      0.59  Q       V |         |         |         |
11+30      0.3597      0.59  Q       V |         |         |         |
11+35      0.3638      0.60  Q       V |         |         |         |
11+40      0.3680      0.60  Q       V |         |         |         |
11+45      0.3722      0.61  Q       V |         |         |         |
11+50      0.3764      0.62  Q       V |         |         |         |
11+55      0.3808      0.63  Q       V |         |         |         |
12+ 0      0.3851      0.63  Q       V |         |         |         |
12+ 5      0.3896      0.65  Q       V |         |         |         |
12+10      0.3942      0.68  Q       V |         |         |         |
12+15      0.3993      0.74  Q        V|         |         |         |
12+20      0.4047      0.77  |Q       V|         |         |         |
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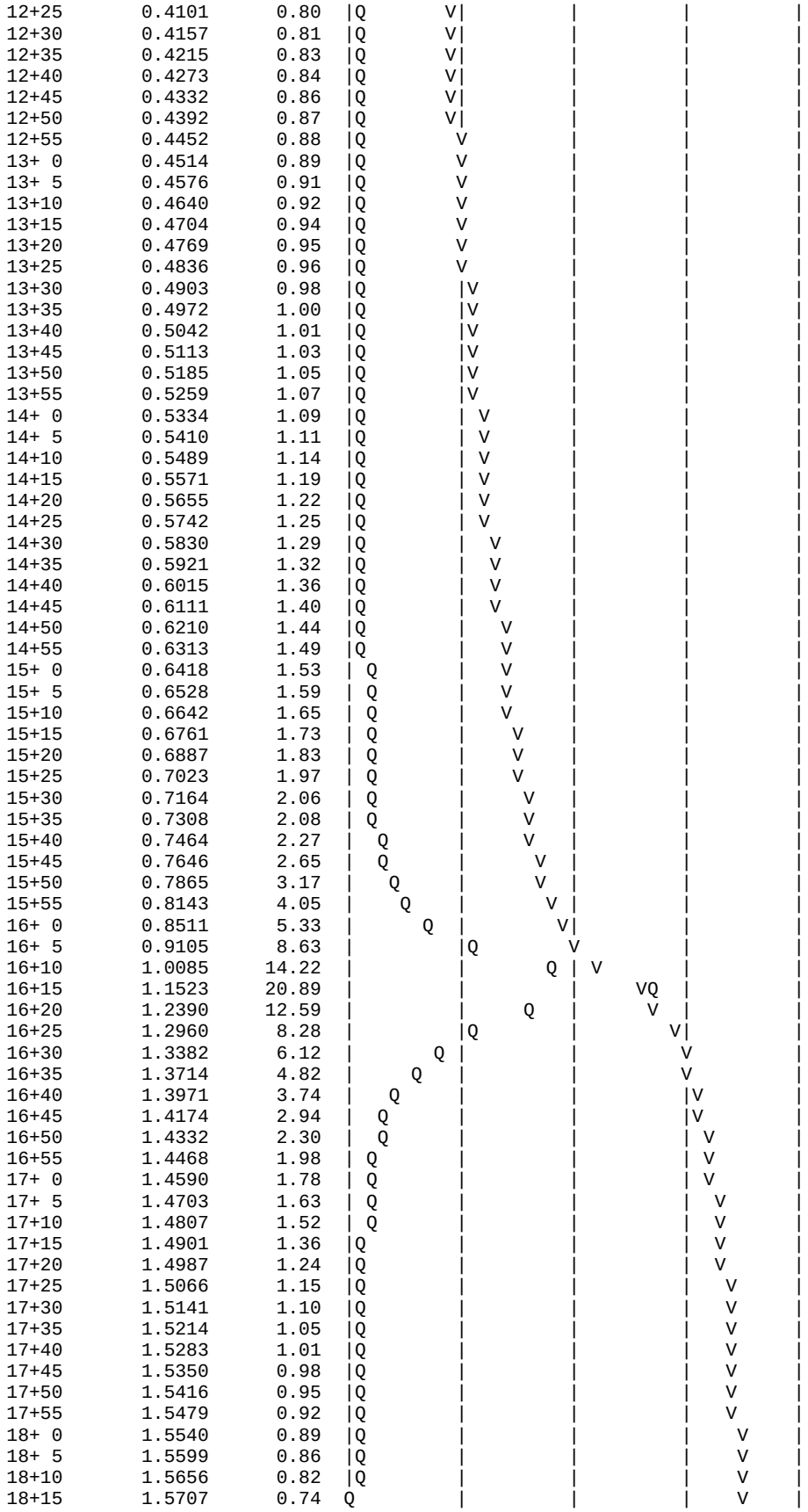

18+20	1.5755	0.70	Q	|	|	|	V |
18+25	1.5802	0.67	Q	|	|	|	V |
18+30	1.5846	0.65	Q	|	|	|	V |
18+35	1.5889	0.63	Q	|	|	|	V |
18+40	1.5931	0.61	Q	|	|	|	V |
18+45	1.5972	0.59	Q	|	|	|	V |
18+50	1.6012	0.58	Q	|	|	|	V |
18+55	1.6051	0.57	Q	|	|	|	V |
19+ 0	1.6089	0.55	Q	|	|	|	V |
19+ 5	1.6126	0.54	Q	|	|	|	V |
19+10	1.6163	0.53	Q	|	|	|	V |
19+15	1.6199	0.52	Q	|	|	|	V |
19+20	1.6235	0.51	Q	|	|	|	V |
19+25	1.6269	0.51	Q	|	|	|	V |
19+30	1.6304	0.50	Q	|	|	|	V |
19+35	1.6337	0.49	Q	|	|	|	V |
19+40	1.6370	0.48	Q	|	|	|	V |
19+45	1.6403	0.47	Q	|	|	|	V |
19+50	1.6435	0.47	Q	|	|	|	V |
19+55	1.6467	0.46	Q	|	|	|	V |
20+ 0	1.6498	0.45	Q	|	|	|	V |
20+ 5	1.6529	0.45	Q	|	|	|	V |
20+10	1.6559	0.44	Q	|	|	|	V |
20+15	1.6589	0.44	Q	|	|	|	V |
20+20	1.6619	0.43	Q	|	|	|	V |
20+25	1.6648	0.42	Q	|	|	|	V |
20+30	1.6677	0.42	Q	|	|	|	V |
20+35	1.6705	0.41	Q	|	|	|	V |
20+40	1.6734	0.41	Q	|	|	|	V |
20+45	1.6761	0.40	Q	|	|	|	V |
20+50	1.6789	0.40	Q	|	|	|	V |
20+55	1.6816	0.39	Q	|	|	|	V |
21+ 0	1.6843	0.39	Q	|	|	|	V |
21+ 5	1.6869	0.39	Q	|	|	|	V |
21+10	1.6896	0.38	Q	|	|	|	V |
21+15	1.6922	0.38	Q	|	|	|	V |
21+20	1.6947	0.37	Q	|	|	|	V |
21+25	1.6973	0.37	Q	|	|	|	V |
21+30	1.6998	0.37	Q	|	|	|	V |
21+35	1.7023	0.36	Q	|	|	|	V |
21+40	1.7048	0.36	Q	|	|	|	V |
21+45	1.7072	0.36	Q	|	|	|	V |
21+50	1.7097	0.35	Q	|	|	|	V |
21+55	1.7121	0.35	Q	|	|	|	V |
22+ 0	1.7144	0.35	Q	|	|	|	V |
22+ 5	1.7168	0.34	Q	|	|	|	V |
22+10	1.7191	0.34	Q	|	|	|	V |
22+15	1.7215	0.34	Q	|	|	|	V |
22+20	1.7237	0.33	Q	|	|	|	V |
22+25	1.7260	0.33	Q	|	|	|	V |
22+30	1.7283	0.33	Q	|	|	|	V|
22+35	1.7305	0.33	Q	|	|	|	V|
22+40	1.7327	0.32	Q	|	|	|	V|
22+45	1.7349	0.32	Q	|	|	|	V|
22+50	1.7371	0.32	Q	|	|	|	V|
22+55	1.7393	0.31	Q	|	|	|	V|
23+ 0	1.7414	0.31	Q	|	|	|	V|
23+ 5	1.7436	0.31	Q	|	|	|	V|
23+10	1.7457	0.31	Q	|	|	|	V|
23+15	1.7478	0.31	Q	|	|	|	V|
23+20	1.7499	0.30	Q	|	|	|	V|
23+25	1.7520	0.30	Q	|	|	|	V|
23+30	1.7540	0.30	Q	|	|	|	V|
23+35	1.7561	0.30	Q	|	|	|	V|
23+40	1.7581	0.29	Q	|	|	|	V|
23+45	1.7601	0.29	Q	|	|	|	V|
23+50	1.7621	0.29	Q	|	|	|	V|
23+55	1.7641	0.29	Q	|	|	|	V|
24+ 0	1.7660	0.29	Q	|	|	|	V|
24+ 5	1.7679	0.27	Q	|	|	|	V|
24+10	1.7695	0.23	Q	|	|	|	V|

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   24+15       1.7703      0.12  Q         |         |         |        V|
   24+20       1.7709      0.07  Q         |         |         |        V|
   24+25       1.7712      0.05  Q         |         |         |        V|
   24+30       1.7714      0.03  Q         |         |         |        V|
   24+35       1.7715      0.02  Q         |         |         |        V|
   24+40       1.7716      0.01  Q         |         |         |        V|
   24+45       1.7717      0.01  Q         |         |         |        V|
   24+50       1.7717      0.00  Q         |         |         |        V|
   24+55       1.7717      0.00  Q         |         |         |        V|
   25+ 0       1.7717      0.00  Q         |         |         |        V|
   25+ 5       1.7718      0.00  Q         |         |         |        V|
   25+10       1.7718      0.00  Q         |         |         |        V|
   25+15       1.7718      0.00  Q         |         |         |         V
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FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 02/08/18

RANCHO LA HABRA HYDROLOGY STUDY
BASIN 'B' ROUTING - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Program License Serial Number 6407

********** HYDROGRAPH INFORMATION **********

From study/file name: prb00224.rte
**********HYDROGRAPH DATA**********
Number of intervals = 303
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 20.887 (CFS)
Total volume = 1.772 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 201.000 to Point/Station 200.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 303
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.500	0.079	0.924	0.076	0.082
1.000	0.157	0.924	0.154	0.160
2.000	0.314	0.924	0.311	0.317
3.000	0.471	0.924	0.468	0.474
4.000	0.628	0.924	0.625	0.631
5.100	0.801	0.924	0.798	0.804
5.250	0.824	11.368	0.785	0.863
5.500	0.864	17.978	0.802	0.926
5.750	0.903	31.669	0.794	1.012
6.000	0.942	37.102	0.814	1.070
7.000	1.099	53.489	0.915	1.283
8.000	1.256	65.865	1.029	1.483
9.000	1.413	76.234	1.150	1.676

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 5.2 10.44 15.67 20.89	Depth (Ft.)
0.083	0.01	0.00	0.000	O	0.00
0.167	0.05	0.00	0.000	O	0.00
0.250	0.16	0.01	0.001	O	0.01
0.333	0.21	0.02	0.002	O	0.01
0.417	0.23	0.04	0.003	O	0.02
0.500	0.25	0.06	0.005	O	0.03
0.583	0.26	0.07	0.006	O	0.04
0.667	0.27	0.09	0.007	O	0.05
0.750	0.28	0.10	0.009	O	0.05
0.833	0.28	0.11	0.010	O	0.06
0.917	0.28	0.13	0.011	O	0.07
1.000	0.28	0.14	0.012	O	0.08
1.083	0.29	0.15	0.013	O	0.08
1.167	0.29	0.16	0.014	O	0.09
1.250	0.29	0.17	0.015	O	0.09
1.333	0.29	0.18	0.015	O	0.10
1.417	0.29	0.19	0.016	O	0.10
1.500	0.29	0.20	0.017	O	0.11
1.583	0.29	0.20	0.017	O	0.11
1.667	0.29	0.21	0.018	O	0.11
1.750	0.30	0.22	0.019	O	0.12
1.833	0.30	0.22	0.019	O	0.12
1.917	0.30	0.23	0.020	O	0.12
2.000	0.30	0.23	0.020	O	0.13
2.083	0.30	0.24	0.021	O	0.13
2.167	0.30	0.24	0.021	O	0.13
2.250	0.30	0.25	0.021	O	0.13
2.333	0.30	0.25	0.022	O	0.14
2.417	0.30	0.26	0.022	O	0.14
2.500	0.31	0.26	0.022	O	0.14
2.583	0.31	0.26	0.023	O	0.14
2.667	0.31	0.27	0.023	O	0.14
2.750	0.31	0.27	0.023	O	0.15
2.833	0.31	0.27	0.023	O	0.15
2.917	0.31	0.28	0.024	O	0.15
3.000	0.31	0.28	0.024	O	0.15
3.083	0.31	0.28	0.024	O	0.15
3.167	0.32	0.28	0.024	O	0.15
3.250	0.32	0.29	0.025	O	0.16
3.333	0.32	0.29	0.025	O	0.16
3.417	0.32	0.29	0.025	O	0.16
3.500	0.32	0.29	0.025	O	0.16
3.583	0.32	0.30	0.025	O	0.16
3.667	0.32	0.30	0.025	O	0.16
3.750	0.32	0.30	0.026	O	0.16
3.833	0.33	0.30	0.026	O	0.16
3.917	0.33	0.30	0.026	O	0.16
4.000	0.33	0.31	0.026	O	0.17
4.083	0.33	0.31	0.026	O	0.17
4.167	0.33	0.31	0.026	O	0.17
4.250	0.33	0.31	0.027	O	0.17
4.333	0.33	0.31	0.027	O	0.17
4.417	0.34	0.31	0.027	O	0.17
4.500	0.34	0.32	0.027	O	0.17
4.583	0.34	0.32	0.027	O	0.17
4.667	0.34	0.32	0.027	O	0.17
4.750	0.34	0.32	0.027	O	0.17
4.833	0.34	0.32	0.028	O	0.17
4.917	0.35	0.32	0.028	O	0.18
5.000	0.35	0.33	0.028	O	0.18
5.083	0.35	0.33	0.028	O	0.18
5.167	0.35	0.33	0.028	O	0.18
5.250	0.35	0.33	0.028	O	0.18
5.333	0.35	0.33	0.028	O	0.18

5.417	0.35	0.33	0.029	O					0.18
5.500	0.36	0.34	0.029	O					0.18
5.583	0.36	0.34	0.029	O					0.18
5.667	0.36	0.34	0.029	O					0.18
5.750	0.36	0.34	0.029	O					0.18
5.833	0.36	0.34	0.029	O					0.19
5.917	0.37	0.34	0.029	O					0.19
6.000	0.37	0.35	0.030	O					0.19
6.083	0.37	0.35	0.030	O					0.19
6.167	0.37	0.35	0.030	O					0.19
6.250	0.37	0.35	0.030	O					0.19
6.333	0.37	0.35	0.030	O					0.19
6.417	0.38	0.35	0.030	O					0.19
6.500	0.38	0.36	0.030	O					0.19
6.583	0.38	0.36	0.031	O					0.19
6.667	0.38	0.36	0.031	O					0.19
6.750	0.39	0.36	0.031	O					0.20
6.833	0.39	0.36	0.031	O					0.20
6.917	0.39	0.37	0.031	O					0.20
7.000	0.39	0.37	0.031	O					0.20
7.083	0.39	0.37	0.032	O					0.20
7.167	0.40	0.37	0.032	O					0.20
7.250	0.40	0.37	0.032	O					0.20
7.333	0.40	0.38	0.032	O					0.20
7.417	0.40	0.38	0.032	O					0.20
7.500	0.41	0.38	0.032	O					0.21
7.583	0.41	0.38	0.033	O					0.21
7.667	0.41	0.38	0.033	O					0.21
7.750	0.41	0.39	0.033	O					0.21
7.833	0.42	0.39	0.033	O					0.21
7.917	0.42	0.39	0.033	O					0.21
8.000	0.42	0.39	0.034	O					0.21
8.083	0.42	0.39	0.034	O					0.21
8.167	0.43	0.40	0.034	O					0.21
8.250	0.43	0.40	0.034	O					0.22
8.333	0.43	0.40	0.034	O					0.22
8.417	0.43	0.40	0.035	O					0.22
8.500	0.44	0.41	0.035	O					0.22
8.583	0.44	0.41	0.035	O					0.22
8.667	0.44	0.41	0.035	O					0.22
8.750	0.45	0.41	0.035	O					0.22
8.833	0.45	0.42	0.036	O					0.23
8.917	0.45	0.42	0.036	O					0.23
9.000	0.46	0.42	0.036	O					0.23
9.083	0.46	0.42	0.036	O					0.23
9.167	0.46	0.43	0.037	O					0.23
9.250	0.47	0.43	0.037	O					0.23
9.333	0.47	0.43	0.037	O					0.23
9.417	0.47	0.44	0.037	O					0.24
9.500	0.48	0.44	0.038	O					0.24
9.583	0.48	0.44	0.038	O					0.24
9.667	0.48	0.45	0.038	O					0.24
9.750	0.49	0.45	0.038	O					0.24
9.833	0.49	0.45	0.039	O					0.24
9.917	0.50	0.45	0.039	O					0.25
10.000	0.50	0.46	0.039	O					0.25
10.083	0.50	0.46	0.039	O					0.25
10.167	0.51	0.46	0.040	O					0.25
10.250	0.51	0.47	0.040	O					0.25
10.333	0.52	0.47	0.040	O					0.26
10.417	0.52	0.48	0.041	O					0.26
10.500	0.53	0.48	0.041	O					0.26
10.583	0.53	0.48	0.041	O					0.26
10.667	0.54	0.49	0.042	O					0.26
10.750	0.54	0.49	0.042	O					0.27
10.833	0.55	0.49	0.042	O					0.27
10.917	0.55	0.50	0.043	O					0.27
11.000	0.56	0.50	0.043	O					0.27
11.083	0.56	0.51	0.043	O					0.27
11.167	0.57	0.51	0.044	O					0.28
11.250	0.57	0.52	0.044	O					0.28

11.333	0.58	0.52	0.045	O	|	|	|	|	0.28
11.417	0.59	0.53	0.045	O	|	|	|	|	0.28
11.500	0.59	0.53	0.045	O	|	|	|	|	0.29
11.583	0.60	0.54	0.046	O	|	|	|	|	0.29
11.667	0.60	0.54	0.046	O	|	|	|	|	0.29
11.750	0.61	0.55	0.047	O	|	|	|	|	0.30
11.833	0.62	0.55	0.047	O	|	|	|	|	0.30
11.917	0.63	0.56	0.048	O	|	|	|	|	0.30
12.000	0.63	0.56	0.048	O	|	|	|	|	0.30
12.083	0.65	0.57	0.049	O	|	|	|	|	0.31
12.167	0.68	0.58	0.049	OI	|	|	|	|	0.31
12.250	0.74	0.59	0.050	OI	|	|	|	|	0.32
12.333	0.77	0.60	0.051	OI	|	|	|	|	0.32
12.417	0.80	0.61	0.052	OI	|	|	|	|	0.33
12.500	0.81	0.63	0.054	OI	|	|	|	|	0.34
12.583	0.83	0.64	0.055	OI	|	|	|	|	0.35
12.667	0.84	0.66	0.056	|O	|	|	|	|	0.36
12.750	0.86	0.67	0.058	|O	|	|	|	|	0.36
12.833	0.87	0.69	0.059	|O	|	|	|	|	0.37
12.917	0.88	0.70	0.060	|O	|	|	|	|	0.38
13.000	0.89	0.72	0.061	|O	|	|	|	|	0.39
13.083	0.91	0.73	0.063	|O	|	|	|	|	0.40
13.167	0.92	0.75	0.064	|O	|	|	|	|	0.40
13.250	0.94	0.76	0.065	|O	|	|	|	|	0.41
13.333	0.95	0.77	0.066	|O	|	|	|	|	0.42
13.417	0.96	0.79	0.067	|O	|	|	|	|	0.43
13.500	0.98	0.80	0.069	|O	|	|	|	|	0.43
13.583	1.00	0.82	0.070	|O	|	|	|	|	0.44
13.667	1.01	0.83	0.071	|O	|	|	|	|	0.45
13.750	1.03	0.85	0.072	|O	|	|	|	|	0.46
13.833	1.05	0.86	0.074	|O	|	|	|	|	0.47
13.917	1.07	0.88	0.075	|O	|	|	|	|	0.47
14.000	1.09	0.89	0.076	|O	|	|	|	|	0.48
14.083	1.11	0.91	0.078	|O	|	|	|	|	0.49
14.167	1.14	0.92	0.079	|O	|	|	|	|	0.50
14.250	1.19	0.92	0.081	|O	|	|	|	|	0.51
14.333	1.22	0.92	0.083	|O	|	|	|	|	0.52
14.417	1.25	0.92	0.085	|O	|	|	|	|	0.54
14.500	1.29	0.92	0.087	|O	|	|	|	|	0.55
14.583	1.32	0.92	0.090	|OI	|	|	|	|	0.57
14.667	1.36	0.92	0.093	|OI	|	|	|	|	0.59
14.750	1.40	0.92	0.096	|OI	|	|	|	|	0.61
14.833	1.44	0.92	0.099	|OI	|	|	|	|	0.63
14.917	1.49	0.92	0.103	|OI	|	|	|	|	0.65
15.000	1.53	0.92	0.107	|OI	|	|	|	|	0.68
15.083	1.59	0.92	0.111	|OI	|	|	|	|	0.71
15.167	1.65	0.92	0.116	|OI	|	|	|	|	0.74
15.250	1.73	0.92	0.122	|OI	|	|	|	|	0.77
15.333	1.83	0.92	0.127	|OI	|	|	|	|	0.81
15.417	1.97	0.92	0.134	|O I	|	|	|	|	0.85
15.500	2.06	0.92	0.142	|O I	|	|	|	|	0.90
15.583	2.08	0.92	0.150	|O I	|	|	|	|	0.95
15.667	2.27	0.92	0.158	|O I	|	|	|	|	1.01
15.750	2.65	0.92	0.169	|O I	|	|	|	|	1.07
15.833	3.17	0.92	0.182	|O I	|	|	|	|	1.16
15.917	4.05	0.92	0.201	|O I	|	|	|	|	1.28
16.000	5.33	0.92	0.227	|O I	|	|	|	|	1.44
16.083	8.63	0.92	0.269	|O |	I	|	|	|	1.71
16.167	14.22	0.92	0.341	|O |	|	I	|	|	2.17
16.250	20.89	0.92	0.455	|O |	|	|	|	I|	2.90
16.333	12.59	0.92	0.564	|O |	|	| I	|	|	3.59
16.417	8.28	0.92	0.630	|O |	I	|	|	|	4.01
16.500	6.12	0.92	0.673	|O |I	|	|	|	|	4.29
16.583	4.82	0.92	0.704	|O I|	|	|	|	|	4.49
16.667	3.74	0.92	0.727	|O I	|	|	|	|	4.63
16.750	2.94	0.92	0.744	|O I	|	|	|	|	4.74
16.833	2.30	0.92	0.756	|O I	|	|	|	|	4.81
16.917	1.98	0.92	0.764	|O I	|	|	|	|	4.87
17.000	1.78	0.92	0.771	|OI	|	|	|	|	4.91
17.083	1.63	0.92	0.776	|OI	|	|	|	|	4.94
17.167	1.52	0.92	0.781	|OI	|	|	|	|	4.97

17.250	1.36	0.92	0.784	|OI				4.99
17.333	1.24	0.92	0.787	|O				5.01
17.417	1.15	0.92	0.789	|O				5.02
17.500	1.10	0.92	0.790	|O				5.03
17.583	1.05	0.92	0.791	|O				5.04
17.667	1.01	0.92	0.792	|O				5.04
17.750	0.98	0.92	0.792	|O				5.04
17.833	0.95	0.92	0.792	|O				5.05
17.917	0.92	0.92	0.792	|O				5.05
18.000	0.89	0.92	0.792	|O				5.04
18.083	0.86	0.92	0.792	|O				5.04
18.167	0.82	0.92	0.791	|O				5.04
18.250	0.74	0.92	0.790	|O				5.03
18.333	0.70	0.92	0.789	|O				5.02
18.417	0.67	0.92	0.787	|O				5.01
18.500	0.65	0.92	0.786	IO				5.00
18.583	0.63	0.92	0.784	IO				4.99
18.667	0.61	0.92	0.782	IO				4.98
18.750	0.59	0.92	0.779	IO				4.96
18.833	0.58	0.92	0.777	IO				4.95
18.917	0.57	0.92	0.775	IO				4.93
19.000	0.55	0.92	0.772	IO				4.92
19.083	0.54	0.92	0.769	IO				4.90
19.167	0.53	0.92	0.767	IO				4.88
19.250	0.52	0.92	0.764	IO				4.87
19.333	0.51	0.92	0.761	IO				4.85
19.417	0.51	0.92	0.758	IO				4.83
19.500	0.50	0.92	0.756	IO				4.81
19.583	0.49	0.92	0.753	IO				4.79
19.667	0.48	0.92	0.750	IO				4.77
19.750	0.47	0.92	0.746	IO				4.75
19.833	0.47	0.92	0.743	IO				4.73
19.917	0.46	0.92	0.740	IO				4.71
20.000	0.45	0.92	0.737	IO				4.69
20.083	0.45	0.92	0.734	IO				4.67
20.167	0.44	0.92	0.730	IO				4.65
20.250	0.44	0.92	0.727	IO				4.63
20.333	0.43	0.92	0.724	IO				4.61
20.417	0.42	0.92	0.720	IO				4.59
20.500	0.42	0.92	0.717	IO				4.56
20.583	0.41	0.92	0.713	IO				4.54
20.667	0.41	0.92	0.710	IO				4.52
20.750	0.40	0.92	0.706	IO				4.50
20.833	0.40	0.92	0.703	IO				4.47
20.917	0.39	0.92	0.699	IO				4.45
21.000	0.39	0.92	0.695	IO				4.43
21.083	0.39	0.92	0.692	IO				4.40
21.167	0.38	0.92	0.688	IO				4.38
21.250	0.38	0.92	0.684	IO				4.36
21.333	0.37	0.92	0.680	IO				4.33
21.417	0.37	0.92	0.677	IO				4.31
21.500	0.37	0.92	0.673	IO				4.28
21.583	0.36	0.92	0.669	IO				4.26
21.667	0.36	0.92	0.665	IO				4.23
21.750	0.36	0.92	0.661	IO				4.21
21.833	0.35	0.92	0.657	IO				4.19
21.917	0.35	0.92	0.653	IO				4.16
22.000	0.35	0.92	0.649	IO				4.13
22.083	0.34	0.92	0.645	IO				4.11
22.167	0.34	0.92	0.641	IO				4.08
22.250	0.34	0.92	0.637	IO				4.06
22.333	0.33	0.92	0.633	IO				4.03
22.417	0.33	0.92	0.629	IO				4.01
22.500	0.33	0.92	0.625	IO				3.98
22.583	0.33	0.92	0.621	IO				3.95
22.667	0.32	0.92	0.617	IO				3.93
22.750	0.32	0.92	0.613	IO				3.90
22.833	0.32	0.92	0.608	IO				3.87
22.917	0.31	0.92	0.604	IO				3.85
23.000	0.31	0.92	0.600	IO				3.82
23.083	0.31	0.92	0.596	IO				3.79

23.167	0.31	0.92	0.591	IO				3.77
23.250	0.31	0.92	0.587	IO				3.74
23.333	0.30	0.92	0.583	IO				3.71
23.417	0.30	0.92	0.579	IO				3.69
23.500	0.30	0.92	0.574	IO				3.66
23.583	0.30	0.92	0.570	IO				3.63
23.667	0.29	0.92	0.566	IO				3.60
23.750	0.29	0.92	0.561	IO				3.58
23.833	0.29	0.92	0.557	IO				3.55
23.917	0.29	0.92	0.553	IO				3.52
24.000	0.29	0.92	0.548	IO				3.49
24.083	0.27	0.92	0.544	IO				3.46
24.167	0.23	0.92	0.539	IO				3.43
24.250	0.12	0.92	0.534	IO				3.40
24.333	0.07	0.92	0.528	IO				3.37
24.417	0.05	0.92	0.522	IO				3.33
24.500	0.03	0.92	0.516	IO				3.29
24.583	0.02	0.92	0.510	IO				3.25
24.667	0.01	0.92	0.504	IO				3.21
24.750	0.01	0.92	0.498	IO				3.17
24.833	0.00	0.92	0.491	IO				3.13
24.917	0.00	0.92	0.485	IO				3.09
25.000	0.00	0.92	0.479	IO				3.05
25.083	0.00	0.92	0.472	IO				3.01
25.167	0.00	0.92	0.466	IO				2.97
25.250	0.00	0.92	0.460	IO				2.93
25.333	0.00	0.92	0.453	IO				2.89
25.417	0.00	0.92	0.447	IO				2.85
25.500	0.00	0.92	0.440	IO				2.81
25.583	0.00	0.92	0.434	IO				2.76
25.667	0.00	0.92	0.428	IO				2.72
25.750	0.00	0.92	0.421	IO				2.68
25.833	0.00	0.92	0.415	IO				2.64
25.917	0.00	0.92	0.409	IO				2.60
26.000	0.00	0.92	0.402	IO				2.56
26.083	0.00	0.92	0.396	IO				2.52
26.167	0.00	0.92	0.390	IO				2.48
26.250	0.00	0.92	0.383	IO				2.44
26.333	0.00	0.92	0.377	IO				2.40
26.417	0.00	0.92	0.370	IO				2.36
26.500	0.00	0.92	0.364	IO				2.32
26.583	0.00	0.92	0.358	IO				2.28
26.667	0.00	0.92	0.351	IO				2.24
26.750	0.00	0.92	0.345	IO				2.20
26.833	0.00	0.92	0.339	IO				2.16
26.917	0.00	0.92	0.332	IO				2.12
27.000	0.00	0.92	0.326	IO				2.08
27.083	0.00	0.92	0.320	IO				2.04
27.167	0.00	0.92	0.313	IO				1.99
27.250	0.00	0.92	0.307	IO				1.95
27.333	0.00	0.92	0.300	IO				1.91
27.417	0.00	0.92	0.294	IO				1.87
27.500	0.00	0.92	0.288	IO				1.83
27.583	0.00	0.92	0.281	IO				1.79
27.667	0.00	0.92	0.275	IO				1.75
27.750	0.00	0.92	0.269	IO				1.71
27.833	0.00	0.92	0.262	IO				1.67
27.917	0.00	0.92	0.256	IO				1.63
28.000	0.00	0.92	0.250	IO				1.59
28.083	0.00	0.92	0.243	IO				1.55
28.167	0.00	0.92	0.237	IO				1.51
28.250	0.00	0.92	0.230	IO				1.47
28.333	0.00	0.92	0.224	IO				1.43
28.417	0.00	0.92	0.218	IO				1.39
28.500	0.00	0.92	0.211	IO				1.35
28.583	0.00	0.92	0.205	IO				1.31
28.667	0.00	0.92	0.199	IO				1.27
28.750	0.00	0.92	0.192	IO				1.22
28.833	0.00	0.92	0.186	IO				1.18
28.917	0.00	0.92	0.180	IO				1.14
29.000	0.00	0.92	0.173	IO				1.10

29.083	0.00	0.92	0.167	IO				1.06
29.167	0.00	0.92	0.160	IO				1.02
29.250	0.00	0.92	0.154	IO				0.98
29.333	0.00	0.92	0.148	IO				0.94
29.417	0.00	0.92	0.141	IO				0.90
29.500	0.00	0.92	0.135	IO				0.86
29.583	0.00	0.92	0.129	IO				0.82
29.667	0.00	0.92	0.122	IO				0.78
29.750	0.00	0.92	0.116	IO				0.74
29.833	0.00	0.92	0.110	IO				0.70
29.917	0.00	0.92	0.103	IO				0.65
30.000	0.00	0.92	0.097	IO				0.61
30.083	0.00	0.92	0.090	IO				0.57
30.167	0.00	0.92	0.084	IO				0.53
30.250	0.00	0.91	0.078	IO				0.49
30.333	0.00	0.84	0.072	IO				0.45
30.417	0.00	0.77	0.066	IO				0.42
30.500	0.00	0.71	0.061	IO				0.39
30.583	0.00	0.66	0.056	IO				0.36
30.667	0.00	0.61	0.052	O				0.33
30.750	0.00	0.56	0.048	O				0.30
30.833	0.00	0.52	0.044	O				0.28
30.917	0.00	0.48	0.041	O				0.26
31.000	0.00	0.44	0.038	O				0.24
31.083	0.00	0.41	0.035	O				0.22
31.167	0.00	0.37	0.032	O				0.20
31.250	0.00	0.35	0.030	O				0.19
31.333	0.00	0.32	0.027	O				0.17
31.417	0.00	0.29	0.025	O				0.16
31.500	0.00	0.27	0.023	O				0.15
31.583	0.00	0.25	0.021	O				0.14
31.667	0.00	0.23	0.020	O				0.13
31.750	0.00	0.21	0.018	O				0.12
31.833	0.00	0.20	0.017	O				0.11
31.917	0.00	0.18	0.016	O				0.10
32.000	0.00	0.17	0.014	O				0.09
32.083	0.00	0.15	0.013	O				0.08
32.167	0.00	0.14	0.012	O				0.08
32.250	0.00	0.13	0.011	O				0.07
32.333	0.00	0.12	0.010	O				0.07
32.417	0.00	0.11	0.010	O				0.06
32.500	0.00	0.10	0.009	O				0.06
32.583	0.00	0.10	0.008	O				0.05
32.667	0.00	0.09	0.008	O				0.05
32.750	0.00	0.08	0.007	O				0.04
32.833	0.00	0.07	0.006	O				0.04
32.917	0.00	0.07	0.006	O				0.04
33.000	0.00	0.06	0.005	O				0.03
33.083	0.00	0.06	0.005	O				0.03
33.167	0.00	0.05	0.005	O				0.03
33.250	0.00	0.05	0.004	O				0.03
33.333	0.00	0.05	0.004	O				0.02
33.417	0.00	0.04	0.004	O				0.02
33.500	0.00	0.04	0.003	O				0.02
33.583	0.00	0.04	0.003	O				0.02
33.667	0.00	0.03	0.003	O				0.02
33.750	0.00	0.03	0.003	O				0.02
33.833	0.00	0.03	0.002	O				0.02
33.917	0.00	0.03	0.002	O				0.01
34.000	0.00	0.02	0.002	O				0.01
34.083	0.00	0.02	0.002	O				0.01
34.167	0.00	0.02	0.002	O				0.01
34.250	0.00	0.02	0.002	O				0.01
34.333	0.00	0.02	0.001	O				0.01
34.417	0.00	0.02	0.001	O				0.01
34.500	0.00	0.01	0.001	O				0.01
34.583	0.00	0.01	0.001	O				0.01
34.667	0.00	0.01	0.001	O				0.01
34.750	0.00	0.01	0.001	O				0.01
34.833	0.00	0.01	0.001	O				0.01
34.917	0.00	0.01	0.001	O				0.01

35.000	0.00	0.01	0.001	O	|	|	|	|	0.00
35.083	0.00	0.01	0.001	O	|	|	|	|	0.00
35.167	0.00	0.01	0.001	O	|	|	|	|	0.00
35.250	0.00	0.01	0.001	O	|	|	|	|	0.00
35.333	0.00	0.01	0.001	O	|	|	|	|	0.00
35.417	0.00	0.01	0.001	O	|	|	|	|	0.00
35.500	0.00	0.01	0.000	O	|	|	|	|	0.00
35.583	0.00	0.01	0.000	O	|	|	|	|	0.00
35.667	0.00	0.00	0.000	O	|	|	|	|	0.00
35.750	0.00	0.00	0.000	O	|	|	|	|	0.00
35.833	0.00	0.00	0.000	O	|	|	|	|	0.00
35.917	0.00	0.00	0.000	O	|	|	|	|	0.00
36.000	0.00	0.00	0.000	O	|	|	|	|	0.00
36.083	0.00	0.00	0.000	O	|	|	|	|	0.00
36.167	0.00	0.00	0.000	O	|	|	|	|	0.00
36.250	0.00	0.00	0.000	O	|	|	|	|	0.00
36.333	0.00	0.00	0.000	O	|	|	|	|	0.00
36.417	0.00	0.00	0.000	O	|	|	|	|	0.00
36.500	0.00	0.00	0.000	O	|	|	|	|	0.00
36.583	0.00	0.00	0.000	O	|	|	|	|	0.00
36.667	0.00	0.00	0.000	O	|	|	|	|	0.00

**********HYDROGRAPH DATA**********

Number of intervals = 440
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.924 (CFS)
Total volume = 1.772 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

AREA "C"

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/07/16 File Name: exc002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'C' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

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Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 298.000(Ft.)
Top (of initial area) elevation = 383.000(Ft.)
Bottom (of initial area) elevation = 324.000(Ft.)
Difference in elevation = 59.000(Ft.)
Slope = 0.19799 s(%)= 19.80
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.532 min.
Rainfall intensity = 1.563(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.756
Subarea runoff = 1.312(CFS)
Total initial stream area = 1.110(Ac.)

++
Process from Point/Station 301.000 to Point/Station 302.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.820(CFS)
Depth of flow = 0.147(Ft.), Average velocity = 2.598(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 2.820(CFS)
' ' flow top width = 14.734(Ft.)

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  '     '    velocity=    2.598(Ft/s)
  '     '       area =      1.085(Sq.Ft)
  '     '       Froude number =     1.687

Upstream point elevation =   324.000(Ft.)
Downstream point elevation =   279.000(Ft.)
Flow length =   505.000(Ft.)
Travel time  =    3.24 min.
Time of concentration =   12.77 min.
Depth of flow =   0.147(Ft.)
Average velocity =   2.598(Ft/s)
Total irregular channel flow =     2.820(CFS)
Irregular channel normal depth above invert elev. =   0.147(Ft.)
Average velocity of channel(s) =   2.598(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.321(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.730
Subarea runoff =      2.950(CFS) for    3.310(Ac.)
Total runoff =      4.262(CFS)       Total area =        4.42(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.172(Ft.), Average velocity =   2.881(Ft/s)


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Process from Point/Station      302.000 to Point/Station      303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     10.464(CFS)
Depth of flow =   0.255(Ft.), Average velocity =   3.219(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     10.464(CFS)
  '     '       flow top width =     25.499(Ft.)
  '     '    velocity=    3.219(Ft/s)
  '     '       area =      3.251(Sq.Ft)
  '     '       Froude number =     1.589

Upstream point elevation =   279.000(Ft.)
Downstream point elevation =   216.000(Ft.)
Flow length =   957.000(Ft.)
Travel time  =    4.96 min.
Time of concentration =   17.73 min.
Depth of flow =   0.255(Ft.)
Average velocity =   3.219(Ft/s)
Total irregular channel flow =    10.464(CFS)
Irregular channel normal depth above invert elev. =   0.255(Ft.)
Average velocity of channel(s) =   3.219(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
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Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.095(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.694
Subarea runoff =     12.320(CFS) for   17.390(Ac.)
Total runoff =     16.582(CFS)        Total area =       21.81(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.303(Ft.), Average velocity =   3.611(Ft/s)


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Process from Point/Station      303.000 to Point/Station      304.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     19.857(CFS)
Depth of flow =   0.455(Ft.), Average velocity =   1.915(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     19.857(CFS)
  '     '       flow top width =     45.539(Ft.)
  '     '    velocity=    1.915(Ft/s)
  '     '       area =     10.369(Sq.Ft)
  '     '       Froude number =     0.707

Upstream point elevation =   216.000(Ft.)
Downstream point elevation =   198.000(Ft.)
Flow length =  1674.000(Ft.)
Travel time  =   14.57 min.
Time of concentration =   32.30 min.
Depth of flow =   0.455(Ft.)
Average velocity =   1.915(Ft/s)
Total irregular channel flow =    19.857(CFS)
Irregular channel normal depth above invert elev. =   0.455(Ft.)
Average velocity of channel(s) =   1.915(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.50
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.253(In/Hr)
Max Catchment Loss (Fm) =     0.253(In/Hr)
Rainfall intensity =      0.776(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.608
Subarea runoff =      6.472(CFS) for   27.030(Ac.)
Total runoff =     23.054(CFS)        Total area =       48.84(Ac.)
Area averaged Fm value =    0.251(In/Hr)
Depth of flow =   0.482(Ft.), Average velocity =   1.988(Ft/s)


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Process from Point/Station      303.000 to Point/Station      304.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     48.840(Ac.)
Runoff from this stream =     23.054(CFS)
Time of concentration =   32.30 min.
Rainfall intensity =     0.776(In/Hr)
Area averaged loss rate (Fm) =    0.2514(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      306.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   380.000(Ft.)
Bottom (of initial area) elevation =   310.000(Ft.)
Difference in elevation =    70.000(Ft.)
Slope =    0.23333  s(%)=      23.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.248 min.
Rainfall intensity =      1.590(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.759
Subarea runoff =      1.399(CFS)
Total initial stream area =        1.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      307.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.743(CFS)
Depth of flow =   0.170(Ft.), Average velocity =   3.296(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              1.00
       2            50.00              0.00
       3           100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.743(CFS)
  '     '       flow top width =     16.966(Ft.)
  '     '    velocity=    3.296(Ft/s)
  '     '       area =      1.439(Sq.Ft)
  '     '       Froude number =     1.994

Upstream point elevation =   310.000(Ft.)
Downstream point elevation =   231.000(Ft.)
Flow length =   665.000(Ft.)
Travel time  =    3.36 min.
Time of concentration =   12.61 min.
Depth of flow =   0.170(Ft.)
Average velocity =   3.296(Ft/s)
Total irregular channel flow =     4.743(CFS)
Irregular channel normal depth above invert elev. =   0.170(Ft.)
Average velocity of channel(s) =   3.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.331(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.731
Subarea runoff =      6.618(CFS) for    7.080(Ac.)
Total runoff =      8.017(CFS)       Total area =        8.24(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.207(Ft.), Average velocity =   3.758(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      304.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.765(CFS)
Depth of flow =   0.320(Ft.), Average velocity =   2.498(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1             0.00              1.00
       2            50.00              0.00
       3           100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.766(CFS)
  '     '       flow top width =     31.968(Ft.)
  '     '    velocity=    2.498(Ft/s)
  '     '       area =      5.110(Sq.Ft)
  '     '       Froude number =     1.101

Upstream point elevation =   231.000(Ft.)
Downstream point elevation =   198.000(Ft.)
Flow length =  1125.000(Ft.)
Travel time  =    7.51 min.
Time of concentration =   20.12 min.
Depth of flow =   0.320(Ft.)
Average velocity =   2.498(Ft/s)
Total irregular channel flow =    12.765(CFS)
Irregular channel normal depth above invert elev. =   0.320(Ft.)
Average velocity of channel(s) =   2.498(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.018(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.679
Subarea runoff =      9.424(CFS) for   16.990(Ac.)
Total runoff =     17.441(CFS)       Total area =       25.23(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.359(Ft.), Average velocity =   2.701(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      304.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     25.230(Ac.)
Runoff from this stream =     17.441(CFS)
Time of concentration =   20.12 min.
Rainfall intensity =     1.018(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      310.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   540.000(Ft.)
Bottom (of initial area) elevation =   485.000(Ft.)
Difference in elevation =    55.000(Ft.)
Slope =    0.18333  s(%)=      18.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.705 min.
Rainfall intensity =      1.547(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      1.588(CFS)
Total initial stream area =        1.360(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.473(CFS)
Depth of flow =   0.183(Ft.), Average velocity =   3.264(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      5.473(CFS)
  '     '       flow top width =     18.313(Ft.)
  '     '    velocity=    3.264(Ft/s)
  '     '       area =      1.677(Sq.Ft)
  '     '       Froude number =     1.901

Upstream point elevation =   485.000(Ft.)
Downstream point elevation =   415.000(Ft.)
Flow length =   665.000(Ft.)
Travel time  =    3.40 min.
Time of concentration =   13.10 min.
Depth of flow =   0.183(Ft.)
Average velocity =   3.264(Ft/s)
Total irregular channel flow =     5.473(CFS)
Irregular channel normal depth above invert elev. =   0.183(Ft.)
Average velocity of channel(s) =   3.264(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.302(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.727
Subarea runoff =      7.694(CFS) for    8.440(Ac.)
Total runoff =      9.281(CFS)       Total area =        9.80(Ac.)
```

```
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.223(Ft.), Average velocity =   3.725(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      312.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     20.310(CFS)
Depth of flow =   0.286(Ft.), Average velocity =   4.963(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     20.310(CFS)
  '     '       flow top width =     28.609(Ft.)
  '     '    velocity=    4.963(Ft/s)
  '     '       area =      4.092(Sq.Ft)
  '     '       Froude number =     2.312

Upstream point elevation =   415.000(Ft.)
Downstream point elevation =   273.000(Ft.)
Flow length =  1058.000(Ft.)
Travel time  =    3.55 min.
Time of concentration =   16.65 min.
Depth of flow =   0.286(Ft.)
Average velocity =   4.963(Ft/s)
Total irregular channel flow =    20.310(CFS)
Irregular channel normal depth above invert elev. =   0.286(Ft.)
Average velocity of channel(s) =   4.963(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.135(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.702
Subarea runoff =     22.003(CFS) for   29.490(Ac.)
Total runoff =     31.284(CFS)        Total area =       39.29(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.336(Ft.), Average velocity =   5.529(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      313.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   267.000(Ft.)
Downstream point/station elevation =   266.000(Ft.)
Pipe length  =   111.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.284(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    31.284(CFS)
Normal flow depth in pipe =   15.64(In.)
Flow top width inside pipe =   44.99(In.)
Critical Depth =   19.91(In.)
Pipe flow velocity =      8.81(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    16.86 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      313.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =     39.290(Ac.)
Runoff from this stream =     31.284(CFS)
Time of concentration =   16.86 min.
Rainfall intensity =     1.127(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      315.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   597.000(Ft.)
Top (of initial area) elevation =   407.000(Ft.)
Bottom (of initial area) elevation =   380.000(Ft.)
Difference in elevation =    27.000(Ft.)
Slope =    0.04523  s(%)=       4.52
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.317 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.584(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     10.056(CFS)
Total initial stream area =        7.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      313.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   374.000(Ft.)
Downstream point/station elevation =   266.000(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.056(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    10.056(CFS)
Normal flow depth in pipe =    6.16(In.)
Flow top width inside pipe =   17.08(In.)
Critical Depth =   14.67(In.)
Pipe flow velocity =     18.80(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =     9.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      313.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      7.660(Ac.)
Runoff from this stream =     10.056(CFS)
Time of concentration =    9.98 min.
Rainfall intensity =     1.522(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:
```

```
Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     39.29    31.284     16.86    0.250      1.127
2      7.66    10.056      9.98    0.125      1.522
Qmax(1) =
          1.000 *    1.000 *    31.284) +
          0.717 *    1.000 *    10.056) + =      38.492
Qmax(2) =
          1.451 *    0.592 *    31.284) +
          1.000 *    1.000 *    10.056) + =      36.932

Total of 2 streams to confluence:
Flow rates before confluence point:
      31.284      10.056
Maximum flow rates at confluence using above data:
       38.492       36.932
Area of streams before confluence:
       39.290        7.660
Effective area values after confluence:
       46.950       30.916
Results of confluence:
Total flow rate =     38.492(CFS)
Time of concentration =    16.864 min.
Effective stream area after confluence =     46.950(Ac.)
Study area average Pervious fraction(Ap) =  0.918
Study area average soil loss rate(Fm) =    0.230(In/Hr)
Study area total (this main stream) =      46.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      313.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   266.000(Ft.)
Downstream point/station elevation =   198.000(Ft.)
Pipe length  =  1125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.492(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    38.492(CFS)
Normal flow depth in pipe =   10.70(In.)
Flow top width inside pipe =   39.96(In.)
Critical Depth =   22.20(In.)
Pipe flow velocity =     18.43(Ft/s)
Travel time through pipe =    1.02 min.
Time of concentration (TC) =    17.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      313.000 to Point/Station      304.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     46.950(Ac.)
Runoff from this stream =     38.492(CFS)
Time of concentration =   17.88 min.
Rainfall intensity =     1.089(In/Hr)
Area averaged loss rate (Fm) =    0.2296(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9184
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     48.84    23.054     32.30    0.251      0.776
2     25.23    17.441     20.12    0.250      1.018
3     46.95    38.492     17.88    0.230      1.089
```

```
Qmax(1) =
          1.000 *    1.000 *    23.054) +
          0.685 *    1.000 *    17.441) +
          0.635 *    1.000 *    38.492) + =      59.452
Qmax(2) =
          1.462 *    0.623 *    23.054) +
          1.000 *    1.000 *    17.441) +
          0.917 *    1.000 *    38.492) + =      73.737
Qmax(3) =
          1.598 *    0.554 *    23.054) +
          1.093 *    0.889 *    17.441) +
          1.000 *    1.000 *    38.492) + =      75.826

Total of 3 main streams to confluence:
Flow rates before confluence point:
      24.054      18.441      39.492
Maximum flow rates at confluence using above data:
       59.452       73.737       75.826
Area of streams before confluence:
       48.840       25.230       46.950
Effective area values after confluence:
      121.020      102.602       96.418


Results of confluence:
Total flow rate =     75.826(CFS)
Time of concentration =    17.881 min.
Effective stream area after confluence  =     96.418(Ac.)
Study area average Pervious fraction(Ap) =  0.968
Study area average soil loss rate(Fm) =    0.243(In/Hr)
Study area total =     121.02(Ac.)
End of computations, total study area =          121.02 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.968
Area averaged SCS curve number (AMC 2) =  78.3
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/10/16 File Name exc00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'C' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
78.3	0.5	0.00	B	0.300	1.000	0.300
78.3	120.5	1.00	C	0.250	1.000	0.250

Area-averaged adjusted loss rate Fm (In/Hr) = 0.250

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.52	0.004	78.3	61.0	6.40	0.040
120.50	0.996	78.3	61.0	6.40	0.040

Area-averaged catchment yield fraction, Y = 0.040
Area-averaged low loss fraction, Yb = 0.960

++
User entry of time of concentration = 0.298 (hours)
Watershed area = 121.02(Ac.)
Catchment Lag time = 0.238 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 34.9533
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.250(In/Hr)
Average low loss rate fraction (Yb) = 0.960 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 121.02(Ac.) (Ref: fig. E-4)

5-minute factor = 0.994 Adjusted rainfall = 0.189(In)
30-minute factor = 0.994 Adjusted rainfall = 0.398(In)
1-hour factor = 0.994 Adjusted rainfall = 0.527(In)
3-hour factor = 0.999 Adjusted rainfall = 0.889(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 1463.59 (CFS))	
1	2.617	38.301
2	11.670	132.502
3	34.146	328.951
4	62.132	409.603
5	73.540	166.967
6	80.919	107.990
7	86.183	77.054
8	90.152	58.080
9	93.120	43.437
10	95.314	32.115
11	96.865	22.701
12	97.868	14.688
13	98.342	6.937
14	98.719	5.507
15	99.034	4.621
16	99.253	3.200
17	99.514	3.816
18	99.745	3.381
19	99.881	1.991
20	99.963	1.205
21	100.000	0.539

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1889	0.1889
2	0.2520	0.0631
3	0.2982	0.0462
4	0.3361	0.0379
5	0.3687	0.0326
6	0.3977	0.0290
7	0.4234	0.0257
8	0.4470	0.0236
9	0.4689	0.0219
10	0.4894	0.0205
11	0.5087	0.0193
12	0.5270	0.0183
13	0.5475	0.0205
14	0.5671	0.0197
15	0.5861	0.0189
16	0.6044	0.0183
17	0.6221	0.0177
18	0.6393	0.0172
19	0.6559	0.0167
20	0.6722	0.0162
21	0.6880	0.0158
22	0.7034	0.0154
23	0.7184	0.0151
24	0.7332	0.0147
25	0.7476	0.0144
26	0.7617	0.0141
27	0.7755	0.0138
28	0.7890	0.0136
29	0.8023	0.0133
30	0.8154	0.0131
31	0.8282	0.0128

32	0.8408	0.0126
33	0.8533	0.0124
34	0.8655	0.0122
35	0.8775	0.0120
36	0.8894	0.0119
37	0.9005	0.0112
38	0.9115	0.0110
39	0.9224	0.0108
40	0.9331	0.0107
41	0.9436	0.0106
42	0.9541	0.0104
43	0.9643	0.0103
44	0.9745	0.0102
45	0.9845	0.0100
46	0.9944	0.0099
47	1.0042	0.0098
48	1.0139	0.0097
49	1.0234	0.0096
50	1.0329	0.0095
51	1.0423	0.0094
52	1.0515	0.0093
53	1.0607	0.0092
54	1.0698	0.0091
55	1.0787	0.0090
56	1.0876	0.0089
57	1.0964	0.0088
58	1.1052	0.0087
59	1.1138	0.0086
60	1.1224	0.0086
61	1.1308	0.0085
62	1.1392	0.0084
63	1.1476	0.0083
64	1.1558	0.0083
65	1.1640	0.0082
66	1.1721	0.0081
67	1.1802	0.0081
68	1.1882	0.0080
69	1.1961	0.0079
70	1.2040	0.0079
71	1.2118	0.0078
72	1.2195	0.0077
73	1.2259	0.0063
74	1.2321	0.0063
75	1.2383	0.0062
76	1.2445	0.0062
77	1.2506	0.0061
78	1.2567	0.0061
79	1.2627	0.0060
80	1.2686	0.0060
81	1.2745	0.0059
82	1.2804	0.0059
83	1.2862	0.0058
84	1.2920	0.0058
85	1.2978	0.0057
86	1.3035	0.0057
87	1.3091	0.0057
88	1.3147	0.0056
89	1.3203	0.0056
90	1.3258	0.0055
91	1.3313	0.0055
92	1.3368	0.0055
93	1.3422	0.0054
94	1.3476	0.0054
95	1.3530	0.0054
96	1.3583	0.0053
97	1.3636	0.0053
98	1.3688	0.0052
99	1.3740	0.0052
100	1.3792	0.0052
101	1.3844	0.0051
102	1.3895	0.0051

103	1.3946	0.0051
104	1.3996	0.0051
105	1.4046	0.0050
106	1.4096	0.0050
107	1.4146	0.0050
108	1.4195	0.0049
109	1.4244	0.0049
110	1.4293	0.0049
111	1.4342	0.0049
112	1.4390	0.0048
113	1.4438	0.0048
114	1.4486	0.0048
115	1.4533	0.0047
116	1.4580	0.0047
117	1.4627	0.0047
118	1.4674	0.0047
119	1.4721	0.0046
120	1.4767	0.0046
121	1.4813	0.0046
122	1.4858	0.0046
123	1.4904	0.0045
124	1.4949	0.0045
125	1.4994	0.0045
126	1.5039	0.0045
127	1.5084	0.0045
128	1.5128	0.0044
129	1.5172	0.0044
130	1.5216	0.0044
131	1.5260	0.0044
132	1.5303	0.0044
133	1.5347	0.0043
134	1.5390	0.0043
135	1.5433	0.0043
136	1.5475	0.0043
137	1.5518	0.0043
138	1.5560	0.0042
139	1.5602	0.0042
140	1.5644	0.0042
141	1.5686	0.0042
142	1.5728	0.0042
143	1.5769	0.0041
144	1.5810	0.0041
145	1.5851	0.0041
146	1.5892	0.0041
147	1.5933	0.0041
148	1.5973	0.0041
149	1.6014	0.0040
150	1.6054	0.0040
151	1.6094	0.0040
152	1.6134	0.0040
153	1.6173	0.0040
154	1.6213	0.0040
155	1.6252	0.0039
156	1.6292	0.0039
157	1.6331	0.0039
158	1.6369	0.0039
159	1.6408	0.0039
160	1.6447	0.0039
161	1.6485	0.0038
162	1.6523	0.0038
163	1.6562	0.0038
164	1.6600	0.0038
165	1.6637	0.0038
166	1.6675	0.0038
167	1.6713	0.0038
168	1.6750	0.0037
169	1.6787	0.0037
170	1.6824	0.0037
171	1.6861	0.0037
172	1.6898	0.0037
173	1.6935	0.0037

174	1.6972	0.0037
175	1.7008	0.0036
176	1.7044	0.0036
177	1.7081	0.0036
178	1.7117	0.0036
179	1.7153	0.0036
180	1.7189	0.0036
181	1.7224	0.0036
182	1.7260	0.0036
183	1.7295	0.0035
184	1.7331	0.0035
185	1.7366	0.0035
186	1.7401	0.0035
187	1.7436	0.0035
188	1.7471	0.0035
189	1.7505	0.0035
190	1.7540	0.0035
191	1.7575	0.0035
192	1.7609	0.0034
193	1.7643	0.0034
194	1.7678	0.0034
195	1.7712	0.0034
196	1.7746	0.0034
197	1.7779	0.0034
198	1.7813	0.0034
199	1.7847	0.0034
200	1.7880	0.0034
201	1.7914	0.0033
202	1.7947	0.0033
203	1.7980	0.0033
204	1.8013	0.0033
205	1.8046	0.0033
206	1.8079	0.0033
207	1.8112	0.0033
208	1.8145	0.0033
209	1.8178	0.0033
210	1.8210	0.0033
211	1.8243	0.0032
212	1.8275	0.0032
213	1.8307	0.0032
214	1.8339	0.0032
215	1.8371	0.0032
216	1.8403	0.0032
217	1.8435	0.0032
218	1.8467	0.0032
219	1.8499	0.0032
220	1.8530	0.0032
221	1.8562	0.0032
222	1.8593	0.0031
223	1.8624	0.0031
224	1.8656	0.0031
225	1.8687	0.0031
226	1.8718	0.0031
227	1.8749	0.0031
228	1.8780	0.0031
229	1.8811	0.0031
230	1.8841	0.0031
231	1.8872	0.0031
232	1.8902	0.0031
233	1.8933	0.0030
234	1.8963	0.0030
235	1.8994	0.0030
236	1.9024	0.0030
237	1.9054	0.0030
238	1.9084	0.0030
239	1.9114	0.0030
240	1.9144	0.0030
241	1.9174	0.0030
242	1.9204	0.0030
243	1.9233	0.0030
244	1.9263	0.0030

245	1.9292	0.0030
246	1.9322	0.0029
247	1.9351	0.0029
248	1.9381	0.0029
249	1.9410	0.0029
250	1.9439	0.0029
251	1.9468	0.0029
252	1.9497	0.0029
253	1.9526	0.0029
254	1.9555	0.0029
255	1.9584	0.0029
256	1.9612	0.0029
257	1.9641	0.0029
258	1.9670	0.0029
259	1.9698	0.0029
260	1.9727	0.0028
261	1.9755	0.0028
262	1.9783	0.0028
263	1.9812	0.0028
264	1.9840	0.0028
265	1.9868	0.0028
266	1.9896	0.0028
267	1.9924	0.0028
268	1.9952	0.0028
269	1.9980	0.0028
270	2.0007	0.0028
271	2.0035	0.0028
272	2.0063	0.0028
273	2.0090	0.0028
274	2.0118	0.0028
275	2.0145	0.0027
276	2.0173	0.0027
277	2.0200	0.0027
278	2.0227	0.0027
279	2.0255	0.0027
280	2.0282	0.0027
281	2.0309	0.0027
282	2.0336	0.0027
283	2.0363	0.0027
284	2.0390	0.0027
285	2.0417	0.0027
286	2.0443	0.0027
287	2.0470	0.0027
288	2.0497	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0026	0.0001
2	0.0027	0.0026	0.0001
3	0.0027	0.0026	0.0001
4	0.0027	0.0026	0.0001
5	0.0027	0.0026	0.0001
6	0.0027	0.0026	0.0001
7	0.0027	0.0026	0.0001
8	0.0027	0.0026	0.0001
9	0.0027	0.0026	0.0001
10	0.0027	0.0026	0.0001
11	0.0028	0.0026	0.0001
12	0.0028	0.0027	0.0001
13	0.0028	0.0027	0.0001
14	0.0028	0.0027	0.0001
15	0.0028	0.0027	0.0001
16	0.0028	0.0027	0.0001
17	0.0028	0.0027	0.0001
18	0.0028	0.0027	0.0001
19	0.0028	0.0027	0.0001
20	0.0028	0.0027	0.0001
21	0.0029	0.0027	0.0001
22	0.0029	0.0028	0.0001

23	0.0029	0.0028	0.0001
24	0.0029	0.0028	0.0001
25	0.0029	0.0028	0.0001
26	0.0029	0.0028	0.0001
27	0.0029	0.0028	0.0001
28	0.0029	0.0028	0.0001
29	0.0029	0.0028	0.0001
30	0.0030	0.0028	0.0001
31	0.0030	0.0028	0.0001
32	0.0030	0.0029	0.0001
33	0.0030	0.0029	0.0001
34	0.0030	0.0029	0.0001
35	0.0030	0.0029	0.0001
36	0.0030	0.0029	0.0001
37	0.0030	0.0029	0.0001
38	0.0030	0.0029	0.0001
39	0.0031	0.0029	0.0001
40	0.0031	0.0029	0.0001
41	0.0031	0.0030	0.0001
42	0.0031	0.0030	0.0001
43	0.0031	0.0030	0.0001
44	0.0031	0.0030	0.0001
45	0.0031	0.0030	0.0001
46	0.0032	0.0030	0.0001
47	0.0032	0.0030	0.0001
48	0.0032	0.0030	0.0001
49	0.0032	0.0031	0.0001
50	0.0032	0.0031	0.0001
51	0.0032	0.0031	0.0001
52	0.0032	0.0031	0.0001
53	0.0033	0.0031	0.0001
54	0.0033	0.0031	0.0001
55	0.0033	0.0032	0.0001
56	0.0033	0.0032	0.0001
57	0.0033	0.0032	0.0001
58	0.0033	0.0032	0.0001
59	0.0033	0.0032	0.0001
60	0.0034	0.0032	0.0001
61	0.0034	0.0032	0.0001
62	0.0034	0.0032	0.0001
63	0.0034	0.0033	0.0001
64	0.0034	0.0033	0.0001
65	0.0034	0.0033	0.0001
66	0.0035	0.0033	0.0001
67	0.0035	0.0033	0.0001
68	0.0035	0.0033	0.0001
69	0.0035	0.0034	0.0001
70	0.0035	0.0034	0.0001
71	0.0035	0.0034	0.0001
72	0.0036	0.0034	0.0001
73	0.0036	0.0034	0.0001
74	0.0036	0.0035	0.0001
75	0.0036	0.0035	0.0001
76	0.0036	0.0035	0.0001
77	0.0037	0.0035	0.0001
78	0.0037	0.0035	0.0001
79	0.0037	0.0036	0.0001
80	0.0037	0.0036	0.0001
81	0.0037	0.0036	0.0002
82	0.0038	0.0036	0.0002
83	0.0038	0.0036	0.0002
84	0.0038	0.0036	0.0002
85	0.0038	0.0037	0.0002
86	0.0038	0.0037	0.0002
87	0.0039	0.0037	0.0002
88	0.0039	0.0037	0.0002
89	0.0039	0.0038	0.0002
90	0.0039	0.0038	0.0002
91	0.0040	0.0038	0.0002
92	0.0040	0.0038	0.0002
93	0.0040	0.0039	0.0002

94	0.0040	0.0039	0.0002
95	0.0041	0.0039	0.0002
96	0.0041	0.0039	0.0002
97	0.0041	0.0040	0.0002
98	0.0041	0.0040	0.0002
99	0.0042	0.0040	0.0002
100	0.0042	0.0040	0.0002
101	0.0042	0.0041	0.0002
102	0.0043	0.0041	0.0002
103	0.0043	0.0041	0.0002
104	0.0043	0.0041	0.0002
105	0.0044	0.0042	0.0002
106	0.0044	0.0042	0.0002
107	0.0044	0.0042	0.0002
108	0.0044	0.0043	0.0002
109	0.0045	0.0043	0.0002
110	0.0045	0.0043	0.0002
111	0.0045	0.0044	0.0002
112	0.0046	0.0044	0.0002
113	0.0046	0.0044	0.0002
114	0.0046	0.0045	0.0002
115	0.0047	0.0045	0.0002
116	0.0047	0.0045	0.0002
117	0.0048	0.0046	0.0002
118	0.0048	0.0046	0.0002
119	0.0049	0.0047	0.0002
120	0.0049	0.0047	0.0002
121	0.0049	0.0047	0.0002
122	0.0050	0.0048	0.0002
123	0.0050	0.0048	0.0002
124	0.0051	0.0049	0.0002
125	0.0051	0.0049	0.0002
126	0.0051	0.0049	0.0002
127	0.0052	0.0050	0.0002
128	0.0052	0.0050	0.0002
129	0.0053	0.0051	0.0002
130	0.0054	0.0051	0.0002
131	0.0054	0.0052	0.0002
132	0.0055	0.0052	0.0002
133	0.0055	0.0053	0.0002
134	0.0056	0.0054	0.0002
135	0.0057	0.0054	0.0002
136	0.0057	0.0055	0.0002
137	0.0058	0.0055	0.0002
138	0.0058	0.0056	0.0002
139	0.0059	0.0057	0.0002
140	0.0060	0.0057	0.0002
141	0.0061	0.0058	0.0002
142	0.0061	0.0059	0.0002
143	0.0062	0.0060	0.0002
144	0.0063	0.0060	0.0003
145	0.0077	0.0074	0.0003
146	0.0078	0.0075	0.0003
147	0.0079	0.0076	0.0003
148	0.0080	0.0077	0.0003
149	0.0081	0.0078	0.0003
150	0.0082	0.0079	0.0003
151	0.0083	0.0080	0.0003
152	0.0084	0.0081	0.0003
153	0.0086	0.0082	0.0003
154	0.0086	0.0083	0.0003
155	0.0088	0.0084	0.0004
156	0.0089	0.0085	0.0004
157	0.0091	0.0087	0.0004
158	0.0092	0.0088	0.0004
159	0.0094	0.0090	0.0004
160	0.0095	0.0091	0.0004
161	0.0097	0.0093	0.0004
162	0.0098	0.0094	0.0004
163	0.0100	0.0096	0.0004
164	0.0102	0.0097	0.0004

165	0.0104	0.0100	0.0004
166	0.0106	0.0101	0.0004
167	0.0108	0.0104	0.0004
168	0.0110	0.0106	0.0004
169	0.0119	0.0114	0.0005
170	0.0120	0.0115	0.0005
171	0.0124	0.0119	0.0005
172	0.0126	0.0121	0.0005
173	0.0131	0.0125	0.0005
174	0.0133	0.0128	0.0005
175	0.0138	0.0133	0.0006
176	0.0141	0.0135	0.0006
177	0.0147	0.0141	0.0006
178	0.0151	0.0144	0.0006
179	0.0158	0.0152	0.0006
180	0.0162	0.0156	0.0007
181	0.0172	0.0165	0.0007
182	0.0177	0.0170	0.0007
183	0.0189	0.0182	0.0008
184	0.0197	0.0189	0.0008
185	0.0183	0.0176	0.0007
186	0.0193	0.0185	0.0008
187	0.0219	0.0209	0.0010
188	0.0236	0.0209	0.0027
189	0.0290	0.0209	0.0082
190	0.0326	0.0209	0.0118
191	0.0462	0.0209	0.0254
192	0.0631	0.0209	0.0422
193	0.1889	0.0209	0.1681
194	0.0379	0.0209	0.0170
195	0.0257	0.0209	0.0048
196	0.0205	0.0197	0.0008
197	0.0205	0.0197	0.0008
198	0.0183	0.0176	0.0007
199	0.0167	0.0160	0.0007
200	0.0154	0.0148	0.0006
201	0.0144	0.0138	0.0006
202	0.0136	0.0130	0.0005
203	0.0128	0.0123	0.0005
204	0.0122	0.0117	0.0005
205	0.0112	0.0107	0.0004
206	0.0107	0.0103	0.0004
207	0.0103	0.0099	0.0004
208	0.0099	0.0095	0.0004
209	0.0096	0.0092	0.0004
210	0.0093	0.0089	0.0004
211	0.0090	0.0086	0.0004
212	0.0087	0.0084	0.0004
213	0.0085	0.0081	0.0003
214	0.0083	0.0079	0.0003
215	0.0081	0.0077	0.0003
216	0.0079	0.0075	0.0003
217	0.0063	0.0061	0.0003
218	0.0062	0.0059	0.0002
219	0.0060	0.0058	0.0002
220	0.0059	0.0056	0.0002
221	0.0057	0.0055	0.0002
222	0.0056	0.0054	0.0002
223	0.0055	0.0053	0.0002
224	0.0054	0.0052	0.0002
225	0.0053	0.0051	0.0002
226	0.0052	0.0050	0.0002
227	0.0051	0.0049	0.0002
228	0.0050	0.0048	0.0002
229	0.0049	0.0047	0.0002
230	0.0048	0.0046	0.0002
231	0.0047	0.0046	0.0002
232	0.0047	0.0045	0.0002
233	0.0046	0.0044	0.0002
234	0.0045	0.0043	0.0002
235	0.0045	0.0043	0.0002

236	0.0044	0.0042	0.0002
237	0.0043	0.0042	0.0002
238	0.0043	0.0041	0.0002
239	0.0042	0.0040	0.0002
240	0.0042	0.0040	0.0002
241	0.0041	0.0039	0.0002
242	0.0041	0.0039	0.0002
243	0.0040	0.0038	0.0002
244	0.0040	0.0038	0.0002
245	0.0039	0.0037	0.0002
246	0.0039	0.0037	0.0002
247	0.0038	0.0037	0.0002
248	0.0038	0.0036	0.0002
249	0.0037	0.0036	0.0001
250	0.0037	0.0035	0.0001
251	0.0036	0.0035	0.0001
252	0.0036	0.0035	0.0001
253	0.0036	0.0034	0.0001
254	0.0035	0.0034	0.0001
255	0.0035	0.0034	0.0001
256	0.0035	0.0033	0.0001
257	0.0034	0.0033	0.0001
258	0.0034	0.0033	0.0001
259	0.0034	0.0032	0.0001
260	0.0033	0.0032	0.0001
261	0.0033	0.0032	0.0001
262	0.0033	0.0031	0.0001
263	0.0032	0.0031	0.0001
264	0.0032	0.0031	0.0001
265	0.0032	0.0031	0.0001
266	0.0032	0.0030	0.0001
267	0.0031	0.0030	0.0001
268	0.0031	0.0030	0.0001
269	0.0031	0.0030	0.0001
270	0.0031	0.0029	0.0001
271	0.0030	0.0029	0.0001
272	0.0030	0.0029	0.0001
273	0.0030	0.0029	0.0001
274	0.0030	0.0028	0.0001
275	0.0029	0.0028	0.0001
276	0.0029	0.0028	0.0001
277	0.0029	0.0028	0.0001
278	0.0029	0.0028	0.0001
279	0.0029	0.0027	0.0001
280	0.0028	0.0027	0.0001
281	0.0028	0.0027	0.0001
282	0.0028	0.0027	0.0001
283	0.0028	0.0027	0.0001
284	0.0028	0.0026	0.0001
285	0.0027	0.0026	0.0001
286	0.0027	0.0026	0.0001
287	0.0027	0.0026	0.0001
288	0.0027	0.0026	0.0001

Total soil rain loss = 1.70(In)
Total effective rainfall = 0.34(In)
Peak flow rate in flood hydrograph = 86.48(CFS)

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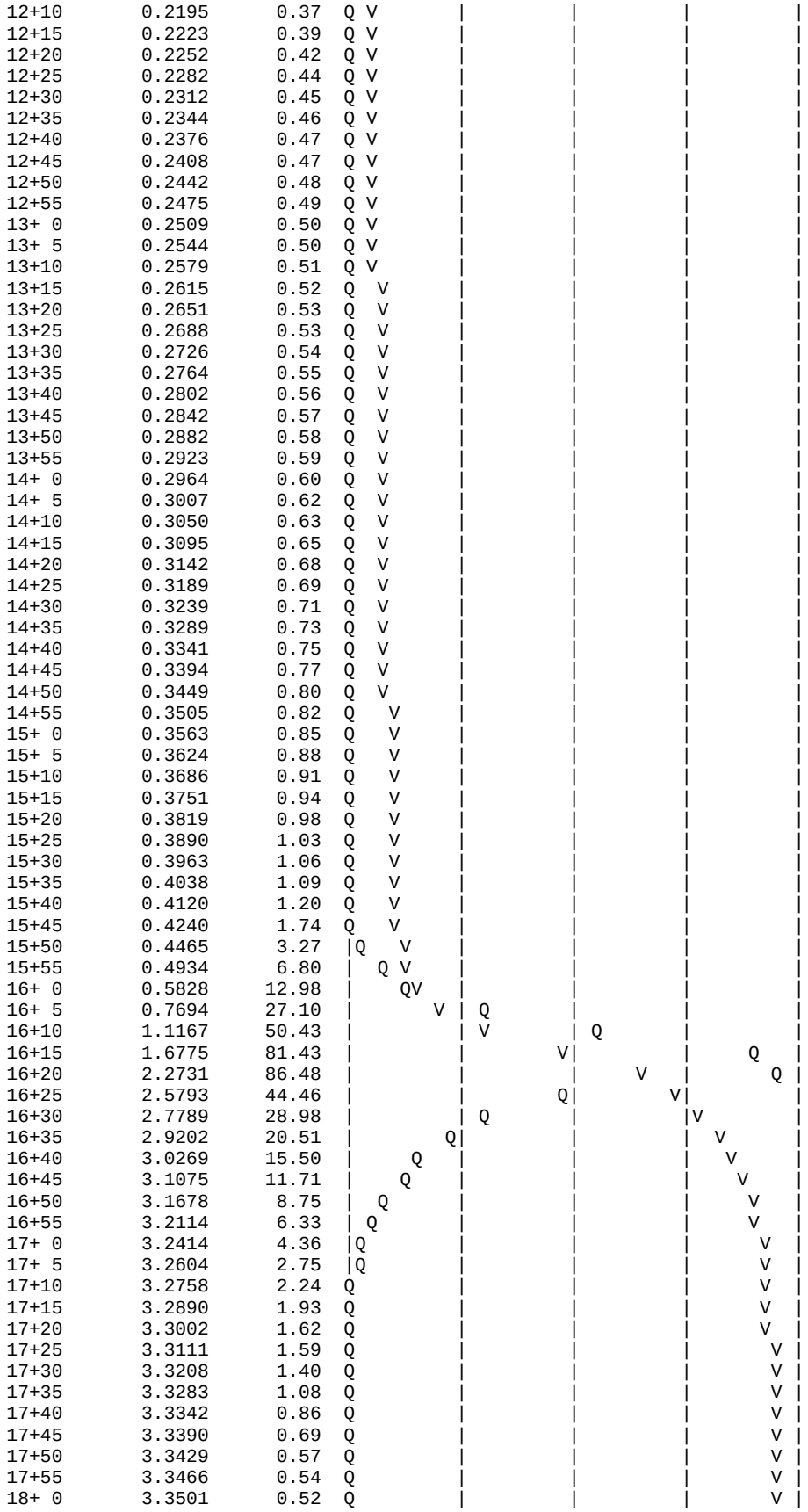
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	22.5	45.0	67.5	90.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0002	0.02	Q	|	|	|	|
0+15	0.0005	0.05	Q	|	|	|	|

0+20	0.0012	0.10	Q				
0+25	0.0020	0.12	Q				
0+30	0.0029	0.13	Q				
0+35	0.0038	0.14	Q				
0+40	0.0048	0.14	Q				
0+45	0.0058	0.15	Q				
0+50	0.0069	0.15	Q				
0+55	0.0080	0.16	Q				
1+ 0	0.0090	0.16	Q				
1+ 5	0.0101	0.16	Q				
1+10	0.0112	0.16	Q				
1+15	0.0123	0.16	Q				
1+20	0.0135	0.16	Q				
1+25	0.0146	0.16	Q				
1+30	0.0157	0.16	Q				
1+35	0.0168	0.16	Q				
1+40	0.0180	0.17	Q				
1+45	0.0191	0.17	Q				
1+50	0.0203	0.17	Q				
1+55	0.0214	0.17	Q				
2+ 0	0.0226	0.17	Q				
2+ 5	0.0237	0.17	Q				
2+10	0.0249	0.17	Q				
2+15	0.0261	0.17	Q				
2+20	0.0272	0.17	Q				
2+25	0.0284	0.17	Q				
2+30	0.0296	0.17	Q				
2+35	0.0308	0.17	Q				
2+40	0.0320	0.17	Q				
2+45	0.0332	0.17	Q				
2+50	0.0344	0.17	Q				
2+55	0.0356	0.17	Q				
3+ 0	0.0368	0.18	Q				
3+ 5	0.0380	0.18	Q				
3+10	0.0392	0.18	Q				
3+15	0.0404	0.18	Q				
3+20	0.0417	0.18	Q				
3+25	0.0429	0.18	Q				
3+30	0.0441	0.18	Q				
3+35	0.0454	0.18	Q				
3+40	0.0466	0.18	Q				
3+45	0.0479	0.18	Q				
3+50	0.0491	0.18	Q				
3+55	0.0504	0.18	Q				
4+ 0	0.0517	0.18	Q				
4+ 5	0.0529	0.19	Q				
4+10	0.0542	0.19	Q				
4+15	0.0555	0.19	Q				
4+20	0.0568	0.19	Q				
4+25	0.0581	0.19	Q				
4+30	0.0594	0.19	Q				
4+35	0.0607	0.19	Q				
4+40	0.0620	0.19	Q				
4+45	0.0633	0.19	Q				
4+50	0.0647	0.19	Q				
4+55	0.0660	0.19	Q				
5+ 0	0.0673	0.19	Q				
5+ 5	0.0687	0.20	Q				
5+10	0.0700	0.20	Q				
5+15	0.0714	0.20	Q				
5+20	0.0727	0.20	Q				
5+25	0.0741	0.20	Q				
5+30	0.0755	0.20	Q				
5+35	0.0769	0.20	Q				
5+40	0.0783	0.20	Q				
5+45	0.0797	0.20	Q				
5+50	0.0811	0.20	Q				
5+55	0.0825	0.20	Q				
6+ 0	0.0839	0.21	Q				
6+ 5	0.0853	0.21	Q				
6+10	0.0867	0.21	Q				

6+15	0.0882	0.21	QV				
6+20	0.0896	0.21	QV				
6+25	0.0911	0.21	QV				
6+30	0.0925	0.21	QV				
6+35	0.0940	0.21	QV				
6+40	0.0955	0.21	QV				
6+45	0.0970	0.22	QV				
6+50	0.0985	0.22	QV				
6+55	0.1000	0.22	QV				
7+ 0	0.1015	0.22	QV				
7+ 5	0.1030	0.22	QV				
7+10	0.1045	0.22	QV				
7+15	0.1060	0.22	QV				
7+20	0.1076	0.22	QV				
7+25	0.1091	0.23	QV				
7+30	0.1107	0.23	QV				
7+35	0.1123	0.23	QV				
7+40	0.1139	0.23	QV				
7+45	0.1154	0.23	QV				
7+50	0.1170	0.23	QV				
7+55	0.1187	0.23	QV				
8+ 0	0.1203	0.24	QV				
8+ 5	0.1219	0.24	QV				
8+10	0.1235	0.24	QV				
8+15	0.1252	0.24	QV				
8+20	0.1269	0.24	QV				
8+25	0.1285	0.24	QV				
8+30	0.1302	0.24	QV				
8+35	0.1319	0.25	QV				
8+40	0.1336	0.25	QV				
8+45	0.1353	0.25	QV				
8+50	0.1371	0.25	QV				
8+55	0.1388	0.25	QV				
9+ 0	0.1406	0.25	QV				
9+ 5	0.1423	0.26	QV				
9+10	0.1441	0.26	QV				
9+15	0.1459	0.26	QV				
9+20	0.1477	0.26	QV				
9+25	0.1495	0.26	QV				
9+30	0.1513	0.27	QV				
9+35	0.1532	0.27	QV				
9+40	0.1551	0.27	QV				
9+45	0.1569	0.27	QV				
9+50	0.1588	0.27	QV				
9+55	0.1607	0.28	QV				
10+ 0	0.1626	0.28	QV				
10+ 5	0.1646	0.28	QV				
10+10	0.1665	0.28	QV				
10+15	0.1685	0.29	QV				
10+20	0.1705	0.29	QV				
10+25	0.1725	0.29	QV				
10+30	0.1745	0.29	Q V				
10+35	0.1766	0.30	Q V				
10+40	0.1786	0.30	Q V				
10+45	0.1807	0.30	Q V				
10+50	0.1828	0.30	Q V				
10+55	0.1849	0.31	Q V				
11+ 0	0.1870	0.31	Q V				
11+ 5	0.1892	0.31	Q V				
11+10	0.1914	0.32	Q V				
11+15	0.1936	0.32	Q V				
11+20	0.1958	0.32	Q V				
11+25	0.1981	0.33	Q V				
11+30	0.2003	0.33	Q V				
11+35	0.2026	0.33	Q V				
11+40	0.2050	0.34	Q V				
11+45	0.2073	0.34	Q V				
11+50	0.2097	0.34	Q V				
11+55	0.2121	0.35	Q V				
12+ 0	0.2145	0.35	Q V				
12+ 5	0.2170	0.36	Q V				



18+ 5	3.3536	0.50	Q	|	|	|	V |
18+10	3.3569	0.48	Q	|	|	|	V |
18+15	3.3600	0.45	Q	|	|	|	V |
18+20	3.3628	0.42	Q	|	|	|	V |
18+25	3.3656	0.40	Q	|	|	|	V |
18+30	3.3682	0.38	Q	|	|	|	V |
18+35	3.3707	0.37	Q	|	|	|	V |
18+40	3.3731	0.35	Q	|	|	|	V |
18+45	3.3755	0.34	Q	|	|	|	V |
18+50	3.3778	0.34	Q	|	|	|	V |
18+55	3.3801	0.33	Q	|	|	|	V |
19+ 0	3.3823	0.32	Q	|	|	|	V |
19+ 5	3.3844	0.31	Q	|	|	|	V |
19+10	3.3865	0.31	Q	|	|	|	V |
19+15	3.3886	0.30	Q	|	|	|	V |
19+20	3.3906	0.29	Q	|	|	|	V|
19+25	3.3926	0.29	Q	|	|	|	V|
19+30	3.3946	0.28	Q	|	|	|	V|
19+35	3.3965	0.28	Q	|	|	|	V|
19+40	3.3984	0.27	Q	|	|	|	V|
19+45	3.4003	0.27	Q	|	|	|	V|
19+50	3.4021	0.27	Q	|	|	|	V|
19+55	3.4039	0.26	Q	|	|	|	V|
20+ 0	3.4057	0.26	Q	|	|	|	V|
20+ 5	3.4074	0.25	Q	|	|	|	V|
20+10	3.4092	0.25	Q	|	|	|	V|
20+15	3.4109	0.25	Q	|	|	|	V|
20+20	3.4126	0.24	Q	|	|	|	V|
20+25	3.4142	0.24	Q	|	|	|	V|
20+30	3.4159	0.24	Q	|	|	|	V|
20+35	3.4175	0.24	Q	|	|	|	V|
20+40	3.4191	0.23	Q	|	|	|	V|
20+45	3.4207	0.23	Q	|	|	|	V|
20+50	3.4222	0.23	Q	|	|	|	V|
20+55	3.4238	0.22	Q	|	|	|	V|
21+ 0	3.4253	0.22	Q	|	|	|	V|
21+ 5	3.4268	0.22	Q	|	|	|	V|
21+10	3.4283	0.22	Q	|	|	|	V|
21+15	3.4298	0.21	Q	|	|	|	V|
21+20	3.4312	0.21	Q	|	|	|	V|
21+25	3.4327	0.21	Q	|	|	|	V|
21+30	3.4341	0.21	Q	|	|	|	V|
21+35	3.4355	0.21	Q	|	|	|	V|
21+40	3.4369	0.20	Q	|	|	|	V|
21+45	3.4383	0.20	Q	|	|	|	V|
21+50	3.4397	0.20	Q	|	|	|	V|
21+55	3.4411	0.20	Q	|	|	|	V|
22+ 0	3.4424	0.20	Q	|	|	|	V|
22+ 5	3.4438	0.19	Q	|	|	|	V|
22+10	3.4451	0.19	Q	|	|	|	V|
22+15	3.4464	0.19	Q	|	|	|	V|
22+20	3.4477	0.19	Q	|	|	|	V|
22+25	3.4490	0.19	Q	|	|	|	V|
22+30	3.4503	0.19	Q	|	|	|	V|
22+35	3.4515	0.18	Q	|	|	|	V|
22+40	3.4528	0.18	Q	|	|	|	V|
22+45	3.4541	0.18	Q	|	|	|	V|
22+50	3.4553	0.18	Q	|	|	|	V|
22+55	3.4565	0.18	Q	|	|	|	V|
23+ 0	3.4577	0.18	Q	|	|	|	V|
23+ 5	3.4589	0.18	Q	|	|	|	V|
23+10	3.4601	0.17	Q	|	|	|	V|
23+15	3.4613	0.17	Q	|	|	|	V|
23+20	3.4625	0.17	Q	|	|	|	V|
23+25	3.4637	0.17	Q	|	|	|	V|
23+30	3.4649	0.17	Q	|	|	|	V|
23+35	3.4660	0.17	Q	|	|	|	V|
23+40	3.4672	0.17	Q	|	|	|	V|
23+45	3.4683	0.17	Q	|	|	|	V|
23+50	3.4694	0.16	Q	|	|	|	V|
23+55	3.4705	0.16	Q	|	|	|	V|

24+ 0	3.4717	0.16	Q	|	|	|	V|
24+ 5	3.4727	0.16	Q	|	|	|	V|
24+10	3.4737	0.14	Q	|	|	|	V|
24+15	3.4744	0.11	Q	|	|	|	V|
24+20	3.4749	0.06	Q	|	|	|	V|
24+25	3.4752	0.04	Q	|	|	|	V|
24+30	3.4754	0.03	Q	|	|	|	V|
24+35	3.4755	0.02	Q	|	|	|	V|
24+40	3.4756	0.02	Q	|	|	|	V|
24+45	3.4757	0.01	Q	|	|	|	V|
24+50	3.4758	0.01	Q	|	|	|	V|
24+55	3.4758	0.01	Q	|	|	|	V|
25+ 0	3.4758	0.00	Q	|	|	|	V|
25+ 5	3.4758	0.00	Q	|	|	|	V|
25+10	3.4758	0.00	Q	|	|	|	V|
25+15	3.4759	0.00	Q	|	|	|	V|
25+20	3.4759	0.00	Q	|	|	|	V|
25+25	3.4759	0.00	Q	|	|	|	V|
25+30	3.4759	0.00	Q	|	|	|	V|
25+35	3.4759	0.00	Q	|	|	|	V|
25+40	3.4759	0.00	Q	|	|	|	V

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/13/16 File Name: PRC002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'C' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

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Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 383.000(Ft.)
Bottom (of initial area) elevation = 321.000(Ft.)
Difference in elevation = 62.000(Ft.)
Slope = 0.20667 s(%)= 20.67
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.475 min.
Rainfall intensity = 1.568(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.757
Subarea runoff = 1.246(CFS)
Total initial stream area = 1.050(Ac.)

++
Process from Point/Station 301.000 to Point/Station 302.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 321.000(Ft.)
Downstream point/station elevation = 297.000(Ft.)
Pipe length = 63.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.246(CFS)
Given pipe size = 8.00(In.)
Calculated individual pipe flow = 1.246(CFS)
Normal flow depth in pipe = 2.21(In.)
Flow top width inside pipe = 7.16(In.)
Critical Depth = 6.34(In.)
Pipe flow velocity = 15.85(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 9.54 min.

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Process from Point/Station      302.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   297.000(Ft.)
End of street segment elevation =   286.000(Ft.)
Length of street segment  =   341.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.363(CFS)
Depth of flow =   0.274(Ft.), Average velocity =   3.512(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.390(Ft.)
Flow velocity =   3.51(Ft/s)
Travel time =    1.62 min.     TC =   11.16  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.428(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.794
Subarea runoff =      2.154(CFS) for    1.950(Ac.)
Total runoff =      3.399(CFS)        Total area =        3.00(Ac.)
Area averaged Fm value =    0.169(In/Hr)
Street flow at end of street =      3.399(CFS)
Half street flow at end of street =      3.399(CFS)
Depth of flow =   0.302(Ft.), Average velocity =   3.798(Ft/s)
Flow width (from curb towards crown)=   8.766(Ft.)


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Process from Point/Station      303.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   280.000(Ft.)
Downstream point/station elevation =   279.000(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.399(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     3.399(CFS)
Normal flow depth in pipe =    4.79(In.)
Flow top width inside pipe =   15.91(In.)
Critical Depth =    8.42(In.)
Pipe flow velocity =      9.00(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.20 min.


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Process from Point/Station      303.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
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Stream flow area =      3.000(Ac.)
Runoff from this stream =      3.399(CFS)
Time of concentration =   11.20 min.
Rainfall intensity =     1.425(In/Hr)
Area averaged loss rate (Fm) =    0.1687(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6750


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Process from Point/Station      305.000 to Point/Station      306.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   233.000(Ft.)
Top (of initial area) elevation =   334.000(Ft.)
Bottom (of initial area) elevation =   297.000(Ft.)
Difference in elevation =    37.000(Ft.)
Slope =    0.15880  s(%)=      15.88
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.974 min.
Rainfall intensity =      2.270(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      1.023(CFS)
Total initial stream area =        0.530(Ac.)


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Process from Point/Station      306.000 to Point/Station      307.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   297.000(Ft.)
End of street segment elevation =   286.000(Ft.)
Length of street segment  =   303.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.586(CFS)
Depth of flow =   0.243(Ft.), Average velocity =   3.407(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.822(Ft.)
Flow velocity =   3.41(Ft/s)
Travel time =    1.48 min.     TC =    6.46  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.955(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
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rational method)(Q=KCIA) is C = 0.842
Subarea runoff =      1.035(CFS) for    0.720(Ac.)
Total runoff =      2.058(CFS)       Total area =        1.25(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      2.058(CFS)
Half street flow at end of street =      2.058(CFS)
Depth of flow =   0.261(Ft.), Average velocity =   3.579(Ft/s)
Flow width (from curb towards crown)=   6.697(Ft.)


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Process from Point/Station      307.000 to Point/Station      304.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   280.000(Ft.)
Downstream point/station elevation =   279.000(Ft.)
Pipe length  =    37.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.058(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     2.058(CFS)
Normal flow depth in pipe =    4.20(In.)
Flow top width inside pipe =   15.22(In.)
Critical Depth =    6.48(In.)
Pipe flow velocity =      6.58(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     6.55 min.


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Process from Point/Station      307.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.058(CFS)
Time of concentration =    6.55 min.
Rainfall intensity =     1.939(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      3.00     3.399     11.20    0.169      1.425
2      1.25     2.058      6.55    0.125      1.939
Qmax(1) =
          1.000 *    1.000 *     3.399) +
          0.717 *    1.000 *     2.058) + =       4.875
Qmax(2) =
          1.409 *    0.585 *     3.399) +
          1.000 *    1.000 *     2.058) + =       4.860

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.399       2.058
Maximum flow rates at confluence using above data:
        4.875        4.860
Area of streams before confluence:
        3.000        1.250
Effective area values after confluence:
        4.250        3.004
Results of confluence:
Total flow rate =      4.875(CFS)
Time of concentration =    11.203 min.
Effective stream area after confluence =      4.250(Ac.)
Study area average Pervious fraction(Ap) =  0.624
Study area average soil loss rate(Fm) =    0.156(In/Hr)
Study area total (this main stream) =       4.25(Ac.)
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Process from Point/Station      304.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   279.000(Ft.)
Downstream point/station elevation =   259.000(Ft.)
Pipe length  =   247.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.875(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     4.875(CFS)
Normal flow depth in pipe =    4.47(In.)
Flow top width inside pipe =   18.68(In.)
Critical Depth =    9.32(In.)
Pipe flow velocity =     12.08(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    11.54 min.


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Process from Point/Station      304.000 to Point/Station      308.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.250(Ac.)
Runoff from this stream =      4.875(CFS)
Time of concentration =   11.54 min.
Rainfall intensity =     1.400(In/Hr)
Area averaged loss rate (Fm) =    0.1559(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6235


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Process from Point/Station      300.000 to Point/Station      309.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   383.000(Ft.)
Bottom (of initial area) elevation =   324.000(Ft.)
Difference in elevation =    59.000(Ft.)
Slope =    0.19667  s(%)=      19.67
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.570 min.
Rainfall intensity =      1.560(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.756
Subarea runoff =      1.308(CFS)
Total initial stream area =        1.110(Ac.)


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Process from Point/Station      309.000 to Point/Station      310.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   324.000(Ft.)
Downstream point/station elevation =   299.000(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.308(CFS)
Given pipe size =      8.00(In.)
Calculated individual pipe flow  =     1.308(CFS)
Normal flow depth in pipe =    2.76(In.)
Flow top width inside pipe =    7.61(In.)
Critical Depth =    6.48(In.)
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Pipe flow velocity =     12.24(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     9.76 min.


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Process from Point/Station      310.000 to Point/Station      311.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =   299.000(Ft.)
End of street segment elevation =   266.000(Ft.)
Length of street segment  =   717.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.832(CFS)
Depth of flow =   0.248(Ft.), Average velocity =   3.885(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.054(Ft.)
Flow velocity =   3.89(Ft/s)
Travel time =    3.08 min.     TC =   12.84  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.318(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff =      4.857(CFS) for    4.750(Ac.)
Total runoff =      6.165(CFS)       Total area =        5.86(Ac.)
Area averaged Fm value =    0.149(In/Hr)
Street flow at end of street =      6.165(CFS)
Half street flow at end of street =      3.082(CFS)
Depth of flow =   0.281(Ft.), Average velocity =   4.273(Ft/s)
Flow width (from curb towards crown)=   7.711(Ft.)


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Process from Point/Station      311.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   260.000(Ft.)
Downstream point/station elevation =   259.000(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.165(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     6.165(CFS)
Normal flow depth in pipe =    6.75(In.)
Flow top width inside pipe =   17.43(In.)
Critical Depth =   11.52(In.)
Pipe flow velocity =     10.18(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.88 min.


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Process from Point/Station      311.000 to Point/Station      308.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.860(Ac.)
Runoff from this stream =      6.165(CFS)
Time of concentration =   12.88 min.
Rainfall intensity =     1.315(In/Hr)
Area averaged loss rate (Fm) =    0.1487(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5947


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Process from Point/Station      312.000 to Point/Station      313.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   350.000(Ft.)
Bottom (of initial area) elevation =   280.000(Ft.)
Difference in elevation =    70.000(Ft.)
Slope =    0.23333  s(%)=      23.33
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.096 min.
Rainfall intensity =      2.239(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =      4.814(CFS)
Total initial stream area =        2.530(Ac.)


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Process from Point/Station      313.000 to Point/Station      314.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =   280.000(Ft.)
End of street segment elevation =   266.000(Ft.)
Length of street segment  =   609.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      6.598(CFS)
Depth of flow =   0.313(Ft.), Average velocity =   3.307(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.332(Ft.)
Flow velocity =   3.31(Ft/s)
Travel time =    3.07 min.     TC =    8.16  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
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Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.708(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      3.380(CFS) for    3.220(Ac.)
Total runoff =      8.194(CFS)       Total area =        5.75(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      8.194(CFS)
Half street flow at end of street =      4.097(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   3.474(Ft/s)
Flow width (from curb towards crown)=  10.259(Ft.)


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Process from Point/Station      314.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   260.000(Ft.)
Downstream point/station elevation =   259.000(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.194(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.194(CFS)
Normal flow depth in pipe =    8.66(In.)
Flow top width inside pipe =   17.99(In.)
Critical Depth =   13.30(In.)
Pipe flow velocity =      9.74(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     8.23 min.


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Process from Point/Station      314.000 to Point/Station      308.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.750(Ac.)
Runoff from this stream =      8.194(CFS)
Time of concentration =    8.23 min.
Rainfall intensity =     1.701(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      4.25     4.875     11.54    0.156      1.400
2      5.86     6.165     12.88    0.149      1.315
3      5.75     8.194      8.23    0.125      1.701
Qmax(1) =
          1.000 *    1.000 *     4.875) +
          1.073 *    0.896 *     6.165) +
          0.809 *    1.000 *     8.194) + =      17.435
Qmax(2) =
          0.931 *    1.000 *     4.875) +
          1.000 *    1.000 *     6.165) +
          0.755 *    1.000 *     8.194) + =      16.893
Qmax(3) =
          1.242 *    0.713 *     4.875) +
          1.331 *    0.639 *     6.165) +
          1.000 *    1.000 *     8.194) + =      17.747

Total of 3 streams to confluence:
Flow rates before confluence point:
       4.875       6.165       8.194
Maximum flow rates at confluence using above data:
       17.435       16.893       17.747
Area of streams before confluence:
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        4.250        5.860        5.750
Effective area values after confluence:
       15.252       15.860       12.522
Results of confluence:
Total flow rate =     17.747(CFS)
Time of concentration =     8.226 min.
Effective stream area after confluence =     12.522(Ac.)
Study area average Pervious fraction(Ap) =  0.568
Study area average soil loss rate(Fm) =    0.142(In/Hr)
Study area total (this main stream) =      15.86(Ac.)


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Process from Point/Station      308.000 to Point/Station      315.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   259.000(Ft.)
Downstream point/station elevation =   241.500(Ft.)
Pipe length  =  1077.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.747(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    17.747(CFS)
Normal flow depth in pipe =   11.16(In.)
Flow top width inside pipe =   33.30(In.)
Critical Depth =   16.21(In.)
Pipe flow velocity =      9.51(Ft/s)
Travel time through pipe =    1.89 min.
Time of concentration (TC) =    10.11 min.


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Process from Point/Station      308.000 to Point/Station      315.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     12.522(Ac.)
Runoff from this stream =     17.747(CFS)
Time of concentration =   10.11 min.
Rainfall intensity =     1.511(In/Hr)
Area averaged loss rate (Fm) =    0.1420(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5681


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Process from Point/Station      316.000 to Point/Station      317.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   280.000(Ft.)
Bottom (of initial area) elevation =   270.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.03333  s(%)=       3.33
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.520 min.
Rainfall intensity =      1.791(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =      1.469(CFS)
Total initial stream area =        0.980(Ac.)


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Process from Point/Station      317.000 to Point/Station      318.000
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**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =   270.000(Ft.)
End of street segment elevation =   255.000(Ft.)
Length of street segment  =   599.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.549(CFS)
Depth of flow =   0.289(Ft.), Average velocity =   3.230(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.139(Ft.)
Flow velocity =   3.23(Ft/s)
Travel time =    3.09 min.     TC =   10.61  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.470(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =      2.101(CFS) for    1.970(Ac.)
Total runoff =      3.570(CFS)        Total area =        2.95(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      3.570(CFS)
Half street flow at end of street =      3.570(CFS)
Depth of flow =   0.316(Ft.), Average velocity =   3.480(Ft/s)
Flow width (from curb towards crown)=   9.483(Ft.)


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Process from Point/Station      318.000 to Point/Station      319.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =   255.000(Ft.)
End of street segment elevation =   248.000(Ft.)
Length of street segment  =   653.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      6.169(CFS)
Depth of flow =   0.412(Ft.), Average velocity =   2.858(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.254(Ft.)
Flow velocity =   2.86(Ft/s)
Travel time =    3.81 min.     TC =   14.42  min.
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 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.233(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.809
Subarea runoff =      5.132(CFS) for    5.780(Ac.)
Total runoff =      8.702(CFS)        Total area =        8.73(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      8.702(CFS)
Half street flow at end of street =      8.702(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   3.105(Ft/s)
Flow width (from curb towards crown)=  16.357(Ft.)


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Process from Point/Station      319.000 to Point/Station      315.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   242.000(Ft.)
Downstream point/station elevation =   241.500(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.702(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     8.702(CFS)
Normal flow depth in pipe =    8.97(In.)
Flow top width inside pipe =   18.00(In.)
Critical Depth =   13.71(In.)
Pipe flow velocity =      9.89(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.45 min.


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Process from Point/Station      319.000 to Point/Station      315.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.730(Ac.)
Runoff from this stream =      8.702(CFS)
Time of concentration =   14.45 min.
Rainfall intensity =     1.231(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     12.52    17.747     10.11    0.142      1.511
2      8.73     8.702     14.45    0.125      1.231
Qmax(1) =
          1.000 *    1.000 *    17.747) +
          1.253 *    0.700 *     8.702) + =      25.379
Qmax(2) =
          0.796 *    1.000 *    17.747) +
          1.000 *    1.000 *     8.702) + =      22.823

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.747       8.702
Maximum flow rates at confluence using above data:
       25.379       22.823
Area of streams before confluence:
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       12.522        8.730
Effective area values after confluence:
       18.633       21.252
Results of confluence:
Total flow rate =     25.379(CFS)
Time of concentration =    10.114 min.
Effective stream area after confluence =     18.633(Ac.)
Study area average Pervious fraction(Ap) =  0.540
Study area average soil loss rate(Fm) =    0.135(In/Hr)
Study area total (this main stream) =      21.25(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      320.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   241.500(Ft.)
Downstream point/station elevation =   241.000(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.379(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    25.379(CFS)
Normal flow depth in pipe =   13.85(In.)
Flow top width inside pipe =   35.03(In.)
Critical Depth =   19.49(In.)
Pipe flow velocity =     10.13(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    10.17 min.


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Process from Point/Station      315.000 to Point/Station      320.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     18.633(Ac.)
Runoff from this stream =     25.379(CFS)
Time of concentration =   10.17 min.
Rainfall intensity =     1.506(In/Hr)
Area averaged loss rate (Fm) =    0.1350(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5401
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      321.000 to Point/Station      322.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   396.000(Ft.)
Bottom (of initial area) elevation =   355.000(Ft.)
Difference in elevation =    41.000(Ft.)
Slope =    0.13667  s(%)=      13.67
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.292 min.
Rainfall intensity =      1.496(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.750
Subarea runoff =      0.561(CFS)
Total initial stream area =        0.500(Ac.)
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Process from Point/Station      322.000 to Point/Station      323.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   355.000(Ft.)
Downstream point/station elevation =   288.000(Ft.)
Pipe length  =   207.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.561(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.561(CFS)
Normal flow depth in pipe =    1.37(In.)
Flow top width inside pipe =    7.64(In.)
Critical Depth =    3.73(In.)
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    10.60 min.


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Process from Point/Station      323.000 to Point/Station      324.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   288.000(Ft.)
End of street segment elevation =   267.000(Ft.)
Length of street segment  =   240.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.908(CFS)
Depth of flow =   0.172(Ft.), Average velocity =   5.116(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.255(Ft.)
Flow velocity =   5.12(Ft/s)
Travel time =    0.78 min.     TC =   11.38  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.412(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.785
Subarea runoff =      0.680(CFS) for    0.620(Ac.)
Total runoff =      1.241(CFS)        Total area =        1.12(Ac.)
Area averaged Fm value =    0.181(In/Hr)
Street flow at end of street =      1.241(CFS)
Half street flow at end of street =      1.241(CFS)
Depth of flow =   0.199(Ft.), Average velocity =   4.850(Ft/s)
Flow width (from curb towards crown)=   3.594(Ft.)


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Process from Point/Station      324.000 to Point/Station      325.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   261.000(Ft.)
Downstream point/station elevation =   260.000(Ft.)
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```
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.241(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.241(CFS)
Normal flow depth in pipe =    2.81(In.)
Flow top width inside pipe =   13.07(In.)
Critical Depth =    4.99(In.)
Pipe flow velocity =      7.04(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    11.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      324.000 to Point/Station      325.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.120(Ac.)
Runoff from this stream =      1.241(CFS)
Time of concentration =   11.43 min.
Rainfall intensity =     1.408(In/Hr)
Area averaged loss rate (Fm) =    0.1808(In/Hr)
Area averaged Pervious ratio (Ap) = 0.7232


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Process from Point/Station      326.000 to Point/Station      327.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   250.000(Ft.)
Top (of initial area) elevation =   297.000(Ft.)
Bottom (of initial area) elevation =   288.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.03600  s(%)=       3.60
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.884 min.
Rainfall intensity =      1.884(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff =      0.902(CFS)
Total initial stream area =        0.570(Ac.)


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Process from Point/Station      327.000 to Point/Station      328.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   288.000(Ft.)
End of street segment elevation =   267.000(Ft.)
Length of street segment  =   293.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      1.734(CFS)
Depth of flow =   0.227(Ft.), Average velocity =   4.591(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.010(Ft.)
Flow velocity =   4.59(Ft/s)
Travel time =    1.06 min.     TC =    7.95  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.735(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =      1.604(CFS) for    1.160(Ac.)
Total runoff =      2.507(CFS)        Total area =        1.73(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      2.507(CFS)
Half street flow at end of street =      2.507(CFS)
Depth of flow =   0.251(Ft.), Average velocity =   4.891(Ft/s)
Flow width (from curb towards crown)=   6.211(Ft.)


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Process from Point/Station      328.000 to Point/Station      325.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   261.000(Ft.)
Downstream point/station elevation =   260.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.507(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     2.507(CFS)
Normal flow depth in pipe =    4.47(In.)
Flow top width inside pipe =   15.55(In.)
Critical Depth =    7.19(In.)
Pipe flow velocity =      7.33(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.02 min.


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Process from Point/Station      328.000 to Point/Station      325.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.730(Ac.)
Runoff from this stream =      2.507(CFS)
Time of concentration =    8.02 min.
Rainfall intensity =     1.726(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      1.12     1.241     11.43    0.181      1.408
2      1.73     2.507      8.02    0.125      1.726
Qmax(1) =
          1.000 *    1.000 *     1.241) +
          0.802 *    1.000 *     2.507) + =       3.251
Qmax(2) =
          1.259 *    0.702 *     1.241) +
          1.000 *    1.000 *     2.507) + =       3.603
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```
Total of 2 streams to confluence:
Flow rates before confluence point:
       1.241       2.507
Maximum flow rates at confluence using above data:
        3.251        3.603
Area of streams before confluence:
        1.120        1.730
Effective area values after confluence:
        2.850        2.516
Results of confluence:
Total flow rate =      3.603(CFS)
Time of concentration =     8.021 min.
Effective stream area after confluence =      2.516(Ac.)
Study area average Pervious fraction(Ap) =  0.588
Study area average soil loss rate(Fm) =    0.147(In/Hr)
Study area total (this main stream) =       2.85(Ac.)


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Process from Point/Station      325.000 to Point/Station      320.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   260.000(Ft.)
Downstream point/station elevation =   241.000(Ft.)
Pipe length  =   220.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.603(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.603(CFS)
Normal flow depth in pipe =    3.79(In.)
Flow top width inside pipe =   17.51(In.)
Critical Depth =    7.97(In.)
Pipe flow velocity =     11.30(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     8.35 min.


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Process from Point/Station      325.000 to Point/Station      320.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.516(Ac.)
Runoff from this stream =      3.603(CFS)
Time of concentration =    8.35 min.
Rainfall intensity =     1.687(In/Hr)
Area averaged loss rate (Fm) =    0.1469(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5877
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     18.63    25.379     10.17    0.135      1.506
2      2.52     3.603      8.35    0.147      1.687
Qmax(1) =
          1.000 *    1.000 *    25.379) +
          0.882 *    1.000 *     3.603) + =      28.558
Qmax(2) =
          1.132 *    0.821 *    25.379) +
          1.000 *    1.000 *     3.603) + =      27.178

Total of 2 main streams to confluence:
Flow rates before confluence point:
      26.379       4.603
Maximum flow rates at confluence using above data:
       28.558       27.178
Area of streams before confluence:
       18.633        2.516
Effective area values after confluence:
```

```
       21.149       17.805


Results of confluence:
Total flow rate =     28.558(CFS)
Time of concentration =    10.170 min.
Effective stream area after confluence  =     21.149(Ac.)
Study area average Pervious fraction(Ap) =  0.546
Study area average soil loss rate(Fm) =    0.136(In/Hr)
Study area total =      21.15(Ac.)


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Process from Point/Station      320.000 to Point/Station      329.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   241.000(Ft.)
Downstream point/station elevation =   240.000(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.558(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    28.558(CFS)
Normal flow depth in pipe =   12.94(In.)
Flow top width inside pipe =   42.60(In.)
Critical Depth =   18.98(In.)
Pipe flow velocity =     10.45(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.27 min.


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Process from Point/Station      320.000 to Point/Station      329.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     21.149(Ac.)
Runoff from this stream =     28.558(CFS)
Time of concentration =   10.27 min.
Rainfall intensity =     1.497(In/Hr)
Area averaged loss rate (Fm) =    0.1364(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5458


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Process from Point/Station      328.000 to Point/Station      330.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   210.000(Ft.)
Top (of initial area) elevation =   267.000(Ft.)
Bottom (of initial area) elevation =   247.000(Ft.)
Difference in elevation =    20.000(Ft.)
Slope =    0.09524  s(%)=       9.52
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.285 min.
Rainfall intensity =      2.193(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.849
Subarea runoff =      0.763(CFS)
Total initial stream area =        0.410(Ac.)


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Process from Point/Station      330.000 to Point/Station      329.000
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**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 241.000(Ft.)
Downstream point/station elevation = 240.000(Ft.)
Pipe length = 29.00(Ft.) Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 0.763(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 0.763(CFS)
Normal flow depth in pipe = 2.60(In.)
Flow top width inside pipe = 12.67(In.)
Critical Depth = 3.90(In.)
Pipe flow velocity = 4.84(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 5.39 min.

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Process from Point/Station 330.000 to Point/Station 329.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.410(Ac.)
Runoff from this stream = 0.763(CFS)
Time of concentration = 5.39 min.
Rainfall intensity = 2.169(In/Hr)
Area averaged loss rate (Fm) = 0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

++

Process from Point/Station 331.000 to Point/Station 332.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.125(In/Hr)
Initial subarea data:
Initial area flow distance = 300.000(Ft.)
Top (of initial area) elevation = 280.000(Ft.)
Bottom (of initial area) elevation = 270.000(Ft.)
Difference in elevation = 10.000(Ft.)
Slope = 0.03333 s(%)= 3.33
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 7.520 min.
Rainfall intensity = 1.791(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff = 2.699(CFS)
Total initial stream area = 1.800(Ac.)

++

Process from Point/Station 332.000 to Point/Station 333.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 270.000(Ft.)
End of street segment elevation = 255.000(Ft.)
Length of street segment = 301.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 9.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)

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Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.670(CFS)
Depth of flow =   0.291(Ft.), Average velocity =   4.577(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.217(Ft.)
Flow velocity =   4.58(Ft/s)
Travel time =    1.10 min.     TC =    8.62  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.656(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.832
Subarea runoff =      1.891(CFS) for    1.530(Ac.)
Total runoff =      4.590(CFS)       Total area =        3.33(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      4.590(CFS)
Half street flow at end of street =      4.590(CFS)
Depth of flow =   0.309(Ft.), Average velocity =   4.808(Ft/s)
Flow width (from curb towards crown)=   9.099(Ft.)


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Process from Point/Station      333.000 to Point/Station      334.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =   255.000(Ft.)
End of street segment elevation =   247.000(Ft.)
Length of street segment  =   708.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.089(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   2.785(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.041(Ft.)
Flow velocity =   2.78(Ft/s)
Travel time =    4.24 min.     TC =   12.85  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.317(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =      0.944(CFS) for    1.830(Ac.)
Total runoff =      5.534(CFS)       Total area =        5.16(Ac.)
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Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      5.534(CFS)
Half street flow at end of street =      5.534(CFS)
Depth of flow =   0.397(Ft.), Average velocity =   2.841(Ft/s)
Flow width (from curb towards crown)=  13.495(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      334.000 to Point/Station      329.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   241.000(Ft.)
Downstream point/station elevation =   240.000(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.534(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.534(CFS)
Normal flow depth in pipe =    7.20(In.)
Flow top width inside pipe =   17.64(In.)
Critical Depth =   10.88(In.)
Pipe flow velocity =      8.38(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    12.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      334.000 to Point/Station      329.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.160(Ac.)
Runoff from this stream =      5.534(CFS)
Time of concentration =   12.94 min.
Rainfall intensity =     1.312(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     21.15    28.558     10.27    0.136      1.497
2      0.41     0.763      5.39    0.125      2.169
3      5.16     5.534     12.94    0.125      1.312
Qmax(1) =
          1.000 *    1.000 *    28.558) +
          0.671 *    1.000 *     0.763) +
          1.156 *    0.794 *     5.534) + =      34.152
Qmax(2) =
          1.494 *    0.524 *    28.558) +
          1.000 *    1.000 *     0.763) +
          1.722 *    0.416 *     5.534) + =      27.095
Qmax(3) =
          0.864 *    1.000 *    28.558) +
          0.581 *    1.000 *     0.763) +
          1.000 *    1.000 *     5.534) + =      30.641

Total of 3 streams to confluence:
Flow rates before confluence point:
      28.558       0.763       5.534
Maximum flow rates at confluence using above data:
       34.152       27.095       30.641
Area of streams before confluence:
       21.149        0.410        5.160
Effective area values after confluence:
       25.657       13.645       26.719
Results of confluence:
Total flow rate =     34.152(CFS)
Time of concentration =    10.273 min.
Effective stream area after confluence =     25.657(Ac.)
```

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Study area average Pervious fraction(Ap) =  0.536
Study area average soil loss rate(Fm) =    0.134(In/Hr)
Study area total (this main stream) =      26.72(Ac.)


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Process from Point/Station      329.000 to Point/Station      335.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   240.000(Ft.)
Downstream point/station elevation =   201.800(Ft.)
Pipe length  =   393.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.152(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    34.152(CFS)
Normal flow depth in pipe =    8.97(In.)
Flow top width inside pipe =   37.42(In.)
Critical Depth =   20.85(In.)
Pipe flow velocity =     21.05(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    10.58 min.


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Process from Point/Station      329.000 to Point/Station      335.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     25.657(Ac.)
Runoff from this stream =     34.152(CFS)
Time of concentration =   10.58 min.
Rainfall intensity =     1.472(In/Hr)
Area averaged loss rate (Fm) =    0.1341(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5362
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      336.000 to Point/Station      337.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 67.70
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.255(In/Hr)
Max Catchment Loss (Fm) =     0.026(In/Hr)
Initial subarea data:
Initial area flow distance =   416.000(Ft.)
Top (of initial area) elevation =   227.000(Ft.)
Bottom (of initial area) elevation =   211.000(Ft.)
Difference in elevation =    16.000(Ft.)
Slope =    0.03846  s(%)=       3.85
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.509 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.946(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =      4.804(CFS)
Total initial stream area =        2.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      337.000 to Point/Station      338.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   206.900(Ft.)
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Downstream point/station elevation =   204.500(Ft.)
Pipe length  =   470.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.804(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     4.804(CFS)
Normal flow depth in pipe =    8.97(In.)
Flow top width inside pipe =   23.22(In.)
Critical Depth =    9.24(In.)
Pipe flow velocity =      4.49(Ft/s)
Travel time through pipe =    1.75 min.
Time of concentration (TC) =     8.25 min.


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Process from Point/Station      337.000 to Point/Station      338.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.780(Ac.)
Runoff from this stream =      4.804(CFS)
Time of concentration =    8.25 min.
Rainfall intensity =     1.698(In/Hr)
Area averaged loss rate (Fm) =    0.0255(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      336.000 to Point/Station      339.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.050(In/Hr)
Initial subarea data:
Initial area flow distance =   364.000(Ft.)
Top (of initial area) elevation =   227.000(Ft.)
Bottom (of initial area) elevation =   223.500(Ft.)
Difference in elevation =     3.500(Ft.)
Slope =    0.00962  s(%)=       0.96
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.677 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.650(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.873
Subarea runoff =      3.657(CFS)
Total initial stream area =        2.540(Ac.)


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Process from Point/Station      339.000 to Point/Station      338.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   216.000(Ft.)
Downstream point/station elevation =   204.500(Ft.)
Pipe length  =   164.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     3.657(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     3.657(CFS)
Normal flow depth in pipe =    4.31(In.)
Flow top width inside pipe =   18.43(In.)
Critical Depth =    8.02(In.)
Pipe flow velocity =      9.53(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     8.96 min.
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Process from Point/Station      339.000 to Point/Station      338.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.540(Ac.)
Runoff from this stream =      3.657(CFS)
Time of concentration =    8.96 min.
Rainfall intensity =     1.619(In/Hr)
Area averaged loss rate (Fm) =    0.0500(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      2.78     4.804      8.25    0.025      1.698
2      2.54     3.657      8.96    0.050      1.619
Qmax(1) =
          1.000 *    1.000 *     4.804) +
          1.050 *    0.921 *     3.657) + =       8.340
Qmax(2) =
          0.953 *    1.000 *     4.804) +
          1.000 *    1.000 *     3.657) + =       8.236

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.804       3.657
Maximum flow rates at confluence using above data:
        8.340        8.236
Area of streams before confluence:
        2.780        2.540
Effective area values after confluence:
        5.119        5.320
Results of confluence:
Total flow rate =      8.340(CFS)
Time of concentration =     8.255 min.
Effective stream area after confluence =      5.119(Ac.)
Study area average Pervious fraction(Ap) =  0.148
Study area average soil loss rate(Fm) =    0.037(In/Hr)
Study area total (this main stream) =       5.32(Ac.)


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Process from Point/Station      338.000 to Point/Station      340.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =   204.500(Ft.)
Downstream point/station elevation =   202.400(Ft.)
Pipe length  =   286.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.340(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     8.340(CFS)
Normal flow depth in pipe =   11.00(In.)
Flow top width inside pipe =   23.92(In.)
Critical Depth =   12.36(In.)
Pipe flow velocity =      5.94(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =     9.06 min.


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Process from Point/Station      338.000 to Point/Station      340.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.119(Ac.)
Runoff from this stream =      8.340(CFS)
Time of concentration =    9.06 min.
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Rainfall intensity =     1.610(In/Hr)
Area averaged loss rate (Fm) =    0.0372(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1477


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Process from Point/Station      341.000 to Point/Station      342.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.050(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   252.000(Ft.)
Bottom (of initial area) elevation =   221.500(Ft.)
Difference in elevation =    30.500(Ft.)
Slope =    0.10167  s(%)=      10.17
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.011 min.
Rainfall intensity =      2.261(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =      2.348(CFS)
Total initial stream area =        1.180(Ac.)


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Process from Point/Station      342.000 to Point/Station      343.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   221.500(Ft.)
End of street segment elevation =   219.000(Ft.)
Length of street segment  =   215.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.883(CFS)
Depth of flow =   0.298(Ft.), Average velocity =   2.255(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.568(Ft.)
Flow velocity =   2.26(Ft/s)
Travel time =    1.59 min.     TC =    6.60  min.
 Adding area flow to street
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.050(In/Hr)
Rainfall intensity =      1.930(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =      2.949(CFS) for    1.950(Ac.)
Total runoff =      5.296(CFS)       Total area =        3.13(Ac.)
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Area averaged Fm value =    0.050(In/Hr)
Street flow at end of street =      5.296(CFS)
Half street flow at end of street =      2.648(CFS)
Depth of flow =   0.324(Ft.), Average velocity =   2.418(Ft/s)
Flow width (from curb towards crown)=   9.842(Ft.)


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Process from Point/Station      343.000 to Point/Station      340.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   211.000(Ft.)
Downstream point/station elevation =   202.400(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.296(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.296(CFS)
Normal flow depth in pipe =    4.13(In.)
Flow top width inside pipe =   15.13(In.)
Critical Depth =   10.65(In.)
Pipe flow velocity =     17.32(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     6.64 min.


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Process from Point/Station      343.000 to Point/Station      340.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.130(Ac.)
Runoff from this stream =      5.296(CFS)
Time of concentration =    6.64 min.
Rainfall intensity =     1.923(In/Hr)
Area averaged loss rate (Fm) =    0.0500(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000


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Process from Point/Station      344.000 to Point/Station      345.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.050(In/Hr)
Initial subarea data:
Initial area flow distance =   263.000(Ft.)
Top (of initial area) elevation =   225.000(Ft.)
Bottom (of initial area) elevation =   221.500(Ft.)
Difference in elevation =     3.500(Ft.)
Slope =    0.01331  s(%)=       1.33
TC = k(0.324)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.140 min.
Rainfall intensity =      1.845(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.876
Subarea runoff =      1.519(CFS)
Total initial stream area =        0.940(Ac.)


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Process from Point/Station      345.000 to Point/Station      346.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   221.500(Ft.)
End of street segment elevation =   219.000(Ft.)
Length of street segment  =   241.000(Ft.)
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Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.213(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   2.419(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.963(Ft.)
Flow velocity =   2.42(Ft/s)
Travel time =    1.66 min.     TC =    8.80  min.
 Adding area flow to street
APARTMENT subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.2000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.050(In/Hr)
Rainfall intensity =      1.636(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =      3.307(CFS) for    2.440(Ac.)
Total runoff =      4.826(CFS)        Total area =        3.38(Ac.)
Area averaged Fm value =    0.050(In/Hr)
Street flow at end of street =      4.826(CFS)
Half street flow at end of street =      4.826(CFS)
Depth of flow =   0.386(Ft.), Average velocity =   2.662(Ft/s)
Flow width (from curb towards crown)=  12.986(Ft.)


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Process from Point/Station      346.000 to Point/Station      340.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   211.000(Ft.)
Downstream point/station elevation =   202.400(Ft.)
Pipe length  =    42.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.826(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.826(CFS)
Normal flow depth in pipe =    3.87(In.)
Flow top width inside pipe =   14.79(In.)
Critical Depth =   10.14(In.)
Pipe flow velocity =     17.28(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.84 min.


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Process from Point/Station      346.000 to Point/Station      340.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      3.380(Ac.)
Runoff from this stream =      4.826(CFS)
Time of concentration =    8.84 min.
Rainfall intensity =     1.632(In/Hr)
Area averaged loss rate (Fm) =    0.0500(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000
Summary of stream data:
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Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1      5.12     8.340      9.06    0.037      1.610
2      3.13     5.296      6.64    0.050      1.923
3      3.38     4.826      8.84    0.050      1.632
Qmax(1) =
          1.000 *    1.000 *     8.340) +
          0.833 *    1.000 *     5.296) +
          0.986 *    1.000 *     4.826) + =      17.507
Qmax(2) =
          1.199 *    0.733 *     8.340) +
          1.000 *    1.000 *     5.296) +
          1.184 *    0.751 *     4.826) + =      16.926
Qmax(3) =
          1.014 *    0.976 *     8.340) +
          0.845 *    1.000 *     5.296) +
          1.000 *    1.000 *     4.826) + =      17.557

Total of 3 streams to confluence:
Flow rates before confluence point:
       8.340       5.296       4.826
Maximum flow rates at confluence using above data:
       17.507       16.926       17.557
Area of streams before confluence:
        5.119        3.130        3.380
Effective area values after confluence:
       11.629        9.425       11.507
Results of confluence:
Total flow rate =     17.557(CFS)
Time of concentration =     8.841 min.
Effective stream area after confluence =     11.507(Ac.)
Study area average Pervious fraction(Ap) =  0.177
Study area average soil loss rate(Fm) =    0.044(In/Hr)
Study area total (this main stream) =      11.63(Ac.)


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Process from Point/Station      340.000 to Point/Station      335.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   202.400(Ft.)
Downstream point/station elevation =   201.800(Ft.)
Pipe length  =   260.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.557(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    17.557(CFS)
Normal flow depth in pipe =   19.01(In.)
Flow top width inside pipe =   35.94(In.)
Critical Depth =   16.09(In.)
Pipe flow velocity =      4.64(Ft/s)
Travel time through pipe =    0.93 min.
Time of concentration (TC) =     9.78 min.


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Process from Point/Station      340.000 to Point/Station      335.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     11.507(Ac.)
Runoff from this stream =     17.557(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     1.541(In/Hr)
Area averaged loss rate (Fm) =    0.0444(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1770
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
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 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     25.66    34.152     10.58    0.134      1.472
2     11.51    17.557      9.78    0.044      1.541
Qmax(1) =
          1.000 *    1.000 *    34.152) +
          0.954 *    1.000 *    17.557) + =      50.903
Qmax(2) =
          1.051 *    0.924 *    34.152) +
          1.000 *    1.000 *    17.557) + =      50.720

Total of 2 main streams to confluence:
Flow rates before confluence point:
      35.152      18.557
Maximum flow rates at confluence using above data:
       50.903       50.720
Area of streams before confluence:
       25.657       11.507
Effective area values after confluence:
       37.163       35.205


Results of confluence:
Total flow rate =     50.903(CFS)
Time of concentration =    10.584 min.
Effective stream area after confluence  =     37.163(Ac.)
Study area average Pervious fraction(Ap) =  0.425
Study area average soil loss rate(Fm) =    0.106(In/Hr)
Study area total =      37.16(Ac.)


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Process from Point/Station      335.000 to Point/Station      347.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   201.800(Ft.)
Downstream point/station elevation =   200.700(Ft.)
Pipe length  =   133.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.903(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    50.903(CFS)
Normal flow depth in pipe =   20.80(In.)
Flow top width inside pipe =   47.57(In.)
Critical Depth =   25.69(In.)
Pipe flow velocity =      9.75(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.81 min.


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Process from Point/Station      335.000 to Point/Station      347.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     37.163(Ac.)
Runoff from this stream =     50.903(CFS)
Time of concentration =   10.81 min.
Rainfall intensity =     1.454(In/Hr)
Area averaged loss rate (Fm) =    0.1063(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4250


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Process from Point/Station      330.000 to Point/Station      348.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   250.000(Ft.)
Top (of initial area) elevation =   247.000(Ft.)
Bottom (of initial area) elevation =   229.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.07200  s(%)=       7.20
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.993 min.
Rainfall intensity =      2.040(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff =      0.862(CFS)
Total initial stream area =        0.500(Ac.)


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Process from Point/Station      348.000 to Point/Station      349.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   229.000(Ft.)
End of street segment elevation =   213.000(Ft.)
Length of street segment  =   254.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      1.443(CFS)
Depth of flow =   0.219(Ft.), Average velocity =   4.232(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.630(Ft.)
Flow velocity =   4.23(Ft/s)
Travel time =    1.00 min.     TC =    6.99  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.867(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =      1.067(CFS) for    0.730(Ac.)
Total runoff =      1.929(CFS)        Total area =        1.23(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      1.929(CFS)
Half street flow at end of street =      1.929(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   4.425(Ft/s)
Flow width (from curb towards crown)=   5.560(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      349.000 to Point/Station      347.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   201.500(Ft.)
Downstream point/station elevation =   200.700(Ft.)
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```
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.929(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     1.929(CFS)
Normal flow depth in pipe =    4.20(In.)
Flow top width inside pipe =   15.23(In.)
Critical Depth =    6.27(In.)
Pipe flow velocity =      6.14(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     7.09 min.


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Process from Point/Station      349.000 to Point/Station      347.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.230(Ac.)
Runoff from this stream =      1.929(CFS)
Time of concentration =    7.09 min.
Rainfall intensity =     1.853(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      334.000 to Point/Station      350.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   250.000(Ft.)
Top (of initial area) elevation =   247.000(Ft.)
Bottom (of initial area) elevation =   229.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.07200  s(%)=       7.20
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.993 min.
Rainfall intensity =      2.040(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff =      0.362(CFS)
Total initial stream area =        0.210(Ac.)


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Process from Point/Station      350.000 to Point/Station      351.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   229.000(Ft.)
End of street segment elevation =   213.000(Ft.)
Length of street segment  =   266.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
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Estimated mean flow rate at midpoint of street =      0.560(CFS)
Depth of flow =   0.151(Ft.), Average velocity =   4.103(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.000(Ft.)
Flow velocity =   4.10(Ft/s)
Travel time =    1.08 min.     TC =    7.07  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Rainfall intensity =      1.855(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =      0.323(CFS) for    0.230(Ac.)
Total runoff =      0.685(CFS)        Total area =        0.44(Ac.)
Area averaged Fm value =    0.125(In/Hr)
Street flow at end of street =      0.685(CFS)
Half street flow at end of street =      0.685(CFS)
Depth of flow =   0.163(Ft.), Average velocity =   4.315(Ft/s)
Flow width (from curb towards crown)=   2.000(Ft.)


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Process from Point/Station      351.000 to Point/Station      347.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   201.500(Ft.)
Downstream point/station elevation =   200.700(Ft.)
Pipe length  =    43.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.685(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     0.685(CFS)
Normal flow depth in pipe =    2.68(In.)
Flow top width inside pipe =   12.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =      4.17(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     7.25 min.


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Process from Point/Station      351.000 to Point/Station      347.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.440(Ac.)
Runoff from this stream =      0.685(CFS)
Time of concentration =    7.25 min.
Rainfall intensity =     1.830(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     37.16    50.903     10.81    0.106      1.454
2      1.23     1.929      7.09    0.125      1.853
3      0.44     0.685      7.25    0.125      1.830
Qmax(1) =
          1.000 *    1.000 *    50.903) +
          0.769 *    1.000 *     1.929) +
          0.780 *    1.000 *     0.685) + =      52.921
Qmax(2) =
          1.296 *    0.655 *    50.903) +
```

```
          1.000 *    1.000 *     1.929) +
          1.014 *    0.978 *     0.685) + =      45.849
Qmax(3) =
          1.279 *    0.670 *    50.903) +
          0.986 *    1.000 *     1.929) +
          1.000 *    1.000 *     0.685) + =      46.207

Total of 3 streams to confluence:
Flow rates before confluence point:
      50.903       1.929       0.685
Maximum flow rates at confluence using above data:
       52.921       45.849       46.207
Area of streams before confluence:
       37.163        1.230        0.440
Effective area values after confluence:
       38.833       26.018       26.577
Results of confluence:
Total flow rate =     52.921(CFS)
Time of concentration =    10.811 min.
Effective stream area after confluence =     38.833(Ac.)
Study area average Pervious fraction(Ap) =  0.428
Study area average soil loss rate(Fm) =    0.107(In/Hr)
Study area total (this main stream) =      38.83(Ac.)


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Process from Point/Station      347.000 to Point/Station      352.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   200.700(Ft.)
Downstream point/station elevation =   200.000(Ft.)
Pipe length  =   227.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.921(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    52.921(CFS)
Normal flow depth in pipe =   28.57(In.)
Flow top width inside pipe =   47.12(In.)
Critical Depth =   26.21(In.)
Pipe flow velocity =      6.79(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    11.37 min.


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Process from Point/Station      347.000 to Point/Station      352.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     38.833(Ac.)
Runoff from this stream =     52.921(CFS)
Time of concentration =   11.37 min.
Rainfall intensity =     1.413(In/Hr)
Area averaged loss rate (Fm) =    0.1071(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4282
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      353.000 to Point/Station      354.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   380.000(Ft.)
Bottom (of initial area) elevation =   310.000(Ft.)
Difference in elevation =    70.000(Ft.)
Slope =    0.23333  s(%)=      23.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.248 min.
Rainfall intensity =      1.590(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.759
Subarea runoff =      1.399(CFS)
Total initial stream area =        1.160(Ac.)


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Process from Point/Station      354.000 to Point/Station      355.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.743(CFS)
Depth of flow =   0.170(Ft.), Average velocity =   3.296(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.743(CFS)
  '     '       flow top width =     16.966(Ft.)
  '     '    velocity=    3.296(Ft/s)
  '     '       area =      1.439(Sq.Ft)
  '     '       Froude number =     1.994

Upstream point elevation =   310.000(Ft.)
Downstream point elevation =   231.000(Ft.)
Flow length =   665.000(Ft.)
Travel time  =    3.36 min.
Time of concentration =   12.61 min.
Depth of flow =   0.170(Ft.)
Average velocity =   3.296(Ft/s)
Total irregular channel flow =     4.743(CFS)
Irregular channel normal depth above invert elev. =   0.170(Ft.)
Average velocity of channel(s) =   3.296(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.331(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.731
Subarea runoff =      6.618(CFS) for    7.080(Ac.)
Total runoff =      8.017(CFS)        Total area =        8.24(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.207(Ft.), Average velocity =   3.758(Ft/s)


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Process from Point/Station      355.000 to Point/Station      352.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     11.054(CFS)
Depth of flow =   0.273(Ft.), Average velocity =   2.967(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
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Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     11.054(CFS)
  '     '       flow top width =     27.297(Ft.)
  '     '    velocity=    2.967(Ft/s)
  '     '       area =      3.726(Sq.Ft)
  '     '       Froude number =     1.415

Upstream point elevation =   231.000(Ft.)
Downstream point elevation =   200.000(Ft.)
Flow length =   607.000(Ft.)
Travel time  =    3.41 min.
Time of concentration =   16.02 min.
Depth of flow =   0.273(Ft.)
Average velocity =   2.967(Ft/s)
Total irregular channel flow =    11.054(CFS)
Irregular channel normal depth above invert elev. =   0.273(Ft.)
Average velocity of channel(s) =   2.967(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.160(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.706
Subarea runoff =      5.983(CFS) for    8.850(Ac.)
Total runoff =     14.000(CFS)       Total area =       17.09(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.298(Ft.), Average velocity =   3.147(Ft/s)


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Process from Point/Station      355.000 to Point/Station      352.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     17.090(Ac.)
Runoff from this stream =     14.000(CFS)
Time of concentration =   16.02 min.
Rainfall intensity =     1.160(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


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Process from Point/Station      356.000 to Point/Station      357.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Initial subarea data:
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =   540.000(Ft.)
Bottom (of initial area) elevation =   485.000(Ft.)
```

```
Difference in elevation =    55.000(Ft.)
Slope =    0.18333  s(%)=      18.33
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.705 min.
Rainfall intensity =      1.547(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff =      1.588(CFS)
Total initial stream area =        1.360(Ac.)


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Process from Point/Station      357.000 to Point/Station      358.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.526(CFS)
Depth of flow =   0.182(Ft.), Average velocity =   3.329(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      5.526(CFS)
  '     '       flow top width =     18.220(Ft.)
  '     '    velocity=    3.329(Ft/s)
  '     '       area =      1.660(Sq.Ft)
  '     '       Froude number =     1.944

Upstream point elevation =   485.000(Ft.)
Downstream point elevation =   415.000(Ft.)
Flow length =   635.000(Ft.)
Travel time  =    3.18 min.
Time of concentration =   12.88 min.
Depth of flow =   0.182(Ft.)
Average velocity =   3.329(Ft/s)
Total irregular channel flow =     5.526(CFS)
Irregular channel normal depth above invert elev. =   0.182(Ft.)
Average velocity of channel(s) =   3.329(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.315(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.729
Subarea runoff =      7.804(CFS) for    8.440(Ac.)
Total runoff =      9.391(CFS)        Total area =        9.80(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.222(Ft.), Average velocity =   3.801(Ft/s)


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Process from Point/Station      358.000 to Point/Station      359.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     20.524(CFS)
Depth of flow =   0.287(Ft.), Average velocity =   4.976(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
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       3            100.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     20.524(CFS)
  '     '       flow top width =     28.722(Ft.)
  '     '    velocity=    4.976(Ft/s)
  '     '       area =      4.125(Sq.Ft)
  '     '       Froude number =     2.314

Upstream point elevation =   415.000(Ft.)
Downstream point elevation =   273.000(Ft.)
Flow length =  1058.000(Ft.)
Travel time  =    3.54 min.
Time of concentration =   16.43 min.
Depth of flow =   0.287(Ft.)
Average velocity =   4.976(Ft/s)
Total irregular channel flow =    20.524(CFS)
Irregular channel normal depth above invert elev. =   0.287(Ft.)
Average velocity of channel(s) =   4.976(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
Rainfall intensity =      1.144(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.703
Subarea runoff =     22.208(CFS) for   29.490(Ac.)
Total runoff =     31.599(CFS)        Total area =       39.29(Ac.)
Area averaged Fm value =    0.250(In/Hr)
Depth of flow =   0.338(Ft.), Average velocity =   5.543(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      359.000 to Point/Station      360.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   267.000(Ft.)
Downstream point/station elevation =   266.000(Ft.)
Pipe length  =   111.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.599(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    31.599(CFS)
Normal flow depth in pipe =   15.72(In.)
Flow top width inside pipe =   45.05(In.)
Critical Depth =   20.02(In.)
Pipe flow velocity =      8.83(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    16.64 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      359.000 to Point/Station      360.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =     39.290(Ac.)
Runoff from this stream =     31.599(CFS)
Time of concentration =   16.64 min.
Rainfall intensity =     1.135(In/Hr)
Area averaged loss rate (Fm) =    0.2500(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      361.000 to Point/Station      362.000
**** INITIAL AREA EVALUATION ****
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 69.00
Pervious ratio(Ap) = 0.5000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.125(In/Hr)
Initial subarea data:
Initial area flow distance =   597.000(Ft.)
Top (of initial area) elevation =   407.000(Ft.)
Bottom (of initial area) elevation =   380.000(Ft.)
Difference in elevation =    27.000(Ft.)
Slope =    0.04523  s(%)=       4.52
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.317 min.
NOTE: Distance EXCEEDS recommended maximum value of   328.084(Ft.)
for this Development Type
Rainfall intensity =      1.584(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     10.056(CFS)
Total initial stream area =        7.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      362.000 to Point/Station      360.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   372.000(Ft.)
Downstream point/station elevation =   266.000(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.056(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    10.056(CFS)
Normal flow depth in pipe =    6.19(In.)
Flow top width inside pipe =   17.10(In.)
Critical Depth =   14.67(In.)
Pipe flow velocity =     18.67(Ft/s)
Travel time through pipe =    0.67 min.
Time of concentration (TC) =     9.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      362.000 to Point/Station      360.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      7.660(Ac.)
Runoff from this stream =     10.056(CFS)
Time of concentration =    9.99 min.
Rainfall intensity =     1.522(In/Hr)
Area averaged loss rate (Fm) =    0.1250(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     39.29    31.599     16.64    0.250      1.135
2      7.66    10.056      9.99    0.125      1.522
Qmax(1) =
          1.000 *    1.000 *    31.599) +
          0.723 *    1.000 *    10.056) + =      38.873
Qmax(2) =
          1.437 *    0.600 *    31.599) +
          1.000 *    1.000 *    10.056) + =      37.303

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
      31.599      10.056
Maximum flow rates at confluence using above data:
       38.873       37.303
Area of streams before confluence:
       39.290        7.660
Effective area values after confluence:
       46.950       31.243
Results of confluence:
Total flow rate =     38.873(CFS)
Time of concentration =    16.637 min.
Effective stream area after confluence =     46.950(Ac.)
Study area average Pervious fraction(Ap) =  0.918
Study area average soil loss rate(Fm) =    0.230(In/Hr)
Study area total (this main stream) =      46.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      360.000 to Point/Station      352.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   266.000(Ft.)
Downstream point/station elevation =   200.000(Ft.)
Pipe length  =  1386.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.873(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    38.873(CFS)
Normal flow depth in pipe =   12.70(In.)
Flow top width inside pipe =   34.41(In.)
Critical Depth =   24.36(In.)
Pipe flow velocity =     17.43(Ft/s)
Travel time through pipe =    1.33 min.
Time of concentration (TC) =    17.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      360.000 to Point/Station      352.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     46.950(Ac.)
Runoff from this stream =     38.873(CFS)
Time of concentration =   17.96 min.
Rainfall intensity =     1.086(In/Hr)
Area averaged loss rate (Fm) =    0.2296(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9184
Summary of stream data:

Stream  Area  Flow rate      TC     Fm       Rainfall Intensity
 No.    (Ac.)   (CFS)       (min) (In/Hr)     (In/Hr)


1     38.83    52.921     11.37    0.107      1.413
2     17.09    14.000     16.02    0.250      1.160
3     46.95    38.873     17.96    0.230      1.086
Qmax(1) =
          1.000 *    1.000 *    52.921) +
          1.277 *    0.710 *    14.000) +
          1.381 *    0.633 *    38.873) + =      99.581
Qmax(2) =
          0.807 *    1.000 *    52.921) +
          1.000 *    1.000 *    14.000) +
          1.086 *    0.892 *    38.873) + =      94.340
Qmax(3) =
          0.750 *    1.000 *    52.921) +
          0.919 *    1.000 *    14.000) +
          1.000 *    1.000 *    38.873) + =      91.436

Total of 3 main streams to confluence:
Flow rates before confluence point:
      53.921      15.000      39.873
```

```
Maximum flow rates at confluence using above data:
       99.581       94.340       91.436
Area of streams before confluence:
       38.833       17.090       46.950
Effective area values after confluence:
       80.675       97.799      102.873


Results of confluence:
Total flow rate =     99.581(CFS)
Time of concentration =    11.368 min.
Effective stream area after confluence  =     80.675(Ac.)
Study area average Pervious fraction(Ap) =  0.747
Study area average soil loss rate(Fm) =    0.187(In/Hr)
Study area total =     102.87(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      360.000 to Point/Station      352.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 79.00
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.250(In/Hr)
Max Catchment Loss (Fm) =     0.250(In/Hr)
The area added to the existing stream with this TC
does not add flow per Para 6b, Page D-15 of the OCHM,
therefore the upstream flow rate of Q =     99.581(CFS) is being used
Time of concentration =    11.37 min.
Rainfall intensity =      1.413(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.778
Subarea runoff =      0.000(CFS) for    6.730(Ac.)
Total runoff =     99.581(CFS)        Total area =       87.40(Ac.)
Area averaged Fm value =    0.192(In/Hr)
End of computations, total study area =          117.28 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.748
Area averaged SCS curve number (AMC 2) =  74.6
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 02/05/18 File Name PRC00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 6407

WESTRIDGE HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'C' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
74.6	0.3	0.00	B	0.300	0.748	0.224
74.6	117.0	1.00	C	0.250	0.748	0.187

Area-averaged adjusted loss rate Fm (In/Hr) = 0.187

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.21	0.002	74.6	56.5	7.69	0.016
0.07	0.001	98.0	98.0	0.20	0.890
87.52	0.746	74.6	56.5	7.69	0.016
29.48	0.251	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.236
Area-averaged low loss fraction, Yb = 0.764

++
User entry of time of concentration = 0.190 (hours)
Watershed area = 117.28(Ac.)
Catchment Lag time = 0.152 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 54.9692
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.187(In/Hr)
Average low loss rate fraction (Yb) = 0.764 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 117.28(Ac.) (Ref: fig. E-4)

5-minute factor = 0.995 Adjusted rainfall = 0.189(In)
30-minute factor = 0.995 Adjusted rainfall = 0.398(In)
1-hour factor = 0.995 Adjusted rainfall = 0.527(In)
3-hour factor = 0.999 Adjusted rainfall = 0.889(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 1418.36 (CFS))	
1	4.907	69.603
2	30.981	369.816
3	67.444	517.174
4	80.808	189.555
5	88.543	109.705
6	93.454	69.653
7	96.452	42.525
8	98.014	22.150
9	98.670	9.318
10	99.132	6.549
11	99.517	5.452
12	99.827	4.401
13	100.000	2.455

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1890	0.1890
2	0.2520	0.0631
3	0.2983	0.0462
4	0.3361	0.0379
5	0.3688	0.0327
6	0.3978	0.0290
7	0.4235	0.0257
8	0.4471	0.0236
9	0.4690	0.0219
10	0.4895	0.0205
11	0.5088	0.0193
12	0.5271	0.0183
13	0.5476	0.0205
14	0.5672	0.0197
15	0.5862	0.0189
16	0.6045	0.0183
17	0.6222	0.0177
18	0.6393	0.0172
19	0.6560	0.0167
20	0.6722	0.0162
21	0.6880	0.0158
22	0.7035	0.0154
23	0.7185	0.0150
24	0.7332	0.0147
25	0.7476	0.0144
26	0.7617	0.0141
27	0.7755	0.0138
28	0.7891	0.0135
29	0.8024	0.0133
30	0.8154	0.0131
31	0.8283	0.0128
32	0.8409	0.0126
33	0.8533	0.0124
34	0.8655	0.0122
35	0.8775	0.0120
36	0.8894	0.0119
37	0.9005	0.0112

38	0.9116	0.0110
39	0.9224	0.0108
40	0.9331	0.0107
41	0.9437	0.0106
42	0.9541	0.0104
43	0.9644	0.0103
44	0.9745	0.0102
45	0.9845	0.0100
46	0.9944	0.0099
47	1.0042	0.0098
48	1.0139	0.0097
49	1.0235	0.0096
50	1.0329	0.0095
51	1.0423	0.0094
52	1.0515	0.0093
53	1.0607	0.0092
54	1.0698	0.0091
55	1.0788	0.0090
56	1.0876	0.0089
57	1.0964	0.0088
58	1.1052	0.0087
59	1.1138	0.0086
60	1.1224	0.0086
61	1.1308	0.0085
62	1.1393	0.0084
63	1.1476	0.0083
64	1.1559	0.0083
65	1.1640	0.0082
66	1.1722	0.0081
67	1.1802	0.0081
68	1.1882	0.0080
69	1.1961	0.0079
70	1.2040	0.0079
71	1.2118	0.0078
72	1.2196	0.0077
73	1.2259	0.0063
74	1.2321	0.0063
75	1.2383	0.0062
76	1.2445	0.0062
77	1.2506	0.0061
78	1.2567	0.0061
79	1.2627	0.0060
80	1.2686	0.0060
81	1.2746	0.0059
82	1.2804	0.0059
83	1.2863	0.0058
84	1.2920	0.0058
85	1.2978	0.0057
86	1.3035	0.0057
87	1.3091	0.0057
88	1.3147	0.0056
89	1.3203	0.0056
90	1.3259	0.0055
91	1.3314	0.0055
92	1.3368	0.0055
93	1.3422	0.0054
94	1.3476	0.0054
95	1.3530	0.0054
96	1.3583	0.0053
97	1.3636	0.0053
98	1.3688	0.0052
99	1.3740	0.0052
100	1.3792	0.0052
101	1.3844	0.0051
102	1.3895	0.0051
103	1.3946	0.0051
104	1.3996	0.0051
105	1.4047	0.0050
106	1.4097	0.0050
107	1.4146	0.0050
108	1.4196	0.0049

109	1.4245	0.0049
110	1.4293	0.0049
111	1.4342	0.0049
112	1.4390	0.0048
113	1.4438	0.0048
114	1.4486	0.0048
115	1.4533	0.0047
116	1.4581	0.0047
117	1.4628	0.0047
118	1.4674	0.0047
119	1.4721	0.0046
120	1.4767	0.0046
121	1.4813	0.0046
122	1.4859	0.0046
123	1.4904	0.0045
124	1.4949	0.0045
125	1.4994	0.0045
126	1.5039	0.0045
127	1.5084	0.0045
128	1.5128	0.0044
129	1.5172	0.0044
130	1.5216	0.0044
131	1.5260	0.0044
132	1.5304	0.0044
133	1.5347	0.0043
134	1.5390	0.0043
135	1.5433	0.0043
136	1.5476	0.0043
137	1.5518	0.0043
138	1.5560	0.0042
139	1.5603	0.0042
140	1.5645	0.0042
141	1.5686	0.0042
142	1.5728	0.0042
143	1.5769	0.0041
144	1.5810	0.0041
145	1.5852	0.0041
146	1.5892	0.0041
147	1.5933	0.0041
148	1.5974	0.0041
149	1.6014	0.0040
150	1.6054	0.0040
151	1.6094	0.0040
152	1.6134	0.0040
153	1.6174	0.0040
154	1.6213	0.0040
155	1.6252	0.0039
156	1.6292	0.0039
157	1.6331	0.0039
158	1.6370	0.0039
159	1.6408	0.0039
160	1.6447	0.0039
161	1.6485	0.0038
162	1.6524	0.0038
163	1.6562	0.0038
164	1.6600	0.0038
165	1.6638	0.0038
166	1.6675	0.0038
167	1.6713	0.0038
168	1.6750	0.0037
169	1.6787	0.0037
170	1.6825	0.0037
171	1.6862	0.0037
172	1.6898	0.0037
173	1.6935	0.0037
174	1.6972	0.0037
175	1.7008	0.0036
176	1.7045	0.0036
177	1.7081	0.0036
178	1.7117	0.0036
179	1.7153	0.0036

180	1.7189	0.0036
181	1.7224	0.0036
182	1.7260	0.0036
183	1.7295	0.0035
184	1.7331	0.0035
185	1.7366	0.0035
186	1.7401	0.0035
187	1.7436	0.0035
188	1.7471	0.0035
189	1.7506	0.0035
190	1.7540	0.0035
191	1.7575	0.0035
192	1.7609	0.0034
193	1.7643	0.0034
194	1.7678	0.0034
195	1.7712	0.0034
196	1.7746	0.0034
197	1.7780	0.0034
198	1.7813	0.0034
199	1.7847	0.0034
200	1.7880	0.0034
201	1.7914	0.0033
202	1.7947	0.0033
203	1.7980	0.0033
204	1.8014	0.0033
205	1.8047	0.0033
206	1.8080	0.0033
207	1.8112	0.0033
208	1.8145	0.0033
209	1.8178	0.0033
210	1.8210	0.0033
211	1.8243	0.0032
212	1.8275	0.0032
213	1.8307	0.0032
214	1.8339	0.0032
215	1.8371	0.0032
216	1.8403	0.0032
217	1.8435	0.0032
218	1.8467	0.0032
219	1.8499	0.0032
220	1.8530	0.0032
221	1.8562	0.0032
222	1.8593	0.0031
223	1.8624	0.0031
224	1.8656	0.0031
225	1.8687	0.0031
226	1.8718	0.0031
227	1.8749	0.0031
228	1.8780	0.0031
229	1.8811	0.0031
230	1.8841	0.0031
231	1.8872	0.0031
232	1.8903	0.0031
233	1.8933	0.0030
234	1.8963	0.0030
235	1.8994	0.0030
236	1.9024	0.0030
237	1.9054	0.0030
238	1.9084	0.0030
239	1.9114	0.0030
240	1.9144	0.0030
241	1.9174	0.0030
242	1.9204	0.0030
243	1.9233	0.0030
244	1.9263	0.0030
245	1.9292	0.0030
246	1.9322	0.0029
247	1.9351	0.0029
248	1.9381	0.0029
249	1.9410	0.0029
250	1.9439	0.0029

251	1.9468	0.0029
252	1.9497	0.0029
253	1.9526	0.0029
254	1.9555	0.0029
255	1.9584	0.0029
256	1.9612	0.0029
257	1.9641	0.0029
258	1.9670	0.0029
259	1.9698	0.0029
260	1.9727	0.0028
261	1.9755	0.0028
262	1.9783	0.0028
263	1.9812	0.0028
264	1.9840	0.0028
265	1.9868	0.0028
266	1.9896	0.0028
267	1.9924	0.0028
268	1.9952	0.0028
269	1.9980	0.0028
270	2.0007	0.0028
271	2.0035	0.0028
272	2.0063	0.0028
273	2.0090	0.0028
274	2.0118	0.0028
275	2.0145	0.0027
276	2.0173	0.0027
277	2.0200	0.0027
278	2.0227	0.0027
279	2.0255	0.0027
280	2.0282	0.0027
281	2.0309	0.0027
282	2.0336	0.0027
283	2.0363	0.0027
284	2.0390	0.0027
285	2.0417	0.0027
286	2.0444	0.0027
287	2.0470	0.0027
288	2.0497	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0020	0.0006
2	0.0027	0.0020	0.0006
3	0.0027	0.0021	0.0006
4	0.0027	0.0021	0.0006
5	0.0027	0.0021	0.0006
6	0.0027	0.0021	0.0006
7	0.0027	0.0021	0.0006
8	0.0027	0.0021	0.0006
9	0.0027	0.0021	0.0006
10	0.0027	0.0021	0.0006
11	0.0028	0.0021	0.0007
12	0.0028	0.0021	0.0007
13	0.0028	0.0021	0.0007
14	0.0028	0.0021	0.0007
15	0.0028	0.0021	0.0007
16	0.0028	0.0021	0.0007
17	0.0028	0.0022	0.0007
18	0.0028	0.0022	0.0007
19	0.0028	0.0022	0.0007
20	0.0028	0.0022	0.0007
21	0.0029	0.0022	0.0007
22	0.0029	0.0022	0.0007
23	0.0029	0.0022	0.0007
24	0.0029	0.0022	0.0007
25	0.0029	0.0022	0.0007
26	0.0029	0.0022	0.0007
27	0.0029	0.0022	0.0007
28	0.0029	0.0022	0.0007

29	0.0029	0.0023	0.0007
30	0.0030	0.0023	0.0007
31	0.0030	0.0023	0.0007
32	0.0030	0.0023	0.0007
33	0.0030	0.0023	0.0007
34	0.0030	0.0023	0.0007
35	0.0030	0.0023	0.0007
36	0.0030	0.0023	0.0007
37	0.0030	0.0023	0.0007
38	0.0030	0.0023	0.0007
39	0.0031	0.0023	0.0007
40	0.0031	0.0023	0.0007
41	0.0031	0.0024	0.0007
42	0.0031	0.0024	0.0007
43	0.0031	0.0024	0.0007
44	0.0031	0.0024	0.0007
45	0.0031	0.0024	0.0007
46	0.0032	0.0024	0.0007
47	0.0032	0.0024	0.0007
48	0.0032	0.0024	0.0007
49	0.0032	0.0024	0.0008
50	0.0032	0.0024	0.0008
51	0.0032	0.0025	0.0008
52	0.0032	0.0025	0.0008
53	0.0033	0.0025	0.0008
54	0.0033	0.0025	0.0008
55	0.0033	0.0025	0.0008
56	0.0033	0.0025	0.0008
57	0.0033	0.0025	0.0008
58	0.0033	0.0025	0.0008
59	0.0033	0.0026	0.0008
60	0.0034	0.0026	0.0008
61	0.0034	0.0026	0.0008
62	0.0034	0.0026	0.0008
63	0.0034	0.0026	0.0008
64	0.0034	0.0026	0.0008
65	0.0034	0.0026	0.0008
66	0.0035	0.0026	0.0008
67	0.0035	0.0027	0.0008
68	0.0035	0.0027	0.0008
69	0.0035	0.0027	0.0008
70	0.0035	0.0027	0.0008
71	0.0035	0.0027	0.0008
72	0.0036	0.0027	0.0008
73	0.0036	0.0027	0.0008
74	0.0036	0.0027	0.0008
75	0.0036	0.0028	0.0009
76	0.0036	0.0028	0.0009
77	0.0037	0.0028	0.0009
78	0.0037	0.0028	0.0009
79	0.0037	0.0028	0.0009
80	0.0037	0.0028	0.0009
81	0.0037	0.0029	0.0009
82	0.0038	0.0029	0.0009
83	0.0038	0.0029	0.0009
84	0.0038	0.0029	0.0009
85	0.0038	0.0029	0.0009
86	0.0038	0.0029	0.0009
87	0.0039	0.0030	0.0009
88	0.0039	0.0030	0.0009
89	0.0039	0.0030	0.0009
90	0.0039	0.0030	0.0009
91	0.0040	0.0030	0.0009
92	0.0040	0.0030	0.0009
93	0.0040	0.0031	0.0009
94	0.0040	0.0031	0.0010
95	0.0041	0.0031	0.0010
96	0.0041	0.0031	0.0010
97	0.0041	0.0031	0.0010
98	0.0041	0.0032	0.0010
99	0.0042	0.0032	0.0010

100	0.0042	0.0032	0.0010
101	0.0042	0.0032	0.0010
102	0.0043	0.0032	0.0010
103	0.0043	0.0033	0.0010
104	0.0043	0.0033	0.0010
105	0.0044	0.0033	0.0010
106	0.0044	0.0033	0.0010
107	0.0044	0.0034	0.0010
108	0.0044	0.0034	0.0010
109	0.0045	0.0034	0.0011
110	0.0045	0.0034	0.0011
111	0.0045	0.0035	0.0011
112	0.0046	0.0035	0.0011
113	0.0046	0.0035	0.0011
114	0.0046	0.0035	0.0011
115	0.0047	0.0036	0.0011
116	0.0047	0.0036	0.0011
117	0.0048	0.0036	0.0011
118	0.0048	0.0037	0.0011
119	0.0049	0.0037	0.0011
120	0.0049	0.0037	0.0012
121	0.0049	0.0038	0.0012
122	0.0050	0.0038	0.0012
123	0.0050	0.0038	0.0012
124	0.0051	0.0039	0.0012
125	0.0051	0.0039	0.0012
126	0.0051	0.0039	0.0012
127	0.0052	0.0040	0.0012
128	0.0052	0.0040	0.0012
129	0.0053	0.0041	0.0013
130	0.0054	0.0041	0.0013
131	0.0054	0.0041	0.0013
132	0.0055	0.0042	0.0013
133	0.0055	0.0042	0.0013
134	0.0056	0.0043	0.0013
135	0.0057	0.0043	0.0013
136	0.0057	0.0044	0.0013
137	0.0058	0.0044	0.0014
138	0.0058	0.0045	0.0014
139	0.0059	0.0045	0.0014
140	0.0060	0.0046	0.0014
141	0.0061	0.0046	0.0014
142	0.0061	0.0047	0.0014
143	0.0062	0.0047	0.0015
144	0.0063	0.0048	0.0015
145	0.0077	0.0059	0.0018
146	0.0078	0.0060	0.0018
147	0.0079	0.0061	0.0019
148	0.0080	0.0061	0.0019
149	0.0081	0.0062	0.0019
150	0.0082	0.0063	0.0019
151	0.0083	0.0064	0.0020
152	0.0084	0.0064	0.0020
153	0.0086	0.0065	0.0020
154	0.0086	0.0066	0.0020
155	0.0088	0.0067	0.0021
156	0.0089	0.0068	0.0021
157	0.0091	0.0069	0.0021
158	0.0092	0.0070	0.0022
159	0.0094	0.0072	0.0022
160	0.0095	0.0072	0.0022
161	0.0097	0.0074	0.0023
162	0.0098	0.0075	0.0023
163	0.0100	0.0077	0.0024
164	0.0102	0.0078	0.0024
165	0.0104	0.0080	0.0025
166	0.0106	0.0081	0.0025
167	0.0108	0.0083	0.0026
168	0.0110	0.0084	0.0026
169	0.0119	0.0091	0.0028
170	0.0120	0.0092	0.0028

171	0.0124	0.0095	0.0029
172	0.0126	0.0096	0.0030
173	0.0131	0.0100	0.0031
174	0.0133	0.0102	0.0031
175	0.0138	0.0106	0.0033
176	0.0141	0.0108	0.0033
177	0.0147	0.0112	0.0035
178	0.0150	0.0115	0.0035
179	0.0158	0.0121	0.0037
180	0.0162	0.0124	0.0038
181	0.0172	0.0131	0.0040
182	0.0177	0.0135	0.0042
183	0.0189	0.0145	0.0045
184	0.0197	0.0150	0.0046
185	0.0183	0.0140	0.0043
186	0.0193	0.0148	0.0046
187	0.0219	0.0156	0.0063
188	0.0236	0.0156	0.0080
189	0.0290	0.0156	0.0134
190	0.0327	0.0156	0.0171
191	0.0462	0.0156	0.0307
192	0.0631	0.0156	0.0475
193	0.1890	0.0156	0.1734
194	0.0379	0.0156	0.0223
195	0.0257	0.0156	0.0101
196	0.0205	0.0156	0.0049
197	0.0205	0.0156	0.0049
198	0.0183	0.0140	0.0043
199	0.0167	0.0127	0.0039
200	0.0154	0.0118	0.0036
201	0.0144	0.0110	0.0034
202	0.0135	0.0104	0.0032
203	0.0128	0.0098	0.0030
204	0.0122	0.0093	0.0029
205	0.0112	0.0085	0.0026
206	0.0107	0.0082	0.0025
207	0.0103	0.0079	0.0024
208	0.0099	0.0076	0.0023
209	0.0096	0.0073	0.0023
210	0.0093	0.0071	0.0022
211	0.0090	0.0069	0.0021
212	0.0087	0.0067	0.0021
213	0.0085	0.0065	0.0020
214	0.0083	0.0063	0.0019
215	0.0081	0.0062	0.0019
216	0.0079	0.0060	0.0019
217	0.0063	0.0048	0.0015
218	0.0062	0.0047	0.0015
219	0.0060	0.0046	0.0014
220	0.0059	0.0045	0.0014
221	0.0057	0.0044	0.0014
222	0.0056	0.0043	0.0013
223	0.0055	0.0042	0.0013
224	0.0054	0.0041	0.0013
225	0.0053	0.0040	0.0012
226	0.0052	0.0040	0.0012
227	0.0051	0.0039	0.0012
228	0.0050	0.0038	0.0012
229	0.0049	0.0038	0.0012
230	0.0048	0.0037	0.0011
231	0.0047	0.0036	0.0011
232	0.0047	0.0036	0.0011
233	0.0046	0.0035	0.0011
234	0.0045	0.0035	0.0011
235	0.0045	0.0034	0.0011
236	0.0044	0.0034	0.0010
237	0.0043	0.0033	0.0010
238	0.0043	0.0033	0.0010
239	0.0042	0.0032	0.0010
240	0.0042	0.0032	0.0010
241	0.0041	0.0031	0.0010

242	0.0041	0.0031	0.0010
243	0.0040	0.0031	0.0009
244	0.0040	0.0030	0.0009
245	0.0039	0.0030	0.0009
246	0.0039	0.0029	0.0009
247	0.0038	0.0029	0.0009
248	0.0038	0.0029	0.0009
249	0.0037	0.0028	0.0009
250	0.0037	0.0028	0.0009
251	0.0036	0.0028	0.0009
252	0.0036	0.0028	0.0009
253	0.0036	0.0027	0.0008
254	0.0035	0.0027	0.0008
255	0.0035	0.0027	0.0008
256	0.0035	0.0026	0.0008
257	0.0034	0.0026	0.0008
258	0.0034	0.0026	0.0008
259	0.0034	0.0026	0.0008
260	0.0033	0.0025	0.0008
261	0.0033	0.0025	0.0008
262	0.0033	0.0025	0.0008
263	0.0032	0.0025	0.0008
264	0.0032	0.0025	0.0008
265	0.0032	0.0024	0.0008
266	0.0032	0.0024	0.0007
267	0.0031	0.0024	0.0007
268	0.0031	0.0024	0.0007
269	0.0031	0.0024	0.0007
270	0.0031	0.0023	0.0007
271	0.0030	0.0023	0.0007
272	0.0030	0.0023	0.0007
273	0.0030	0.0023	0.0007
274	0.0030	0.0023	0.0007
275	0.0029	0.0022	0.0007
276	0.0029	0.0022	0.0007
277	0.0029	0.0022	0.0007
278	0.0029	0.0022	0.0007
279	0.0029	0.0022	0.0007
280	0.0028	0.0022	0.0007
281	0.0028	0.0021	0.0007
282	0.0028	0.0021	0.0007
283	0.0028	0.0021	0.0007
284	0.0028	0.0021	0.0006
285	0.0027	0.0021	0.0006
286	0.0027	0.0021	0.0006
287	0.0027	0.0021	0.0006
288	0.0027	0.0020	0.0006

Total soil rain loss = 1.35(In)
Total effective rainfall = 0.70(In)
Peak flow rate in flood hydrograph = 113.04(CFS)

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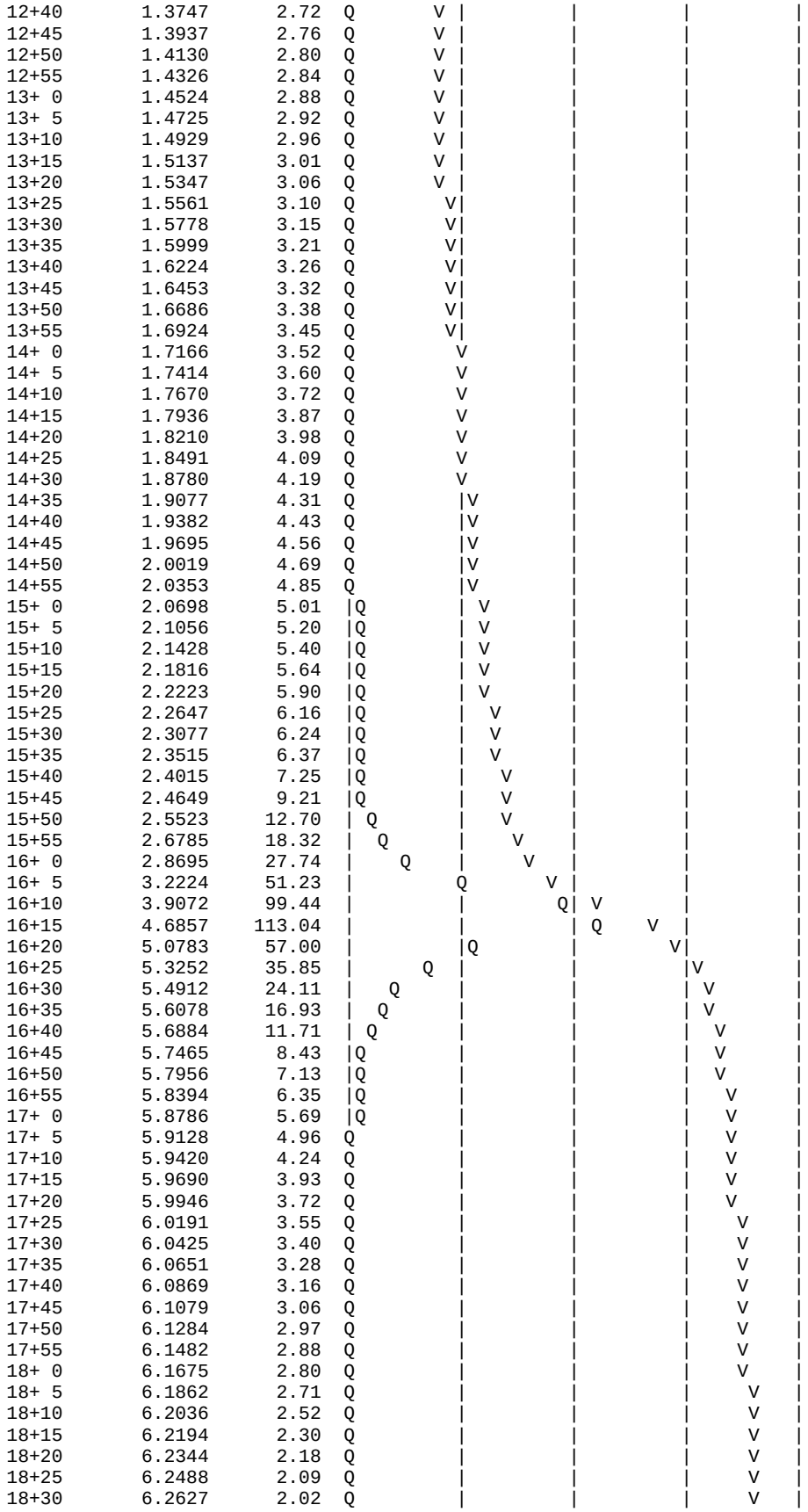
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0003	0.04	Q	|	|	|	|
0+10	0.0022	0.28	Q	|	|	|	|
0+15	0.0064	0.60	Q	|	|	|	|
0+20	0.0113	0.72	Q	|	|	|	|
0+25	0.0168	0.80	Q	|	|	|	|
0+30	0.0226	0.84	Q	|	|	|	|
0+35	0.0286	0.87	Q	|	|	|	|
0+40	0.0347	0.89	Q	|	|	|	|
0+45	0.0409	0.90	Q	|	|	|	|

0+50	0.0471	0.90	Q	|	|	|	|
0+55	0.0534	0.91	Q	|	|	|	|
1+ 0	0.0597	0.92	Q	|	|	|	|
1+ 5	0.0661	0.92	Q	|	|	|	|
1+10	0.0724	0.92	Q	|	|	|	|
1+15	0.0788	0.93	Q	|	|	|	|
1+20	0.0852	0.93	Q	|	|	|	|
1+25	0.0917	0.93	Q	|	|	|	|
1+30	0.0981	0.94	Q	|	|	|	|
1+35	0.1046	0.94	Q	|	|	|	|
1+40	0.1111	0.94	Q	|	|	|	|
1+45	0.1176	0.95	Q	|	|	|	|
1+50	0.1242	0.95	Q	|	|	|	|
1+55	0.1308	0.95	Q	|	|	|	|
2+ 0	0.1373	0.96	Q	|	|	|	|
2+ 5	0.1440	0.96	Q	|	|	|	|
2+10	0.1506	0.96	Q	|	|	|	|
2+15	0.1573	0.97	Q	|	|	|	|
2+20	0.1640	0.97	Q	|	|	|	|
2+25	0.1707	0.98	Q	|	|	|	|
2+30	0.1774	0.98	QV	|	|	|	|
2+35	0.1842	0.98	QV	|	|	|	|
2+40	0.1910	0.99	QV	|	|	|	|
2+45	0.1978	0.99	QV	|	|	|	|
2+50	0.2047	0.99	QV	|	|	|	|
2+55	0.2116	1.00	QV	|	|	|	|
3+ 0	0.2185	1.00	QV	|	|	|	|
3+ 5	0.2254	1.01	QV	|	|	|	|
3+10	0.2323	1.01	QV	|	|	|	|
3+15	0.2393	1.01	QV	|	|	|	|
3+20	0.2463	1.02	QV	|	|	|	|
3+25	0.2534	1.02	QV	|	|	|	|
3+30	0.2605	1.03	QV	|	|	|	|
3+35	0.2676	1.03	QV	|	|	|	|
3+40	0.2747	1.04	QV	|	|	|	|
3+45	0.2819	1.04	QV	|	|	|	|
3+50	0.2890	1.04	QV	|	|	|	|
3+55	0.2963	1.05	QV	|	|	|	|
4+ 0	0.3035	1.05	QV	|	|	|	|
4+ 5	0.3108	1.06	QV	|	|	|	|
4+10	0.3181	1.06	QV	|	|	|	|
4+15	0.3254	1.07	QV	|	|	|	|
4+20	0.3328	1.07	QV	|	|	|	|
4+25	0.3402	1.08	QV	|	|	|	|
4+30	0.3477	1.08	Q V	|	|	|	|
4+35	0.3551	1.09	Q V	|	|	|	|
4+40	0.3627	1.09	Q V	|	|	|	|
4+45	0.3702	1.10	Q V	|	|	|	|
4+50	0.3778	1.10	Q V	|	|	|	|
4+55	0.3854	1.11	Q V	|	|	|	|
5+ 0	0.3930	1.11	Q V	|	|	|	|
5+ 5	0.4007	1.12	Q V	|	|	|	|
5+10	0.4084	1.12	Q V	|	|	|	|
5+15	0.4162	1.13	Q V	|	|	|	|
5+20	0.4240	1.13	Q V	|	|	|	|
5+25	0.4318	1.14	Q V	|	|	|	|
5+30	0.4397	1.14	Q V	|	|	|	|
5+35	0.4476	1.15	Q V	|	|	|	|
5+40	0.4555	1.15	Q V	|	|	|	|
5+45	0.4635	1.16	Q V	|	|	|	|
5+50	0.4715	1.16	Q V	|	|	|	|
5+55	0.4796	1.17	Q V	|	|	|	|
6+ 0	0.4877	1.18	Q V	|	|	|	|
6+ 5	0.4958	1.18	Q V	|	|	|	|
6+10	0.5040	1.19	Q V	|	|	|	|
6+15	0.5122	1.19	Q V	|	|	|	|
6+20	0.5205	1.20	Q V	|	|	|	|
6+25	0.5288	1.21	Q V	|	|	|	|
6+30	0.5372	1.21	Q V	|	|	|	|
6+35	0.5456	1.22	Q V	|	|	|	|
6+40	0.5540	1.23	Q V	|	|	|	|

6+45	0.5625	1.23	Q	V				
6+50	0.5711	1.24	Q	V				
6+55	0.5797	1.25	Q	V				
7+ 0	0.5883	1.25	Q	V				
7+ 5	0.5970	1.26	Q	V				
7+10	0.6057	1.27	Q	V				
7+15	0.6145	1.28	Q	V				
7+20	0.6234	1.28	Q	V				
7+25	0.6323	1.29	Q	V				
7+30	0.6412	1.30	Q	V				
7+35	0.6502	1.31	Q	V				
7+40	0.6593	1.31	Q	V				
7+45	0.6684	1.32	Q	V				
7+50	0.6775	1.33	Q	V				
7+55	0.6868	1.34	Q	V				
8+ 0	0.6960	1.35	Q	V				
8+ 5	0.7054	1.36	Q	V				
8+10	0.7148	1.36	Q	V				
8+15	0.7242	1.37	Q	V				
8+20	0.7338	1.38	Q	V				
8+25	0.7433	1.39	Q	V				
8+30	0.7530	1.40	Q	V				
8+35	0.7627	1.41	Q	V				
8+40	0.7725	1.42	Q	V				
8+45	0.7823	1.43	Q	V				
8+50	0.7922	1.44	Q	V				
8+55	0.8022	1.45	Q	V				
9+ 0	0.8123	1.46	Q	V				
9+ 5	0.8224	1.47	Q	V				
9+10	0.8326	1.48	Q	V				
9+15	0.8429	1.49	Q	V				
9+20	0.8533	1.50	Q	V				
9+25	0.8637	1.52	Q	V				
9+30	0.8742	1.53	Q	V				
9+35	0.8848	1.54	Q	V				
9+40	0.8955	1.55	Q	V				
9+45	0.9063	1.56	Q	V				
9+50	0.9171	1.58	Q	V				
9+55	0.9281	1.59	Q	V				
10+ 0	0.9391	1.60	Q	V				
10+ 5	0.9502	1.62	Q	V				
10+10	0.9615	1.63	Q	V				
10+15	0.9728	1.64	Q	V				
10+20	0.9842	1.66	Q	V				
10+25	0.9957	1.67	Q	V				
10+30	1.0073	1.69	Q	V				
10+35	1.0191	1.70	Q	V				
10+40	1.0309	1.72	Q	V				
10+45	1.0429	1.74	Q	V				
10+50	1.0549	1.75	Q	V				
10+55	1.0671	1.77	Q	V				
11+ 0	1.0794	1.79	Q	V				
11+ 5	1.0918	1.80	Q	V				
11+10	1.1044	1.82	Q	V				
11+15	1.1171	1.84	Q	V				
11+20	1.1299	1.86	Q	V				
11+25	1.1428	1.88	Q	V				
11+30	1.1559	1.90	Q	V				
11+35	1.1692	1.92	Q	V				
11+40	1.1826	1.94	Q	V				
11+45	1.1961	1.97	Q	V				
11+50	1.2098	1.99	Q	V				
11+55	1.2237	2.01	Q	V				
12+ 0	1.2377	2.04	Q	V				
12+ 5	1.2521	2.09	Q	V				
12+10	1.2674	2.23	Q	V				
12+15	1.2842	2.43	Q	V				
12+20	1.3015	2.52	Q	V				
12+25	1.3193	2.58	Q	V				
12+30	1.3374	2.64	Q	V				
12+35	1.3559	2.68	Q	V				



18+35	6.2762	1.96	Q	|	|	|	V |
18+40	6.2893	1.91	Q	|	|	|	V |
18+45	6.3022	1.87	Q	|	|	|	V |
18+50	6.3147	1.83	Q	|	|	|	V |
18+55	6.3271	1.79	Q	|	|	|	V |
19+ 0	6.3391	1.75	Q	|	|	|	V |
19+ 5	6.3509	1.72	Q	|	|	|	V |
19+10	6.3626	1.69	Q	|	|	|	V |
19+15	6.3740	1.66	Q	|	|	|	V |
19+20	6.3852	1.63	Q	|	|	|	V |
19+25	6.3962	1.60	Q	|	|	|	V |
19+30	6.4070	1.57	Q	|	|	|	V |
19+35	6.4177	1.55	Q	|	|	|	V |
19+40	6.4282	1.53	Q	|	|	|	V |
19+45	6.4386	1.50	Q	|	|	|	V |
19+50	6.4488	1.48	Q	|	|	|	V |
19+55	6.4588	1.46	Q	|	|	|	V |
20+ 0	6.4687	1.44	Q	|	|	|	V |
20+ 5	6.4785	1.42	Q	|	|	|	V |
20+10	6.4881	1.40	Q	|	|	|	V |
20+15	6.4976	1.38	Q	|	|	|	V |
20+20	6.5070	1.36	Q	|	|	|	V |
20+25	6.5163	1.35	Q	|	|	|	V |
20+30	6.5255	1.33	Q	|	|	|	V |
20+35	6.5345	1.31	Q	|	|	|	V |
20+40	6.5434	1.30	Q	|	|	|	V |
20+45	6.5523	1.28	Q	|	|	|	V |
20+50	6.5610	1.27	Q	|	|	|	V |
20+55	6.5696	1.25	Q	|	|	|	V |
21+ 0	6.5782	1.24	Q	|	|	|	V |
21+ 5	6.5866	1.23	Q	|	|	|	V |
21+10	6.5950	1.21	Q	|	|	|	V |
21+15	6.6032	1.20	Q	|	|	|	V |
21+20	6.6114	1.19	Q	|	|	|	V |
21+25	6.6195	1.18	Q	|	|	|	V |
21+30	6.6275	1.16	Q	|	|	|	V |
21+35	6.6355	1.15	Q	|	|	|	V |
21+40	6.6433	1.14	Q	|	|	|	V |
21+45	6.6511	1.13	Q	|	|	|	V |
21+50	6.6588	1.12	Q	|	|	|	V |
21+55	6.6665	1.11	Q	|	|	|	V |
22+ 0	6.6740	1.10	Q	|	|	|	V |
22+ 5	6.6815	1.09	Q	|	|	|	V |
22+10	6.6890	1.08	Q	|	|	|	V|
22+15	6.6963	1.07	Q	|	|	|	V|
22+20	6.7036	1.06	Q	|	|	|	V|
22+25	6.7109	1.05	Q	|	|	|	V|
22+30	6.7181	1.04	Q	|	|	|	V|
22+35	6.7252	1.03	Q	|	|	|	V|
22+40	6.7323	1.03	Q	|	|	|	V|
22+45	6.7393	1.02	Q	|	|	|	V|
22+50	6.7462	1.01	Q	|	|	|	V|
22+55	6.7531	1.00	Q	|	|	|	V|
23+ 0	6.7600	0.99	Q	|	|	|	V|
23+ 5	6.7668	0.99	Q	|	|	|	V|
23+10	6.7735	0.98	Q	|	|	|	V|
23+15	6.7802	0.97	Q	|	|	|	V|
23+20	6.7868	0.96	Q	|	|	|	V|
23+25	6.7934	0.96	Q	|	|	|	V|
23+30	6.8000	0.95	Q	|	|	|	V|
23+35	6.8065	0.94	Q	|	|	|	V|
23+40	6.8129	0.94	Q	|	|	|	V|
23+45	6.8193	0.93	Q	|	|	|	V|
23+50	6.8257	0.92	Q	|	|	|	V|
23+55	6.8320	0.92	Q	|	|	|	V|
24+ 0	6.8383	0.91	Q	|	|	|	V|
24+ 5	6.8442	0.86	Q	|	|	|	V|
24+10	6.8485	0.62	Q	|	|	|	V|
24+15	6.8505	0.29	Q	|	|	|	V|
24+20	6.8517	0.17	Q	|	|	|	V|
24+25	6.8524	0.10	Q	|	|	|	V|

24+30	6.8529	0.06	Q	|	|	|	V|
24+35	6.8531	0.03	Q	|	|	|	V|
24+40	6.8532	0.02	Q	|	|	|	V|
24+45	6.8533	0.01	Q	|	|	|	V|
24+50	6.8533	0.01	Q	|	|	|	V|
24+55	6.8534	0.00	Q	|	|	|	V|
25+ 0	6.8534	0.00	Q	|	|	|	V|

FLOOD HYDROGRAPH ROUTING PROGRAM
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012
Study date: 03/20/17

WESTRIDGE HYDROLOGY STUDY
PROPOSED ROUTING - BASIN 'C' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, MARCH 20, 2017
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********** HYDROGRAPH INFORMATION **********

From study/file name: PRC00224.rte
**********HYDROGRAPH DATA**********
Number of intervals = 305
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 104.107 (CFS)
Total volume = 7.071 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 300.000 to Point/Station 301.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 305
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.500	0.834	0.692	0.832	0.836
1.000	1.693	1.672	1.687	1.699
1.500	2.577	3.059	2.566	2.588
2.000	3.488	4.757	3.472	3.504
3.000	5.388	7.930	5.361	5.415
4.000	7.399	20.434	7.329	7.469
5.000	9.523	35.089	9.402	9.644
6.000	11.764	44.538	11.611	11.917
7.000	14.126	52.170	13.946	14.306
8.000	16.610	58.766	16.408	16.812
8.900	18.942	83.236	18.655	19.229
9.000	19.207	83.236	18.920	19.494
9.500	20.556	448.796	19.011	22.101
10.000	21.935	1159.965	17.941	25.929

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	26.0	52.05	78.08	104.11	Depth (Ft.)
0.083	0.03	0.00	0.000	O	|	|	|	|	0.00
0.167	0.13	0.00	0.001	O	|	|	|	|	0.00
0.250	0.41	0.00	0.002	O	|	|	|	|	0.00
0.333	0.62	0.00	0.006	O	|	|	|	|	0.00
0.417	0.72	0.01	0.011	O	|	|	|	|	0.01
0.500	0.78	0.01	0.016	O	|	|	|	|	0.01
0.583	0.83	0.02	0.021	O	|	|	|	|	0.01
0.667	0.87	0.02	0.027	O	|	|	|	|	0.02
0.750	0.89	0.03	0.033	O	|	|	|	|	0.02
0.833	0.91	0.03	0.039	O	|	|	|	|	0.02
0.917	0.92	0.04	0.045	O	|	|	|	|	0.03
1.000	0.93	0.04	0.051	O	|	|	|	|	0.03
1.083	0.94	0.05	0.057	O	|	|	|	|	0.03
1.167	0.94	0.05	0.063	O	|	|	|	|	0.04
1.250	0.95	0.06	0.069	O	|	|	|	|	0.04
1.333	0.95	0.06	0.075	O	|	|	|	|	0.05
1.417	0.96	0.07	0.082	O	|	|	|	|	0.05
1.500	0.96	0.07	0.088	O	|	|	|	|	0.05
1.583	0.97	0.08	0.094	O	|	|	|	|	0.06
1.667	0.97	0.08	0.100	O	|	|	|	|	0.06
1.750	0.97	0.09	0.106	O	|	|	|	|	0.06
1.833	0.98	0.09	0.112	O	|	|	|	|	0.07
1.917	0.98	0.10	0.118	O	|	|	|	|	0.07
2.000	0.98	0.10	0.124	O	|	|	|	|	0.07
2.083	0.99	0.11	0.130	O	|	|	|	|	0.08
2.167	0.99	0.11	0.136	O	|	|	|	|	0.08
2.250	1.00	0.12	0.143	O	|	|	|	|	0.09
2.333	1.00	0.12	0.149	O	|	|	|	|	0.09
2.417	1.00	0.13	0.155	O	|	|	|	|	0.09
2.500	1.01	0.13	0.161	O	|	|	|	|	0.10
2.583	1.01	0.14	0.167	O	|	|	|	|	0.10
2.667	1.01	0.14	0.173	O	|	|	|	|	0.10
2.750	1.02	0.15	0.179	O	|	|	|	|	0.11
2.833	1.02	0.15	0.185	O	|	|	|	|	0.11
2.917	1.03	0.16	0.191	O	|	|	|	|	0.11
3.000	1.03	0.16	0.197	O	|	|	|	|	0.12
3.083	1.03	0.17	0.203	O	|	|	|	|	0.12
3.167	1.04	0.17	0.208	O	|	|	|	|	0.12
3.250	1.04	0.18	0.214	O	|	|	|	|	0.13
3.333	1.05	0.18	0.220	O	|	|	|	|	0.13
3.417	1.05	0.19	0.226	O	|	|	|	|	0.14
3.500	1.06	0.19	0.232	O	|	|	|	|	0.14
3.583	1.06	0.20	0.238	O	|	|	|	|	0.14
3.667	1.06	0.20	0.244	O	|	|	|	|	0.15
3.750	1.07	0.21	0.250	O	|	|	|	|	0.15
3.833	1.07	0.21	0.256	O	|	|	|	|	0.15
3.917	1.08	0.22	0.262	O	|	|	|	|	0.16
4.000	1.08	0.22	0.268	O	|	|	|	|	0.16
4.083	1.09	0.23	0.274	O	|	|	|	|	0.16
4.167	1.09	0.23	0.280	O	|	|	|	|	0.17
4.250	1.10	0.24	0.286	O	|	|	|	|	0.17
4.333	1.10	0.24	0.292	O	|	|	|	|	0.17
4.417	1.11	0.25	0.297	O	|	|	|	|	0.18
4.500	1.11	0.25	0.303	O	|	|	|	|	0.18
4.583	1.12	0.26	0.309	O	|	|	|	|	0.19
4.667	1.12	0.26	0.315	O	|	|	|	|	0.19
4.750	1.13	0.27	0.321	O	|	|	|	|	0.19
4.833	1.13	0.27	0.327	O	|	|	|	|	0.20
4.917	1.14	0.28	0.333	O	|	|	|	|	0.20
5.000	1.14	0.28	0.339	O	|	|	|	|	0.20
5.083	1.15	0.29	0.345	O	|	|	|	|	0.21
5.167	1.15	0.29	0.351	O	|	|	|	|	0.21
5.250	1.16	0.30	0.357	O	|	|	|	|	0.21

5.333	1.16	0.30	0.363	O	|	|	|	|	0.22
5.417	1.17	0.31	0.368	O	|	|	|	|	0.22
5.500	1.17	0.31	0.374	O	|	|	|	|	0.22
5.583	1.18	0.32	0.380	O	|	|	|	|	0.23
5.667	1.18	0.32	0.386	O	|	|	|	|	0.23
5.750	1.19	0.33	0.392	O	|	|	|	|	0.24
5.833	1.20	0.33	0.398	O	|	|	|	|	0.24
5.917	1.20	0.34	0.404	O	|	|	|	|	0.24
6.000	1.21	0.34	0.410	O	|	|	|	|	0.25
6.083	1.21	0.35	0.416	O	|	|	|	|	0.25
6.167	1.22	0.35	0.422	O	|	|	|	|	0.25
6.250	1.23	0.36	0.428	O	|	|	|	|	0.26
6.333	1.23	0.36	0.434	O	|	|	|	|	0.26
6.417	1.24	0.37	0.440	O	|	|	|	|	0.26
6.500	1.25	0.37	0.446	O	|	|	|	|	0.27
6.583	1.25	0.38	0.452	O	|	|	|	|	0.27
6.667	1.26	0.38	0.458	O	|	|	|	|	0.27
6.750	1.27	0.39	0.464	O	|	|	|	|	0.28
6.833	1.27	0.39	0.470	O	|	|	|	|	0.28
6.917	1.28	0.40	0.476	O	|	|	|	|	0.29
7.000	1.29	0.40	0.483	O	|	|	|	|	0.29
7.083	1.29	0.41	0.489	O	|	|	|	|	0.29
7.167	1.30	0.41	0.495	O	|	|	|	|	0.30
7.250	1.31	0.42	0.501	O	|	|	|	|	0.30
7.333	1.32	0.42	0.507	O	|	|	|	|	0.30
7.417	1.32	0.43	0.513	O	|	|	|	|	0.31
7.500	1.33	0.43	0.520	O	|	|	|	|	0.31
7.583	1.34	0.44	0.526	O	|	|	|	|	0.32
7.667	1.35	0.44	0.532	O	|	|	|	|	0.32
7.750	1.36	0.45	0.538	O	|	|	|	|	0.32
7.833	1.36	0.45	0.545	O	|	|	|	|	0.33
7.917	1.37	0.46	0.551	O	|	|	|	|	0.33
8.000	1.38	0.46	0.557	O	|	|	|	|	0.33
8.083	1.39	0.47	0.563	O	|	|	|	|	0.34
8.167	1.40	0.47	0.570	O	|	|	|	|	0.34
8.250	1.41	0.48	0.576	O	|	|	|	|	0.35
8.333	1.42	0.48	0.583	O	|	|	|	|	0.35
8.417	1.43	0.49	0.589	O	|	|	|	|	0.35
8.500	1.44	0.49	0.596	O	|	|	|	|	0.36
8.583	1.45	0.50	0.602	O	|	|	|	|	0.36
8.667	1.46	0.50	0.609	O	|	|	|	|	0.36
8.750	1.47	0.51	0.615	O	|	|	|	|	0.37
8.833	1.48	0.52	0.622	O	|	|	|	|	0.37
8.917	1.49	0.52	0.628	O	|	|	|	|	0.38
9.000	1.50	0.53	0.635	O	|	|	|	|	0.38
9.083	1.51	0.53	0.642	O	|	|	|	|	0.38
9.167	1.52	0.54	0.649	O	|	|	|	|	0.39
9.250	1.53	0.54	0.655	O	|	|	|	|	0.39
9.333	1.54	0.55	0.662	O	|	|	|	|	0.40
9.417	1.55	0.56	0.669	O	|	|	|	|	0.40
9.500	1.56	0.56	0.676	O	|	|	|	|	0.41
9.583	1.58	0.57	0.683	O	|	|	|	|	0.41
9.667	1.59	0.57	0.690	O	|	|	|	|	0.41
9.750	1.60	0.58	0.697	O	|	|	|	|	0.42
9.833	1.61	0.58	0.704	O	|	|	|	|	0.42
9.917	1.63	0.59	0.711	O	|	|	|	|	0.43
10.000	1.64	0.60	0.718	O	|	|	|	|	0.43
10.083	1.65	0.60	0.725	O	|	|	|	|	0.43
10.167	1.67	0.61	0.733	O	|	|	|	|	0.44
10.250	1.68	0.61	0.740	O	|	|	|	|	0.44
10.333	1.70	0.62	0.747	O	|	|	|	|	0.45
10.417	1.71	0.63	0.755	O	|	|	|	|	0.45
10.500	1.73	0.63	0.762	O	|	|	|	|	0.46
10.583	1.74	0.64	0.770	O	|	|	|	|	0.46
10.667	1.76	0.65	0.777	O	|	|	|	|	0.47
10.750	1.77	0.65	0.785	O	|	|	|	|	0.47
10.833	1.79	0.66	0.793	O	|	|	|	|	0.48
10.917	1.81	0.66	0.801	O	|	|	|	|	0.48
11.000	1.83	0.67	0.809	O	|	|	|	|	0.48
11.083	1.84	0.68	0.817	O	|	|	|	|	0.49
11.167	1.86	0.68	0.825	O	|	|	|	|	0.49

11.250	1.88	0.69	0.833	O	|	|	|	|	0.50
11.333	1.90	0.70	0.841	O	|	|	|	|	0.50
11.417	1.92	0.71	0.849	O	|	|	|	|	0.51
11.500	1.94	0.72	0.858	O	|	|	|	|	0.51
11.583	1.96	0.73	0.866	O	|	|	|	|	0.52
11.667	1.98	0.74	0.875	O	|	|	|	|	0.52
11.750	2.01	0.75	0.883	O	|	|	|	|	0.53
11.833	2.03	0.76	0.892	O	|	|	|	|	0.53
11.917	2.05	0.77	0.901	O	|	|	|	|	0.54
12.000	2.08	0.78	0.910	O	|	|	|	|	0.54
12.083	2.12	0.79	0.919	O	|	|	|	|	0.55
12.167	2.20	0.80	0.928	O	|	|	|	|	0.55
12.250	2.37	0.81	0.939	O	|	|	|	|	0.56
12.333	2.51	0.82	0.950	O	|	|	|	|	0.57
12.417	2.58	0.84	0.961	O	|	|	|	|	0.57
12.500	2.65	0.85	0.974	O	|	|	|	|	0.58
12.583	2.70	0.87	0.986	O	|	|	|	|	0.59
12.667	2.75	0.88	0.999	O	|	|	|	|	0.60
12.750	2.80	0.90	1.012	O	|	|	|	|	0.60
12.833	2.84	0.91	1.025	O	|	|	|	|	0.61
12.917	2.89	0.93	1.039	O	|	|	|	|	0.62
13.000	2.93	0.94	1.052	O	|	|	|	|	0.63
13.083	2.97	0.96	1.066	O	|	|	|	|	0.64
13.167	3.01	0.97	1.080	O	|	|	|	|	0.64
13.250	3.06	0.99	1.094	O	|	|	|	|	0.65
13.333	3.11	1.01	1.108	O	|	|	|	|	0.66
13.417	3.16	1.02	1.123	O	|	|	|	|	0.67
13.500	3.21	1.04	1.138	O	|	|	|	|	0.68
13.583	3.26	1.06	1.153	OI	|	|	|	|	0.69
13.667	3.31	1.07	1.168	OI	|	|	|	|	0.69
13.750	3.37	1.09	1.184	OI	|	|	|	|	0.70
13.833	3.43	1.11	1.200	OI	|	|	|	|	0.71
13.917	3.50	1.13	1.216	OI	|	|	|	|	0.72
14.000	3.56	1.15	1.232	OI	|	|	|	|	0.73
14.083	3.64	1.17	1.249	OI	|	|	|	|	0.74
14.167	3.74	1.19	1.267	OI	|	|	|	|	0.75
14.250	3.87	1.21	1.284	OI	|	|	|	|	0.76
14.333	4.00	1.23	1.303	OI	|	|	|	|	0.77
14.417	4.11	1.25	1.323	OI	|	|	|	|	0.78
14.500	4.22	1.27	1.343	OI	|	|	|	|	0.80
14.583	4.33	1.30	1.363	OI	|	|	|	|	0.81
14.667	4.45	1.32	1.384	OI	|	|	|	|	0.82
14.750	4.58	1.34	1.406	OI	|	|	|	|	0.83
14.833	4.71	1.37	1.429	OI	|	|	|	|	0.85
14.917	4.86	1.40	1.452	OI	|	|	|	|	0.86
15.000	5.02	1.43	1.477	OI	|	|	|	|	0.87
15.083	5.20	1.45	1.502	OI	|	|	|	|	0.89
15.167	5.39	1.48	1.528	OI	|	|	|	|	0.90
15.250	5.61	1.52	1.556	OI	|	|	|	|	0.92
15.333	5.85	1.55	1.585	OI	|	|	|	|	0.94
15.417	6.11	1.58	1.615	OI	|	|	|	|	0.95
15.500	6.31	1.62	1.647	OI	|	|	|	|	0.97
15.583	6.43	1.66	1.679	OI	|	|	|	|	0.99
15.667	6.87	1.70	1.714	O I	|	|	|	|	1.01
15.750	8.24	1.77	1.754	O I	|	|	|	|	1.03
15.833	10.68	1.85	1.806	O I	|	|	|	|	1.06
15.917	15.11	1.97	1.882	O I	|	|	|	|	1.11
16.000	21.97	2.15	1.996	O I	|	|	|	|	1.17
16.083	38.59	2.45	2.188	O	| I	|	|	|	1.28
16.167	65.78	2.98	2.529	O	|	| I	|	|	1.47
16.250	104.11	4.02	3.090	|O	|	|	|	I	1.78
16.333	83.86	5.12	3.706	|O	|	|	I	|	2.11
16.417	47.53	5.81	4.121	|O	|	I	|	|	2.33
16.500	33.28	6.21	4.357	|O	I	|	|	|	2.46
16.583	24.95	6.47	4.514	|O	I|	|	|	|	2.54
16.667	19.55	6.65	4.622	| O	I |	|	|	|	2.60
16.750	15.30	6.77	4.696	| O I	|	|	|	|	2.64
16.833	11.92	6.85	4.743	| OI	|	|	|	|	2.66
16.917	9.17	6.89	4.768	| O	|	|	|	|	2.67
17.000	7.20	6.91	4.777	| O	|	|	|	|	2.68
17.083	6.43	6.91	4.776	|IO	|	|	|	|	2.68

17.167	5.77	6.90	4.771	|IO	|	|	|	2.68
17.250	5.34	6.88	4.762	|IO	|	|	|	2.67
17.333	5.01	6.86	4.750	|IO	|	|	|	2.66
17.417	4.45	6.84	4.735	|IO	|	|	|	2.66
17.500	4.09	6.81	4.718	|IO	|	|	|	2.65
17.583	3.60	6.78	4.697	|IO	|	|	|	2.64
17.667	3.43	6.74	4.675	|IO	|	|	|	2.62
17.750	3.29	6.70	4.652	|IO	|	|	|	2.61
17.833	3.18	6.66	4.628	I O	|	|	|	2.60
17.917	3.08	6.62	4.604	I O	|	|	|	2.59
18.000	2.99	6.58	4.579	I O	|	|	|	2.57
18.083	2.89	6.54	4.554	I O	|	|	|	2.56
18.167	2.76	6.50	4.529	IO	|	|	|	2.55
18.250	2.55	6.45	4.503	IO	|	|	|	2.53
18.333	2.38	6.41	4.476	IO	|	|	|	2.52
18.417	2.27	6.36	4.448	IO	|	|	|	2.51
18.500	2.18	6.31	4.419	IO	|	|	|	2.49
18.583	2.11	6.26	4.391	IO	|	|	|	2.48
18.667	2.04	6.22	4.362	IO	|	|	|	2.46
18.750	1.99	6.17	4.333	IO	|	|	|	2.44
18.833	1.94	6.12	4.304	IO	|	|	|	2.43
18.917	1.89	6.07	4.276	IO	|	|	|	2.41
19.000	1.85	6.02	4.247	IO	|	|	|	2.40
19.083	1.81	5.98	4.218	IO	|	|	|	2.38
19.167	1.78	5.93	4.190	IO	|	|	|	2.37
19.250	1.75	5.88	4.161	IO	|	|	|	2.35
19.333	1.71	5.83	4.133	IO	|	|	|	2.34
19.417	1.68	5.79	4.104	IO	|	|	|	2.32
19.500	1.65	5.74	4.076	IO	|	|	|	2.31
19.583	1.63	5.69	4.048	IO	|	|	|	2.29
19.667	1.60	5.65	4.020	IO	|	|	|	2.28
19.750	1.58	5.60	3.992	IO	|	|	|	2.27
19.833	1.55	5.55	3.965	IO	|	|	|	2.25
19.917	1.53	5.51	3.937	IO	|	|	|	2.24
20.000	1.51	5.46	3.910	IO	|	|	|	2.22
20.083	1.49	5.42	3.883	IO	|	|	|	2.21
20.167	1.47	5.37	3.856	IO	|	|	|	2.19
20.250	1.45	5.33	3.829	IO	|	|	|	2.18
20.333	1.43	5.28	3.802	IO	|	|	|	2.17
20.417	1.41	5.24	3.776	IO	|	|	|	2.15
20.500	1.39	5.19	3.750	IO	|	|	|	2.14
20.583	1.37	5.15	3.723	IO	|	|	|	2.12
20.667	1.36	5.11	3.698	IO	|	|	|	2.11
20.750	1.34	5.06	3.672	IO	|	|	|	2.10
20.833	1.32	5.02	3.646	IO	|	|	|	2.08
20.917	1.31	4.98	3.621	IO	|	|	|	2.07
21.000	1.29	4.94	3.596	IO	|	|	|	2.06
21.083	1.28	4.90	3.571	IO	|	|	|	2.04
21.167	1.27	4.85	3.546	IO	|	|	|	2.03
21.250	1.25	4.81	3.521	IO	|	|	|	2.02
21.333	1.24	4.77	3.497	IO	|	|	|	2.00
21.417	1.23	4.73	3.473	IO	|	|	|	1.99
21.500	1.21	4.68	3.449	IO	|	|	|	1.98
21.583	1.20	4.64	3.425	IO	|	|	|	1.97
21.667	1.19	4.60	3.401	IO	|	|	|	1.95
21.750	1.18	4.55	3.378	IO	|	|	|	1.94
21.833	1.17	4.51	3.355	IO	|	|	|	1.93
21.917	1.16	4.47	3.332	IO	|	|	|	1.91
22.000	1.14	4.42	3.309	IO	|	|	|	1.90
22.083	1.13	4.38	3.287	IO	|	|	|	1.89
22.167	1.12	4.34	3.264	IO	|	|	|	1.88
22.250	1.11	4.30	3.242	IO	|	|	|	1.87
22.333	1.10	4.26	3.221	IO	|	|	|	1.85
22.417	1.10	4.22	3.199	IO	|	|	|	1.84
22.500	1.09	4.18	3.178	IO	|	|	|	1.83
22.583	1.08	4.14	3.156	IO	|	|	|	1.82
22.667	1.07	4.10	3.135	IO	|	|	|	1.81
22.750	1.06	4.06	3.115	IO	|	|	|	1.80
22.833	1.05	4.02	3.094	IO	|	|	|	1.78
22.917	1.04	3.98	3.074	IO	|	|	|	1.77
23.000	1.03	3.95	3.053	IO	|	|	|	1.76

23.083	1.03	3.91	3.034	IO				1.75
23.167	1.02	3.87	3.014	IO				1.74
23.250	1.01	3.84	2.994	IO				1.73
23.333	1.00	3.80	2.975	IO				1.72
23.417	1.00	3.76	2.956	IO				1.71
23.500	0.99	3.73	2.937	IO				1.70
23.583	0.98	3.69	2.918	IO				1.69
23.667	0.97	3.66	2.899	IO				1.68
23.750	0.97	3.63	2.881	IO				1.67
23.833	0.96	3.59	2.863	IO				1.66
23.917	0.95	3.56	2.845	IO				1.65
24.000	0.95	3.52	2.827	IO				1.64
24.083	0.91	3.49	2.809	IO				1.63
24.167	0.80	3.46	2.791	IO				1.62
24.250	0.52	3.42	2.772	IO				1.61
24.333	0.31	3.38	2.751	IO				1.60
24.417	0.21	3.34	2.730	IO				1.58
24.500	0.15	3.30	2.708	IO				1.57
24.583	0.10	3.26	2.686	IO				1.56
24.667	0.07	3.22	2.665	O				1.55
24.750	0.04	3.18	2.643	O				1.54
24.833	0.03	3.14	2.622	O				1.52
24.917	0.02	3.10	2.600	O				1.51
25.000	0.01	3.06	2.579	O				1.50
25.083	0.01	3.03	2.558	O				1.49
25.167	0.01	3.00	2.538	O				1.48
25.250	0.01	2.96	2.517	O				1.47
25.333	0.00	2.93	2.497	O				1.45
25.417	0.00	2.90	2.477	O				1.44
25.500	0.00	2.87	2.457	O				1.43
25.583	0.00	2.84	2.437	O				1.42
25.667	0.00	2.81	2.418	O				1.41
25.750	0.00	2.78	2.398	O				1.40
25.833	0.00	2.75	2.379	O				1.39
25.917	0.00	2.72	2.361	O				1.38
26.000	0.00	2.69	2.342	O				1.37
26.083	0.00	2.66	2.324	O				1.36
26.167	0.00	2.63	2.305	O				1.35
26.250	0.00	2.60	2.287	O				1.34
26.333	0.00	2.58	2.269	O				1.33
26.417	0.00	2.55	2.252	O				1.32
26.500	0.00	2.52	2.234	O				1.31
26.583	0.00	2.49	2.217	O				1.30
26.667	0.00	2.47	2.200	O				1.29
26.750	0.00	2.44	2.183	O				1.28
26.833	0.00	2.41	2.166	O				1.27
26.917	0.00	2.39	2.150	O				1.26
27.000	0.00	2.36	2.133	O				1.25
27.083	0.00	2.34	2.117	O				1.24
27.167	0.00	2.31	2.101	O				1.23
27.250	0.00	2.29	2.085	O				1.22
27.333	0.00	2.26	2.070	O				1.21
27.417	0.00	2.24	2.054	O				1.20
27.500	0.00	2.21	2.039	O				1.20
27.583	0.00	2.19	2.024	O				1.19
27.667	0.00	2.17	2.009	O				1.18
27.750	0.00	2.14	1.994	O				1.17
27.833	0.00	2.12	1.979	O				1.16
27.917	0.00	2.10	1.965	O				1.15
28.000	0.00	2.08	1.950	O				1.15
28.083	0.00	2.05	1.936	O				1.14
28.167	0.00	2.03	1.922	O				1.13
28.250	0.00	2.01	1.908	O				1.12
28.333	0.00	1.99	1.894	O				1.11
28.417	0.00	1.97	1.881	O				1.11
28.500	0.00	1.95	1.867	O				1.10
28.583	0.00	1.92	1.854	O				1.09
28.667	0.00	1.90	1.841	O				1.08
28.750	0.00	1.88	1.828	O				1.08
28.833	0.00	1.86	1.815	O				1.07
28.917	0.00	1.84	1.802	O				1.06

29.000	0.00	1.82	1.789	O	|	|	|	|	1.05
29.083	0.00	1.80	1.777	O	|	|	|	|	1.05
29.167	0.00	1.78	1.765	O	|	|	|	|	1.04
29.250	0.00	1.77	1.752	O	|	|	|	|	1.03
29.333	0.00	1.75	1.740	O	|	|	|	|	1.03
29.417	0.00	1.73	1.728	O	|	|	|	|	1.02
29.500	0.00	1.71	1.716	O	|	|	|	|	1.01
29.583	0.00	1.69	1.705	O	|	|	|	|	1.01
29.667	0.00	1.67	1.693	O	|	|	|	|	1.00
29.750	0.00	1.66	1.682	O	|	|	|	|	0.99
29.833	0.00	1.65	1.670	O	|	|	|	|	0.99
29.917	0.00	1.63	1.659	O	|	|	|	|	0.98
30.000	0.00	1.62	1.648	O	|	|	|	|	0.97
30.083	0.00	1.61	1.637	O	|	|	|	|	0.97
30.167	0.00	1.60	1.626	O	|	|	|	|	0.96
30.250	0.00	1.58	1.615	O	|	|	|	|	0.95
30.333	0.00	1.57	1.604	O	|	|	|	|	0.95
30.417	0.00	1.56	1.593	O	|	|	|	|	0.94
30.500	0.00	1.55	1.582	O	|	|	|	|	0.94
30.583	0.00	1.53	1.572	O	|	|	|	|	0.93
30.667	0.00	1.52	1.561	O	|	|	|	|	0.92
30.750	0.00	1.51	1.551	O	|	|	|	|	0.92
30.833	0.00	1.50	1.540	O	|	|	|	|	0.91
30.917	0.00	1.49	1.530	O	|	|	|	|	0.91
31.000	0.00	1.47	1.520	O	|	|	|	|	0.90
31.083	0.00	1.46	1.510	O	|	|	|	|	0.89
31.167	0.00	1.45	1.500	O	|	|	|	|	0.89
31.250	0.00	1.44	1.490	O	|	|	|	|	0.88
31.333	0.00	1.43	1.480	O	|	|	|	|	0.88
31.417	0.00	1.42	1.470	O	|	|	|	|	0.87
31.500	0.00	1.41	1.460	O	|	|	|	|	0.86
31.583	0.00	1.40	1.451	O	|	|	|	|	0.86
31.667	0.00	1.38	1.441	O	|	|	|	|	0.85
31.750	0.00	1.37	1.432	O	|	|	|	|	0.85
31.833	0.00	1.36	1.422	O	|	|	|	|	0.84
31.917	0.00	1.35	1.413	O	|	|	|	|	0.84
32.000	0.00	1.34	1.404	O	|	|	|	|	0.83
32.083	0.00	1.33	1.394	O	|	|	|	|	0.83
32.167	0.00	1.32	1.385	O	|	|	|	|	0.82
32.250	0.00	1.31	1.376	O	|	|	|	|	0.82
32.333	0.00	1.30	1.367	O	|	|	|	|	0.81
32.417	0.00	1.29	1.358	O	|	|	|	|	0.81
32.500	0.00	1.28	1.350	O	|	|	|	|	0.80
32.583	0.00	1.27	1.341	O	|	|	|	|	0.79
32.667	0.00	1.26	1.332	O	|	|	|	|	0.79
32.750	0.00	1.25	1.323	O	|	|	|	|	0.78
32.833	0.00	1.24	1.315	O	|	|	|	|	0.78
32.917	0.00	1.23	1.306	O	|	|	|	|	0.77
33.000	0.00	1.22	1.298	O	|	|	|	|	0.77
33.083	0.00	1.21	1.289	O	|	|	|	|	0.77
33.167	0.00	1.20	1.281	O	|	|	|	|	0.76
33.250	0.00	1.19	1.273	O	|	|	|	|	0.76
33.333	0.00	1.18	1.265	O	|	|	|	|	0.75
33.417	0.00	1.17	1.257	O	|	|	|	|	0.75
33.500	0.00	1.16	1.249	O	|	|	|	|	0.74
33.583	0.00	1.16	1.241	O	|	|	|	|	0.74
33.667	0.00	1.15	1.233	O	|	|	|	|	0.73
33.750	0.00	1.14	1.225	O	|	|	|	|	0.73
33.833	0.00	1.13	1.217	O	|	|	|	|	0.72
33.917	0.00	1.12	1.209	O	|	|	|	|	0.72
34.000	0.00	1.11	1.202	O	|	|	|	|	0.71
34.083	0.00	1.10	1.194	O	|	|	|	|	0.71
34.167	0.00	1.09	1.186	O	|	|	|	|	0.71
34.250	0.00	1.09	1.179	O	|	|	|	|	0.70
34.333	0.00	1.08	1.171	O	|	|	|	|	0.70
34.417	0.00	1.07	1.164	O	|	|	|	|	0.69
34.500	0.00	1.06	1.157	O	|	|	|	|	0.69
34.583	0.00	1.05	1.149	O	|	|	|	|	0.68
34.667	0.00	1.04	1.142	O	|	|	|	|	0.68
34.750	0.00	1.04	1.135	O	|	|	|	|	0.68
34.833	0.00	1.03	1.128	O	|	|	|	|	0.67

34.917	0.00	1.02	1.121	O	|	|	|	0.67
35.000	0.00	1.01	1.114	O	|	|	|	0.66
35.083	0.00	1.00	1.107	O	|	|	|	0.66
35.167	0.00	1.00	1.100	O	|	|	|	0.65
35.250	0.00	0.99	1.093	O	|	|	|	0.65
35.333	0.00	0.98	1.086	O	|	|	|	0.65
35.417	0.00	0.97	1.080	O	|	|	|	0.64
35.500	0.00	0.96	1.073	O	|	|	|	0.64
35.583	0.00	0.96	1.066	O	|	|	|	0.64
35.667	0.00	0.95	1.060	O	|	|	|	0.63
35.750	0.00	0.94	1.053	O	|	|	|	0.63
35.833	0.00	0.93	1.047	O	|	|	|	0.62
35.917	0.00	0.93	1.040	O	|	|	|	0.62
36.000	0.00	0.92	1.034	O	|	|	|	0.62
36.083	0.00	0.91	1.028	O	|	|	|	0.61
36.167	0.00	0.91	1.022	O	|	|	|	0.61
36.250	0.00	0.90	1.015	O	|	|	|	0.61
36.333	0.00	0.89	1.009	O	|	|	|	0.60
36.417	0.00	0.88	1.003	O	|	|	|	0.60
36.500	0.00	0.88	0.997	O	|	|	|	0.59
36.583	0.00	0.87	0.991	O	|	|	|	0.59
36.667	0.00	0.86	0.985	O	|	|	|	0.59
36.750	0.00	0.86	0.979	O	|	|	|	0.58
36.833	0.00	0.85	0.973	O	|	|	|	0.58
36.917	0.00	0.84	0.967	O	|	|	|	0.58
37.000	0.00	0.84	0.962	O	|	|	|	0.57
37.083	0.00	0.83	0.956	O	|	|	|	0.57
37.167	0.00	0.82	0.950	O	|	|	|	0.57
37.250	0.00	0.82	0.944	O	|	|	|	0.56
37.333	0.00	0.81	0.939	O	|	|	|	0.56
37.417	0.00	0.81	0.933	O	|	|	|	0.56
37.500	0.00	0.80	0.928	O	|	|	|	0.55
37.583	0.00	0.79	0.922	O	|	|	|	0.55
37.667	0.00	0.79	0.917	O	|	|	|	0.55
37.750	0.00	0.78	0.911	O	|	|	|	0.55
37.833	0.00	0.77	0.906	O	|	|	|	0.54
37.917	0.00	0.77	0.901	O	|	|	|	0.54
38.000	0.00	0.76	0.895	O	|	|	|	0.54
38.083	0.00	0.76	0.890	O	|	|	|	0.53
38.167	0.00	0.75	0.885	O	|	|	|	0.53
38.250	0.00	0.74	0.880	O	|	|	|	0.53
38.333	0.00	0.74	0.875	O	|	|	|	0.52
38.417	0.00	0.73	0.870	O	|	|	|	0.52
38.500	0.00	0.73	0.865	O	|	|	|	0.52
38.583	0.00	0.72	0.860	O	|	|	|	0.51
38.667	0.00	0.72	0.855	O	|	|	|	0.51
38.750	0.00	0.71	0.850	O	|	|	|	0.51
38.833	0.00	0.70	0.845	O	|	|	|	0.51
38.917	0.00	0.70	0.840	O	|	|	|	0.50
39.000	0.00	0.69	0.835	O	|	|	|	0.50
39.083	0.00	0.69	0.831	O	|	|	|	0.50
39.167	0.00	0.69	0.826	O	|	|	|	0.50
39.250	0.00	0.68	0.821	O	|	|	|	0.49
39.333	0.00	0.68	0.817	O	|	|	|	0.49
39.417	0.00	0.67	0.812	O	|	|	|	0.49
39.500	0.00	0.67	0.807	O	|	|	|	0.48
39.583	0.00	0.67	0.803	O	|	|	|	0.48
39.667	0.00	0.66	0.798	O	|	|	|	0.48
39.750	0.00	0.66	0.794	O	|	|	|	0.48
39.833	0.00	0.65	0.789	O	|	|	|	0.47
39.917	0.00	0.65	0.784	O	|	|	|	0.47
40.000	0.00	0.65	0.780	O	|	|	|	0.47
40.083	0.00	0.64	0.776	O	|	|	|	0.46
40.167	0.00	0.64	0.771	O	|	|	|	0.46
40.250	0.00	0.64	0.767	O	|	|	|	0.46
40.333	0.00	0.63	0.762	O	|	|	|	0.46
40.417	0.00	0.63	0.758	O	|	|	|	0.45
40.500	0.00	0.63	0.754	O	|	|	|	0.45
40.583	0.00	0.62	0.749	O	|	|	|	0.45
40.667	0.00	0.62	0.745	O	|	|	|	0.45
40.750	0.00	0.61	0.741	O	|	|	|	0.44

40.833	0.00	0.61	0.737	O	|	|	|	|	0.44
40.917	0.00	0.61	0.732	O	|	|	|	|	0.44
41.000	0.00	0.60	0.728	O	|	|	|	|	0.44
41.083	0.00	0.60	0.724	O	|	|	|	|	0.43
41.167	0.00	0.60	0.720	O	|	|	|	|	0.43
41.250	0.00	0.59	0.716	O	|	|	|	|	0.43
41.333	0.00	0.59	0.712	O	|	|	|	|	0.43
41.417	0.00	0.59	0.708	O	|	|	|	|	0.42
41.500	0.00	0.58	0.704	O	|	|	|	|	0.42
41.583	0.00	0.58	0.700	O	|	|	|	|	0.42
41.667	0.00	0.58	0.696	O	|	|	|	|	0.42
41.750	0.00	0.57	0.692	O	|	|	|	|	0.41
41.833	0.00	0.57	0.688	O	|	|	|	|	0.41
41.917	0.00	0.57	0.684	O	|	|	|	|	0.41
42.000	0.00	0.56	0.680	O	|	|	|	|	0.41
42.083	0.00	0.56	0.676	O	|	|	|	|	0.41
42.167	0.00	0.56	0.672	O	|	|	|	|	0.40
42.250	0.00	0.55	0.668	O	|	|	|	|	0.40
42.333	0.00	0.55	0.665	O	|	|	|	|	0.40
42.417	0.00	0.55	0.661	O	|	|	|	|	0.40
42.500	0.00	0.55	0.657	O	|	|	|	|	0.39
42.583	0.00	0.54	0.653	O	|	|	|	|	0.39
42.667	0.00	0.54	0.650	O	|	|	|	|	0.39
42.750	0.00	0.54	0.646	O	|	|	|	|	0.39
42.833	0.00	0.53	0.642	O	|	|	|	|	0.39
42.917	0.00	0.53	0.639	O	|	|	|	|	0.38
43.000	0.00	0.53	0.635	O	|	|	|	|	0.38
43.083	0.00	0.52	0.631	O	|	|	|	|	0.38
43.167	0.00	0.52	0.628	O	|	|	|	|	0.38
43.250	0.00	0.52	0.624	O	|	|	|	|	0.37
43.333	0.00	0.51	0.621	O	|	|	|	|	0.37
43.417	0.00	0.51	0.617	O	|	|	|	|	0.37
43.500	0.00	0.51	0.614	O	|	|	|	|	0.37
43.583	0.00	0.51	0.610	O	|	|	|	|	0.37
43.667	0.00	0.50	0.607	O	|	|	|	|	0.36
43.750	0.00	0.50	0.603	O	|	|	|	|	0.36
43.833	0.00	0.50	0.600	O	|	|	|	|	0.36
43.917	0.00	0.49	0.596	O	|	|	|	|	0.36
44.000	0.00	0.49	0.593	O	|	|	|	|	0.36
44.083	0.00	0.49	0.590	O	|	|	|	|	0.35
44.167	0.00	0.49	0.586	O	|	|	|	|	0.35
44.250	0.00	0.48	0.583	O	|	|	|	|	0.35
44.333	0.00	0.48	0.579	O	|	|	|	|	0.35
44.417	0.00	0.48	0.576	O	|	|	|	|	0.35
44.500	0.00	0.48	0.573	O	|	|	|	|	0.34
44.583	0.00	0.47	0.570	O	|	|	|	|	0.34
44.667	0.00	0.47	0.566	O	|	|	|	|	0.34
44.750	0.00	0.47	0.563	O	|	|	|	|	0.34
44.833	0.00	0.46	0.560	O	|	|	|	|	0.34
44.917	0.00	0.46	0.557	O	|	|	|	|	0.33
45.000	0.00	0.46	0.554	O	|	|	|	|	0.33
45.083	0.00	0.46	0.550	O	|	|	|	|	0.33
45.167	0.00	0.45	0.547	O	|	|	|	|	0.33
45.250	0.00	0.45	0.544	O	|	|	|	|	0.33
45.333	0.00	0.45	0.541	O	|	|	|	|	0.32
45.417	0.00	0.45	0.538	O	|	|	|	|	0.32
45.500	0.00	0.44	0.535	O	|	|	|	|	0.32
45.583	0.00	0.44	0.532	O	|	|	|	|	0.32
45.667	0.00	0.44	0.529	O	|	|	|	|	0.32
45.750	0.00	0.44	0.526	O	|	|	|	|	0.32
45.833	0.00	0.43	0.523	O	|	|	|	|	0.31
45.917	0.00	0.43	0.520	O	|	|	|	|	0.31
46.000	0.00	0.43	0.517	O	|	|	|	|	0.31
46.083	0.00	0.43	0.514	O	|	|	|	|	0.31
46.167	0.00	0.42	0.511	O	|	|	|	|	0.31
46.250	0.00	0.42	0.508	O	|	|	|	|	0.30
46.333	0.00	0.42	0.505	O	|	|	|	|	0.30
46.417	0.00	0.42	0.502	O	|	|	|	|	0.30
46.500	0.00	0.41	0.499	O	|	|	|	|	0.30
46.583	0.00	0.41	0.497	O	|	|	|	|	0.30
46.667	0.00	0.41	0.494	O	|	|	|	|	0.30

46.750	0.00	0.41	0.491	O	|	|	|	0.29
46.833	0.00	0.41	0.488	O	|	|	|	0.29
46.917	0.00	0.40	0.485	O	|	|	|	0.29
47.000	0.00	0.40	0.483	O	|	|	|	0.29
47.083	0.00	0.40	0.480	O	|	|	|	0.29
47.167	0.00	0.40	0.477	O	|	|	|	0.29
47.250	0.00	0.39	0.474	O	|	|	|	0.28
47.333	0.00	0.39	0.472	O	|	|	|	0.28
47.417	0.00	0.39	0.469	O	|	|	|	0.28
47.500	0.00	0.39	0.466	O	|	|	|	0.28
47.583	0.00	0.38	0.464	O	|	|	|	0.28
47.667	0.00	0.38	0.461	O	|	|	|	0.28
47.750	0.00	0.38	0.458	O	|	|	|	0.27
47.833	0.00	0.38	0.456	O	|	|	|	0.27
47.917	0.00	0.38	0.453	O	|	|	|	0.27
48.000	0.00	0.37	0.451	O	|	|	|	0.27
48.083	0.00	0.37	0.448	O	|	|	|	0.27
48.167	0.00	0.37	0.446	O	|	|	|	0.27
48.250	0.00	0.37	0.443	O	|	|	|	0.27
48.333	0.00	0.37	0.440	O	|	|	|	0.26
48.417	0.00	0.36	0.438	O	|	|	|	0.26
48.500	0.00	0.36	0.435	O	|	|	|	0.26
48.583	0.00	0.36	0.433	O	|	|	|	0.26
48.667	0.00	0.36	0.431	O	|	|	|	0.26
48.750	0.00	0.36	0.428	O	|	|	|	0.26
48.833	0.00	0.35	0.426	O	|	|	|	0.26
48.917	0.00	0.35	0.423	O	|	|	|	0.25
49.000	0.00	0.35	0.421	O	|	|	|	0.25
49.083	0.00	0.35	0.418	O	|	|	|	0.25
49.167	0.00	0.35	0.416	O	|	|	|	0.25
49.250	0.00	0.34	0.414	O	|	|	|	0.25
49.333	0.00	0.34	0.411	O	|	|	|	0.25
49.417	0.00	0.34	0.409	O	|	|	|	0.25
49.500	0.00	0.34	0.407	O	|	|	|	0.24
49.583	0.00	0.34	0.404	O	|	|	|	0.24
49.667	0.00	0.33	0.402	O	|	|	|	0.24
49.750	0.00	0.33	0.400	O	|	|	|	0.24
49.833	0.00	0.33	0.397	O	|	|	|	0.24
49.917	0.00	0.33	0.395	O	|	|	|	0.24
50.000	0.00	0.33	0.393	O	|	|	|	0.24
50.083	0.00	0.32	0.391	O	|	|	|	0.23
50.167	0.00	0.32	0.388	O	|	|	|	0.23
50.250	0.00	0.32	0.386	O	|	|	|	0.23
50.333	0.00	0.32	0.384	O	|	|	|	0.23
50.417	0.00	0.32	0.382	O	|	|	|	0.23
50.500	0.00	0.32	0.380	O	|	|	|	0.23
50.583	0.00	0.31	0.378	O	|	|	|	0.23
50.667	0.00	0.31	0.375	O	|	|	|	0.23
50.750	0.00	0.31	0.373	O	|	|	|	0.22
50.833	0.00	0.31	0.371	O	|	|	|	0.22
50.917	0.00	0.31	0.369	O	|	|	|	0.22
51.000	0.00	0.30	0.367	O	|	|	|	0.22
51.083	0.00	0.30	0.365	O	|	|	|	0.22
51.167	0.00	0.30	0.363	O	|	|	|	0.22
51.250	0.00	0.30	0.361	O	|	|	|	0.22
51.333	0.00	0.30	0.359	O	|	|	|	0.21
51.417	0.00	0.30	0.357	O	|	|	|	0.21
51.500	0.00	0.29	0.355	O	|	|	|	0.21
51.583	0.00	0.29	0.352	O	|	|	|	0.21
51.667	0.00	0.29	0.350	O	|	|	|	0.21
51.750	0.00	0.29	0.348	O	|	|	|	0.21
51.833	0.00	0.29	0.346	O	|	|	|	0.21
51.917	0.00	0.29	0.345	O	|	|	|	0.21
52.000	0.00	0.28	0.343	O	|	|	|	0.21
52.083	0.00	0.28	0.341	O	|	|	|	0.20
52.167	0.00	0.28	0.339	O	|	|	|	0.20
52.250	0.00	0.28	0.337	O	|	|	|	0.20
52.333	0.00	0.28	0.335	O	|	|	|	0.20
52.417	0.00	0.28	0.333	O	|	|	|	0.20
52.500	0.00	0.27	0.331	O	|	|	|	0.20
52.583	0.00	0.27	0.329	O	|	|	|	0.20

52.667	0.00	0.27	0.327	O	|	|	|	0.20
52.750	0.00	0.27	0.325	O	|	|	|	0.20
52.833	0.00	0.27	0.324	O	|	|	|	0.19
52.917	0.00	0.27	0.322	O	|	|	|	0.19
53.000	0.00	0.27	0.320	O	|	|	|	0.19
53.083	0.00	0.26	0.318	O	|	|	|	0.19
53.167	0.00	0.26	0.316	O	|	|	|	0.19
53.250	0.00	0.26	0.314	O	|	|	|	0.19
53.333	0.00	0.26	0.313	O	|	|	|	0.19
53.417	0.00	0.26	0.311	O	|	|	|	0.19
53.500	0.00	0.26	0.309	O	|	|	|	0.19
53.583	0.00	0.25	0.307	O	|	|	|	0.18
53.667	0.00	0.25	0.306	O	|	|	|	0.18
53.750	0.00	0.25	0.304	O	|	|	|	0.18
53.833	0.00	0.25	0.302	O	|	|	|	0.18
53.917	0.00	0.25	0.300	O	|	|	|	0.18
54.000	0.00	0.25	0.299	O	|	|	|	0.18
54.083	0.00	0.25	0.297	O	|	|	|	0.18
54.167	0.00	0.24	0.295	O	|	|	|	0.18
54.250	0.00	0.24	0.294	O	|	|	|	0.18
54.333	0.00	0.24	0.292	O	|	|	|	0.18
54.417	0.00	0.24	0.290	O	|	|	|	0.17
54.500	0.00	0.24	0.289	O	|	|	|	0.17
54.583	0.00	0.24	0.287	O	|	|	|	0.17
54.667	0.00	0.24	0.285	O	|	|	|	0.17
54.750	0.00	0.24	0.284	O	|	|	|	0.17
54.833	0.00	0.23	0.282	O	|	|	|	0.17
54.917	0.00	0.23	0.280	O	|	|	|	0.17
55.000	0.00	0.23	0.279	O	|	|	|	0.17
55.083	0.00	0.23	0.277	O	|	|	|	0.17
55.167	0.00	0.23	0.276	O	|	|	|	0.17
55.250	0.00	0.23	0.274	O	|	|	|	0.16
55.333	0.00	0.23	0.273	O	|	|	|	0.16
55.417	0.00	0.22	0.271	O	|	|	|	0.16
55.500	0.00	0.22	0.269	O	|	|	|	0.16
55.583	0.00	0.22	0.268	O	|	|	|	0.16
55.667	0.00	0.22	0.266	O	|	|	|	0.16
55.750	0.00	0.22	0.265	O	|	|	|	0.16
55.833	0.00	0.22	0.263	O	|	|	|	0.16
55.917	0.00	0.22	0.262	O	|	|	|	0.16
56.000	0.00	0.22	0.260	O	|	|	|	0.16
56.083	0.00	0.21	0.259	O	|	|	|	0.16
56.167	0.00	0.21	0.257	O	|	|	|	0.15
56.250	0.00	0.21	0.256	O	|	|	|	0.15
56.333	0.00	0.21	0.254	O	|	|	|	0.15
56.417	0.00	0.21	0.253	O	|	|	|	0.15
56.500	0.00	0.21	0.252	O	|	|	|	0.15
56.583	0.00	0.21	0.250	O	|	|	|	0.15
56.667	0.00	0.21	0.249	O	|	|	|	0.15
56.750	0.00	0.21	0.247	O	|	|	|	0.15
56.833	0.00	0.20	0.246	O	|	|	|	0.15
56.917	0.00	0.20	0.245	O	|	|	|	0.15
57.000	0.00	0.20	0.243	O	|	|	|	0.15
57.083	0.00	0.20	0.242	O	|	|	|	0.14
57.167	0.00	0.20	0.240	O	|	|	|	0.14
57.250	0.00	0.20	0.239	O	|	|	|	0.14
57.333	0.00	0.20	0.238	O	|	|	|	0.14
57.417	0.00	0.20	0.236	O	|	|	|	0.14
57.500	0.00	0.19	0.235	O	|	|	|	0.14
57.583	0.00	0.19	0.234	O	|	|	|	0.14
57.667	0.00	0.19	0.232	O	|	|	|	0.14
57.750	0.00	0.19	0.231	O	|	|	|	0.14
57.833	0.00	0.19	0.230	O	|	|	|	0.14
57.917	0.00	0.19	0.228	O	|	|	|	0.14
58.000	0.00	0.19	0.227	O	|	|	|	0.14
58.083	0.00	0.19	0.226	O	|	|	|	0.14
58.167	0.00	0.19	0.224	O	|	|	|	0.13
58.250	0.00	0.19	0.223	O	|	|	|	0.13
58.333	0.00	0.18	0.222	O	|	|	|	0.13
58.417	0.00	0.18	0.221	O	|	|	|	0.13
58.500	0.00	0.18	0.219	O	|	|	|	0.13

58.583	0.00	0.18	0.218	O	|	|	|	0.13
58.667	0.00	0.18	0.217	O	|	|	|	0.13
58.750	0.00	0.18	0.216	O	|	|	|	0.13
58.833	0.00	0.18	0.214	O	|	|	|	0.13
58.917	0.00	0.18	0.213	O	|	|	|	0.13
59.000	0.00	0.18	0.212	O	|	|	|	0.13
59.083	0.00	0.17	0.211	O	|	|	|	0.13
59.167	0.00	0.17	0.210	O	|	|	|	0.13
59.250	0.00	0.17	0.208	O	|	|	|	0.12
59.333	0.00	0.17	0.207	O	|	|	|	0.12
59.417	0.00	0.17	0.206	O	|	|	|	0.12
59.500	0.00	0.17	0.205	O	|	|	|	0.12
59.583	0.00	0.17	0.204	O	|	|	|	0.12
59.667	0.00	0.17	0.202	O	|	|	|	0.12
59.750	0.00	0.17	0.201	O	|	|	|	0.12
59.833	0.00	0.17	0.200	O	|	|	|	0.12
59.917	0.00	0.17	0.199	O	|	|	|	0.12
60.000	0.00	0.16	0.198	O	|	|	|	0.12
60.083	0.00	0.16	0.197	O	|	|	|	0.12
60.167	0.00	0.16	0.196	O	|	|	|	0.12
60.250	0.00	0.16	0.195	O	|	|	|	0.12
60.333	0.00	0.16	0.193	O	|	|	|	0.12
60.417	0.00	0.16	0.192	O	|	|	|	0.12
60.500	0.00	0.16	0.191	O	|	|	|	0.11
60.583	0.00	0.16	0.190	O	|	|	|	0.11
60.667	0.00	0.16	0.189	O	|	|	|	0.11
60.750	0.00	0.16	0.188	O	|	|	|	0.11
60.833	0.00	0.16	0.187	O	|	|	|	0.11
60.917	0.00	0.15	0.186	O	|	|	|	0.11
61.000	0.00	0.15	0.185	O	|	|	|	0.11
61.083	0.00	0.15	0.184	O	|	|	|	0.11
61.167	0.00	0.15	0.183	O	|	|	|	0.11
61.250	0.00	0.15	0.182	O	|	|	|	0.11
61.333	0.00	0.15	0.181	O	|	|	|	0.11
61.417	0.00	0.15	0.180	O	|	|	|	0.11
61.500	0.00	0.15	0.179	O	|	|	|	0.11
61.583	0.00	0.15	0.178	O	|	|	|	0.11
61.667	0.00	0.15	0.177	O	|	|	|	0.11
61.750	0.00	0.15	0.176	O	|	|	|	0.11
61.833	0.00	0.14	0.175	O	|	|	|	0.10
61.917	0.00	0.14	0.174	O	|	|	|	0.10
62.000	0.00	0.14	0.173	O	|	|	|	0.10
62.083	0.00	0.14	0.172	O	|	|	|	0.10
62.167	0.00	0.14	0.171	O	|	|	|	0.10
62.250	0.00	0.14	0.170	O	|	|	|	0.10
62.333	0.00	0.14	0.169	O	|	|	|	0.10
62.417	0.00	0.14	0.168	O	|	|	|	0.10
62.500	0.00	0.14	0.167	O	|	|	|	0.10
62.583	0.00	0.14	0.166	O	|	|	|	0.10
62.667	0.00	0.14	0.165	O	|	|	|	0.10
62.750	0.00	0.14	0.164	O	|	|	|	0.10
62.833	0.00	0.14	0.163	O	|	|	|	0.10
62.917	0.00	0.13	0.162	O	|	|	|	0.10
63.000	0.00	0.13	0.161	O	|	|	|	0.10
63.083	0.00	0.13	0.160	O	|	|	|	0.10
63.167	0.00	0.13	0.159	O	|	|	|	0.10
63.250	0.00	0.13	0.158	O	|	|	|	0.09
63.333	0.00	0.13	0.157	O	|	|	|	0.09
63.417	0.00	0.13	0.157	O	|	|	|	0.09
63.500	0.00	0.13	0.156	O	|	|	|	0.09
63.583	0.00	0.13	0.155	O	|	|	|	0.09
63.667	0.00	0.13	0.154	O	|	|	|	0.09
63.750	0.00	0.13	0.153	O	|	|	|	0.09
63.833	0.00	0.13	0.152	O	|	|	|	0.09
63.917	0.00	0.13	0.151	O	|	|	|	0.09
64.000	0.00	0.12	0.150	O	|	|	|	0.09
64.083	0.00	0.12	0.150	O	|	|	|	0.09
64.167	0.00	0.12	0.149	O	|	|	|	0.09
64.250	0.00	0.12	0.148	O	|	|	|	0.09
64.333	0.00	0.12	0.147	O	|	|	|	0.09
64.417	0.00	0.12	0.146	O	|	|	|	0.09

64.500	0.00	0.12	0.145	O	|	|	|	|	0.09
64.583	0.00	0.12	0.145	O	|	|	|	|	0.09
64.667	0.00	0.12	0.144	O	|	|	|	|	0.09
64.750	0.00	0.12	0.143	O	|	|	|	|	0.09
64.833	0.00	0.12	0.142	O	|	|	|	|	0.09
64.917	0.00	0.12	0.141	O	|	|	|	|	0.08
65.000	0.00	0.12	0.140	O	|	|	|	|	0.08
65.083	0.00	0.12	0.140	O	|	|	|	|	0.08
65.167	0.00	0.12	0.139	O	|	|	|	|	0.08
65.250	0.00	0.11	0.138	O	|	|	|	|	0.08
65.333	0.00	0.11	0.137	O	|	|	|	|	0.08
65.417	0.00	0.11	0.137	O	|	|	|	|	0.08
65.500	0.00	0.11	0.136	O	|	|	|	|	0.08
65.583	0.00	0.11	0.135	O	|	|	|	|	0.08
65.667	0.00	0.11	0.134	O	|	|	|	|	0.08
65.750	0.00	0.11	0.133	O	|	|	|	|	0.08
65.833	0.00	0.11	0.133	O	|	|	|	|	0.08
65.917	0.00	0.11	0.132	O	|	|	|	|	0.08
66.000	0.00	0.11	0.131	O	|	|	|	|	0.08
66.083	0.00	0.11	0.130	O	|	|	|	|	0.08
66.167	0.00	0.11	0.130	O	|	|	|	|	0.08
66.250	0.00	0.11	0.129	O	|	|	|	|	0.08
66.333	0.00	0.11	0.128	O	|	|	|	|	0.08
66.417	0.00	0.11	0.127	O	|	|	|	|	0.08
66.500	0.00	0.11	0.127	O	|	|	|	|	0.08
66.583	0.00	0.10	0.126	O	|	|	|	|	0.08
66.667	0.00	0.10	0.125	O	|	|	|	|	0.08
66.750	0.00	0.10	0.125	O	|	|	|	|	0.07
66.833	0.00	0.10	0.124	O	|	|	|	|	0.07
66.917	0.00	0.10	0.123	O	|	|	|	|	0.07
67.000	0.00	0.10	0.122	O	|	|	|	|	0.07
67.083	0.00	0.10	0.122	O	|	|	|	|	0.07
67.167	0.00	0.10	0.121	O	|	|	|	|	0.07
67.250	0.00	0.10	0.120	O	|	|	|	|	0.07
67.333	0.00	0.10	0.120	O	|	|	|	|	0.07
67.417	0.00	0.10	0.119	O	|	|	|	|	0.07
67.500	0.00	0.10	0.118	O	|	|	|	|	0.07
67.583	0.00	0.10	0.118	O	|	|	|	|	0.07
67.667	0.00	0.10	0.117	O	|	|	|	|	0.07
67.750	0.00	0.10	0.116	O	|	|	|	|	0.07
67.833	0.00	0.10	0.116	O	|	|	|	|	0.07
67.917	0.00	0.10	0.115	O	|	|	|	|	0.07
68.000	0.00	0.09	0.114	O	|	|	|	|	0.07
68.083	0.00	0.09	0.114	O	|	|	|	|	0.07
68.167	0.00	0.09	0.113	O	|	|	|	|	0.07
68.250	0.00	0.09	0.112	O	|	|	|	|	0.07
68.333	0.00	0.09	0.112	O	|	|	|	|	0.07
68.417	0.00	0.09	0.111	O	|	|	|	|	0.07
68.500	0.00	0.09	0.110	O	|	|	|	|	0.07
68.583	0.00	0.09	0.110	O	|	|	|	|	0.07
68.667	0.00	0.09	0.109	O	|	|	|	|	0.07
68.750	0.00	0.09	0.109	O	|	|	|	|	0.07
68.833	0.00	0.09	0.108	O	|	|	|	|	0.06
68.917	0.00	0.09	0.107	O	|	|	|	|	0.06
69.000	0.00	0.09	0.107	O	|	|	|	|	0.06
69.083	0.00	0.09	0.106	O	|	|	|	|	0.06
69.167	0.00	0.09	0.106	O	|	|	|	|	0.06
69.250	0.00	0.09	0.105	O	|	|	|	|	0.06
69.333	0.00	0.09	0.104	O	|	|	|	|	0.06
69.417	0.00	0.09	0.104	O	|	|	|	|	0.06
69.500	0.00	0.09	0.103	O	|	|	|	|	0.06
69.583	0.00	0.09	0.103	O	|	|	|	|	0.06
69.667	0.00	0.08	0.102	O	|	|	|	|	0.06
69.750	0.00	0.08	0.101	O	|	|	|	|	0.06
69.833	0.00	0.08	0.101	O	|	|	|	|	0.06
69.917	0.00	0.08	0.100	O	|	|	|	|	0.06
70.000	0.00	0.08	0.100	O	|	|	|	|	0.06
70.083	0.00	0.08	0.099	O	|	|	|	|	0.06
70.167	0.00	0.08	0.099	O	|	|	|	|	0.06
70.250	0.00	0.08	0.098	O	|	|	|	|	0.06
70.333	0.00	0.08	0.097	O	|	|	|	|	0.06

70.417	0.00	0.08	0.097	O	|	|	|	0.06
70.500	0.00	0.08	0.096	O	|	|	|	0.06
70.583	0.00	0.08	0.096	O	|	|	|	0.06
70.667	0.00	0.08	0.095	O	|	|	|	0.06
70.750	0.00	0.08	0.095	O	|	|	|	0.06
70.833	0.00	0.08	0.094	O	|	|	|	0.06
70.917	0.00	0.08	0.094	O	|	|	|	0.06
71.000	0.00	0.08	0.093	O	|	|	|	0.06
71.083	0.00	0.08	0.093	O	|	|	|	0.06
71.167	0.00	0.08	0.092	O	|	|	|	0.06
71.250	0.00	0.08	0.092	O	|	|	|	0.05
71.333	0.00	0.08	0.091	O	|	|	|	0.05
71.417	0.00	0.08	0.090	O	|	|	|	0.05
71.500	0.00	0.07	0.090	O	|	|	|	0.05
71.583	0.00	0.07	0.089	O	|	|	|	0.05
71.667	0.00	0.07	0.089	O	|	|	|	0.05
71.750	0.00	0.07	0.088	O	|	|	|	0.05
71.833	0.00	0.07	0.088	O	|	|	|	0.05
71.917	0.00	0.07	0.087	O	|	|	|	0.05
72.000	0.00	0.07	0.087	O	|	|	|	0.05
72.083	0.00	0.07	0.086	O	|	|	|	0.05
72.167	0.00	0.07	0.086	O	|	|	|	0.05
72.250	0.00	0.07	0.085	O	|	|	|	0.05
72.333	0.00	0.07	0.085	O	|	|	|	0.05
72.417	0.00	0.07	0.084	O	|	|	|	0.05
72.500	0.00	0.07	0.084	O	|	|	|	0.05
72.583	0.00	0.07	0.084	O	|	|	|	0.05
72.667	0.00	0.07	0.083	O	|	|	|	0.05
72.750	0.00	0.07	0.083	O	|	|	|	0.05
72.833	0.00	0.07	0.082	O	|	|	|	0.05
72.917	0.00	0.07	0.082	O	|	|	|	0.05
73.000	0.00	0.07	0.081	O	|	|	|	0.05
73.083	0.00	0.07	0.081	O	|	|	|	0.05
73.167	0.00	0.07	0.080	O	|	|	|	0.05
73.250	0.00	0.07	0.080	O	|	|	|	0.05
73.333	0.00	0.07	0.079	O	|	|	|	0.05
73.417	0.00	0.07	0.079	O	|	|	|	0.05
73.500	0.00	0.07	0.078	O	|	|	|	0.05
73.583	0.00	0.06	0.078	O	|	|	|	0.05
73.667	0.00	0.06	0.078	O	|	|	|	0.05
73.750	0.00	0.06	0.077	O	|	|	|	0.05
73.833	0.00	0.06	0.077	O	|	|	|	0.05
73.917	0.00	0.06	0.076	O	|	|	|	0.05
74.000	0.00	0.06	0.076	O	|	|	|	0.05
74.083	0.00	0.06	0.075	O	|	|	|	0.05
74.167	0.00	0.06	0.075	O	|	|	|	0.04
74.250	0.00	0.06	0.074	O	|	|	|	0.04
74.333	0.00	0.06	0.074	O	|	|	|	0.04
74.417	0.00	0.06	0.074	O	|	|	|	0.04
74.500	0.00	0.06	0.073	O	|	|	|	0.04
74.583	0.00	0.06	0.073	O	|	|	|	0.04
74.667	0.00	0.06	0.072	O	|	|	|	0.04
74.750	0.00	0.06	0.072	O	|	|	|	0.04
74.833	0.00	0.06	0.072	O	|	|	|	0.04
74.917	0.00	0.06	0.071	O	|	|	|	0.04
75.000	0.00	0.06	0.071	O	|	|	|	0.04
75.083	0.00	0.06	0.070	O	|	|	|	0.04
75.167	0.00	0.06	0.070	O	|	|	|	0.04
75.250	0.00	0.06	0.070	O	|	|	|	0.04
75.333	0.00	0.06	0.069	O	|	|	|	0.04
75.417	0.00	0.06	0.069	O	|	|	|	0.04
75.500	0.00	0.06	0.068	O	|	|	|	0.04
75.583	0.00	0.06	0.068	O	|	|	|	0.04
75.667	0.00	0.06	0.068	O	|	|	|	0.04
75.750	0.00	0.06	0.067	O	|	|	|	0.04
75.833	0.00	0.06	0.067	O	|	|	|	0.04
75.917	0.00	0.06	0.066	O	|	|	|	0.04
76.000	0.00	0.05	0.066	O	|	|	|	0.04
76.083	0.00	0.05	0.066	O	|	|	|	0.04
76.167	0.00	0.05	0.065	O	|	|	|	0.04
76.250	0.00	0.05	0.065	O	|	|	|	0.04

76.333	0.00	0.05	0.065	O	|	|	|	|	0.04
76.417	0.00	0.05	0.064	O	|	|	|	|	0.04
76.500	0.00	0.05	0.064	O	|	|	|	|	0.04
76.583	0.00	0.05	0.063	O	|	|	|	|	0.04
76.667	0.00	0.05	0.063	O	|	|	|	|	0.04
76.750	0.00	0.05	0.063	O	|	|	|	|	0.04
76.833	0.00	0.05	0.062	O	|	|	|	|	0.04
76.917	0.00	0.05	0.062	O	|	|	|	|	0.04
77.000	0.00	0.05	0.062	O	|	|	|	|	0.04
77.083	0.00	0.05	0.061	O	|	|	|	|	0.04
77.167	0.00	0.05	0.061	O	|	|	|	|	0.04
77.250	0.00	0.05	0.061	O	|	|	|	|	0.04
77.333	0.00	0.05	0.060	O	|	|	|	|	0.04
77.417	0.00	0.05	0.060	O	|	|	|	|	0.04
77.500	0.00	0.05	0.060	O	|	|	|	|	0.04
77.583	0.00	0.05	0.059	O	|	|	|	|	0.04
77.667	0.00	0.05	0.059	O	|	|	|	|	0.04
77.750	0.00	0.05	0.059	O	|	|	|	|	0.04
77.833	0.00	0.05	0.058	O	|	|	|	|	0.03
77.917	0.00	0.05	0.058	O	|	|	|	|	0.03
78.000	0.00	0.05	0.058	O	|	|	|	|	0.03
78.083	0.00	0.05	0.057	O	|	|	|	|	0.03
78.167	0.00	0.05	0.057	O	|	|	|	|	0.03
78.250	0.00	0.05	0.057	O	|	|	|	|	0.03
78.333	0.00	0.05	0.056	O	|	|	|	|	0.03
78.417	0.00	0.05	0.056	O	|	|	|	|	0.03
78.500	0.00	0.05	0.056	O	|	|	|	|	0.03
78.583	0.00	0.05	0.055	O	|	|	|	|	0.03
78.667	0.00	0.05	0.055	O	|	|	|	|	0.03
78.750	0.00	0.05	0.055	O	|	|	|	|	0.03
78.833	0.00	0.05	0.054	O	|	|	|	|	0.03
78.917	0.00	0.04	0.054	O	|	|	|	|	0.03
79.000	0.00	0.04	0.054	O	|	|	|	|	0.03
79.083	0.00	0.04	0.053	O	|	|	|	|	0.03
79.167	0.00	0.04	0.053	O	|	|	|	|	0.03
79.250	0.00	0.04	0.053	O	|	|	|	|	0.03
79.333	0.00	0.04	0.053	O	|	|	|	|	0.03
79.417	0.00	0.04	0.052	O	|	|	|	|	0.03
79.500	0.00	0.04	0.052	O	|	|	|	|	0.03
79.583	0.00	0.04	0.052	O	|	|	|	|	0.03
79.667	0.00	0.04	0.051	O	|	|	|	|	0.03
79.750	0.00	0.04	0.051	O	|	|	|	|	0.03
79.833	0.00	0.04	0.051	O	|	|	|	|	0.03
79.917	0.00	0.04	0.051	O	|	|	|	|	0.03
80.000	0.00	0.04	0.050	O	|	|	|	|	0.03
80.083	0.00	0.04	0.050	O	|	|	|	|	0.03
80.167	0.00	0.04	0.050	O	|	|	|	|	0.03
80.250	0.00	0.04	0.049	O	|	|	|	|	0.03
80.333	0.00	0.04	0.049	O	|	|	|	|	0.03
80.417	0.00	0.04	0.049	O	|	|	|	|	0.03
80.500	0.00	0.04	0.049	O	|	|	|	|	0.03
80.583	0.00	0.04	0.048	O	|	|	|	|	0.03
80.667	0.00	0.04	0.048	O	|	|	|	|	0.03
80.750	0.00	0.04	0.048	O	|	|	|	|	0.03
80.833	0.00	0.04	0.047	O	|	|	|	|	0.03
80.917	0.00	0.04	0.047	O	|	|	|	|	0.03
81.000	0.00	0.04	0.047	O	|	|	|	|	0.03
81.083	0.00	0.04	0.047	O	|	|	|	|	0.03
81.167	0.00	0.04	0.046	O	|	|	|	|	0.03
81.250	0.00	0.04	0.046	O	|	|	|	|	0.03
81.333	0.00	0.04	0.046	O	|	|	|	|	0.03
81.417	0.00	0.04	0.046	O	|	|	|	|	0.03
81.500	0.00	0.04	0.045	O	|	|	|	|	0.03
81.583	0.00	0.04	0.045	O	|	|	|	|	0.03
81.667	0.00	0.04	0.045	O	|	|	|	|	0.03
81.750	0.00	0.04	0.045	O	|	|	|	|	0.03
81.833	0.00	0.04	0.044	O	|	|	|	|	0.03
81.917	0.00	0.04	0.044	O	|	|	|	|	0.03
82.000	0.00	0.04	0.044	O	|	|	|	|	0.03
82.083	0.00	0.04	0.044	O	|	|	|	|	0.03
82.167	0.00	0.04	0.043	O	|	|	|	|	0.03

82.250	0.00	0.04	0.043	O	|	|	|	|	0.03
82.333	0.00	0.04	0.043	O	|	|	|	|	0.03
82.417	0.00	0.04	0.043	O	|	|	|	|	0.03
82.500	0.00	0.04	0.042	O	|	|	|	|	0.03
82.583	0.00	0.03	0.042	O	|	|	|	|	0.03
82.667	0.00	0.03	0.042	O	|	|	|	|	0.03
82.750	0.00	0.03	0.042	O	|	|	|	|	0.02
82.833	0.00	0.03	0.041	O	|	|	|	|	0.02
82.917	0.00	0.03	0.041	O	|	|	|	|	0.02
83.000	0.00	0.03	0.041	O	|	|	|	|	0.02
83.083	0.00	0.03	0.041	O	|	|	|	|	0.02
83.167	0.00	0.03	0.040	O	|	|	|	|	0.02
83.250	0.00	0.03	0.040	O	|	|	|	|	0.02
83.333	0.00	0.03	0.040	O	|	|	|	|	0.02
83.417	0.00	0.03	0.040	O	|	|	|	|	0.02
83.500	0.00	0.03	0.040	O	|	|	|	|	0.02
83.583	0.00	0.03	0.039	O	|	|	|	|	0.02
83.667	0.00	0.03	0.039	O	|	|	|	|	0.02
83.750	0.00	0.03	0.039	O	|	|	|	|	0.02
83.833	0.00	0.03	0.039	O	|	|	|	|	0.02
83.917	0.00	0.03	0.038	O	|	|	|	|	0.02
84.000	0.00	0.03	0.038	O	|	|	|	|	0.02
84.083	0.00	0.03	0.038	O	|	|	|	|	0.02
84.167	0.00	0.03	0.038	O	|	|	|	|	0.02
84.250	0.00	0.03	0.038	O	|	|	|	|	0.02
84.333	0.00	0.03	0.037	O	|	|	|	|	0.02
84.417	0.00	0.03	0.037	O	|	|	|	|	0.02
84.500	0.00	0.03	0.037	O	|	|	|	|	0.02
84.583	0.00	0.03	0.037	O	|	|	|	|	0.02
84.667	0.00	0.03	0.036	O	|	|	|	|	0.02
84.750	0.00	0.03	0.036	O	|	|	|	|	0.02
84.833	0.00	0.03	0.036	O	|	|	|	|	0.02
84.917	0.00	0.03	0.036	O	|	|	|	|	0.02
85.000	0.00	0.03	0.036	O	|	|	|	|	0.02
85.083	0.00	0.03	0.035	O	|	|	|	|	0.02
85.167	0.00	0.03	0.035	O	|	|	|	|	0.02
85.250	0.00	0.03	0.035	O	|	|	|	|	0.02
85.333	0.00	0.03	0.035	O	|	|	|	|	0.02
85.417	0.00	0.03	0.035	O	|	|	|	|	0.02
85.500	0.00	0.03	0.034	O	|	|	|	|	0.02
85.583	0.00	0.03	0.034	O	|	|	|	|	0.02
85.667	0.00	0.03	0.034	O	|	|	|	|	0.02
85.750	0.00	0.03	0.034	O	|	|	|	|	0.02
85.833	0.00	0.03	0.034	O	|	|	|	|	0.02
85.917	0.00	0.03	0.033	O	|	|	|	|	0.02
86.000	0.00	0.03	0.033	O	|	|	|	|	0.02
86.083	0.00	0.03	0.033	O	|	|	|	|	0.02
86.167	0.00	0.03	0.033	O	|	|	|	|	0.02
86.250	0.00	0.03	0.033	O	|	|	|	|	0.02
86.333	0.00	0.03	0.033	O	|	|	|	|	0.02
86.417	0.00	0.03	0.032	O	|	|	|	|	0.02
86.500	0.00	0.03	0.032	O	|	|	|	|	0.02
86.583	0.00	0.03	0.032	O	|	|	|	|	0.02
86.667	0.00	0.03	0.032	O	|	|	|	|	0.02
86.750	0.00	0.03	0.032	O	|	|	|	|	0.02
86.833	0.00	0.03	0.031	O	|	|	|	|	0.02
86.917	0.00	0.03	0.031	O	|	|	|	|	0.02
87.000	0.00	0.03	0.031	O	|	|	|	|	0.02
87.083	0.00	0.03	0.031	O	|	|	|	|	0.02
87.167	0.00	0.03	0.031	O	|	|	|	|	0.02
87.250	0.00	0.03	0.031	O	|	|	|	|	0.02
87.333	0.00	0.03	0.030	O	|	|	|	|	0.02
87.417	0.00	0.03	0.030	O	|	|	|	|	0.02
87.500	0.00	0.02	0.030	O	|	|	|	|	0.02
87.583	0.00	0.02	0.030	O	|	|	|	|	0.02
87.667	0.00	0.02	0.030	O	|	|	|	|	0.02
87.750	0.00	0.02	0.030	O	|	|	|	|	0.02
87.833	0.00	0.02	0.029	O	|	|	|	|	0.02
87.917	0.00	0.02	0.029	O	|	|	|	|	0.02
88.000	0.00	0.02	0.029	O	|	|	|	|	0.02
88.083	0.00	0.02	0.029	O	|	|	|	|	0.02

88.167	0.00	0.02	0.029	O	|	|	|	|	0.02
88.250	0.00	0.02	0.029	O	|	|	|	|	0.02
88.333	0.00	0.02	0.028	O	|	|	|	|	0.02
88.417	0.00	0.02	0.028	O	|	|	|	|	0.02
88.500	0.00	0.02	0.028	O	|	|	|	|	0.02
88.583	0.00	0.02	0.028	O	|	|	|	|	0.02
88.667	0.00	0.02	0.028	O	|	|	|	|	0.02
88.750	0.00	0.02	0.028	O	|	|	|	|	0.02
88.833	0.00	0.02	0.027	O	|	|	|	|	0.02
88.917	0.00	0.02	0.027	O	|	|	|	|	0.02
89.000	0.00	0.02	0.027	O	|	|	|	|	0.02
89.083	0.00	0.02	0.027	O	|	|	|	|	0.02
89.167	0.00	0.02	0.027	O	|	|	|	|	0.02
89.250	0.00	0.02	0.027	O	|	|	|	|	0.02
89.333	0.00	0.02	0.026	O	|	|	|	|	0.02
89.417	0.00	0.02	0.026	O	|	|	|	|	0.02
89.500	0.00	0.02	0.026	O	|	|	|	|	0.02
89.583	0.00	0.02	0.026	O	|	|	|	|	0.02
89.667	0.00	0.02	0.026	O	|	|	|	|	0.02
89.750	0.00	0.02	0.026	O	|	|	|	|	0.02
89.833	0.00	0.02	0.026	O	|	|	|	|	0.02
89.917	0.00	0.02	0.025	O	|	|	|	|	0.02
90.000	0.00	0.02	0.025	O	|	|	|	|	0.02
90.083	0.00	0.02	0.025	O	|	|	|	|	0.02
90.167	0.00	0.02	0.025	O	|	|	|	|	0.01
90.250	0.00	0.02	0.025	O	|	|	|	|	0.01
90.333	0.00	0.02	0.025	O	|	|	|	|	0.01
90.417	0.00	0.02	0.025	O	|	|	|	|	0.01
90.500	0.00	0.02	0.024	O	|	|	|	|	0.01
90.583	0.00	0.02	0.024	O	|	|	|	|	0.01
90.667	0.00	0.02	0.024	O	|	|	|	|	0.01
90.750	0.00	0.02	0.024	O	|	|	|	|	0.01
90.833	0.00	0.02	0.024	O	|	|	|	|	0.01
90.917	0.00	0.02	0.024	O	|	|	|	|	0.01
91.000	0.00	0.02	0.024	O	|	|	|	|	0.01
91.083	0.00	0.02	0.023	O	|	|	|	|	0.01
91.167	0.00	0.02	0.023	O	|	|	|	|	0.01
91.250	0.00	0.02	0.023	O	|	|	|	|	0.01
91.333	0.00	0.02	0.023	O	|	|	|	|	0.01
91.417	0.00	0.02	0.023	O	|	|	|	|	0.01
91.500	0.00	0.02	0.023	O	|	|	|	|	0.01
91.583	0.00	0.02	0.023	O	|	|	|	|	0.01
91.667	0.00	0.02	0.023	O	|	|	|	|	0.01
91.750	0.00	0.02	0.022	O	|	|	|	|	0.01
91.833	0.00	0.02	0.022	O	|	|	|	|	0.01
91.917	0.00	0.02	0.022	O	|	|	|	|	0.01
92.000	0.00	0.02	0.022	O	|	|	|	|	0.01
92.083	0.00	0.02	0.022	O	|	|	|	|	0.01
92.167	0.00	0.02	0.022	O	|	|	|	|	0.01
92.250	0.00	0.02	0.022	O	|	|	|	|	0.01
92.333	0.00	0.02	0.022	O	|	|	|	|	0.01
92.417	0.00	0.02	0.021	O	|	|	|	|	0.01
92.500	0.00	0.02	0.021	O	|	|	|	|	0.01
92.583	0.00	0.02	0.021	O	|	|	|	|	0.01
92.667	0.00	0.02	0.021	O	|	|	|	|	0.01
92.750	0.00	0.02	0.021	O	|	|	|	|	0.01
92.833	0.00	0.02	0.021	O	|	|	|	|	0.01
92.917	0.00	0.02	0.021	O	|	|	|	|	0.01
93.000	0.00	0.02	0.021	O	|	|	|	|	0.01
93.083	0.00	0.02	0.020	O	|	|	|	|	0.01
93.167	0.00	0.02	0.020	O	|	|	|	|	0.01
93.250	0.00	0.02	0.020	O	|	|	|	|	0.01
93.333	0.00	0.02	0.020	O	|	|	|	|	0.01
93.417	0.00	0.02	0.020	O	|	|	|	|	0.01
93.500	0.00	0.02	0.020	O	|	|	|	|	0.01
93.583	0.00	0.02	0.020	O	|	|	|	|	0.01
93.667	0.00	0.02	0.020	O	|	|	|	|	0.01
93.750	0.00	0.02	0.020	O	|	|	|	|	0.01
93.833	0.00	0.02	0.019	O	|	|	|	|	0.01
93.917	0.00	0.02	0.019	O	|	|	|	|	0.01
94.000	0.00	0.02	0.019	O	|	|	|	|	0.01

94.083	0.00	0.02	0.019	O	|	|	|	|	0.01
94.167	0.00	0.02	0.019	O	|	|	|	|	0.01
94.250	0.00	0.02	0.019	O	|	|	|	|	0.01
94.333	0.00	0.02	0.019	O	|	|	|	|	0.01
94.417	0.00	0.02	0.019	O	|	|	|	|	0.01
94.500	0.00	0.02	0.019	O	|	|	|	|	0.01
94.583	0.00	0.02	0.018	O	|	|	|	|	0.01
94.667	0.00	0.02	0.018	O	|	|	|	|	0.01
94.750	0.00	0.02	0.018	O	|	|	|	|	0.01
94.833	0.00	0.02	0.018	O	|	|	|	|	0.01
94.917	0.00	0.01	0.018	O	|	|	|	|	0.01
95.000	0.00	0.01	0.018	O	|	|	|	|	0.01
95.083	0.00	0.01	0.018	O	|	|	|	|	0.01
95.167	0.00	0.01	0.018	O	|	|	|	|	0.01
95.250	0.00	0.01	0.018	O	|	|	|	|	0.01
95.333	0.00	0.01	0.018	O	|	|	|	|	0.01
95.417	0.00	0.01	0.017	O	|	|	|	|	0.01
95.500	0.00	0.01	0.017	O	|	|	|	|	0.01
95.583	0.00	0.01	0.017	O	|	|	|	|	0.01
95.667	0.00	0.01	0.017	O	|	|	|	|	0.01
95.750	0.00	0.01	0.017	O	|	|	|	|	0.01
95.833	0.00	0.01	0.017	O	|	|	|	|	0.01
95.917	0.00	0.01	0.017	O	|	|	|	|	0.01
96.000	0.00	0.01	0.017	O	|	|	|	|	0.01
96.083	0.00	0.01	0.017	O	|	|	|	|	0.01
96.167	0.00	0.01	0.017	O	|	|	|	|	0.01
96.250	0.00	0.01	0.016	O	|	|	|	|	0.01
96.333	0.00	0.01	0.016	O	|	|	|	|	0.01
96.417	0.00	0.01	0.016	O	|	|	|	|	0.01
96.500	0.00	0.01	0.016	O	|	|	|	|	0.01
96.583	0.00	0.01	0.016	O	|	|	|	|	0.01
96.667	0.00	0.01	0.016	O	|	|	|	|	0.01
96.750	0.00	0.01	0.016	O	|	|	|	|	0.01
96.833	0.00	0.01	0.016	O	|	|	|	|	0.01
96.917	0.00	0.01	0.016	O	|	|	|	|	0.01
97.000	0.00	0.01	0.016	O	|	|	|	|	0.01
97.083	0.00	0.01	0.016	O	|	|	|	|	0.01
97.167	0.00	0.01	0.015	O	|	|	|	|	0.01
97.250	0.00	0.01	0.015	O	|	|	|	|	0.01
97.333	0.00	0.01	0.015	O	|	|	|	|	0.01
97.417	0.00	0.01	0.015	O	|	|	|	|	0.01
97.500	0.00	0.01	0.015	O	|	|	|	|	0.01
97.583	0.00	0.01	0.015	O	|	|	|	|	0.01
97.667	0.00	0.01	0.015	O	|	|	|	|	0.01
97.750	0.00	0.01	0.015	O	|	|	|	|	0.01
97.833	0.00	0.01	0.015	O	|	|	|	|	0.01
97.917	0.00	0.01	0.015	O	|	|	|	|	0.01
98.000	0.00	0.01	0.015	O	|	|	|	|	0.01
98.083	0.00	0.01	0.015	O	|	|	|	|	0.01
98.167	0.00	0.01	0.014	O	|	|	|	|	0.01
98.250	0.00	0.01	0.014	O	|	|	|	|	0.01
98.333	0.00	0.01	0.014	O	|	|	|	|	0.01
98.417	0.00	0.01	0.014	O	|	|	|	|	0.01
98.500	0.00	0.01	0.014	O	|	|	|	|	0.01
98.583	0.00	0.01	0.014	O	|	|	|	|	0.01
98.667	0.00	0.01	0.014	O	|	|	|	|	0.01
98.750	0.00	0.01	0.014	O	|	|	|	|	0.01
98.833	0.00	0.01	0.014	O	|	|	|	|	0.01
98.917	0.00	0.01	0.014	O	|	|	|	|	0.01
99.000	0.00	0.01	0.014	O	|	|	|	|	0.01
99.083	0.00	0.01	0.014	O	|	|	|	|	0.01
99.167	0.00	0.01	0.013	O	|	|	|	|	0.01
99.250	0.00	0.01	0.013	O	|	|	|	|	0.01
99.333	0.00	0.01	0.013	O	|	|	|	|	0.01
99.417	0.00	0.01	0.013	O	|	|	|	|	0.01
99.500	0.00	0.01	0.013	O	|	|	|	|	0.01
99.583	0.00	0.01	0.013	O	|	|	|	|	0.01
99.667	0.00	0.01	0.013	O	|	|	|	|	0.01
99.750	0.00	0.01	0.013	O	|	|	|	|	0.01
99.833	0.00	0.01	0.013	O	|	|	|	|	0.01
99.917	0.00	0.01	0.013	O	|	|	|	|	0.01

100.000	0.00	0.01	0.013	O	|	|	|	|	0.01
100.083	0.00	0.01	0.013	O	|	|	|	|	0.01
100.167	0.00	0.01	0.013	O	|	|	|	|	0.01
100.250	0.00	0.01	0.013	O	|	|	|	|	0.01
100.333	0.00	0.01	0.012	O	|	|	|	|	0.01
100.417	0.00	0.01	0.012	O	|	|	|	|	0.01
100.500	0.00	0.01	0.012	O	|	|	|	|	0.01
100.583	0.00	0.01	0.012	O	|	|	|	|	0.01
100.667	0.00	0.01	0.012	O	|	|	|	|	0.01
100.750	0.00	0.01	0.012	O	|	|	|	|	0.01
100.833	0.00	0.01	0.012	O	|	|	|	|	0.01
100.917	0.00	0.01	0.012	O	|	|	|	|	0.01
101.000	0.00	0.01	0.012	O	|	|	|	|	0.01
101.083	0.00	0.01	0.012	O	|	|	|	|	0.01
101.167	0.00	0.01	0.012	O	|	|	|	|	0.01
101.250	0.00	0.01	0.012	O	|	|	|	|	0.01
101.333	0.00	0.01	0.012	O	|	|	|	|	0.01
101.417	0.00	0.01	0.012	O	|	|	|	|	0.01
101.500	0.00	0.01	0.011	O	|	|	|	|	0.01
101.583	0.00	0.01	0.011	O	|	|	|	|	0.01
101.667	0.00	0.01	0.011	O	|	|	|	|	0.01
101.750	0.00	0.01	0.011	O	|	|	|	|	0.01
101.833	0.00	0.01	0.011	O	|	|	|	|	0.01
101.917	0.00	0.01	0.011	O	|	|	|	|	0.01
102.000	0.00	0.01	0.011	O	|	|	|	|	0.01
102.083	0.00	0.01	0.011	O	|	|	|	|	0.01
102.167	0.00	0.01	0.011	O	|	|	|	|	0.01
102.250	0.00	0.01	0.011	O	|	|	|	|	0.01
102.333	0.00	0.01	0.011	O	|	|	|	|	0.01
102.417	0.00	0.01	0.011	O	|	|	|	|	0.01
102.500	0.00	0.01	0.011	O	|	|	|	|	0.01
102.583	0.00	0.01	0.011	O	|	|	|	|	0.01
102.667	0.00	0.01	0.011	O	|	|	|	|	0.01
102.750	0.00	0.01	0.011	O	|	|	|	|	0.01
102.833	0.00	0.01	0.010	O	|	|	|	|	0.01
102.917	0.00	0.01	0.010	O	|	|	|	|	0.01
103.000	0.00	0.01	0.010	O	|	|	|	|	0.01
103.083	0.00	0.01	0.010	O	|	|	|	|	0.01
103.167	0.00	0.01	0.010	O	|	|	|	|	0.01
103.250	0.00	0.01	0.010	O	|	|	|	|	0.01
103.333	0.00	0.01	0.010	O	|	|	|	|	0.01
103.417	0.00	0.01	0.010	O	|	|	|	|	0.01
103.500	0.00	0.01	0.010	O	|	|	|	|	0.01
103.583	0.00	0.01	0.010	O	|	|	|	|	0.01
103.667	0.00	0.01	0.010	O	|	|	|	|	0.01
103.750	0.00	0.01	0.010	O	|	|	|	|	0.01
103.833	0.00	0.01	0.010	O	|	|	|	|	0.01
103.917	0.00	0.01	0.010	O	|	|	|	|	0.01
104.000	0.00	0.01	0.010	O	|	|	|	|	0.01
104.083	0.00	0.01	0.010	O	|	|	|	|	0.01
104.167	0.00	0.01	0.010	O	|	|	|	|	0.01
104.250	0.00	0.01	0.010	O	|	|	|	|	0.01
104.333	0.00	0.01	0.009	O	|	|	|	|	0.01
104.417	0.00	0.01	0.009	O	|	|	|	|	0.01
104.500	0.00	0.01	0.009	O	|	|	|	|	0.01
104.583	0.00	0.01	0.009	O	|	|	|	|	0.01
104.667	0.00	0.01	0.009	O	|	|	|	|	0.01
104.750	0.00	0.01	0.009	O	|	|	|	|	0.01
104.833	0.00	0.01	0.009	O	|	|	|	|	0.01
104.917	0.00	0.01	0.009	O	|	|	|	|	0.01
105.000	0.00	0.01	0.009	O	|	|	|	|	0.01
105.083	0.00	0.01	0.009	O	|	|	|	|	0.01
105.167	0.00	0.01	0.009	O	|	|	|	|	0.01
105.250	0.00	0.01	0.009	O	|	|	|	|	0.01
105.333	0.00	0.01	0.009	O	|	|	|	|	0.01
105.417	0.00	0.01	0.009	O	|	|	|	|	0.01
105.500	0.00	0.01	0.009	O	|	|	|	|	0.01
105.583	0.00	0.01	0.009	O	|	|	|	|	0.01
105.667	0.00	0.01	0.009	O	|	|	|	|	0.01
105.750	0.00	0.01	0.009	O	|	|	|	|	0.01
105.833	0.00	0.01	0.009	O	|	|	|	|	0.01

105.917	0.00	0.01	0.008	O	|	|	|	|	0.01
106.000	0.00	0.01	0.008	O	|	|	|	|	0.01
106.083	0.00	0.01	0.008	O	|	|	|	|	0.01
106.167	0.00	0.01	0.008	O	|	|	|	|	0.01
106.250	0.00	0.01	0.008	O	|	|	|	|	0.00
106.333	0.00	0.01	0.008	O	|	|	|	|	0.00
106.417	0.00	0.01	0.008	O	|	|	|	|	0.00
106.500	0.00	0.01	0.008	O	|	|	|	|	0.00
106.583	0.00	0.01	0.008	O	|	|	|	|	0.00
106.667	0.00	0.01	0.008	O	|	|	|	|	0.00
106.750	0.00	0.01	0.008	O	|	|	|	|	0.00
106.833	0.00	0.01	0.008	O	|	|	|	|	0.00
106.917	0.00	0.01	0.008	O	|	|	|	|	0.00
107.000	0.00	0.01	0.008	O	|	|	|	|	0.00
107.083	0.00	0.01	0.008	O	|	|	|	|	0.00
107.167	0.00	0.01	0.008	O	|	|	|	|	0.00
107.250	0.00	0.01	0.008	O	|	|	|	|	0.00
107.333	0.00	0.01	0.008	O	|	|	|	|	0.00
107.417	0.00	0.01	0.008	O	|	|	|	|	0.00
107.500	0.00	0.01	0.008	O	|	|	|	|	0.00
107.583	0.00	0.01	0.008	O	|	|	|	|	0.00
107.667	0.00	0.01	0.008	O	|	|	|	|	0.00
107.750	0.00	0.01	0.007	O	|	|	|	|	0.00
107.833	0.00	0.01	0.007	O	|	|	|	|	0.00
107.917	0.00	0.01	0.007	O	|	|	|	|	0.00
108.000	0.00	0.01	0.007	O	|	|	|	|	0.00
108.083	0.00	0.01	0.007	O	|	|	|	|	0.00
108.167	0.00	0.01	0.007	O	|	|	|	|	0.00
108.250	0.00	0.01	0.007	O	|	|	|	|	0.00
108.333	0.00	0.01	0.007	O	|	|	|	|	0.00
108.417	0.00	0.01	0.007	O	|	|	|	|	0.00
108.500	0.00	0.01	0.007	O	|	|	|	|	0.00
108.583	0.00	0.01	0.007	O	|	|	|	|	0.00
108.667	0.00	0.01	0.007	O	|	|	|	|	0.00
108.750	0.00	0.01	0.007	O	|	|	|	|	0.00
108.833	0.00	0.01	0.007	O	|	|	|	|	0.00
108.917	0.00	0.01	0.007	O	|	|	|	|	0.00
109.000	0.00	0.01	0.007	O	|	|	|	|	0.00
109.083	0.00	0.01	0.007	O	|	|	|	|	0.00
109.167	0.00	0.01	0.007	O	|	|	|	|	0.00
109.250	0.00	0.01	0.007	O	|	|	|	|	0.00
109.333	0.00	0.01	0.007	O	|	|	|	|	0.00
109.417	0.00	0.01	0.007	O	|	|	|	|	0.00
109.500	0.00	0.01	0.007	O	|	|	|	|	0.00
109.583	0.00	0.01	0.007	O	|	|	|	|	0.00
109.667	0.00	0.01	0.007	O	|	|	|	|	0.00
109.750	0.00	0.01	0.007	O	|	|	|	|	0.00
109.833	0.00	0.01	0.006	O	|	|	|	|	0.00
109.917	0.00	0.01	0.006	O	|	|	|	|	0.00
110.000	0.00	0.01	0.006	O	|	|	|	|	0.00
110.083	0.00	0.01	0.006	O	|	|	|	|	0.00
110.167	0.00	0.01	0.006	O	|	|	|	|	0.00
110.250	0.00	0.01	0.006	O	|	|	|	|	0.00
110.333	0.00	0.01	0.006	O	|	|	|	|	0.00
110.417	0.00	0.01	0.006	O	|	|	|	|	0.00
110.500	0.00	0.01	0.006	O	|	|	|	|	0.00
110.583	0.00	0.01	0.006	O	|	|	|	|	0.00
110.667	0.00	0.01	0.006	O	|	|	|	|	0.00
110.750	0.00	0.01	0.006	O	|	|	|	|	0.00
110.833	0.00	0.01	0.006	O	|	|	|	|	0.00
110.917	0.00	0.01	0.006	O	|	|	|	|	0.00
111.000	0.00	0.00	0.006	O	|	|	|	|	0.00
111.083	0.00	0.00	0.006	O	|	|	|	|	0.00
111.167	0.00	0.00	0.006	O	|	|	|	|	0.00
111.250	0.00	0.00	0.006	O	|	|	|	|	0.00
111.333	0.00	0.00	0.006	O	|	|	|	|	0.00
111.417	0.00	0.00	0.006	O	|	|	|	|	0.00
111.500	0.00	0.00	0.006	O	|	|	|	|	0.00
111.583	0.00	0.00	0.006	O	|	|	|	|	0.00
111.667	0.00	0.00	0.006	O	|	|	|	|	0.00
111.750	0.00	0.00	0.006	O	|	|	|	|	0.00

111.833	0.00	0.00	0.006	O	|	|	|	|	0.00
111.917	0.00	0.00	0.006	O	|	|	|	|	0.00
112.000	0.00	0.00	0.006	O	|	|	|	|	0.00
112.083	0.00	0.00	0.006	O	|	|	|	|	0.00
112.167	0.00	0.00	0.006	O	|	|	|	|	0.00
112.250	0.00	0.00	0.006	O	|	|	|	|	0.00
112.333	0.00	0.00	0.005	O	|	|	|	|	0.00
112.417	0.00	0.00	0.005	O	|	|	|	|	0.00
112.500	0.00	0.00	0.005	O	|	|	|	|	0.00
112.583	0.00	0.00	0.005	O	|	|	|	|	0.00
112.667	0.00	0.00	0.005	O	|	|	|	|	0.00
112.750	0.00	0.00	0.005	O	|	|	|	|	0.00
112.833	0.00	0.00	0.005	O	|	|	|	|	0.00
112.917	0.00	0.00	0.005	O	|	|	|	|	0.00
113.000	0.00	0.00	0.005	O	|	|	|	|	0.00
113.083	0.00	0.00	0.005	O	|	|	|	|	0.00
113.167	0.00	0.00	0.005	O	|	|	|	|	0.00
113.250	0.00	0.00	0.005	O	|	|	|	|	0.00
113.333	0.00	0.00	0.005	O	|	|	|	|	0.00
113.417	0.00	0.00	0.005	O	|	|	|	|	0.00
113.500	0.00	0.00	0.005	O	|	|	|	|	0.00
113.583	0.00	0.00	0.005	O	|	|	|	|	0.00
113.667	0.00	0.00	0.005	O	|	|	|	|	0.00
113.750	0.00	0.00	0.005	O	|	|	|	|	0.00
113.833	0.00	0.00	0.005	O	|	|	|	|	0.00
113.917	0.00	0.00	0.005	O	|	|	|	|	0.00
114.000	0.00	0.00	0.005	O	|	|	|	|	0.00
114.083	0.00	0.00	0.005	O	|	|	|	|	0.00
114.167	0.00	0.00	0.005	O	|	|	|	|	0.00
114.250	0.00	0.00	0.005	O	|	|	|	|	0.00
114.333	0.00	0.00	0.005	O	|	|	|	|	0.00
114.417	0.00	0.00	0.005	O	|	|	|	|	0.00
114.500	0.00	0.00	0.005	O	|	|	|	|	0.00
114.583	0.00	0.00	0.005	O	|	|	|	|	0.00
114.667	0.00	0.00	0.005	O	|	|	|	|	0.00
114.750	0.00	0.00	0.005	O	|	|	|	|	0.00
114.833	0.00	0.00	0.005	O	|	|	|	|	0.00
114.917	0.00	0.00	0.005	O	|	|	|	|	0.00
115.000	0.00	0.00	0.005	O	|	|	|	|	0.00
115.083	0.00	0.00	0.005	O	|	|	|	|	0.00
115.167	0.00	0.00	0.005	O	|	|	|	|	0.00
115.250	0.00	0.00	0.004	O	|	|	|	|	0.00
115.333	0.00	0.00	0.004	O	|	|	|	|	0.00
115.417	0.00	0.00	0.004	O	|	|	|	|	0.00
115.500	0.00	0.00	0.004	O	|	|	|	|	0.00
115.583	0.00	0.00	0.004	O	|	|	|	|	0.00
115.667	0.00	0.00	0.004	O	|	|	|	|	0.00
115.750	0.00	0.00	0.004	O	|	|	|	|	0.00
115.833	0.00	0.00	0.004	O	|	|	|	|	0.00
115.917	0.00	0.00	0.004	O	|	|	|	|	0.00
116.000	0.00	0.00	0.004	O	|	|	|	|	0.00
116.083	0.00	0.00	0.004	O	|	|	|	|	0.00
116.167	0.00	0.00	0.004	O	|	|	|	|	0.00
116.250	0.00	0.00	0.004	O	|	|	|	|	0.00
116.333	0.00	0.00	0.004	O	|	|	|	|	0.00
116.417	0.00	0.00	0.004	O	|	|	|	|	0.00
116.500	0.00	0.00	0.004	O	|	|	|	|	0.00
116.583	0.00	0.00	0.004	O	|	|	|	|	0.00
116.667	0.00	0.00	0.004	O	|	|	|	|	0.00
116.750	0.00	0.00	0.004	O	|	|	|	|	0.00
116.833	0.00	0.00	0.004	O	|	|	|	|	0.00
116.917	0.00	0.00	0.004	O	|	|	|	|	0.00
117.000	0.00	0.00	0.004	O	|	|	|	|	0.00
117.083	0.00	0.00	0.004	O	|	|	|	|	0.00
117.167	0.00	0.00	0.004	O	|	|	|	|	0.00
117.250	0.00	0.00	0.004	O	|	|	|	|	0.00
117.333	0.00	0.00	0.004	O	|	|	|	|	0.00
117.417	0.00	0.00	0.004	O	|	|	|	|	0.00
117.500	0.00	0.00	0.004	O	|	|	|	|	0.00
117.583	0.00	0.00	0.004	O	|	|	|	|	0.00
117.667	0.00	0.00	0.004	O	|	|	|	|	0.00

117.750	0.00	0.00	0.004	O	|	|	|	|	0.00
117.833	0.00	0.00	0.004	O	|	|	|	|	0.00
117.917	0.00	0.00	0.004	O	|	|	|	|	0.00
118.000	0.00	0.00	0.004	O	|	|	|	|	0.00
118.083	0.00	0.00	0.004	O	|	|	|	|	0.00
118.167	0.00	0.00	0.004	O	|	|	|	|	0.00
118.250	0.00	0.00	0.004	O	|	|	|	|	0.00
118.333	0.00	0.00	0.004	O	|	|	|	|	0.00
118.417	0.00	0.00	0.004	O	|	|	|	|	0.00
118.500	0.00	0.00	0.004	O	|	|	|	|	0.00
118.583	0.00	0.00	0.004	O	|	|	|	|	0.00
118.667	0.00	0.00	0.004	O	|	|	|	|	0.00
118.750	0.00	0.00	0.004	O	|	|	|	|	0.00
118.833	0.00	0.00	0.004	O	|	|	|	|	0.00
118.917	0.00	0.00	0.003	O	|	|	|	|	0.00
119.000	0.00	0.00	0.003	O	|	|	|	|	0.00
119.083	0.00	0.00	0.003	O	|	|	|	|	0.00
119.167	0.00	0.00	0.003	O	|	|	|	|	0.00
119.250	0.00	0.00	0.003	O	|	|	|	|	0.00
119.333	0.00	0.00	0.003	O	|	|	|	|	0.00
119.417	0.00	0.00	0.003	O	|	|	|	|	0.00
119.500	0.00	0.00	0.003	O	|	|	|	|	0.00
119.583	0.00	0.00	0.003	O	|	|	|	|	0.00
119.667	0.00	0.00	0.003	O	|	|	|	|	0.00
119.750	0.00	0.00	0.003	O	|	|	|	|	0.00
119.833	0.00	0.00	0.003	O	|	|	|	|	0.00
119.917	0.00	0.00	0.003	O	|	|	|	|	0.00
120.000	0.00	0.00	0.003	O	|	|	|	|	0.00
120.083	0.00	0.00	0.003	O	|	|	|	|	0.00
120.167	0.00	0.00	0.003	O	|	|	|	|	0.00
120.250	0.00	0.00	0.003	O	|	|	|	|	0.00
120.333	0.00	0.00	0.003	O	|	|	|	|	0.00
120.417	0.00	0.00	0.003	O	|	|	|	|	0.00
120.500	0.00	0.00	0.003	O	|	|	|	|	0.00
120.583	0.00	0.00	0.003	O	|	|	|	|	0.00
120.667	0.00	0.00	0.003	O	|	|	|	|	0.00
120.750	0.00	0.00	0.003	O	|	|	|	|	0.00
120.833	0.00	0.00	0.003	O	|	|	|	|	0.00
120.917	0.00	0.00	0.003	O	|	|	|	|	0.00
121.000	0.00	0.00	0.003	O	|	|	|	|	0.00
121.083	0.00	0.00	0.003	O	|	|	|	|	0.00
121.167	0.00	0.00	0.003	O	|	|	|	|	0.00
121.250	0.00	0.00	0.003	O	|	|	|	|	0.00
121.333	0.00	0.00	0.003	O	|	|	|	|	0.00
121.417	0.00	0.00	0.003	O	|	|	|	|	0.00
121.500	0.00	0.00	0.003	O	|	|	|	|	0.00
121.583	0.00	0.00	0.003	O	|	|	|	|	0.00
121.667	0.00	0.00	0.003	O	|	|	|	|	0.00
121.750	0.00	0.00	0.003	O	|	|	|	|	0.00
121.833	0.00	0.00	0.003	O	|	|	|	|	0.00
121.917	0.00	0.00	0.003	O	|	|	|	|	0.00
122.000	0.00	0.00	0.003	O	|	|	|	|	0.00
122.083	0.00	0.00	0.003	O	|	|	|	|	0.00
122.167	0.00	0.00	0.003	O	|	|	|	|	0.00
122.250	0.00	0.00	0.003	O	|	|	|	|	0.00
122.333	0.00	0.00	0.003	O	|	|	|	|	0.00
122.417	0.00	0.00	0.003	O	|	|	|	|	0.00
122.500	0.00	0.00	0.003	O	|	|	|	|	0.00
122.583	0.00	0.00	0.003	O	|	|	|	|	0.00
122.667	0.00	0.00	0.003	O	|	|	|	|	0.00
122.750	0.00	0.00	0.003	O	|	|	|	|	0.00
122.833	0.00	0.00	0.003	O	|	|	|	|	0.00
122.917	0.00	0.00	0.003	O	|	|	|	|	0.00
123.000	0.00	0.00	0.003	O	|	|	|	|	0.00
123.083	0.00	0.00	0.003	O	|	|	|	|	0.00
123.167	0.00	0.00	0.003	O	|	|	|	|	0.00
123.250	0.00	0.00	0.003	O	|	|	|	|	0.00
123.333	0.00	0.00	0.003	O	|	|	|	|	0.00
123.417	0.00	0.00	0.003	O	|	|	|	|	0.00
123.500	0.00	0.00	0.003	O	|	|	|	|	0.00
123.583	0.00	0.00	0.003	O	|	|	|	|	0.00

123.667	0.00	0.00	0.003	O	|	|	|	|	0.00
123.750	0.00	0.00	0.002	O	|	|	|	|	0.00
123.833	0.00	0.00	0.002	O	|	|	|	|	0.00
123.917	0.00	0.00	0.002	O	|	|	|	|	0.00
124.000	0.00	0.00	0.002	O	|	|	|	|	0.00
124.083	0.00	0.00	0.002	O	|	|	|	|	0.00
124.167	0.00	0.00	0.002	O	|	|	|	|	0.00
124.250	0.00	0.00	0.002	O	|	|	|	|	0.00
124.333	0.00	0.00	0.002	O	|	|	|	|	0.00
124.417	0.00	0.00	0.002	O	|	|	|	|	0.00
124.500	0.00	0.00	0.002	O	|	|	|	|	0.00
124.583	0.00	0.00	0.002	O	|	|	|	|	0.00
124.667	0.00	0.00	0.002	O	|	|	|	|	0.00
124.750	0.00	0.00	0.002	O	|	|	|	|	0.00
124.833	0.00	0.00	0.002	O	|	|	|	|	0.00
124.917	0.00	0.00	0.002	O	|	|	|	|	0.00
125.000	0.00	0.00	0.002	O	|	|	|	|	0.00
125.083	0.00	0.00	0.002	O	|	|	|	|	0.00
125.167	0.00	0.00	0.002	O	|	|	|	|	0.00
125.250	0.00	0.00	0.002	O	|	|	|	|	0.00
125.333	0.00	0.00	0.002	O	|	|	|	|	0.00
125.417	0.00	0.00	0.002	O	|	|	|	|	0.00
125.500	0.00	0.00	0.002	O	|	|	|	|	0.00
125.583	0.00	0.00	0.002	O	|	|	|	|	0.00
125.667	0.00	0.00	0.002	O	|	|	|	|	0.00
125.750	0.00	0.00	0.002	O	|	|	|	|	0.00
125.833	0.00	0.00	0.002	O	|	|	|	|	0.00
125.917	0.00	0.00	0.002	O	|	|	|	|	0.00
126.000	0.00	0.00	0.002	O	|	|	|	|	0.00
126.083	0.00	0.00	0.002	O	|	|	|	|	0.00
126.167	0.00	0.00	0.002	O	|	|	|	|	0.00
126.250	0.00	0.00	0.002	O	|	|	|	|	0.00
126.333	0.00	0.00	0.002	O	|	|	|	|	0.00
126.417	0.00	0.00	0.002	O	|	|	|	|	0.00
126.500	0.00	0.00	0.002	O	|	|	|	|	0.00
126.583	0.00	0.00	0.002	O	|	|	|	|	0.00
126.667	0.00	0.00	0.002	O	|	|	|	|	0.00
126.750	0.00	0.00	0.002	O	|	|	|	|	0.00
126.833	0.00	0.00	0.002	O	|	|	|	|	0.00
126.917	0.00	0.00	0.002	O	|	|	|	|	0.00
127.000	0.00	0.00	0.002	O	|	|	|	|	0.00
127.083	0.00	0.00	0.002	O	|	|	|	|	0.00
127.167	0.00	0.00	0.002	O	|	|	|	|	0.00
127.250	0.00	0.00	0.002	O	|	|	|	|	0.00
127.333	0.00	0.00	0.002	O	|	|	|	|	0.00
127.417	0.00	0.00	0.002	O	|	|	|	|	0.00
127.500	0.00	0.00	0.002	O	|	|	|	|	0.00
127.583	0.00	0.00	0.002	O	|	|	|	|	0.00
127.667	0.00	0.00	0.002	O	|	|	|	|	0.00
127.750	0.00	0.00	0.002	O	|	|	|	|	0.00
127.833	0.00	0.00	0.002	O	|	|	|	|	0.00
127.917	0.00	0.00	0.002	O	|	|	|	|	0.00
128.000	0.00	0.00	0.002	O	|	|	|	|	0.00
128.083	0.00	0.00	0.002	O	|	|	|	|	0.00
128.167	0.00	0.00	0.002	O	|	|	|	|	0.00
128.250	0.00	0.00	0.002	O	|	|	|	|	0.00
128.333	0.00	0.00	0.002	O	|	|	|	|	0.00
128.417	0.00	0.00	0.002	O	|	|	|	|	0.00
128.500	0.00	0.00	0.002	O	|	|	|	|	0.00
128.583	0.00	0.00	0.002	O	|	|	|	|	0.00
128.667	0.00	0.00	0.002	O	|	|	|	|	0.00
128.750	0.00	0.00	0.002	O	|	|	|	|	0.00
128.833	0.00	0.00	0.002	O	|	|	|	|	0.00
128.917	0.00	0.00	0.002	O	|	|	|	|	0.00
129.000	0.00	0.00	0.002	O	|	|	|	|	0.00
129.083	0.00	0.00	0.002	O	|	|	|	|	0.00
129.167	0.00	0.00	0.002	O	|	|	|	|	0.00
129.250	0.00	0.00	0.002	O	|	|	|	|	0.00
129.333	0.00	0.00	0.002	O	|	|	|	|	0.00
129.417	0.00	0.00	0.002	O	|	|	|	|	0.00
129.500	0.00	0.00	0.002	O	|	|	|	|	0.00

```
129.583    0.00    0.00      0.002  O       |       |       |       |     0.00
129.667    0.00    0.00      0.002  O       |       |       |       |     0.00

        Remaining water in basin =    0.00 (Ac.Ft)


        ****************************HYDROGRAPH DATA****************************
                      Number of intervals =  1556
                      Time interval =    5.0 (Min.)
                      Maximum/Peak flow rate =        6.910 (CFS)
                      Total volume =       7.069 (Ac.Ft)
               Status of hydrographs being held in storage
                           Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
               Peak (CFS)      0.000     0.000     0.000     0.000     0.000
               Vol (Ac.Ft)     0.000     0.000     0.000     0.000     0.000
        ***********************************************************************

        -----------------------------------------------------------------------
```

AREA “D”

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/10/16 File Name: EXD002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'D' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 400.000 to Point/Station 401.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 293.000(Ft.)
Top (of initial area) elevation = 481.000(Ft.)
Bottom (of initial area) elevation = 437.000(Ft.)
Difference in elevation = 44.000(Ft.)
Slope = 0.15017 s(%)= 15.02
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.005 min.
Rainfall intensity = 1.520(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.752
Subarea runoff = 0.400(CFS)
Total initial stream area = 0.350(Ac.)

++

Process from Point/Station 401.000 to Point/Station 402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 3.849(CFS)
Depth of flow = 0.153(Ft.), Average velocity = 3.305(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 3.849(CFS)
' ' flow top width = 15.262(Ft.)

```
  '     '    velocity=    3.305(Ft/s)
  '     '       area =      1.165(Sq.Ft)
  '     '       Froude number =     2.108

Upstream point elevation =   437.000(Ft.)
Downstream point elevation =   355.000(Ft.)
Flow length =   596.000(Ft.)
Travel time  =    3.01 min.
Time of concentration =   13.01 min.
Depth of flow =   0.153(Ft.)
Average velocity =   3.305(Ft/s)
Total irregular channel flow =     3.849(CFS)
Irregular channel normal depth above invert elev. =   0.153(Ft.)
Average velocity of channel(s) =   3.305(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 81.50
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      1.307(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.744
Subarea runoff =      6.811(CFS) for    7.060(Ac.)
Total runoff =      7.211(CFS)       Total area =        7.41(Ac.)
Area averaged Fm value =    0.226(In/Hr)
Depth of flow =   0.193(Ft.), Average velocity =   3.867(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     11.989(CFS)
Depth of flow =   0.265(Ft.), Average velocity =   3.422(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     11.989(CFS)
  '     '       flow top width =     26.471(Ft.)
  '     '    velocity=    3.422(Ft/s)
  '     '       area =      3.504(Sq.Ft)
  '     '       Froude number =     1.658

Upstream point elevation =   355.000(Ft.)
Downstream point elevation =   301.000(Ft.)
Flow length =   763.000(Ft.)
Travel time  =    3.72 min.
Time of concentration =   16.73 min.
Depth of flow =   0.265(Ft.)
Average velocity =   3.422(Ft/s)
Total irregular channel flow =    11.989(CFS)
Irregular channel normal depth above invert elev. =   0.265(Ft.)
Average velocity of channel(s) =   3.422(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.750
SCS curve number for soil(AMC 2)  = 82.75
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.213(In/Hr)
```

Max Catchment Loss (Fm) = 0.213(In/Hr)
Rainfall intensity = 1.132(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.727
Subarea runoff = 9.502(CFS) for 12.900(Ac.)
Total runoff = 16.713(CFS) Total area = 20.31(Ac.)
Area averaged Fm value = 0.217(In/Hr)
Depth of flow = 0.300(Ft.), Average velocity = 3.718(Ft/s)
End of computations, total study area = 20.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) = 82.3

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/10/16 File Name: PRD002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'D' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 400.000 to Point/Station 401.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 79.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.250(In/Hr)
Initial subarea data:
Initial area flow distance = 293.000(Ft.)
Top (of initial area) elevation = 481.000(Ft.)
Bottom (of initial area) elevation = 437.000(Ft.)
Difference in elevation = 44.000(Ft.)
Slope = 0.15017 s(%)= 15.02
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.005 min.
Rainfall intensity = 1.520(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.752
Subarea runoff = 0.400(CFS)
Total initial stream area = 0.350(Ac.)

++

Process from Point/Station 401.000 to Point/Station 402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.023(CFS)
Depth of flow = 0.155(Ft.), Average velocity = 3.342(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	50.00	0.00
3	100.00	1.00

Manning's 'N' friction factor = 0.030

Sub-Channel flow = 4.023(CFS)
' ' flow top width = 15.517(Ft.)

```
  '     '    velocity=    3.342(Ft/s)
  '     '       area =      1.204(Sq.Ft)
  '     '       Froude number =     2.114

Upstream point elevation =   437.000(Ft.)
Downstream point elevation =   355.000(Ft.)
Flow length =   596.000(Ft.)
Travel time  =    2.97 min.
Time of concentration =   12.98 min.
Depth of flow =   0.155(Ft.)
Average velocity =   3.342(Ft/s)
Total irregular channel flow =     4.023(CFS)
Irregular channel normal depth above invert elev. =   0.155(Ft.)
Average velocity of channel(s) =   3.342(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.500
SCS curve number for soil(AMC 2)  = 81.50
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.225(In/Hr)
Max Catchment Loss (Fm) =     0.225(In/Hr)
Rainfall intensity =      1.309(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.745
Subarea runoff =      7.155(CFS) for    7.400(Ac.)
Total runoff =      7.555(CFS)       Total area =        7.75(Ac.)
Area averaged Fm value =    0.226(In/Hr)
Depth of flow =   0.197(Ft.), Average velocity =   3.912(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.275(CFS)
Depth of flow =   0.267(Ft.), Average velocity =   3.442(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              1.00
       2             50.00              0.00
       3            100.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.275(CFS)
  '     '       flow top width =     26.706(Ft.)
  '     '    velocity=    3.442(Ft/s)
  '     '       area =      3.566(Sq.Ft)
  '     '       Froude number =     1.660

Upstream point elevation =   355.000(Ft.)
Downstream point elevation =   301.000(Ft.)
Flow length =   763.000(Ft.)
Travel time  =    3.69 min.
Time of concentration =   16.67 min.
Depth of flow =   0.267(Ft.)
Average velocity =   3.442(Ft/s)
Total irregular channel flow =    12.275(CFS)
Irregular channel normal depth above invert elev. =   0.267(Ft.)
Average velocity of channel(s) =   3.442(Ft/s)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.750
SCS curve number for soil(AMC 2)  = 82.75
Pervious ratio(Ap) = 1.0000  Max loss rate(Fp)=     0.213(In/Hr)
```

Max Catchment Loss (Fm) = 0.213(In/Hr)
Rainfall intensity = 1.134(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.727
Subarea runoff = 9.384(CFS) for 12.790(Ac.)
Total runoff = 16.939(CFS) Total area = 20.54(Ac.)
Area averaged Fm value = 0.218(In/Hr)
Depth of flow = 0.301(Ft.), Average velocity = 3.731(Ft/s)
End of computations, total study area = 20.54 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number (AMC 2) = 82.2

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/18/16 File Name exd00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'D' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
82.3	6.8	0.33	C	0.250	1.000	0.250
82.3	13.5	0.67	D	0.200	1.000	0.200

Area-averaged adjusted loss rate Fm (In/Hr) = 0.217

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
6.77	0.333	82.3	66.2	5.10	0.084
13.54	0.667	82.3	66.2	5.10	0.084

Area-averaged catchment yield fraction, Y = 0.084
Area-averaged low loss fraction, Yb = 0.916
++
User entry of time of concentration = 0.279 (hours)
Watershed area = 20.31(Ac.)
Catchment Lag time = 0.223 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 37.3580
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.217(In/Hr)
Average low loss rate fraction (Yb) = 0.916 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 20.31(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)
30-minute factor = 0.999 Adjusted rainfall = 0.400(In)
1-hour factor = 0.999 Adjusted rainfall = 0.529(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 245.62 (CFS))	
1	2.856	7.015
2	13.127	25.229
3	40.102	66.257
4	65.474	62.318
5	76.077	26.045
6	83.094	17.235
7	88.097	12.287
8	91.776	9.037
9	94.496	6.680
10	96.376	4.618
11	97.657	3.148
12	98.255	1.469
13	98.670	1.018
14	99.015	0.848
15	99.253	0.585
16	99.532	0.686
17	99.765	0.572
18	99.902	0.335
19	100.000	0.242

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2532	0.0634
3	0.2996	0.0465
4	0.3377	0.0380
5	0.3705	0.0328
6	0.3996	0.0292
7	0.4254	0.0258
8	0.4491	0.0237
9	0.4711	0.0220
10	0.4917	0.0206
11	0.5111	0.0194
12	0.5295	0.0184
13	0.5499	0.0204
14	0.5695	0.0196
15	0.5884	0.0189
16	0.6066	0.0182
17	0.6242	0.0176
18	0.6413	0.0171
19	0.6579	0.0166
20	0.6741	0.0161
21	0.6898	0.0157
22	0.7051	0.0153
23	0.7201	0.0150
24	0.7347	0.0146
25	0.7490	0.0143
26	0.7630	0.0140
27	0.7768	0.0137
28	0.7902	0.0135
29	0.8035	0.0132
30	0.8164	0.0130
31	0.8292	0.0127
32	0.8417	0.0125
33	0.8540	0.0123

34	0.8662	0.0121
35	0.8781	0.0119
36	0.8899	0.0118
37	0.9011	0.0112
38	0.9121	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9442	0.0106
42	0.9546	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0144	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0612	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1480	0.0083
64	1.1563	0.0083
65	1.1644	0.0082
66	1.1726	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3587	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051
102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051

105	1.4050	0.0050
106	1.4100	0.0050
107	1.4150	0.0050
108	1.4199	0.0049
109	1.4248	0.0049
110	1.4297	0.0049
111	1.4345	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4678	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5087	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5731	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6450	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036

176	1.7048	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7298	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7883	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8082	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8213	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8533	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9206	0.0030
243	1.9236	0.0030
244	1.9266	0.0030
245	1.9295	0.0030
246	1.9325	0.0029

247	1.9354	0.0029
248	1.9383	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0311	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0024	0.0002
2	0.0027	0.0024	0.0002
3	0.0027	0.0025	0.0002
4	0.0027	0.0025	0.0002
5	0.0027	0.0025	0.0002
6	0.0027	0.0025	0.0002
7	0.0027	0.0025	0.0002
8	0.0027	0.0025	0.0002
9	0.0027	0.0025	0.0002
10	0.0027	0.0025	0.0002
11	0.0028	0.0025	0.0002
12	0.0028	0.0025	0.0002
13	0.0028	0.0025	0.0002
14	0.0028	0.0025	0.0002
15	0.0028	0.0026	0.0002
16	0.0028	0.0026	0.0002
17	0.0028	0.0026	0.0002
18	0.0028	0.0026	0.0002
19	0.0028	0.0026	0.0002
20	0.0028	0.0026	0.0002
21	0.0029	0.0026	0.0002
22	0.0029	0.0026	0.0002
23	0.0029	0.0026	0.0002
24	0.0029	0.0026	0.0002

25	0.0029	0.0027	0.0002
26	0.0029	0.0027	0.0002
27	0.0029	0.0027	0.0002
28	0.0029	0.0027	0.0002
29	0.0029	0.0027	0.0002
30	0.0030	0.0027	0.0002
31	0.0030	0.0027	0.0003
32	0.0030	0.0027	0.0003
33	0.0030	0.0027	0.0003
34	0.0030	0.0027	0.0003
35	0.0030	0.0028	0.0003
36	0.0030	0.0028	0.0003
37	0.0030	0.0028	0.0003
38	0.0030	0.0028	0.0003
39	0.0031	0.0028	0.0003
40	0.0031	0.0028	0.0003
41	0.0031	0.0028	0.0003
42	0.0031	0.0028	0.0003
43	0.0031	0.0029	0.0003
44	0.0031	0.0029	0.0003
45	0.0031	0.0029	0.0003
46	0.0031	0.0029	0.0003
47	0.0032	0.0029	0.0003
48	0.0032	0.0029	0.0003
49	0.0032	0.0029	0.0003
50	0.0032	0.0029	0.0003
51	0.0032	0.0030	0.0003
52	0.0032	0.0030	0.0003
53	0.0033	0.0030	0.0003
54	0.0033	0.0030	0.0003
55	0.0033	0.0030	0.0003
56	0.0033	0.0030	0.0003
57	0.0033	0.0030	0.0003
58	0.0033	0.0030	0.0003
59	0.0033	0.0031	0.0003
60	0.0034	0.0031	0.0003
61	0.0034	0.0031	0.0003
62	0.0034	0.0031	0.0003
63	0.0034	0.0031	0.0003
64	0.0034	0.0031	0.0003
65	0.0034	0.0031	0.0003
66	0.0035	0.0032	0.0003
67	0.0035	0.0032	0.0003
68	0.0035	0.0032	0.0003
69	0.0035	0.0032	0.0003
70	0.0035	0.0032	0.0003
71	0.0035	0.0032	0.0003
72	0.0036	0.0033	0.0003
73	0.0036	0.0033	0.0003
74	0.0036	0.0033	0.0003
75	0.0036	0.0033	0.0003
76	0.0036	0.0033	0.0003
77	0.0037	0.0034	0.0003
78	0.0037	0.0034	0.0003
79	0.0037	0.0034	0.0003
80	0.0037	0.0034	0.0003
81	0.0037	0.0034	0.0003
82	0.0038	0.0034	0.0003
83	0.0038	0.0035	0.0003
84	0.0038	0.0035	0.0003
85	0.0038	0.0035	0.0003
86	0.0038	0.0035	0.0003
87	0.0039	0.0035	0.0003
88	0.0039	0.0036	0.0003
89	0.0039	0.0036	0.0003
90	0.0039	0.0036	0.0003
91	0.0040	0.0036	0.0003
92	0.0040	0.0036	0.0003
93	0.0040	0.0037	0.0003
94	0.0040	0.0037	0.0003
95	0.0041	0.0037	0.0003

96	0.0041	0.0037	0.0003
97	0.0041	0.0038	0.0003
98	0.0041	0.0038	0.0003
99	0.0042	0.0038	0.0004
100	0.0042	0.0038	0.0004
101	0.0042	0.0039	0.0004
102	0.0043	0.0039	0.0004
103	0.0043	0.0039	0.0004
104	0.0043	0.0039	0.0004
105	0.0044	0.0040	0.0004
106	0.0044	0.0040	0.0004
107	0.0044	0.0040	0.0004
108	0.0044	0.0041	0.0004
109	0.0045	0.0041	0.0004
110	0.0045	0.0041	0.0004
111	0.0045	0.0042	0.0004
112	0.0046	0.0042	0.0004
113	0.0046	0.0042	0.0004
114	0.0046	0.0043	0.0004
115	0.0047	0.0043	0.0004
116	0.0047	0.0043	0.0004
117	0.0048	0.0044	0.0004
118	0.0048	0.0044	0.0004
119	0.0049	0.0044	0.0004
120	0.0049	0.0045	0.0004
121	0.0049	0.0045	0.0004
122	0.0050	0.0045	0.0004
123	0.0050	0.0046	0.0004
124	0.0051	0.0046	0.0004
125	0.0051	0.0047	0.0004
126	0.0051	0.0047	0.0004
127	0.0052	0.0048	0.0004
128	0.0052	0.0048	0.0004
129	0.0053	0.0049	0.0004
130	0.0054	0.0049	0.0005
131	0.0054	0.0050	0.0005
132	0.0055	0.0050	0.0005
133	0.0055	0.0051	0.0005
134	0.0056	0.0051	0.0005
135	0.0057	0.0052	0.0005
136	0.0057	0.0052	0.0005
137	0.0058	0.0053	0.0005
138	0.0058	0.0053	0.0005
139	0.0059	0.0054	0.0005
140	0.0060	0.0055	0.0005
141	0.0061	0.0055	0.0005
142	0.0061	0.0056	0.0005
143	0.0062	0.0057	0.0005
144	0.0063	0.0057	0.0005
145	0.0077	0.0071	0.0007
146	0.0078	0.0071	0.0007
147	0.0079	0.0073	0.0007
148	0.0080	0.0073	0.0007
149	0.0081	0.0074	0.0007
150	0.0082	0.0075	0.0007
151	0.0083	0.0076	0.0007
152	0.0084	0.0077	0.0007
153	0.0086	0.0078	0.0007
154	0.0086	0.0079	0.0007
155	0.0088	0.0081	0.0007
156	0.0089	0.0081	0.0007
157	0.0091	0.0083	0.0008
158	0.0092	0.0084	0.0008
159	0.0094	0.0086	0.0008
160	0.0095	0.0087	0.0008
161	0.0097	0.0089	0.0008
162	0.0098	0.0090	0.0008
163	0.0100	0.0092	0.0008
164	0.0101	0.0093	0.0009
165	0.0104	0.0095	0.0009
166	0.0106	0.0097	0.0009

167	0.0108	0.0099	0.0009
168	0.0110	0.0101	0.0009
169	0.0118	0.0108	0.0010
170	0.0119	0.0109	0.0010
171	0.0123	0.0113	0.0010
172	0.0125	0.0115	0.0011
173	0.0130	0.0119	0.0011
174	0.0132	0.0121	0.0011
175	0.0137	0.0126	0.0012
176	0.0140	0.0128	0.0012
177	0.0146	0.0134	0.0012
178	0.0150	0.0137	0.0013
179	0.0157	0.0144	0.0013
180	0.0161	0.0148	0.0014
181	0.0171	0.0156	0.0014
182	0.0176	0.0161	0.0015
183	0.0189	0.0173	0.0016
184	0.0196	0.0179	0.0017
185	0.0184	0.0168	0.0016
186	0.0194	0.0178	0.0016
187	0.0220	0.0181	0.0039
188	0.0237	0.0181	0.0056
189	0.0292	0.0181	0.0111
190	0.0328	0.0181	0.0147
191	0.0465	0.0181	0.0284
192	0.0634	0.0181	0.0453
193	0.1898	0.0181	0.1718
194	0.0380	0.0181	0.0200
195	0.0258	0.0181	0.0078
196	0.0206	0.0181	0.0025
197	0.0204	0.0181	0.0024
198	0.0182	0.0167	0.0015
199	0.0166	0.0152	0.0014
200	0.0153	0.0140	0.0013
201	0.0143	0.0131	0.0012
202	0.0135	0.0123	0.0011
203	0.0127	0.0117	0.0011
204	0.0121	0.0111	0.0010
205	0.0112	0.0102	0.0009
206	0.0107	0.0098	0.0009
207	0.0103	0.0094	0.0009
208	0.0099	0.0091	0.0008
209	0.0096	0.0088	0.0008
210	0.0093	0.0085	0.0008
211	0.0090	0.0082	0.0008
212	0.0087	0.0080	0.0007
213	0.0085	0.0078	0.0007
214	0.0083	0.0076	0.0007
215	0.0081	0.0074	0.0007
216	0.0079	0.0072	0.0007
217	0.0063	0.0058	0.0005
218	0.0062	0.0056	0.0005
219	0.0060	0.0055	0.0005
220	0.0059	0.0054	0.0005
221	0.0057	0.0053	0.0005
222	0.0056	0.0051	0.0005
223	0.0055	0.0050	0.0005
224	0.0054	0.0049	0.0005
225	0.0053	0.0048	0.0004
226	0.0052	0.0047	0.0004
227	0.0051	0.0047	0.0004
228	0.0050	0.0046	0.0004
229	0.0049	0.0045	0.0004
230	0.0048	0.0044	0.0004
231	0.0047	0.0043	0.0004
232	0.0047	0.0043	0.0004
233	0.0046	0.0042	0.0004
234	0.0045	0.0041	0.0004
235	0.0045	0.0041	0.0004
236	0.0044	0.0040	0.0004
237	0.0043	0.0040	0.0004

238	0.0043	0.0039	0.0004
239	0.0042	0.0039	0.0004
240	0.0042	0.0038	0.0004
241	0.0041	0.0038	0.0003
242	0.0041	0.0037	0.0003
243	0.0040	0.0037	0.0003
244	0.0040	0.0036	0.0003
245	0.0039	0.0036	0.0003
246	0.0039	0.0035	0.0003
247	0.0038	0.0035	0.0003
248	0.0038	0.0035	0.0003
249	0.0037	0.0034	0.0003
250	0.0037	0.0034	0.0003
251	0.0036	0.0033	0.0003
252	0.0036	0.0033	0.0003
253	0.0036	0.0033	0.0003
254	0.0035	0.0032	0.0003
255	0.0035	0.0032	0.0003
256	0.0035	0.0032	0.0003
257	0.0034	0.0031	0.0003
258	0.0034	0.0031	0.0003
259	0.0034	0.0031	0.0003
260	0.0033	0.0031	0.0003
261	0.0033	0.0030	0.0003
262	0.0033	0.0030	0.0003
263	0.0032	0.0030	0.0003
264	0.0032	0.0029	0.0003
265	0.0032	0.0029	0.0003
266	0.0032	0.0029	0.0003
267	0.0031	0.0029	0.0003
268	0.0031	0.0028	0.0003
269	0.0031	0.0028	0.0003
270	0.0031	0.0028	0.0003
271	0.0030	0.0028	0.0003
272	0.0030	0.0028	0.0003
273	0.0030	0.0027	0.0003
274	0.0030	0.0027	0.0002
275	0.0029	0.0027	0.0002
276	0.0029	0.0027	0.0002
277	0.0029	0.0026	0.0002
278	0.0029	0.0026	0.0002
279	0.0029	0.0026	0.0002
280	0.0028	0.0026	0.0002
281	0.0028	0.0026	0.0002
282	0.0028	0.0026	0.0002
283	0.0028	0.0025	0.0002
284	0.0028	0.0025	0.0002
285	0.0027	0.0025	0.0002
286	0.0027	0.0025	0.0002
287	0.0027	0.0025	0.0002
288	0.0027	0.0025	0.0002

Total soil rain loss = 1.61(In)
Total effective rainfall = 0.44(In)
Peak flow rate in flood hydrograph = 15.99(CFS)

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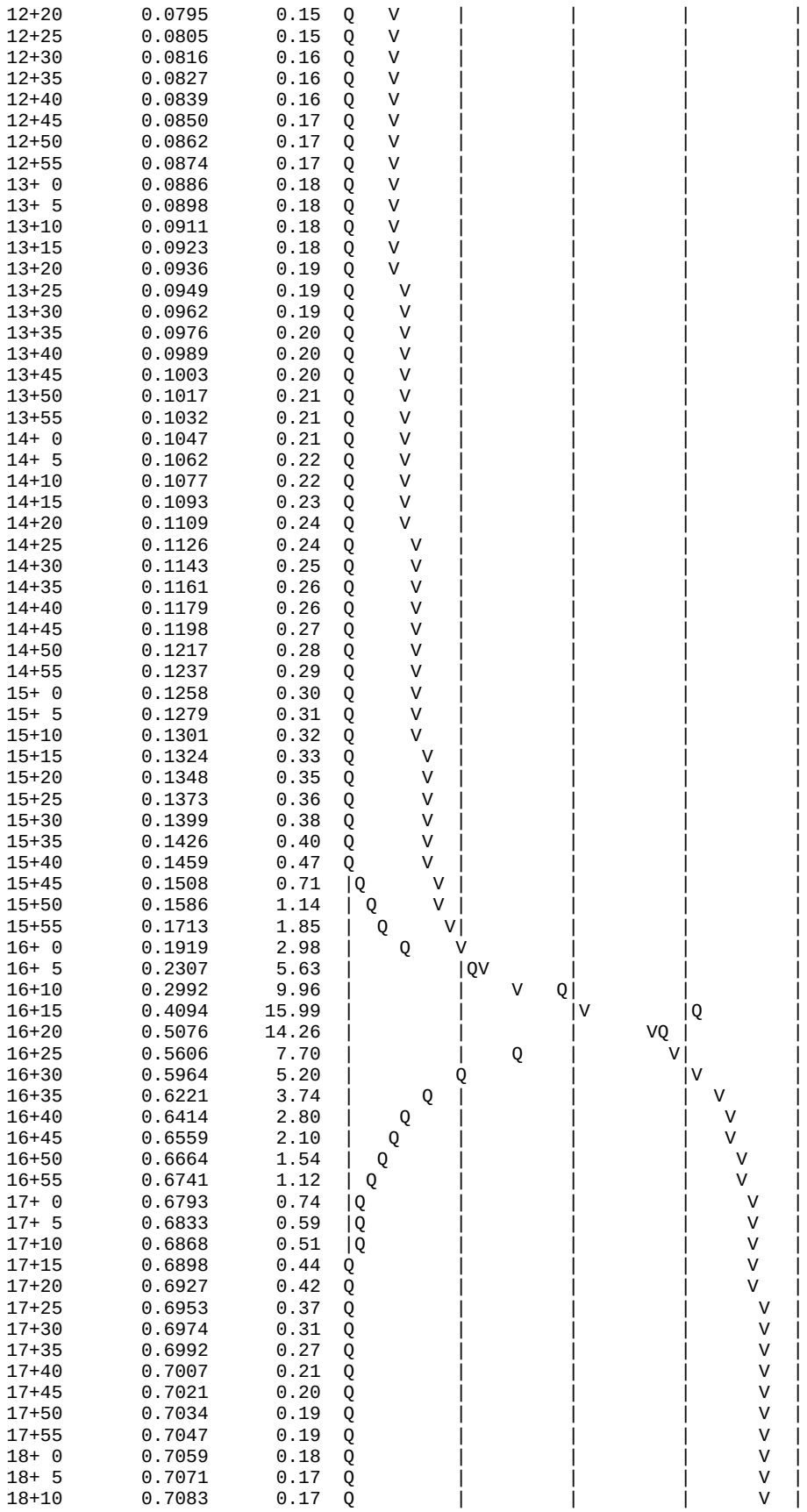
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0002	0.02	Q	|	|	|	|
0+20	0.0005	0.04	Q	|	|	|	|
0+25	0.0008	0.04	Q	|	|	|	|

0+30	0.0011	0.05	Q				
0+35	0.0014	0.05	Q				
0+40	0.0018	0.05	Q				
0+45	0.0021	0.05	Q				
0+50	0.0025	0.05	Q				
0+55	0.0029	0.06	Q				
1+ 0	0.0033	0.06	Q				
1+ 5	0.0037	0.06	Q				
1+10	0.0040	0.06	Q				
1+15	0.0044	0.06	Q				
1+20	0.0048	0.06	Q				
1+25	0.0052	0.06	Q				
1+30	0.0056	0.06	Q				
1+35	0.0060	0.06	Q				
1+40	0.0064	0.06	Q				
1+45	0.0068	0.06	Q				
1+50	0.0072	0.06	Q				
1+55	0.0076	0.06	Q				
2+ 0	0.0080	0.06	Q				
2+ 5	0.0085	0.06	Q				
2+10	0.0089	0.06	Q				
2+15	0.0093	0.06	Q				
2+20	0.0097	0.06	Q				
2+25	0.0101	0.06	Q				
2+30	0.0105	0.06	Q				
2+35	0.0109	0.06	Q				
2+40	0.0114	0.06	Q				
2+45	0.0118	0.06	Q				
2+50	0.0122	0.06	Q				
2+55	0.0126	0.06	Q				
3+ 0	0.0130	0.06	Q				
3+ 5	0.0135	0.06	Q				
3+10	0.0139	0.06	Q				
3+15	0.0143	0.06	Q				
3+20	0.0148	0.06	Q				
3+25	0.0152	0.06	Q				
3+30	0.0156	0.06	Q				
3+35	0.0161	0.06	Q				
3+40	0.0165	0.06	Q				
3+45	0.0170	0.06	Q				
3+50	0.0174	0.06	Q				
3+55	0.0178	0.06	Q				
4+ 0	0.0183	0.06	Q				
4+ 5	0.0187	0.07	Q				
4+10	0.0192	0.07	QV				
4+15	0.0196	0.07	QV				
4+20	0.0201	0.07	QV				
4+25	0.0206	0.07	QV				
4+30	0.0210	0.07	QV				
4+35	0.0215	0.07	QV				
4+40	0.0219	0.07	QV				
4+45	0.0224	0.07	QV				
4+50	0.0229	0.07	QV				
4+55	0.0233	0.07	QV				
5+ 0	0.0238	0.07	QV				
5+ 5	0.0243	0.07	QV				
5+10	0.0248	0.07	QV				
5+15	0.0252	0.07	QV				
5+20	0.0257	0.07	QV				
5+25	0.0262	0.07	QV				
5+30	0.0267	0.07	QV				
5+35	0.0272	0.07	QV				
5+40	0.0277	0.07	QV				
5+45	0.0281	0.07	QV				
5+50	0.0286	0.07	QV				
5+55	0.0291	0.07	QV				
6+ 0	0.0296	0.07	QV				
6+ 5	0.0301	0.07	QV				
6+10	0.0306	0.07	QV				
6+15	0.0312	0.07	QV				
6+20	0.0317	0.07	QV				

6+25	0.0322	0.07	QV	|	|	|	|
6+30	0.0327	0.07	QV	|	|	|	|
6+35	0.0332	0.08	QV	|	|	|	|
6+40	0.0337	0.08	QV	|	|	|	|
6+45	0.0342	0.08	QV	|	|	|	|
6+50	0.0348	0.08	QV	|	|	|	|
6+55	0.0353	0.08	QV	|	|	|	|
7+ 0	0.0358	0.08	QV	|	|	|	|
7+ 5	0.0364	0.08	QV	|	|	|	|
7+10	0.0369	0.08	QV	|	|	|	|
7+15	0.0374	0.08	QV	|	|	|	|
7+20	0.0380	0.08	Q V	|	|	|	|
7+25	0.0385	0.08	Q V	|	|	|	|
7+30	0.0391	0.08	Q V	|	|	|	|
7+35	0.0396	0.08	Q V	|	|	|	|
7+40	0.0402	0.08	Q V	|	|	|	|
7+45	0.0408	0.08	Q V	|	|	|	|
7+50	0.0413	0.08	Q V	|	|	|	|
7+55	0.0419	0.08	Q V	|	|	|	|
8+ 0	0.0425	0.08	Q V	|	|	|	|
8+ 5	0.0430	0.08	Q V	|	|	|	|
8+10	0.0436	0.08	Q V	|	|	|	|
8+15	0.0442	0.08	Q V	|	|	|	|
8+20	0.0448	0.09	Q V	|	|	|	|
8+25	0.0454	0.09	Q V	|	|	|	|
8+30	0.0460	0.09	Q V	|	|	|	|
8+35	0.0466	0.09	Q V	|	|	|	|
8+40	0.0472	0.09	Q V	|	|	|	|
8+45	0.0478	0.09	Q V	|	|	|	|
8+50	0.0484	0.09	Q V	|	|	|	|
8+55	0.0490	0.09	Q V	|	|	|	|
9+ 0	0.0496	0.09	Q V	|	|	|	|
9+ 5	0.0502	0.09	Q V	|	|	|	|
9+10	0.0509	0.09	Q V	|	|	|	|
9+15	0.0515	0.09	Q V	|	|	|	|
9+20	0.0521	0.09	Q V	|	|	|	|
9+25	0.0528	0.09	Q V	|	|	|	|
9+30	0.0534	0.09	Q V	|	|	|	|
9+35	0.0541	0.09	Q V	|	|	|	|
9+40	0.0547	0.10	Q V	|	|	|	|
9+45	0.0554	0.10	Q V	|	|	|	|
9+50	0.0561	0.10	Q V	|	|	|	|
9+55	0.0567	0.10	Q V	|	|	|	|
10+ 0	0.0574	0.10	Q V	|	|	|	|
10+ 5	0.0581	0.10	Q V	|	|	|	|
10+10	0.0588	0.10	Q V	|	|	|	|
10+15	0.0595	0.10	Q V	|	|	|	|
10+20	0.0602	0.10	Q V	|	|	|	|
10+25	0.0609	0.10	Q V	|	|	|	|
10+30	0.0616	0.10	Q V	|	|	|	|
10+35	0.0623	0.10	Q V	|	|	|	|
10+40	0.0630	0.11	Q V	|	|	|	|
10+45	0.0638	0.11	Q V	|	|	|	|
10+50	0.0645	0.11	Q V	|	|	|	|
10+55	0.0653	0.11	Q V	|	|	|	|
11+ 0	0.0660	0.11	Q V	|	|	|	|
11+ 5	0.0668	0.11	Q V	|	|	|	|
11+10	0.0675	0.11	Q V	|	|	|	|
11+15	0.0683	0.11	Q V	|	|	|	|
11+20	0.0691	0.11	Q V	|	|	|	|
11+25	0.0699	0.12	Q V	|	|	|	|
11+30	0.0707	0.12	Q V	|	|	|	|
11+35	0.0715	0.12	Q V	|	|	|	|
11+40	0.0723	0.12	Q V	|	|	|	|
11+45	0.0731	0.12	Q V	|	|	|	|
11+50	0.0740	0.12	Q V	|	|	|	|
11+55	0.0748	0.12	Q V	|	|	|	|
12+ 0	0.0757	0.12	Q V	|	|	|	|
12+ 5	0.0766	0.13	Q V	|	|	|	|
12+10	0.0775	0.13	Q V	|	|	|	|
12+15	0.0784	0.14	Q V	|	|	|	|


12+20 0.0795 0.15
12+25 0.0805 0.15
12+30 0.0816 0.16
12+35 0.0827 0.16
12+40 0.0839 0.16
12+45 0.0850 0.17
12+50 0.0862 0.17
12+55 0.0874 0.17
13+ 0 0.0886 0.18
13+ 5 0.0898 0.18
13+10 0.0911 0.18
13+15 0.0923 0.18
13+20 0.0936 0.19
13+25 0.0949 0.19
13+30 0.0962 0.19
13+35 0.0976 0.20
13+40 0.0989 0.20
13+45 0.1003 0.20
13+50 0.1017 0.21
13+55 0.1032 0.21
14+ 0 0.1047 0.21
14+ 5 0.1062 0.22
14+10 0.1077 0.22
14+15 0.1093 0.23
14+20 0.1109 0.24
14+25 0.1126 0.24
14+30 0.1143 0.25
14+35 0.1161 0.26
14+40 0.1179 0.26
14+45 0.1198 0.27
14+50 0.1217 0.28
14+55 0.1237 0.29
15+ 0 0.1258 0.30
15+ 5 0.1279 0.31
15+10 0.1301 0.32
15+15 0.1324 0.33
15+20 0.1348 0.35
15+25 0.1373 0.36
15+30 0.1399 0.38
15+35 0.1426 0.40
15+40 0.1459 0.47
15+45 0.1508 0.71
15+50 0.1586 1.14
15+55 0.1713 1.85
16+ 0 0.1919 2.98
16+ 5 0.2307 5.63
16+10 0.2992 9.96
16+15 0.4094 15.99
16+20 0.5076 14.26
16+25 0.5606 7.70
16+30 0.5964 5.20
16+35 0.6221 3.74
16+40 0.6414 2.80
16+45 0.6559 2.10
16+50 0.6664 1.54
16+55 0.6741 1.12
17+ 0 0.6793 0.74
17+ 5 0.6833 0.59
17+10 0.6868 0.51
17+15 0.6898 0.44
17+20 0.6927 0.42
17+25 0.6953 0.37
17+30 0.6974 0.31
17+35 0.6992 0.27
17+40 0.7007 0.21
17+45 0.7021 0.20
17+50 0.7034 0.19
17+55 0.7047 0.19
18+ 0 0.7059 0.18
18+ 5 0.7071 0.17
18+10 0.7083 0.17

18+15	0.7093	0.16	Q	|	|	|	V |
18+20	0.7103	0.14	Q	|	|	|	V |
18+25	0.7113	0.14	Q	|	|	|	V |
18+30	0.7122	0.13	Q	|	|	|	V |
18+35	0.7131	0.13	Q	|	|	|	V |
18+40	0.7139	0.12	Q	|	|	|	V |
18+45	0.7147	0.12	Q	|	|	|	V |
18+50	0.7155	0.12	Q	|	|	|	V |
18+55	0.7163	0.11	Q	|	|	|	V |
19+ 0	0.7171	0.11	Q	|	|	|	V |
19+ 5	0.7178	0.11	Q	|	|	|	V |
19+10	0.7186	0.11	Q	|	|	|	V |
19+15	0.7193	0.11	Q	|	|	|	V |
19+20	0.7200	0.10	Q	|	|	|	V |
19+25	0.7207	0.10	Q	|	|	|	V |
19+30	0.7214	0.10	Q	|	|	|	V |
19+35	0.7221	0.10	Q	|	|	|	V |
19+40	0.7227	0.10	Q	|	|	|	V |
19+45	0.7234	0.09	Q	|	|	|	V |
19+50	0.7240	0.09	Q	|	|	|	V |
19+55	0.7247	0.09	Q	|	|	|	V |
20+ 0	0.7253	0.09	Q	|	|	|	V |
20+ 5	0.7259	0.09	Q	|	|	|	V |
20+10	0.7265	0.09	Q	|	|	|	V |
20+15	0.7271	0.09	Q	|	|	|	V |
20+20	0.7277	0.09	Q	|	|	|	V |
20+25	0.7283	0.08	Q	|	|	|	V |
20+30	0.7289	0.08	Q	|	|	|	V |
20+35	0.7294	0.08	Q	|	|	|	V |
20+40	0.7300	0.08	Q	|	|	|	V |
20+45	0.7306	0.08	Q	|	|	|	V |
20+50	0.7311	0.08	Q	|	|	|	V|
20+55	0.7316	0.08	Q	|	|	|	V|
21+ 0	0.7322	0.08	Q	|	|	|	V|
21+ 5	0.7327	0.08	Q	|	|	|	V|
21+10	0.7332	0.08	Q	|	|	|	V|
21+15	0.7338	0.08	Q	|	|	|	V|
21+20	0.7343	0.07	Q	|	|	|	V|
21+25	0.7348	0.07	Q	|	|	|	V|
21+30	0.7353	0.07	Q	|	|	|	V|
21+35	0.7358	0.07	Q	|	|	|	V|
21+40	0.7363	0.07	Q	|	|	|	V|
21+45	0.7368	0.07	Q	|	|	|	V|
21+50	0.7372	0.07	Q	|	|	|	V|
21+55	0.7377	0.07	Q	|	|	|	V|
22+ 0	0.7382	0.07	Q	|	|	|	V|
22+ 5	0.7387	0.07	Q	|	|	|	V|
22+10	0.7391	0.07	Q	|	|	|	V|
22+15	0.7396	0.07	Q	|	|	|	V|
22+20	0.7400	0.07	Q	|	|	|	V|
22+25	0.7405	0.07	Q	|	|	|	V|
22+30	0.7409	0.07	Q	|	|	|	V|
22+35	0.7414	0.06	Q	|	|	|	V|
22+40	0.7418	0.06	Q	|	|	|	V|
22+45	0.7423	0.06	Q	|	|	|	V|
22+50	0.7427	0.06	Q	|	|	|	V|
22+55	0.7431	0.06	Q	|	|	|	V|
23+ 0	0.7436	0.06	Q	|	|	|	V|
23+ 5	0.7440	0.06	Q	|	|	|	V|
23+10	0.7444	0.06	Q	|	|	|	V|
23+15	0.7448	0.06	Q	|	|	|	V|
23+20	0.7452	0.06	Q	|	|	|	V|
23+25	0.7457	0.06	Q	|	|	|	V|
23+30	0.7461	0.06	Q	|	|	|	V|
23+35	0.7465	0.06	Q	|	|	|	V|
23+40	0.7469	0.06	Q	|	|	|	V|
23+45	0.7473	0.06	Q	|	|	|	V|
23+50	0.7477	0.06	Q	|	|	|	V|
23+55	0.7481	0.06	Q	|	|	|	V|
24+ 0	0.7485	0.06	Q	|	|	|	V|
24+ 5	0.7488	0.05	Q	|	|	|	V|

24+10	0.7492	0.05	Q				V
24+15	0.7494	0.03	Q				V
24+20	0.7495	0.02	Q				V
24+25	0.7496	0.01	Q				V
24+30	0.7497	0.01	Q				V
24+35	0.7497	0.01	Q				V
24+40	0.7498	0.00	Q				V
24+45	0.7498	0.00	Q				V
24+50	0.7498	0.00	Q				V
24+55	0.7498	0.00	Q				V
25+ 0	0.7498	0.00	Q				V
25+ 5	0.7498	0.00	Q				V
25+10	0.7498	0.00	Q				V
25+15	0.7498	0.00	Q				V
25+20	0.7498	0.00	Q				V
25+25	0.7498	0.00	Q				V
25+30	0.7498	0.00	Q				V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/11/16 File Name PRD00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'D' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

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******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
82.2	6.8	0.33	C	0.250	1.000	0.250
82.2	13.7	0.67	D	0.200	1.000	0.200

Area-averaged adjusted loss rate Fm (In/Hr) = 0.217

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
6.84	0.333	82.2	66.1	5.13	0.083
13.70	0.667	82.2	66.1	5.13	0.083

Area-averaged catchment yield fraction, Y = 0.083
Area-averaged low loss fraction, Yb = 0.917

++
User entry of time of concentration = 0.278 (hours)
Watershed area = 20.54(Ac.)
Catchment Lag time = 0.222 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 37.4970
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.217(In/Hr)
Average low loss rate fraction (Yb) = 0.917 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 20.54(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.190(In)
30-minute factor = 0.999 Adjusted rainfall = 0.400(In)
1-hour factor = 0.999 Adjusted rainfall = 0.529(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 248.41 (CFS))	
1	2.870	7.130
2	13.214	25.695
3	40.438	67.625
4	65.651	62.632
5	76.214	26.238
6	83.214	17.389
7	88.198	12.380
8	91.865	9.109
9	94.565	6.708
10	96.432	4.638
11	97.691	3.127
12	98.275	1.450
13	98.687	1.025
14	99.029	0.849
15	99.266	0.590
16	99.550	0.704
17	99.775	0.559
18	99.908	0.331
19	100.000	0.228

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1898	0.1898
2	0.2532	0.0634
3	0.2996	0.0465
4	0.3377	0.0380
5	0.3705	0.0328
6	0.3996	0.0292
7	0.4254	0.0258
8	0.4491	0.0237
9	0.4711	0.0220
10	0.4917	0.0206
11	0.5111	0.0194
12	0.5295	0.0184
13	0.5499	0.0204
14	0.5695	0.0196
15	0.5884	0.0189
16	0.6066	0.0182
17	0.6242	0.0176
18	0.6413	0.0171
19	0.6579	0.0166
20	0.6741	0.0161
21	0.6898	0.0157
22	0.7051	0.0153
23	0.7201	0.0150
24	0.7347	0.0146
25	0.7490	0.0143
26	0.7630	0.0140
27	0.7768	0.0137
28	0.7902	0.0135
29	0.8035	0.0132
30	0.8164	0.0130
31	0.8292	0.0127
32	0.8417	0.0125
33	0.8540	0.0123

34	0.8662	0.0121
35	0.8781	0.0119
36	0.8899	0.0118
37	0.9011	0.0112
38	0.9121	0.0110
39	0.9229	0.0108
40	0.9336	0.0107
41	0.9441	0.0106
42	0.9546	0.0104
43	0.9648	0.0103
44	0.9750	0.0101
45	0.9850	0.0100
46	0.9949	0.0099
47	1.0047	0.0098
48	1.0144	0.0097
49	1.0239	0.0096
50	1.0334	0.0095
51	1.0427	0.0094
52	1.0520	0.0093
53	1.0612	0.0092
54	1.0702	0.0091
55	1.0792	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1056	0.0087
59	1.1142	0.0086
60	1.1228	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1480	0.0083
64	1.1563	0.0083
65	1.1644	0.0082
66	1.1726	0.0081
67	1.1806	0.0081
68	1.1886	0.0080
69	1.1965	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2199	0.0077
73	1.2262	0.0063
74	1.2325	0.0063
75	1.2387	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2570	0.0061
79	1.2630	0.0060
80	1.2690	0.0060
81	1.2749	0.0059
82	1.2808	0.0059
83	1.2866	0.0058
84	1.2924	0.0058
85	1.2981	0.0057
86	1.3038	0.0057
87	1.3095	0.0057
88	1.3151	0.0056
89	1.3207	0.0056
90	1.3262	0.0055
91	1.3317	0.0055
92	1.3372	0.0055
93	1.3426	0.0054
94	1.3480	0.0054
95	1.3533	0.0054
96	1.3587	0.0053
97	1.3639	0.0053
98	1.3692	0.0052
99	1.3744	0.0052
100	1.3796	0.0052
101	1.3847	0.0051
102	1.3898	0.0051
103	1.3949	0.0051
104	1.4000	0.0051

105	1.4050	0.0050
106	1.4100	0.0050
107	1.4150	0.0050
108	1.4199	0.0049
109	1.4248	0.0049
110	1.4297	0.0049
111	1.4345	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4489	0.0048
115	1.4537	0.0047
116	1.4584	0.0047
117	1.4631	0.0047
118	1.4678	0.0047
119	1.4724	0.0046
120	1.4770	0.0046
121	1.4816	0.0046
122	1.4862	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5087	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5263	0.0044
132	1.5307	0.0044
133	1.5350	0.0043
134	1.5393	0.0043
135	1.5436	0.0043
136	1.5479	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5731	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5936	0.0041
148	1.5977	0.0041
149	1.6017	0.0040
150	1.6057	0.0040
151	1.6097	0.0040
152	1.6137	0.0040
153	1.6177	0.0040
154	1.6216	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6450	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6678	0.0038
167	1.6716	0.0038
168	1.6753	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6938	0.0037
174	1.6975	0.0037
175	1.7011	0.0036

176	1.7048	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036
181	1.7227	0.0036
182	1.7263	0.0036
183	1.7298	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7404	0.0035
187	1.7439	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7543	0.0035
191	1.7578	0.0035
192	1.7612	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7816	0.0034
199	1.7850	0.0034
200	1.7883	0.0034
201	1.7917	0.0033
202	1.7950	0.0033
203	1.7983	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8082	0.0033
207	1.8115	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8213	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8310	0.0032
214	1.8342	0.0032
215	1.8374	0.0032
216	1.8406	0.0032
217	1.8438	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8533	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8627	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8813	0.0031
230	1.8844	0.0031
231	1.8875	0.0031
232	1.8905	0.0031
233	1.8936	0.0030
234	1.8966	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9206	0.0030
243	1.9236	0.0030
244	1.9266	0.0030
245	1.9295	0.0030
246	1.9325	0.0029

247	1.9354	0.0029
248	1.9383	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9586	0.0029
256	1.9615	0.0029
257	1.9644	0.0029
258	1.9672	0.0029
259	1.9701	0.0029
260	1.9729	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9814	0.0028
264	1.9842	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9954	0.0028
269	1.9982	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0065	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0175	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0257	0.0027
280	2.0284	0.0027
281	2.0311	0.0027
282	2.0339	0.0027
283	2.0365	0.0027
284	2.0392	0.0027
285	2.0419	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0499	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0024	0.0002
2	0.0027	0.0025	0.0002
3	0.0027	0.0025	0.0002
4	0.0027	0.0025	0.0002
5	0.0027	0.0025	0.0002
6	0.0027	0.0025	0.0002
7	0.0027	0.0025	0.0002
8	0.0027	0.0025	0.0002
9	0.0027	0.0025	0.0002
10	0.0027	0.0025	0.0002
11	0.0028	0.0025	0.0002
12	0.0028	0.0025	0.0002
13	0.0028	0.0025	0.0002
14	0.0028	0.0026	0.0002
15	0.0028	0.0026	0.0002
16	0.0028	0.0026	0.0002
17	0.0028	0.0026	0.0002
18	0.0028	0.0026	0.0002
19	0.0028	0.0026	0.0002
20	0.0028	0.0026	0.0002
21	0.0029	0.0026	0.0002
22	0.0029	0.0026	0.0002
23	0.0029	0.0026	0.0002
24	0.0029	0.0026	0.0002

25	0.0029	0.0027	0.0002
26	0.0029	0.0027	0.0002
27	0.0029	0.0027	0.0002
28	0.0029	0.0027	0.0002
29	0.0029	0.0027	0.0002
30	0.0030	0.0027	0.0002
31	0.0030	0.0027	0.0002
32	0.0030	0.0027	0.0002
33	0.0030	0.0027	0.0002
34	0.0030	0.0027	0.0002
35	0.0030	0.0028	0.0003
36	0.0030	0.0028	0.0003
37	0.0030	0.0028	0.0003
38	0.0030	0.0028	0.0003
39	0.0031	0.0028	0.0003
40	0.0031	0.0028	0.0003
41	0.0031	0.0028	0.0003
42	0.0031	0.0028	0.0003
43	0.0031	0.0029	0.0003
44	0.0031	0.0029	0.0003
45	0.0031	0.0029	0.0003
46	0.0031	0.0029	0.0003
47	0.0032	0.0029	0.0003
48	0.0032	0.0029	0.0003
49	0.0032	0.0029	0.0003
50	0.0032	0.0029	0.0003
51	0.0032	0.0030	0.0003
52	0.0032	0.0030	0.0003
53	0.0033	0.0030	0.0003
54	0.0033	0.0030	0.0003
55	0.0033	0.0030	0.0003
56	0.0033	0.0030	0.0003
57	0.0033	0.0030	0.0003
58	0.0033	0.0030	0.0003
59	0.0033	0.0031	0.0003
60	0.0034	0.0031	0.0003
61	0.0034	0.0031	0.0003
62	0.0034	0.0031	0.0003
63	0.0034	0.0031	0.0003
64	0.0034	0.0031	0.0003
65	0.0034	0.0032	0.0003
66	0.0035	0.0032	0.0003
67	0.0035	0.0032	0.0003
68	0.0035	0.0032	0.0003
69	0.0035	0.0032	0.0003
70	0.0035	0.0032	0.0003
71	0.0035	0.0033	0.0003
72	0.0036	0.0033	0.0003
73	0.0036	0.0033	0.0003
74	0.0036	0.0033	0.0003
75	0.0036	0.0033	0.0003
76	0.0036	0.0033	0.0003
77	0.0037	0.0034	0.0003
78	0.0037	0.0034	0.0003
79	0.0037	0.0034	0.0003
80	0.0037	0.0034	0.0003
81	0.0037	0.0034	0.0003
82	0.0038	0.0034	0.0003
83	0.0038	0.0035	0.0003
84	0.0038	0.0035	0.0003
85	0.0038	0.0035	0.0003
86	0.0038	0.0035	0.0003
87	0.0039	0.0036	0.0003
88	0.0039	0.0036	0.0003
89	0.0039	0.0036	0.0003
90	0.0039	0.0036	0.0003
91	0.0040	0.0036	0.0003
92	0.0040	0.0037	0.0003
93	0.0040	0.0037	0.0003
94	0.0040	0.0037	0.0003
95	0.0041	0.0037	0.0003

96	0.0041	0.0037	0.0003
97	0.0041	0.0038	0.0003
98	0.0041	0.0038	0.0003
99	0.0042	0.0038	0.0003
100	0.0042	0.0038	0.0003
101	0.0042	0.0039	0.0004
102	0.0043	0.0039	0.0004
103	0.0043	0.0039	0.0004
104	0.0043	0.0040	0.0004
105	0.0044	0.0040	0.0004
106	0.0044	0.0040	0.0004
107	0.0044	0.0040	0.0004
108	0.0044	0.0041	0.0004
109	0.0045	0.0041	0.0004
110	0.0045	0.0041	0.0004
111	0.0045	0.0042	0.0004
112	0.0046	0.0042	0.0004
113	0.0046	0.0042	0.0004
114	0.0046	0.0043	0.0004
115	0.0047	0.0043	0.0004
116	0.0047	0.0043	0.0004
117	0.0048	0.0044	0.0004
118	0.0048	0.0044	0.0004
119	0.0049	0.0044	0.0004
120	0.0049	0.0045	0.0004
121	0.0049	0.0045	0.0004
122	0.0050	0.0046	0.0004
123	0.0050	0.0046	0.0004
124	0.0051	0.0046	0.0004
125	0.0051	0.0047	0.0004
126	0.0051	0.0047	0.0004
127	0.0052	0.0048	0.0004
128	0.0052	0.0048	0.0004
129	0.0053	0.0049	0.0004
130	0.0054	0.0049	0.0004
131	0.0054	0.0050	0.0005
132	0.0055	0.0050	0.0005
133	0.0055	0.0051	0.0005
134	0.0056	0.0051	0.0005
135	0.0057	0.0052	0.0005
136	0.0057	0.0052	0.0005
137	0.0058	0.0053	0.0005
138	0.0058	0.0053	0.0005
139	0.0059	0.0054	0.0005
140	0.0060	0.0055	0.0005
141	0.0061	0.0056	0.0005
142	0.0061	0.0056	0.0005
143	0.0062	0.0057	0.0005
144	0.0063	0.0057	0.0005
145	0.0077	0.0071	0.0006
146	0.0078	0.0072	0.0006
147	0.0079	0.0073	0.0007
148	0.0080	0.0073	0.0007
149	0.0081	0.0074	0.0007
150	0.0082	0.0075	0.0007
151	0.0083	0.0076	0.0007
152	0.0084	0.0077	0.0007
153	0.0086	0.0078	0.0007
154	0.0086	0.0079	0.0007
155	0.0088	0.0081	0.0007
156	0.0089	0.0081	0.0007
157	0.0091	0.0083	0.0008
158	0.0092	0.0084	0.0008
159	0.0094	0.0086	0.0008
160	0.0095	0.0087	0.0008
161	0.0097	0.0089	0.0008
162	0.0098	0.0090	0.0008
163	0.0100	0.0092	0.0008
164	0.0101	0.0093	0.0008
165	0.0104	0.0095	0.0009
166	0.0106	0.0097	0.0009

167	0.0108	0.0099	0.0009
168	0.0110	0.0101	0.0009
169	0.0118	0.0108	0.0010
170	0.0119	0.0110	0.0010
171	0.0123	0.0113	0.0010
172	0.0125	0.0115	0.0010
173	0.0130	0.0119	0.0011
174	0.0132	0.0121	0.0011
175	0.0137	0.0126	0.0011
176	0.0140	0.0128	0.0012
177	0.0146	0.0134	0.0012
178	0.0150	0.0137	0.0012
179	0.0157	0.0144	0.0013
180	0.0161	0.0148	0.0013
181	0.0171	0.0157	0.0014
182	0.0176	0.0162	0.0015
183	0.0189	0.0173	0.0016
184	0.0196	0.0180	0.0016
185	0.0184	0.0169	0.0015
186	0.0194	0.0178	0.0016
187	0.0220	0.0181	0.0039
188	0.0237	0.0181	0.0056
189	0.0292	0.0181	0.0111
190	0.0328	0.0181	0.0147
191	0.0465	0.0181	0.0284
192	0.0634	0.0181	0.0453
193	0.1898	0.0181	0.1718
194	0.0380	0.0181	0.0200
195	0.0258	0.0181	0.0078
196	0.0206	0.0181	0.0025
197	0.0204	0.0181	0.0024
198	0.0182	0.0167	0.0015
199	0.0166	0.0152	0.0014
200	0.0153	0.0141	0.0013
201	0.0143	0.0131	0.0012
202	0.0135	0.0123	0.0011
203	0.0127	0.0117	0.0011
204	0.0121	0.0111	0.0010
205	0.0112	0.0102	0.0009
206	0.0107	0.0098	0.0009
207	0.0103	0.0094	0.0009
208	0.0099	0.0091	0.0008
209	0.0096	0.0088	0.0008
210	0.0093	0.0085	0.0008
211	0.0090	0.0082	0.0007
212	0.0087	0.0080	0.0007
213	0.0085	0.0078	0.0007
214	0.0083	0.0076	0.0007
215	0.0081	0.0074	0.0007
216	0.0079	0.0072	0.0007
217	0.0063	0.0058	0.0005
218	0.0062	0.0056	0.0005
219	0.0060	0.0055	0.0005
220	0.0059	0.0054	0.0005
221	0.0057	0.0053	0.0005
222	0.0056	0.0051	0.0005
223	0.0055	0.0050	0.0005
224	0.0054	0.0049	0.0004
225	0.0053	0.0048	0.0004
226	0.0052	0.0048	0.0004
227	0.0051	0.0047	0.0004
228	0.0050	0.0046	0.0004
229	0.0049	0.0045	0.0004
230	0.0048	0.0044	0.0004
231	0.0047	0.0044	0.0004
232	0.0047	0.0043	0.0004
233	0.0046	0.0042	0.0004
234	0.0045	0.0042	0.0004
235	0.0045	0.0041	0.0004
236	0.0044	0.0040	0.0004
237	0.0043	0.0040	0.0004

238	0.0043	0.0039	0.0004
239	0.0042	0.0039	0.0003
240	0.0042	0.0038	0.0003
241	0.0041	0.0038	0.0003
242	0.0041	0.0037	0.0003
243	0.0040	0.0037	0.0003
244	0.0040	0.0036	0.0003
245	0.0039	0.0036	0.0003
246	0.0039	0.0035	0.0003
247	0.0038	0.0035	0.0003
248	0.0038	0.0035	0.0003
249	0.0037	0.0034	0.0003
250	0.0037	0.0034	0.0003
251	0.0036	0.0033	0.0003
252	0.0036	0.0033	0.0003
253	0.0036	0.0033	0.0003
254	0.0035	0.0032	0.0003
255	0.0035	0.0032	0.0003
256	0.0035	0.0032	0.0003
257	0.0034	0.0031	0.0003
258	0.0034	0.0031	0.0003
259	0.0034	0.0031	0.0003
260	0.0033	0.0031	0.0003
261	0.0033	0.0030	0.0003
262	0.0033	0.0030	0.0003
263	0.0032	0.0030	0.0003
264	0.0032	0.0029	0.0003
265	0.0032	0.0029	0.0003
266	0.0032	0.0029	0.0003
267	0.0031	0.0029	0.0003
268	0.0031	0.0028	0.0003
269	0.0031	0.0028	0.0003
270	0.0031	0.0028	0.0003
271	0.0030	0.0028	0.0003
272	0.0030	0.0028	0.0002
273	0.0030	0.0027	0.0002
274	0.0030	0.0027	0.0002
275	0.0029	0.0027	0.0002
276	0.0029	0.0027	0.0002
277	0.0029	0.0027	0.0002
278	0.0029	0.0026	0.0002
279	0.0029	0.0026	0.0002
280	0.0028	0.0026	0.0002
281	0.0028	0.0026	0.0002
282	0.0028	0.0026	0.0002
283	0.0028	0.0025	0.0002
284	0.0028	0.0025	0.0002
285	0.0027	0.0025	0.0002
286	0.0027	0.0025	0.0002
287	0.0027	0.0025	0.0002
288	0.0027	0.0025	0.0002

Total soil rain loss = 1.61(In)
Total effective rainfall = 0.44(In)
Peak flow rate in flood hydrograph = 16.26(CFS)

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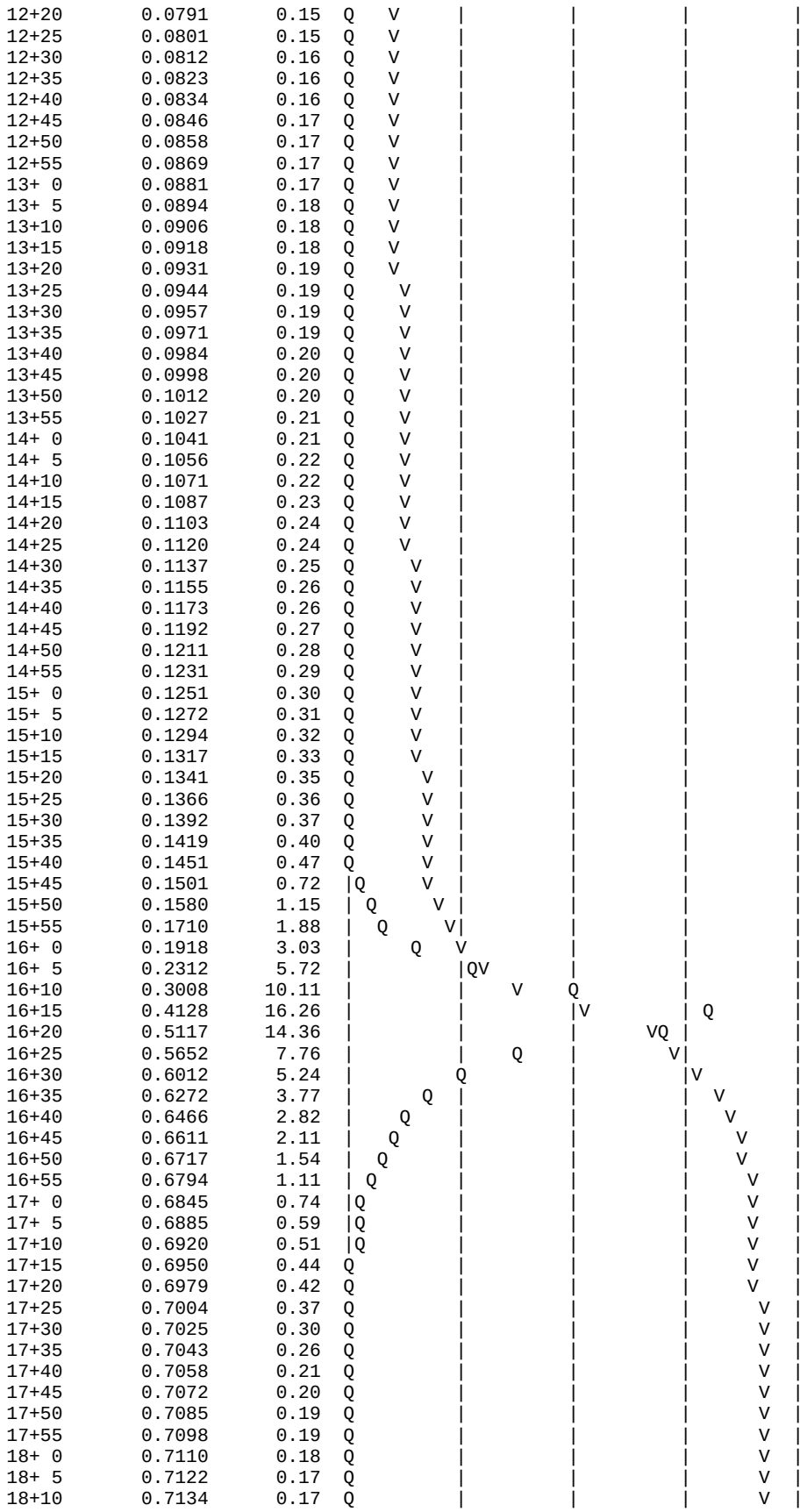
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0002	0.02	Q	|	|	|	|
0+20	0.0005	0.04	Q	|	|	|	|
0+25	0.0008	0.04	Q	|	|	|	|

0+30	0.0011	0.05	Q				
0+35	0.0014	0.05	Q				
0+40	0.0018	0.05	Q				
0+45	0.0021	0.05	Q				
0+50	0.0025	0.05	Q				
0+55	0.0029	0.05	Q				
1+ 0	0.0033	0.06	Q				
1+ 5	0.0036	0.06	Q				
1+10	0.0040	0.06	Q				
1+15	0.0044	0.06	Q				
1+20	0.0048	0.06	Q				
1+25	0.0052	0.06	Q				
1+30	0.0056	0.06	Q				
1+35	0.0060	0.06	Q				
1+40	0.0064	0.06	Q				
1+45	0.0068	0.06	Q				
1+50	0.0072	0.06	Q				
1+55	0.0076	0.06	Q				
2+ 0	0.0080	0.06	Q				
2+ 5	0.0084	0.06	Q				
2+10	0.0088	0.06	Q				
2+15	0.0092	0.06	Q				
2+20	0.0096	0.06	Q				
2+25	0.0101	0.06	Q				
2+30	0.0105	0.06	Q				
2+35	0.0109	0.06	Q				
2+40	0.0113	0.06	Q				
2+45	0.0117	0.06	Q				
2+50	0.0121	0.06	Q				
2+55	0.0126	0.06	Q				
3+ 0	0.0130	0.06	Q				
3+ 5	0.0134	0.06	Q				
3+10	0.0138	0.06	Q				
3+15	0.0143	0.06	Q				
3+20	0.0147	0.06	Q				
3+25	0.0151	0.06	Q				
3+30	0.0156	0.06	Q				
3+35	0.0160	0.06	Q				
3+40	0.0164	0.06	Q				
3+45	0.0169	0.06	Q				
3+50	0.0173	0.06	Q				
3+55	0.0178	0.06	Q				
4+ 0	0.0182	0.06	Q				
4+ 5	0.0186	0.06	Q				
4+10	0.0191	0.07	QV				
4+15	0.0195	0.07	QV				
4+20	0.0200	0.07	QV				
4+25	0.0204	0.07	QV				
4+30	0.0209	0.07	QV				
4+35	0.0214	0.07	QV				
4+40	0.0218	0.07	QV				
4+45	0.0223	0.07	QV				
4+50	0.0228	0.07	QV				
4+55	0.0232	0.07	QV				
5+ 0	0.0237	0.07	QV				
5+ 5	0.0242	0.07	QV				
5+10	0.0246	0.07	QV				
5+15	0.0251	0.07	QV				
5+20	0.0256	0.07	QV				
5+25	0.0261	0.07	QV				
5+30	0.0265	0.07	QV				
5+35	0.0270	0.07	QV				
5+40	0.0275	0.07	QV				
5+45	0.0280	0.07	QV				
5+50	0.0285	0.07	QV				
5+55	0.0290	0.07	QV				
6+ 0	0.0295	0.07	QV				
6+ 5	0.0300	0.07	QV				
6+10	0.0305	0.07	QV				
6+15	0.0310	0.07	QV				
6+20	0.0315	0.07	QV				

6+25	0.0320	0.07	QV	|	|	|	|
6+30	0.0325	0.07	QV	|	|	|	|
6+35	0.0330	0.07	QV	|	|	|	|
6+40	0.0336	0.08	QV	|	|	|	|
6+45	0.0341	0.08	QV	|	|	|	|
6+50	0.0346	0.08	QV	|	|	|	|
6+55	0.0351	0.08	QV	|	|	|	|
7+ 0	0.0356	0.08	QV	|	|	|	|
7+ 5	0.0362	0.08	QV	|	|	|	|
7+10	0.0367	0.08	QV	|	|	|	|
7+15	0.0373	0.08	QV	|	|	|	|
7+20	0.0378	0.08	Q V	|	|	|	|
7+25	0.0383	0.08	Q V	|	|	|	|
7+30	0.0389	0.08	Q V	|	|	|	|
7+35	0.0394	0.08	Q V	|	|	|	|
7+40	0.0400	0.08	Q V	|	|	|	|
7+45	0.0406	0.08	Q V	|	|	|	|
7+50	0.0411	0.08	Q V	|	|	|	|
7+55	0.0417	0.08	Q V	|	|	|	|
8+ 0	0.0422	0.08	Q V	|	|	|	|
8+ 5	0.0428	0.08	Q V	|	|	|	|
8+10	0.0434	0.08	Q V	|	|	|	|
8+15	0.0440	0.08	Q V	|	|	|	|
8+20	0.0446	0.08	Q V	|	|	|	|
8+25	0.0451	0.09	Q V	|	|	|	|
8+30	0.0457	0.09	Q V	|	|	|	|
8+35	0.0463	0.09	Q V	|	|	|	|
8+40	0.0469	0.09	Q V	|	|	|	|
8+45	0.0475	0.09	Q V	|	|	|	|
8+50	0.0481	0.09	Q V	|	|	|	|
8+55	0.0487	0.09	Q V	|	|	|	|
9+ 0	0.0494	0.09	Q V	|	|	|	|
9+ 5	0.0500	0.09	Q V	|	|	|	|
9+10	0.0506	0.09	Q V	|	|	|	|
9+15	0.0512	0.09	Q V	|	|	|	|
9+20	0.0519	0.09	Q V	|	|	|	|
9+25	0.0525	0.09	Q V	|	|	|	|
9+30	0.0531	0.09	Q V	|	|	|	|
9+35	0.0538	0.09	Q V	|	|	|	|
9+40	0.0544	0.09	Q V	|	|	|	|
9+45	0.0551	0.10	Q V	|	|	|	|
9+50	0.0558	0.10	Q V	|	|	|	|
9+55	0.0564	0.10	Q V	|	|	|	|
10+ 0	0.0571	0.10	Q V	|	|	|	|
10+ 5	0.0578	0.10	Q V	|	|	|	|
10+10	0.0585	0.10	Q V	|	|	|	|
10+15	0.0592	0.10	Q V	|	|	|	|
10+20	0.0599	0.10	Q V	|	|	|	|
10+25	0.0606	0.10	Q V	|	|	|	|
10+30	0.0613	0.10	Q V	|	|	|	|
10+35	0.0620	0.10	Q V	|	|	|	|
10+40	0.0627	0.10	Q V	|	|	|	|
10+45	0.0634	0.11	Q V	|	|	|	|
10+50	0.0642	0.11	Q V	|	|	|	|
10+55	0.0649	0.11	Q V	|	|	|	|
11+ 0	0.0657	0.11	Q V	|	|	|	|
11+ 5	0.0664	0.11	Q V	|	|	|	|
11+10	0.0672	0.11	Q V	|	|	|	|
11+15	0.0680	0.11	Q V	|	|	|	|
11+20	0.0687	0.11	Q V	|	|	|	|
11+25	0.0695	0.11	Q V	|	|	|	|
11+30	0.0703	0.12	Q V	|	|	|	|
11+35	0.0711	0.12	Q V	|	|	|	|
11+40	0.0719	0.12	Q V	|	|	|	|
11+45	0.0728	0.12	Q V	|	|	|	|
11+50	0.0736	0.12	Q V	|	|	|	|
11+55	0.0744	0.12	Q V	|	|	|	|
12+ 0	0.0753	0.12	Q V	|	|	|	|
12+ 5	0.0762	0.13	Q V	|	|	|	|
12+10	0.0771	0.13	Q V	|	|	|	|
12+15	0.0780	0.14	Q V	|	|	|	|


12+20 0.0791 0.15
12+25 0.0801 0.15
12+30 0.0812 0.16
12+35 0.0823 0.16
12+40 0.0834 0.16
12+45 0.0846 0.17
12+50 0.0858 0.17
12+55 0.0869 0.17
13+ 0 0.0881 0.17
13+ 5 0.0894 0.18
13+10 0.0906 0.18
13+15 0.0918 0.18
13+20 0.0931 0.19
13+25 0.0944 0.19
13+30 0.0957 0.19
13+35 0.0971 0.19
13+40 0.0984 0.20
13+45 0.0998 0.20
13+50 0.1012 0.20
13+55 0.1027 0.21
14+ 0 0.1041 0.21
14+ 5 0.1056 0.22
14+10 0.1071 0.22
14+15 0.1087 0.23
14+20 0.1103 0.24
14+25 0.1120 0.24
14+30 0.1137 0.25
14+35 0.1155 0.26
14+40 0.1173 0.26
14+45 0.1192 0.27
14+50 0.1211 0.28
14+55 0.1231 0.29
15+ 0 0.1251 0.30
15+ 5 0.1272 0.31
15+10 0.1294 0.32
15+15 0.1317 0.33
15+20 0.1341 0.35
15+25 0.1366 0.36
15+30 0.1392 0.37
15+35 0.1419 0.40
15+40 0.1451 0.47
15+45 0.1501 0.72
15+50 0.1580 1.15
15+55 0.1710 1.88
16+ 0 0.1918 3.03
16+ 5 0.2312 5.72
16+10 0.3008 10.11
16+15 0.4128 16.26
16+20 0.5117 14.36
16+25 0.5652 7.76
16+30 0.6012 5.24
16+35 0.6272 3.77
16+40 0.6466 2.82
16+45 0.6611 2.11
16+50 0.6717 1.54
16+55 0.6794 1.11
17+ 0 0.6845 0.74
17+ 5 0.6885 0.59
17+10 0.6920 0.51
17+15 0.6950 0.44
17+20 0.6979 0.42
17+25 0.7004 0.37
17+30 0.7025 0.30
17+35 0.7043 0.26
17+40 0.7058 0.21
17+45 0.7072 0.20
17+50 0.7085 0.19
17+55 0.7098 0.19
18+ 0 0.7110 0.18
18+ 5 0.7122 0.17
18+10 0.7134 0.17

18+15	0.7144	0.15	Q	|	|	|	V |
18+20	0.7154	0.14	Q	|	|	|	V |
18+25	0.7163	0.14	Q	|	|	|	V |
18+30	0.7172	0.13	Q	|	|	|	V |
18+35	0.7181	0.13	Q	|	|	|	V |
18+40	0.7190	0.12	Q	|	|	|	V |
18+45	0.7198	0.12	Q	|	|	|	V |
18+50	0.7206	0.12	Q	|	|	|	V |
18+55	0.7214	0.11	Q	|	|	|	V |
19+ 0	0.7221	0.11	Q	|	|	|	V |
19+ 5	0.7229	0.11	Q	|	|	|	V |
19+10	0.7236	0.11	Q	|	|	|	V |
19+15	0.7243	0.10	Q	|	|	|	V |
19+20	0.7250	0.10	Q	|	|	|	V |
19+25	0.7257	0.10	Q	|	|	|	V |
19+30	0.7264	0.10	Q	|	|	|	V |
19+35	0.7271	0.10	Q	|	|	|	V |
19+40	0.7277	0.10	Q	|	|	|	V |
19+45	0.7284	0.09	Q	|	|	|	V |
19+50	0.7290	0.09	Q	|	|	|	V |
19+55	0.7297	0.09	Q	|	|	|	V |
20+ 0	0.7303	0.09	Q	|	|	|	V |
20+ 5	0.7309	0.09	Q	|	|	|	V |
20+10	0.7315	0.09	Q	|	|	|	V |
20+15	0.7321	0.09	Q	|	|	|	V |
20+20	0.7327	0.09	Q	|	|	|	V |
20+25	0.7333	0.08	Q	|	|	|	V |
20+30	0.7338	0.08	Q	|	|	|	V |
20+35	0.7344	0.08	Q	|	|	|	V |
20+40	0.7350	0.08	Q	|	|	|	V |
20+45	0.7355	0.08	Q	|	|	|	V |
20+50	0.7361	0.08	Q	|	|	|	V|
20+55	0.7366	0.08	Q	|	|	|	V|
21+ 0	0.7371	0.08	Q	|	|	|	V|
21+ 5	0.7377	0.08	Q	|	|	|	V|
21+10	0.7382	0.08	Q	|	|	|	V|
21+15	0.7387	0.07	Q	|	|	|	V|
21+20	0.7392	0.07	Q	|	|	|	V|
21+25	0.7397	0.07	Q	|	|	|	V|
21+30	0.7402	0.07	Q	|	|	|	V|
21+35	0.7407	0.07	Q	|	|	|	V|
21+40	0.7412	0.07	Q	|	|	|	V|
21+45	0.7417	0.07	Q	|	|	|	V|
21+50	0.7422	0.07	Q	|	|	|	V|
21+55	0.7426	0.07	Q	|	|	|	V|
22+ 0	0.7431	0.07	Q	|	|	|	V|
22+ 5	0.7436	0.07	Q	|	|	|	V|
22+10	0.7440	0.07	Q	|	|	|	V|
22+15	0.7445	0.07	Q	|	|	|	V|
22+20	0.7449	0.07	Q	|	|	|	V|
22+25	0.7454	0.07	Q	|	|	|	V|
22+30	0.7458	0.06	Q	|	|	|	V|
22+35	0.7463	0.06	Q	|	|	|	V|
22+40	0.7467	0.06	Q	|	|	|	V|
22+45	0.7472	0.06	Q	|	|	|	V|
22+50	0.7476	0.06	Q	|	|	|	V|
22+55	0.7480	0.06	Q	|	|	|	V|
23+ 0	0.7485	0.06	Q	|	|	|	V|
23+ 5	0.7489	0.06	Q	|	|	|	V|
23+10	0.7493	0.06	Q	|	|	|	V|
23+15	0.7497	0.06	Q	|	|	|	V|
23+20	0.7501	0.06	Q	|	|	|	V|
23+25	0.7505	0.06	Q	|	|	|	V|
23+30	0.7509	0.06	Q	|	|	|	V|
23+35	0.7513	0.06	Q	|	|	|	V|
23+40	0.7517	0.06	Q	|	|	|	V|
23+45	0.7521	0.06	Q	|	|	|	V|
23+50	0.7525	0.06	Q	|	|	|	V|
23+55	0.7529	0.06	Q	|	|	|	V|
24+ 0	0.7533	0.06	Q	|	|	|	V|
24+ 5	0.7537	0.05	Q	|	|	|	V|

24+10	0.7540	0.05	Q	|	|	|	V|
24+15	0.7543	0.03	Q	|	|	|	V|
24+20	0.7544	0.02	Q	|	|	|	V|
24+25	0.7545	0.01	Q	|	|	|	V|
24+30	0.7545	0.01	Q	|	|	|	V|
24+35	0.7546	0.01	Q	|	|	|	V|
24+40	0.7546	0.00	Q	|	|	|	V|
24+45	0.7546	0.00	Q	|	|	|	V|
24+50	0.7547	0.00	Q	|	|	|	V|
24+55	0.7547	0.00	Q	|	|	|	V|
25+ 0	0.7547	0.00	Q	|	|	|	V|
25+ 5	0.7547	0.00	Q	|	|	|	V|
25+10	0.7547	0.00	Q	|	|	|	V|
25+15	0.7547	0.00	Q	|	|	|	V|
25+20	0.7547	0.00	Q	|	|	|	V|
25+25	0.7547	0.00	Q	|	|	|	V|
25+30	0.7547	0.00	Q	|	|	|	V|

AREA “E”

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/11/16 File Name: EXE002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'E' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 500.000 to Point/Station 501.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.125(In/Hr)
Initial subarea data:
Initial area flow distance = 265.000(Ft.)
Top (of initial area) elevation = 371.000(Ft.)
Bottom (of initial area) elevation = 341.000(Ft.)
Difference in elevation = 30.000(Ft.)
Slope = 0.11321 s(%)= 11.32
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.604 min.
Rainfall intensity = 2.120(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff = 1.149(CFS)
Total initial stream area = 0.640(Ac.)

++
Process from Point/Station 501.000 to Point/Station 502.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 341.000(Ft.)
End of street segment elevation = 301.000(Ft.)
Length of street segment = 551.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 9.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)

```
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.029(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   4.728(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.472(Ft.)
Flow velocity =   4.73(Ft/s)
Travel time =    1.94 min.     TC =    7.55  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 70.98
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.023(In/Hr)
Rainfall intensity =      1.787(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =      5.635(CFS) for    3.670(Ac.)
Total runoff =      6.784(CFS)       Total area =        4.31(Ac.)
Area averaged Fm value =    0.038(In/Hr)
Street flow at end of street =      6.784(CFS)
Half street flow at end of street =      3.392(CFS)
Depth of flow =   0.271(Ft.), Average velocity =   5.221(Ft/s)
Flow width (from curb towards crown)=   7.232(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   301.000(Ft.)
End of street segment elevation =   250.000(Ft.)
Length of street segment  =   730.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      7.392(CFS)
Depth of flow =   0.279(Ft.), Average velocity =   5.235(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.611(Ft.)
Flow velocity =   5.23(Ft/s)
Travel time =    2.32 min.     TC =    9.87  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.200
SCS curve number for soil(AMC 2)  = 70.20
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.240(In/Hr)
Max Catchment Loss (Fm) =     0.024(In/Hr)
Rainfall intensity =      1.532(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      1.046(CFS) for    1.500(Ac.)
Total runoff =      7.830(CFS)       Total area =        5.81(Ac.)
Area averaged Fm value =    0.035(In/Hr)
```

Street flow at end of street = 7.830(CFS)
Half street flow at end of street = 3.915(CFS)
Depth of flow = 0.283(Ft.), Average velocity = 5.299(Ft/s)
Flow width (from curb towards crown)= 7.824(Ft.)
End of computations, total study area = 5.81 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.144
Area averaged SCS curve number (AMC 2) = 70.6

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/11/16 File Name EXE00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'E' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
70.6	3.6	0.61	C	0.250	0.144	0.036
70.6	2.3	0.39	D	0.200	0.144	0.029

Area-averaged adjusted loss rate Fm (In/Hr) = 0.033

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.51	0.088	70.6	51.7	9.33	0.002
3.05	0.525	98.0	98.0	0.20	0.890
0.32	0.056	70.6	51.7	9.33	0.002
1.93	0.331	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.762
Area-averaged low loss fraction, Yb = 0.238
++
User entry of time of concentration = 0.165 (hours)
Watershed area = 5.81(Ac.)
Catchment Lag time = 0.132 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 63.3232
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.033(In/Hr)
Average low loss rate fraction (Yb) = 0.238 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 5.81(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.190(In)
30-minute factor = 1.000 Adjusted rainfall = 0.400(In)
1-hour factor = 1.000 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 70.26 (CFS))	
1	6.078	4.270
2	41.093	24.604
3	73.456	22.740
4	85.329	8.343
5	92.102	4.759
6	96.050	2.774
7	97.988	1.362
8	98.747	0.533
9	99.236	0.343
10	99.678	0.311
11	99.925	0.174
12	100.000	0.052

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1899	0.1899
2	0.2533	0.0634
3	0.2998	0.0465
4	0.3379	0.0381
5	0.3707	0.0328
6	0.3999	0.0292
7	0.4257	0.0258
8	0.4494	0.0237
9	0.4714	0.0220
10	0.4921	0.0206
11	0.5115	0.0194
12	0.5299	0.0184
13	0.5503	0.0204
14	0.5698	0.0196
15	0.5887	0.0189
16	0.6069	0.0182
17	0.6245	0.0176
18	0.6416	0.0171
19	0.6582	0.0166
20	0.6743	0.0161
21	0.6900	0.0157
22	0.7054	0.0153
23	0.7203	0.0150
24	0.7349	0.0146
25	0.7492	0.0143
26	0.7632	0.0140
27	0.7770	0.0137
28	0.7904	0.0135
29	0.8036	0.0132
30	0.8166	0.0130
31	0.8293	0.0127
32	0.8418	0.0125
33	0.8542	0.0123
34	0.8663	0.0121
35	0.8782	0.0119
36	0.8900	0.0118
37	0.9011	0.0112
38	0.9121	0.0110

39	0.9230	0.0108
40	0.9337	0.0107
41	0.9442	0.0105
42	0.9546	0.0104
43	0.9649	0.0103
44	0.9751	0.0101
45	0.9851	0.0100
46	0.9950	0.0099
47	1.0048	0.0098
48	1.0144	0.0097
49	1.0240	0.0096
50	1.0335	0.0095
51	1.0428	0.0094
52	1.0521	0.0093
53	1.0612	0.0092
54	1.0703	0.0091
55	1.0793	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1057	0.0087
59	1.1143	0.0086
60	1.1229	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1481	0.0083
64	1.1563	0.0083
65	1.1645	0.0082
66	1.1726	0.0081
67	1.1807	0.0081
68	1.1887	0.0080
69	1.1966	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2200	0.0077
73	1.2263	0.0063
74	1.2326	0.0063
75	1.2388	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2571	0.0061
79	1.2631	0.0060
80	1.2691	0.0060
81	1.2750	0.0059
82	1.2808	0.0059
83	1.2867	0.0058
84	1.2925	0.0058
85	1.2982	0.0057
86	1.3039	0.0057
87	1.3095	0.0057
88	1.3152	0.0056
89	1.3207	0.0056
90	1.3263	0.0055
91	1.3318	0.0055
92	1.3372	0.0055
93	1.3427	0.0054
94	1.3480	0.0054
95	1.3534	0.0054
96	1.3587	0.0053
97	1.3640	0.0053
98	1.3692	0.0052
99	1.3745	0.0052
100	1.3796	0.0052
101	1.3848	0.0051
102	1.3899	0.0051
103	1.3950	0.0051
104	1.4000	0.0051
105	1.4051	0.0050
106	1.4101	0.0050
107	1.4150	0.0050
108	1.4200	0.0049
109	1.4249	0.0049

110	1.4298	0.0049
111	1.4346	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4490	0.0048
115	1.4537	0.0047
116	1.4585	0.0047
117	1.4632	0.0047
118	1.4678	0.0047
119	1.4725	0.0046
120	1.4771	0.0046
121	1.4817	0.0046
122	1.4863	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5088	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5264	0.0044
132	1.5307	0.0044
133	1.5351	0.0043
134	1.5394	0.0043
135	1.5437	0.0043
136	1.5480	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5732	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5937	0.0041
148	1.5977	0.0041
149	1.6018	0.0040
150	1.6058	0.0040
151	1.6098	0.0040
152	1.6138	0.0040
153	1.6177	0.0040
154	1.6217	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6451	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6679	0.0038
167	1.6716	0.0038
168	1.6754	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6939	0.0037
174	1.6975	0.0037
175	1.7012	0.0036
176	1.7048	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036

181	1.7228	0.0036
182	1.7264	0.0036
183	1.7299	0.0035
184	1.7334	0.0035
185	1.7369	0.0035
186	1.7405	0.0035
187	1.7440	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7544	0.0035
191	1.7578	0.0035
192	1.7613	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7817	0.0034
199	1.7850	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7951	0.0033
203	1.7984	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8116	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8214	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8311	0.0032
214	1.8343	0.0032
215	1.8375	0.0032
216	1.8407	0.0032
217	1.8439	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8534	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8628	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8814	0.0031
230	1.8845	0.0031
231	1.8875	0.0031
232	1.8906	0.0031
233	1.8936	0.0030
234	1.8967	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9207	0.0030
243	1.9237	0.0030
244	1.9266	0.0030
245	1.9296	0.0030
246	1.9325	0.0029
247	1.9354	0.0029
248	1.9384	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029

252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9587	0.0029
256	1.9616	0.0029
257	1.9644	0.0029
258	1.9673	0.0029
259	1.9701	0.0029
260	1.9730	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9815	0.0028
264	1.9843	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9955	0.0028
269	1.9983	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0066	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0176	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0258	0.0027
280	2.0285	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0393	0.0027
285	2.0420	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0500	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0006	0.0020
2	0.0027	0.0006	0.0020
3	0.0027	0.0006	0.0020
4	0.0027	0.0006	0.0021
5	0.0027	0.0006	0.0021
6	0.0027	0.0006	0.0021
7	0.0027	0.0006	0.0021
8	0.0027	0.0006	0.0021
9	0.0027	0.0007	0.0021
10	0.0027	0.0007	0.0021
11	0.0028	0.0007	0.0021
12	0.0028	0.0007	0.0021
13	0.0028	0.0007	0.0021
14	0.0028	0.0007	0.0021
15	0.0028	0.0007	0.0021
16	0.0028	0.0007	0.0021
17	0.0028	0.0007	0.0021
18	0.0028	0.0007	0.0022
19	0.0028	0.0007	0.0022
20	0.0028	0.0007	0.0022
21	0.0029	0.0007	0.0022
22	0.0029	0.0007	0.0022
23	0.0029	0.0007	0.0022
24	0.0029	0.0007	0.0022
25	0.0029	0.0007	0.0022
26	0.0029	0.0007	0.0022
27	0.0029	0.0007	0.0022
28	0.0029	0.0007	0.0022
29	0.0029	0.0007	0.0022

30	0.0030	0.0007	0.0022
31	0.0030	0.0007	0.0023
32	0.0030	0.0007	0.0023
33	0.0030	0.0007	0.0023
34	0.0030	0.0007	0.0023
35	0.0030	0.0007	0.0023
36	0.0030	0.0007	0.0023
37	0.0030	0.0007	0.0023
38	0.0030	0.0007	0.0023
39	0.0031	0.0007	0.0023
40	0.0031	0.0007	0.0023
41	0.0031	0.0007	0.0024
42	0.0031	0.0007	0.0024
43	0.0031	0.0007	0.0024
44	0.0031	0.0007	0.0024
45	0.0031	0.0007	0.0024
46	0.0031	0.0008	0.0024
47	0.0032	0.0008	0.0024
48	0.0032	0.0008	0.0024
49	0.0032	0.0008	0.0024
50	0.0032	0.0008	0.0024
51	0.0032	0.0008	0.0025
52	0.0032	0.0008	0.0025
53	0.0033	0.0008	0.0025
54	0.0033	0.0008	0.0025
55	0.0033	0.0008	0.0025
56	0.0033	0.0008	0.0025
57	0.0033	0.0008	0.0025
58	0.0033	0.0008	0.0025
59	0.0033	0.0008	0.0025
60	0.0034	0.0008	0.0026
61	0.0034	0.0008	0.0026
62	0.0034	0.0008	0.0026
63	0.0034	0.0008	0.0026
64	0.0034	0.0008	0.0026
65	0.0034	0.0008	0.0026
66	0.0035	0.0008	0.0026
67	0.0035	0.0008	0.0026
68	0.0035	0.0008	0.0027
69	0.0035	0.0008	0.0027
70	0.0035	0.0008	0.0027
71	0.0035	0.0008	0.0027
72	0.0036	0.0008	0.0027
73	0.0036	0.0009	0.0027
74	0.0036	0.0009	0.0027
75	0.0036	0.0009	0.0028
76	0.0036	0.0009	0.0028
77	0.0037	0.0009	0.0028
78	0.0037	0.0009	0.0028
79	0.0037	0.0009	0.0028
80	0.0037	0.0009	0.0028
81	0.0037	0.0009	0.0028
82	0.0038	0.0009	0.0029
83	0.0038	0.0009	0.0029
84	0.0038	0.0009	0.0029
85	0.0038	0.0009	0.0029
86	0.0038	0.0009	0.0029
87	0.0039	0.0009	0.0029
88	0.0039	0.0009	0.0030
89	0.0039	0.0009	0.0030
90	0.0039	0.0009	0.0030
91	0.0040	0.0009	0.0030
92	0.0040	0.0009	0.0030
93	0.0040	0.0010	0.0031
94	0.0040	0.0010	0.0031
95	0.0041	0.0010	0.0031
96	0.0041	0.0010	0.0031
97	0.0041	0.0010	0.0031
98	0.0041	0.0010	0.0032
99	0.0042	0.0010	0.0032
100	0.0042	0.0010	0.0032

101	0.0042	0.0010	0.0032
102	0.0043	0.0010	0.0032
103	0.0043	0.0010	0.0033
104	0.0043	0.0010	0.0033
105	0.0044	0.0010	0.0033
106	0.0044	0.0010	0.0033
107	0.0044	0.0011	0.0034
108	0.0044	0.0011	0.0034
109	0.0045	0.0011	0.0034
110	0.0045	0.0011	0.0034
111	0.0045	0.0011	0.0035
112	0.0046	0.0011	0.0035
113	0.0046	0.0011	0.0035
114	0.0046	0.0011	0.0035
115	0.0047	0.0011	0.0036
116	0.0047	0.0011	0.0036
117	0.0048	0.0011	0.0036
118	0.0048	0.0011	0.0037
119	0.0049	0.0012	0.0037
120	0.0049	0.0012	0.0037
121	0.0049	0.0012	0.0038
122	0.0050	0.0012	0.0038
123	0.0050	0.0012	0.0038
124	0.0051	0.0012	0.0039
125	0.0051	0.0012	0.0039
126	0.0051	0.0012	0.0039
127	0.0052	0.0012	0.0040
128	0.0052	0.0012	0.0040
129	0.0053	0.0013	0.0040
130	0.0054	0.0013	0.0041
131	0.0054	0.0013	0.0041
132	0.0055	0.0013	0.0042
133	0.0055	0.0013	0.0042
134	0.0056	0.0013	0.0042
135	0.0057	0.0013	0.0043
136	0.0057	0.0014	0.0043
137	0.0058	0.0014	0.0044
138	0.0058	0.0014	0.0044
139	0.0059	0.0014	0.0045
140	0.0060	0.0014	0.0045
141	0.0061	0.0014	0.0046
142	0.0061	0.0015	0.0047
143	0.0062	0.0015	0.0047
144	0.0063	0.0015	0.0048
145	0.0077	0.0018	0.0059
146	0.0078	0.0019	0.0059
147	0.0079	0.0019	0.0060
148	0.0080	0.0019	0.0061
149	0.0081	0.0019	0.0062
150	0.0082	0.0019	0.0062
151	0.0083	0.0020	0.0063
152	0.0084	0.0020	0.0064
153	0.0086	0.0020	0.0065
154	0.0086	0.0021	0.0066
155	0.0088	0.0021	0.0067
156	0.0089	0.0021	0.0068
157	0.0091	0.0022	0.0069
158	0.0092	0.0022	0.0070
159	0.0094	0.0022	0.0071
160	0.0095	0.0023	0.0072
161	0.0097	0.0023	0.0074
162	0.0098	0.0023	0.0075
163	0.0100	0.0024	0.0076
164	0.0101	0.0024	0.0077
165	0.0104	0.0025	0.0079
166	0.0105	0.0025	0.0080
167	0.0108	0.0026	0.0083
168	0.0110	0.0026	0.0084
169	0.0118	0.0028	0.0090
170	0.0119	0.0028	0.0092
171	0.0123	0.0028	0.0095

172	0.0125	0.0028	0.0098
173	0.0130	0.0028	0.0102
174	0.0132	0.0028	0.0104
175	0.0137	0.0028	0.0110
176	0.0140	0.0028	0.0112
177	0.0146	0.0028	0.0118
178	0.0150	0.0028	0.0122
179	0.0157	0.0028	0.0129
180	0.0161	0.0028	0.0134
181	0.0171	0.0028	0.0143
182	0.0176	0.0028	0.0149
183	0.0189	0.0028	0.0161
184	0.0196	0.0028	0.0168
185	0.0184	0.0028	0.0156
186	0.0194	0.0028	0.0166
187	0.0220	0.0028	0.0192
188	0.0237	0.0028	0.0209
189	0.0292	0.0028	0.0264
190	0.0328	0.0028	0.0301
191	0.0465	0.0028	0.0437
192	0.0634	0.0028	0.0606
193	0.1899	0.0028	0.1872
194	0.0381	0.0028	0.0353
195	0.0258	0.0028	0.0231
196	0.0206	0.0028	0.0178
197	0.0204	0.0028	0.0176
198	0.0182	0.0028	0.0154
199	0.0166	0.0028	0.0138
200	0.0153	0.0028	0.0126
201	0.0143	0.0028	0.0115
202	0.0135	0.0028	0.0107
203	0.0127	0.0028	0.0100
204	0.0121	0.0028	0.0094
205	0.0112	0.0027	0.0085
206	0.0107	0.0025	0.0081
207	0.0103	0.0024	0.0078
208	0.0099	0.0024	0.0075
209	0.0096	0.0023	0.0073
210	0.0093	0.0022	0.0071
211	0.0090	0.0021	0.0068
212	0.0087	0.0021	0.0066
213	0.0085	0.0020	0.0065
214	0.0083	0.0020	0.0063
215	0.0081	0.0019	0.0061
216	0.0079	0.0019	0.0060
217	0.0063	0.0015	0.0048
218	0.0062	0.0015	0.0047
219	0.0060	0.0014	0.0046
220	0.0059	0.0014	0.0045
221	0.0057	0.0014	0.0044
222	0.0056	0.0013	0.0043
223	0.0055	0.0013	0.0042
224	0.0054	0.0013	0.0041
225	0.0053	0.0013	0.0040
226	0.0052	0.0012	0.0039
227	0.0051	0.0012	0.0039
228	0.0050	0.0012	0.0038
229	0.0049	0.0012	0.0037
230	0.0048	0.0011	0.0037
231	0.0047	0.0011	0.0036
232	0.0047	0.0011	0.0036
233	0.0046	0.0011	0.0035
234	0.0045	0.0011	0.0034
235	0.0045	0.0011	0.0034
236	0.0044	0.0010	0.0033
237	0.0043	0.0010	0.0033
238	0.0043	0.0010	0.0033
239	0.0042	0.0010	0.0032
240	0.0042	0.0010	0.0032
241	0.0041	0.0010	0.0031
242	0.0041	0.0010	0.0031

243	0.0040	0.0010	0.0030
244	0.0040	0.0009	0.0030
245	0.0039	0.0009	0.0030
246	0.0039	0.0009	0.0029
247	0.0038	0.0009	0.0029
248	0.0038	0.0009	0.0029
249	0.0037	0.0009	0.0028
250	0.0037	0.0009	0.0028
251	0.0036	0.0009	0.0028
252	0.0036	0.0009	0.0027
253	0.0036	0.0009	0.0027
254	0.0035	0.0008	0.0027
255	0.0035	0.0008	0.0027
256	0.0035	0.0008	0.0026
257	0.0034	0.0008	0.0026
258	0.0034	0.0008	0.0026
259	0.0034	0.0008	0.0026
260	0.0033	0.0008	0.0025
261	0.0033	0.0008	0.0025
262	0.0033	0.0008	0.0025
263	0.0032	0.0008	0.0025
264	0.0032	0.0008	0.0024
265	0.0032	0.0008	0.0024
266	0.0032	0.0008	0.0024
267	0.0031	0.0007	0.0024
268	0.0031	0.0007	0.0024
269	0.0031	0.0007	0.0023
270	0.0031	0.0007	0.0023
271	0.0030	0.0007	0.0023
272	0.0030	0.0007	0.0023
273	0.0030	0.0007	0.0023
274	0.0030	0.0007	0.0023
275	0.0029	0.0007	0.0022
276	0.0029	0.0007	0.0022
277	0.0029	0.0007	0.0022
278	0.0029	0.0007	0.0022
279	0.0029	0.0007	0.0022
280	0.0028	0.0007	0.0022
281	0.0028	0.0007	0.0021
282	0.0028	0.0007	0.0021
283	0.0028	0.0007	0.0021
284	0.0028	0.0007	0.0021
285	0.0027	0.0007	0.0021
286	0.0027	0.0006	0.0021
287	0.0027	0.0006	0.0021
288	0.0027	0.0006	0.0020

Total soil rain loss = 0.38(In)
Total effective rainfall = 1.67(In)
Peak flow rate in flood hydrograph = 6.77(CFS)

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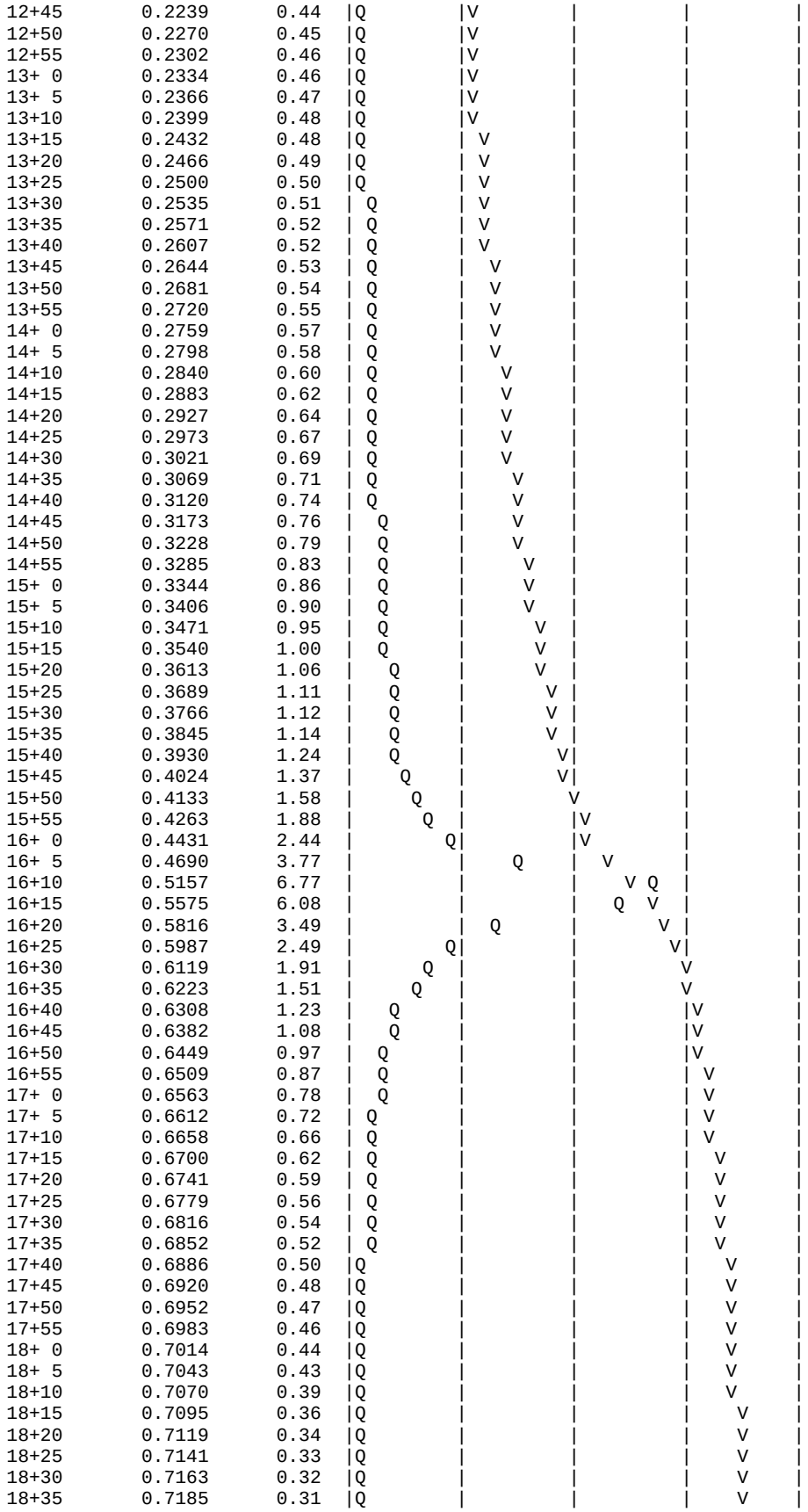
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0005	0.06	Q	|	|	|	|
0+15	0.0012	0.11	Q	|	|	|	|
0+20	0.0020	0.12	Q	|	|	|	|
0+25	0.0029	0.13	Q	|	|	|	|
0+30	0.0039	0.14	Q	|	|	|	|
0+35	0.0049	0.14	Q	|	|	|	|
0+40	0.0059	0.14	Q	|	|	|	|
0+45	0.0069	0.14	Q	|	|	|	|
0+50	0.0079	0.15	Q	|	|	|	|

0+55	0.0089	0.15	Q	|	|	|	|
1+ 0	0.0099	0.15	Q	|	|	|	|
1+ 5	0.0109	0.15	Q	|	|	|	|
1+10	0.0119	0.15	Q	|	|	|	|
1+15	0.0129	0.15	Q	|	|	|	|
1+20	0.0140	0.15	Q	|	|	|	|
1+25	0.0150	0.15	Q	|	|	|	|
1+30	0.0160	0.15	Q	|	|	|	|
1+35	0.0171	0.15	Q	|	|	|	|
1+40	0.0181	0.15	Q	|	|	|	|
1+45	0.0192	0.15	Q	|	|	|	|
1+50	0.0202	0.15	Q	|	|	|	|
1+55	0.0213	0.15	QV	|	|	|	|
2+ 0	0.0223	0.15	QV	|	|	|	|
2+ 5	0.0234	0.15	QV	|	|	|	|
2+10	0.0244	0.15	QV	|	|	|	|
2+15	0.0255	0.16	QV	|	|	|	|
2+20	0.0266	0.16	QV	|	|	|	|
2+25	0.0277	0.16	QV	|	|	|	|
2+30	0.0287	0.16	QV	|	|	|	|
2+35	0.0298	0.16	QV	|	|	|	|
2+40	0.0309	0.16	QV	|	|	|	|
2+45	0.0320	0.16	QV	|	|	|	|
2+50	0.0331	0.16	QV	|	|	|	|
2+55	0.0342	0.16	QV	|	|	|	|
3+ 0	0.0353	0.16	QV	|	|	|	|
3+ 5	0.0364	0.16	QV	|	|	|	|
3+10	0.0375	0.16	QV	|	|	|	|
3+15	0.0386	0.16	QV	|	|	|	|
3+20	0.0398	0.16	QV	|	|	|	|
3+25	0.0409	0.16	Q V	|	|	|	|
3+30	0.0420	0.16	Q V	|	|	|	|
3+35	0.0432	0.17	Q V	|	|	|	|
3+40	0.0443	0.17	Q V	|	|	|	|
3+45	0.0455	0.17	Q V	|	|	|	|
3+50	0.0466	0.17	Q V	|	|	|	|
3+55	0.0478	0.17	Q V	|	|	|	|
4+ 0	0.0489	0.17	Q V	|	|	|	|
4+ 5	0.0501	0.17	Q V	|	|	|	|
4+10	0.0513	0.17	Q V	|	|	|	|
4+15	0.0524	0.17	Q V	|	|	|	|
4+20	0.0536	0.17	Q V	|	|	|	|
4+25	0.0548	0.17	Q V	|	|	|	|
4+30	0.0560	0.17	Q V	|	|	|	|
4+35	0.0572	0.17	Q V	|	|	|	|
4+40	0.0584	0.17	Q V	|	|	|	|
4+45	0.0596	0.18	Q V	|	|	|	|
4+50	0.0608	0.18	Q V	|	|	|	|
4+55	0.0620	0.18	Q V	|	|	|	|
5+ 0	0.0633	0.18	Q V	|	|	|	|
5+ 5	0.0645	0.18	Q V	|	|	|	|
5+10	0.0657	0.18	Q V	|	|	|	|
5+15	0.0670	0.18	Q V	|	|	|	|
5+20	0.0682	0.18	Q V	|	|	|	|
5+25	0.0695	0.18	Q V	|	|	|	|
5+30	0.0707	0.18	Q V	|	|	|	|
5+35	0.0720	0.18	Q V	|	|	|	|
5+40	0.0733	0.18	Q V	|	|	|	|
5+45	0.0746	0.19	Q V	|	|	|	|
5+50	0.0758	0.19	Q V	|	|	|	|
5+55	0.0771	0.19	Q V	|	|	|	|
6+ 0	0.0784	0.19	Q V	|	|	|	|
6+ 5	0.0797	0.19	Q V	|	|	|	|
6+10	0.0811	0.19	Q V	|	|	|	|
6+15	0.0824	0.19	Q V	|	|	|	|
6+20	0.0837	0.19	Q V	|	|	|	|
6+25	0.0850	0.19	Q V	|	|	|	|
6+30	0.0864	0.19	Q V	|	|	|	|
6+35	0.0877	0.20	Q V	|	|	|	|
6+40	0.0891	0.20	Q V	|	|	|	|
6+45	0.0904	0.20	Q V	|	|	|	|

6+50	0.0918	0.20	Q	V	|	|	|	|
6+55	0.0932	0.20	Q	V	|	|	|	|
7+ 0	0.0946	0.20	Q	V	|	|	|	|
7+ 5	0.0960	0.20	Q	V	|	|	|	|
7+10	0.0974	0.20	Q	V	|	|	|	|
7+15	0.0988	0.20	Q	V	|	|	|	|
7+20	0.1002	0.21	Q	V	|	|	|	|
7+25	0.1016	0.21	Q	V	|	|	|	|
7+30	0.1030	0.21	Q	V	|	|	|	|
7+35	0.1045	0.21	Q	V	|	|	|	|
7+40	0.1059	0.21	Q	V	|	|	|	|
7+45	0.1074	0.21	Q	V	|	|	|	|
7+50	0.1089	0.21	Q	V	|	|	|	|
7+55	0.1103	0.21	Q	V	|	|	|	|
8+ 0	0.1118	0.22	Q	V	|	|	|	|
8+ 5	0.1133	0.22	Q	V	|	|	|	|
8+10	0.1148	0.22	Q	V	|	|	|	|
8+15	0.1164	0.22	Q	V	|	|	|	|
8+20	0.1179	0.22	Q	V	|	|	|	|
8+25	0.1194	0.22	Q	V	|	|	|	|
8+30	0.1210	0.22	Q	V	|	|	|	|
8+35	0.1225	0.23	Q	V	|	|	|	|
8+40	0.1241	0.23	Q	V	|	|	|	|
8+45	0.1257	0.23	Q	V	|	|	|	|
8+50	0.1273	0.23	Q	V	|	|	|	|
8+55	0.1289	0.23	Q	V	|	|	|	|
9+ 0	0.1305	0.23	Q	V	|	|	|	|
9+ 5	0.1321	0.24	Q	V	|	|	|	|
9+10	0.1337	0.24	Q	V	|	|	|	|
9+15	0.1354	0.24	Q	V	|	|	|	|
9+20	0.1370	0.24	Q	V	|	|	|	|
9+25	0.1387	0.24	Q	V	|	|	|	|
9+30	0.1404	0.24	Q	V	|	|	|	|
9+35	0.1421	0.25	Q	V	|	|	|	|
9+40	0.1438	0.25	Q	V	|	|	|	|
9+45	0.1455	0.25	|Q	V	|	|	|	|
9+50	0.1473	0.25	|Q	V	|	|	|	|
9+55	0.1490	0.25	|Q	V	|	|	|	|
10+ 0	0.1508	0.26	|Q	V	|	|	|	|
10+ 5	0.1526	0.26	|Q	V	|	|	|	|
10+10	0.1544	0.26	|Q	V	|	|	|	|
10+15	0.1562	0.26	|Q	V	|	|	|	|
10+20	0.1581	0.27	|Q	V	|	|	|	|
10+25	0.1599	0.27	|Q	V	|	|	|	|
10+30	0.1618	0.27	|Q	V	|	|	|	|
10+35	0.1636	0.27	|Q	V	|	|	|	|
10+40	0.1655	0.28	|Q	V	|	|	|	|
10+45	0.1675	0.28	|Q	V	|	|	|	|
10+50	0.1694	0.28	|Q	V	|	|	|	|
10+55	0.1714	0.28	|Q	V	|	|	|	|
11+ 0	0.1733	0.29	|Q	V	|	|	|	|
11+ 5	0.1753	0.29	|Q	V	|	|	|	|
11+10	0.1773	0.29	|Q	V	|	|	|	|
11+15	0.1794	0.30	|Q	V	|	|	|	|
11+20	0.1814	0.30	|Q	V	|	|	|	|
11+25	0.1835	0.30	|Q	V	|	|	|	|
11+30	0.1856	0.31	|Q	V	|	|	|	|
11+35	0.1877	0.31	|Q	V	|	|	|	|
11+40	0.1899	0.31	|Q	V	|	|	|	|
11+45	0.1921	0.32	|Q	V	|	|	|	|
11+50	0.1943	0.32	|Q	V	|	|	|	|
11+55	0.1965	0.32	|Q	V	|	|	|	|
12+ 0	0.1987	0.33	|Q	V	|	|	|	|
12+ 5	0.2011	0.34	|Q	V	|	|	|	|
12+10	0.2036	0.37	|Q	V	|	|	|	|
12+15	0.2063	0.39	|Q	V	|	|	|	|
12+20	0.2091	0.41	|Q	V	|	|	|	|
12+25	0.2120	0.42	|Q	V	|	|	|	|
12+30	0.2149	0.43	|Q	V	|	|	|	|
12+35	0.2179	0.43	|Q	V	|	|	|	|
12+40	0.2209	0.44	|Q	V	|	|	|	|



18+40	0.7206	0.30	|Q	|	|	|	V |
18+45	0.7226	0.30	|Q	|	|	|	V |
18+50	0.7246	0.29	|Q	|	|	|	V |
18+55	0.7265	0.28	|Q	|	|	|	V |
19+ 0	0.7285	0.28	|Q	|	|	|	V |
19+ 5	0.7303	0.27	|Q	|	|	|	V |
19+10	0.7322	0.27	|Q	|	|	|	V |
19+15	0.7340	0.26	|Q	|	|	|	V |
19+20	0.7358	0.26	|Q	|	|	|	V |
19+25	0.7375	0.25	|Q	|	|	|	V |
19+30	0.7393	0.25	|Q	|	|	|	V |
19+35	0.7410	0.25	Q	|	|	|	V |
19+40	0.7426	0.24	Q	|	|	|	V |
19+45	0.7443	0.24	Q	|	|	|	V |
19+50	0.7459	0.24	Q	|	|	|	V |
19+55	0.7475	0.23	Q	|	|	|	V |
20+ 0	0.7491	0.23	Q	|	|	|	V |
20+ 5	0.7506	0.23	Q	|	|	|	V |
20+10	0.7522	0.22	Q	|	|	|	V |
20+15	0.7537	0.22	Q	|	|	|	V |
20+20	0.7552	0.22	Q	|	|	|	V |
20+25	0.7567	0.21	Q	|	|	|	V |
20+30	0.7581	0.21	Q	|	|	|	V |
20+35	0.7596	0.21	Q	|	|	|	V |
20+40	0.7610	0.21	Q	|	|	|	V |
20+45	0.7624	0.20	Q	|	|	|	V |
20+50	0.7638	0.20	Q	|	|	|	V |
20+55	0.7652	0.20	Q	|	|	|	V |
21+ 0	0.7665	0.20	Q	|	|	|	V |
21+ 5	0.7679	0.20	Q	|	|	|	V |
21+10	0.7692	0.19	Q	|	|	|	V |
21+15	0.7705	0.19	Q	|	|	|	V |
21+20	0.7718	0.19	Q	|	|	|	V |
21+25	0.7731	0.19	Q	|	|	|	V |
21+30	0.7744	0.19	Q	|	|	|	V |
21+35	0.7757	0.18	Q	|	|	|	V |
21+40	0.7769	0.18	Q	|	|	|	V |
21+45	0.7782	0.18	Q	|	|	|	V |
21+50	0.7794	0.18	Q	|	|	|	V |
21+55	0.7806	0.18	Q	|	|	|	V |
22+ 0	0.7818	0.18	Q	|	|	|	V |
22+ 5	0.7830	0.17	Q	|	|	|	V |
22+10	0.7842	0.17	Q	|	|	|	V |
22+15	0.7854	0.17	Q	|	|	|	V |
22+20	0.7865	0.17	Q	|	|	|	V |
22+25	0.7877	0.17	Q	|	|	|	V |
22+30	0.7888	0.17	Q	|	|	|	V |
22+35	0.7900	0.17	Q	|	|	|	V|
22+40	0.7911	0.16	Q	|	|	|	V|
22+45	0.7922	0.16	Q	|	|	|	V|
22+50	0.7933	0.16	Q	|	|	|	V|
22+55	0.7944	0.16	Q	|	|	|	V|
23+ 0	0.7955	0.16	Q	|	|	|	V|
23+ 5	0.7966	0.16	Q	|	|	|	V|
23+10	0.7977	0.16	Q	|	|	|	V|
23+15	0.7988	0.16	Q	|	|	|	V|
23+20	0.7998	0.15	Q	|	|	|	V|
23+25	0.8009	0.15	Q	|	|	|	V|
23+30	0.8019	0.15	Q	|	|	|	V|
23+35	0.8029	0.15	Q	|	|	|	V|
23+40	0.8040	0.15	Q	|	|	|	V|
23+45	0.8050	0.15	Q	|	|	|	V|
23+50	0.8060	0.15	Q	|	|	|	V|
23+55	0.8070	0.15	Q	|	|	|	V|
24+ 0	0.8080	0.15	Q	|	|	|	V|
24+ 5	0.8090	0.14	Q	|	|	|	V|
24+10	0.8095	0.09	Q	|	|	|	V|
24+15	0.8098	0.04	Q	|	|	|	V|
24+20	0.8100	0.02	Q	|	|	|	V|
24+25	0.8100	0.01	Q	|	|	|	V|
24+30	0.8101	0.01	Q	|	|	|	V|

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   24+35       0.8101      0.00  Q         |         |         |        V|
   24+40       0.8101      0.00  Q         |         |         |        V|
   24+45       0.8101      0.00  Q         |         |         |        V|
   24+50       0.8101      0.00  Q         |         |         |        V|
   24+55       0.8101      0.00  Q         |         |         |         V
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Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2014 Version 9.0
Rational Hydrology Study, Date: 02/05/18 File Name: PRE002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'E' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, FEBRUARY 5, 2018
BY: BRIAN LOWELL, PE

Program License Serial Number 6407

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 500.000 to Point/Station 501.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 69.00
Pervious ratio(Ap) = 0.5000 Max loss rate(Fp)= 0.250(In/Hr)
Max Catchment Loss (Fm) = 0.125(In/Hr)
Initial subarea data:
Initial area flow distance = 265.000(Ft.)
Top (of initial area) elevation = 372.000(Ft.)
Bottom (of initial area) elevation = 341.000(Ft.)
Difference in elevation = 31.000(Ft.)
Slope = 0.11698 s(%)= 11.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.567 min.
Rainfall intensity = 2.128(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff = 1.154(CFS)
Total initial stream area = 0.640(Ac.)

++
Process from Point/Station 501.000 to Point/Station 502.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 341.000(Ft.)
End of street segment elevation = 297.000(Ft.)
Length of street segment = 584.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 9.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)

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 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.025(CFS)
Depth of flow =   0.235(Ft.), Average velocity =   4.806(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.428(Ft.)
Flow velocity =   4.81(Ft/s)
Travel time =    2.03 min.     TC =    7.59  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.050
SCS curve number for soil(AMC 2)  = 69.30
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.248(In/Hr)
Max Catchment Loss (Fm) =     0.025(In/Hr)
Rainfall intensity =      1.781(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =      1.681(CFS) for    1.190(Ac.)
Total runoff =      2.835(CFS)       Total area =        1.83(Ac.)
Area averaged Fm value =    0.060(In/Hr)
Street flow at end of street =      2.835(CFS)
Half street flow at end of street =      2.835(CFS)
Depth of flow =   0.258(Ft.), Average velocity =   5.111(Ft/s)
Flow width (from curb towards crown)=   6.542(Ft.)


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Process from Point/Station      502.000 to Point/Station      503.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   297.000(Ft.)
End of street segment elevation =   256.000(Ft.)
Length of street segment  =   608.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =   9.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.028(CFS)
Depth of flow =   0.266(Ft.), Average velocity =   4.953(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.961(Ft.)
Flow velocity =   4.95(Ft/s)
Travel time =    2.05 min.     TC =    9.64  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.150
SCS curve number for soil(AMC 2)  = 69.90
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.242(In/Hr)
Max Catchment Loss (Fm) =     0.024(In/Hr)
Rainfall intensity =      1.553(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.870
Subarea runoff =      0.326(CFS) for    0.510(Ac.)
Total runoff =      3.161(CFS)       Total area =        2.34(Ac.)
Area averaged Fm value =    0.052(In/Hr)
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Street flow at end of street =      3.161(CFS)
Half street flow at end of street =      3.161(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   4.997(Ft/s)
Flow width (from curb towards crown)=   7.113(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
SCS curve number for soil(AMC 2)  = 70.98
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.234(In/Hr)
Max Catchment Loss (Fm) =     0.023(In/Hr)
Time of concentration =     9.64 min.
Rainfall intensity =      1.553(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      4.750(CFS) for    3.450(Ac.)
Total runoff =      7.911(CFS)       Total area =        5.79(Ac.)
Area averaged Fm value =    0.035(In/Hr)
End of computations, total study area =            5.79 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.144
Area averaged SCS curve number (AMC 2) =  70.3
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/11/16 File Name pre00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'E' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
71.2	3.5	0.61	C	0.250	0.144	0.036
71.2	2.3	0.39	D	0.200	0.144	0.029

Area-averaged adjusted loss rate Fm (In/Hr) = 0.033

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.51	0.088	71.2	52.4	9.07	0.003
3.03	0.523	98.0	98.0	0.20	0.890
0.32	0.056	71.2	52.4	9.07	0.003
1.93	0.333	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.762
Area-averaged low loss fraction, Yb = 0.238
++
User entry of time of concentration = 0.122 (hours)
Watershed area = 5.79(Ac.)
Catchment Lag time = 0.098 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 85.2428
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.033(In/Hr)
Average low loss rate fraction (Yb) = 0.238 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 5.79(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.190(In)
30-minute factor = 1.000 Adjusted rainfall = 0.400(In)
1-hour factor = 1.000 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 70.02 (CFS))	
1	10.134	7.096
2	61.479	35.953
3	83.939	15.728
4	93.052	6.381
5	97.291	2.968
6	98.679	0.972
7	99.350	0.470
8	99.845	0.347
9	100.000	0.108

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1899	0.1899
2	0.2533	0.0634
3	0.2998	0.0465
4	0.3379	0.0381
5	0.3707	0.0328
6	0.3999	0.0292
7	0.4257	0.0258
8	0.4494	0.0237
9	0.4714	0.0220
10	0.4921	0.0206
11	0.5115	0.0194
12	0.5299	0.0184
13	0.5503	0.0204
14	0.5698	0.0196
15	0.5887	0.0189
16	0.6069	0.0182
17	0.6245	0.0176
18	0.6416	0.0171
19	0.6582	0.0166
20	0.6743	0.0161
21	0.6900	0.0157
22	0.7054	0.0153
23	0.7203	0.0150
24	0.7349	0.0146
25	0.7492	0.0143
26	0.7632	0.0140
27	0.7770	0.0137
28	0.7904	0.0135
29	0.8036	0.0132
30	0.8166	0.0130
31	0.8293	0.0127
32	0.8418	0.0125
33	0.8542	0.0123
34	0.8663	0.0121
35	0.8782	0.0119
36	0.8900	0.0118
37	0.9011	0.0112
38	0.9121	0.0110
39	0.9230	0.0108
40	0.9337	0.0107
41	0.9442	0.0105

42	0.9546	0.0104
43	0.9649	0.0103
44	0.9751	0.0101
45	0.9851	0.0100
46	0.9950	0.0099
47	1.0048	0.0098
48	1.0144	0.0097
49	1.0240	0.0096
50	1.0335	0.0095
51	1.0428	0.0094
52	1.0521	0.0093
53	1.0612	0.0092
54	1.0703	0.0091
55	1.0793	0.0090
56	1.0881	0.0089
57	1.0969	0.0088
58	1.1057	0.0087
59	1.1143	0.0086
60	1.1229	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1481	0.0083
64	1.1563	0.0083
65	1.1645	0.0082
66	1.1726	0.0081
67	1.1807	0.0081
68	1.1887	0.0080
69	1.1966	0.0079
70	1.2044	0.0079
71	1.2122	0.0078
72	1.2200	0.0077
73	1.2263	0.0063
74	1.2326	0.0063
75	1.2388	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2571	0.0061
79	1.2631	0.0060
80	1.2691	0.0060
81	1.2750	0.0059
82	1.2808	0.0059
83	1.2867	0.0058
84	1.2925	0.0058
85	1.2982	0.0057
86	1.3039	0.0057
87	1.3095	0.0057
88	1.3152	0.0056
89	1.3207	0.0056
90	1.3263	0.0055
91	1.3318	0.0055
92	1.3372	0.0055
93	1.3427	0.0054
94	1.3480	0.0054
95	1.3534	0.0054
96	1.3587	0.0053
97	1.3640	0.0053
98	1.3692	0.0052
99	1.3745	0.0052
100	1.3796	0.0052
101	1.3848	0.0051
102	1.3899	0.0051
103	1.3950	0.0051
104	1.4000	0.0051
105	1.4051	0.0050
106	1.4101	0.0050
107	1.4150	0.0050
108	1.4200	0.0049
109	1.4249	0.0049
110	1.4298	0.0049
111	1.4346	0.0049
112	1.4394	0.0048

113	1.4442	0.0048
114	1.4490	0.0048
115	1.4537	0.0047
116	1.4585	0.0047
117	1.4632	0.0047
118	1.4678	0.0047
119	1.4725	0.0046
120	1.4771	0.0046
121	1.4817	0.0046
122	1.4863	0.0046
123	1.4908	0.0045
124	1.4953	0.0045
125	1.4998	0.0045
126	1.5043	0.0045
127	1.5088	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5264	0.0044
132	1.5307	0.0044
133	1.5351	0.0043
134	1.5394	0.0043
135	1.5437	0.0043
136	1.5480	0.0043
137	1.5522	0.0043
138	1.5564	0.0042
139	1.5606	0.0042
140	1.5648	0.0042
141	1.5690	0.0042
142	1.5732	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5855	0.0041
146	1.5896	0.0041
147	1.5937	0.0041
148	1.5977	0.0041
149	1.6018	0.0040
150	1.6058	0.0040
151	1.6098	0.0040
152	1.6138	0.0040
153	1.6177	0.0040
154	1.6217	0.0040
155	1.6256	0.0039
156	1.6295	0.0039
157	1.6334	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6451	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6565	0.0038
164	1.6603	0.0038
165	1.6641	0.0038
166	1.6679	0.0038
167	1.6716	0.0038
168	1.6754	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6939	0.0037
174	1.6975	0.0037
175	1.7012	0.0036
176	1.7048	0.0036
177	1.7084	0.0036
178	1.7120	0.0036
179	1.7156	0.0036
180	1.7192	0.0036
181	1.7228	0.0036
182	1.7264	0.0036
183	1.7299	0.0035

184	1.7334	0.0035
185	1.7369	0.0035
186	1.7405	0.0035
187	1.7440	0.0035
188	1.7474	0.0035
189	1.7509	0.0035
190	1.7544	0.0035
191	1.7578	0.0035
192	1.7613	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7817	0.0034
199	1.7850	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7951	0.0033
203	1.7984	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8116	0.0033
208	1.8148	0.0033
209	1.8181	0.0033
210	1.8214	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8311	0.0032
214	1.8343	0.0032
215	1.8375	0.0032
216	1.8407	0.0032
217	1.8439	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8534	0.0032
221	1.8565	0.0031
222	1.8596	0.0031
223	1.8628	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8814	0.0031
230	1.8845	0.0031
231	1.8875	0.0031
232	1.8906	0.0031
233	1.8936	0.0030
234	1.8967	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9207	0.0030
243	1.9237	0.0030
244	1.9266	0.0030
245	1.9296	0.0030
246	1.9325	0.0029
247	1.9354	0.0029
248	1.9384	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029

255	1.9587	0.0029
256	1.9616	0.0029
257	1.9644	0.0029
258	1.9673	0.0029
259	1.9701	0.0029
260	1.9730	0.0028
261	1.9758	0.0028
262	1.9786	0.0028
263	1.9815	0.0028
264	1.9843	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9955	0.0028
269	1.9983	0.0028
270	2.0010	0.0028
271	2.0038	0.0028
272	2.0066	0.0028
273	2.0093	0.0028
274	2.0121	0.0028
275	2.0148	0.0027
276	2.0176	0.0027
277	2.0203	0.0027
278	2.0230	0.0027
279	2.0258	0.0027
280	2.0285	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0393	0.0027
285	2.0420	0.0027
286	2.0446	0.0027
287	2.0473	0.0027
288	2.0500	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0006	0.0020
2	0.0027	0.0006	0.0020
3	0.0027	0.0006	0.0020
4	0.0027	0.0006	0.0021
5	0.0027	0.0006	0.0021
6	0.0027	0.0006	0.0021
7	0.0027	0.0006	0.0021
8	0.0027	0.0006	0.0021
9	0.0027	0.0007	0.0021
10	0.0027	0.0007	0.0021
11	0.0028	0.0007	0.0021
12	0.0028	0.0007	0.0021
13	0.0028	0.0007	0.0021
14	0.0028	0.0007	0.0021
15	0.0028	0.0007	0.0021
16	0.0028	0.0007	0.0021
17	0.0028	0.0007	0.0021
18	0.0028	0.0007	0.0022
19	0.0028	0.0007	0.0022
20	0.0028	0.0007	0.0022
21	0.0029	0.0007	0.0022
22	0.0029	0.0007	0.0022
23	0.0029	0.0007	0.0022
24	0.0029	0.0007	0.0022
25	0.0029	0.0007	0.0022
26	0.0029	0.0007	0.0022
27	0.0029	0.0007	0.0022
28	0.0029	0.0007	0.0022
29	0.0029	0.0007	0.0022
30	0.0030	0.0007	0.0022
31	0.0030	0.0007	0.0023
32	0.0030	0.0007	0.0023

33	0.0030	0.0007	0.0023
34	0.0030	0.0007	0.0023
35	0.0030	0.0007	0.0023
36	0.0030	0.0007	0.0023
37	0.0030	0.0007	0.0023
38	0.0030	0.0007	0.0023
39	0.0031	0.0007	0.0023
40	0.0031	0.0007	0.0023
41	0.0031	0.0007	0.0024
42	0.0031	0.0007	0.0024
43	0.0031	0.0007	0.0024
44	0.0031	0.0007	0.0024
45	0.0031	0.0007	0.0024
46	0.0031	0.0007	0.0024
47	0.0032	0.0008	0.0024
48	0.0032	0.0008	0.0024
49	0.0032	0.0008	0.0024
50	0.0032	0.0008	0.0024
51	0.0032	0.0008	0.0025
52	0.0032	0.0008	0.0025
53	0.0033	0.0008	0.0025
54	0.0033	0.0008	0.0025
55	0.0033	0.0008	0.0025
56	0.0033	0.0008	0.0025
57	0.0033	0.0008	0.0025
58	0.0033	0.0008	0.0025
59	0.0033	0.0008	0.0025
60	0.0034	0.0008	0.0026
61	0.0034	0.0008	0.0026
62	0.0034	0.0008	0.0026
63	0.0034	0.0008	0.0026
64	0.0034	0.0008	0.0026
65	0.0034	0.0008	0.0026
66	0.0035	0.0008	0.0026
67	0.0035	0.0008	0.0026
68	0.0035	0.0008	0.0027
69	0.0035	0.0008	0.0027
70	0.0035	0.0008	0.0027
71	0.0035	0.0008	0.0027
72	0.0036	0.0008	0.0027
73	0.0036	0.0009	0.0027
74	0.0036	0.0009	0.0027
75	0.0036	0.0009	0.0028
76	0.0036	0.0009	0.0028
77	0.0037	0.0009	0.0028
78	0.0037	0.0009	0.0028
79	0.0037	0.0009	0.0028
80	0.0037	0.0009	0.0028
81	0.0037	0.0009	0.0029
82	0.0038	0.0009	0.0029
83	0.0038	0.0009	0.0029
84	0.0038	0.0009	0.0029
85	0.0038	0.0009	0.0029
86	0.0038	0.0009	0.0029
87	0.0039	0.0009	0.0030
88	0.0039	0.0009	0.0030
89	0.0039	0.0009	0.0030
90	0.0039	0.0009	0.0030
91	0.0040	0.0009	0.0030
92	0.0040	0.0009	0.0030
93	0.0040	0.0010	0.0031
94	0.0040	0.0010	0.0031
95	0.0041	0.0010	0.0031
96	0.0041	0.0010	0.0031
97	0.0041	0.0010	0.0031
98	0.0041	0.0010	0.0032
99	0.0042	0.0010	0.0032
100	0.0042	0.0010	0.0032
101	0.0042	0.0010	0.0032
102	0.0043	0.0010	0.0032
103	0.0043	0.0010	0.0033

104	0.0043	0.0010	0.0033
105	0.0044	0.0010	0.0033
106	0.0044	0.0010	0.0033
107	0.0044	0.0011	0.0034
108	0.0044	0.0011	0.0034
109	0.0045	0.0011	0.0034
110	0.0045	0.0011	0.0034
111	0.0045	0.0011	0.0035
112	0.0046	0.0011	0.0035
113	0.0046	0.0011	0.0035
114	0.0046	0.0011	0.0035
115	0.0047	0.0011	0.0036
116	0.0047	0.0011	0.0036
117	0.0048	0.0011	0.0036
118	0.0048	0.0011	0.0037
119	0.0049	0.0012	0.0037
120	0.0049	0.0012	0.0037
121	0.0049	0.0012	0.0038
122	0.0050	0.0012	0.0038
123	0.0050	0.0012	0.0038
124	0.0051	0.0012	0.0039
125	0.0051	0.0012	0.0039
126	0.0051	0.0012	0.0039
127	0.0052	0.0012	0.0040
128	0.0052	0.0012	0.0040
129	0.0053	0.0013	0.0041
130	0.0054	0.0013	0.0041
131	0.0054	0.0013	0.0041
132	0.0055	0.0013	0.0042
133	0.0055	0.0013	0.0042
134	0.0056	0.0013	0.0042
135	0.0057	0.0013	0.0043
136	0.0057	0.0014	0.0043
137	0.0058	0.0014	0.0044
138	0.0058	0.0014	0.0044
139	0.0059	0.0014	0.0045
140	0.0060	0.0014	0.0045
141	0.0061	0.0014	0.0046
142	0.0061	0.0015	0.0047
143	0.0062	0.0015	0.0047
144	0.0063	0.0015	0.0048
145	0.0077	0.0018	0.0059
146	0.0078	0.0019	0.0059
147	0.0079	0.0019	0.0060
148	0.0080	0.0019	0.0061
149	0.0081	0.0019	0.0062
150	0.0082	0.0019	0.0062
151	0.0083	0.0020	0.0063
152	0.0084	0.0020	0.0064
153	0.0086	0.0020	0.0065
154	0.0086	0.0021	0.0066
155	0.0088	0.0021	0.0067
156	0.0089	0.0021	0.0068
157	0.0091	0.0022	0.0069
158	0.0092	0.0022	0.0070
159	0.0094	0.0022	0.0071
160	0.0095	0.0023	0.0072
161	0.0097	0.0023	0.0074
162	0.0098	0.0023	0.0075
163	0.0100	0.0024	0.0076
164	0.0101	0.0024	0.0077
165	0.0104	0.0025	0.0079
166	0.0105	0.0025	0.0080
167	0.0108	0.0026	0.0083
168	0.0110	0.0026	0.0084
169	0.0118	0.0028	0.0090
170	0.0119	0.0028	0.0092
171	0.0123	0.0028	0.0096
172	0.0125	0.0028	0.0098
173	0.0130	0.0028	0.0102
174	0.0132	0.0028	0.0104

175	0.0137	0.0028	0.0110
176	0.0140	0.0028	0.0112
177	0.0146	0.0028	0.0119
178	0.0150	0.0028	0.0122
179	0.0157	0.0028	0.0129
180	0.0161	0.0028	0.0134
181	0.0171	0.0028	0.0143
182	0.0176	0.0028	0.0149
183	0.0189	0.0028	0.0161
184	0.0196	0.0028	0.0168
185	0.0184	0.0028	0.0156
186	0.0194	0.0028	0.0166
187	0.0220	0.0028	0.0192
188	0.0237	0.0028	0.0209
189	0.0292	0.0028	0.0264
190	0.0328	0.0028	0.0301
191	0.0465	0.0028	0.0437
192	0.0634	0.0028	0.0606
193	0.1899	0.0028	0.1872
194	0.0381	0.0028	0.0353
195	0.0258	0.0028	0.0231
196	0.0206	0.0028	0.0178
197	0.0204	0.0028	0.0176
198	0.0182	0.0028	0.0154
199	0.0166	0.0028	0.0138
200	0.0153	0.0028	0.0126
201	0.0143	0.0028	0.0115
202	0.0135	0.0028	0.0107
203	0.0127	0.0028	0.0100
204	0.0121	0.0028	0.0094
205	0.0112	0.0027	0.0085
206	0.0107	0.0025	0.0081
207	0.0103	0.0024	0.0078
208	0.0099	0.0024	0.0075
209	0.0096	0.0023	0.0073
210	0.0093	0.0022	0.0071
211	0.0090	0.0021	0.0068
212	0.0087	0.0021	0.0066
213	0.0085	0.0020	0.0065
214	0.0083	0.0020	0.0063
215	0.0081	0.0019	0.0061
216	0.0079	0.0019	0.0060
217	0.0063	0.0015	0.0048
218	0.0062	0.0015	0.0047
219	0.0060	0.0014	0.0046
220	0.0059	0.0014	0.0045
221	0.0057	0.0014	0.0044
222	0.0056	0.0013	0.0043
223	0.0055	0.0013	0.0042
224	0.0054	0.0013	0.0041
225	0.0053	0.0013	0.0040
226	0.0052	0.0012	0.0039
227	0.0051	0.0012	0.0039
228	0.0050	0.0012	0.0038
229	0.0049	0.0012	0.0037
230	0.0048	0.0011	0.0037
231	0.0047	0.0011	0.0036
232	0.0047	0.0011	0.0036
233	0.0046	0.0011	0.0035
234	0.0045	0.0011	0.0034
235	0.0045	0.0011	0.0034
236	0.0044	0.0010	0.0033
237	0.0043	0.0010	0.0033
238	0.0043	0.0010	0.0033
239	0.0042	0.0010	0.0032
240	0.0042	0.0010	0.0032
241	0.0041	0.0010	0.0031
242	0.0041	0.0010	0.0031
243	0.0040	0.0010	0.0030
244	0.0040	0.0009	0.0030
245	0.0039	0.0009	0.0030

246	0.0039	0.0009	0.0029
247	0.0038	0.0009	0.0029
248	0.0038	0.0009	0.0029
249	0.0037	0.0009	0.0028
250	0.0037	0.0009	0.0028
251	0.0036	0.0009	0.0028
252	0.0036	0.0009	0.0027
253	0.0036	0.0008	0.0027
254	0.0035	0.0008	0.0027
255	0.0035	0.0008	0.0027
256	0.0035	0.0008	0.0026
257	0.0034	0.0008	0.0026
258	0.0034	0.0008	0.0026
259	0.0034	0.0008	0.0026
260	0.0033	0.0008	0.0025
261	0.0033	0.0008	0.0025
262	0.0033	0.0008	0.0025
263	0.0032	0.0008	0.0025
264	0.0032	0.0008	0.0024
265	0.0032	0.0008	0.0024
266	0.0032	0.0008	0.0024
267	0.0031	0.0007	0.0024
268	0.0031	0.0007	0.0024
269	0.0031	0.0007	0.0023
270	0.0031	0.0007	0.0023
271	0.0030	0.0007	0.0023
272	0.0030	0.0007	0.0023
273	0.0030	0.0007	0.0023
274	0.0030	0.0007	0.0023
275	0.0029	0.0007	0.0022
276	0.0029	0.0007	0.0022
277	0.0029	0.0007	0.0022
278	0.0029	0.0007	0.0022
279	0.0029	0.0007	0.0022
280	0.0028	0.0007	0.0022
281	0.0028	0.0007	0.0021
282	0.0028	0.0007	0.0021
283	0.0028	0.0007	0.0021
284	0.0028	0.0007	0.0021
285	0.0027	0.0007	0.0021
286	0.0027	0.0006	0.0021
287	0.0027	0.0006	0.0021
288	0.0027	0.0006	0.0020

Total soil rain loss = 0.38(In)
Total effective rainfall = 1.67(In)
Peak flow rate in flood hydrograph = 8.35(CFS)

++

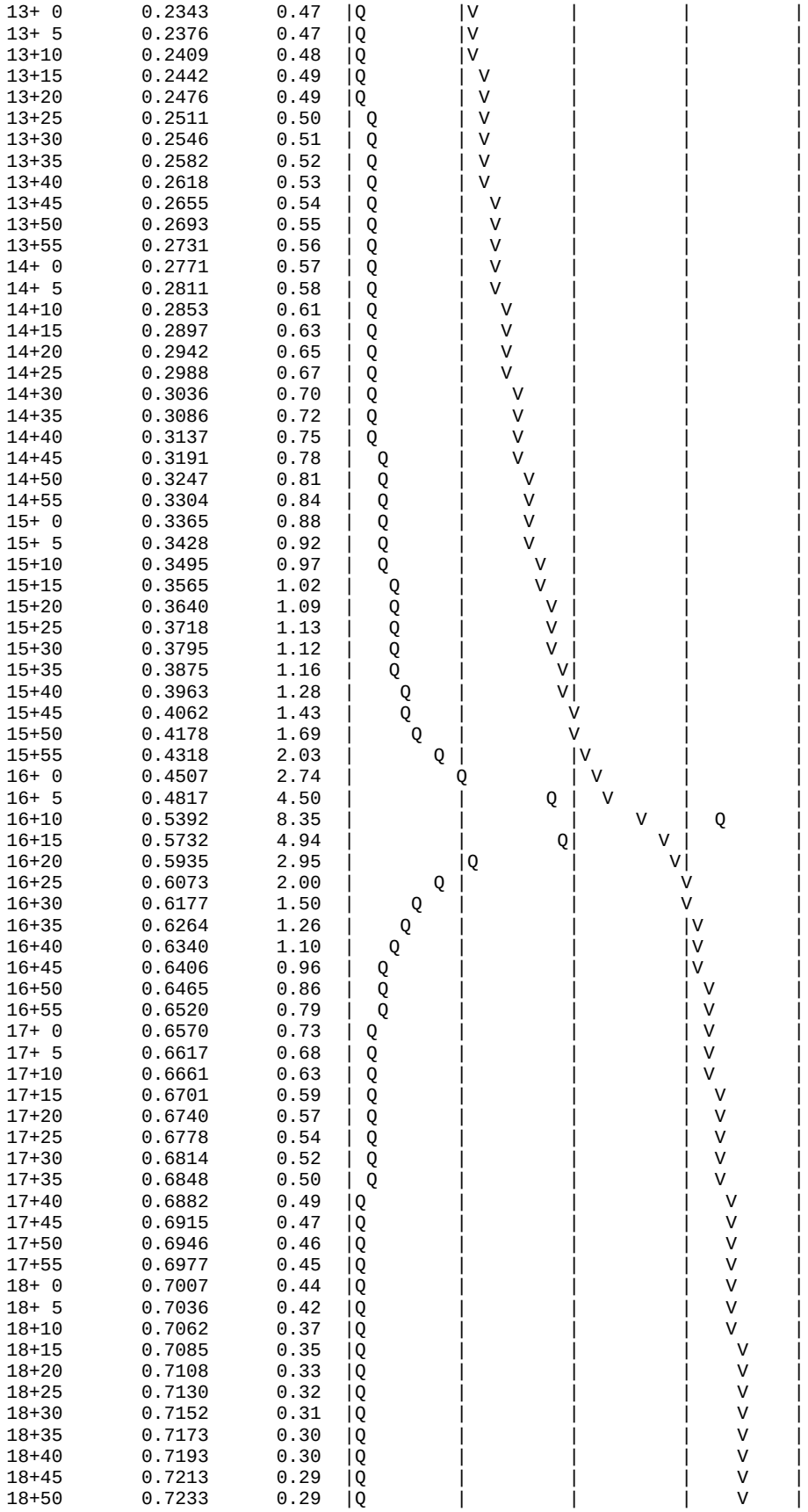
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0007	0.09	Q	|	|	|	|
0+15	0.0015	0.12	Q	|	|	|	|
0+20	0.0024	0.13	Q	|	|	|	|
0+25	0.0034	0.14	Q	|	|	|	|
0+30	0.0044	0.14	Q	|	|	|	|
0+35	0.0054	0.14	Q	|	|	|	|
0+40	0.0064	0.14	Q	|	|	|	|
0+45	0.0074	0.15	Q	|	|	|	|
0+50	0.0084	0.15	Q	|	|	|	|
0+55	0.0094	0.15	Q	|	|	|	|
1+ 0	0.0104	0.15	Q	|	|	|	|
1+ 5	0.0114	0.15	Q	|	|	|	|

1+10	0.0124	0.15	Q				
1+15	0.0134	0.15	Q				
1+20	0.0145	0.15	Q				
1+25	0.0155	0.15	Q				
1+30	0.0165	0.15	Q				
1+35	0.0176	0.15	Q				
1+40	0.0186	0.15	Q				
1+45	0.0197	0.15	Q				
1+50	0.0207	0.15	QV				
1+55	0.0218	0.15	QV				
2+ 0	0.0228	0.15	QV				
2+ 5	0.0239	0.15	QV				
2+10	0.0249	0.15	QV				
2+15	0.0260	0.15	QV				
2+20	0.0271	0.16	QV				
2+25	0.0281	0.16	QV				
2+30	0.0292	0.16	QV				
2+35	0.0303	0.16	QV				
2+40	0.0314	0.16	QV				
2+45	0.0325	0.16	QV				
2+50	0.0336	0.16	QV				
2+55	0.0347	0.16	QV				
3+ 0	0.0358	0.16	QV				
3+ 5	0.0369	0.16	QV				
3+10	0.0380	0.16	QV				
3+15	0.0391	0.16	QV				
3+20	0.0402	0.16	QV				
3+25	0.0414	0.16	Q V				
3+30	0.0425	0.16	Q V				
3+35	0.0436	0.16	Q V				
3+40	0.0448	0.17	Q V				
3+45	0.0459	0.17	Q V				
3+50	0.0471	0.17	Q V				
3+55	0.0482	0.17	Q V				
4+ 0	0.0494	0.17	Q V				
4+ 5	0.0506	0.17	Q V				
4+10	0.0517	0.17	Q V				
4+15	0.0529	0.17	Q V				
4+20	0.0541	0.17	Q V				
4+25	0.0553	0.17	Q V				
4+30	0.0565	0.17	Q V				
4+35	0.0577	0.17	Q V				
4+40	0.0589	0.17	Q V				
4+45	0.0601	0.18	Q V				
4+50	0.0613	0.18	Q V				
4+55	0.0625	0.18	Q V				
5+ 0	0.0637	0.18	Q V				
5+ 5	0.0650	0.18	Q V				
5+10	0.0662	0.18	Q V				
5+15	0.0674	0.18	Q V				
5+20	0.0687	0.18	Q V				
5+25	0.0699	0.18	Q V				
5+30	0.0712	0.18	Q V				
5+35	0.0725	0.18	Q V				
5+40	0.0737	0.18	Q V				
5+45	0.0750	0.19	Q V				
5+50	0.0763	0.19	Q V				
5+55	0.0776	0.19	Q V				
6+ 0	0.0789	0.19	Q V				
6+ 5	0.0802	0.19	Q V				
6+10	0.0815	0.19	Q V				
6+15	0.0828	0.19	Q V				
6+20	0.0841	0.19	Q V				
6+25	0.0855	0.19	Q V				
6+30	0.0868	0.19	Q V				
6+35	0.0882	0.20	Q V				
6+40	0.0895	0.20	Q V				
6+45	0.0909	0.20	Q V				
6+50	0.0922	0.20	Q V				
6+55	0.0936	0.20	Q V				
7+ 0	0.0950	0.20	Q V				

```
 7+ 5      0.0964      0.20  Q   V     |         |         |         |
 7+10      0.0978      0.20  Q   V     |         |         |         |
 7+15      0.0992      0.20  Q   V     |         |         |         |
 7+20      0.1006      0.21  Q   V     |         |         |         |
 7+25      0.1021      0.21  Q    V    |         |         |         |
 7+30      0.1035      0.21  Q    V    |         |         |         |
 7+35      0.1049      0.21  Q    V    |         |         |         |
 7+40      0.1064      0.21  Q    V    |         |         |         |
 7+45      0.1078      0.21  Q    V    |         |         |         |
 7+50      0.1093      0.21  Q    V    |         |         |         |
 7+55      0.1108      0.21  Q    V    |         |         |         |
 8+ 0      0.1123      0.22  Q    V    |         |         |         |
 8+ 5      0.1138      0.22  Q    V    |         |         |         |
 8+10      0.1153      0.22  Q    V    |         |         |         |
 8+15      0.1168      0.22  Q    V    |         |         |         |
 8+20      0.1183      0.22  Q    V    |         |         |         |
 8+25      0.1199      0.22  Q    V    |         |         |         |
 8+30      0.1214      0.22  Q     V   |         |         |         |
 8+35      0.1230      0.23  Q     V   |         |         |         |
 8+40      0.1245      0.23  Q     V   |         |         |         |
 8+45      0.1261      0.23  Q     V   |         |         |         |
 8+50      0.1277      0.23  Q     V   |         |         |         |
 8+55      0.1293      0.23  Q     V   |         |         |         |
 9+ 0      0.1309      0.23  Q     V   |         |         |         |
 9+ 5      0.1326      0.24  Q     V   |         |         |         |
 9+10      0.1342      0.24  Q     V   |         |         |         |
 9+15      0.1358      0.24  Q     V   |         |         |         |
 9+20      0.1375      0.24  Q     V   |         |         |         |
 9+25      0.1392      0.24  Q     V   |         |         |         |
 9+30      0.1409      0.25  Q     V   |         |         |         |
 9+35      0.1426      0.25  Q      V  |         |         |         |
 9+40      0.1443      0.25  Q      V  |         |         |         |
 9+45      0.1460      0.25  |Q     V  |         |         |         |
 9+50      0.1478      0.25  |Q     V  |         |         |         |
 9+55      0.1495      0.26  |Q     V  |         |         |         |
10+ 0      0.1513      0.26  |Q     V  |         |         |         |
10+ 5      0.1531      0.26  |Q     V  |         |         |         |
10+10      0.1549      0.26  |Q     V  |         |         |         |
10+15      0.1567      0.26  |Q     V  |         |         |         |
10+20      0.1585      0.27  |Q     V  |         |         |         |
10+25      0.1604      0.27  |Q     V  |         |         |         |
10+30      0.1622      0.27  |Q      V |         |         |         |
10+35      0.1641      0.27  |Q      V |         |         |         |
10+40      0.1660      0.28  |Q      V |         |         |         |
10+45      0.1680      0.28  |Q      V |         |         |         |
10+50      0.1699      0.28  |Q      V |         |         |         |
10+55      0.1719      0.28  |Q      V |         |         |         |
11+ 0      0.1738      0.29  |Q      V |         |         |         |
11+ 5      0.1758      0.29  |Q      V |         |         |         |
11+10      0.1779      0.29  |Q      V |         |         |         |
11+15      0.1799      0.30  |Q      V |         |         |         |
11+20      0.1820      0.30  |Q       V|         |         |         |
11+25      0.1840      0.30  |Q       V|         |         |         |
11+30      0.1862      0.31  |Q       V|         |         |         |
11+35      0.1883      0.31  |Q       V|         |         |         |
11+40      0.1904      0.31  |Q       V|         |         |         |
11+45      0.1926      0.32  |Q       V|         |         |         |
11+50      0.1948      0.32  |Q       V|         |         |         |
11+55      0.1971      0.32  |Q       V|         |         |         |
12+ 0      0.1993      0.33  |Q       V|         |         |         |
12+ 5      0.2017      0.34  |Q       V|         |         |         |
12+10      0.2043      0.38  |Q        V         |         |         |
12+15      0.2071      0.40  |Q        V         |         |         |
12+20      0.2099      0.41  |Q        V         |         |         |
12+25      0.2128      0.42  |Q        V         |         |         |
12+30      0.2158      0.43  |Q        V         |         |         |
12+35      0.2188      0.43  |Q        V         |         |         |
12+40      0.2218      0.44  |Q        V         |         |         |
12+45      0.2249      0.45  |Q        |V        |         |         |
12+50      0.2280      0.45  |Q        |V        |         |         |
12+55      0.2311      0.46  |Q        |V        |         |         |
```



```
  18+55      0.7252     0.28  |Q       |         |         |    V    |
  19+ 0      0.7271     0.27  |Q       |         |         |     V   |
  19+ 5      0.7289     0.27  |Q       |         |         |     V   |
  19+10      0.7308     0.26  |Q       |         |         |     V   |
  19+15      0.7326     0.26  |Q       |         |         |     V   |
  19+20      0.7343     0.26  |Q       |         |         |     V   |
  19+25      0.7360     0.25  |Q       |         |         |     V   |
  19+30      0.7377     0.25  Q        |         |         |     V   |
  19+35      0.7394     0.24  Q        |         |         |     V   |
  19+40      0.7411     0.24  Q        |         |         |     V   |
  19+45      0.7427     0.24  Q        |         |         |     V   |
  19+50      0.7443     0.23  Q        |         |         |     V   |
  19+55      0.7459     0.23  Q        |         |         |     V   |
  20+ 0      0.7475     0.23  Q        |         |         |      V  |
  20+ 5      0.7490     0.22  Q        |         |         |      V  |
  20+10      0.7505     0.22  Q        |         |         |      V  |
  20+15      0.7520     0.22  Q        |         |         |      V  |
  20+20      0.7535     0.21  Q        |         |         |      V  |
  20+25      0.7550     0.21  Q        |         |         |      V  |
  20+30      0.7564     0.21  Q        |         |         |      V  |
  20+35      0.7578     0.21  Q        |         |         |      V  |
  20+40      0.7592     0.20  Q        |         |         |      V  |
  20+45      0.7606     0.20  Q        |         |         |      V  |
  20+50      0.7620     0.20  Q        |         |         |      V  |
  20+55      0.7634     0.20  Q        |         |         |      V  |
  21+ 0      0.7647     0.20  Q        |         |         |      V  |
  21+ 5      0.7661     0.19  Q        |         |         |      V  |
  21+10      0.7674     0.19  Q        |         |         |       V |
  21+15      0.7687     0.19  Q        |         |         |       V |
  21+20      0.7700     0.19  Q        |         |         |       V |
  21+25      0.7713     0.19  Q        |         |         |       V |
  21+30      0.7725     0.18  Q        |         |         |       V |
  21+35      0.7738     0.18  Q        |         |         |       V |
  21+40      0.7750     0.18  Q        |         |         |       V |
  21+45      0.7763     0.18  Q        |         |         |       V |
  21+50      0.7775     0.18  Q        |         |         |       V |
  21+55      0.7787     0.18  Q        |         |         |       V |
  22+ 0      0.7799     0.17  Q        |         |         |       V |
  22+ 5      0.7811     0.17  Q        |         |         |       V |
  22+10      0.7822     0.17  Q        |         |         |       V |
  22+15      0.7834     0.17  Q        |         |         |       V |
  22+20      0.7846     0.17  Q        |         |         |       V |
  22+25      0.7857     0.17  Q        |         |         |       V |
  22+30      0.7868     0.17  Q        |         |         |       V |
  22+35      0.7880     0.16  Q        |         |         |        V|
  22+40      0.7891     0.16  Q        |         |         |        V|
  22+45      0.7902     0.16  Q        |         |         |        V|
  22+50      0.7913     0.16  Q        |         |         |        V|
  22+55      0.7924     0.16  Q        |         |         |        V|
  23+ 0      0.7935     0.16  Q        |         |         |        V|
  23+ 5      0.7946     0.16  Q        |         |         |        V|
  23+10      0.7956     0.16  Q        |         |         |        V|
  23+15      0.7967     0.15  Q        |         |         |        V|
  23+20      0.7977     0.15  Q        |         |         |        V|
  23+25      0.7988     0.15  Q        |         |         |        V|
  23+30      0.7998     0.15  Q        |         |         |        V|
  23+35      0.8009     0.15  Q        |         |         |        V|
  23+40      0.8019     0.15  Q        |         |         |        V|
  23+45      0.8029     0.15  Q        |         |         |        V|
  23+50      0.8039     0.15  Q        |         |         |        V|
  23+55      0.8049     0.15  Q        |         |         |        V|
  24+ 0      0.8059     0.14  Q        |         |         |        V|
  24+ 5      0.8068     0.13  Q        |         |         |        V|
  24+10      0.8072     0.06  Q        |         |         |        V|
  24+15      0.8073     0.02  Q        |         |         |        V|
  24+20      0.8074     0.01  Q        |         |         |        V|
  24+25      0.8074     0.00  Q        |         |         |        V|
  24+30      0.8074     0.00  Q        |         |         |        V|
  24+35      0.8074     0.00  Q        |         |         |        V|
  24+40      0.8074     0.00  Q        |         |         |        V|
-------------------------------------------------------------------
```

AREA “F”

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/12/16 File Name: exf002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
EXISTING CONDITION RATIONAL METHOD - AREA 'F' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 601.000 to Point/Station 602.000
**** INITIAL AREA EVALUATION ****

SCS curve number for soil(AMC 2) = 74.40
Pervious ratio(Ap) = 0.1000 Max loss rate(Fp)= 0.205(In/Hr)
Max Catchment Loss (Fm) = 0.021(In/Hr)
Initial subarea data:
Initial area flow distance = 255.000(Ft.)
Top (of initial area) elevation = 310.000(Ft.)
Bottom (of initial area) elevation = 301.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.03529 s(%)= 3.53
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.444 min.
Rainfall intensity = 2.156(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.891
Subarea runoff = 3.228(CFS)
Total initial stream area = 1.680(Ac.)
End of computations, total study area = 1.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number (AMC 2) = 74.4

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/13/16 File Name EXF00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

WESTRIDGE HYDROLOGY STUDY
EXISTING CONDITION UNIT HYDROGRAPH - AREA 'F' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
74.4	1.7	1.00	D	0.200	0.100	0.020

Area-averaged adjusted loss rate Fm (In/Hr) = 0.020

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.17	0.100	74.4	56.3	7.77	0.015
1.51	0.900	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.802
Area-averaged low loss fraction, Yb = 0.198
++
User entry of time of concentration = 0.091 (hours)
Watershed area = 1.68(Ac.)
Catchment Lag time = 0.073 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 114.8475
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.020(In/Hr)
Average low loss rate fraction (Yb) = 0.198 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 1.68(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.190(In)

30-minute factor = 1.000 Adjusted rainfall = 0.400(In)
1-hour factor = 1.000 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 20.32 (CFS))	
1	19.656	3.994
2	75.825	11.412
3	92.019	3.290
4	97.659	1.146
5	99.077	0.288
6	99.802	0.147
7	100.000	0.040

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1900	0.1900
2	0.2534	0.0634
3	0.2999	0.0465
4	0.3380	0.0381
5	0.3708	0.0328
6	0.4000	0.0292
7	0.4258	0.0258
8	0.4495	0.0237
9	0.4715	0.0220
10	0.4921	0.0206
11	0.5116	0.0194
12	0.5300	0.0184
13	0.5504	0.0204
14	0.5699	0.0196
15	0.5888	0.0189
16	0.6070	0.0182
17	0.6246	0.0176
18	0.6417	0.0171
19	0.6583	0.0166
20	0.6744	0.0161
21	0.6901	0.0157
22	0.7054	0.0153
23	0.7204	0.0150
24	0.7350	0.0146
25	0.7493	0.0143
26	0.7633	0.0140
27	0.7770	0.0137
28	0.7905	0.0134
29	0.8037	0.0132
30	0.8166	0.0130
31	0.8294	0.0127
32	0.8419	0.0125
33	0.8542	0.0123
34	0.8663	0.0121
35	0.8782	0.0119
36	0.8900	0.0118
37	0.9012	0.0112
38	0.9122	0.0110
39	0.9230	0.0108
40	0.9337	0.0107
41	0.9442	0.0105
42	0.9547	0.0104
43	0.9649	0.0103
44	0.9751	0.0101
45	0.9851	0.0100
46	0.9950	0.0099
47	1.0048	0.0098

48	1.0145	0.0097
49	1.0240	0.0096
50	1.0335	0.0095
51	1.0428	0.0094
52	1.0521	0.0093
53	1.0612	0.0092
54	1.0703	0.0091
55	1.0793	0.0090
56	1.0882	0.0089
57	1.0970	0.0088
58	1.1057	0.0087
59	1.1143	0.0086
60	1.1229	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1481	0.0083
64	1.1563	0.0083
65	1.1645	0.0082
66	1.1726	0.0081
67	1.1807	0.0081
68	1.1887	0.0080
69	1.1966	0.0079
70	1.2045	0.0079
71	1.2123	0.0078
72	1.2200	0.0077
73	1.2263	0.0063
74	1.2326	0.0063
75	1.2388	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2571	0.0061
79	1.2631	0.0060
80	1.2691	0.0060
81	1.2750	0.0059
82	1.2809	0.0059
83	1.2867	0.0058
84	1.2925	0.0058
85	1.2982	0.0057
86	1.3039	0.0057
87	1.3096	0.0057
88	1.3152	0.0056
89	1.3208	0.0056
90	1.3263	0.0055
91	1.3318	0.0055
92	1.3372	0.0055
93	1.3427	0.0054
94	1.3481	0.0054
95	1.3534	0.0054
96	1.3587	0.0053
97	1.3640	0.0053
98	1.3693	0.0052
99	1.3745	0.0052
100	1.3796	0.0052
101	1.3848	0.0051
102	1.3899	0.0051
103	1.3950	0.0051
104	1.4001	0.0051
105	1.4051	0.0050
106	1.4101	0.0050
107	1.4150	0.0050
108	1.4200	0.0049
109	1.4249	0.0049
110	1.4298	0.0049
111	1.4346	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4490	0.0048
115	1.4538	0.0047
116	1.4585	0.0047
117	1.4632	0.0047
118	1.4678	0.0047

119	1.4725	0.0046
120	1.4771	0.0046
121	1.4817	0.0046
122	1.4863	0.0046
123	1.4908	0.0045
124	1.4954	0.0045
125	1.4999	0.0045
126	1.5043	0.0045
127	1.5088	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5264	0.0044
132	1.5308	0.0044
133	1.5351	0.0043
134	1.5394	0.0043
135	1.5437	0.0043
136	1.5480	0.0043
137	1.5522	0.0043
138	1.5565	0.0042
139	1.5607	0.0042
140	1.5649	0.0042
141	1.5690	0.0042
142	1.5732	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5856	0.0041
146	1.5896	0.0041
147	1.5937	0.0041
148	1.5978	0.0041
149	1.6018	0.0040
150	1.6058	0.0040
151	1.6098	0.0040
152	1.6138	0.0040
153	1.6178	0.0040
154	1.6217	0.0040
155	1.6256	0.0039
156	1.6296	0.0039
157	1.6335	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6451	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6566	0.0038
164	1.6604	0.0038
165	1.6641	0.0038
166	1.6679	0.0038
167	1.6717	0.0038
168	1.6754	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6939	0.0037
174	1.6976	0.0037
175	1.7012	0.0036
176	1.7048	0.0036
177	1.7085	0.0036
178	1.7121	0.0036
179	1.7157	0.0036
180	1.7192	0.0036
181	1.7228	0.0036
182	1.7264	0.0036
183	1.7299	0.0035
184	1.7334	0.0035
185	1.7370	0.0035
186	1.7405	0.0035
187	1.7440	0.0035
188	1.7475	0.0035
189	1.7509	0.0035

190	1.7544	0.0035
191	1.7578	0.0035
192	1.7613	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7817	0.0034
199	1.7851	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7951	0.0033
203	1.7984	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8116	0.0033
208	1.8149	0.0033
209	1.8181	0.0033
210	1.8214	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8311	0.0032
214	1.8343	0.0032
215	1.8375	0.0032
216	1.8407	0.0032
217	1.8439	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8534	0.0032
221	1.8565	0.0031
222	1.8597	0.0031
223	1.8628	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8814	0.0031
230	1.8845	0.0031
231	1.8875	0.0031
232	1.8906	0.0031
233	1.8936	0.0030
234	1.8967	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9207	0.0030
243	1.9237	0.0030
244	1.9266	0.0030
245	1.9296	0.0030
246	1.9325	0.0029
247	1.9355	0.0029
248	1.9384	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9587	0.0029
256	1.9616	0.0029
257	1.9644	0.0029
258	1.9673	0.0029
259	1.9701	0.0029
260	1.9730	0.0028

261	1.9758	0.0028
262	1.9787	0.0028
263	1.9815	0.0028
264	1.9843	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9955	0.0028
269	1.9983	0.0028
270	2.0011	0.0028
271	2.0038	0.0028
272	2.0066	0.0028
273	2.0094	0.0028
274	2.0121	0.0028
275	2.0149	0.0027
276	2.0176	0.0027
277	2.0203	0.0027
278	2.0231	0.0027
279	2.0258	0.0027
280	2.0285	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0393	0.0027
285	2.0420	0.0027
286	2.0447	0.0027
287	2.0473	0.0027
288	2.0500	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0005	0.0021
2	0.0027	0.0005	0.0021
3	0.0027	0.0005	0.0022
4	0.0027	0.0005	0.0022
5	0.0027	0.0005	0.0022
6	0.0027	0.0005	0.0022
7	0.0027	0.0005	0.0022
8	0.0027	0.0005	0.0022
9	0.0027	0.0005	0.0022
10	0.0027	0.0005	0.0022
11	0.0028	0.0005	0.0022
12	0.0028	0.0005	0.0022
13	0.0028	0.0005	0.0022
14	0.0028	0.0006	0.0022
15	0.0028	0.0006	0.0022
16	0.0028	0.0006	0.0022
17	0.0028	0.0006	0.0023
18	0.0028	0.0006	0.0023
19	0.0028	0.0006	0.0023
20	0.0028	0.0006	0.0023
21	0.0029	0.0006	0.0023
22	0.0029	0.0006	0.0023
23	0.0029	0.0006	0.0023
24	0.0029	0.0006	0.0023
25	0.0029	0.0006	0.0023
26	0.0029	0.0006	0.0023
27	0.0029	0.0006	0.0023
28	0.0029	0.0006	0.0024
29	0.0029	0.0006	0.0024
30	0.0030	0.0006	0.0024
31	0.0030	0.0006	0.0024
32	0.0030	0.0006	0.0024
33	0.0030	0.0006	0.0024
34	0.0030	0.0006	0.0024
35	0.0030	0.0006	0.0024
36	0.0030	0.0006	0.0024
37	0.0030	0.0006	0.0024
38	0.0030	0.0006	0.0024

39	0.0031	0.0006	0.0025
40	0.0031	0.0006	0.0025
41	0.0031	0.0006	0.0025
42	0.0031	0.0006	0.0025
43	0.0031	0.0006	0.0025
44	0.0031	0.0006	0.0025
45	0.0031	0.0006	0.0025
46	0.0031	0.0006	0.0025
47	0.0032	0.0006	0.0025
48	0.0032	0.0006	0.0025
49	0.0032	0.0006	0.0026
50	0.0032	0.0006	0.0026
51	0.0032	0.0006	0.0026
52	0.0032	0.0006	0.0026
53	0.0033	0.0006	0.0026
54	0.0033	0.0006	0.0026
55	0.0033	0.0006	0.0026
56	0.0033	0.0007	0.0026
57	0.0033	0.0007	0.0027
58	0.0033	0.0007	0.0027
59	0.0033	0.0007	0.0027
60	0.0034	0.0007	0.0027
61	0.0034	0.0007	0.0027
62	0.0034	0.0007	0.0027
63	0.0034	0.0007	0.0027
64	0.0034	0.0007	0.0027
65	0.0034	0.0007	0.0028
66	0.0035	0.0007	0.0028
67	0.0035	0.0007	0.0028
68	0.0035	0.0007	0.0028
69	0.0035	0.0007	0.0028
70	0.0035	0.0007	0.0028
71	0.0035	0.0007	0.0028
72	0.0036	0.0007	0.0029
73	0.0036	0.0007	0.0029
74	0.0036	0.0007	0.0029
75	0.0036	0.0007	0.0029
76	0.0036	0.0007	0.0029
77	0.0037	0.0007	0.0029
78	0.0037	0.0007	0.0029
79	0.0037	0.0007	0.0030
80	0.0037	0.0007	0.0030
81	0.0037	0.0007	0.0030
82	0.0038	0.0007	0.0030
83	0.0038	0.0007	0.0030
84	0.0038	0.0008	0.0030
85	0.0038	0.0008	0.0031
86	0.0038	0.0008	0.0031
87	0.0039	0.0008	0.0031
88	0.0039	0.0008	0.0031
89	0.0039	0.0008	0.0031
90	0.0039	0.0008	0.0032
91	0.0040	0.0008	0.0032
92	0.0040	0.0008	0.0032
93	0.0040	0.0008	0.0032
94	0.0040	0.0008	0.0032
95	0.0041	0.0008	0.0033
96	0.0041	0.0008	0.0033
97	0.0041	0.0008	0.0033
98	0.0041	0.0008	0.0033
99	0.0042	0.0008	0.0033
100	0.0042	0.0008	0.0034
101	0.0042	0.0008	0.0034
102	0.0043	0.0008	0.0034
103	0.0043	0.0008	0.0034
104	0.0043	0.0009	0.0035
105	0.0044	0.0009	0.0035
106	0.0044	0.0009	0.0035
107	0.0044	0.0009	0.0035
108	0.0044	0.0009	0.0036
109	0.0045	0.0009	0.0036

110	0.0045	0.0009	0.0036
111	0.0045	0.0009	0.0036
112	0.0046	0.0009	0.0037
113	0.0046	0.0009	0.0037
114	0.0046	0.0009	0.0037
115	0.0047	0.0009	0.0038
116	0.0047	0.0009	0.0038
117	0.0048	0.0009	0.0038
118	0.0048	0.0009	0.0038
119	0.0049	0.0010	0.0039
120	0.0049	0.0010	0.0039
121	0.0049	0.0010	0.0040
122	0.0050	0.0010	0.0040
123	0.0050	0.0010	0.0040
124	0.0051	0.0010	0.0041
125	0.0051	0.0010	0.0041
126	0.0051	0.0010	0.0041
127	0.0052	0.0010	0.0042
128	0.0052	0.0010	0.0042
129	0.0053	0.0011	0.0043
130	0.0054	0.0011	0.0043
131	0.0054	0.0011	0.0044
132	0.0055	0.0011	0.0044
133	0.0055	0.0011	0.0044
134	0.0056	0.0011	0.0045
135	0.0057	0.0011	0.0045
136	0.0057	0.0011	0.0046
137	0.0058	0.0011	0.0046
138	0.0058	0.0012	0.0047
139	0.0059	0.0012	0.0047
140	0.0060	0.0012	0.0048
141	0.0061	0.0012	0.0049
142	0.0061	0.0012	0.0049
143	0.0062	0.0012	0.0050
144	0.0063	0.0012	0.0050
145	0.0077	0.0015	0.0062
146	0.0078	0.0015	0.0063
147	0.0079	0.0016	0.0064
148	0.0080	0.0016	0.0064
149	0.0081	0.0016	0.0065
150	0.0082	0.0016	0.0066
151	0.0083	0.0016	0.0067
152	0.0084	0.0017	0.0067
153	0.0086	0.0017	0.0069
154	0.0086	0.0017	0.0070
155	0.0088	0.0017	0.0071
156	0.0089	0.0017	0.0072
157	0.0091	0.0017	0.0074
158	0.0092	0.0017	0.0075
159	0.0094	0.0017	0.0077
160	0.0095	0.0017	0.0078
161	0.0097	0.0017	0.0080
162	0.0098	0.0017	0.0081
163	0.0100	0.0017	0.0084
164	0.0101	0.0017	0.0085
165	0.0104	0.0017	0.0087
166	0.0105	0.0017	0.0089
167	0.0108	0.0017	0.0092
168	0.0110	0.0017	0.0093
169	0.0118	0.0017	0.0101
170	0.0119	0.0017	0.0103
171	0.0123	0.0017	0.0106
172	0.0125	0.0017	0.0109
173	0.0130	0.0017	0.0113
174	0.0132	0.0017	0.0115
175	0.0137	0.0017	0.0120
176	0.0140	0.0017	0.0123
177	0.0146	0.0017	0.0129
178	0.0150	0.0017	0.0133
179	0.0157	0.0017	0.0140
180	0.0161	0.0017	0.0145

181	0.0171	0.0017	0.0154
182	0.0176	0.0017	0.0159
183	0.0189	0.0017	0.0172
184	0.0196	0.0017	0.0179
185	0.0184	0.0017	0.0167
186	0.0194	0.0017	0.0178
187	0.0220	0.0017	0.0204
188	0.0237	0.0017	0.0221
189	0.0292	0.0017	0.0275
190	0.0328	0.0017	0.0312
191	0.0465	0.0017	0.0448
192	0.0634	0.0017	0.0617
193	0.1900	0.0017	0.1883
194	0.0381	0.0017	0.0364
195	0.0258	0.0017	0.0242
196	0.0206	0.0017	0.0189
197	0.0204	0.0017	0.0187
198	0.0182	0.0017	0.0165
199	0.0166	0.0017	0.0149
200	0.0153	0.0017	0.0137
201	0.0143	0.0017	0.0126
202	0.0134	0.0017	0.0118
203	0.0127	0.0017	0.0111
204	0.0121	0.0017	0.0105
205	0.0112	0.0017	0.0095
206	0.0107	0.0017	0.0090
207	0.0103	0.0017	0.0086
208	0.0099	0.0017	0.0082
209	0.0096	0.0017	0.0079
210	0.0093	0.0017	0.0076
211	0.0090	0.0017	0.0073
212	0.0087	0.0017	0.0070
213	0.0085	0.0017	0.0068
214	0.0083	0.0016	0.0066
215	0.0081	0.0016	0.0065
216	0.0079	0.0016	0.0063
217	0.0063	0.0012	0.0051
218	0.0062	0.0012	0.0049
219	0.0060	0.0012	0.0048
220	0.0059	0.0012	0.0047
221	0.0057	0.0011	0.0046
222	0.0056	0.0011	0.0045
223	0.0055	0.0011	0.0044
224	0.0054	0.0011	0.0043
225	0.0053	0.0010	0.0042
226	0.0052	0.0010	0.0042
227	0.0051	0.0010	0.0041
228	0.0050	0.0010	0.0040
229	0.0049	0.0010	0.0039
230	0.0048	0.0010	0.0039
231	0.0047	0.0009	0.0038
232	0.0047	0.0009	0.0037
233	0.0046	0.0009	0.0037
234	0.0045	0.0009	0.0036
235	0.0045	0.0009	0.0036
236	0.0044	0.0009	0.0035
237	0.0043	0.0009	0.0035
238	0.0043	0.0008	0.0034
239	0.0042	0.0008	0.0034
240	0.0042	0.0008	0.0033
241	0.0041	0.0008	0.0033
242	0.0041	0.0008	0.0032
243	0.0040	0.0008	0.0032
244	0.0040	0.0008	0.0032
245	0.0039	0.0008	0.0031
246	0.0039	0.0008	0.0031
247	0.0038	0.0008	0.0031
248	0.0038	0.0007	0.0030
249	0.0037	0.0007	0.0030
250	0.0037	0.0007	0.0030
251	0.0036	0.0007	0.0029

252	0.0036	0.0007	0.0029
253	0.0036	0.0007	0.0029
254	0.0035	0.0007	0.0028
255	0.0035	0.0007	0.0028
256	0.0035	0.0007	0.0028
257	0.0034	0.0007	0.0028
258	0.0034	0.0007	0.0027
259	0.0034	0.0007	0.0027
260	0.0033	0.0007	0.0027
261	0.0033	0.0007	0.0026
262	0.0033	0.0006	0.0026
263	0.0032	0.0006	0.0026
264	0.0032	0.0006	0.0026
265	0.0032	0.0006	0.0026
266	0.0032	0.0006	0.0025
267	0.0031	0.0006	0.0025
268	0.0031	0.0006	0.0025
269	0.0031	0.0006	0.0025
270	0.0031	0.0006	0.0025
271	0.0030	0.0006	0.0024
272	0.0030	0.0006	0.0024
273	0.0030	0.0006	0.0024
274	0.0030	0.0006	0.0024
275	0.0029	0.0006	0.0024
276	0.0029	0.0006	0.0023
277	0.0029	0.0006	0.0023
278	0.0029	0.0006	0.0023
279	0.0029	0.0006	0.0023
280	0.0028	0.0006	0.0023
281	0.0028	0.0006	0.0023
282	0.0028	0.0006	0.0022
283	0.0028	0.0005	0.0022
284	0.0028	0.0005	0.0022
285	0.0027	0.0005	0.0022
286	0.0027	0.0005	0.0022
287	0.0027	0.0005	0.0022
288	0.0027	0.0005	0.0021

Total soil rain loss = 0.28(In)
Total effective rainfall = 1.77(In)
Peak flow rate in flood hydrograph = 2.56(CFS)

++

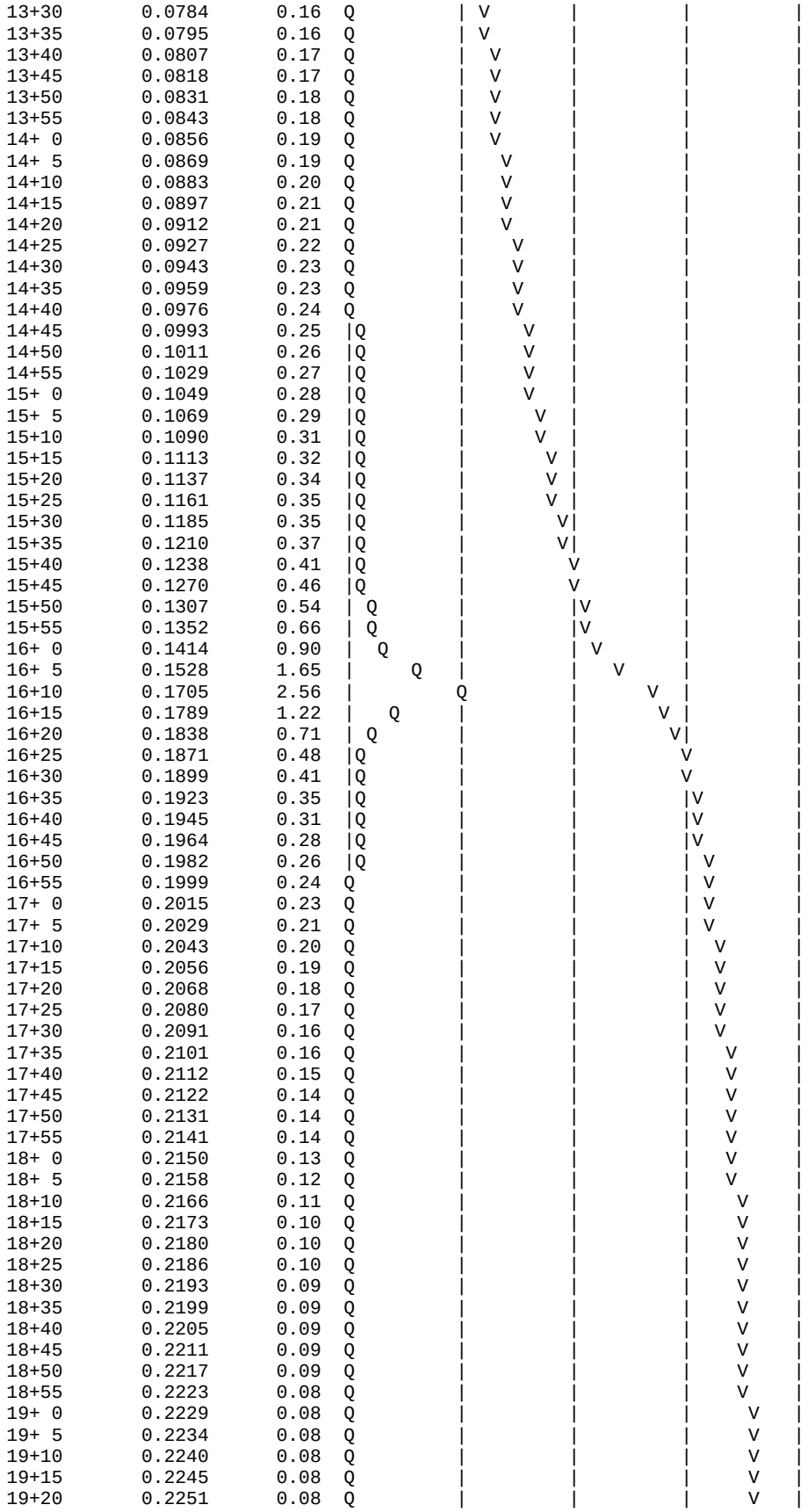
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0003	0.03	Q	|	|	|	|
0+15	0.0006	0.04	Q	|	|	|	|
0+20	0.0009	0.04	Q	|	|	|	|
0+25	0.0012	0.04	Q	|	|	|	|
0+30	0.0015	0.04	Q	|	|	|	|
0+35	0.0018	0.04	Q	|	|	|	|
0+40	0.0021	0.04	Q	|	|	|	|
0+45	0.0024	0.04	Q	|	|	|	|
0+50	0.0027	0.04	Q	|	|	|	|
0+55	0.0030	0.04	Q	|	|	|	|
1+ 0	0.0033	0.04	Q	|	|	|	|
1+ 5	0.0036	0.05	Q	|	|	|	|
1+10	0.0039	0.05	Q	|	|	|	|
1+15	0.0042	0.05	Q	|	|	|	|
1+20	0.0045	0.05	Q	|	|	|	|
1+25	0.0049	0.05	Q	|	|	|	|
1+30	0.0052	0.05	Q	|	|	|	|
1+35	0.0055	0.05	Q	|	|	|	|

1+40	0.0058	0.05	Q				
1+45	0.0061	0.05	Q				
1+50	0.0065	0.05	QV				
1+55	0.0068	0.05	QV				
2+ 0	0.0071	0.05	QV				
2+ 5	0.0074	0.05	QV				
2+10	0.0077	0.05	QV				
2+15	0.0081	0.05	QV				
2+20	0.0084	0.05	QV				
2+25	0.0087	0.05	QV				
2+30	0.0091	0.05	QV				
2+35	0.0094	0.05	QV				
2+40	0.0097	0.05	QV				
2+45	0.0101	0.05	QV				
2+50	0.0104	0.05	QV				
2+55	0.0107	0.05	QV				
3+ 0	0.0111	0.05	QV				
3+ 5	0.0114	0.05	QV				
3+10	0.0117	0.05	QV				
3+15	0.0121	0.05	QV				
3+20	0.0124	0.05	Q V				
3+25	0.0128	0.05	Q V				
3+30	0.0131	0.05	Q V				
3+35	0.0135	0.05	Q V				
3+40	0.0138	0.05	Q V				
3+45	0.0142	0.05	Q V				
3+50	0.0145	0.05	Q V				
3+55	0.0149	0.05	Q V				
4+ 0	0.0152	0.05	Q V				
4+ 5	0.0156	0.05	Q V				
4+10	0.0159	0.05	Q V				
4+15	0.0163	0.05	Q V				
4+20	0.0167	0.05	Q V				
4+25	0.0170	0.05	Q V				
4+30	0.0174	0.05	Q V				
4+35	0.0178	0.05	Q V				
4+40	0.0181	0.05	Q V				
4+45	0.0185	0.05	Q V				
4+50	0.0189	0.05	Q V				
4+55	0.0192	0.05	Q V				
5+ 0	0.0196	0.05	Q V				
5+ 5	0.0200	0.05	Q V				
5+10	0.0204	0.05	Q V				
5+15	0.0208	0.06	Q V				
5+20	0.0211	0.06	Q V				
5+25	0.0215	0.06	Q V				
5+30	0.0219	0.06	Q V				
5+35	0.0223	0.06	Q V				
5+40	0.0227	0.06	Q V				
5+45	0.0231	0.06	Q V				
5+50	0.0235	0.06	Q V				
5+55	0.0239	0.06	Q V				
6+ 0	0.0243	0.06	Q V				
6+ 5	0.0247	0.06	Q V				
6+10	0.0251	0.06	Q V				
6+15	0.0255	0.06	Q V				
6+20	0.0259	0.06	Q V				
6+25	0.0263	0.06	Q V				
6+30	0.0267	0.06	Q V				
6+35	0.0271	0.06	Q V				
6+40	0.0275	0.06	Q V				
6+45	0.0279	0.06	Q V				
6+50	0.0283	0.06	Q V				
6+55	0.0288	0.06	Q V				
7+ 0	0.0292	0.06	Q V				
7+ 5	0.0296	0.06	Q V				
7+10	0.0300	0.06	Q V				
7+15	0.0305	0.06	Q V				
7+20	0.0309	0.06	Q V				
7+25	0.0313	0.06	Q V				
7+30	0.0318	0.06	Q V				

```
 7+35      0.0322      0.06  Q    V    |         |         |         |
 7+40      0.0327      0.06  Q    V    |         |         |         |
 7+45      0.0331      0.06  Q    V    |         |         |         |
 7+50      0.0336      0.07  Q    V    |         |         |         |
 7+55      0.0340      0.07  Q    V    |         |         |         |
 8+ 0      0.0345      0.07  Q    V    |         |         |         |
 8+ 5      0.0349      0.07  Q    V    |         |         |         |
 8+10      0.0354      0.07  Q    V    |         |         |         |
 8+15      0.0359      0.07  Q    V    |         |         |         |
 8+20      0.0363      0.07  Q    V    |         |         |         |
 8+25      0.0368      0.07  Q    V    |         |         |         |
 8+30      0.0373      0.07  Q     V   |         |         |         |
 8+35      0.0378      0.07  Q     V   |         |         |         |
 8+40      0.0382      0.07  Q     V   |         |         |         |
 8+45      0.0387      0.07  Q     V   |         |         |         |
 8+50      0.0392      0.07  Q     V   |         |         |         |
 8+55      0.0397      0.07  Q     V   |         |         |         |
 9+ 0      0.0402      0.07  Q     V   |         |         |         |
 9+ 5      0.0407      0.07  Q     V   |         |         |         |
 9+10      0.0412      0.07  Q     V   |         |         |         |
 9+15      0.0417      0.07  Q     V   |         |         |         |
 9+20      0.0422      0.07  Q     V   |         |         |         |
 9+25      0.0427      0.07  Q     V   |         |         |         |
 9+30      0.0432      0.08  Q     V   |         |         |         |
 9+35      0.0438      0.08  Q      V  |         |         |         |
 9+40      0.0443      0.08  Q      V  |         |         |         |
 9+45      0.0448      0.08  Q      V  |         |         |         |
 9+50      0.0453      0.08  Q      V  |         |         |         |
 9+55      0.0459      0.08  Q      V  |         |         |         |
10+ 0      0.0464      0.08  Q      V  |         |         |         |
10+ 5      0.0470      0.08  Q      V  |         |         |         |
10+10      0.0475      0.08  Q      V  |         |         |         |
10+15      0.0481      0.08  Q      V  |         |         |         |
10+20      0.0486      0.08  Q      V  |         |         |         |
10+25      0.0492      0.08  Q      V  |         |         |         |
10+30      0.0498      0.08  Q       V |         |         |         |
10+35      0.0504      0.08  Q       V |         |         |         |
10+40      0.0510      0.08  Q       V |         |         |         |
10+45      0.0515      0.09  Q       V |         |         |         |
10+50      0.0521      0.09  Q       V |         |         |         |
10+55      0.0527      0.09  Q       V |         |         |         |
11+ 0      0.0533      0.09  Q       V |         |         |         |
11+ 5      0.0540      0.09  Q       V |         |         |         |
11+10      0.0546      0.09  Q       V |         |         |         |
11+15      0.0552      0.09  Q       V |         |         |         |
11+20      0.0558      0.09  Q        V|         |         |         |
11+25      0.0565      0.09  Q        V|         |         |         |
11+30      0.0571      0.09  Q        V|         |         |         |
11+35      0.0578      0.09  Q        V|         |         |         |
11+40      0.0584      0.10  Q        V|         |         |         |
11+45      0.0591      0.10  Q        V|         |         |         |
11+50      0.0598      0.10  Q        V|         |         |         |
11+55      0.0605      0.10  Q        V|         |         |         |
12+ 0      0.0612      0.10  Q        V|         |         |         |
12+ 5      0.0619      0.11  Q         V         |         |         |
12+10      0.0627      0.12  Q         V         |         |         |
12+15      0.0636      0.13  Q         V         |         |         |
12+20      0.0645      0.13  Q         V         |         |         |
12+25      0.0654      0.13  Q         V         |         |         |
12+30      0.0663      0.13  Q         V         |         |         |
12+35      0.0672      0.13  Q         V         |         |         |
12+40      0.0681      0.14  Q         |V        |         |         |
12+45      0.0691      0.14  Q         |V        |         |         |
12+50      0.0700      0.14  Q         |V        |         |         |
12+55      0.0710      0.14  Q         |V        |         |         |
13+ 0      0.0720      0.14  Q         |V        |         |         |
13+ 5      0.0730      0.15  Q         |V        |         |         |
13+10      0.0740      0.15  Q         |V        |         |         |
13+15      0.0751      0.15  Q         | V       |         |         |
13+20      0.0762      0.16  Q         | V       |         |         |
13+25      0.0772      0.16  Q         | V       |         |         |
```



```
  19+25      0.2256     0.08  Q        |         |         |     V   |
  19+30      0.2261     0.08  Q        |         |         |     V   |
  19+35      0.2266     0.07  Q        |         |         |     V   |
  19+40      0.2271     0.07  Q        |         |         |     V   |
  19+45      0.2276     0.07  Q        |         |         |     V   |
  19+50      0.2281     0.07  Q        |         |         |     V   |
  19+55      0.2286     0.07  Q        |         |         |     V   |
  20+ 0      0.2291     0.07  Q        |         |         |      V  |
  20+ 5      0.2295     0.07  Q        |         |         |      V  |
  20+10      0.2300     0.07  Q        |         |         |      V  |
  20+15      0.2305     0.07  Q        |         |         |      V  |
  20+20      0.2309     0.07  Q        |         |         |      V  |
  20+25      0.2313     0.06  Q        |         |         |      V  |
  20+30      0.2318     0.06  Q        |         |         |      V  |
  20+35      0.2322     0.06  Q        |         |         |      V  |
  20+40      0.2326     0.06  Q        |         |         |      V  |
  20+45      0.2331     0.06  Q        |         |         |      V  |
  20+50      0.2335     0.06  Q        |         |         |      V  |
  20+55      0.2339     0.06  Q        |         |         |      V  |
  21+ 0      0.2343     0.06  Q        |         |         |      V  |
  21+ 5      0.2347     0.06  Q        |         |         |      V  |
  21+10      0.2351     0.06  Q        |         |         |       V |
  21+15      0.2355     0.06  Q        |         |         |       V |
  21+20      0.2359     0.06  Q        |         |         |       V |
  21+25      0.2363     0.06  Q        |         |         |       V |
  21+30      0.2367     0.06  Q        |         |         |       V |
  21+35      0.2371     0.06  Q        |         |         |       V |
  21+40      0.2374     0.05  Q        |         |         |       V |
  21+45      0.2378     0.05  Q        |         |         |       V |
  21+50      0.2382     0.05  Q        |         |         |       V |
  21+55      0.2386     0.05  Q        |         |         |       V |
  22+ 0      0.2389     0.05  Q        |         |         |       V |
  22+ 5      0.2393     0.05  Q        |         |         |       V |
  22+10      0.2396     0.05  Q        |         |         |       V |
  22+15      0.2400     0.05  Q        |         |         |       V |
  22+20      0.2404     0.05  Q        |         |         |       V |
  22+25      0.2407     0.05  Q        |         |         |       V |
  22+30      0.2410     0.05  Q        |         |         |        V|
  22+35      0.2414     0.05  Q        |         |         |        V|
  22+40      0.2417     0.05  Q        |         |         |        V|
  22+45      0.2421     0.05  Q        |         |         |        V|
  22+50      0.2424     0.05  Q        |         |         |        V|
  22+55      0.2427     0.05  Q        |         |         |        V|
  23+ 0      0.2431     0.05  Q        |         |         |        V|
  23+ 5      0.2434     0.05  Q        |         |         |        V|
  23+10      0.2437     0.05  Q        |         |         |        V|
  23+15      0.2440     0.05  Q        |         |         |        V|
  23+20      0.2444     0.05  Q        |         |         |        V|
  23+25      0.2447     0.05  Q        |         |         |        V|
  23+30      0.2450     0.05  Q        |         |         |        V|
  23+35      0.2453     0.05  Q        |         |         |        V|
  23+40      0.2456     0.05  Q        |         |         |        V|
  23+45      0.2459     0.04  Q        |         |         |        V|
  23+50      0.2462     0.04  Q        |         |         |        V|
  23+55      0.2465     0.04  Q        |         |         |        V|
  24+ 0      0.2468     0.04  Q        |         |         |        V|
  24+ 5      0.2471     0.04  Q        |         |         |        V|
  24+10      0.2472     0.01  Q        |         |         |        V|
  24+15      0.2472     0.00  Q        |         |         |        V|
  24+20      0.2472     0.00  Q        |         |         |        V|
  24+25      0.2472     0.00  Q        |         |         |        V|
  24+30      0.2472     0.00  Q        |         |         |         V
-------------------------------------------------------------------------
```

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 8.2
Rational Hydrology Study, Date: 10/13/16 File Name: PRF002.roc

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RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION RATIONAL METHOD - AREA 'F' - 2 YEAR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Program License Serial Number 4094

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++
Process from Point/Station 601.000 to Point/Station 602.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.900
SCS curve number for soil(AMC 2) = 74.40
Pervious ratio(Ap) = 0.1000 Max loss rate(Fp)= 0.205(In/Hr)
Max Catchment Loss (Fm) = 0.021(In/Hr)
Initial subarea data:
Initial area flow distance = 255.000(Ft.)
Top (of initial area) elevation = 310.000(Ft.)
Bottom (of initial area) elevation = 301.000(Ft.)
Difference in elevation = 9.000(Ft.)
Slope = 0.03529 s(%)= 3.53
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.444 min.
Rainfall intensity = 2.156(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.891
Subarea runoff = 3.228(CFS)
Total initial stream area = 1.680(Ac.)
End of computations, total study area = 1.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number (AMC 2) = 74.4

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/20/16 File Name prf00224.out

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Orange County Unit Hydrograph Hydrology Method
Manual Date(s) - October 1986, November 1996

Program License Serial Number 4094

RANCHO LA HABRA HYDROLOGY STUDY
PROPOSED CONDITION UNIT HYDROGRAPH - AREA 'F' - 2 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, OCTOBER 3, 2016
BY: BRIAN LOWELL, PE

Storm Event Year = 2

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used
++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	Area (Ac.)	Area Fraction	Soil Group	Fp (In/Hr)	Ap (dec.)	Fm (In/Hr)
74.4	1.7	1.00	D	0.200	0.100	0.020

Area-averaged adjusted loss rate Fm (In/Hr) = 0.020

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.17	0.100	74.4	56.3	7.77	0.015
1.51	0.900	98.0	98.0	0.20	0.890

Area-averaged catchment yield fraction, Y = 0.802
Area-averaged low loss fraction, Yb = 0.198
++
User entry of time of concentration = 0.091 (hours)
Watershed area = 1.68(Ac.)
Catchment Lag time = 0.073 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 114.8095
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.020(In/Hr)
Average low loss rate fraction (Yb) = 0.198 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.190(In)
Computed peak 30-minute rainfall = 0.400(In)
Specified peak 1-hour rainfall = 0.530(In)
Computed peak 3-hour rainfall = 0.890(In)
Specified peak 6-hour rainfall = 1.220(In)
Specified peak 24-hour rainfall = 2.050(In)

Rainfall depth area reduction factors:
Using a total area of 1.68(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.190(In)

30-minute factor = 1.000 Adjusted rainfall = 0.400(In)
1-hour factor = 1.000 Adjusted rainfall = 0.530(In)
3-hour factor = 1.000 Adjusted rainfall = 0.890(In)
6-hour factor = 1.000 Adjusted rainfall = 1.220(In)
24-hour factor = 1.000 Adjusted rainfall = 2.050(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 20.32 (CFS))	
1	19.643	3.991
2	75.813	11.412
3	92.011	3.291
4	97.656	1.147
5	99.076	0.288
6	99.801	0.147
7	100.000	0.040

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.1900	0.1900
2	0.2534	0.0634
3	0.2999	0.0465
4	0.3380	0.0381
5	0.3708	0.0328
6	0.4000	0.0292
7	0.4258	0.0258
8	0.4495	0.0237
9	0.4715	0.0220
10	0.4921	0.0206
11	0.5116	0.0194
12	0.5300	0.0184
13	0.5504	0.0204
14	0.5699	0.0196
15	0.5888	0.0189
16	0.6070	0.0182
17	0.6246	0.0176
18	0.6417	0.0171
19	0.6583	0.0166
20	0.6744	0.0161
21	0.6901	0.0157
22	0.7054	0.0153
23	0.7204	0.0150
24	0.7350	0.0146
25	0.7493	0.0143
26	0.7633	0.0140
27	0.7770	0.0137
28	0.7905	0.0134
29	0.8037	0.0132
30	0.8166	0.0130
31	0.8294	0.0127
32	0.8419	0.0125
33	0.8542	0.0123
34	0.8663	0.0121
35	0.8782	0.0119
36	0.8900	0.0118
37	0.9012	0.0112
38	0.9122	0.0110
39	0.9230	0.0108
40	0.9337	0.0107
41	0.9442	0.0105
42	0.9547	0.0104
43	0.9649	0.0103
44	0.9751	0.0101
45	0.9851	0.0100
46	0.9950	0.0099
47	1.0048	0.0098

48	1.0145	0.0097
49	1.0240	0.0096
50	1.0335	0.0095
51	1.0428	0.0094
52	1.0521	0.0093
53	1.0612	0.0092
54	1.0703	0.0091
55	1.0793	0.0090
56	1.0882	0.0089
57	1.0970	0.0088
58	1.1057	0.0087
59	1.1143	0.0086
60	1.1229	0.0086
61	1.1313	0.0085
62	1.1397	0.0084
63	1.1481	0.0083
64	1.1563	0.0083
65	1.1645	0.0082
66	1.1726	0.0081
67	1.1807	0.0081
68	1.1887	0.0080
69	1.1966	0.0079
70	1.2045	0.0079
71	1.2123	0.0078
72	1.2200	0.0077
73	1.2263	0.0063
74	1.2326	0.0063
75	1.2388	0.0062
76	1.2449	0.0062
77	1.2510	0.0061
78	1.2571	0.0061
79	1.2631	0.0060
80	1.2691	0.0060
81	1.2750	0.0059
82	1.2809	0.0059
83	1.2867	0.0058
84	1.2925	0.0058
85	1.2982	0.0057
86	1.3039	0.0057
87	1.3096	0.0057
88	1.3152	0.0056
89	1.3208	0.0056
90	1.3263	0.0055
91	1.3318	0.0055
92	1.3372	0.0055
93	1.3427	0.0054
94	1.3481	0.0054
95	1.3534	0.0054
96	1.3587	0.0053
97	1.3640	0.0053
98	1.3693	0.0052
99	1.3745	0.0052
100	1.3796	0.0052
101	1.3848	0.0051
102	1.3899	0.0051
103	1.3950	0.0051
104	1.4001	0.0051
105	1.4051	0.0050
106	1.4101	0.0050
107	1.4150	0.0050
108	1.4200	0.0049
109	1.4249	0.0049
110	1.4298	0.0049
111	1.4346	0.0049
112	1.4394	0.0048
113	1.4442	0.0048
114	1.4490	0.0048
115	1.4538	0.0047
116	1.4585	0.0047
117	1.4632	0.0047
118	1.4678	0.0047

119	1.4725	0.0046
120	1.4771	0.0046
121	1.4817	0.0046
122	1.4863	0.0046
123	1.4908	0.0045
124	1.4954	0.0045
125	1.4999	0.0045
126	1.5043	0.0045
127	1.5088	0.0045
128	1.5132	0.0044
129	1.5176	0.0044
130	1.5220	0.0044
131	1.5264	0.0044
132	1.5308	0.0044
133	1.5351	0.0043
134	1.5394	0.0043
135	1.5437	0.0043
136	1.5480	0.0043
137	1.5522	0.0043
138	1.5565	0.0042
139	1.5607	0.0042
140	1.5649	0.0042
141	1.5690	0.0042
142	1.5732	0.0042
143	1.5773	0.0041
144	1.5814	0.0041
145	1.5856	0.0041
146	1.5896	0.0041
147	1.5937	0.0041
148	1.5978	0.0041
149	1.6018	0.0040
150	1.6058	0.0040
151	1.6098	0.0040
152	1.6138	0.0040
153	1.6178	0.0040
154	1.6217	0.0040
155	1.6256	0.0039
156	1.6296	0.0039
157	1.6335	0.0039
158	1.6373	0.0039
159	1.6412	0.0039
160	1.6451	0.0039
161	1.6489	0.0038
162	1.6527	0.0038
163	1.6566	0.0038
164	1.6604	0.0038
165	1.6641	0.0038
166	1.6679	0.0038
167	1.6717	0.0038
168	1.6754	0.0037
169	1.6791	0.0037
170	1.6828	0.0037
171	1.6865	0.0037
172	1.6902	0.0037
173	1.6939	0.0037
174	1.6976	0.0037
175	1.7012	0.0036
176	1.7048	0.0036
177	1.7085	0.0036
178	1.7121	0.0036
179	1.7157	0.0036
180	1.7192	0.0036
181	1.7228	0.0036
182	1.7264	0.0036
183	1.7299	0.0035
184	1.7334	0.0035
185	1.7370	0.0035
186	1.7405	0.0035
187	1.7440	0.0035
188	1.7475	0.0035
189	1.7509	0.0035

190	1.7544	0.0035
191	1.7578	0.0035
192	1.7613	0.0034
193	1.7647	0.0034
194	1.7681	0.0034
195	1.7715	0.0034
196	1.7749	0.0034
197	1.7783	0.0034
198	1.7817	0.0034
199	1.7851	0.0034
200	1.7884	0.0034
201	1.7917	0.0033
202	1.7951	0.0033
203	1.7984	0.0033
204	1.8017	0.0033
205	1.8050	0.0033
206	1.8083	0.0033
207	1.8116	0.0033
208	1.8149	0.0033
209	1.8181	0.0033
210	1.8214	0.0033
211	1.8246	0.0032
212	1.8278	0.0032
213	1.8311	0.0032
214	1.8343	0.0032
215	1.8375	0.0032
216	1.8407	0.0032
217	1.8439	0.0032
218	1.8470	0.0032
219	1.8502	0.0032
220	1.8534	0.0032
221	1.8565	0.0031
222	1.8597	0.0031
223	1.8628	0.0031
224	1.8659	0.0031
225	1.8690	0.0031
226	1.8721	0.0031
227	1.8752	0.0031
228	1.8783	0.0031
229	1.8814	0.0031
230	1.8845	0.0031
231	1.8875	0.0031
232	1.8906	0.0031
233	1.8936	0.0030
234	1.8967	0.0030
235	1.8997	0.0030
236	1.9027	0.0030
237	1.9057	0.0030
238	1.9087	0.0030
239	1.9117	0.0030
240	1.9147	0.0030
241	1.9177	0.0030
242	1.9207	0.0030
243	1.9237	0.0030
244	1.9266	0.0030
245	1.9296	0.0030
246	1.9325	0.0029
247	1.9355	0.0029
248	1.9384	0.0029
249	1.9413	0.0029
250	1.9442	0.0029
251	1.9471	0.0029
252	1.9500	0.0029
253	1.9529	0.0029
254	1.9558	0.0029
255	1.9587	0.0029
256	1.9616	0.0029
257	1.9644	0.0029
258	1.9673	0.0029
259	1.9701	0.0029
260	1.9730	0.0028

261	1.9758	0.0028
262	1.9787	0.0028
263	1.9815	0.0028
264	1.9843	0.0028
265	1.9871	0.0028
266	1.9899	0.0028
267	1.9927	0.0028
268	1.9955	0.0028
269	1.9983	0.0028
270	2.0011	0.0028
271	2.0038	0.0028
272	2.0066	0.0028
273	2.0094	0.0028
274	2.0121	0.0028
275	2.0149	0.0027
276	2.0176	0.0027
277	2.0203	0.0027
278	2.0231	0.0027
279	2.0258	0.0027
280	2.0285	0.0027
281	2.0312	0.0027
282	2.0339	0.0027
283	2.0366	0.0027
284	2.0393	0.0027
285	2.0420	0.0027
286	2.0447	0.0027
287	2.0473	0.0027
288	2.0500	0.0027

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0027	0.0005	0.0021
2	0.0027	0.0005	0.0021
3	0.0027	0.0005	0.0022
4	0.0027	0.0005	0.0022
5	0.0027	0.0005	0.0022
6	0.0027	0.0005	0.0022
7	0.0027	0.0005	0.0022
8	0.0027	0.0005	0.0022
9	0.0027	0.0005	0.0022
10	0.0027	0.0005	0.0022
11	0.0028	0.0005	0.0022
12	0.0028	0.0005	0.0022
13	0.0028	0.0005	0.0022
14	0.0028	0.0006	0.0022
15	0.0028	0.0006	0.0022
16	0.0028	0.0006	0.0022
17	0.0028	0.0006	0.0023
18	0.0028	0.0006	0.0023
19	0.0028	0.0006	0.0023
20	0.0028	0.0006	0.0023
21	0.0029	0.0006	0.0023
22	0.0029	0.0006	0.0023
23	0.0029	0.0006	0.0023
24	0.0029	0.0006	0.0023
25	0.0029	0.0006	0.0023
26	0.0029	0.0006	0.0023
27	0.0029	0.0006	0.0023
28	0.0029	0.0006	0.0024
29	0.0029	0.0006	0.0024
30	0.0030	0.0006	0.0024
31	0.0030	0.0006	0.0024
32	0.0030	0.0006	0.0024
33	0.0030	0.0006	0.0024
34	0.0030	0.0006	0.0024
35	0.0030	0.0006	0.0024
36	0.0030	0.0006	0.0024
37	0.0030	0.0006	0.0024
38	0.0030	0.0006	0.0024

39	0.0031	0.0006	0.0025
40	0.0031	0.0006	0.0025
41	0.0031	0.0006	0.0025
42	0.0031	0.0006	0.0025
43	0.0031	0.0006	0.0025
44	0.0031	0.0006	0.0025
45	0.0031	0.0006	0.0025
46	0.0031	0.0006	0.0025
47	0.0032	0.0006	0.0025
48	0.0032	0.0006	0.0025
49	0.0032	0.0006	0.0026
50	0.0032	0.0006	0.0026
51	0.0032	0.0006	0.0026
52	0.0032	0.0006	0.0026
53	0.0033	0.0006	0.0026
54	0.0033	0.0006	0.0026
55	0.0033	0.0006	0.0026
56	0.0033	0.0007	0.0026
57	0.0033	0.0007	0.0027
58	0.0033	0.0007	0.0027
59	0.0033	0.0007	0.0027
60	0.0034	0.0007	0.0027
61	0.0034	0.0007	0.0027
62	0.0034	0.0007	0.0027
63	0.0034	0.0007	0.0027
64	0.0034	0.0007	0.0027
65	0.0034	0.0007	0.0028
66	0.0035	0.0007	0.0028
67	0.0035	0.0007	0.0028
68	0.0035	0.0007	0.0028
69	0.0035	0.0007	0.0028
70	0.0035	0.0007	0.0028
71	0.0035	0.0007	0.0028
72	0.0036	0.0007	0.0029
73	0.0036	0.0007	0.0029
74	0.0036	0.0007	0.0029
75	0.0036	0.0007	0.0029
76	0.0036	0.0007	0.0029
77	0.0037	0.0007	0.0029
78	0.0037	0.0007	0.0029
79	0.0037	0.0007	0.0030
80	0.0037	0.0007	0.0030
81	0.0037	0.0007	0.0030
82	0.0038	0.0007	0.0030
83	0.0038	0.0007	0.0030
84	0.0038	0.0008	0.0030
85	0.0038	0.0008	0.0031
86	0.0038	0.0008	0.0031
87	0.0039	0.0008	0.0031
88	0.0039	0.0008	0.0031
89	0.0039	0.0008	0.0031
90	0.0039	0.0008	0.0032
91	0.0040	0.0008	0.0032
92	0.0040	0.0008	0.0032
93	0.0040	0.0008	0.0032
94	0.0040	0.0008	0.0032
95	0.0041	0.0008	0.0033
96	0.0041	0.0008	0.0033
97	0.0041	0.0008	0.0033
98	0.0041	0.0008	0.0033
99	0.0042	0.0008	0.0033
100	0.0042	0.0008	0.0034
101	0.0042	0.0008	0.0034
102	0.0043	0.0008	0.0034
103	0.0043	0.0008	0.0034
104	0.0043	0.0009	0.0035
105	0.0044	0.0009	0.0035
106	0.0044	0.0009	0.0035
107	0.0044	0.0009	0.0035
108	0.0044	0.0009	0.0036
109	0.0045	0.0009	0.0036

110	0.0045	0.0009	0.0036
111	0.0045	0.0009	0.0036
112	0.0046	0.0009	0.0037
113	0.0046	0.0009	0.0037
114	0.0046	0.0009	0.0037
115	0.0047	0.0009	0.0038
116	0.0047	0.0009	0.0038
117	0.0048	0.0009	0.0038
118	0.0048	0.0009	0.0038
119	0.0049	0.0010	0.0039
120	0.0049	0.0010	0.0039
121	0.0049	0.0010	0.0040
122	0.0050	0.0010	0.0040
123	0.0050	0.0010	0.0040
124	0.0051	0.0010	0.0041
125	0.0051	0.0010	0.0041
126	0.0051	0.0010	0.0041
127	0.0052	0.0010	0.0042
128	0.0052	0.0010	0.0042
129	0.0053	0.0011	0.0043
130	0.0054	0.0011	0.0043
131	0.0054	0.0011	0.0044
132	0.0055	0.0011	0.0044
133	0.0055	0.0011	0.0044
134	0.0056	0.0011	0.0045
135	0.0057	0.0011	0.0045
136	0.0057	0.0011	0.0046
137	0.0058	0.0011	0.0046
138	0.0058	0.0012	0.0047
139	0.0059	0.0012	0.0047
140	0.0060	0.0012	0.0048
141	0.0061	0.0012	0.0049
142	0.0061	0.0012	0.0049
143	0.0062	0.0012	0.0050
144	0.0063	0.0012	0.0050
145	0.0077	0.0015	0.0062
146	0.0078	0.0015	0.0063
147	0.0079	0.0016	0.0064
148	0.0080	0.0016	0.0064
149	0.0081	0.0016	0.0065
150	0.0082	0.0016	0.0066
151	0.0083	0.0016	0.0067
152	0.0084	0.0017	0.0067
153	0.0086	0.0017	0.0069
154	0.0086	0.0017	0.0070
155	0.0088	0.0017	0.0071
156	0.0089	0.0017	0.0072
157	0.0091	0.0017	0.0074
158	0.0092	0.0017	0.0075
159	0.0094	0.0017	0.0077
160	0.0095	0.0017	0.0078
161	0.0097	0.0017	0.0080
162	0.0098	0.0017	0.0081
163	0.0100	0.0017	0.0084
164	0.0101	0.0017	0.0085
165	0.0104	0.0017	0.0087
166	0.0105	0.0017	0.0089
167	0.0108	0.0017	0.0092
168	0.0110	0.0017	0.0093
169	0.0118	0.0017	0.0101
170	0.0119	0.0017	0.0103
171	0.0123	0.0017	0.0106
172	0.0125	0.0017	0.0109
173	0.0130	0.0017	0.0113
174	0.0132	0.0017	0.0115
175	0.0137	0.0017	0.0120
176	0.0140	0.0017	0.0123
177	0.0146	0.0017	0.0129
178	0.0150	0.0017	0.0133
179	0.0157	0.0017	0.0140
180	0.0161	0.0017	0.0145

181	0.0171	0.0017	0.0154
182	0.0176	0.0017	0.0159
183	0.0189	0.0017	0.0172
184	0.0196	0.0017	0.0179
185	0.0184	0.0017	0.0167
186	0.0194	0.0017	0.0178
187	0.0220	0.0017	0.0204
188	0.0237	0.0017	0.0221
189	0.0292	0.0017	0.0275
190	0.0328	0.0017	0.0312
191	0.0465	0.0017	0.0448
192	0.0634	0.0017	0.0617
193	0.1900	0.0017	0.1883
194	0.0381	0.0017	0.0364
195	0.0258	0.0017	0.0242
196	0.0206	0.0017	0.0189
197	0.0204	0.0017	0.0187
198	0.0182	0.0017	0.0165
199	0.0166	0.0017	0.0149
200	0.0153	0.0017	0.0137
201	0.0143	0.0017	0.0126
202	0.0134	0.0017	0.0118
203	0.0127	0.0017	0.0111
204	0.0121	0.0017	0.0105
205	0.0112	0.0017	0.0095
206	0.0107	0.0017	0.0090
207	0.0103	0.0017	0.0086
208	0.0099	0.0017	0.0082
209	0.0096	0.0017	0.0079
210	0.0093	0.0017	0.0076
211	0.0090	0.0017	0.0073
212	0.0087	0.0017	0.0070
213	0.0085	0.0017	0.0068
214	0.0083	0.0016	0.0066
215	0.0081	0.0016	0.0065
216	0.0079	0.0016	0.0063
217	0.0063	0.0012	0.0051
218	0.0062	0.0012	0.0049
219	0.0060	0.0012	0.0048
220	0.0059	0.0012	0.0047
221	0.0057	0.0011	0.0046
222	0.0056	0.0011	0.0045
223	0.0055	0.0011	0.0044
224	0.0054	0.0011	0.0043
225	0.0053	0.0010	0.0042
226	0.0052	0.0010	0.0042
227	0.0051	0.0010	0.0041
228	0.0050	0.0010	0.0040
229	0.0049	0.0010	0.0039
230	0.0048	0.0010	0.0039
231	0.0047	0.0009	0.0038
232	0.0047	0.0009	0.0037
233	0.0046	0.0009	0.0037
234	0.0045	0.0009	0.0036
235	0.0045	0.0009	0.0036
236	0.0044	0.0009	0.0035
237	0.0043	0.0009	0.0035
238	0.0043	0.0008	0.0034
239	0.0042	0.0008	0.0034
240	0.0042	0.0008	0.0033
241	0.0041	0.0008	0.0033
242	0.0041	0.0008	0.0032
243	0.0040	0.0008	0.0032
244	0.0040	0.0008	0.0032
245	0.0039	0.0008	0.0031
246	0.0039	0.0008	0.0031
247	0.0038	0.0008	0.0031
248	0.0038	0.0007	0.0030
249	0.0037	0.0007	0.0030
250	0.0037	0.0007	0.0030
251	0.0036	0.0007	0.0029

252	0.0036	0.0007	0.0029
253	0.0036	0.0007	0.0029
254	0.0035	0.0007	0.0028
255	0.0035	0.0007	0.0028
256	0.0035	0.0007	0.0028
257	0.0034	0.0007	0.0028
258	0.0034	0.0007	0.0027
259	0.0034	0.0007	0.0027
260	0.0033	0.0007	0.0027
261	0.0033	0.0007	0.0026
262	0.0033	0.0006	0.0026
263	0.0032	0.0006	0.0026
264	0.0032	0.0006	0.0026
265	0.0032	0.0006	0.0026
266	0.0032	0.0006	0.0025
267	0.0031	0.0006	0.0025
268	0.0031	0.0006	0.0025
269	0.0031	0.0006	0.0025
270	0.0031	0.0006	0.0025
271	0.0030	0.0006	0.0024
272	0.0030	0.0006	0.0024
273	0.0030	0.0006	0.0024
274	0.0030	0.0006	0.0024
275	0.0029	0.0006	0.0024
276	0.0029	0.0006	0.0023
277	0.0029	0.0006	0.0023
278	0.0029	0.0006	0.0023
279	0.0029	0.0006	0.0023
280	0.0028	0.0006	0.0023
281	0.0028	0.0006	0.0023
282	0.0028	0.0006	0.0022
283	0.0028	0.0005	0.0022
284	0.0028	0.0005	0.0022
285	0.0027	0.0005	0.0022
286	0.0027	0.0005	0.0022
287	0.0027	0.0005	0.0022
288	0.0027	0.0005	0.0021

Total soil rain loss = 0.28(In)
Total effective rainfall = 1.77(In)
Peak flow rate in flood hydrograph = 2.56(CFS)

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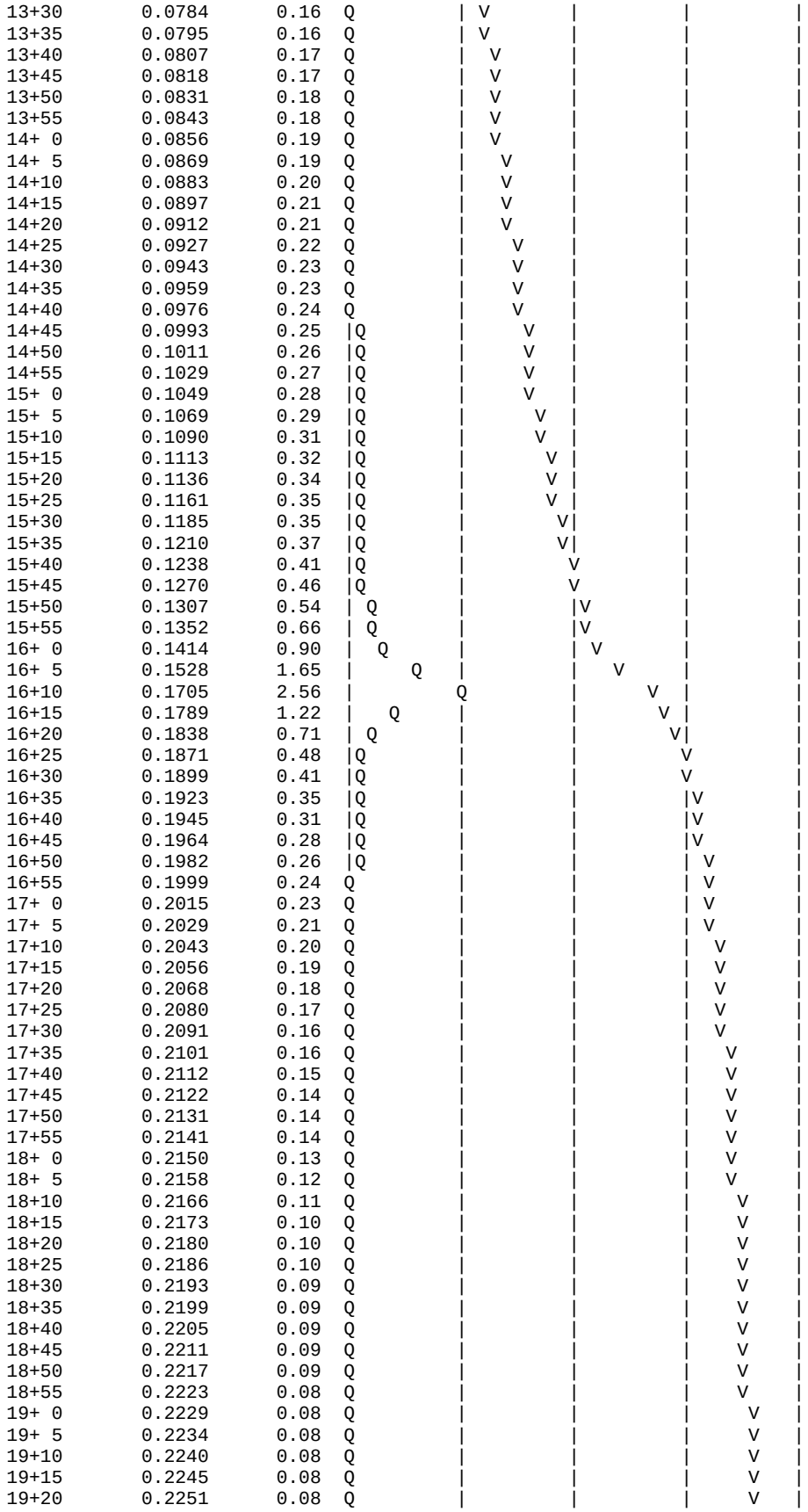
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q	|	|	|	|
0+10	0.0003	0.03	Q	|	|	|	|
0+15	0.0006	0.04	Q	|	|	|	|
0+20	0.0009	0.04	Q	|	|	|	|
0+25	0.0012	0.04	Q	|	|	|	|
0+30	0.0015	0.04	Q	|	|	|	|
0+35	0.0018	0.04	Q	|	|	|	|
0+40	0.0021	0.04	Q	|	|	|	|
0+45	0.0024	0.04	Q	|	|	|	|
0+50	0.0027	0.04	Q	|	|	|	|
0+55	0.0030	0.04	Q	|	|	|	|
1+ 0	0.0033	0.04	Q	|	|	|	|
1+ 5	0.0036	0.05	Q	|	|	|	|
1+10	0.0039	0.05	Q	|	|	|	|
1+15	0.0042	0.05	Q	|	|	|	|
1+20	0.0045	0.05	Q	|	|	|	|
1+25	0.0049	0.05	Q	|	|	|	|
1+30	0.0052	0.05	Q	|	|	|	|
1+35	0.0055	0.05	Q	|	|	|	|

1+40	0.0058	0.05	Q				
1+45	0.0061	0.05	Q				
1+50	0.0065	0.05	QV				
1+55	0.0068	0.05	QV				
2+ 0	0.0071	0.05	QV				
2+ 5	0.0074	0.05	QV				
2+10	0.0077	0.05	QV				
2+15	0.0081	0.05	QV				
2+20	0.0084	0.05	QV				
2+25	0.0087	0.05	QV				
2+30	0.0091	0.05	QV				
2+35	0.0094	0.05	QV				
2+40	0.0097	0.05	QV				
2+45	0.0101	0.05	QV				
2+50	0.0104	0.05	QV				
2+55	0.0107	0.05	QV				
3+ 0	0.0111	0.05	QV				
3+ 5	0.0114	0.05	QV				
3+10	0.0117	0.05	QV				
3+15	0.0121	0.05	QV				
3+20	0.0124	0.05	Q V				
3+25	0.0128	0.05	Q V				
3+30	0.0131	0.05	Q V				
3+35	0.0135	0.05	Q V				
3+40	0.0138	0.05	Q V				
3+45	0.0142	0.05	Q V				
3+50	0.0145	0.05	Q V				
3+55	0.0149	0.05	Q V				
4+ 0	0.0152	0.05	Q V				
4+ 5	0.0156	0.05	Q V				
4+10	0.0159	0.05	Q V				
4+15	0.0163	0.05	Q V				
4+20	0.0167	0.05	Q V				
4+25	0.0170	0.05	Q V				
4+30	0.0174	0.05	Q V				
4+35	0.0178	0.05	Q V				
4+40	0.0181	0.05	Q V				
4+45	0.0185	0.05	Q V				
4+50	0.0189	0.05	Q V				
4+55	0.0192	0.05	Q V				
5+ 0	0.0196	0.05	Q V				
5+ 5	0.0200	0.05	Q V				
5+10	0.0204	0.05	Q V				
5+15	0.0208	0.06	Q V				
5+20	0.0211	0.06	Q V				
5+25	0.0215	0.06	Q V				
5+30	0.0219	0.06	Q V				
5+35	0.0223	0.06	Q V				
5+40	0.0227	0.06	Q V				
5+45	0.0231	0.06	Q V				
5+50	0.0235	0.06	Q V				
5+55	0.0239	0.06	Q V				
6+ 0	0.0243	0.06	Q V				
6+ 5	0.0247	0.06	Q V				
6+10	0.0251	0.06	Q V				
6+15	0.0255	0.06	Q V				
6+20	0.0259	0.06	Q V				
6+25	0.0263	0.06	Q V				
6+30	0.0267	0.06	Q V				
6+35	0.0271	0.06	Q V				
6+40	0.0275	0.06	Q V				
6+45	0.0279	0.06	Q V				
6+50	0.0283	0.06	Q V				
6+55	0.0288	0.06	Q V				
7+ 0	0.0292	0.06	Q V				
7+ 5	0.0296	0.06	Q V				
7+10	0.0300	0.06	Q V				
7+15	0.0305	0.06	Q V				
7+20	0.0309	0.06	Q V				
7+25	0.0313	0.06	Q V				
7+30	0.0318	0.06	Q V				

```
 7+35      0.0322      0.06  Q    V    |         |         |         |
 7+40      0.0327      0.06  Q    V    |         |         |         |
 7+45      0.0331      0.06  Q    V    |         |         |         |
 7+50      0.0336      0.07  Q    V    |         |         |         |
 7+55      0.0340      0.07  Q    V    |         |         |         |
 8+ 0      0.0345      0.07  Q    V    |         |         |         |
 8+ 5      0.0349      0.07  Q    V    |         |         |         |
 8+10      0.0354      0.07  Q    V    |         |         |         |
 8+15      0.0359      0.07  Q    V    |         |         |         |
 8+20      0.0363      0.07  Q    V    |         |         |         |
 8+25      0.0368      0.07  Q    V    |         |         |         |
 8+30      0.0373      0.07  Q     V   |         |         |         |
 8+35      0.0378      0.07  Q     V   |         |         |         |
 8+40      0.0382      0.07  Q     V   |         |         |         |
 8+45      0.0387      0.07  Q     V   |         |         |         |
 8+50      0.0392      0.07  Q     V   |         |         |         |
 8+55      0.0397      0.07  Q     V   |         |         |         |
 9+ 0      0.0402      0.07  Q     V   |         |         |         |
 9+ 5      0.0407      0.07  Q     V   |         |         |         |
 9+10      0.0412      0.07  Q     V   |         |         |         |
 9+15      0.0417      0.07  Q     V   |         |         |         |
 9+20      0.0422      0.07  Q     V   |         |         |         |
 9+25      0.0427      0.07  Q     V   |         |         |         |
 9+30      0.0432      0.08  Q     V   |         |         |         |
 9+35      0.0438      0.08  Q      V  |         |         |         |
 9+40      0.0443      0.08  Q      V  |         |         |         |
 9+45      0.0448      0.08  Q      V  |         |         |         |
 9+50      0.0453      0.08  Q      V  |         |         |         |
 9+55      0.0459      0.08  Q      V  |         |         |         |
10+ 0      0.0464      0.08  Q      V  |         |         |         |
10+ 5      0.0470      0.08  Q      V  |         |         |         |
10+10      0.0475      0.08  Q      V  |         |         |         |
10+15      0.0481      0.08  Q      V  |         |         |         |
10+20      0.0486      0.08  Q      V  |         |         |         |
10+25      0.0492      0.08  Q      V  |         |         |         |
10+30      0.0498      0.08  Q       V |         |         |         |
10+35      0.0504      0.08  Q       V |         |         |         |
10+40      0.0510      0.08  Q       V |         |         |         |
10+45      0.0515      0.09  Q       V |         |         |         |
10+50      0.0521      0.09  Q       V |         |         |         |
10+55      0.0527      0.09  Q       V |         |         |         |
11+ 0      0.0533      0.09  Q       V |         |         |         |
11+ 5      0.0540      0.09  Q       V |         |         |         |
11+10      0.0546      0.09  Q       V |         |         |         |
11+15      0.0552      0.09  Q       V |         |         |         |
11+20      0.0558      0.09  Q        V|         |         |         |
11+25      0.0565      0.09  Q        V|         |         |         |
11+30      0.0571      0.09  Q        V|         |         |         |
11+35      0.0578      0.09  Q        V|         |         |         |
11+40      0.0584      0.10  Q        V|         |         |         |
11+45      0.0591      0.10  Q        V|         |         |         |
11+50      0.0598      0.10  Q        V|         |         |         |
11+55      0.0605      0.10  Q        V|         |         |         |
12+ 0      0.0612      0.10  Q        V|         |         |         |
12+ 5      0.0619      0.11  Q         V         |         |         |
12+10      0.0627      0.12  Q         V         |         |         |
12+15      0.0636      0.13  Q         V         |         |         |
12+20      0.0645      0.13  Q         V         |         |         |
12+25      0.0654      0.13  Q         V         |         |         |
12+30      0.0663      0.13  Q         V         |         |         |
12+35      0.0672      0.13  Q         V         |         |         |
12+40      0.0681      0.14  Q         |V        |         |         |
12+45      0.0691      0.14  Q         |V        |         |         |
12+50      0.0700      0.14  Q         |V        |         |         |
12+55      0.0710      0.14  Q         |V        |         |         |
13+ 0      0.0720      0.14  Q         |V        |         |         |
13+ 5      0.0730      0.15  Q         |V        |         |         |
13+10      0.0740      0.15  Q         |V        |         |         |
13+15      0.0751      0.15  Q         | V       |         |         |
13+20      0.0762      0.16  Q         | V       |         |         |
13+25      0.0772      0.16  Q         | V       |         |         |
```



19+25	0.2256	0.08	Q	|	|	|	V |
19+30	0.2261	0.08	Q	|	|	|	V |
19+35	0.2266	0.07	Q	|	|	|	V |
19+40	0.2271	0.07	Q	|	|	|	V |
19+45	0.2276	0.07	Q	|	|	|	V |
19+50	0.2281	0.07	Q	|	|	|	V |
19+55	0.2286	0.07	Q	|	|	|	V |
20+ 0	0.2291	0.07	Q	|	|	|	V |
20+ 5	0.2295	0.07	Q	|	|	|	V |
20+10	0.2300	0.07	Q	|	|	|	V |
20+15	0.2305	0.07	Q	|	|	|	V |
20+20	0.2309	0.07	Q	|	|	|	V |
20+25	0.2313	0.06	Q	|	|	|	V |
20+30	0.2318	0.06	Q	|	|	|	V |
20+35	0.2322	0.06	Q	|	|	|	V |
20+40	0.2326	0.06	Q	|	|	|	V |
20+45	0.2331	0.06	Q	|	|	|	V |
20+50	0.2335	0.06	Q	|	|	|	V |
20+55	0.2339	0.06	Q	|	|	|	V |
21+ 0	0.2343	0.06	Q	|	|	|	V |
21+ 5	0.2347	0.06	Q	|	|	|	V |
21+10	0.2351	0.06	Q	|	|	|	V |
21+15	0.2355	0.06	Q	|	|	|	V |
21+20	0.2359	0.06	Q	|	|	|	V |
21+25	0.2363	0.06	Q	|	|	|	V |
21+30	0.2367	0.06	Q	|	|	|	V |
21+35	0.2371	0.06	Q	|	|	|	V |
21+40	0.2374	0.05	Q	|	|	|	V |
21+45	0.2378	0.05	Q	|	|	|	V |
21+50	0.2382	0.05	Q	|	|	|	V |
21+55	0.2386	0.05	Q	|	|	|	V |
22+ 0	0.2389	0.05	Q	|	|	|	V |
22+ 5	0.2393	0.05	Q	|	|	|	V |
22+10	0.2396	0.05	Q	|	|	|	V |
22+15	0.2400	0.05	Q	|	|	|	V |
22+20	0.2404	0.05	Q	|	|	|	V |
22+25	0.2407	0.05	Q	|	|	|	V |
22+30	0.2410	0.05	Q	|	|	|	V|
22+35	0.2414	0.05	Q	|	|	|	V|
22+40	0.2417	0.05	Q	|	|	|	V|
22+45	0.2421	0.05	Q	|	|	|	V|
22+50	0.2424	0.05	Q	|	|	|	V|
22+55	0.2427	0.05	Q	|	|	|	V|
23+ 0	0.2431	0.05	Q	|	|	|	V|
23+ 5	0.2434	0.05	Q	|	|	|	V|
23+10	0.2437	0.05	Q	|	|	|	V|
23+15	0.2440	0.05	Q	|	|	|	V|
23+20	0.2444	0.05	Q	|	|	|	V|
23+25	0.2447	0.05	Q	|	|	|	V|
23+30	0.2450	0.05	Q	|	|	|	V|
23+35	0.2453	0.05	Q	|	|	|	V|
23+40	0.2456	0.05	Q	|	|	|	V|
23+45	0.2459	0.04	Q	|	|	|	V|
23+50	0.2462	0.04	Q	|	|	|	V|
23+55	0.2465	0.04	Q	|	|	|	V|
24+ 0	0.2468	0.04	Q	|	|	|	V|
24+ 5	0.2471	0.04	Q	|	|	|	V|
24+10	0.2472	0.01	Q	|	|	|	V|
24+15	0.2472	0.00	Q	|	|	|	V|
24+20	0.2472	0.00	Q	|	|	|	V|
24+25	0.2472	0.00	Q	|	|	|	V|
24+30	0.2472	0.00	Q	|	|	|	V|

Attachment G
City of La Habra WQMP Plan Check Comments and Comment Responses

PRIORITY
WATER QUALITY MANAGEMENT PLAN (WQMP) CHECKLIST

The purpose of this checklist is to provide a format for uniform, comprehensive, and well-documented reviews of the Water Quality Management Plans (WQMPs) submitted by project applicants. The completed checklist should be transmitted to the project applicant with the project WQMP. A copy of the completed checklist should be retained with the project planning/permitting file.

Contact Name:	Brian Lowell, P.E.	Tracking #:	
Contact Title:		Site Name:	Rancho La Habra
Company Name:	Hunsaker & Associates, Irvine, Inc.	Site Address:	1400 South La Habra Hills Drive
Mailing Address:	3 Hughes	Type of Facility:	Residential
City, State, Zip:	Irvine, CA 92618	Submittal Date:	01/10/2017
Phone Number:	(951) 352-7200	Plan Return Date:	01/24/2017
Email Address:		Disturbed Area:	96.6 acres

First Review
WQMP Received on: 01/10/2017
Review Completed on: 01/24/2017

Second Review
WQMP Received on:
Review Completed on:

Third Review
WQMP Received on:
Review Completed on:

Fourth Review
WQMP Received on:
Review Completed on:

Fifth Review
WQMP Received on:
Review Completed on:

Sixth Review
WQMP Received on:
Review Completed on:

Sets of WQMPs/plans needed	3	City of La Habra 201 E. La Habra Blvd. La Habra, CA 90633	*For Office Use Only* Plan Checked By: Date:
Sets of electronic records (CD) needed	1		_____ Signature
			(562) 802-7880

WQMP REQUIREMENT	SATISFACTION			COMMENTS
	YES	NO	N/A	
Title Page				
Site address (or addresses) and planning area number	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Date WQMP was prepared/revised	☐	☒	☐	Must be provided.
Consultant/Engineer Stamp (wet ink application)	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Owner's Certification				
A signed certification statement, in which the project owner acknowledges and accepts the provisions of the WQMP, follows the title page.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Engineer's Certification				
A signed certification statement, in which the project engineer acknowledges and accepts the provisions of the WQMP, follows the title page.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Section 1.0 - Permit Numbers and Conditions of Approval				
Lists the Discretionary Permit(s).	☐	☐	☒	Required for Final WQMP.
The lot & tract/parcel map number describing the subject property.	☐	☐	☒	Required for Final WQMP.
Lists, verbatim, the Water Quality Conditions, including condition requiring preparation of WQMP, if applicable.	☐	☐	☒	Required for Final WQMP.
Final Resolution of Approval, Conditional Use Permit, etc. is included as an Attachment to the WQMP.	☐	☐	☒	Required for Final WQMP.
Identifies applicable Watershed Infiltration and Hydromodification Master Plan (WIHMP), if available.	☐	☐	☒	Required for Final WQMP.
Section 2.0 - Project Description				
For ALL Projects:				
Describes all paved areas, including the type of parking areas, to include square footage.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Describes all landscaped areas to include square footage.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Describes any Streets, roads or highway projects that are planned and constructed as part of this WQMP, even if they will become dedicated public right-of-way upon project completion.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Identifies the quantity and percentage of pervious and impervious surface for pre-project and project conditions.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Hydrologic Conditions of Concern (HCOC) identified including a color copy of the HCOC map (located in Appendix XVI.3. of the TGD) indicating the project location and arrows from the project site to the receiving water(s).	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Describe post-development drainage characteristics.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Describes ownership of all portions of project and site. • Will any infrastructure transfer to public agencies (City, County, Caltrans, etc.)? • Will a homeowners or property owners association be formed? Will the association be involved in long term maintenance?	☐	☒	☐	See "Additional Items Requiring Corrections" below.
For COMMERCIAL & INDUSTRIAL Projects:				
Provides Standard Industrial Classification (SIC) Code which best describes the facilities operations?	☐	☐	☒	Required for Final WQMP.
Describes the type of use (or uses) for each building or tenant space and any activities that will be routinely conducted	☐	☐	☒	Required for Final WQMP.

WQMP REQUIREMENT	SATISFACTION			COMMENTS
	YES	NO	N/A	
outdoors.				
Describes areas for food preparation, cooking, and eating (specifies location and type of area), if applicable.	☐	☐	☒	Required for Final WQMP.
Describes delivery areas and loading docks (specify location and design and if below grade and types of materials expected to be stored), if applicable.	☐	☐	☒	Required for Final WQMP.
Describes outdoor materials storage areas (describe and depict location(s), specify type(s) of materials expected to be stored), if applicable.	☐	☐	☒	Required for Final WQMP.
Describes any activities associated with equipment or vehicle maintenance and repair, including washing or cleaning. Indicates number of service bays or number of fueling islands/fuel pumps, if applicable.	☐	☐	☒	Required for Final WQMP.
For RESIDENTIAL Projects:				
Range of lot and home sizes;	☐	☐	☒	Required for Final WQMP.
Describes all community facilities such as: laundry, car wash, swimming pools, jacuzzi, parks, open spaces, tot lots, etc.	☐	☐	☒	Required for Final WQMP.
Section 3.0 - Site Description				
Describes project area and surrounding planning areas in sufficient detail to allow project location to be plotted on a base map.	☐	☐	☒	Required for Final WQMP.
Provides site address and site size to nearest tenth acre.	☐	☐	☒	Required for Final WQMP.
Identifies the zoning or land use designation.	☐	☐	☒	Required for Final WQMP.
Identifies soil types of the site.	☐	☐	☒	Required for Final WQMP.
Identifies site Precipitation Zone and Topography.	☐	☐	☒	Required for Final WQMP.
Identifies site soil type, geology, and infiltration.	☐	☐	☒	Required for Final WQMP.
Identifies all hydrologic (groundwater) conditions.	☐	☐	☒	Required for Final WQMP.
Provides utility and infrastructure information.	☐	☐	☒	Required for Final WQMP.
Describes pre-project site drainage and how it ties into drainage of surrounding or adjacent areas and describes planned project drainage and how it will tie into drainage of surrounding or adjacent areas.	☐	☐	☒	Required for Final WQMP.
Section 4.0 - Best Management Practices (BMPs)				
All Projects:				
If applicable Watershed Infiltration and Hydromodification Master Plan (WIHMP) available: Incorporates watershed specific criteria.	☐	☐	☒	Required for Final WQMP.
Lists applicable performance criteria for hydromodification controls, LID, and treatment control BMPs verbatim from the Model WQMP and provides calculations based on performance criteria.	☐	☐	☒	Required for Final WQMP.
Provides calculations for LID design storm capture volume for project based on accepted criteria.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Describes the selected site design and drainage plan including:				
• A narrative of site design practices utilized or rationale for not using practices (e.g. constraints).	☐	☐	☒	Required for Final WQMP.
• Includes a table containing the following information: list of drainage management area(s) (DMA), list of LID BMPs proposed in each DMA, and a list of GPS coordinates (provide the latitude and longitude with at least 6 decimals) for LID and/or Treatment Control BMPs.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Reference to the WQMP BMP Exhibit (site plan).	☐	☐	☒	Required for Final WQMP.
Describes that BMPs have been chosen using an appropriate	☐	☐	☒	Required for Final WQMP.

WQMP REQUIREMENT	SATISFACTION			COMMENTS
	YES	NO	N/A	
hierarchy (i.e. infiltration, biotreatment, etc.).				
Proper and accepted terminology is consistently used to describe all structural BMPs.	☐	☐	☒	Required for Final WQMP.
Describes applicable site design and LID performance criteria:				
• All proposed LID BMPs are designed to follow the appropriate design standard.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• The worksheets that the BMPs are based off of (INF-3, BIO-1, etc.) are included in the WQMP.	☐	☐	☒	Required for Final WQMP.
• Under "OC Specific Design Criteria..." the applicable boxes are checked (and documentation shown in calculations, cross sections, etc.). If for some reason one of these elements is not incorporated, a valid reason is provided (on the form next to the unchecked box).	☐	☐	☒	Required for Final WQMP.
• All relevant worksheets (i.e. Simple Sizing Worksheet, etc.) must also be included.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Provides calculated LID design storm Design Capture Volume (DCV) or flowrate for each drainage area, based on accepted criteria.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Hydrologic Source Controls (if HSCs required to meet retention criteria):				
Provide narrative and justification of HSCs being used and show how they meet retention requirements based on accepted criteria.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Infiltration BMPs:				
If infiltration BMPs are infeasible to treat LID DCV: provides documentation as to how much DCV can be met and why it is not feasible to meet the full volume with infiltration BMPs.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Infiltration Feasibility Worksheet (Table 2.7 of the TGD) is completed and included in the WQMP. All answers checked "yes" or "no" on the Infiltration Feasibility Worksheet provided with documentation (i.e. soils report, maps, etc.).	☐	☐	☒	Required for Final WQMP.
Evapotranspiration, Rainwater Harvesting BMPs (If DCV not met through above BMPs):				
Describe selection, suitability, sizing, and draw down information, with applicable calculations, all based on accepted criteria, as appropriate.	☐	☐	☒	Required for Final WQMP.
Biotreatment BMPs (If infiltration deemed infeasible):				
Provides selection, suitability, sizing, and draw down information, with applicable calculations, all based on accepted criteria, as appropriate.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Provides documentation as to why it is not feasible to meet the full volume with infiltration BMPs.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Biotreatment BMPs are selected based on pollutant removal (see Table 4.2 of the TGD for performance rankings).	☐	☐	☒	Required for Final WQMP.
In the case that a BMP ranked below other biotreatment BMPs for pollutant removal is used, a valid reason (i.e. site constraints) is provided as to why the higher ranked BMPs are infeasible.	☐	☐	☒	Required for Final WQMP.
Hydromodification Control BMPs (If required):				
Describe selection, suitability and sizing information, with applicable calculations, all based on accepted criteria, as appropriate.	☐	☐	☒	Required if applicable.
Treatment Control BMPs (only if all LID options shown infeasible):				

WQMP REQUIREMENT	SATISFACTION			COMMENTS
	YES	NO	N/A	
Describe sections for selection, sizing, and infeasibility, with appropriate calculations, as applicable.	☐	☐	☒	Required if applicable.
Source Control BMPs:				
All applicable source control BMPs are identified as being proposed.	☐	☐	☒	Required for Final WQMP.
For each box that is checked "included," a detailed narrative is provided including the components of the BMP (e.g. N1: Education, N12 Employee Education, etc), the frequency of inspections and maintenance, the responsible entity (individual, not company), etc.	☐	☐	☒	Required for Final WQMP.
For the Routine Non-Structural BMPs N1 (Education for Property Owners, Tenants, and Occupants) and N12 (Employee Training), describes the concepts that will be addressed by the education and training. List of standard educational materials that will be used provided and references to the Orange County Watershed websites included. Copies of any educational materials not on the website included in the Attachment to the WQMP.	☐	☐	☒	Required for Final WQMP.
For each source control BMP checked "Not Applicable," an explanation for its exclusion is included.	☐	☐	☒	Required for Final WQMP.
Section 5.0 - Inspection & Maintenance Responsibility for BMPs				
Identifies the entity (or entities) responsible for the long-term inspection and maintenance of all source control BMPs and all Treatment Control BMPs, including name, title, company, address, and phone number.	☐	☐	☒	Required for Final WQMP.
Describes the minimum frequency for inspection and maintenance (to include adequate irrigation procedure) to ensure the effectiveness of each BMP.	☐	☐	☒	Required for Final WQMP.
If ownership of the BMPs will be transferred to a public agency, does the WQMP include an Attachment indicating the public agency's intent to accept the BMPs as designed?	☐	☐	☒	Required for Final WQMP.
Is an appropriate mechanism for the long-term operation and maintenance, including funding, in place?	☐	☐	☒	Required for Final WQMP.
Recorded Master Covenant Agreement (MCA) has been signed and dated with wet ink application and has been notarized and recorded (along with attached O&M Plan, Site Map, and Owner's Certification) with the County Recorder's Office.	☐	☐	☒	Required for Final WQMP.
Section 6.0 - Location Map and Plot Plan				
Full-sized copies (24" x 36" or larger) of all relevant plans (i.e. grading plans, plumbing plans, drainage plans, landscape plans, etc.) showing the site with all proposed structural BMPs and water quality notes have been signed and stamped with wet ink application by a California licensed civil engineer and included as an attachment.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Provides the following information:				
• Title block containing at least the project name, address, and owner.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Site boundaries and/or DMAs.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Land uses and land covers, as applicable.	☐	☐	☒	Required for Final WQMP.
• Proposed landscape plan for LID BMP [to include plant species, root barrier/protection, (if applicable)]	☐	☐	☒	Required if applicable.
• Suitability/feasibility constraints.	☐	☐	☒	Required for Final WQMP.
• Locations of all structural BMPs [to include dimensions,	☐	☒	☐	See "Additional Items

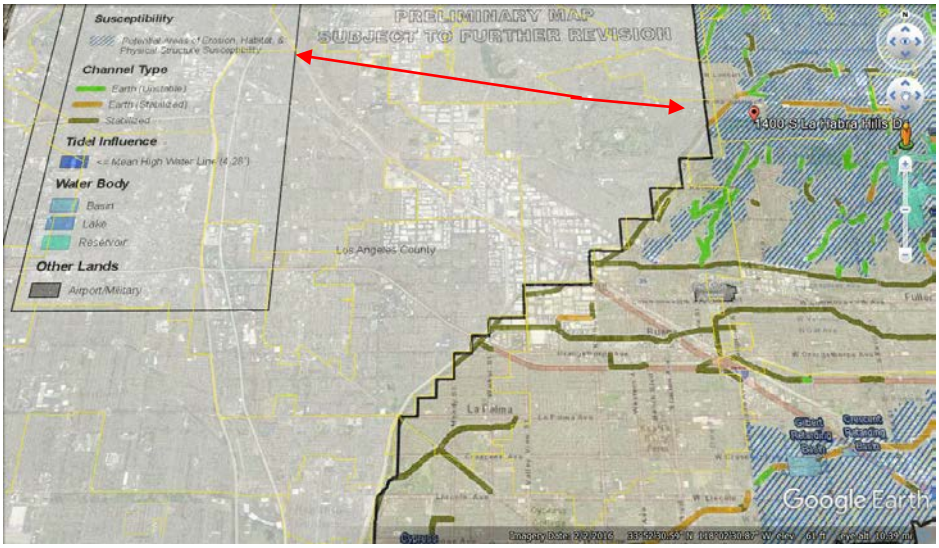
WQMP REQUIREMENT	SATISFACTION			COMMENTS
	YES	NO	N/A	
and/or make, model (if applicable)]				Requiring Corrections" below.
• Cross-sectional details of all structural BMPs showing the type and depth of all layers (i.e. amended soil layer, gravel layer, storm drain stenciling, etc.) following the criteria from the design standard used.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Conveyance systems (i.e. ribbon gutters, area drains, storm drains, roof drains, swales, etc.) indicated with inverts and elevations.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Drainage connections, flow information, adequate ponding depth (i.e. placement of sump pumps), including general surface flow lines, concrete or other surface ditches or channels, as well as storm drain facilities (e.g. catch basins and underground storm drain pipes, detention systems, sump pumps, etc.)	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Depicts where and how on-site drainage ties into the off-site drainage system.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
• Overflow processes.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Geotechnical Investigation				
Includes all geotechnical documents (i.e. Geotechnical Report, Soils Report, Percolation Report, Soils Letter, etc.) sufficient to determine infiltration feasibility.	☐	☒	☐	See "Additional Items Requiring Corrections" below.
Requirements for Final Approval				
Three (3) hard copies of the WQMP, three (3) copies of the full sized grading plans (24x36 or larger), one (1) copy of all original (wet ink documentation) forms and certifications, and one (1) electronic copy (email, CD, download from FTP site, etc.) of all documents listed above.				
Requirements for Next Submittal				
One (1) hard copy of the WQMP, one (1) copy of the full-sized grading plans (24x36 or larger), one (1) copy of all forms and certifications, and one (1) electronic copy (email, CD, download from FTP site, etc.) of all documents listed above.				

ADDITIONAL ITEMS REQUIRING CORRECTIONS:

Notes:

- *The comments herein are for the Preliminary WQMP only. Additional comments anticipated for the Final WQMP.*

1. **HCOCs – Section II.3 currently shows "No – Show Map;" however, according to the HCOC map, this site *is* in an area susceptible to hydromodification (i.e. horizontal blue strip area indicates site is located in "potential areas of erosion, habitat, & physical structure susceptibility), and the site ultimately discharges to stabilized earthen channels (i.e. stabilized earthen channels are not considered "engineered and/or hardened").**



Check "Yes – Describe applicable hydrologic conditions of concern below" and provide detailed calculations to show that HCOCs are addressed. For projects that are potentially susceptible to hydromodification impacts, it must be demonstrated that:

   a. **The post-development runoff volume does not exceed the pre-development runoff volume for the 2-yr, 24-hr storm event by more than 5 percent, and**

   b. **The time of concentration of post-development runoff for the 2-yr, 24-hr storm event is not less than the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent. Note that the TGD has errors concerning the time of concentration requirements.**

2. **Multiple Sections (i.e. Section II.4, Section IV.3.1, WQMP Exhibit) – It is unclear what BMPs are proposed. The WQMP describes the use of proprietary biotreatment systems (i.e. modular wetland systems); however, Section II.4 and Section IV.3.1 provide inconsistent information regarding the use of Hydraulic Source Control (HSC) BMPs. For instance, Section IV.3.1 states that "Hydraulic Source Control (HSCs) are not proposed;" however, Section II.4 indicates that "Hydraulic Source Control measures are being implemented" (i.e. HSC-2, HSC-3). Additionally, the WQMP Exhibit indicates Bioretention with no under drains (INF-3), Catch Basins with water quality inserts, Detention/Water Quality Basins, Impervious Area Dispersion (HSC-2), and Street Trees (HSC-3) are proposed. All BMPs must be described and the WQMP must be accurate and consistent throughout.**

3. **Geotechnical Investigation – The Geotechnical Report does not adequately demonstrate infiltration to be feasible or infeasible at the site. The MS4 Permit requires for infiltration to be implemented unless deemed technically infeasible. The following, but not limited to, items must be addressed:**

    a. **The Geotechnical Report states the "*project site was formerly used for oil production*" and indicated that rough grading that occurred between 1997 and 1999 included "*removal and stocking of crude oil-affected native soils.*" To demonstrate infiltration is infeasible due to pollutant mobilization, a geotechnical engineer (or equivalent) must evaluate the site and certify that there is onsite contamination which will pose a risk to the groundwater quality. Include a letter signed and stamped with wet ink application by a California licensed geotechnical engineer (or equivalent) stating that contamination exists onsite and implementing infiltration BMPs will result in contamination of the groundwater. If infiltration is infeasible due to contaminated soils risk to groundwater, include justification of the use of biofiltration BMPs and provide a description within the WQMP (i.e. state the following or similar; "Infiltration is infeasible onsite due contaminated soils risk to groundwater, resulting in a concern for groundwater contamination and pollutant mobilization").**

    b. **Infiltration Rate: The geotechnical investigation identifies the infiltration potential of the site; however, a generalized evaluation of the site soils cannot be utilized to determine infiltration infeasibility. A site-specific percolation test demonstrating infiltration is infeasible due to a measured infiltration rate of saturated in-situ soils less than 0.3 inches per hour is required.**

    a. **Groundwater Depth Analysis: The report provides groundwater was encountered at 29' BSG; however, it must be shown that the seasonally high groundwater depth is within 5-10 feet below the base of an infiltration BMP (depending on the BMP type) to demonstrate infiltration infeasibility. Site-specific, seasonally high groundwater must be explored. Seasonally high groundwater refers to data points collected during different seasons and occurring at locations on or near the project site [specifically, the shallowest recorded measurements in each water year, defined as October 1 through September 30 (of the following year) are averaged for all years on record].**

4. **DCV (Sections IV.1, IV.2.2, Attachment C - Worksheet D) – It is unclear how several DCV calculations were derived (i.e. step-by-step calculations must be provided). The following, but not limited to, items must be addressed:**

    a. **Tributary Area: "Tributary area" is provided for each 'developed' DMA (i.e. totaling 175.6 acres) in Section IV.1; however, the WQMP does not provide adequate description of the tributary area (i.e. offsite run-on) for each DMA accounted for in the DCV sizing calculations. Furthermore, the "tributary area" provide for each 'developed' DMA in Worksheet D is significantly different from the tributary area provided in Sections IV.1 & IV.2.2. Note, this comment applies to the revision of Section IV.2.2 as well, which provides inconsistent values for the DCV from Section IV.1.**

    b. **Impervious Fraction: The impervious fraction of each DMA could not be verified without a detailed description provided in Section II.1 for each DMA.**

5. **BMP Sizing (Attachment C - Worksheet D) – Each individual BMP must be separately sized accounting for the drainage areas flowing to each BMP. For instance, DMAs C & E indicate that each DMA will include (2) MWS units; however, it cannot be assumed that a percentage of that drainage area will flow to one BMP and the rest will flow to the other BMP. A full analysis of the tributary areas to each BMP must be performed.**

6. **BMP Sizing (Section IV.3.4) – It must be demonstrated that each LID BMP is sized to treat the DCV (or Design Flowrate) for the corresponding DMA (or tributary area). For instance, Section IV.3.4 indicates a MWS-4-4 unit is proposed in DMA F, which has a treatment capacity of 0.052 cfs; however, the design flowrate for DMA F is indicated as 0.28 cfs. This cannot be accepted as the proposed LID BMP would be undersized.**
7. Hydrology Analysis – A Hydrology Analysis report was provided as an attachment to the WQMP; however, the Hydrology Analysis report provides inconsistent information with the WQMP. For instance, the Hydrology Analysis indicates the proposed project area is 197.93 acres vs. 150.8 acres. Revise the WQMP to detail any offsite run-on occurring at the site.
8. Title Page – The site address is indicated as 1302 West Imperial Highway; however, throughout the WQMP the site address is listed as 1400 South La Habra Hills Drive. Revise the WQMP to provide accurate and consistent information throughout. The title page must be signed and stamped with wet ink application by a California licensed civil engineer prior to Preliminary WQMP approval.
9. Owner's Certification – Michael Battaglia is listed as "Vice President Project Development" on the owner's certification form. The owner or approved signatory must sign and date the certification with wet ink application prior to Preliminary WQMP approval. An approved signatory must be a partner to the company which owns the title to the land, or equivalent.
10. Engineer's Certification Page – The form must be included (see attached), signed, dated, and stamped with wet ink application by a California licensed civil engineer.
11. Section II.1, Narrative Project Description – The WQMP indicates the proposed condition consists of "3.4 acres of D.G. trails" and identifies this land-use as a pervious area; however, this surface would be considered impervious. Revise narrative and calculations to show the decomposed granite as an impervious surface. Note, this comment applies to the revision of the WQMP Exhibit as well.
12. Section II.1, Narrative Project Description – Provide a detailed description of the impervious/pervious condition for each DMA, which will be utilized to confirm the DCV calculations provided throughout the WQMP.
13. Section II.1, Narrative Project Description – The WQMP indicates the project will "include 16.3 acres of private and public streets." Revise the WQMP to provide further description of any infrastructure that will transfer to public agencies (City, County, Caltrans, etc.) as well as any streets, roads or sidewalks that are planned and constructed as part of this WQMP, even if they will become dedicated public right-of-way upon project completion.
14. Sections IV.2.2 & IV.3.4, and Attachment C – The WQMP provides tables which indicates the design flowrate for several DMAs; however, it is unclear how these values were derived. Note, design flowrate calculations are also provided in Attachment C (i.e. Worksheet D); however, the tributary area is inconsistent with the information provided throughout the WQMP. Revise WQMP to provide step-by-step calculations which validate this information. Note, the design flowrates provided in Section IV.2.2 are significantly different from the corresponding design flowrates provided in Section IV.3.4. All information must be accurate and consistent throughout.
15. Plans – The WQMP Exhibit does not contain much of the information necessary to fully evaluate the site. If only the WQMP Exhibit is available at this time, the WQMP Exhibit must indicate the quantity and make/model for each LID BMP, locations of all LID BMPs, cross-sectional details of each LID BMP, conveyance systems, drainage connections, overflow processes, etc. Note, the entire project site (100%) must be treated with LID BMPs prior to being discharged.

16. Plans – Full-sized copies (24''x36'' or larger) of all plans signed, stamped, and dated with wet ink application by a California licensed civil engineer must be provided prior to Preliminary WQMP approval.

17. Plans – The WQMP (Section II.4) indicates that several DMAs will ultimately discharge to "existing …City of La Habra storm drain lines" after stormwater treatment; however, it is unclear if the LID BMPs will directly connect to the storm drain lines or be discharged at grade. The WQMP and the Plans must clearly indicate how treated stormwater is ultimately conveyed offsite. Additionally, any connections to the back of a catch basin and/or storm drain line must be approved by the City of La Habra. Proof of approval must be provided.

18. Section VI, WQMP Exhibit – The proposed drainage in DMA F is unclear. Provide drainage arrows which indicate conveyance to the proposed LID BMP, and indicate how treated stormwater is conveyed from the LID BMP offsite.

19. Section VI, WQMP Exhibit – The WQMP (Section IV.3.4) indicates (1) MWS unit is proposed for DMA A and DMA B, and (2) MWS units are proposed for DMA C; however, the WQMP Exhibit appears to indicate 2 MWS units are proposed for DMA A, (2) MWS units are proposed for DMA B, and (3) MWS units are proposed for DMA C. Revise the WQMP Exhibit and/or the WQMP to provide accurate and consistent information throughout. Additionally, the WQMP must provide the make/model for the MWS units proposed for each DMA.

20. Section VI, WQMP Exhibit – Provide the owner/developer name in the title block of the exhibit/map. Additionally, indicate match lines on all exhibit sheets.

21. Section IV, WQMP Exhibit – One of the WQMP Exhibits provides acreage for DMAs which are significantly different from the acreage provided throughout the WQMP. All information must be accurate and consistent throughout. Two documents are titled "WQMP Exhibit;" however, the documents must be revised to provided different titles and/or indicate sequential sheet numbers to avoid confusion.

22. Attachment C, Worksheet D – It is unclear how the Time of concentration (Tc) values were derived. Calculations for Tc must be provided following the TGD guidelines (Appendix IV.2). It appears as though the results of a hydraulic analysis are provided in a supplemental Hydrology Analysis report; however, it is unclear that the 85^{th} percentile storm depth was analyzed (i.e. the Hydrology Analysis utilizes the 2-yr, 24-hr storm depth, etc.). Also, see comment herein regarding inconsistency between the WQMP and Hydrology Analysis Report.

ENGINEER'S CERTIFICATION

WATER QUALITY MANAGEMENT PLAN

Preparer (Engineer) Certification			
Preparer (Engineer):			
Title		PE Registration #	
Company			
Address			
Email			
Telephone #			
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board**.**			
Preparer Signature		Date	
Place Stamp Here			

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1st Plan Check Comment Response

Attn:		**Date:**	**January 18, 2018**
P/C Log #	**PWQMP 2nd review responses**	**Project:**	**0766**
	Rancho La Habra		
From:	**Brian Lowell**	**Phone:**	**951-509-7055**
Company:	**Hunsaker & Associates**	**W.O. No.:**	

Comment Number and Response to Comment

1 HCOCs – Section II.3 currently shows "No – Show Map;" however, according to the HCOC map, this site is in an area susceptible to hydromodification (i.e. horizontal blue strip area indicates site is located in "potential areas of erosion, habitat, & physical structure susceptibility), and the site ultimately discharges to stabilized earthen channels (i.e. stabilized earthen channels are not considered "engineered and/or hardened").

Check "Yes – Describe applicable hydrologic conditions of concern below" and provide detailed calculations to show that HCOCs are addressed. For projects that are potentially susceptible to hydromodification impacts, it must be demonstrated that:

Response: Although the project site is situated within the "blue striped areas", the developed project will discharge directly into Coyote Creek. Portions of the site will discharge into the earthen stabilized portion of the creek while other portions will discharge into engineered and hardened portions of the channel.

Per an email with J.T. Yean with O.C. Public Works, dated 10-19-2016 (attached), "Stabilized channels (earthen, rip-rap, concrete and other engineered channels) do not have HCOC concern."

Furthermore, once developed, the blue stripe designation will be removed.

2 Multiple Sections (i.e. Section II.4, Section IV.3.1, WQMP Exhibit) – It is unclear what BMPs are proposed. The WQMP describes the use of proprietary biotreatment systems (i.e. modular wetland systems); however, Section II.4 and Section IV.3.1 provide inconsistent information regarding the use of Hydraulic Source Control (HSC) BMPs. For instance, Section IV.3.1 states that "Hydraulic Source Control (HSCs) are not proposed;" however, Section II.4 indicates that "Hydraulic Source Control measures are being implemented" (i.e. HSC-2, HSC-3). Additionally, the WQMP Exhibit indicates Bioretention with no under drains (INF-3), Catch Basins with water quality inserts, Detention/Water Quality Basins, Impervious Area Dispersion (HSC-2), and Street Trees (HSC-3) are proposed. All BMPs must be described and the WQMP must be accurate and consistent throughout

Response: Updated section IV 3.1 to reflect the use of LID, HSC 2 & 3

3 Geotechnical Investigation – The Geotechnical Report does not adequately demonstrate infiltration to be feasible or infeasible at the site. The MS4 Permit requires for infiltration to be implemented unless deemed technically infeasible. The following, but not limited to, items must be addressed

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Response: In accordance with your request, LGC Geotechnical , Inc . (LGC Geotechnical) has prepared this memorandum to respond to Comment No. 3 within the City of La Habra WQMP checklist dated January 24, 2017 (City of La Habra, 2017) for the proposed Rancho La Habra Residential Development, VTTM 17845, City of La Habra, California.

Site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays which have infiltration rates below 0.3 inches per hour. This is a hillside project and our experience indicates the vast majority of landslides are caused by inappropriate handling of surface/subsurface water. Additionally, a portion of the site is located in a State of California Seismic Hazard Zone for liquefaction potential. Intentional storm water infiltration would result in significant increased risks of geotechnical hazards such as liquefaction and landslides and therefore is not recommended. Refer to storm water infiltration infeasibility outlined in Section 2.4.2.4 of the Technical Guidance Document (County of Orange, 2013) .

4 DCV (Sections IV.1, IV.2.2, Attachment C - Worksheet D) – It is unclear how several DCV calculations were derived (i.e. step-by-step calculations must be provided). The following, but not limited to, items must be addressed:

a. Tributary Area: "Tributary area" is provided for each 'developed' DMA (i.e. totaling 175.6 acres) in Section IV.1; however, the WQMP does not provide adequate description of the tributary area (i.e. offsite run-on) for each DMA accounted for in the DCV sizing calculations. Furthermore, the "tributary area" provide for each 'developed' DMA in Worksheet D is significantly different from the tributary area provided in Sections IV.1 & IV.2.2. Note, this comment applies to the revision of Section IV.2.2 as well, which provides inconsistent values for the DCV from Section IV.1.
b. Impervious Fraction: The impervious fraction of each DMA could not be verified without a detailed description provided in Section II.1 for each DMA.

Response: Attachment C has a majority of the supporting calculations. Section IV.1 was revised and more detail was added. Section IV.2.2 is more of a summary of the calculations presented in attachment C and section IV.1

The entirety of the document has been revised and updated to ensure continuity throughout.

a. Tributary areas have been updated in section II.4 and contains a very detailed breakdown of the pervious and impervious areas, by DMA. Additionally, the scope of the WQMP consists of 150.8 acres with additional off-site 47 acres flowing through the DMA 'C', not tributary, and connects directly to the municipal storm drain system. This is further detailed in section II.1 Hydrology report scope is 197.8 acres, WQMP scope is 150.8 acres because the 47 acres bypass the site.

b. Detailed description was added to section II.1

5 BMP Sizing (Attachment C - Worksheet D) – Each individual BMP must be separately sized accounting for the drainage areas flowing to each BMP. For instance, DMAs C & E indicate that each DMA will include (2) MWS units; however, it cannot be assumed that a percentage of that drainage area will flow to one BMP and the rest will flow to the other BMP. A full analysis of the tributary areas to each BMP must be performed.

Response: The MWS will be installed on the effluent pipe of each basin. Multiple systems will be installed in parallel, forcing the entire DCV for the corresponding DMA to flow through the modular wetland system. The lowest orifice of the outlet structure will be above the DCV water surface level, therefore the entire DCV will be treated within 48-hours. This applies to DMA A, B & C.

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DMA E is tributary to two existing catch basins, each basin will be retrofitted with a MWS immediately upstream to catch and treat the DCV. The geometry of the site divides the DMA into approximately 2 equal half's (due to the crown of the street).

DMA F proposes one single MWS which will treat the DMA in its entirety.

6 BMP Sizing (Section IV.3.4) – It must be demonstrated that each LID BMP is sized to treat the DCV (or Design Flowrate) for the corresponding DMA (or tributary area). For instance, Section IV.3.4 indicates a MWS-4-4 unit is proposed in DMA F, which has a treatment capacity of 0.052 cfs; however, the design flowrate for DMA F is indicated as 0.28 cfs. This cannot be accepted as the proposed LID BMP would be undersized.

Response: IV 3.4 has been updated accordingly.

7 Hydrology Analysis – A Hydrology Analysis report was provided as an attachment to the WQMP; however, the Hydrology Analysis report provides inconsistent information with the WQMP. For instance, the Hydrology Analysis indicates the proposed project area is 197.93 acres vs. 150.8 acres. Revise the WQMP to detail any offsite run-on occurring at the site.

Response: In the existing condition, 47.0 acres located off-site, southerly and upstream of the proposed development, have potential to generate run-on tributary to DMA 'C'. The limits of the hydrology study were expanded to include this offsite area. However, the proposed condition will route the potential run-on from the off-site tributary area around the site and directly connect to the existing municipal storm drain system within Beach Boulevard. By bypassing the site, these 47 acres are not within the scope of the WQMP and are not included the DCV calculations for DMA 'C'. For clarity in comparing the supporting hydrology analysis study area to the study area of this P.W.Q.M.P., the area breakdown is as follows:

- On-site proposed development area = 115.4 acres
- On-site undeveloped area = 35.4 acres

  Total WQMP Study Area (omitting offsite area) = **150.8 acres**

- Offsite area tributary through drainage area 'C' = 47.0 acres

  Total Hydrology Study Area = **197.8 acres**

8 Title Page – The site address is indicated as 1302 West Imperial Highway; however, throughout the WQMP the site address is listed as 1400 South La Habra Hills Drive. Revise the WQMP to provide accurate and consistent information throughout. The title page must be signed and stamped with wet ink application by a California licensed civil engineer prior to Preliminary WQMP approval.

Response: Updated site address to reflect 1400 South La Habra Hills Drive.

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9 Owner's Certification – Michael Battaglia is listed as "Vice President Project Development" on the owner's certification form. The owner or approved signatory must sign and date the certification with wet ink application prior to Preliminary WQMP approval. An approved signatory must be a partner to the company which owns the title to the land, or equivalent.

Response: Michael Battaglia is an approved signatory, the forms will be wet signed by him.

10 Engineer's Certification Page – The form must be included (see attached), signed, dated, and stamped with wet ink application by a California licensed civil engineer.

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Response: Noted. Certification added to certification section of report.

11 Section II.1, Narrative Project Description – The WQMP indicates the proposed condition consists of "3.4 acres of D.G. trails" and identifies this land-use as a pervious area; however, this surface would be considered impervious. Revise narrative and calculations to show the decomposed granite as an impervious surface. Note, this comment applies to the revision of the WQMP Exhibit as well.

Response: Revised section to reflect D.G. Trail as *'Impervious'*

12 Section II.1, Narrative Project Description – Provide a detailed description of the impervious/pervious condition for each DMA, which will be utilized to confirm the DCV calculations provided throughout the WQMP

Response: For clarity, detailed description was added to section II.4

13 Section II.1, Narrative Project Description – The WQMP indicates the project will "include 16.3 acres of private and public streets." Revise the WQMP to provide further description of any infrastructure that will transfer to public agencies (City, County, Caltrans, etc.) as well as any streets, roads or sidewalks that are planned and constructed as part of this WQMP, even if they will become dedicated public right-of-way upon project completion

Response: Added narrative to II.1 describing all streets are to be HOA owned and maintained with exception to La Habra Hills Drive whose right-of-way will be transferred to the City along with maintenance responsibility.

14 Sections IV.2.2 & IV.3.4, and Attachment C – The WQMP provides tables which indicates the design flowrate for several DMAs; however, it is unclear how these values were derived. Note, design flowrate calculations are also provided in Attachment C (i.e. Worksheet D); however, the tributary area is inconsistent with the information provided throughout the WQMP. Revise WQMP to provide step-by-step calculations which validate this information. Note, the design flowrates provided in Section IV.2.2 are significantly different from the corresponding design flowrates provided in Section IV.3.4. All information must be accurate and consistent throughout.

Response: Report has been updated to ensure consistency throughout. Additional calculations have been added and WinTR-55 was utilized to determine time of concentration. A print out was included in attachment 'C' for reference.

15 Plans – The WQMP Exhibit does not contain much of the information necessary to fully evaluate the site. If only the WQMP Exhibit is available at this time, the WQMP Exhibit must indicate the quantity and make/model for each LID BMP, locations of all LID BMPs, cross-sectional details of each LID BMP, conveyance systems, drainage connections, overflow processes, etc. Note, the entire project site (100%) must be treated with LID BMPs prior to being discharged.

Response: The P-WQMP narrative has been revised to help clarify the proposed project. The tentative tract map has been included in the WQMP as a supporting document. Improvement plans have not been prepared at this time, as the project is still in the planning and entitlement phase. It is our belief that the tentative tract map in conjunction with the WQMP and all of its supporting attachments provides sufficient detail to support the drainage pattern and BMP design indicated in this *"Preliminary WQMP"*.

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16 Plans – Full-sized copies (24''x36'' or larger) of all plans signed, stamped, and dated with wet ink application by a California licensed civil engineer must be provided prior to Preliminary WQMP approval.

Response: This is a second request for signed and stamped improvement plans. This project is seeking entitlement at this time, improvement plans have not been prepared and will not be prepared prior to the tentative tract maps approval. A copy of the TTM has been included in place of improvements.

17 Plans – The WQMP (Section II.4) indicates that several DMAs will ultimately discharge to "existing …City of La Habra storm drain lines" after stormwater treatment; however, it is unclear if the LID BMPs will directly connect to the storm drain lines or be discharged at grade. The WQMP and the Plans must clearly indicate how treated stormwater is ultimately conveyed offsite. Additionally, any connections to the back of a catch basin and/or storm drain line must be approved by the City of La Habra. Proof of approval must be provided.

Response: Added a new first paragraph to section II.4 describing how modular wetlands function. The modular wetland system is a prefabricated structure that outlets underground to either an existing or proposed storm drain network. The system does not discharge at grade.

18 Section VI, WQMP Exhibit – The proposed drainage in DMA F is unclear. Provide drainage arrows which indicate conveyance to the proposed LID BMP, and indicate how treated stormwater is conveyed from the LID BMP offsite.

Response: Added flow arrows to BMP map for DMA 'F'.

19 Section VI, WQMP Exhibit – The WQMP (Section IV.3.4) indicates (1) MWS unit is proposed for DMA A and DMA B, and (2) MWS units are proposed for DMA C; however, the WQMP Exhibit appears to indicate 2 MWS units are proposed for DMA A, (2) MWS units are proposed for DMA B, and (3) MWS units are proposed for DMA C. Revise the WQMP Exhibit and/or the WQMP to provide accurate and consistent information throughout. Additionally, the WQMP must provide the make/model for the MWS units proposed for each DMA.

Response: The exhibit has been updated to reflect the correct number of MWS per DMA.

20 Section VI, WQMP Exhibit – Provide the owner/developer name in the title block of the exhibit/map. Additionally, indicate match lines on all exhibit sheets.

Response: Added Owner and Developer to title block of exhibits. Added match-lines to exhibits

21 Section IV, WQMP Exhibit – One of the WQMP Exhibits provides acreage for DMAs which are significantly different from the acreage provided throughout the WQMP. All information must be accurate and consistent throughout. Two documents are titled "WQMP Exhibit;" however, the documents must be revised to provided different titles and/or indicate sequential sheet numbers to avoid confusion.

Response: Exhibits have been updated accordingly.

22 Attachment C, Worksheet D – It is unclear how the Time of concentration (Tc) values were derived. Calculations for Tc must be provided following the TGD guidelines (Appendix IV.2). It appears as though the results of a hydraulic analysis are provided in a supplemental Hydrology Analysis report; however, it is unclear that the 85th percentile storm depth was analyzed (i.e. the Hydrology Analysis utilizes the 2-yr, 24-hr storm depth, etc.). Also, see comment herein regarding inconsistency between the WQMP and Hydrology Analysis Report.

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Response: Section II.4 addresses inconsistent areas between WQMP and Hydrology reports. In general, there is 47 acres that flow through, bypassing DMA 'C'. These 47 acres had to be accounted for in the hydrology analysis, but are not tributary to the basins or BMPs, and were therefore omitted from the WQMP.

The time of concentration was determined by the hydrology analysis, and has since been revised and determined through the WinTR-55 software, per the TGD requirements. Print-outs have been included in attachment 'C'.

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LGC Geotechnical, Inc.

PROJECT MEMORANDUM

To: Cal Atlantic Homes
15360 Barranca Parkway
Irvine, California 92618

Date: January 10, 2018
Project No.: 14057-01

Attention: Mr. Michael Battaglia

From: Dennis Boratynec, GE 2770 DDB

Subject: ***Geotechnical Response to City of La Habra Priority Water Quality Management (WQMP) Comment No. 3 dated January 24, 2017, Proposed Rancho La Habra Residential Development, VTTM 17845, City of La Habra, California***

References: City of La Habra, 2017, Priority Water Quality Management (WQMP) Checklist, 1400 South La Habra Hills Drive, dated January 24, 2017.

County of Orange, 2013, Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), Exhibit 7.III, December 20, 2013.

LGC Geotechnical, Inc., 2016, Preliminary Report for Proposed Rancho La Habra, Residential Development, VTTM 17845, City of La Habra, California, Project No. 14057-01, dated June 23, 2016.

In accordance with your request, LGC Geotechnical, Inc. (LGC Geotechnical) has prepared this memorandum to respond to Comment No. 3 within the City of La Habra WQMP checklist dated January 24, 2017 (City of La Habra, 2017) for the proposed Rancho La Habra Residential Development, VTTM 17845, City of La Habra, California.

Site soils (i.e., bedrock, fill and alluvium) are predominately fine-grained silts and clays which have infiltration rates below 0.3 inches per hour. This is a hillside project and our experience indicates the vast majority of landslides are caused by inappropriate handling of surface/subsurface water. Additionally, a portion of the site is located in a State of California Seismic Hazard Zone for liquefaction potential. Intentional storm water infiltration would result in significant increased risks of geotechnical hazards such as liquefaction and landslides and therefore is not recommended. Refer to storm water infiltration infeasibility outlined in Section 2.4.2.4 of the Technical Guidance Document (County of Orange, 2013).

Should you have any questions regarding this memorandum, please do not hesitate to contact our office.