Appendix H

Conceptual Water Quality Management Plan/ Hydrology Analysis

WQ XX-XXXX

CONCEPTUAL
County of Orange/Santa Ana Region Priority Project Water Quality Management Plan (WQMP)

Project Name:

CIELO VISTA SUBDIVISION
PERMIT#: PA10-0004

TENTATIVE TRACT 17341, YORBA LINDA, CALIFORNIA

APN: 351-031-05 AND 351-031-17

Prepared for:

Sage Community Group

3 Corporate Plaza

Newport Beach, California 92660

949-644-3514

Prepared by:

Charles Hartman & Associates

27127 Calle Arroyo, Suite 1904

San Juan Capistrano, CA 92675

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Gary Brown, P.E.

Date Prepared: September 21, 2012
Revised: July 10, 2013

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Project Owner's Certification			
Planning Application No. (If applicable)	PA10-0004	Grading Permit No.	Not Available
Tract/Parcel Map and Lot(s) No.	TRACT 17341	Building Permit No.	Not Available
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			TRACT 17341 APN: 351-031-05 351-031-17

This Conceptual Water Quality Management Plan (CWQMP) has been prepared for Sage Community Group by Charles Hartman and Associates. The CWQMP is intended to comply with the requirements of the County of Orange 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 , including the ongoing operation and maintenance of all best management practices (BMPs), 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 CWQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: SAGE COMMUNITY GROUP			
Title	PRINCIPAL		
Company	SAGE COMMUNITY GROUP		
Address	3 CORPORATE PLAZA		
Email	lnetherton@sagecommunity.com		
Telephone #	949-644-3514		
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.			
Owner Signature		Date	

DRAFT

Preparer (Engineer): GARY BROWN			
Title	Project Engineer	PE Registration #	57145
Company	Charles Hartman and Associates		
Address	27127 Calle Arroyo, Suite 1904		
Email	gary@chaengineering.com		
Telephone #	949-661-6695		

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	7/10/2013
Place Stamp Here			

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Attachment N ..... TR55 Calculations (per Drainage Subareas shown in separate H&H Report by CHA)

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Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Provide discretionary or grading/building permit information and water quality conditions of approval, or permit issuance, applied to the project. If conditions are unknown, please request applicable conditions from staff. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available on the OC Planning website (ocplanning.net).*

Project Infomation			
Permit/Application No. (If applicable)	PA10-0004	Grading or Building Permit No. (If applicable)	NOT AVAILABLE
Address of Project Site (or Tract Map and Lot Number if no address) and APN	TRACT 17341, Yorba Linda, California APN: 351-031-05 & 351-031-17		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	Conditions of Approval have not yet been applied.		
Conceptual WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	No. The present report is the Conceptual WQMP.		

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Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	None available at this time.

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Section II Project Description

II.1 Project Description

Provide a detailed project description including:

- Project areas;
- Land uses;
- Land cover;
- Design elements;
- A general description not broken down by drainage management areas (DMAs).

Include attributes relevant to determining applicable source controls. *Refer to Section 2.2 in the Technical Guidance Document (TGD) for information that must be included in the project description.*

Description of Proposed Project				
Development Category (From Model WQMP, Table 7.11-2; or -3):				
Project Area (ACRE): 83.96	Number of Dwelling Units: 112		SIC Code: 23616	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	83.96 acres	100%	0	0%
Post-Project Conditions	55.47 acres	66%	28.49 acres	34%
Drainage Patterns/Connections	The subject site proposes development of new residential homes within an open space setting on approximately 84.0 acres located in unincorporated Orange County and within the City of Yorba Linda Sphere of Influence. The subject site has two distinct areas of development: the northern 42.7 acres "North Site" and the southern 41.3 acres "South Site". The North Site and South Site are divided by the proposed limit of grading line within Lots 29 through 40. The north site consists of 17 new residential lots and the extension of Aspen Way. The residential lots consist of 3.65 acres, streets consist of 1.00 acres, and landscaping consists of 3.05 acres. Approximately 35.0 acres of the North Site will be preserved in its existing state as open space. This open space area is split into two portions on either side of the 100' foot wide SCE Easement.			

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	The South Site receives offsite open space flows throughout the southeastern portion of the tract boundary. Approximately 4.26 acres combines with onsite landscaping/open space to the west. There is approximately 3.83 acres of offsite/open space and 1.24 acres offsite landscaping that enters the onsite storm drain system. There is 1.92 acres of offsite open space that combines with onsite open space along the southeast perimeter of tract boundary.

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Narrative Project Description: (Use as much space as necessary.)	The 84.0 Cielo Vista project consisting of the North and South Sites, currently mapped as two separate parcels, located along the northeast boundary of the City of Yorba Linda in Orange County, CA. Sage Community Group is processing Tentative Tract Map (TTM) 17341 through Orange County for entitlement approval to construct 112 single-family detached homesites, streets, and associated infrastructure. As such, the project will be defined as a "priority" project for water quality purposes, requiring preparation of this Conceptual WQMP. The range of residential lot sizes proposed on the TTM is from approximately 0.17 acre to approximately 0.77 acre. Home sizes have not yet been established but are expected to range from 2,200 SF to 3,200 SF, with an average footprint of 1,800 SF. A typical single-family detached home will have parking in the garage on each homesite, plus additional parking on the driveway, and visitor parking on the street. TTM 17341 is developed to accomodate this standard concept for the homesites. Each homesite will include portions of the existing and/or proposed slopes that are required to accomodate the proposed development. A Homeowners Association (HOA) will be formed to own and maintain the open space lands proposed, and any infrastructure that will not be accepted by the public agencies. At the time of this writing, the developer anticipates the streets and all utilities will be dedicated to the appropriate public entity, with rights-of-way and/or access easements dedicated to those agencies on the final map. The TTM depicts lettered lots A through E. Lots A, B & E are proposed detention basins for collecting and treating run-off from the proposed public streets and the driveways on each homesite. Lots C & D are proposed open space. Lot D in particular will contain an area of native vegetation that is existing to remain undisturbed. All lettered lots will be owned and maintained by the HOA. The impervious surfaces proposed within this development include the streets and sidewalks along the proposed public streets, and the improvements on each homesite that will include the building, driveway, and proposed hardscape.

COPY

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the Technical Guidance Document (TGD) for guidance.*

Pollutants of Concern			
Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	
Nutrients	E ☒	N ☐	
Heavy Metals	E ☐	N ☒	
Pathogens (Bacteria/Virus)	E ☒	N ☐	
Pesticides	E ☒	N ☐	
Oil and Grease	E ☒	N ☐	
Toxic Organic Compounds	E ☐	N ☒	
Trash and Debris	E ☒	N ☐	

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II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the Technical Guidance Document (TGD) for North Orange County.*

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*

Refer to Figure XVI-3d provided in Attachment C. The project is located in a stream susceptibility area.

NORTH SITE

Hydrologic Conditions of Concern criteria will be mitigated with the use of an above ground retention basin. This basin is located at the North Site.

The Pre-development 2-year volume per TR-55 calculations is 0.707 inches of runoff depth over the 8.12 acres. This results in a volume of 0.707/12 x 8.12 = 0.478 acre-ft. This can be exceeded by 5%. So, 0.478 x 1.05 = 0.502 acre-ft.

The Post-development 2-year volume per Tr-55 calculations is 1.051 inches of runoff depth over 8.12 acres. This results in a volume of 1.051/12 x 8.12 = 0.711 acre-ft.

The net volume required to retain is 0.711 – 0.502 = 0.209 acre-ft (9,104 cubic feet)

(when combined w/ LID DCV of 17,668 cubic feet, the required volume for North site is 26,772 cubic feet.)

SOUTH SITE

Refer to Offsite Hydrology Report by TRWE which will provide additional information. The project soils engineer does not recommend stormwater runoff to percolate, saturate or load the underlying soils in the South Site. This is due to hillside terrain, liquefaction potential, and landslide proximity.

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BASIN VOLUME CALCULATION

BOTTOM AREA=	4908	SF	
LID VOLUME =	17668	CF	
HCOC VOLUME =	9104	CF	
TOTAL REQ'D VOLUME =	26772	CF	
MAX SIDE SLOPE =	3:00		1
MAXIMUM TOP LENGTH =	90	FT	
DEPTH =	4	FT	
TOP WIDTH =	76	FT	
BOTTOM LENGTH CALC=	89.00		
BOTTOM WIDTH CALC=	75.00		
BOTTOM AREA CALC =	6675.00	SF	
TOP AREA CALC =	6840	SF	
VOLUME AVAILABLE =	27030	CF	

NOTE THAT A LOW FLOW PIPE WILL ENSURE
THAT THE BASIN IS DRAINED WITHIN 48-HOURS

HCOC CALCULATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site PRE
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north pre.w55

Date: 7/24/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	.177
Area N-2	Area D	Outlet	1.03	85	0.1
Area N-3	Area D	Outlet	1.5	85	0.1
Area N-4	Area D	Outlet	1.08	85	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 0.707"

Cielo Vista
North Site PRE
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.37
	10.01
Area N-2	0.61
	9.94
Area N-3	0.88
	9.94
Area N-4	0.64
	9.94
REACHES	
OUTLET	4.32

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site POST
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north post.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	0.1
Area N-2	Area D	Outlet	1.03	94	0.1
Area N-3	Area D	Outlet	1.5	94	0.1
Area N-4	Area D	Outlet	1.08	98	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 1.051"

Brown

Cielo Vista
North Site POST
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.66
	9.94
Area N-2	1.17
	9.93
Area N-3	1.71
	9.93
Area N-4	1.51
	9.93
REACHES	
OUTLET	7.03

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. *Refer to Section 2.2.4 in the Technical Guidance Document (TGD).*

The 84 acre tract has two characteristic regions, the 42.7 acre northerly region "North Site", and the 41.3 acre southerly region "South Site". The North Site drains toward the existing westerly channel at Confluence "BCD" near the western boundary of the tract, immediately south of Aspen Way. All improvements within the North Site are directed to the detention basin prior to exiting the site and combining with confluence BCD.

The South site drains toward two distinct locations: either the existing 8' x 7' concrete box located in Via Del Agua or to an existing drainage stub located in the residential area near the southwest boundary of the tract. In the Post Development Condition the natural drainage patterns will be maintained such that flows to the downstream facilities will not exceed the existing 2 year 24 hour storm by more than 110%. Runoff from the developed areas of the subject site will be collected in a drainage system within planned local streets and directed to a single Contech Storm Filter before combining with offsite flows and leaving the site. Additionally, (33) filterra units with planter boxes 4 ft by 8 ft are proposed to treat runoff within the street right of way of the subdivision entrance.

II.5 Property Ownership/Management

Describe property ownership/management. *Refer to Section 2.2.5 in the Technical Guidance Document (TGD).*

The project will be owned and operated by Sage Community Group during construction. A home owner's association (H.O.A.) will be formed in order to manage the overall site and community areas and monitor the conduct of the individual home owners.

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Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the Technical Guidance Document (TGD).*

Name of Planned Community/Planning Area (if applicable)	Tract 17341
Location/Address	Via Del Agua at Stonehaven
General Plan Land Use Designation	To be determined
Zoning	To be determined
Acreage of Project Site	83.96 acres
Predominant Soil Type	Sandstone and Siltstone

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.2 in the Technical Guidance Document (TGD).*

Site Characteristics	
Precipitation Zone	Rainfall Zone – Design Capture Storm Depth = 0.90", per Figure XVI-1, provided in Attachment C.
Topography	The Existing site consists of rolling terrain that directs runoff in valley and creeks that slope southwesterly at slopes varying from 2% to areas as steep as 1.5:1. The project site is characterized by steep sloping hillsides vegetated by scrub and chaparral. Elevations range from approximately 590 feet above mean sea level (MSL) in the southern portions of the project site, to approximately 885 feet above

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	MSL at the highest point in the northern portions of the project site. A westerly draining canyon of approximately 100 to 200 feet in depth bisects the project site. Side slopes within this canyon vary from 1.5;1 to 2: 1 with locally steeper and flatter elements.
Drainage Patterns/Connections	The North Site runoff consists of three parts. (Refer to the separate hydrology report for maps and calculations related to offsite/onsite conveyance). The first part, offsite runoff from the Northwest Subarea "D" (Creek "D") will be conveyed through a storm drain between Lot 96 and Lot 97, then underneath the extended Aspen Way, before it outlets just upstream of Confluence BCD. The second part, runoff from the East Subarea "C" (Creek "C") is intercepted via debris basin/inlets along the toe of the landscaped slope adjacent to lots 101 through 112. The runoff is then directed southerly via a combination storm drain and above ground channel that outlets upstream of Confluence BCD. The third part, consists of the North Site improvements that directs all runoff to the single retention basin. The fully mitigated runoff leaving the retention Basin outlets upstream of Confluence BCD. No improvements are proposed within Subarea "B" (Creek "B"). As a result, all drainage generated in Subarea "B" continues to Confluence BCD and is not affected by the proposed improvements. The South Site runoff consists of two parts: The first part, the westerly landscaped slope combines with offsite area and is directed southerly along the tract boundary. All runoff will settle in the proposed rip rap pad prior to leaving the tract boundary. The second part, offsite runoff from the east Wire Springs Canyon a.k.a. Blue Mud Canyon, Area "A" (Creek "A") will be intercepted by a debris basin and inlet, and piped via a new 84" Bypass storm drain onsite RCP (exact size to be determined during final engineering) within the proposed streets and connects to the existing 8'x7' RCB storm drain at Via Del Agua/Stonehaven. All runoff generated within the South Site improvements (not including the westerly slope) is collected in onsite inlets and storm drains and is directed to filterra units and a single Contech Stormfilter prior to discharging into the 84"RCP Bypass Storm drain. Refer to Hydrology Study (Onsite) by Charles Hartman & Assoc (CHA) dated March 28, 2013.
Soil Type, Geology, and Infiltration Properties	Preliminary geotechnical studies performed for the project site indicate that a branch of the Whittier Fault Zone traverses the site in a generally northwesterly to southeasterly direction. The geotechnical studies also indicate a potential ancient landslide exists along the primarily northwest facing slope located within the northerly portion

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	of the site. Per Figure XVI-2b, the majority of the site is Soil Type D, with pockets of alluvial soil.
Hydrogeologic (Groundwater) Conditions	To be determined during the geotechnical investigation.
Geotechnical Conditions (relevant to infiltration)	Per the Soils investigation by LGC Geotechnical, infiltrating stormwater into the underlying soil strata is only recommended at the water quality basin at the North Site. The Soils engineer advises against allowing percolation in the South Site. (See Soils Engineer's memo in Attachment "G".)
Off-Site Drainage	Refer to CEQA Drainage Study for Cielo Vista by Tory R Walker Engineering, dated March 27, 2013
Utility and Infrastructure Information	New storm drain will be constructed within the proposed street right of way in order to collect, mitigate, and treat the onsite generated runoff. Additional storm drain will be constructed in both the North Site and South Site that will provide a bypass for the large offsite flows currently entering (and leaving) the tract boundary.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the Technical Guidance Document (TGD).*

Receiving Waters	Santa Ana River – Orange County channel E-06 to E-01 The Santa Ana River is watershed 'E', located in the North Orange County Integrated Regional Water Management Plan (NOC IRWMP). The project site is located in the Santa Ana Hydrologic Basin Planning Area (HSA) 801.13, Santa Ana Narrows.
303(d) Listed Impairments	Pathogens
Applicable TMDLs	Pathogens
Pollutants of Concern for the Project	Pathogens

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Environmentally Sensitive and Special Biological Significant Areas	Per Watershed E: Lower Santa Ana River ESA Map, the project is not adjacent to the ESA, nor does it discharge directly into it. The existing zoning and land use is "Agriculture/Oil Production Overlay" as noted on the TTM. The land is largely vacant with serveral existing oil wells spread across the southerly portion of the site. Some of the well pads have above-ground storage tanks, and dirt access roads cross the site to serve the existing wells. A phase 1 Environmental Site Assessment (ESA) was performed in 2006 and identified the existing oil production facilities as being of "minor environmental concern" and notes these facilities can be abandoned or removed in conformance with standard industry practice.

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Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. (Please ask your assigned planner or plan checker regarding whether your project is part of an approved WIHMP or equivalent.)
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-3.2.2 of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

(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.	Not applicable.	

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Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	For proposed projects within the North County permit area that may have an HCOC, each Priority Project proponent must determine the impact of the proposed development on the downstream hydrologic characteristics. The evaluation of potential impacts is based on the following for a two-year frequency storm event: Increases in runoff volume; Decreases in infiltration; Changes in time of concentration; Potential for increases in post development downstream erosion; and, Potential for adverse downstream impacts on physical structure, aquatic and riparian habitat. A project does not have an HCOC if either of the following conditions is met: The volumes and time of concentration of stormwater runoff for the post-development condition do not significantly exceed those of the predevelopment condition for a two-year frequency storm event (a difference of five percent or less is considered insignificant). The site infiltrates at least the runoff from a two-year storm event.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	The following performance criteria for LID implementation are stated in both permits: Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume) A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration (ET) cannot be feasibily implemented for the full design capture volume. In this case, infiltration, harvest and use, and ET practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMPs shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate and as calculated in TGD appendix VI. If treatment control BMPs can treat all of the remaining unmet volume and have a medium to high effectiveness for reducing primary POCs, the project is considered to be in compliance; a waiver application and participation in an alternative program is not required.

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Calculate LID design storm capture volume for Project.	LID design storm capture volume is calculated using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (above ground retention basins), Storm Filter and Filterra. The volume or flowrate is dependent on individual drainage areas and its characteristics. Detailed calculations for all drainage management areas (DMAs) will be provided in the Final Project WQMP.

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IV.2. Site Design and Drainage

Describe site design and drainage including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP "BMP Exhibit."
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs.

Refer to Section 2.4.2 in the Technical Guidance Document (TGD).

SITE DESIGN PRACTICES

SITE PLANNING AND LAYOUT

1. Minimize Impervious Area: Project will maximize the amount of roof impervious areas outletting to landscaping.
2. Maximize Natural Infiltration Capacity: Natural infiltration is not recommended for this site and therefore not provided due to the lateral movement of any percolated flows in the soil.
3. Preserve Existing Drainage Pattern and Time of Concentration: Drainage patterns will mimic assumed tributary areas determined for the existing storm drain laterals provided to the site, as prepared from existing hydrology reports.
4. Disconnect Impervious Areas: Impervious areas will disconnect and outlet to pervious areas such as landscaping, where possible.

VEGETATIVE PROTECTION, SELECTIVE REVEGETATION, AND SOIL STOCKPILING

1. Protect Existing Vegetation and Sensitive Areas: Existing hedge along site perimeter and landscaping from hedge to existing along the perimeter will be protected.
2. Revegetate Disturbed Areas: all disturbed areas within the hedge will be developed.
3. Soil Stockpiling and Site Generated Organics: Protect soil stockpile to prevent excessive compaction and cover stockpile to prevent significant erosion and leaching of nutrients.
4. Firescaping: The project is not located in a high risk wildfire zone.
5. Xeriscape Landscaping: Proposed landscaping considers practical turf areas, efficient irrigation, and practical turn areas on this project to reduce water use and decrease energy use.

SLOPES AND CHANNEL BUFFERS

There are no channel buffers. Slopes will be landscaped along the project perimeter.

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CIELO VISTA RUNOFF SUMMARY TABLE

	2-YEAR EXISTING	2-YEAR DEVELOPED	25-YEAR EXISTING	25-YEAR DEVELOPED
NORTH SITE				
AREA 'C'	11.26 CFS (10.7 AC)	12.4 CFS (10.7 AC)	27.04 CFS (10.7 AC)	28.31 CFS (10.7 AC)
SOUTH SITE				
AREA 'A'	33.38 CFS (29.7 AC)	36.04 CFS (29.8 AC)	77.53 CFS (29.7 AC)	81.02 CFS (29.8 AC)
AREA 'E'	22.89 CFS (19.0 AC)	9.25 CFS (8.5 AC)	52.94 CFS (19.0 AC)	21.89 CFS (8.5 AC)

TECHNIQUES TO MINIMIZE LAND DISTURBANCE

Areas that do not require grading will be protected to the maximum extent practicable to avoid soil disturbance. Areas to be protected will be delineated with the use of fencing or other delineators such as type, paint, ect.

DRAINAGE MANAGEMENT AREAS AND LID BMPS

Drainage management areas will be determined and provided in the Final Project Water Quality Management Plan. Refer to Section IV.3 for discussion of LID BMPs.

GIS COORDINATES

The general site coordinates for LID and Treatment Control BMPs is approximately N33.8953 E117.7609

The funding mechanism for the Operations and Maintenance Program will be the Property Owner's Association.

CONCEPTUAL

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the Technical Guidance Document (TGD) for selecting LID BMPs and Section 2.4.3 in the Technical Guidance Document (TGD) for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls (HSCs)

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

CONCEPTUAL

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met, state why.

Name	Included?
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: Filterra Unit	☐
Other:	☐

SAMPLE

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration BMPs. If not, document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

NORTH SITE:

17,668 CU-FT, WITH MINIMUM BOTTOM AREA OF RETENTION BASIN = 4,908 SQ-FT

SOUTH SITE: (WILL PURSUE ALTERNATIVE COMPLIANCE APPROACH)

S-1: 15,001 CU-FT

S-2: 21,759 CU-FT

S-3: 27,011 CU-FT

S-4: 2,797 CU-FT

S-5: 3,278 CU-FT

(REFER TO THE CALCULATIONS IN THE FOLLOWING WORKSHEETS 'B' AND 'H'

CONCEPTUAL

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration and/or rainwater harvesting BMPs included.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

TABLE 1

CIELO VISTA VOLUME CALCULATION SPREADSHEET

NORTH							USE 3:1 SIDE SLOPES					4 FEET		VOLUME	VOLUME	Q IN	Q OUT
AREA NAME	AREA ACRES		C FACTOR	VOL REQ'D (0.75")	Q25 EX	Q25 PR	AVAILABLE TOP LENGTH	BASIN DIMENSIONS TOP WIDTH	AREA	DEPTH IN BASIN	BOTOM LENGTH	BOTTOM WIDTH	AREA	AVAILABLE CU. FT.	REQUIRED CU. FT		
C-1	1.09	0.75	0.71	0.04													
C-2	1.23	0.75	0.71	0.05													
C-3	3.47	0.75	0.71	0.15													
C-1C	1.51	0.15	0.26	0.02													
C-4A	0.4	0.95	0.86	0.02													
C-4	0.96	0.15	0.26	0.01													
TOTAL	7.57			0.25	27.1	28.3	90	50	4500	3.3	70.2	30.2	2,120	10,923	10,890	28.3	13.7
								(INCLUDES 1' FREEBOARD)		4.3	64.2	24.2	1,554	13,015	10,890		

SOUTH						
AREA NAME	AREA ACRES		C FACTOR	VOL REQ'D (0.75")	Q2 EX	Q2 PR
A-1	2.79	0.75	0.71	0.12		
A-1A	2.45	0.75	0.71	0.10		
A-2	1.8	0.75	0.71	0.07		
A-3	0.41	0.15	0.26	0.00		
A-4	2.37	0.75	0.71	0.10		
A-5	2.07	0.75	0.71	0.09		
A-6	2.04	0.15	0.26	0.03		
A-7	3.65	0.75	0.71	0.16		
A-8	2.78	0.75	0.71	0.12		
A-9	1.62	0.15	0.26	0.02		
A-10	4.25	0.75	0.71	0.18		
A-11	2.15	0.75	0.71	0.09		
A-8A	0.41	0.15	0.26	0.00		
A-8B	0.28	0.95	0.86	0.01		
A-8C	0.3	0.15	0.26	0.00		
A-8D	0.36	0.95	0.86	0.01		
TOTAL	29.73			1.10	33.4	36.1

SLOPES						
AREA NAME	AREA ACRES		C FACTOR	VOL REQ'D (0.75")	Q2 EX	Q2 PR
E-2	0.22	0.15	0.26	0.00		
AA-3A	0.52	0.15	0.26	0.00		
AA-4A	0.86	0.15	0.26	0.01		
TOTAL	1.38			0.01		

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with evapotranspiration and/or rainwater harvesting BMPs in combination with infiltration BMPs. If not, document below how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

Reclaimed water is not available onsite.

Harvest and Reuse is NOT FEASIBLE.

The feasibility screening criteria for harvest and reuse listed in the OC CAMP Technical Guidance Document (page XIV-46) states that the "use of harvested water should not conflict with applicable plumbing and health codes at the time of project application." The California Plumbing Code does not currently provide standards for the stormwater harvesting systems for indoor residential use. Thus, stormwater harvesting for indoor residential use is not required for this project.

CONCEPTUAL

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs included. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☒
Other: Contech Stormfilter	☒
Other: Filterra Unit	☒

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not, document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

NORTH SITE

The water quality basin will provide treatment for the North Site.

As shown in Table 1, 0.25 acre-ft (10,890 cubic feet) is required for detention, and it has been provided for with an availability of 10,923 cubic feet at a depth of 3.3 feet. Additionally, the 25-year runoff was routed through the basin and adequately detains the 25-year peak using an 18"RCP outfall with an invert equal to the bottom of the basin. (See Hydrology Study (Onsite) by CHA, dated March 28, 2013)

SOUTH SITE

Bio treatment is proposed for the south using Filterra Units. Calculations for the specific area contributing to each Filterra will be provided at the Final WQMP .

DRAFT

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. *See Section 5 of the Technical Guidance Document (TGD).* Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval (if applicable).

Hydromodification Control BMPs	
BMP Name	**BMP Description**
North Site: Above Ground Retention Basin (Refer to the HCOC calculations using TR-55)	BMP will provide onsite detention to reduce the proposed 2 year 24 hour peak flows, so that they do not significantly exceed those of the predevelopment condition by more than 5%. Details of the proposed detention system will be provided in the Project Final Water quality Management Plan.
South Site: Refer to separate Hydrology and Hydraulic Report by TRW Associates for the effect of mitigating potential hydromodification by designing the large bypass storm drain to 'throttle' the large flows. (Refer to the HCOC calculations using TR-55)	

IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP.*

Regional/Sub-Regional LID BMPs

CONCEPTUAL

Not Applicable

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**
Contech Storm Filter	Stormwater is treated by the actions of a series of cartridges. Under normal conditions all stormwater leaving the Storm Filter is fully treated. During heavy storm events, excess runoff is conveyed through the structure untreated through a bypass.
Filterra	Stormwater is treated by entering the catch basin and flowing through several unique strata as treatment. The treated storm water is then collected with a pipe several feet below the entrance flowline. These filterra units will be installed with an impermeable liner in order to limit potential percolation and/or seepage into soil layers below.
NORTH SITE Detention Basin	A detention basin will be constructed to provide a volume of 10,890 cubic feet in an area 90 feet by 50 feet. The basin will have maximum 3:1 side slopes, will be vegetated, will have an open unlined bottom, and will have storm drain at both ends in order to accommodate inflows and outflows. (See Table 1 after Page 19)

CONCEPTUAL

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

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)	☐	☒	No Hazardous Waste
N6	Local Industrial Permit Compliance	☐	☒	City of Yorba Linda does not issue Water Quality Permits
N7	Spill Contingency Plan	☐	☒	Not Applicable for Project
N8	Underground Storage Tank Compliance	☐	☒	No underground Storage Tanks.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No Hazardous Materials
N10	Uniform Fire Code Implementation	☐	☒	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☐	☒	
N13	Housekeeping of Loading Docks	☐	☒	No Loading Docks
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No Gasoline Outlets

Education for property owners, tenants, and occupants (N_1) – Education is a key element in the source control plan, as preventing pollutants from entering the storm drain system is the most cost effective of all BMPs. Education shall be keyed to the various practices that lead to pollutant generation, but which most homeowners and renters are unaware. Such practices on the surface appear mundane, but actually may have severe cumulative effects on water quality. These practices include car washing, littering, landscape

maintenance, cleaning up after pets, ect. Environmental awareness education materials shall be provided to all members of the HOA periodically. Example educational materials are provided in Section VII.

Activity Restrictions (Conditions, Covenants, and Restrictions) (N2) – Conditions, Covenants, and Restrictions (CC&Rs) shall be prepared for the purpose of surface water quality protection, or use restrictions will be developed through lease terms.

Common Area Landscape Management (N3) – Ongoing Maintenance shall be consistent with Orange County Landscape Irrigation Code, plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (DAMP Section 5.5)

BMP Maintenance (N4) – Home Owners Association (HOAs) or another designated entity shall be responsible for the inspection and maintenance of structural BMPs within their boundaries. The overall scope of the proposed operation and maintenance plan is provided in Section V.

Local Water Quality Permit Compliance (N6) – The City of Yorba Linda does not issue water quality permits.

Common Area Litter Control (N11) – Litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations by tenants/homeowners or businesses and reporting the violations to the the owner/HOA for investigation shall be conducted.

Common Area Catch Basin Inspection (N14) – 80% of all privately maintained drainage facilities shall be inspected each year and, if necessary, cleaned and maintained prior to the storm season, no later than October 1st each year; 100% of all privately-maintained drainage facilities shall be inspected, cleaned and maintained in a two year period. Drainage facilities include catch basins and inlets, water quality basins, detention basins, open drainage channels, and lift stations.

Street Sweeping Private Streets and Parking Lots (N15) – Private streets shall be swept at a minimum prior to the storm season, no later than October 1st each year. Parking lots shall be swept twice a month, as needed, or as directed by authorized agency staff, weather permitting.

CONFIDENTIAL

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if structural source controls were not used.

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
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 SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	Not proposed for project
S7	Maintenance bays	☐	☒	Not proposed for project
S8	Vehicle wash areas	☐	☒	Not proposed for project
S9	Outdoor processing areas	☐	☒	Not proposed for project
S10	Equipment wash areas	☐	☒	Not proposed for project
S11	Fueling areas	☐	☒	Not proposed for project
S12	Hillside landscaping	☒	☐	
S13	Wash water control for food preparation areas	☐	☒	Not proposed for project
S14	Community car wash racks	☐	☒	Not proposed for project

CONFIDENTIAL

Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the funding mechanism through which BMPs will be maintained. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. *Refer to Section 7.II 4.0 in the Model WQMP.*

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Stormfilter by Contech	H.O.A.	To be cleaned out as necessary during inspection. Cartridges should be replaced every year, after any chemical spill, or as required by inspection to insure proper function and drainage..	Before October 1st and after major storm events.
Above Ground Detention Basins	H.O.A.	Cleaned and Maintained	Before October 1st and after major storm events.
Filterra	H.O.A.	Cleaned and Maintained	Before October 1st and after major storm events.

CONCEPTUAL

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

Include a BMP Exhibit (Site Plan), at a size no less than 24" by 36," which includes the following minimum information:

- Insert in the title block (lower right hand corner) of BMP Exhibit: the WQMP Number (assigned by staff) and the grading/building or Planning Application permit numbers
- Project location (address, tract/lot number(s), etc.)
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Delineate the area being treated by each structural BMP
- GIS coordinates for LID and Treatment Control BMPs
- Drainage connections
- BMP details
- Preparer name and stamp

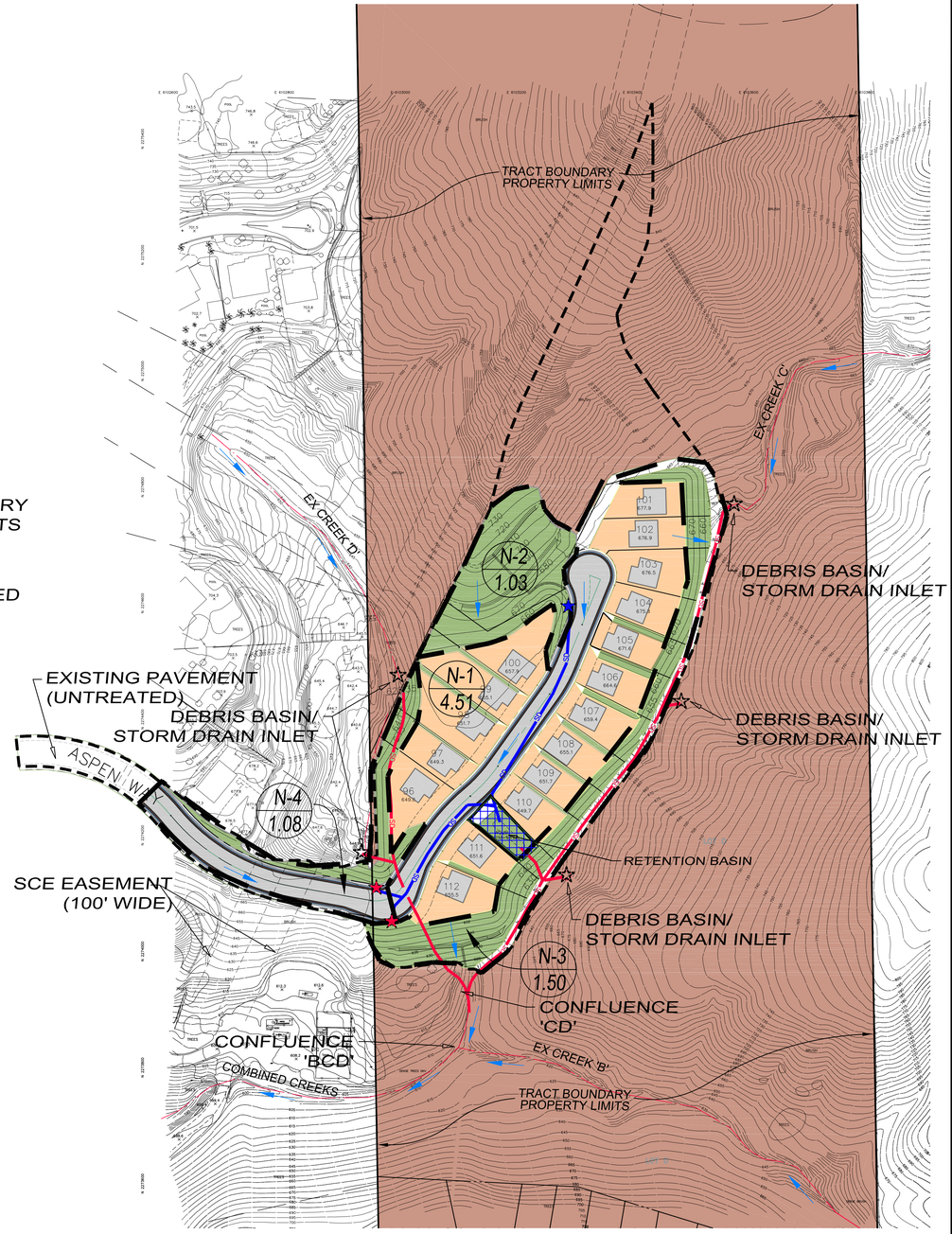
Please do not include any areas outside of the project area or any information not related to drainage or water quality. The approved BMP Exhibit (Site Plan) shall be submitted as a plan sheet on all grading and building plan sets submitted for plan check review and approval. The BMP Exhibit shall be at the same size as the rest of the plan sheets in the submittal and shall have an approval stamp and signature prior to plan check submittal.

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Each approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office, prior to close-out of grading and/or building permit. Educational Materials are not required to be included.

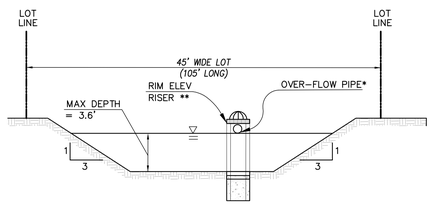
CONCEPTUAL



BMP EXHIBIT (SITE PLAN)

LEGEND

- Streets
- Sidewalks
- Individual Lot Landscaping/Hardscape
- H.O.A. Maintained Landcaping
- Water Quality Basin (North Site) Above & Underground
- Contech Stormfilter
- Perimeter Drainage Inlets for Offsite Flow (Untreated)
- Catch Basin Stenciling & Signage
- Onsite Area Inlets requiring treatment
- Untreated Stormwater
- Offsite Runoff and Mitigated
- Drainage Flow Direction
- Overall Drainage Boundary (see separate drainage report)
- Subarea Drainage Areas per BMP calculations.



SECTION A-A RETENTION BASIN

* THE OVER-FLOW PIPE/RISER WILL CONNECT TO THE PERIMETER STORM SYSTEM AND WILL BE DESIGNED AND SIZED SUCH THAT IT IS ONLY ACTIVATED IN THE EVENT THE PERMEABLE BOTTOM OF THE RETENTION BASIN IS UNABLE TO ADEQUATELY DRAWDOWN WITHIN 48-HOURS.

* THE LOW-FLOW PIPE WILL CONNECT TO THE PERIMETER STORM SYSTEM AND WILL BE DESIGNED AND SIZED SUCH THAT

BMP SUMMARY TABLE (SOUTH SITE)

SUBAREA	AREA (ACRES)	BMP PROPOSED	AVG AREA PER FILTERRA
S-1	6.57	(7) FILTERRAS	0.94 ACRE PER FILTERRA
S-2	10.22	(11) FILTERRAS	0.93 ACRE PER FILTERRA
S-3	12.33	(13) FILTERRAS	0.95 ACRE PER FILTERRA
S-4	1.85	VEGETATION/TREES	
S-5	1.66	(2) FILTERRAS	0.83 ACRE PER FILTERRA
S-1,S-2,S-3	29.12	STORM FILTER	
SOUTH SITE	32.63	(33) FILTERRAS (1) STORM FILTER VEGETATION/TREES	0.99 ACRE PER FILTERRA

BMP SUMMARY TABLE (NORTH SITE)

SUBAREA	AREA (ACRES)	BMP PROPOSED
N-1	4.51	RETENTION BASIN & VEGETATION/TREES
N-2	1.03	
N-3	1.50	
N-4	1.14	
NORTH SITE	8.18	RETENTION BASIN & VEGETATION/TREES

SCALE: 1"=100'

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

Project Location: Yorba Linda, Orange County, California - Via Del Agua at Stonehaven
G.I.S. COORDINATE: N33.8953, E117.7609 DATE: JULY 9, 2013

TITLE: BMP EXHIBIT (SITE PLAN)
for
CIELO VISTA - VTTM NO. 17341

ORANGE COUNTY

PREPARED BY:
CHARLES HAATMAN & ASSOC
PLANNING - ENGINEERING - SURVEYING
27127 CALLE ARROYO - SUITE 1904
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REGISTERED PROFESSIONAL ENGINEER CHARLES D. HAATMAN 19 RCE 29243 Exp. 3/31/2015 CIVIL STATE OF CALIFORNIA

PREPARED FOR :
SAGE COMMUNITY GROUP
3 CORPORATE PLAZA, SUITE 102
NEWPORT BEACH, CA 92660
PHONE: (949) 644-3514

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

INF-4: Bioinfiltration Fact Sheet

Bioinfiltration facilities are designed for partial infiltration of runoff and partial biotreatment. These facilities are similar to bioretention devices with underdrains but they include a raised underdrain above a gravel sump designed to facilitate infiltration. These facilities can be used in areas where there are no hazards associated with infiltration, but infiltration of the full DCV may not be feasible due to low infiltration rates or high depths of fill. These facilities may not result in retention of the full DCV but they can be used to achieve the maximum feasible infiltration and ET.

Also known as:

- *Rain gardens*
- *Infiltration planter*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening Considerations

- Bioinfiltration shall pass infeasibility screening criteria for infiltration BMPs (**TGD Section 2.4.2.4**) to be considered for use.
- Infiltration rates are allowed to be less than 0.3 inches per hour.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, and road medians.
- Drainage area is ≤ 5 acres, preferrably ≤ 1 acre.
- Area is available for infiltration.
- Site slope is less than 15 percent.

OC-Specific Design Criteria and Considerations

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ Depth to mounded seasonally high groundwater shall not be less than 5 feet.
- ☐ If sheet flow is conveyed to the treatment area over stabilized grassed areas, the site must be graded in such a way that minimizes erosive conditions; sheet flow velocities should not exceed 1 foot per second.
- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth exceeds 6 inches to mitigate the risk of drowning.
- ☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media
- ☐ The minimum amended soil depth is 1.5 feet (3 feet is preferred).
- ☐ The depth of gravel below the underdrain elevation must be designed so that the effective depth that would infiltrate in 48 hours is stored in the gravel layer.
- ☐ Underdrain should be placed at the top of the gravel drainage layer to facilitate infiltration.

- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native plant species and/or hardy cultivars that are not invasive and do not require chemical fertilizers or pesticides should be used to the maximum extent feasible
- ☐ The bioinfiltration area should be covered with 2-4 inches (average 3 inches) of mulch at startup and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ An overflow device is required at the top of the ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.
- ☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media
- ☐ Ponding area side slopes shall be 3H:1V.

Simple Sizing Method for Bioinfiltration

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioinfiltration facility, the user selects the basin geometry and then determines the volume retained. The sizing steps are as follows:

Step 1: Select Bioinfiltration Geometry

Determine the desired ponding depth (not to exceed 1.5 ft), gravel depth, surface area, and media saturated hydraulic conductivity. A target media hydraulic conductivity of 5 inches per hour is recommended.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$$DD_P = (d_P / K_{MEDIA}) \times 12$$

Where:

DD_P = time to drain ponded water, hours

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used as a default unless other information is available to support an alternative value.)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media filter until 48 hour drawdown time is achieved.

Step 3: Verify That Gravel Depth is Designed for 48 Hour Drawdown

In order to demonstrate that bioinfiltration systems have been designed to achieve the maximum feasible retention (See **Appendix XI**), the gravel depth below the underdrains must be designed with a thickness such that it draws down in 48 hours.

$$DD_G = ((d_G \times n_G) / K_{DESIGN}) \times 12$$

Where:

DD_G = time to drain gravel layer, hours

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

K_{DESIGN} = bioretention design infiltration rate, in/hr (See **Appendix VII**)

If DD_G is less than 48 hours, adjust d_G until DD_G is at least 48 hours or greater.

Step 4: Determine the BMP Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$A = DCV / d_{EFFECTIVE}$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

DCV = design capture volume, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft

$d_{EFFECTIVE} = (d_P + n_M d_M + n_G d_G)$

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Capture Efficiency Method for Bioinfiltration

Option 1: Accounting for Retention plus Biotreatment in Capture Efficiency Calculation

To size bioinfiltration facilities using the Capture Efficiency Method, the system should be divided into its retention and biotreatment components and analyzed as a treatment train per instructions in **Appendix III.5** Sizing Approaches for Treatment Trains and Hybrid Systems.

- Retention Storage: Water stored in gravel below underdrains.
- Biotreatment Storage: Water stored in surface ponding and media pore space.

The retention component should be analyzed as the first component of the treatment train, and will yield a capture efficiency that is used as an input to the biotreatment sizing approach.

The retention component should be sized such that the depth of gravel drains in 48 hours at the design infiltration rate.

Option 2: Sizing of Biotreatment Only; Presumptive Approach for Retention

Alternatively, bioinfiltration BMPs can be sized accounting for only the capture efficiency of the biotreatment component (See BIO-1: Bioretention with Underdrains for sizing methods). The retention component should be sized such that the depth of gravel drains in 48 hours or greater at the design infiltration rate. This provides presumption that water is infiltrated without quantifying the volume that is infiltrated. It is inherently a conservative sizing method.

Configuration for Use in a Treatment Train

- Bioinfiltration areas are inherently a treatment train BMP because they include both retention and biotreatment components.
- Bioinfiltration areas may be preceded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the bioretention cell.
- Bioinfiltration areas can be incorporated in a treatment train to provide enhanced water quality treatment and reductions in runoff volume and rate.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf**
- SMC LID Manual (pp 68): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 7): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in ***Appendix*** **XI.2**.

BIO-1: Bioretention with Underdrains

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. **Bioretention must be designed without an underdrain** in areas of high soil permeability.

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), **bioinfiltration facilities**, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.
- ☐ The minimum soil depth is 2 feet (3 feet is preferred).
- ☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.
- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.
- ☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible
- ☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).
- ☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).
- ☐ An overflow device is required at the top of the bioretention area ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.
- ☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/ft

Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [$((K_{MEDIA} \times T_{ROUTING})/12)$, d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See **Appendix III.3.3**) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

A = Design Volume / d_p

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: **http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf**
- SMC LID Manual (pp 68): **http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- San Diego County LID Handbook Appendix 4 (Factsheet 7): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: **http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf**

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source:
http://www.americastusa.com
/index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

☐ In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in **Appendix III.3.2**.
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in **Appendix III.3.3**).

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9: **http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf**
- Santa Barbara BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Please only attach the educational materials specifically applicable to this project. Other materials specific to the project may be included as well and must be attached.

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	☒		☐

DRAFT

Attachments

Attachment A.. ..... Educational Materials

Attachment B. .....Vicinity Map

Attachment C. .....Infiltration Map Figure XVI-2G

Attachment D. .....Susceptibility Map Figure XVI-3C

Attachment E. .....Rainfall Zones Figure XVI-1

Attachment F. .....Hydrologic Soil Group XVI-2B

Attachment G. .....Soils Engineer Discussion Memo and Soils Map Figure S

Attachment H. ..... O. C. Hydrology 2-Year Frequency (North Site)

Attachment I. .....O.C. Hydrology 2-Year Frequency (South Site)

Attachment J. ..... Onsite/Offsite 2-year Runoff Comparison by TRWE

Attachment K. .....Santa Ana River Hydrologic Unit

CONCEPTUAL

Attachment A.. ..... Educational Materials

CONCEPTUAL

StormFilter Information

CIELO VISTA AREA "A"

STORM FILTER CARTRIDGE CALCULATION:

FIRST FLUSH $Q = 0.68 \times 0.2 \times 29.8 = 4.05_{CFS}$
(70% IMP)

$$\frac{4.05}{27X} = 0.0018 \quad , 27X = \frac{4.05}{0.0018} \quad , X = 83$$

SO, REQ'D (83) 27-INCH CARTRIDGES

USE OFFLINE DESIGN W/ 18' x 28' VAULT

CONTECH® STORMWATER SOLUTIONS

Operation and Maintenance

The Stormwater Management StormFilter®

Vault, Cast-In-Place, and Linear Units

Important: These guidelines should be used as a part of your site stormwater management plan.

Description

The Stormwater Management StormFilter® (StormFilter) is a passive, flow-through, stormwater filtration system. The system is comprised of one or more vaults that house rechargeable, media-filled, filter cartridges. The StormFilter works by passing stormwater through the media-filled cartridges, which trap particulates and adsorb materials such as dissolved metals and hydrocarbons. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharged into an open channel drainage way.

The StormFilter is offered in multiple configurations, including vault, linear, catch basin, manhole, and cast-in-place. The vault, linear, manhole, and catch basin models utilize pre-manufactured units to ease the design and installation processes. The cast-in-place units are customized for larger flows and may be either covered or uncovered underground units.

Purpose

The StormFilter is a passive, flow-through, stormwater filtration system designed to improve the quality of stormwater runoff from the urban environment before it enters receiving waterways. It is intended to function as a Best Management Practice (BMP) to meet federal, state, and local requirements for treating runoff in compliance with the Clean Water Act.

Through independent third party studies, it has been demonstrated that the StormFilter is highly effective for treatment of first flush flows and for treatment of flow-paced flows during the latter part of a storm. In general, the StormFilter's efficiency is highest when pollutant concentrations are highest. The primary non-point source pollutants targeted for removal by the StormFilter are: suspended solids (TSS), oil and grease, soluble metals, nutrients, organics, and trash and debris.

Sizing

The StormFilter is sized to treat the peak flow of a water quality design storm. The peak flow is determined from calculations based on the contributing watershed hydrology and from a design storm magnitude set by the local stormwater management agency. The particular size of a StormFilter unit is determined by the number of filter cartridges (see Figure 1) required to treat this peak flow.

The flow rate through each filter cartridge is adjustable, allowing control over the amount of contact time between the influent and the filter media. The maximum flow rate through each cartridge can be adjusted to between 5 and 15 gpm using a calibrated restrictor disc at the base of each filter cartridge. Adjustments to the cartridge flow rate will affect the number of cartridges required to treat the peak flow.

Basic Function

The StormFilter is designed to siphon stormwater runoff through a filter cartridge containing media. A variety of filter media is available and can be customized for each site to target and remove the desired levels of sediments, dissolved phosphorus, dissolved metals, organics, and oil and grease. In many cases, a combination of media is recommended to maximize the effectiveness of the stormwater pollutant removal.

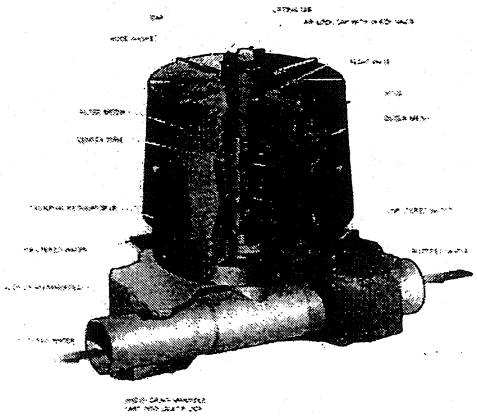


Figure 1. The StormFilter Cartridge

Priming System Function

When stormwater in the StormFilter unit enters a StormFilter cartridge, it percolates horizontally through the cartridge's filter media and collects in the center tube of the cartridge, where the float in the cartridge is in a closed (downward) position.

Water continues to pass through the filter media and into the cartridge's center tube. The air in the cartridge is displaced by the water and purged from beneath the filter hood through the one-way check valve located in the cap. Once the center tube is filled with water (approximately 18 inches deep), there is enough buoyant force on the float to open the float valve and allow the treated water in the center tube to flow into the under-drain manifold. This causes the check valve to close, initiating a siphon that draws polluted water throughout the full surface area and volume of the filter. Thus, the entire filter cartridge is used to filter water throughout the duration of the storm, regardless of the water surface elevation in the unit. This siphon continues until the water surface elevation drops to the elevation of the hood's scrubbing regulators.

The cartridges are connected to the under-drain manifold with a plastic connector. Since some media used is potentially buoyant, a threaded connector affixed to the under-drain manifold (with glue or other adhesive) is necessary to ensure that the cartridge isn't lifted out of place. For the heavier compost media, a slip connector is used.

The StormFilter is also equipped with flow spreaders that trap floating debris and surface films, even during overflow conditions. Depending on individual site characteristics, some systems are equipped with high and/or base flow bypasses. High flow bypasses are installed when the calculated peak storm event generates a flow that overcomes the overflow capacity of the system. This is especially important for precast systems. Base flow bypasses are sometimes installed to bypass continuous inflows caused by ground water seepage, which usually do not require treatment. All StormFilter units are designed with an overflow. The overflow operates when the inflow rate is greater than the treatment capacity of the filter cartridges.

Maintenance Guidelines

The primary purpose of the StormFilter is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site.

Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is also good practice to inspect the system after severe storm events.

Types of Maintenance

Presently, procedures have been developed for two levels of maintenance:

- Inspection/minor maintenance
- Major maintenance.

Inspection/minor maintenance activities are combined since minor maintenance does not require special equipment and typically little or no materials are in need of disposal.

Inspection/minor maintenance typically involves:

- Inspection of the vault itself
- Removal of vegetation and trash and debris.

Major maintenance typically includes:

- Cartridge replacement
- Sediment removal

Important: Applicable safety (OSHA) and disposal regulations should be followed during all maintenance activities.

Maintenance Activity Timing

Two scheduled inspections/maintenance activities should take place during the year.

First, an inspection/minor maintenance activity should be done. During the minor maintenance activity (routine inspection, debris removal), the need for major maintenance should be determined and, if disposal during major maintenance will be required, samples of the sediments and media should be obtained.

Second, if required, a major maintenance activity (replacement of the filter cartridges and associated sediment removal) should be performed.

In addition to these two scheduled activities, it is important to check the condition of the StormFilter unit after major storms for damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the maintenance activity schedule depending on the actual operating conditions encountered by the system.

In general, minor maintenance activities will occur late in the rainy season, and major maintenance will occur in late summer to early fall when flows into the system are not likely to be present.

Maintenance Activity Frequency

The primary factor controlling timing of maintenance for the StormFilter is sedimentation.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media. The flow through the system will naturally decrease as more and more solids are trapped. Eventually the flow through the system will be low enough to require replacement of the cartridges. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on an as-needed basis in order to prevent material from being re-suspended and discharged to the system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction should be inspected and maintained more often than those in fully stabilized areas.

The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after large storms.

Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system. It is recommended that the maintenance agency develop a database to properly manage StormFilter maintenance programs.

Prior to the development of the maintenance database, the following maintenance frequencies should be followed:

Inspection/minor maintenance
- One time per year
- After Major Storms

Major maintenance
- One time per year
- In the event of a chemical spill

Frequencies should be updated as required.

The recommended initial frequency for inspection/minor maintenance is two times per year for precast units. StormFilter units should be inspected after all major storms. Sediment removal and cartridge replacement on an annual basis is recommended until further knowledge is gained about a particular system.

Once an understanding of site characteristics has been established, maintenance may not be needed for one to two years, but inspection is warranted.

Maintenance Methods

Inspection/Minor Maintenance

The primary goal of a maintenance inspection is to assess the condition of the cartridges relative to the level of sediment loading. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, it is likely that the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Stormwater Solutions immediately.

To conduct an inspection and/or minor maintenance:

Important: Maintenance must be performed by a utility worker familiar with StormFilter units.

1. If applicable, set up safety equipment to protect pedestrians from fall hazards due to open vault doors or when work is being done near walkways or roadways.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.

3. Open the doors to the vault and allow the system to air out for 5-10 minutes.

4. Without entering the vault, inspect the inside of the unit, including components.

5. Take notes about the external and internal condition of the vault.

   Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the level of water and estimate the flow rate per drainage pipe. Record all observations.

6. Remove large loose debris and trash using a pole with a grapple or net on the end.

7. Close and fasten the door.

8. Remove safety equipment.

9. Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.

10. Finally, review the condition reports from the previous minor and major maintenance visits, and schedule cartridge replacement if needed.

Major Maintenance

Depending on the configuration of the particular system, a worker may be required to enter the vault to perform some tasks.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows exist. Standing water present in the vault should be regarded as polluted and should be contained during this operation by temporarily capping the manifold connectors.

Replacement cartridges will be delivered to the site. Information concerning how to obtain the replacement cartridges is available from CONTECH Stormwater Solutions.

> **Warning:** In the case of a spill, the worker should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Stormwater Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect pedestrians from fall hazards due to open vault doors or when work is being done near walkways or roadways.

2. Visually inspect the external condition of the unit and take notes concerning defects/problems.

3. Open the doors to the vault and allow the system to air out for 5-10 minutes.

4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.

5. Make notes about the external and internal condition of the vault.

   Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.

6. Remove large loose debris and trash using a pole with a grapple or net on the end.

7. Using a boom, crane, or other device (dolly and ramp), offload the replacement cartridges (up to 150 lbs. each) and set aside.
8. Remove used cartridges from the vault using one of the following methods:

Important: This activity will require that workers enter the vault to remove the cartridges from the drainage system.

Method 1:

a. Using an appropriate sling, attach the cable from the boom, crane, or tripod to the cartridge being removed. Contact CONTECH Stormwater Solutions for specifications on appropriate attachment devices.

This activity will require that workers enter the vault to remove the cartridges from the drainage system and place them under the vault opening for lifting.

Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

b. Remove the used cartridges (250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless CONTECH Stormwater Solutions performs the maintenance activities and damage is not related to discharges to the system.

c. Set the used cartridge aside or load onto the hauling truck.

d. Continue steps a through c until all cartridges have been removed.

Method 2:

a. Unscrew the cartridge cap.

b. Remove the cartridge hood.

c. Tip the cartridge on its side.

Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

d. Empty the cartridge onto the vault floor.

e. Set the empty, used cartridge aside or load onto the hauling truck.

f. Continue steps a through e until all cartridges have been removed.

9. Remove deposited sediment from the floor of the vault and, if large amounts are present, from the forebay. This can usually be accomplished by shoveling the sediment into containers, which, once full, are lifted mechanically from the vault and placed onto the hauling truck. If Method 2 in Step 8 is used to empty the cartridges, or in cases of extreme sediment loading, a vactor truck may be required.

10. Once the sediments are removed, assess the condition of the vault and the condition of the manifold and connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude above the floor of the vault.
    a. If required, apply a light coating of FDA approved silicon grease to the outside of the exposed portion of the connectors. This ensures a watertight connection between the cartridge and the drainage pipe.
    b. Replace any damaged connectors.
11. Using the boom, crane, or tripod, lower and install the new cartridges. Once

again, take care not to damage connections.

12. Close and fasten the door.

13. Remove safety equipment.

14. Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loadings of other materials to the system.

15. Finally, dispose of the residual materials in accordance with applicable regulations. Make arrangements to return the used cartridges to CONTECH Stormwater Solutions.

Related Maintenance Activities

(Performed on an as-needed basis)

StormFilter units are often just one of many components in a more comprehensive stormwater drainage and treatment system. The entire system may include catch basins, detention vaults, sedimentation vaults and manholes, detention/retention ponds, swales, artificial wetlands, and other miscellaneous components.
In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil and grease loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in a manner that will not allow the material to affect surface or ground water. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. It is not appropriate to discharge untreated materials back to the stormwater drainage system.

Part of arranging for maintenance to occur should include coordination of disposal of solids (landfill coordination) and liquids (municipal vacuum truck decant facility, local wastewater treatment plant, on-site treatment and discharge).

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals. CONTECH Stormwater Solutions will determine disposal methods or reuse of the media contained in the cartridges. If the material has been contaminated with any unusual substance, the cost of special handling and disposal will be the responsibility of the owner.

StormFilter Minor Maintenance and Inspection Data Sheet

Date: _____ **Personnel:** _____

Location: _____ **System Size:** _____

System Type: Vault Cast-In-Place Linear

System Observations

Media Months in Service: _____

Oil and Grease in Forebay: **Yes** **No** _____

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: **Yes** **No** How Deep: _____

StormFilter Minor Maintenance Activities (check off if done and give description)

Trash and Debris Removal: _____

Minor Structural Repairs: _____

Drainage Area Report

Excessive Oil and Grease Loading: **Yes** **No** Source: _____

Sediment Accumulation on Pavement: **Yes** **No** Source: _____

Erosion of Landscaped Areas: **Yes** **No** Source: _____

Items Needing Further Work: _____

Other Comments: _____

Review the condition reports from the previous minor and major maintenance visits.

StormFilter Major Maintenance/Cartridge Replacement Data Sheet

Date: _____ **Personnel:** _____

Location: _____ **System Size:** _____

System Type: Vault Cast-In-Place Linear

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Media Months in Service: _____

Oil and Grease in Forebay: **Yes** **No** _____

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil and Grease Loading: **Yes** **No** Source: _____

Sediment Accumulation on Pavement: **Yes** **No** Source: _____

Erosion of Landscaped Areas: **Yes** **No** Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: **Yes** **No** Details: _____

Replace Cartridges: **Yes** **No** Details: _____

Sediment Removed: **Yes** **No** Details: _____

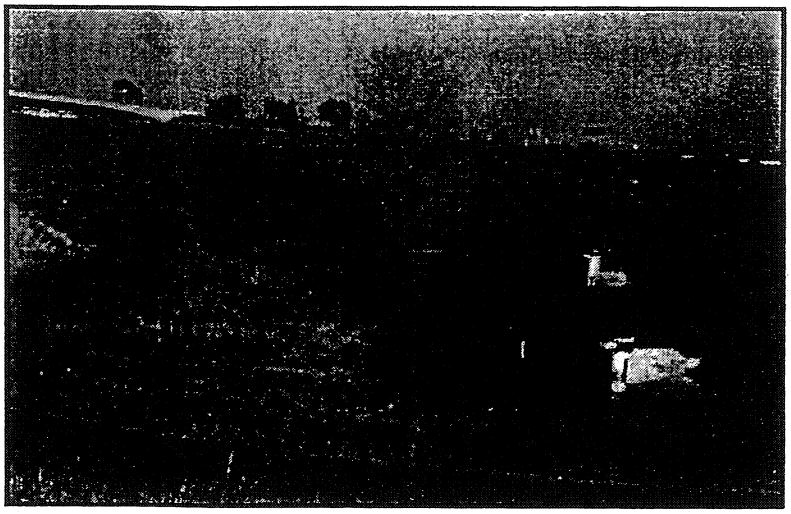
Quantity of Sediment Removed (estimate?): _____

Minor Structural Repairs: **Yes** **No** Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes: _____

Extended Detention Basin TC-22



Design Considerations

- Tributary Area
- Area Required
- Hydraulic Head

Description

Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to detain the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a large permanent pool. They can also be used to provide flood control by including additional flood detention storage.

California Experience

Caltrans constructed and monitored 5 extended detention basins in southern California with design drain times of 72 hours. Four of the basins were earthen, less costly and had substantially better load reduction because of infiltration that occurred, than the concrete basin. The Caltrans study reaffirmed the flexibility and performance of this conventional technology. The small headloss and few siting constraints suggest that these devices are one of the most applicable technologies for stormwater treatment.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	■
☑	Metals	▲
☑	Bacteria	▲
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

Advantages

- Due to the simplicity of design, extended detention basins are relatively easy and inexpensive to construct and operate.
- Extended detention basins can provide substantial capture of sediment and the toxics fraction associated with particulates.
- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency

relationships resulting from the increase of impervious cover in a watershed.

Limitations

- Limitation of the diameter of the orifice may not allow use of extended detention in watersheds of less than 5 acres (would require an orifice with a diameter of less than 0.5 inches that would be prone to clogging).
- Dry extended detention ponds have only moderate pollutant removal when compared to some other structural stormwater practices, and they are relatively ineffective at removing soluble pollutants.
- Although wet ponds can increase property values, dry ponds can actually detract from the value of a home due to the adverse aesthetics of dry, bare areas and inlet and outlet structures.

Design and Sizing Guidelines

- Capture volume determined by local requirements or sized to treat 85% of the annual runoff volume.
- Outlet designed to discharge the capture volume over a period of hours.
- Length to width ratio of at least 1.5:1 where feasible.
- Basin depths optimally range from 2 to 5 feet.
- Include energy dissipation in the inlet design to reduce resuspension of accumulated sediment.
- A maintenance ramp and perimeter access should be included in the design to facilitate access to the basin for maintenance activities and for vector surveillance and control.
- Use a draw down time of 48 hours in most areas of California. Draw down times in excess of 48 hours may result in vector breeding, and should be used only after coordination with local vector control authorities. Draw down times of less than 48 hours should be limited to BMP drainage areas with coarse soils that readily settle and to watersheds where warming may be determined to downstream fisheries.

Construction/Inspection Considerations

- Inspect facility after first large to storm to determine whether the desired residence time has been achieved.
- When constructed with small tributary area, orifice sizing is critical [illegible] verify that flow through additional openings such as bolt holes does not occur.

Performance

One objective of stormwater management practices can be to reduce the flood hazard associated with large storm events by reducing the peak flow associated with these storms. Dry extended detention basins can easily be designed for flood control, and this is actually the primary purpose of most detention ponds.

Dry extended detention basins provide moderate pollutant removal, provided that the recommended design features are incorporated. Although they can be effective at removing some pollutants through settling, they are less effective at removing soluble pollutants because of the absence of a permanent pool. Several studies are available on the effectiveness of dry extended detention ponds including one recently concluded by Caltrans (2002).

The load reduction is greater than the concentration reduction because of the substantial infiltration that occurs. Although the infiltration of stormwater is clearly beneficial to surface receiving waters, there is the potential for groundwater contamination. Previous research on the effects of incidental infiltration on groundwater quality indicated that the risk of contamination is minimal.

There were substantial differences in the amount of infiltration that were observed in the earthen basins during the Caltrans study. On average, approximately 40 percent of the runoff entering the unlined basins infiltrated and was not discharged. The percentage ranged from a high of about 60 percent to a low of only about 8 percent for the different facilities. Climatic conditions and local water table elevation are likely the principal causes of this difference. The least infiltration occurred at a site located on the coast where humidity is higher and the basin invert is within a few meters of sea level. Conversely, the most infiltration occurred at a facility located well inland in Los Angeles County where the climate is much warmer and the humidity is less, resulting in lower soil moisture content in the basin floor at the beginning of storms.

Vegetated detention basins appear to have greater pollutant removal than concrete basins. In the Caltrans study, the concrete basin exported sediment and associated pollutants during a number of storms. Export was not as common in the earthen basins, where the vegetation appeared to help stabilize the retained sediment.

Siting Criteria

Dry extended detention ponds are among the most widely applicable stormwater management practices and are especially useful in retrofit situations where their low hydraulic head requirements allow them to be sited within the constraints of the existing storm drain system. In addition, many communities have detention basins designed for flood control. It is possible to modify these facilities to incorporate features that provide water quality treatment and/or channel protection. Although dry extended detention ponds can be applied rather broadly, designers need to ensure that they are feasible at the site in question. This section provides basic guidelines for siting dry extended detention ponds.

In general, dry extended detention ponds should be used on sites with a minimum area of 5 acres. With this size catchment area, the orifice size can be on the order of 0.5 inches. On smaller sites, it can be challenging to provide channel or water quality control because the orifice diameter at the outlet needed to control relatively small storms becomes very small and thus prone to clogging. In addition, it is generally more cost-effective to control larger drainage areas due to the economies of scale.

Extended detention basins can be used with almost all soils and geology, with minor design adjustments for regions of rapidly percolating soils such as sand. In these areas, extended detention ponds may need an impermeable liner to prevent ground water contamination.

The base of the extended detention facility should not intersect the water table. A permanently wet bottom may become a mosquito breeding ground. Research in Southwest Florida (Santana et al., 1994) demonstrated that intermittently flooded systems, such as dry extended detention ponds, produce more mosquitoes than other pond systems, particularly when the facilities remained wet for more than 3 days following heavy rainfall.

A study in Prince George's County, Maryland, found that stormwater management practices can increase stream temperatures (Galli, 1990). Overall, dry extended detention ponds increased temperature by about 5°F. In cold water streams, dry ponds should be designed to detain stormwater for a relatively short time (i.e., 24 hours) to minimize the amount of warming that occurs in the basin.

Additional Design Guidelines

In order to enhance the effectiveness of extended detention basins, the dimensions of the basin must be sized appropriately. Merely providing the required storage volume will not ensure maximum constituent removal. By effectively configuring the basin, the designer will create a long flow path, promote the establishment of low velocities, and avoid having stagnant areas of the basin. To promote settling and to attain an appealing environment, the design of the basin should consider the length to width ratio, cross-sectional areas, basin slopes and pond configuration, and aesthetics (Young et al., 1996).

Energy dissipation structures should be included for the basin inlet to prevent resuspension of accumulated sediment. The use of stilling basins for this purpose should be avoided because the standing water provides a breeding area for mosquitoes.

Extended detention facilities should be sized to completely capture the water quality volume. A micropool is often recommended for inclusion in the design and one is shown in the schematic diagram. These small permanent pools greatly increase the potential for mosquito breeding and complicate maintenance activities; consequently, they are not recommended for use in California.

A large aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W) where feasible. Basin depths optimally range from 2 to 5 feet.

The facility's drawdown time should be regulated by an orifice or weir. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes. The outlet design implemented by Caltrans in the facilities constructed in San Diego County used an outlet riser with orifices

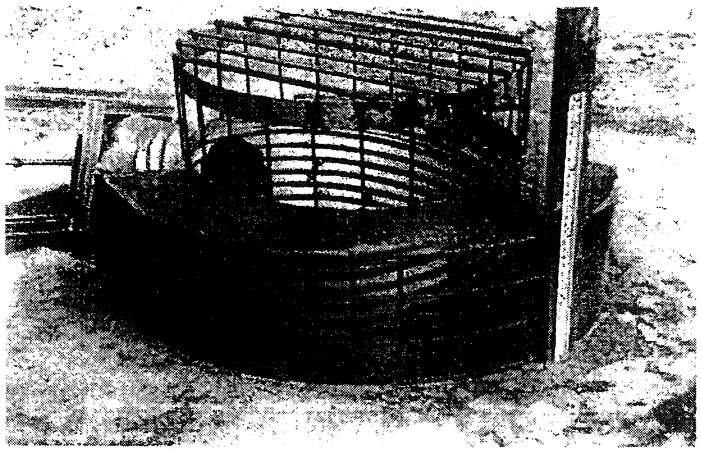


Figure 1
Example of Extended Detention Outlet Structure

sized to discharge the water quality volume, and the riser overflow height was set to the design storm elevation. A stainless steel screen was placed around the outlet riser to ensure that the orifices would not become clogged with debris. Sites either used a separate riser or broad crested weir for overflow of runoff for the 25 and greater year storms. A picture of a typical outlet is presented in Figure 1.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure can be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed.

Summary of Design Recommendations

(1) Facility Sizing - The required water quality volume is determined by local regulations or the basin should be sized to capture and treat 85% of the annual runoff volume. See Section 5.5.1 of the handbook for a discussion of volume-based design.

Basin Configuration – A high aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W). The flowpath length is defined as the distance from the inlet to the outlet as measured at the surface. The width is defined as the mean width of the basin. Basin depths optimally range from 2 to 5 feet. The basin may include a sediment forebay to provide the opportunity for larger particles to settle out.

A micropool should not be incorporated in the design because of vector concerns. For online facilities, the principal and emergency spillways must be sized to provide one foot of freeboard during the 25-year event and to safely pass the flow from 100-year storm.

(2) Pond Side Slopes - Side slopes of the pond should be 3:1 (H:V) or flatter for grass stabilized slopes. Slopes steeper than 3:1 (H:V) must be stabilized with an appropriate slope stabilization practice.

(3) Basin Lining – Basins must be constructed to prevent possible contamination of groundwater below the facility

(4) Basin Inlet – Energy dissipation is required at the basin inlet to reduce resuspension of accumulated sediment and to reduce the tendency for short-circuiting.

(5) Outflow Structure - The facility's drawdown time should be regulated by a gate valve or orifice plate. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure should be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed. This same valve also can be used to regulate the rate of discharge from the basin.

The discharge through a control orifice is calculated from:

$$Q = CA(2g(H-H_o))^{0.5}$$

where: Q = discharge (ft^3/s)
C = orifice coefficient
A = area of the orifice (ft^2)
g = gravitational constant (32.2)
H = water surface elevation (ft)
H_o= orifice elevation (ft)

Recommended values for C are 0.66 for thin materials and 0.80 when the material is thicker than the orifice diameter. This equation can be implemented in spreadsheet form with the pond stage/volume relationship to calculate drain time. To do this, use the initial height of the water above the orifice for the water quality volume. Calculate the discharge and assume that it remains constant for approximately 10 minutes. Based on that discharge, estimate the total discharge during that interval and the new elevation based on the stage volume relationship. Continue to iterate until H is approximately equal to H_o. When using multiple orifices the discharge from each is summed.

(6) Splitter Box - When the pond is designed as an offline facility, a splitter structure is used to isolate the water quality volume. The splitter box, or other flow diverting approach, should be designed to convey the 25-year storm event while providing at least 1.0 foot of freeboard along pond side slopes.

(7) Erosion Protection at the Outfall - For online facilities, special consideration should be given to the facility's outfall location. Flared pipe end sections that discharge at or near the stream invert are preferred. The channel immediately below the pond outfall should be modified to conform to natural dimensions, and lined with large stone riprap placed over filter cloth. Energy dissipation may be required to reduce flow velocities from the primary spillway to non-erosive velocities.

(8) Safety Considerations - Safety is provided either by fencing of the facility or by managing the contours of the pond to eliminate dropoffs and other hazards. Earthen side slopes should not exceed 3:1 (H:V) and should terminate on a flat safety bench area. Landscaping can be used to impede access to the facility. The primary spillway opening must not permit access by small children. Outfall pipes above 48 inches in diameter should be fenced.

Maintenance

Routine maintenance activity is often thought to consist mostly of sediment and trash and debris removal; however, these activities often constitute only a small fraction of the maintenance hours. During a recent study by Caltrans, 72 hours of maintenance was performed annually, but only a little over 7 hours was spent on sediment and trash removal. The largest recurring activity was vegetation management, routine mowing. The largest absolute number of hours was associated with vector control because of mosquito breeding that occurred in the stilling basins (example of standing water to be avoided) installed as energy dissipaters. In most cases, basic housekeeping practices such as removal of debris accumulations and vegetation

management to ensure that the basin dewaters completely in 48-72 hours is sufficient to prevent creating mosquito and other vector habitats.

Consequently, maintenance costs should be estimated based primarily on the mowing frequency and the time required. Mowing should be done at least annually to avoid establishment of woody vegetation, but may need to be performed much more frequently if aesthetics are an important consideration.

Typical activities and frequencies include:

- Schedule semiannual inspection for the beginning and end of the wet season for standing water, slope stability, sediment accumulation, trash and debris, and presence of burrows.
- Remove accumulated trash and debris in the basin and around the riser pipe during the semiannual inspections. The frequency of this activity may be altered to meet specific site conditions.
- Trim vegetation at the beginning and end of the wet season and inspect monthly to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and re-grade about every 10 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Inspect the basin each year for accumulated sediment volume.

Cost

Construction Cost

The construction costs associated with extended detention basins vary considerably. One recent study evaluated the cost of all pond systems (Brown and Schueler, 1997). Adjusting for inflation, the cost of dry extended detention ponds can be estimated with the equation:

$$C = 12.4V^{0.756}$$

where: C = Construction, design, and permitting cost, and
V = Volume (ft^3)

Using this equation, typical construction costs are:

$ 41,600 for a 1 acre-foot pond

$ 239,000 for a 10 acre-foot pond

$ 1,380,000 for a 100 acre-foot pond

Interestingly, these costs are generally slightly higher than the predicted cost of wet ponds (according to Brown and Schueler, 1997) on a cost per total volume basis, which highlights the difficulty of developing reasonably accurate construction estimates. In addition, a typical facility constructed by Caltrans cost about $160,000 with a capture volume of only 0.3 ac-ft.

An economic concern associated with dry ponds is that they might detract slightly from the value of adjacent properties. One study found that dry ponds can actually detract from the

perceived value of homes adjacent to a dry pond by between 3 and 10 percent (Emmerling-Dinovo, 1995).

Maintenance Cost

For ponds, the annual cost of routine maintenance is typically estimated at about 3 to 5 percent of the construction cost (EPA website). Alternatively, a community can estimate the cost of the maintenance activities outlined in the maintenance section. Table 1 presents the maintenance costs estimated by Caltrans based on their experience with five basins located in southern California. Again, it should be emphasized that the vast majority of hours are related to vegetation management (mowing).

Table 1 Estimated Average Annual Maintenance Effort

Activity	Labor Hours	Equipment & Material ($)	Cost
Inspections	4	7	183
Maintenance	49	126	2282
Vector Control	0	0	0
Administration	3	0	132
Materials	-	535	535
Total	56	$668	$3,132

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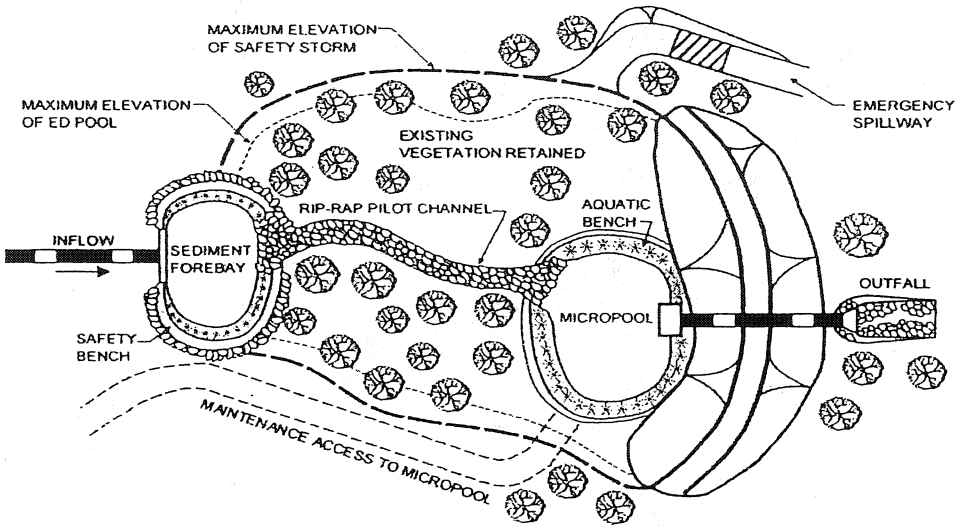
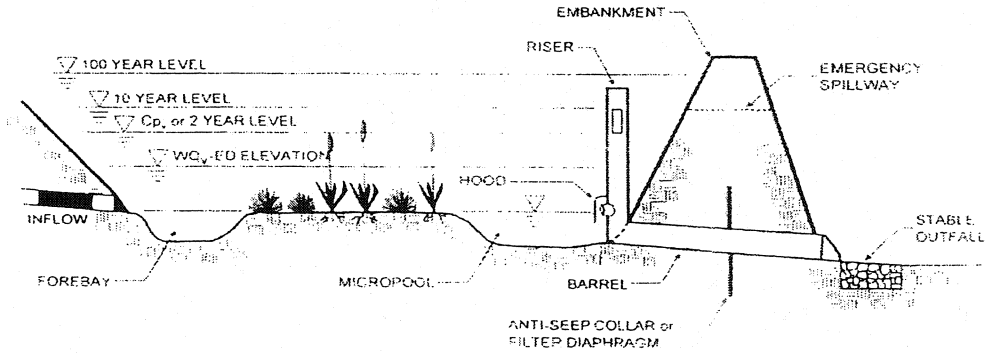
U.S. Environmental Protection Agency (USEPA). 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA-840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

TC-22 Extended Detention Basin



PLAN VIEW



PROFILE

Schematic of an Extended Detention Basin (MDE, 2000)

FILTERRA SIZING

WEST SIDE; "A-8B" = 0.28 acres

EAST SIDE: "A-8D" = 0.36 acres

USE 4'×8' BOX FOR EACH LOCATION

filterra
Bioretention Systems

Table 1: Filterra® Quick Sizing Table
(Western Zone - 0.2 in/hr Uniform Intensity Approach)

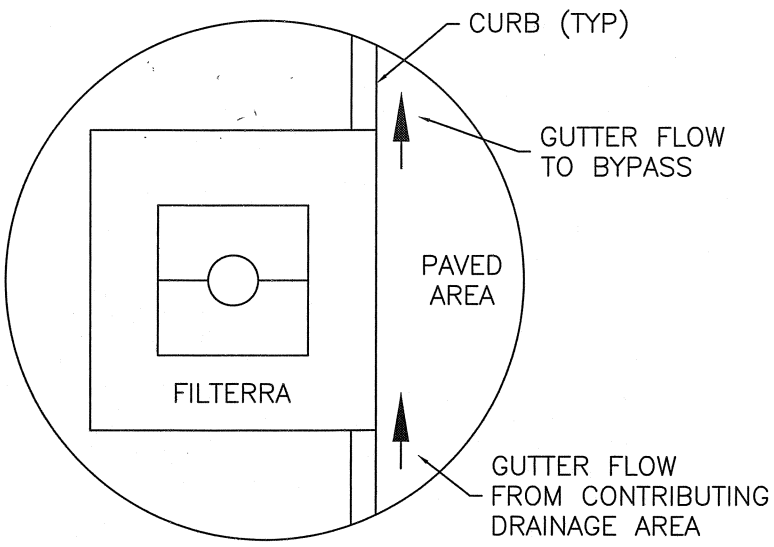
Available Filterra® Box Sizes (feet)	Recommended Commercial Contributing Drainage Area (acres) where C = 0.85	Outlet Pipe
4x4	up to 0.22	4" SDR-35 PVC
4x6.5 or 6.5x4	0.23 to 0.35	4" SDR-35 PVC
4x8 or 8x4	0.36 to 0.44	4" SDR-35 PVC
Standard 6x6	0.45 to 0.49	4" SDR-35 PVC
6x8 or 8x6	0.50 to 0.65	4" SDR-35 PVC
6x10 or 10x6	0.66 to 0.82	6" SDR-35 PVC
6x12 or 12x6	0.83 to 0.98	6" SDR-35 PVC

Available Filterra® Box Sizes (feet)	Recommended Residential Contributing Drainage Area (acres) where C = 0.50	Outlet Pipe
4x4	up to 0.37	4" SDR-35 PVC
4x6.5 or 6.5x4	0.38 to 0.60	4" SDR-35 PVC
4x8 or 8x4	0.61 to 0.74	4" SDR-35 PVC
Standard 6x6	0.75 to 0.83	4" SDR-35 PVC
6x8 or 8x6	0.84 to 1.11	4" SDR-35 PVC
6x10 or 10x6	1.12 to 1.39	6" SDR-35 PVC
6x12 or 12x6	1.40 to 1.67	6" SDR-35 PVC

Notes:

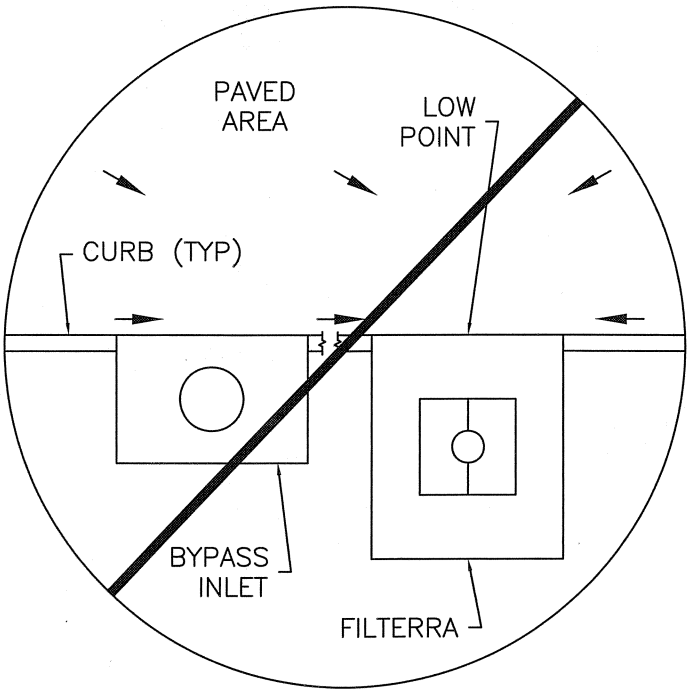
1. All boxes are a standard 3.5 feet depth (INV to TC)
2. A standard SDR-35 PVC pipe coupling is cast into the wall for easy connection to discharge drain
3. Dimensions shown are internal. Please add 1' to each external (using 6" walls)
4. In line with TR55 data, for Commercial Developments a minimum (runoff coefficient) C factor of 0.85 is recommended. For Residential Developments, use of C factors less than 0.5 require individual site review by Filterra.
5. Please ask for Sizing Tables for other target treatment goals, e.g. 0.3 in/hr
6. This sizing table is valid only for CA, NV, AZ, OR, ID, AK & HI

GRADING AND GUTTER FLOW

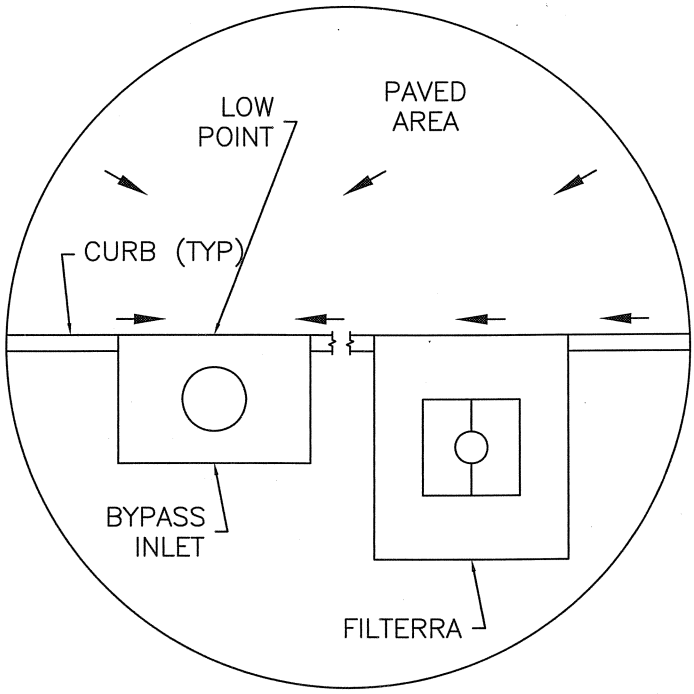


GUTTER FLOW

GRADING AND CURB AND GUTTER SHOULD BE SUCH THAT GUTTER FLOW APPROACHES THE FILTERRA FROM ONE SIDE OF THE THROAT AND FLOWS AWAY FROM THE FILTERRA ON THE OPPOSITE SIDE DURING EXTREME STORM EVENTS. DESIGN OR INSTALLATION SUCH THAT FLOW APPROACHES FROM BOTH SIDES WILL RESULT IN SITE MAINTENANCE ISSUES AND VOID MANUFACTURER'S MAINTENANCE PROGRAM AND WARRANTY.



INCORRECT



CORRECT

MODIFICATIONS OF DRAWINGS ARE ONLY PERMITTED BY WRITTEN AUTHORIZATION FROM FILTERRA

AMERICAST®

Copyright © 2007 by Americast

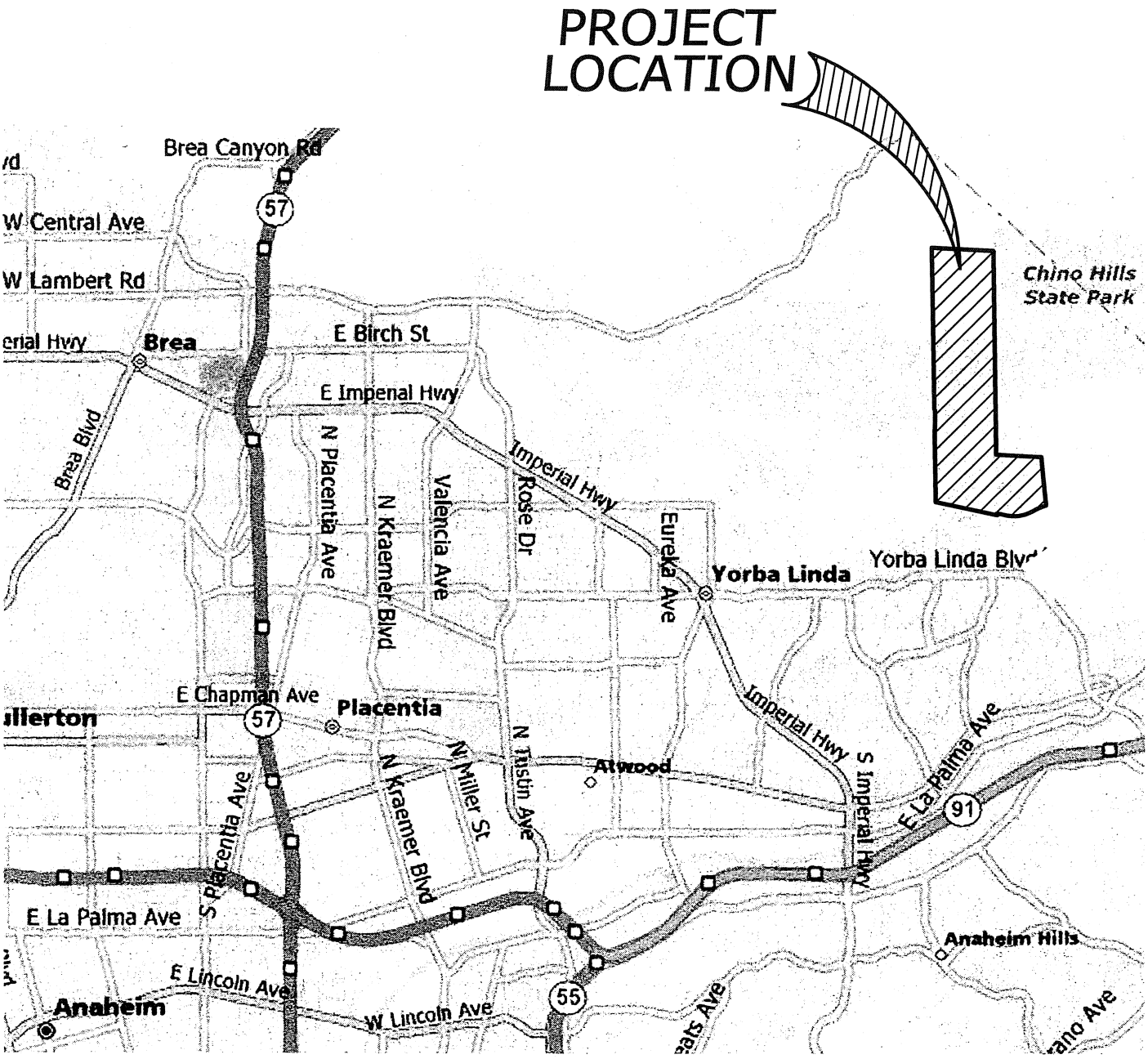
DATE: 03–03–05	DWG: GU1–A

FILTERRA® GUIDELINES
GRADING AND GUTTER FLOW

filterra®
US PAT 6,277,274 AND 6,569,321

Attachment B. .....Vicinity Map

CONCEPTUAL



Vicinity Map

NOT TO SCALE

N

SCALE: N.T.S.

Attachment C. .....Infiltration Map Figure XVI-2G

SUBJECT TO FURTHER REVISION

LEGEND

- OCWD Groundwater Basin Protection Boundary
- City Boundaries

Infiltration Constraints

- 1 Constraint
- 2 Overlapping Constraints
- 3 Overlapping Constraints
- 4 Overlapping Constraints

Analysis Layers Included: 1. Hydrologic Soil Group D, 2. Landslide Hazard Zone, 3. Groundwater Protection Areas 4. Approximate Selinium Area, 5. Depth to Groundwater <= 5'

Note: Screening datasets are not exhaustive. The applicant should always conduct a review of available site-specific information relative to infiltration constraints as part of assessing the feasibility of stormwater infiltration.
Source;
Infiltration Constraint Analysis: PACE/Geosyntec

SITE

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
INFILTRATION ANALYSIS
OVERLAPPING CONSTRAINT LOCATIONS

JOB
ORANGE COUNTY
INFILTRATION STUDY
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-2g

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2g_InfiltrationFinal_20110215.mxd

Attachment D. .....Susceptibility Map Figure XVI-3C

Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

Earth (Unstable)

Earth (Stabilized)

Stabilized

Tidal Influence

<= Mean High Water Line (4.28')

Water Body

Basin

Dam

Lake

Reservoir

Forest Areas

Cleveland National Forest

Other Lands

Airport/Military

San Gabriel-Coyote Creek Watershed

San Bernardino County

Riverside County

Anaheim Bay-Huntington Harbor Watershed

Santa Ana River Watershed

Newport Bay Watershed

South Orange County

SITE

GARBON CANYON

YORBA LINDA RESERVOIR

MILLER RETARDING BASIN

KRAEMER BASIN

ANAHEIM LAKE

WARNER BASIN

OLIVE HILLS

FLETCHER RETARDING BASIN

WALNUT CANYON RESERVOIR

VILLA PARK DAM

PETERS CANYON RESERVOIR

IRVINE LAKE

SOUTHPARK PUMP STATION

BARTLETT RETARDING BASIN

Yorba Linda

Los Alamitos Naval Air Station

Seal Beach Naval Weapons Station

Huntington Beach

Costa Mesa

John Wayne Airport

Long Beach

PRELIMINARY MAP - SUBJECT TO FURTHER REVISION

N

0 6,000 12,000 24,000 Feet

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TITLE

SUSCEPTIBILITY ANALYIS
SANTA ANA RIVER

JOB

ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO. CA

SCALE	1" = 6000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE

XVI-3c

Attachment E. .....Rainfall Zones Figure XVI-1

E-06/Sht 09 & E-01

SUBJECT TO FURTHER REVISION

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.

SITE

0 3 6 12 Kilometers

0 1.8 3.6 7.2 Miles

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

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

Attachment F.....Hydrologic Soil Group XVI-2B

SUBJECT TO FURTHER REVISION

SEE FIGURE'S FOR MORE DETAIL

SITE

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

LEGEND

City Boundaries

Hydrologic Soil Groups

D Soils

Source:
D Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2b

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2b_D-Soils_20110215.mxd

Attachment G. ..... Soils Engineer Discussion Memo and Soils Map Figure S

CONCEPTUAL

From: Kevin Colson [kcolson@lgcgeotechnical.com]
Sent: Wednesday, May 23, 2012 3:34 PM
To: chuck@chaengineering.com; 'Larry Netherton'
Subject: Infiltration
Attachments: Hydrologic Soils Groups.pdf; Infiltration Trench.pdf; Exhibit 7.III.pdf; Maps.pdf

Hi Chuck and Larry,

I have attached several excerpts from documents from the County's website regarding WQMP's. I have highlighted some of the line items for infiltration which concur with our recommendation that the site is not appropriate for infiltration. In short, the site is a hillside grading project with steep slopes in a landslide prone area, we will have areas of compacted fill and areas of bedrock, neither of which are anticipated to infiltrate at a sufficient rate. The attached maps also show the site to be in a landslide prone area and a Hydrologic Soil Group D soils. The documents indicate that sites in these areas are not suitable for infiltration.

I am suppose to receive a call back from the County tomorrow to clarify if we have sufficient cause to move to an alternative system or if we need to gather data and provide a report any way.

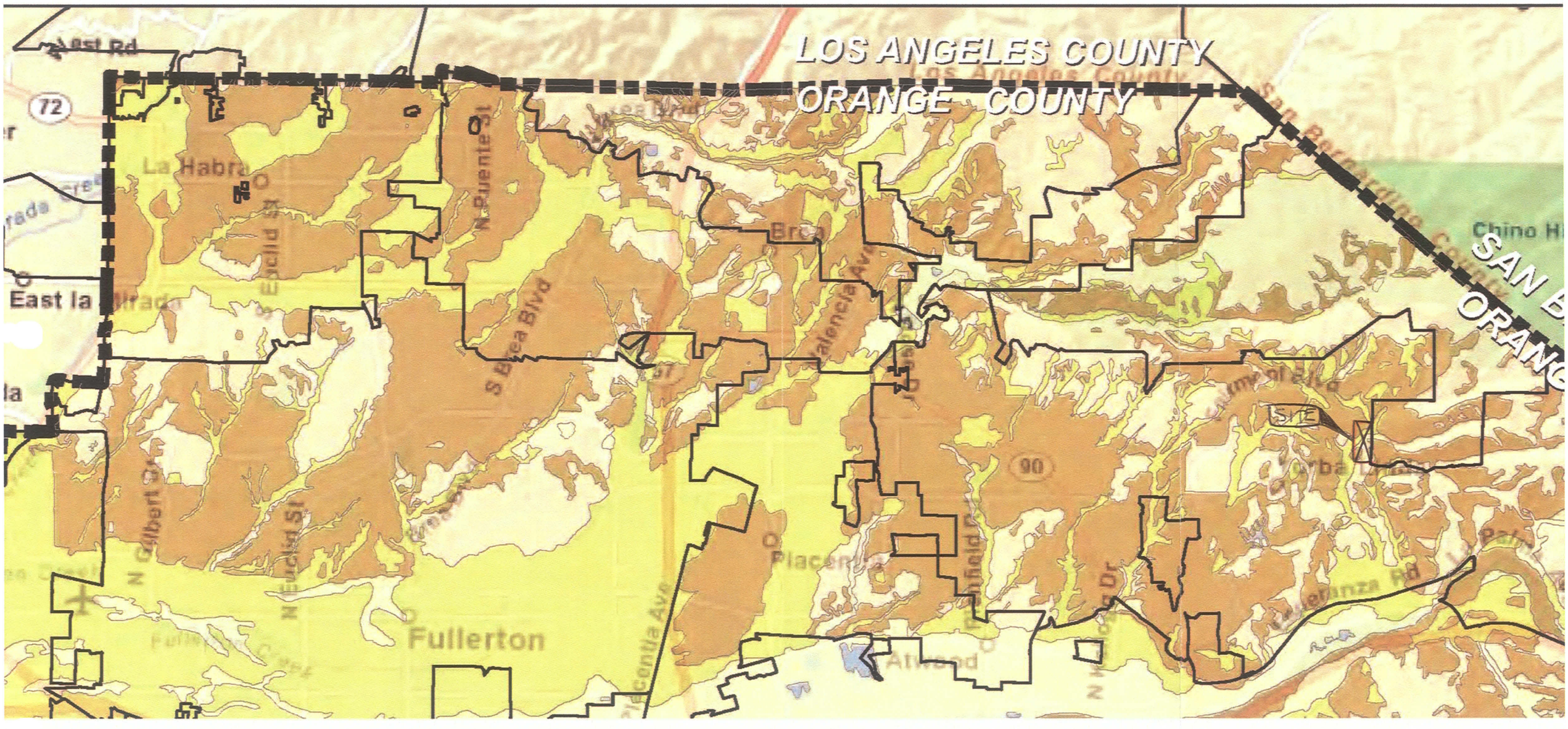
I will get back to you tomorrow.

Best regards,

Kevin B. Colson
Vice President

LGC Geotechnical, Inc.

120 Calle Iglesia, Suite A
San Clemente, CA 92672
office (949) 369-6141
cell (949) 412-0648
kcolson@lgcgeotechnical.com
www.lgcgeotechnical.com



SOILS MAP

FIGURE 'S'

(REFER TO FIG. XVI-2b)

Attachment H. ..... O. C. Hydrology 2-Year Frequency (North Site)

CONCEPTUAL

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
       (c) Copyright 1983-2007 Advanced Engineering Software (aes)
           Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-YEAR                                                                  *
* NORTH                                                                   *
* AREA E & F      EXISTING 2-YR (NORTH)                                   *
 **************************************************************************

  FILE NAME: CIELOXN.DAT
  TIME/DATE OF STUDY: 10:55 03/29/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ======= ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        0.43      0.20      1.000     83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        2.20      0.20      1.000     83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    2.67
 EFFECTIVE AREA(ACRES) =      2.63   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       3.19

****************************************************************************
 FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    638.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.2651
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       3.19
 FLOW VELOCITY(FEET/SEC) =   6.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.74   Tc(MIN.) =   11.46
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.46
 RAINFALL INTENSITY(INCH/HR) =   1.41
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       2.63
 TOTAL STREAM AREA(ACRES) =       2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.19

****************************************************************************
 FLOW PROCESS FROM NODE    602.10 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    780.00  DOWNSTREAM(FEET) =    638.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.501
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        1.63      0.20      1.000    83    8.50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      2.16
 TOTAL AREA(ACRES) =      1.63   PEAK FLOW RATE(CFS) =      2.16

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.50
 RAINFALL INTENSITY(INCH/HR) =   1.67
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.63
 TOTAL STREAM AREA(ACRES) =       1.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.16

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        3.19   11.46    1.407  0.20( 0.20) 1.00       2.6     600.00
     2        2.16    8.50    1.669  0.20( 0.20) 1.00       1.6     602.10
```

```
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        5.04    8.50    1.669  0.20( 0.20) 1.00        3.6     602.10
     2        4.96   11.46    1.407  0.20( 0.20) 1.00        4.3     600.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.04    Tc(MIN.) =     8.50
 EFFECTIVE AREA(ACRES) =       3.58   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =         4.3
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.50
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        4.19      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    4.19      SUBAREA RUNOFF(CFS) =    5.54
 EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      10.28

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    638.00  DOWNSTREAM(FEET) =    613.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   670.00   CHANNEL SLOPE =  0.0373
 CHANNEL FLOW THRU SUBAREA(CFS) =      10.28
 FLOW VELOCITY(FEET/SEC) =   4.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.30   Tc(MIN.) =   10.80
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.80
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        2.20      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    2.49
 EFFECTIVE AREA(ACRES) =      9.97   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       10.7       PEAK FLOW RATE(CFS) =      11.26
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.80
 EFFECTIVE AREA(ACRES) =      9.97  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =      11.26

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       11.26   10.80    1.455  0.20( 0.20) 1.00       10.0     602.10
     2       10.19   13.82    1.263  0.20( 0.20) 1.00       10.7     600.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

$T_c = 10.8$ min

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

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* DEVELOPED                                                             *
* NORTH                                                                 *
 ************************************************************************

  FILE NAME: CIELODN.DAT
  TIME/DATE OF STUDY: 10:59 04/08/2013
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ======= ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.43      0.20      1.000    83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.61      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.61      SUBAREA RUNOFF(CFS) =     1.95
  EFFECTIVE AREA(ACRES) =      2.04   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.0       PEAK FLOW RATE(CFS) =       2.47

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    665.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.4000
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.47
  FLOW VELOCITY(FEET/SEC) =   5.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     680.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.74
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.460
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK               D        1.51      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     1.51      SUBAREA RUNOFF(CFS) =     1.75
  EFFECTIVE AREA(ACRES) =      3.55   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.94
  TOTAL AREA(ACRES) =        3.5       PEAK FLOW RATE(CFS) =       4.07

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    618.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1035.00   CHANNEL SLOPE =  0.0454
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.07
  FLOW VELOCITY(FEET/SEC) =   4.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.03   Tc(MIN.) =   14.76
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.76
  RAINFALL INTENSITY(INCH/HR) =   1.22
  AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.94
  EFFECTIVE STREAM AREA(ACRES) =       3.55
  TOTAL STREAM AREA(ACRES) =       3.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.07

****************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    680.00  DOWNSTREAM(FEET) =    674.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.341
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
```

```
     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN   (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        1.23       0.20       0.600     75     9.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.62
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      1.62

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    501.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.34
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        1.09       0.20       1.000     83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.09      SUBAREA RUNOFF(CFS) =    1.36
  EFFECTIVE AREA(ACRES) =      2.32   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       2.97

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  674.00  DOWNSTREAM ELEVATION(FEET) =  646.00
  STREET LENGTH(FEET) =   340.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.11
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.40
  STREET FLOW TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =   10.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        3.47       0.20       0.600     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    4.27
  EFFECTIVE AREA(ACRES) =      5.79    AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.68
  TOTAL AREA(ACRES) =        5.8       PEAK FLOW RATE(CFS) =       7.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.03
  FLOW VELOCITY(FEET/SEC.) =  5.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.60
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  PUBLIC PARK                D        0.40       0.20       0.850     75
```

```
  COMMERCIAL                  D        0.96      0.20     0.100    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.321
  SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    1.74
  EFFECTIVE AREA(ACRES) =      7.15   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =        7.2       PEAK FLOW RATE(CFS) =       8.78

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.41
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       7.15
  TOTAL STREAM AREA(ACRES) =       7.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.78

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1        4.07   14.76    1.216  0.20( 0.19) 0.94        3.5     600.00
      2        8.78   10.41    1.486  0.20( 0.12) 0.61        7.2     500.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1       12.40   10.41    1.486  0.20( 0.14) 0.69        9.7     500.00
      2       11.11   14.76    1.216  0.20( 0.14) 0.72       10.7     600.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.40    Tc(MIN.) =    10.41
  EFFECTIVE AREA(ACRES) =       9.65   AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
  TOTAL AREA(ACRES) =       10.7
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       10.7  TC(MIN.) =     10.41
  EFFECTIVE AREA(ACRES) =      9.65  AREA-AVERAGED Fm(INCH/HR)=  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.693
  PEAK FLOW RATE(CFS)   =      12.40

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1       12.40   10.41    1.486  0.20( 0.14) 0.69        9.7     500.00
      2       11.11   14.76    1.216  0.20( 0.14) 0.72       10.7     600.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

Attachment I. .....O.C. Hydrology 2-Year Frequency (South Site)

CONCEPTUAL

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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           Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-YEAR                                                                 *
* AREA B                  EXISTING 2-YEAR (SOUTH "A")                    *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 15:06 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  ==================  ======  ===== ======= ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       1.86      0.20      1.000    83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.04
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      2.04

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D      13.03      0.20      1.000    83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   14.30
 EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      16.34
 FLOW VELOCITY(FEET/SEC) =   8.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   13.03
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.03
 RAINFALL INTENSITY(INCH/HR) =   1.31
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.89
 TOTAL STREAM AREA(ACRES) =      14.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                D       1.65      0.20      1.000    83   10.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.90
 TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      1.90

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.52
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D      13.18      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   15.15
 EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      17.05

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    755.00  DOWNSTREAM(FEET) =    564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.05
  FLOW VELOCITY(FEET/SEC) =   9.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =   13.05
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.05
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.83
  TOTAL STREAM AREA(ACRES) =      14.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       16.34   13.03    1.306  0.20( 0.20) 1.00      14.9     200.00
      2       17.05   13.05    1.305  0.20( 0.20) 1.00      14.8     202.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.38    Tc(MIN.) =    13.03
  EFFECTIVE AREA(ACRES) =      29.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       29.7
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       29.7  TC(MIN.) =     13.03
  EFFECTIVE AREA(ACRES) =     29.70  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      33.38

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 29.7

Q = 33.4 CFS

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-year                                                                *
* AREA C          EXISTING 2-YEAR (SOUTH "E")                           *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 15:07 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        2.17      0.20      1.000    83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.62
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      2.62

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       16.79      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   20.27
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      22.89

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.89
  FLOW VELOCITY(FEET/SEC) =   8.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   12.02
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       19.0  TC(MIN.) =     12.02
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      22.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 19.0 acre

Q = 22.9 cfs

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* AREA B DEVELOPED   PROPOSED 2-YEAR (SOUTH B)                          *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:19 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.79      0.20      0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.70
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      2.70

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.45      0.20      0.600    75
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =    2.37
 EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      5.07
 PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =   15.83
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   15.83
 RAINFALL INTENSITY(INCH/HR) =   1.17
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       5.24
 TOTAL STREAM AREA(ACRES) =       5.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.37     0.20      0.600    75    9.65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      3.05
 TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      3.05

****************************************************************************
 FLOW PROCESS FROM NODE    102.20 TO NODE    102.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 D        0.41     0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.51
 EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       3.56

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.65
  RAINFALL INTENSITY(INCH/HR) =   1.55
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.64
  EFFECTIVE STREAM AREA(ACRES) =       2.78
  TOTAL STREAM AREA(ACRES) =       2.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.56

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        5.07   15.83    1.168  0.20( 0.12) 0.60       5.2     100.00
      2        3.56    9.65    1.552  0.20( 0.13) 0.64       2.8     102.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.79    9.65    1.552  0.20( 0.12) 0.62       6.0     102.10
      2        7.67   15.83    1.168  0.20( 0.12) 0.61       8.0     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =     9.65
  EFFECTIVE AREA(ACRES) =       5.97   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =        8.0
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.65
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        1.80      0.20     0.600    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    2.32
  EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =        9.8       PEAK FLOW RATE(CFS) =      10.00

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.00
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       D        2.07      0.20     0.600    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.07     SUBAREA RUNOFF(CFS) =     2.59
  EFFECTIVE AREA(ACRES) =      9.84   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.29
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   10.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.40
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       9.84
  TOTAL STREAM AREA(ACRES) =      11.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
  ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        0.41      0.20      0.850    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  D        0.28      0.20      0.100    75
  COMMERCIAL                  D        0.36      0.20      0.100    75
  PUBLIC PARK                 D        0.32      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =     0.96     SUBAREA RUNOFF(CFS) =     1.90
  EFFECTIVE AREA(ACRES) =      1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.67

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.78      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    5.36
 EFFECTIVE AREA(ACRES) =      4.15   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.26
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.57
 EFFECTIVE STREAM AREA(ACRES) =       4.15
 TOTAL STREAM AREA(ACRES) =       4.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.03

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.29   10.40    1.487  0.20( 0.12) 0.61       9.8     102.10
     1       10.98   16.59    1.137  0.20( 0.12) 0.61      11.9     100.00
     2        8.03    5.00    2.264  0.20( 0.11) 0.57       4.2     104.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.00    2.264  0.20( 0.12) 0.59       8.9     104.10
     2       17.42   10.40    1.487  0.20( 0.12) 0.60      14.0     102.10
     3       14.80   16.59    1.137  0.20( 0.12) 0.60      16.0     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.42    Tc(MIN.) =    10.40
 EFFECTIVE AREA(ACRES) =      13.99   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =      16.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.42
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.44
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.44
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```
 RAINFALL INTENSITY(INCH/HR) =   1.48
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      13.99
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.42

****************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      5.16
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.32
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    2.79
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       7.95

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    649.00  DOWNSTREAM(FEET) =    604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.95
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.71
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.71
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.646
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        4.25      0.20      0.600    75
 PUBLIC PARK                 D        1.62      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.650
 SUBAREA AREA(ACRES) =    8.02      SUBAREA RUNOFF(CFS) =   10.94
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 EFFECTIVE AREA(ACRES) =     13.71   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.67
 TOTAL AREA(ACRES) =       13.7       PEAK FLOW RATE(CFS) =      18.66

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.65
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.67
 EFFECTIVE STREAM AREA(ACRES) =      13.71
 TOTAL STREAM AREA(ACRES) =      13.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       17.30    5.04    2.253  0.20( 0.12) 0.59       8.9     104.10
     1       17.42   10.44    1.484  0.20( 0.12) 0.60      14.0     102.10
     1       14.80   16.63    1.135  0.20( 0.12) 0.60      16.0     100.00
     2       18.66    8.71    1.646  0.20( 0.13) 0.67      13.7     105.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       32.43    5.04    2.253  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    8.71    1.646  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.44    1.484  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   16.63    1.135  0.20( 0.13) 0.63      29.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =      26.07   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =       29.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.49
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1956.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   576.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  43.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2006.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.26
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.21
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      29.8  TC(MIN.) =      9.21
  EFFECTIVE AREA(ACRES) =     26.07  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
  PEAK FLOW RATE(CFS)   =      36.04

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1       32.43    5.54    2.134  0.20( 0.13) 0.63       16.8     104.10
      2       36.04    9.21    1.594  0.20( 0.13) 0.63       26.1     105.10
      3       34.08   10.94    1.445  0.20( 0.13) 0.63       27.7     102.10
      4       27.17   17.17    1.115  0.20( 0.13) 0.63       29.8     100.00
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A=29.8 ac
Q= 36.1

Q intcpt from 33.4 cfs

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2007 Advanced Engineering Software (aes)
            Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA C DEVELOPED   PROPOSED 2-YEAR (SOUTH C)                           *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:53 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       1.76      0.20      1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      2.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 D       3.42      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     4.31
  EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.49

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     665.00  DOWNSTREAM(FEET) =     615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.49
  FLOW VELOCITY(FEET/SEC) =   5.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        1.63      0.20      0.850    75
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.52      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
  SUBAREA AREA(ACRES) =     2.15      SUBAREA RUNOFF(CFS) =     2.36
  EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.13      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.13      SUBAREA RUNOFF(CFS) =     1.22
  EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =       9.25

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     615.00  DOWNSTREAM(FEET) =     605.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.25
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.50
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     12.50
  EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
  PEAK FLOW RATE(CFS)    =       9.25
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 8,5

$Q_2 = 9.2$

Attachment J. ..... Onsite/Offsite 2-year Runoff Comparison by TRWE

(Excerpt included. See attached separate report by others)

CONCEPTUAL

TORY R. WALKER ENGINEERING, INC.
WATER RESOURCES PLANNING & ENGINEERING

TECHNICAL MEMORANDUM

TO: Larry Netherton
Sage Community Group, Inc.

FROM: Tory Walker, PE, CFM, LEED GA
Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.

DATE: April 9, 2013

RE: Summary of Unit Hydrograph Analysis for Hydromodification Compliance of Cielo Vista, Yorba Linda, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed Cielo Vista development project in the City of Yorba Linda using the Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the Orange County Hydrology Manual. Total hydrographs for the 2-year storm event were prepared for existing and developed conditions for all on and off-site contributing drainage areas in order to demonstrate that the project meets the current Orange County hydromodification requirements.

METHODOLOGY FOR UNIT HYDROGRAPH ANALYSIS

Design Storm

The 2-year, 24-hour design rainfall was determined using the Unit Hydrograph Method Design Storm from Section B.4 of the Orange County Hydrology Manual (OCHM). As required by the OCHM, the precipitation values were corrected to account for the tendency of the average rainfall intensity to decrease with respect to increased area for single event storms. In order to provide the peak flow at the confluence of Creek B, Creek C, and Creek D at the Western Boundary (see Hydrology Map in Attachments), a single design storm was created for use in all three creeks by using correction factors based on the total area of the Creek B, C, and D catchments. A separate design storm was created for Creek A as no confluence analysis was required for this creek at the southern boundary. Rainfall distributions are listed in the Appendix.

Losses

Catchment losses and effective rainfall were computed using the Curve Number Method as described in Section C of the OCHM. This method requires the determination of soil and cover type parameters for each catchment. Curve Numbers (CN) in this report reflect the assumption of Antecedent Moisture Condition I (AMC I), which is required for the 2 year return period storm. For detailed information and maps on soil type, cover type, and CN selection please refer to the following sections and the Attachments for this memo.

Unit Hydrograph Method

The Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the OCHM was used for the hydrologic calculations for this project. S-Curves were developed for each catchment based on watershed characteristics. The unit hydrograph was then convoluted with the effective rainfall for each catchment to determine the total hydrograph. The total hydrograph at the confluence of Creeks B, C, and D was calculated by summation of the individual flow ordinates for each creek's hydrograph.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In existing conditions, hydrologic soil groups D and C dominate each catchment with only small patches of type B soil in some areas (refer to Attachments for Soil Type Maps). Both group D and group C soils have slow infiltration rates when saturated. This is especially true for D soils, which consist chiefly of clay soils with a high swelling potential, clay pan or clay layer at or near the surface, or shallow soils over nearly impervious materials. Group D soils have a very slow rate of water transmission. As a result, losses due to infiltration will be relatively low for all catchments.

Cover type for each catchment consists primarily of natural open space with only a small portion of residential development located in the lower reaches. In fact, Creek A and Creek B were determined to be entirely natural open space. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial". Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM.

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is included in the Attachments.

Peak Flow Determination

The existing conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 1 and 2 below. It is important to note that the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

TABLE 1 - Existing Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek B	224	131.0
Creek C	717	327.9
Creek D	473	275.6
TOTAL: Confluence of Creeks B, C, & D	1414	647.0

TABLE 2 - Existing Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek A	674	296.6

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In developed conditions, the distribution of hydrologic soil groups is assumed to remain the same as the existing conditions described in the previous section (refer to Attachments for Soil Type Maps).

The proposed project site is approximately 4% of the total of all drainage areas, and as a result the cover type for each catchment remains primarily natural open space with only a small portion of residential development located in the lower reaches. The main difference from existing conditions is that residential development is now present in Creek A and Creek B.

Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial."

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is presented in the Attachments.

Peak Flow Determination

The proposed conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 3 and 4. As was noted in existing conditions, the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

It is evident from Tables 3 and 4 that the development of the project site has a negligible effect on the peak flows of all four creeks. The largest peak flow increase is a mere 0.5 cfs in Creek A. These minute increases in peak flow are attributable to two factors. First, the area being developed is relatively small when compared to the size of each catchment. Second, the fact that the infiltration capacity of each catchment has already been greatly exceeded during the peak of the storm makes the addition of impervious area somewhat irrelevant.

Thus, while the increase in total runoff volume may be more significant, the project's impact on the maximum peak flows of the hydrographs for all creeks is minimal.

TABLE 3 - Developed Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek B	224	131.1	0.1
Creek C	717	328.0	0.0
Creek D	473	275.6	0.0
TOTAL: Confluence of Creeks B, C, & D	1414	647.2	0.1

TABLE 4 - Developed Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek A	674	297.1	0.5

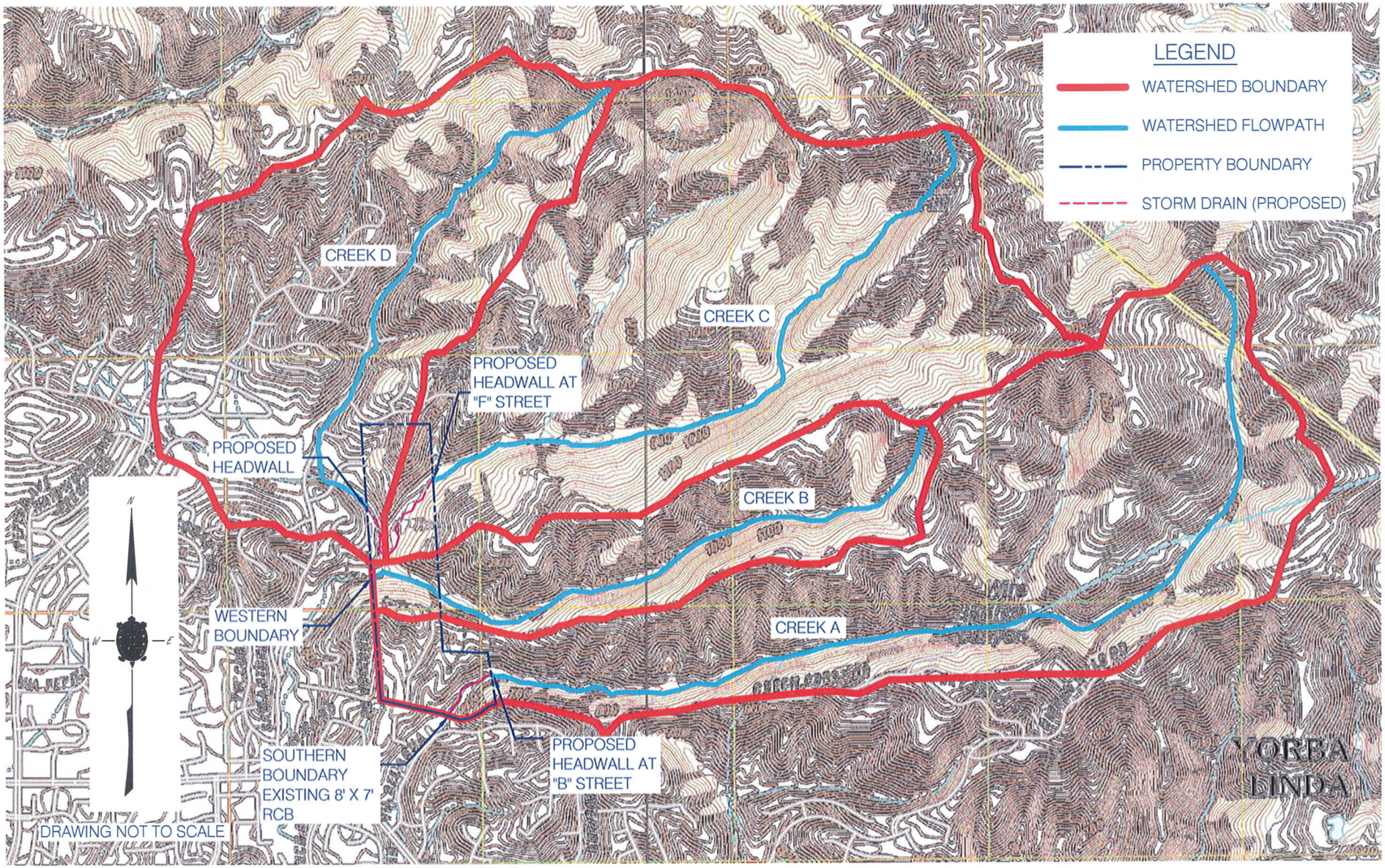
SUMMARY

This study has demonstrated that the increase in peak flow for all receiving creeks due to development of the proposed Cielo Vista site is less than 1%, thus complying with the current Orange County hydromodification criteria.

ATTACHMENTS

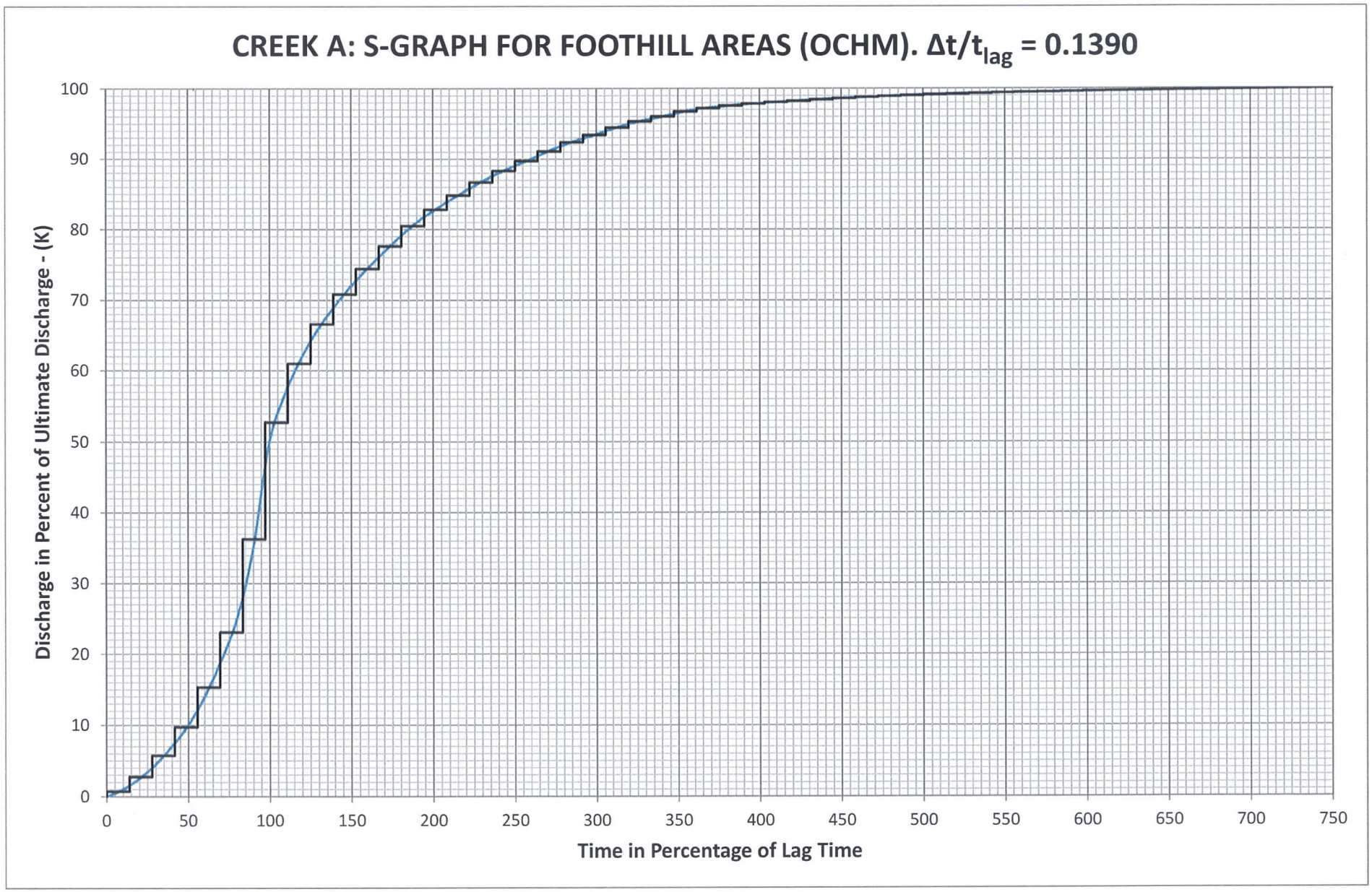
1. Hydrology Map
2. Rainfall, Curve Number, and Unit Hydrograph Calculations

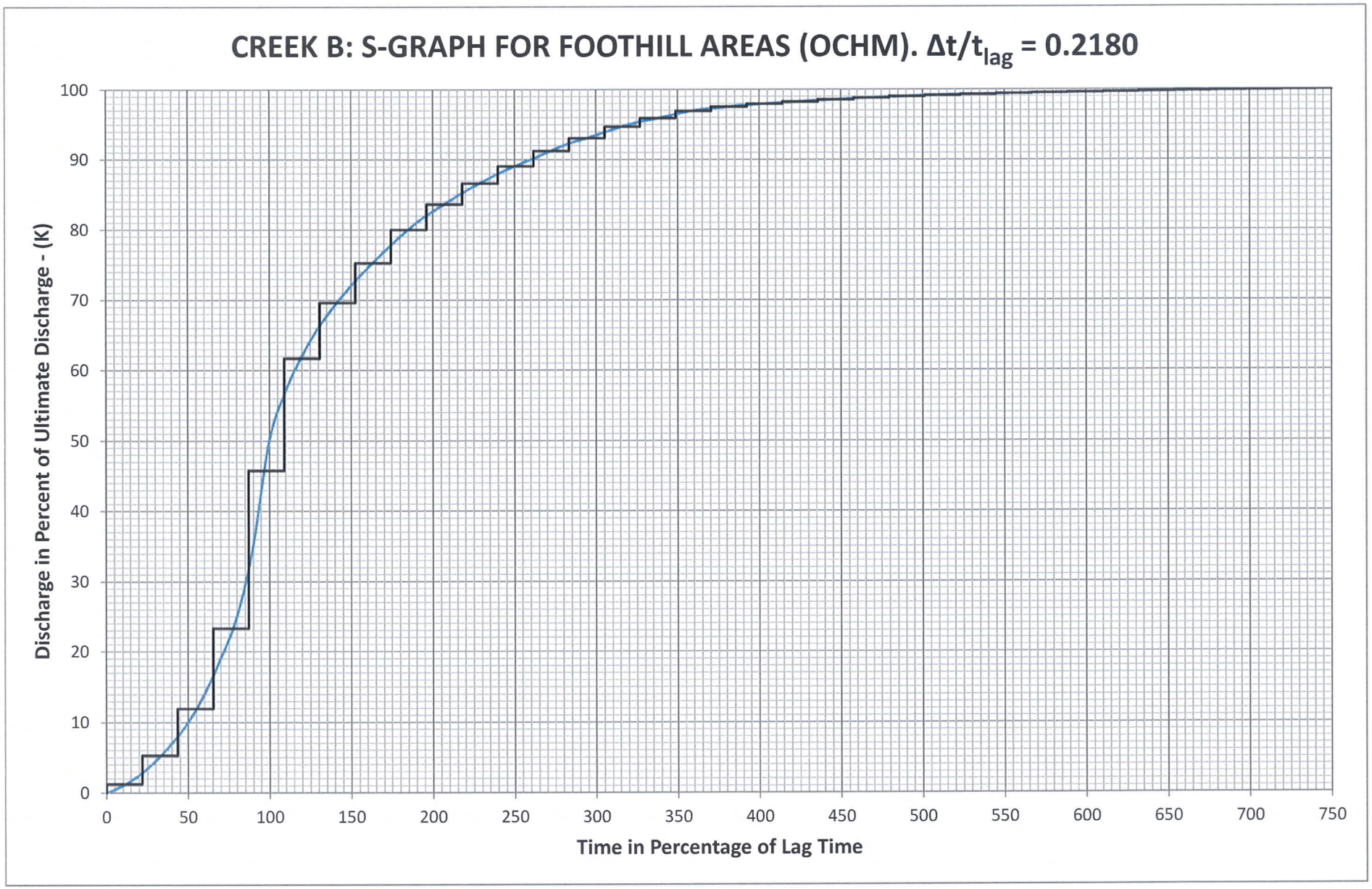
ATTACHMENT 1. Hydrology Map

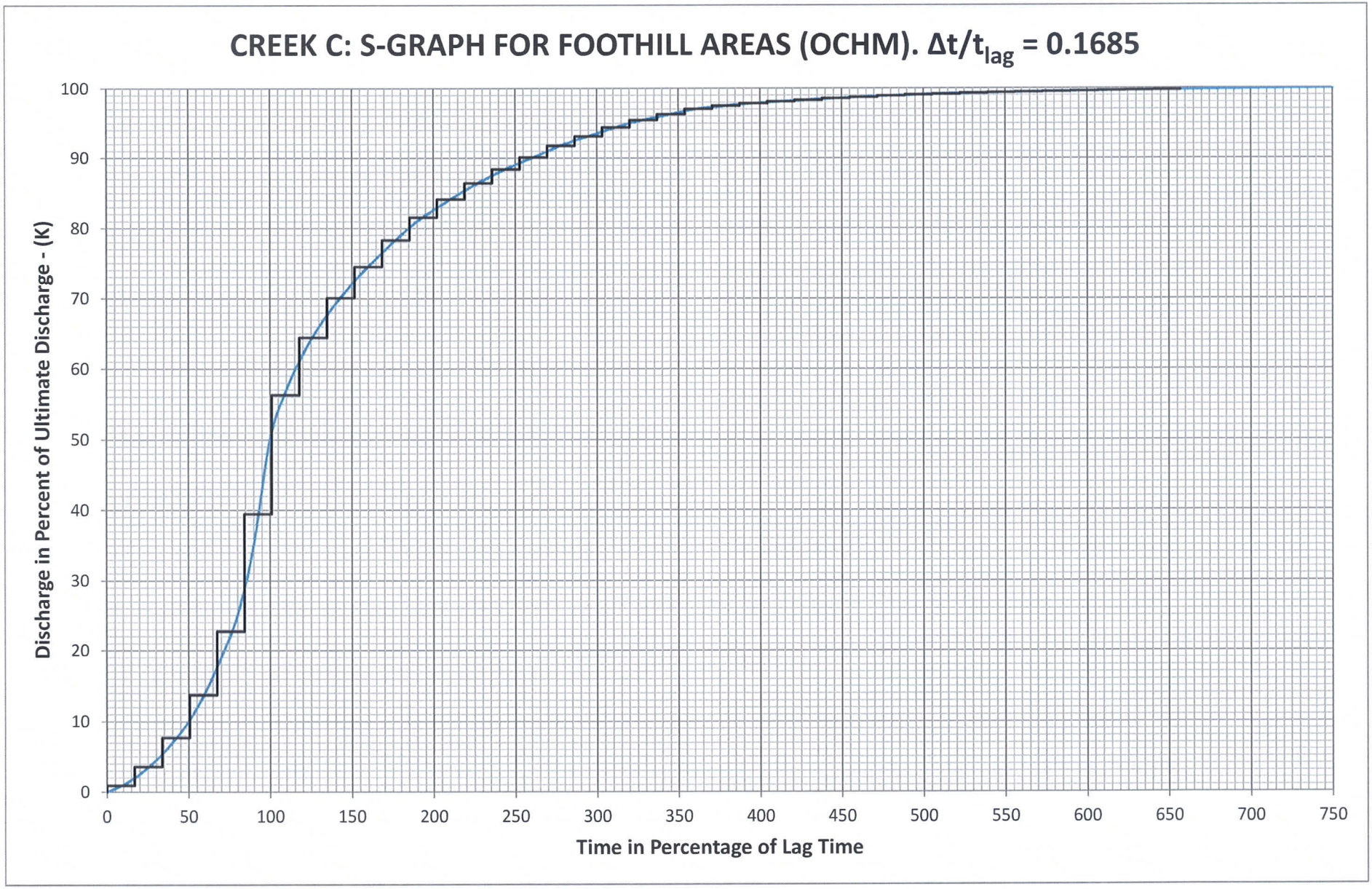

LEGEND
WATERSHED BOUNDARY
WATERSHED FLOWPATH
PROPERTY BOUNDARY
STORM DRAIN (PROPOSED)
CREEK D
CREEK C
CREEK B
CREEK A
PROPOSED HEADWALL AT "F" STREET
PROPOSED HEADWALL
WESTERN BOUNDARY
SOUTHERN BOUNDARY EXISTING 8' X 7' RCB
PROPOSED HEADWALL AT "B" STREET
DRAWING NOT TO SCALE
YORBA LINDA

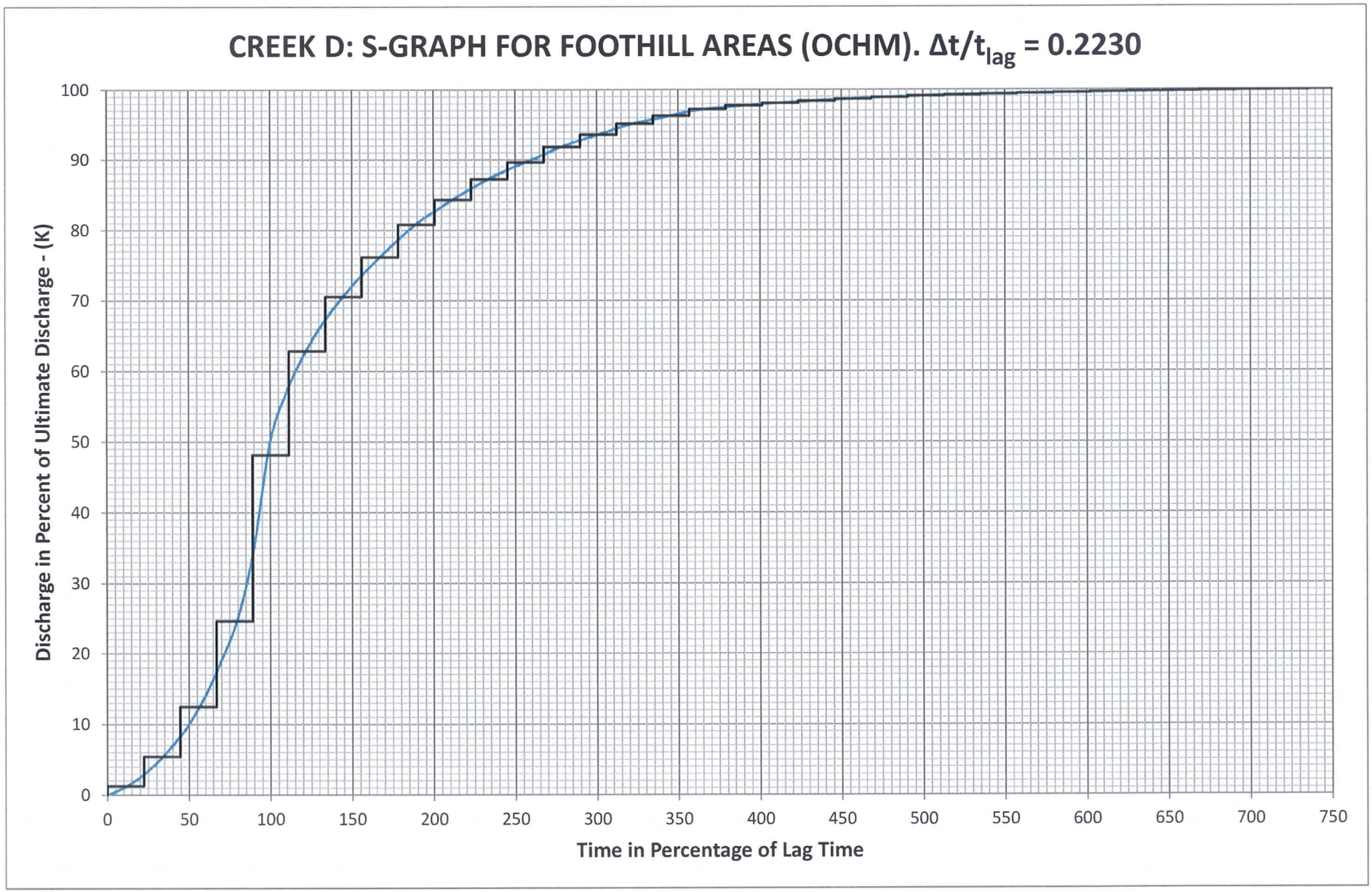
ATTACHMENT 2. Hydrograph Calculations

Lag Time Determination*							
n	0.045						
C_t	1.08						
m	0.38						
Δt	5	min					
Basin ID	**Area (mi2)**	**L (mi)**	**L_ca (mi)**	**S2 (ft/mi)**	**Tlag (hrs)**	**Tlag (min)**	**Δt/tlag**
CREEK A	1.053	2.778	1.373	322.6	0.599	36.0	13.90%
CREEK B	0.351	1.588	0.870	450.9	0.382	22.9	21.80%
CREEK C	1.120	2.008	1.297	413.6	0.495	29.7	16.85%
CREEK D	0.739	1.626	0.769	415.9	0.374	22.4	22.30%
*All variables as defined in Section E.3 of the Orange County Hydrology Manual							


CREEK A: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1390
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK B: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2180
Discharge in Percent of Ultimate Discharge - (K)
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Time in Percentage of Lag Time


CREEK C: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1685
Discharge in Percent of Ultimate Discharge - (K)
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Time in Percentage of Lag Time


CREEK D: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2230
Discharge in Percent of Ultimate Discharge - (K)
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
Time in Percentage of Lag Time

2-yr, 24-hr Design Storm Rainfall per Section B.4 of the Orange County Hydrology Manual:

			Corrections per Basin (dimensionless)		Corrected Precipitation Per Basin (in/hr)		Design Storm Incremental precipitation per basin[1]	
time (min)	I (in/hr)	P (in)	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D
5	2.264	0.189	96.10	92.15	2.18	2.09	0.0031	0.0031
10	1.521	0.253	96.10	92.15	1.46	1.40	0.0031	0.0031
15	1.205	0.301	96.10	92.15	1.16	1.11	0.0031	0.0031
20	1.021	0.340	96.10	92.15	0.98	0.94	0.0031	0.0032
25	0.899	0.374	96.10	92.15	0.86	0.83	0.0032	0.0032
30	0.809	0.405	96.10	92.15	0.78	0.75	0.0032	0.0032
35	0.741	0.432	96.10	92.15	0.71	0.68	0.0032	0.0032
40	0.686	0.457	96.10	92.15	0.66	0.63	0.0032	0.0032
45	0.641	0.481	96.10	92.15	0.62	0.59	0.0032	0.0032
50	0.604	0.503	96.10	92.15	0.58	0.56	0.0032	0.0032
55	0.572	0.524	96.10	92.15	0.55	0.53	0.0032	0.0032
60	0.544	0.544	96.10	92.15	0.52	0.50	0.0032	0.0032
65	0.519	0.563	96.25	92.44	0.50	0.48	0.0032	0.0032
70	0.498	0.581	96.40	92.74	0.48	0.46	0.0032	0.0033
75	0.478	0.598	96.54	93.03	0.46	0.45	0.0033	0.0033
80	0.461	0.615	96.69	93.33	0.45	0.43	0.0033	0.0033
85	0.445	0.631	96.84	93.62	0.43	0.42	0.0033	0.0033
90	0.431	0.646	96.98	93.91	0.42	0.40	0.0033	0.0033
95	0.418	0.661	97.13	94.21	0.41	0.39	0.0033	0.0033
100	0.406	0.676	97.28	94.50	0.39	0.38	0.0033	0.0033
105	0.394	0.690	97.42	94.80	0.38	0.37	0.0033	0.0033
110	0.384	0.704	97.57	95.09	0.37	0.37	0.0033	0.0033
115	0.374	0.717	97.72	95.38	0.37	0.36	0.0033	0.0034
120	0.365	0.730	97.86	95.68	0.36	0.35	0.0034	0.0034
125	0.357	0.743	98.01	95.97	0.35	0.34	0.0034	0.0034
130	0.349	0.756	98.15	96.27	0.34	0.34	0.0034	0.0034
135	0.341	0.768	98.30	96.56	0.34	0.33	0.0034	0.0034
140	0.334	0.780	98.45	96.85	0.33	0.32	0.0034	0.0034
145	0.328	0.792	98.59	97.15	0.32	0.32	0.0034	0.0034
150	0.321	0.803	98.74	97.44	0.32	0.31	0.0034	0.0034
155	0.315	0.815	98.89	97.73	0.31	0.31	0.0034	0.0034
160	0.310	0.826	99.03	98.03	0.31	0.30	0.0034	0.0035
165	0.304	0.837	99.18	98.32	0.30	0.30	0.0035	0.0035
170	0.299	0.847	99.33	98.62	0.30	0.29	0.0035	0.0035
175	0.294	0.858	99.47	98.91	0.29	0.29	0.0035	0.0035
180	0.289	0.868	99.62	99.20	0.29	0.29	0.0035	0.0035
185	0.285	0.878	99.63	99.22	0.28	0.28	0.0035	0.0035
190	0.281	0.888	99.63	99.23	0.28	0.28	0.0035	0.0035
195	0.276	0.898	99.64	99.24	0.28	0.27	0.0035	0.0035

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

200	0.272	0.908	99.64	99.25	0.27	0.27	0.0036	0.0036
205	0.269	0.918	99.65	99.26	0.27	0.27	0.0036	0.0036
210	0.265	0.927	99.65	99.28	0.26	0.26	0.0036	0.0036
215	0.261	0.936	99.66	99.29	0.26	0.26	0.0036	0.0036
220	0.258	0.946	99.67	99.30	0.26	0.26	0.0036	0.0036
225	0.255	0.955	99.67	99.31	0.25	0.25	0.0036	0.0036
230	0.251	0.964	99.68	99.32	0.25	0.25	0.0036	0.0036
235	0.248	0.973	99.68	99.33	0.25	0.25	0.0037	0.0037
240	0.245	0.981	99.69	99.35	0.24	0.24	0.0037	0.0037
245	0.242	0.990	99.69	99.36	0.24	0.24	0.0037	0.0037
250	0.240	0.999	99.70	99.37	0.24	0.24	0.0037	0.0037
255	0.237	1.007	99.71	99.38	0.24	0.24	0.0037	0.0037
260	0.234	1.015	99.71	99.39	0.23	0.23	0.0037	0.0037
265	0.232	1.024	99.72	99.41	0.23	0.23	0.0037	0.0037
270	0.229	1.032	99.72	99.42	0.23	0.23	0.0038	0.0038
275	0.227	1.040	99.73	99.43	0.23	0.23	0.0038	0.0038
280	0.225	1.048	99.73	99.44	0.22	0.22	0.0038	0.0038
285	0.222	1.056	99.74	99.45	0.22	0.22	0.0038	0.0038
290	0.220	1.064	99.75	99.47	0.22	0.22	0.0038	0.0038
295	0.218	1.072	99.75	99.48	0.22	0.22	0.0038	0.0038
300	0.216	1.079	99.76	99.49	0.22	0.21	0.0038	0.0038
305	0.214	1.087	99.76	99.50	0.21	0.21	0.0039	0.0039
310	0.212	1.094	99.77	99.51	0.21	0.21	0.0039	0.0039
315	0.210	1.102	99.77	99.52	0.21	0.21	0.0039	0.0039
320	0.208	1.109	99.78	99.54	0.21	0.21	0.0039	0.0039
325	0.206	1.117	99.78	99.55	0.21	0.21	0.0039	0.0039
330	0.204	1.124	99.79	99.56	0.20	0.20	0.0040	0.0040
335	0.203	1.131	99.80	99.57	0.20	0.20	0.0040	0.0040
340	0.201	1.138	99.80	99.58	0.20	0.20	0.0040	0.0040
345	0.199	1.145	99.81	99.60	0.20	0.20	0.0040	0.0040
350	0.198	1.153	99.81	99.61	0.20	0.20	0.0040	0.0040
355	0.196	1.160	99.82	99.62	0.20	0.20	0.0040	0.0040
360	0.194	1.166	99.82	99.63	0.19	0.19	0.0041	0.0041
365	0.193	1.173	99.82	99.63	0.19	0.19	0.0041	0.0041
370	0.191	1.180	99.83	99.63	0.19	0.19	0.0041	0.0041
375	0.190	1.187	99.83	99.63	0.19	0.19	0.0041	0.0041
380	0.188	1.194	99.83	99.64	0.19	0.19	0.0041	0.0041
385	0.187	1.200	99.83	99.64	0.19	0.19	0.0042	0.0042
390	0.186	1.207	99.83	99.64	0.19	0.19	0.0042	0.0042
395	0.184	1.213	99.83	99.64	0.18	0.18	0.0042	0.0042
400	0.183	1.220	99.83	99.64	0.18	0.18	0.0042	0.0042
405	0.182	1.226	99.83	99.64	0.18	0.18	0.0043	0.0043
410	0.180	1.233	99.83	99.64	0.18	0.18	0.0043	0.0043
415	0.179	1.239	99.83	99.64	0.18	0.18	0.0043	0.0043
420	0.178	1.246	99.83	99.64	0.18	0.18	0.0043	0.0043
425	0.177	1.252	99.83	99.64	0.18	0.18	0.0043	0.0043
430	0.176	1.258	99.83	99.64	0.18	0.17	0.0044	0.0044

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

435	0.174	1.264	99.83	99.64	0.17	0.17	0.0044	0.0044
440	0.173	1.271	99.83	99.65	0.17	0.17	0.0044	0.0044
445	0.172	1.277	99.83	99.65	0.17	0.17	0.0044	0.0044
450	0.171	1.283	99.83	99.65	0.17	0.17	0.0045	0.0045
455	0.170	1.289	99.83	99.65	0.17	0.17	0.0045	0.0045
460	0.169	1.295	99.83	99.65	0.17	0.17	0.0045	0.0045
465	0.168	1.301	99.83	99.65	0.17	0.17	0.0045	0.0045
470	0.167	1.307	99.83	99.65	0.17	0.17	0.0046	0.0046
475	0.166	1.313	99.83	99.65	0.17	0.17	0.0046	0.0046
480	0.165	1.319	99.83	99.65	0.16	0.16	0.0046	0.0046
485	0.164	1.324	99.83	99.65	0.16	0.16	0.0046	0.0046
490	0.163	1.330	99.83	99.65	0.16	0.16	0.0047	0.0047
495	0.162	1.336	99.84	99.65	0.16	0.16	0.0047	0.0047
500	0.161	1.342	99.84	99.66	0.16	0.16	0.0047	0.0047
505	0.160	1.347	99.84	99.66	0.16	0.16	0.0048	0.0048
510	0.159	1.353	99.84	99.66	0.16	0.16	0.0048	0.0048
515	0.158	1.359	99.84	99.66	0.16	0.16	0.0048	0.0048
520	0.157	1.364	99.84	99.66	0.16	0.16	0.0048	0.0048
525	0.157	1.370	99.84	99.66	0.16	0.16	0.0049	0.0049
530	0.156	1.375	99.84	99.66	0.16	0.16	0.0049	0.0049
535	0.155	1.381	99.84	99.66	0.15	0.15	0.0049	0.0049
540	0.154	1.386	99.84	99.66	0.15	0.15	0.0050	0.0050
545	0.153	1.392	99.84	99.66	0.15	0.15	0.0050	0.0050
550	0.152	1.397	99.84	99.66	0.15	0.15	0.0050	0.0050
555	0.152	1.403	99.84	99.66	0.15	0.15	0.0051	0.0051
560	0.151	1.408	99.84	99.67	0.15	0.15	0.0051	0.0051
565	0.150	1.413	99.84	99.67	0.15	0.15	0.0052	0.0052
570	0.149	1.419	99.84	99.67	0.15	0.15	0.0052	0.0052
575	0.149	1.424	99.84	99.67	0.15	0.15	0.0052	0.0052
580	0.148	1.429	99.84	99.67	0.15	0.15	0.0053	0.0053
585	0.147	1.434	99.84	99.67	0.15	0.15	0.0053	0.0053
590	0.146	1.440	99.84	99.67	0.15	0.15	0.0053	0.0053
595	0.146	1.445	99.84	99.67	0.15	0.15	0.0054	0.0054
600	0.145	1.450	99.84	99.67	0.14	0.14	0.0054	0.0054
605	0.144	1.455	99.84	99.67	0.14	0.14	0.0055	0.0055
610	0.144	1.460	99.84	99.67	0.14	0.14	0.0055	0.0055
615	0.143	1.465	99.84	99.67	0.14	0.14	0.0056	0.0056
620	0.142	1.470	99.85	99.68	0.14	0.14	0.0056	0.0056
625	0.142	1.475	99.85	99.68	0.14	0.14	0.0057	0.0057
630	0.141	1.480	99.85	99.68	0.14	0.14	0.0057	0.0057
635	0.140	1.485	99.85	99.68	0.14	0.14	0.0058	0.0058
640	0.140	1.490	99.85	99.68	0.14	0.14	0.0058	0.0058
645	0.139	1.495	99.85	99.68	0.14	0.14	0.0059	0.0059
650	0.138	1.500	99.85	99.68	0.14	0.14	0.0059	0.0059
655	0.138	1.505	99.85	99.68	0.14	0.14	0.0060	0.0060
660	0.137	1.510	99.85	99.68	0.14	0.14	0.0060	0.0060
665	0.137	1.515	99.85	99.68	0.14	0.14	0.0061	0.0061

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

670	0.136	1.520	99.85	99.68	0.14	0.14	0.0061	0.0061
675	0.136	1.525	99.85	99.68	0.14	0.14	0.0062	0.0062
680	0.135	1.529	99.85	99.69	0.13	0.13	0.0062	0.0062
685	0.134	1.534	99.85	99.69	0.13	0.13	0.0063	0.0063
690	0.134	1.539	99.85	99.69	0.13	0.13	0.0064	0.0064
695	0.133	1.544	99.85	99.69	0.13	0.13	0.0065	0.0065
700	0.133	1.548	99.85	99.69	0.13	0.13	0.0065	0.0065
705	0.132	1.553	99.85	99.69	0.13	0.13	0.0066	0.0066
710	0.132	1.558	99.85	99.69	0.13	0.13	0.0067	0.0067
715	0.131	1.562	99.85	99.69	0.13	0.13	0.0068	0.0068
720	0.131	1.567	99.85	99.69	0.13	0.13	0.0068	0.0068
725	0.130	1.572	99.85	99.69	0.13	0.13	0.0070	0.0070
730	0.130	1.576	99.85	99.69	0.13	0.13	0.0070	0.0071
735	0.129	1.581	99.85	99.69	0.13	0.13	0.0072	0.0072
740	0.129	1.586	99.85	99.70	0.13	0.13	0.0072	0.0073
745	0.128	1.590	99.86	99.70	0.13	0.13	0.0073	0.0074
750	0.128	1.595	99.86	99.70	0.13	0.13	0.0074	0.0074
755	0.127	1.599	99.86	99.70	0.13	0.13	0.0075	0.0076
760	0.127	1.604	99.86	99.70	0.13	0.13	0.0076	0.0076
765	0.126	1.608	99.86	99.70	0.13	0.13	0.0077	0.0078
770	0.126	1.613	99.86	99.70	0.13	0.13	0.0078	0.0079
775	0.125	1.617	99.86	99.70	0.13	0.12	0.0080	0.0080
780	0.125	1.621	99.86	99.70	0.12	0.12	0.0081	0.0081
785	0.124	1.626	99.86	99.70	0.12	0.12	0.0082	0.0083
790	0.124	1.630	99.86	99.70	0.12	0.12	0.0083	0.0083
795	0.123	1.635	99.86	99.70	0.12	0.12	0.0085	0.0085
800	0.123	1.639	99.86	99.71	0.12	0.12	0.0086	0.0086
805	0.122	1.643	99.86	99.71	0.12	0.12	0.0088	0.0088
810	0.122	1.648	99.86	99.71	0.12	0.12	0.0089	0.0089
815	0.122	1.652	99.86	99.71	0.12	0.12	0.0091	0.0091
820	0.121	1.656	99.86	99.71	0.12	0.12	0.0092	0.0093
825	0.121	1.661	99.86	99.71	0.12	0.12	0.0095	0.0095
830	0.120	1.665	99.86	99.71	0.12	0.12	0.0096	0.0096
835	0.120	1.669	99.86	99.71	0.12	0.12	0.0099	0.0099
840	0.120	1.673	99.86	99.71	0.12	0.12	0.0100	0.0101
845	0.119	1.678	99.86	99.71	0.12	0.12	0.0116	0.0128
850	0.119	1.682	99.86	99.71	0.12	0.12	0.0117	0.0129
855	0.118	1.686	99.86	99.71	0.12	0.12	0.0120	0.0131
860	0.118	1.690	99.86	99.72	0.12	0.12	0.0122	0.0133
865	0.118	1.695	99.86	99.72	0.12	0.12	0.0125	0.0136
870	0.117	1.699	99.87	99.72	0.12	0.12	0.0127	0.0137
875	0.117	1.703	99.87	99.72	0.12	0.12	0.0131	0.0140
880	0.116	1.707	99.87	99.72	0.12	0.12	0.0134	0.0142
885	0.116	1.711	99.87	99.72	0.12	0.12	0.0139	0.0147
890	0.116	1.715	99.87	99.72	0.12	0.12	0.0142	0.0149
895	0.115	1.719	99.87	99.72	0.12	0.11	0.0148	0.0154
900	0.115	1.723	99.87	99.72	0.11	0.11	0.0152	0.0157

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

905	0.115	1.727	99.87	99.72	0.11	0.11	0.0160	0.0165
910	0.114	1.732	99.87	99.72	0.11	0.11	0.0165	0.0169
915	0.114	1.736	99.87	99.72	0.11	0.11	0.0176	0.0178
920	0.113	1.740	99.87	99.73	0.11	0.11	0.0182	0.0184
925	0.113	1.744	99.87	99.73	0.11	0.11	0.0190	0.0182
930	0.113	1.748	99.87	99.73	0.11	0.11	0.0200	0.0192
935	0.112	1.752	99.87	99.73	0.11	0.11	0.0226	0.0217
940	0.112	1.756	99.87	99.73	0.11	0.11	0.0243	0.0233
945	0.112	1.760	99.87	99.73	0.11	0.11	0.0291	0.0279
950	0.111	1.764	99.87	99.73	0.11	0.11	0.0326	0.0313
955	0.111	1.767	99.87	99.73	0.11	0.11	0.0459	0.0440
960	0.111	1.771	99.87	99.73	0.11	0.11	0.0623	0.0597
965	0.110	1.775	99.87	99.73	0.11	0.11	0.1813	0.1738
970	0.110	1.779	99.87	99.73	0.11	0.11	0.0377	0.0362
975	0.110	1.783	99.87	99.73	0.11	0.11	0.0264	0.0253
980	0.109	1.787	99.87	99.74	0.11	0.11	0.0212	0.0203
985	0.109	1.791	99.87	99.74	0.11	0.11	0.0189	0.0190
990	0.109	1.795	99.87	99.74	0.11	0.11	0.0170	0.0173
995	0.108	1.799	99.88	99.74	0.11	0.11	0.0156	0.0161
1000	0.108	1.803	99.88	99.74	0.11	0.11	0.0145	0.0152
1005	0.108	1.806	99.88	99.74	0.11	0.11	0.0136	0.0144
1010	0.108	1.810	99.88	99.74	0.11	0.11	0.0129	0.0139
1015	0.107	1.814	99.88	99.74	0.11	0.11	0.0124	0.0134
1020	0.107	1.818	99.88	99.74	0.11	0.11	0.0119	0.0130
1025	0.107	1.822	99.88	99.74	0.11	0.11	0.0102	0.0102
1030	0.106	1.825	99.88	99.74	0.11	0.11	0.0098	0.0098
1035	0.106	1.829	99.88	99.74	0.11	0.11	0.0094	0.0094
1040	0.106	1.833	99.88	99.75	0.11	0.11	0.0090	0.0090
1045	0.105	1.837	99.88	99.75	0.11	0.11	0.0087	0.0087
1050	0.105	1.840	99.88	99.75	0.11	0.10	0.0084	0.0084
1055	0.105	1.844	99.88	99.75	0.10	0.10	0.0081	0.0082
1060	0.105	1.848	99.88	99.75	0.10	0.10	0.0079	0.0079
1065	0.104	1.852	99.88	99.75	0.10	0.10	0.0077	0.0077
1070	0.104	1.855	99.88	99.75	0.10	0.10	0.0075	0.0075
1075	0.104	1.859	99.88	99.75	0.10	0.10	0.0073	0.0073
1080	0.103	1.863	99.88	99.75	0.10	0.10	0.0071	0.0072
1085	0.103	1.866	99.88	99.75	0.10	0.10	0.0069	0.0069
1090	0.103	1.870	99.88	99.75	0.10	0.10	0.0067	0.0067
1095	0.103	1.874	99.88	99.75	0.10	0.10	0.0066	0.0066
1100	0.102	1.877	99.88	99.76	0.10	0.10	0.0064	0.0064
1105	0.102	1.881	99.88	99.76	0.10	0.10	0.0063	0.0063
1110	0.102	1.884	99.88	99.76	0.10	0.10	0.0062	0.0062
1115	0.102	1.888	99.88	99.76	0.10	0.10	0.0060	0.0060
1120	0.101	1.892	99.89	99.76	0.10	0.10	0.0059	0.0059
1125	0.101	1.895	99.89	99.76	0.10	0.10	0.0058	0.0058
1130	0.101	1.899	99.89	99.76	0.10	0.10	0.0057	0.0057
1135	0.101	1.902	99.89	99.76	0.10	0.10	0.0056	0.0056

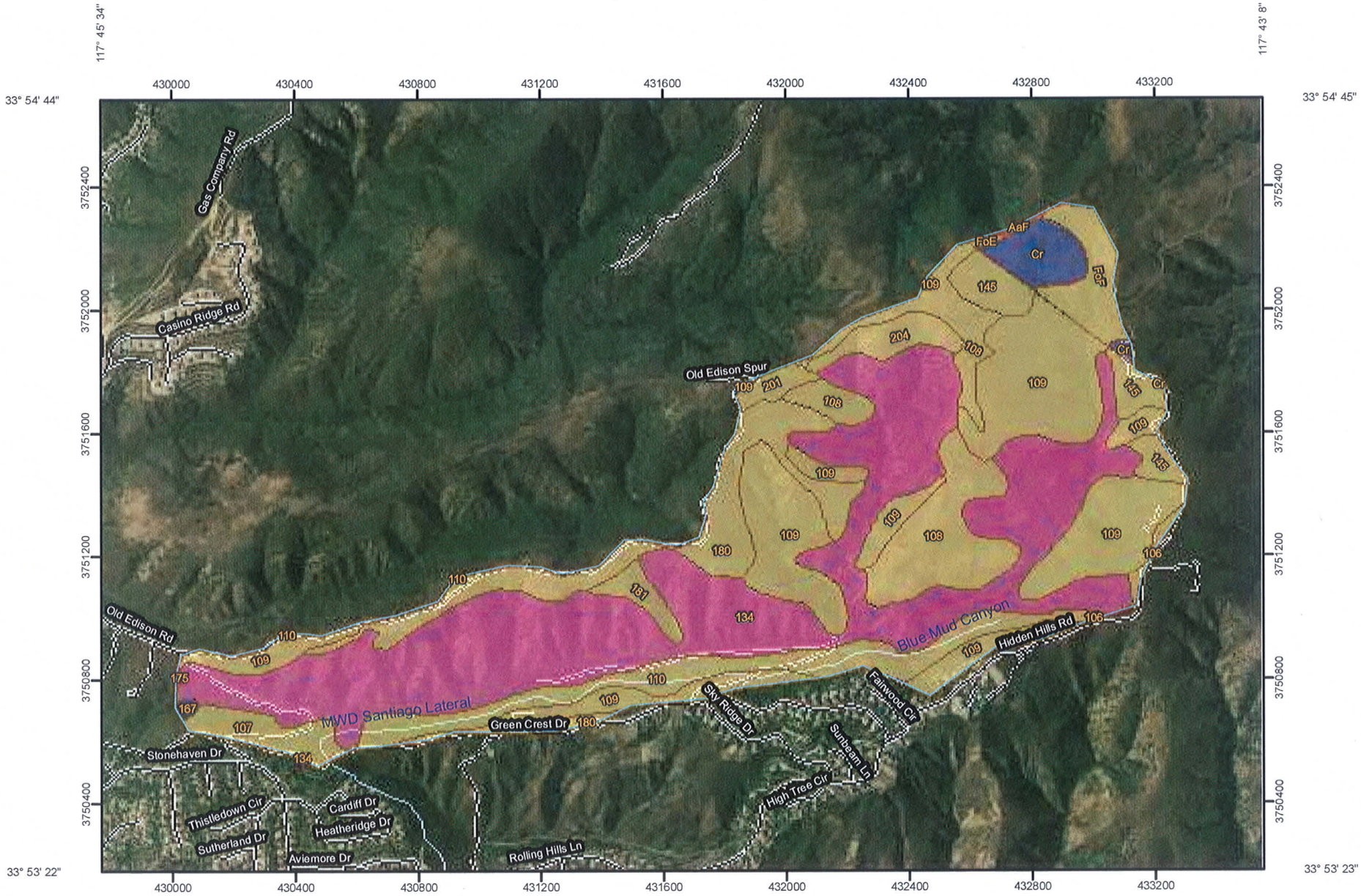
[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

1140	0.100	1.906	99.89	99.76	0.10	0.10	0.0055	0.0055
1145	0.100	1.910	99.89	99.76	0.10	0.10	0.0055	0.0054
1150	0.100	1.913	99.89	99.76	0.10	0.10	0.0054	0.0054
1155	0.100	1.917	99.89	99.77	0.10	0.10	0.0053	0.0053
1160	0.099	1.920	99.89	99.77	0.10	0.10	0.0052	0.0052
1165	0.099	1.924	99.89	99.77	0.10	0.10	0.0051	0.0051
1170	0.099	1.927	99.89	99.77	0.10	0.10	0.0051	0.0051
1175	0.099	1.931	99.89	99.77	0.10	0.10	0.0050	0.0050
1180	0.098	1.934	99.89	99.77	0.10	0.10	0.0049	0.0049
1185	0.098	1.938	99.89	99.77	0.10	0.10	0.0049	0.0049
1190	0.098	1.941	99.89	99.77	0.10	0.10	0.0048	0.0048
1195	0.098	1.945	99.89	99.77	0.10	0.10	0.0047	0.0047
1200	0.097	1.948	99.89	99.77	0.10	0.10	0.0047	0.0047
1205	0.097	1.952	99.89	99.77	0.10	0.10	0.0046	0.0046
1210	0.097	1.955	99.89	99.77	0.10	0.10	0.0046	0.0046
1215	0.097	1.958	99.89	99.78	0.10	0.10	0.0045	0.0045
1220	0.096	1.962	99.89	99.78	0.10	0.10	0.0045	0.0045
1225	0.096	1.965	99.89	99.78	0.10	0.10	0.0044	0.0044
1230	0.096	1.969	99.89	99.78	0.10	0.10	0.0044	0.0044
1235	0.096	1.972	99.89	99.78	0.10	0.10	0.0043	0.0043
1240	0.096	1.975	99.89	99.78	0.10	0.10	0.0043	0.0043
1245	0.095	1.979	99.90	99.78	0.10	0.10	0.0042	0.0042
1250	0.095	1.982	99.90	99.78	0.10	0.09	0.0042	0.0042
1255	0.095	1.986	99.90	99.78	0.09	0.09	0.0042	0.0042
1260	0.095	1.989	99.90	99.78	0.09	0.09	0.0041	0.0041
1265	0.094	1.992	99.90	99.78	0.09	0.09	0.0041	0.0041
1270	0.094	1.996	99.90	99.78	0.09	0.09	0.0040	0.0040
1275	0.094	1.999	99.90	99.79	0.09	0.09	0.0040	0.0040
1280	0.094	2.002	99.90	99.79	0.09	0.09	0.0040	0.0040
1285	0.094	2.006	99.90	99.79	0.09	0.09	0.0039	0.0039
1290	0.093	2.009	99.90	99.79	0.09	0.09	0.0039	0.0039
1295	0.093	2.012	99.90	99.79	0.09	0.09	0.0039	0.0039
1300	0.093	2.016	99.90	99.79	0.09	0.09	0.0038	0.0038
1305	0.093	2.019	99.90	99.79	0.09	0.09	0.0038	0.0038
1310	0.093	2.022	99.90	99.79	0.09	0.09	0.0038	0.0038
1315	0.092	2.026	99.90	99.79	0.09	0.09	0.0037	0.0037
1320	0.092	2.029	99.90	99.79	0.09	0.09	0.0037	0.0037
1325	0.092	2.032	99.90	99.79	0.09	0.09	0.0037	0.0037
1330	0.092	2.035	99.90	99.79	0.09	0.09	0.0036	0.0036
1335	0.092	2.039	99.90	99.80	0.09	0.09	0.0036	0.0036
1340	0.091	2.042	99.90	99.80	0.09	0.09	0.0036	0.0036
1345	0.091	2.045	99.90	99.80	0.09	0.09	0.0036	0.0036
1350	0.091	2.048	99.90	99.80	0.09	0.09	0.0035	0.0035
1355	0.091	2.052	99.90	99.80	0.09	0.09	0.0035	0.0035
1360	0.091	2.055	99.90	99.80	0.09	0.09	0.0035	0.0035
1365	0.090	2.058	99.90	99.80	0.09	0.09	0.0035	0.0035
1370	0.090	2.061	99.91	99.80	0.09	0.09	0.0034	0.0034

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

1375	0.090	2.064	99.91	99.80	0.09	0.09	0.0034	0.0034
1380	0.090	2.068	99.91	99.80	0.09	0.09	0.0034	0.0034
1385	0.090	2.071	99.91	99.80	0.09	0.09	0.0034	0.0034
1390	0.090	2.074	99.91	99.80	0.09	0.09	0.0033	0.0033
1395	0.089	2.077	99.91	99.81	0.09	0.09	0.0033	0.0033
1400	0.089	2.080	99.91	99.81	0.09	0.09	0.0033	0.0033
1405	0.089	2.083	99.91	99.81	0.09	0.09	0.0033	0.0033
1410	0.089	2.087	99.91	99.81	0.09	0.09	0.0033	0.0033
1415	0.089	2.090	99.91	99.81	0.09	0.09	0.0032	0.0032
1420	0.088	2.093	99.91	99.81	0.09	0.09	0.0032	0.0032
1425	0.088	2.096	99.91	99.81	0.09	0.09	0.0032	0.0032
1430	0.088	2.099	99.91	99.81	0.09	0.09	0.0032	0.0032
1435	0.088	2.102	99.91	99.81	0.09	0.09	0.0032	0.0032
1440	0.088	2.105	99.91	99.81	0.09	0.09	0.0031	0.0031

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.



Map Scale: 1:17,900 if printed on A size (8.5" x 11") sheet.

N

Meters
0 200 400 800 1,200

Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:17,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.5	0.4%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	12.8	2.1%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	56.1	9.1%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	142.3	23.2%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	41.0	6.7%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	238.5	38.9%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	19.3	3.1%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	0.9	0.2%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.2	0.0%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	48.1	7.8%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	6.1	1.0%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	4.9	0.8%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.4	1.7%
Subtotals for Soil Survey Area			**583.0**	**95.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaF	Alo clay, 30 to 50 percent slopes	D	0.5	0.1%
Cr	CIENEBA-ROCK OUTCROP COMPLEX	B	13.9	2.3%
FoE	FONTANA CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	0.7	0.1%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	15.9	2.6%
Subtotals for Soil Survey Area			**30.9**	**5.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

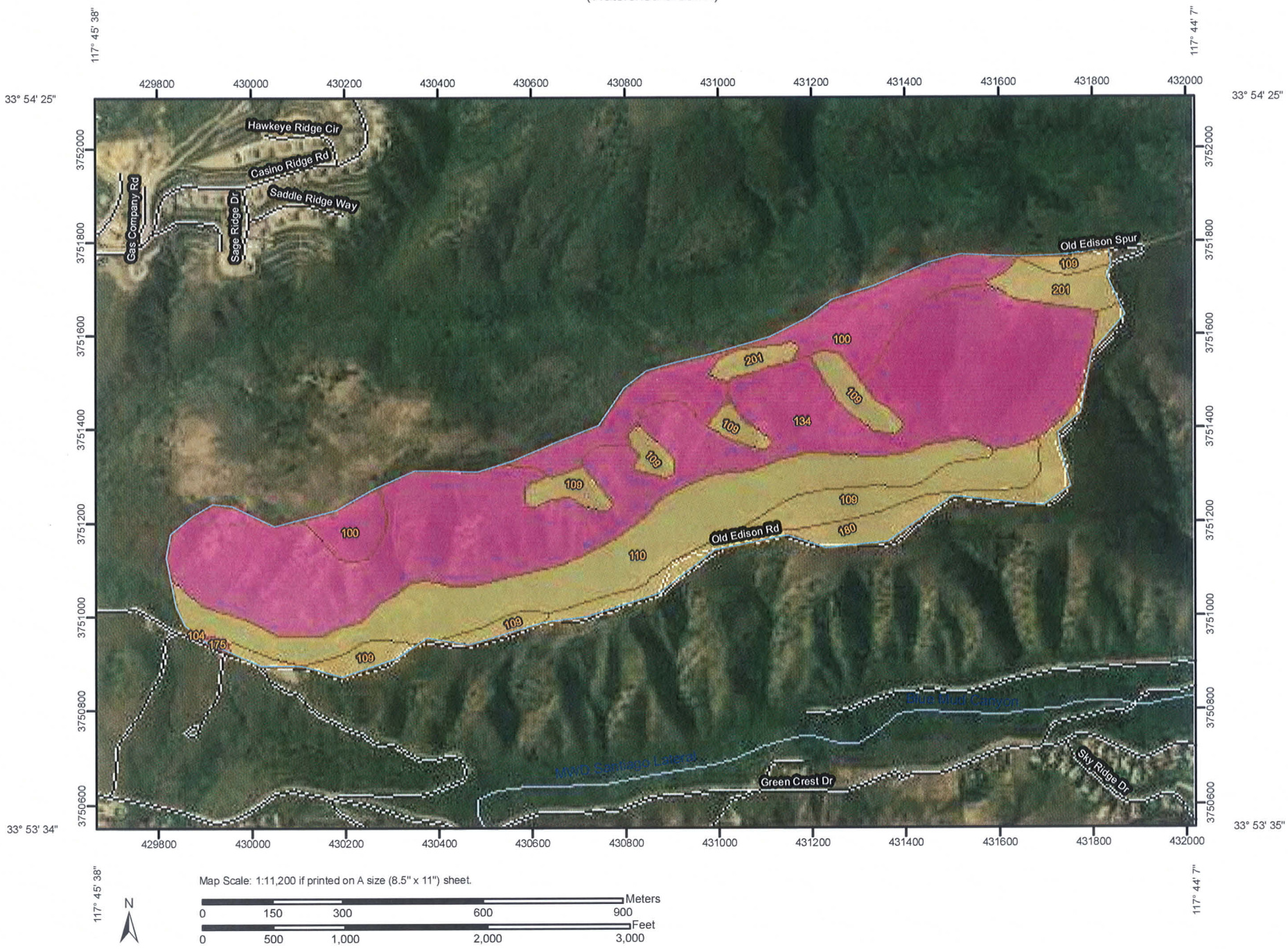
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher


117° 45' 38"
117° 44' 7"
33° 54' 25"
33° 53' 34"
33° 53' 35"
429800
430000
430200
430400
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431000
431200
431400
431600
431800
432000
3752000
3751800
3751600
3751400
3751200
3751000
3750800
3750600
Hawkeye Ridge Cir
Casino Ridge Rd
Saddle Ridge Way
Gas Company Rd
Sage Ridge Dr
Old Edison Spur
Old Edison Rd
Blue Mud Canyon
MWD Santiago Lateral
Green Crest Dr
Sky Ridge Dr
100
109
110
134
180
201
104
175
N
Map Scale: 1:11,200 if printed on A size (8.5" x 11") sheet.
Meters
0
150
300
600
900
Feet
0
500
1,000
2,000
3,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:11,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	24.2	11.8%
104	ALO VARIANT CLAY, 15 TO 30 PERCENT SLOPES	D	0.1	0.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	24.8	12.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	37.6	18.3%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	99.4	48.3%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.3	0.1%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	12.8	6.2%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	6.9	3.3%
Totals for Area of Interest			**206.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

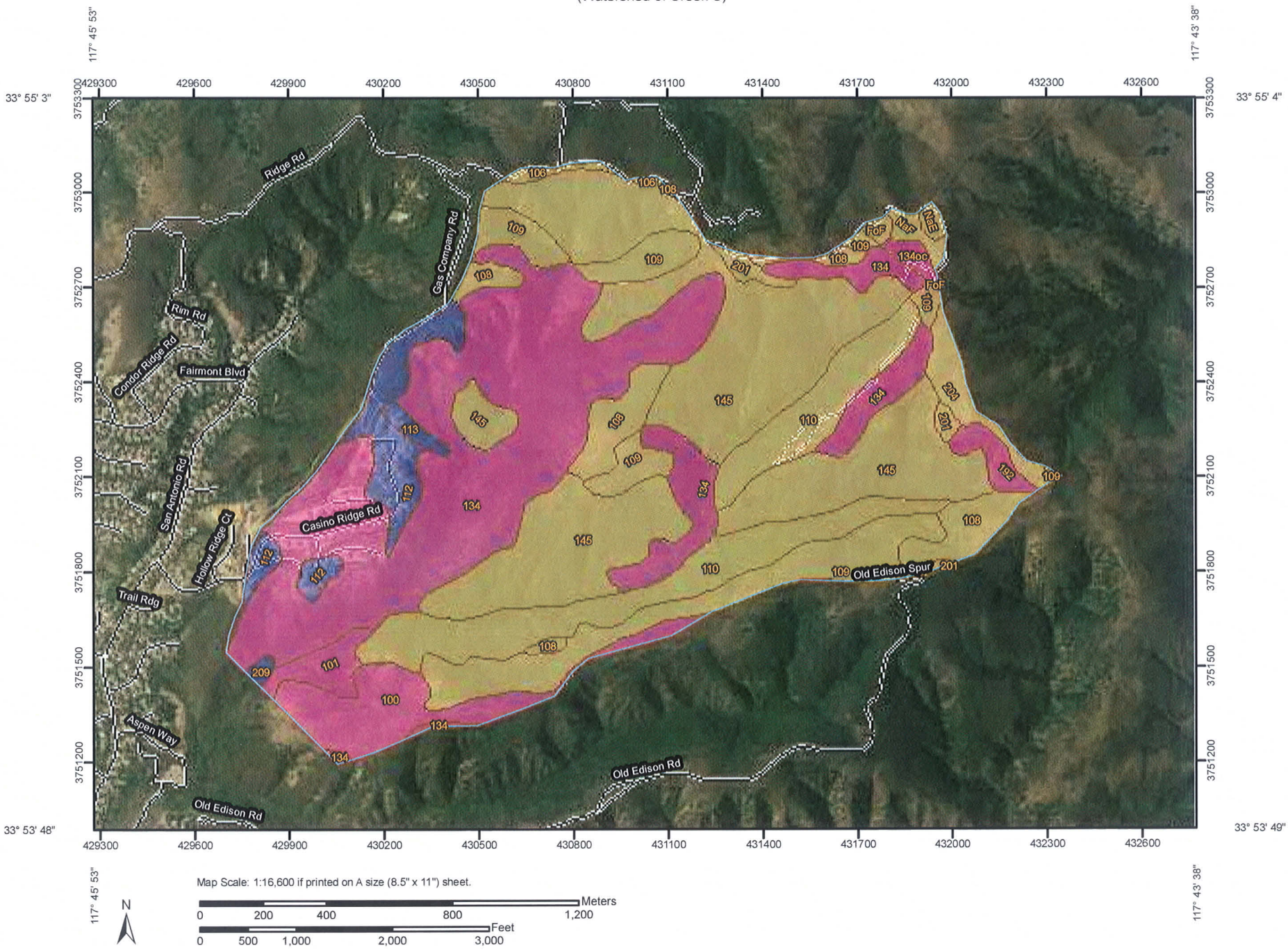
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside Cou California, and San Bernardino County Southwestern Part, California
(Watershed of Creek C)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:16,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	33.6	4.8%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	8.9	1.3%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.7	0.4%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	32.2	4.6%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	70.4	10.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	75.8	10.8%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	30.2	4.3%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	3.1	0.4%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	212.0	30.2%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	201.0	28.6%
192	ROCK OUTCROP-CIENEBA COMPLEX, 30 TO 75 PERCENT SLOPES	D	6.4	0.9%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	5.2	0.7%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.2	1.5%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	1.4	0.2%
Subtotals for Soil Survey Area			**693.1**	**98.6%**
Totals for Area of Interest			**702.7**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
134oc	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	3.0	0.4%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	1.5	0.2%
NaE	NACIMIENTO CLAY LOAM, 9 TO 30 PERCENT SLOPES	C	1.6	0.2%

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NaF	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	3.4	0.5%
Subtotals for Soil Survey Area			**9.6**	**1.4%**
Totals for Area of Interest			**702.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

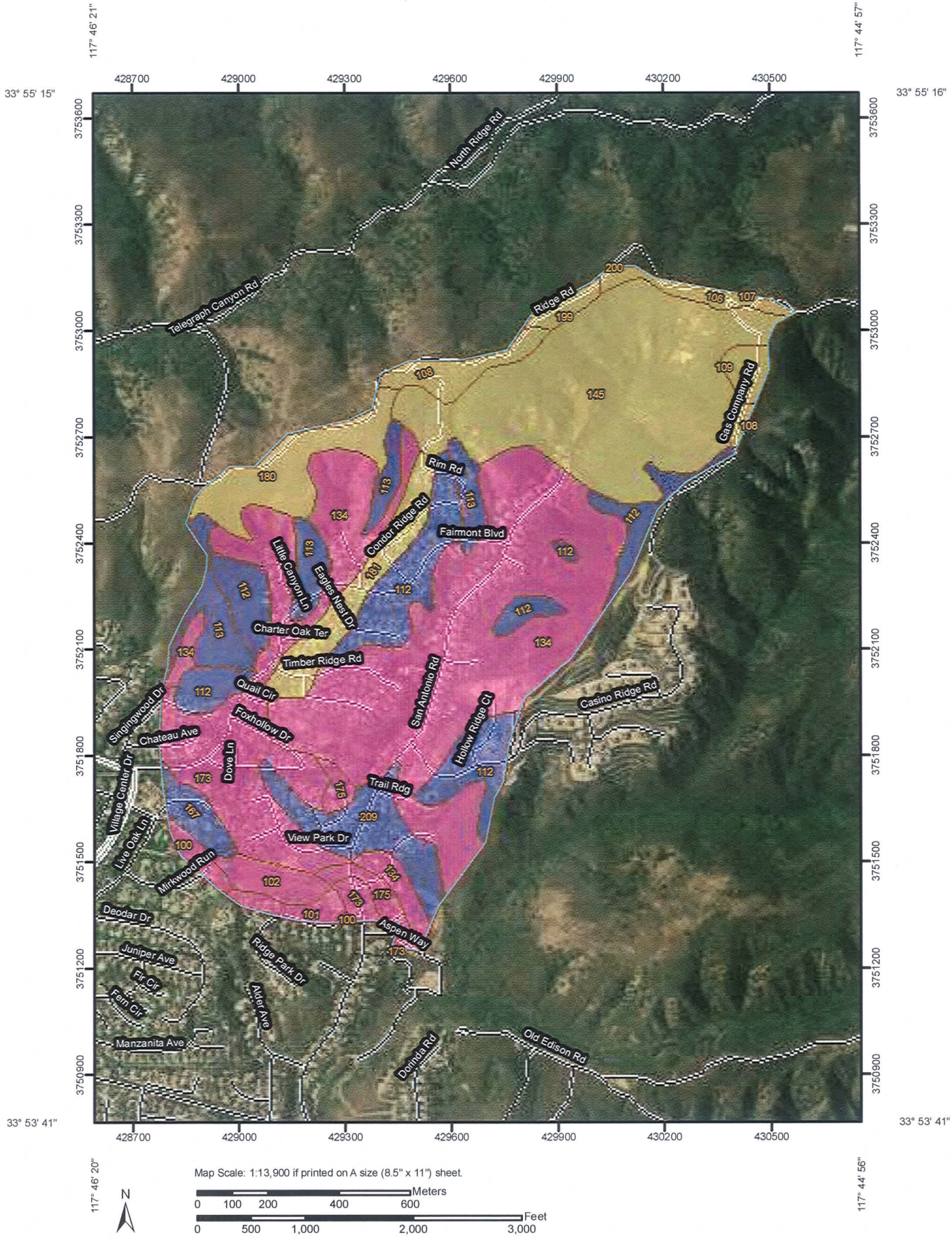
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed of Creek D)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

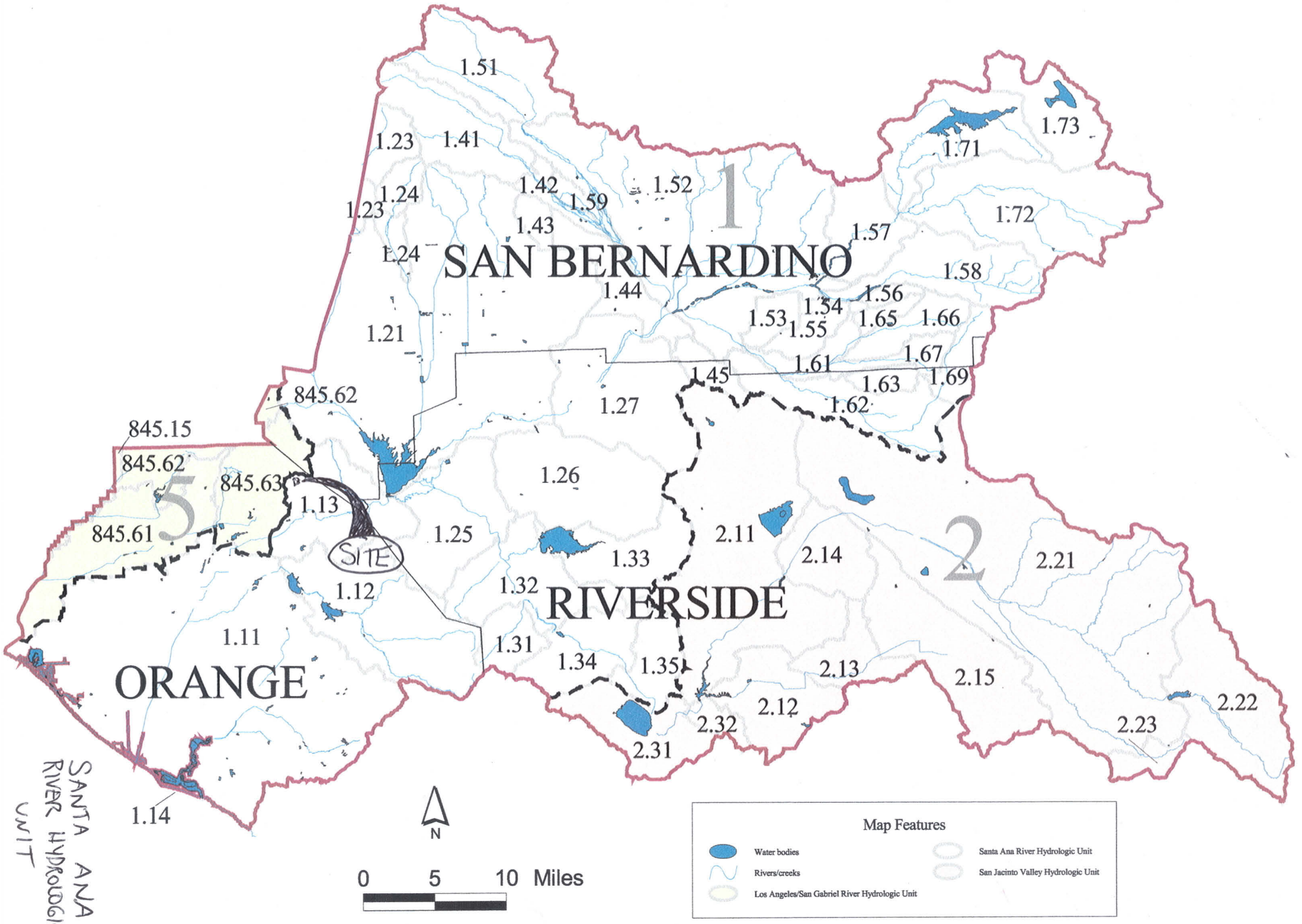
Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Attachment K. .....Santa Ana River Hydrologic Unit

CONCEPTUAL

Attachment K .....Santa Ana River Hydrologic Unit


1.51
1.23
1.41
1.24
1.23
1.42
1.59
1.52
1.43
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SAN BERNARDINO
1
1.73
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1.21
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1.61
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1.27
845.62
845.15
845.62
845.63
5
1.13
1.26
845.61
1.25
SITE
2.11
2.14
2
2.21
1.33
1.32
1.12
RIVERSIDE
1.11
1.31
1.34
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2.13
2.15
2.22
ORANGE
2.12
2.32
2.23
2.31
1.14
N
0 5 10 Miles
Map Features
Water bodies
Rivers/creeks
Los Angeles/San Gabriel River Hydrologic Unit
Santa Ana River Hydrologic Unit
San Jacinto Valley Hydrologic Unit
SANTA ANA RIVER HYDROLOGIC UNIT

Attachment L. .....TGD Worksheets for LID/DCV Sizing

CONCEPTUAL

SOUTH SITE "S-1"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.9	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	6.57	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.78	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.74	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	15,001	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	↓	sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-2"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	10.22	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.72	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.69	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	21,759	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-3"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	12.33	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.74	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.71	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	27,011	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-4"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.85	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.45	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.49	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	2,797	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-5"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.66	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.65	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.64	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	3,278	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	↓	sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

"NORTH SITE"

Worksheet B: Simple Design Capture Volume Sizing Method

N1 + N2 + N3 + N4 = 8.18

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	8.18	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.73	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.70	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	17,668	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	1.5	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	0.6	
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=	0.9	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3.6	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	4,908	sq-ft

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

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25		
		Level of pretreatment/ expected sediment loads	0.25		
		Redundancy	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$				0.6	
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)				~ 1.5 ~	
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$				0.9	

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

ASSUMED INFILTRATION TO BE 0.9 INCH/HOUR FOR CEQA LEVEL REVIEW.

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

Attachment M. .....TR55 Calculations (Onsite Comparison Only Per BMP Site Plan)

CONCEPTUAL

HCOC CALCULATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site PRE
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north pre.w55

Date: 7/24/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	.177
Area N-2	Area D	Outlet	1.03	85	0.1
Area N-3	Area D	Outlet	1.5	85	0.1
Area N-4	Area D	Outlet	1.08	85	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 0.707"

Cielo Vista
North Site PRE
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.37
	10.01
Area N-2	0.61
	9.94
Area N-3	0.88
	9.94
Area N-4	0.64
	9.94
REACHES	
OUTLET	4.32

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site POST
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north post.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	0.1
Area N-2	Area D	Outlet	1.03	94	0.1
Area N-3	Area D	Outlet	1.5	94	0.1
Area N-4	Area D	Outlet	1.08	98	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 1.051"

Brown

Cielo Vista
North Site POST
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.66
	9.94
Area N-2	1.17
	9.93
Area N-3	1.71
	9.93
Area N-4	1.51
	9.93
REACHES	
OUTLET	7.03

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: SOUTH Site PRE
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo SOUTH pre.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area S-1	Area D	Outlet	6.57	70	.137
Area S-2	Area D	Outlet	10.22	70	0.1
Area S-3	Area D	Outlet	12.33	70	0.1
Area S-4	Area D	Outlet	1.85	70	.165
Area S-5	Area S	Outlet	1.66	70	.139

Total area: 32.63 (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>

RUNOFF AMOUNT = 0.234"

Brown

Cielo Vista
SOUTH Site PRE
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area S-1	0.38
	10.05
Area S-2	0.67
	10.03
Area S-3	0.81
	10.03
Area S-4	0.10
	10.07
Area S-5	0.10
	10.05
REACHES	
OUTLET	2.03

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: SOUTH Site POST
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo SOUTH post.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area S-1	Area D	Outlet	6.57	86	0.1
Area S-2	Area D	Outlet	10.22	86	0.1
Area S-3	Area D	Outlet	12.33	86	0.1
Area S-4	Area D	Outlet	1.85	94	0.1
Area S-5	Area S	Outlet	1.66	86	.147

Total area: 32.63 (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>

RUNOFF AMOUNT = 0.909"

Brown

Cielo Vista
SOUTH Site POST
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area S-1	4.22 9.93
Area S-2	6.56 9.93
Area S-3	7.91 9.93
Area S-4	2.11 9.93
Area S-5	0.98 9.97
REACHES	
OUTLET	21.71

Attachment N. .....TR55 Calculations (per Drainage Subareas Shown in separate H&H Report by CHA)

CONCEPTUAL

TR55 RESULTS PRE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA A-1	0.145	4.81	1.13	0.474	0.23	0.10
AREA A-2	0.1	1.62	0.40	0.235	0.25	0.15
AREA A-3	0.125	4.28	1.02	0.474	0.24	0.11
AREA A-4	0.1	1.79	0.44	0.302	0.25	0.17
AREA A-5	0.1	1.51	0.37	0.225	0.25	0.15
AREA A-6	0.1	1.34	0.33	0.202	0.25	0.15
SUBTOTAL		15.35	3.69	1.91	0.24	0.12

TR55 RESULTS POST-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA A-1	0.1	0.51	0.18	0.118	0.35	0.23
AREA A-2	0.1	1.46	0.10	0.013	0.07	0.01
AREA A-3	0.21	1.24	0.39	0.296	0.31	0.24
AREA A-4	0.1	1.14	1.59	1.559	1.39	1.37
AREA A-5	0.1	1.94	0.70	0.502	0.36	0.26
AREA A-6	0.1	3.62	4.13	1.427	1.14	0.39
AREA A-7	0.1	2.78	1.78	0.877	0.64	0.32
AREA AA-1	0.1	2.27	0.82	0.544	0.36	0.24
AREA AA-2	0.1	6.22	7.09	1.438	1.14	0.23
SUBTOTAL		21.18	16.78	6.77	0.79	0.32

TR55 RESULTS PRE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA B-1	0.1	2.69	0.66	0.443	0.25	0.16
AREA B-2	0.1	3.76	0.92	0.474	0.24	0.13
AREA B-3	0.1	1.01	0.25	0.119	0.25	0.12
AREA B-4	0.1	3.26	0.80	0.470	0.25	0.14
AREA B-5	0.1	1.52	0.37	0.226	0.24	0.15
AREA B-6	0.1	1.06	0.26	0.132	0.25	0.12
AREA B-7	0.1	0.78	0.19	0.091	0.24	0.12
SUBTOTAL		14.08	3.45	1.96	0.25	0.14

TR55 RESULTS POST RE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA B-1	0.1	5.24	2.57	0.727	0.49	0.14
AREA B-2	0.1	1.81	0.89	0.639	0.49	0.35
AREA B-3	0.1	0.41	0.15	0.095	0.37	0.23
AREA B-4	0.1	2.37	1.16	0.704	0.49	0.30
AREA B-5	0.1	2.07	1.22	0.787	0.59	0.38
AREA B-6	0.327	0.62	0.16	0.137	0.26	0.22
AREA BB-1	0.1	0.36	0.46	0.637	1.28	1.77
AREA BB-2	0.1	0.32	0.12	0.082	0.38	0.26
AREA BB-3	0.1	0.76	0.19	0.088	0.25	0.12
AREA BB-4	0.1	0.28	0.34	0.485	1.21	1.73
AREA BB-5	0.1	0.41	0.15	0.095	0.37	0.23
AREA BB-6	0.1	0.76	0.21	0.098	0.28	0.13
SUBTOTAL		15.41	7.62	4.57	0.49	0.30

TR55 RESULTS PRE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA C-1	0.11	2.29	0.55	0.408	0.24	0.18
AREA C-2	0.1	1.54	0.38	0.228	0.25	0.15
AREA C-3	0.1	3.44	0.85	0.474	0.25	0.14
AREA C-4	0.1	1.38	0.47	0.209	0.34	0.15
AREA C-5	0.1	2.15	0.54	0.396	0.25	0.18
AREA C-6	0.1	2.50	0.62	0.429	0.25	0.17
AREA C-7	0.108	4.32	1.05	0.474	0.24	0.11
AREA C-8	0.269	1.31	0.26	0.196	0.20	0.15
SUBTOTAL		18.93	4.72	2.81	0.25	0.15

TR55 RESULTS POST-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA C-1	0.1	3.30	0.81	0.471	0.25	0.14
AREA C-2	0.119	1.63	0.57	0.428	0.35	0.26
AREA C-3	0.1	1.91	0.47	0.34	0.25	0.18
AREA C-4	0.1	0.52	0.33	0.281	0.63	0.54
AREA C-5	0.255	1.13	0.59	0.571	0.52	0.51
SUBTOTAL		8.49	2.77	2.09	0.33	0.25

TR55 RESULTS PRE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA D-1	0.1	0.87	0.71	0.62	0.82	0.71
AREA D-2	0.1	0.42	0.27	0.246	0.64	0.59
AREA D-3	0.104	0.54	0.43	0.424	0.80	0.79
AREA D-4	0.1	0.31	0.20	0.201	0.65	0.65
SUBTOTAL		2.14	1.61	1.49	0.75	0.70
SUBTOTAL NORTH		50.50	13.47	8.17	0.27	0.16

TR55 RESULTS POST-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA D-1	0.1	2.40	0.59	0.419	0.25	0.17
AREA D-2	0.1	0.27	0.10	0.075	0.37	0.28
AREA D-3	0.1	0.26	0.09	0.075	0.35	0.29
AREA D-4	0.1	1.61	0.40	0.234	0.25	0.15
AREA D-5	0.1	0.88	0.22	0.1	0.25	0.11
SUBTOTAL		5.42	1.40	0.90	0.26	0.17
SUBTOTAL NORTH		50.50	28.57	14.34	0.57	0.28

TR55 RESULTS PRE-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA E-1	0.1	2.21	0.54	0.397	0.24	0.18
AREA E-2	0.1	1.92	0.47	0.343	0.24	0.18
AREA E-3	0.1	3.38	0.83	0.473	0.25	0.14
AREA E-4	0.11	1.11	0.27	0.147	0.24	0.13
AREA E-5	0.1	1.34	0.33	0.202	0.25	0.15
AREA E-6	0.1	0.84	0.68	0.609	0.81	0.73
SUBTOTAL		10.80	3.12	2.17	0.29	0.20

TR55 RESULTS POST-DEVELOPMENT	TIME OF CONC. HOURS	AREA ACRE	PEAK FLOW CFS	RUNOFF INCHES	FLOW PER ACRE	RUNOFF DEPTH PER ACRE
AREA E-1	0.1	2.03	0.50	0.368	0.25	0.18
AREA E-2	0.1	1.51	0.54	0.375	0.36	0.25
AREA E-3	0.1	0.96	0.78	0.651	0.81	0.68
AREA E-4	0.1	1.09	0.39	0.264	0.36	0.24
AREA E-5	0.1	4.71	3.28	0.938	0.70	0.20
AREA E-6	0.1	0.50	0.12	0.059	0.24	0.12
SUBTOTAL		10.80	5.61	2.66	0.52	0.25

	AREA ACRS	PK FLOW CFS	RUNOFF INCHES	VOLUME ACRE-FT
PRE-DEV	61.30	16.59	10.343	52.84
POST-DEV	61.30	34.18	16.997	86.83
DIFFERENCE	0.00	17.59	6.654	
PRE-DEV NORTH	10.80	3.12	2.171	1.95
POST-DEV NORTH	10.80	5.61	2.655	2.39
DIFFERENCE	0.00	2.49	0.484	0.44
PRE-DEV SOUTH	50.50	13.47	8.172	34.39
POST-DEV SOUTH	50.50	28.57	14.342	60.36
DIFFERENCE	0.00	15.10	6.170	25.97

VOLUME BY BASIN	AREA SQ MILE	RUNOFF INCHES	DIFFERENCE INCHES	VOLUME ACRE-FT	BOTTOM WIDTH	BOTTOM LENGTH	TOP WIDTH	TOP LENGTH
PRE-BASIN A		0.38						
POST-BASIN A	0.02	0.85	0.850	0.91	85	140	117	172
POST-BASIN AA	0.013	1.198	0.818	0.57				
				1.47	TOTAL			
PRE-BASIN B		0.367						
POST-BASIN B	0.02	0.669						
POST-BASIN BB	0.005	0.192	0.494	0.66	48	105	72	129
PRE-BASIN C		0.4						
POST-BASIN C		0.435	NO IMPACT					
PRE-BASIN D		0.436						
POST-BASIN D		0.278	NO IMPACT					
PRE-BASIN E		0.377						
POST-BASIN E	0.017	0.616	0.239	0.22	25	37	57	69

DETENTION VOLUME CALCULATIONS

SIDE SLOPE	3
BOTTOM WIDTH	48
BOTTOM LENGTH	105
DEPTH OF BASIN	4

CALCULATED	
TOP WIDTH	72
TOP LENGTH	129
BOTTOM AREA	5040
TOP AREA	9288
VOLUME PROVIDED	28656 CF
VOLUME PROVIDED	0.657851 AC-FT

SUMMARY TR55 / HYDROLOGY CALCULATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloA.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	4.81	77	.145
Area A-2	Area A	REACH 1	1.62	77	0.1
Area A-3	Area A	REACH 2	4.28	77	.125
Area A-4	Area A	REACH 2	1.79	77	0.1
Area A-5	Area A	REACH 3	1.51	77	0.1
Area A-6	Area A	REACH 3	1.34	77	0.100

Total area: 15.35 (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>

Brown

Cielo Vista
Existing Onsite Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	4.81	0.145	77	REACH 1	Area A
Area A-2	1.62	0.100	77	REACH 1	Area A
Area A-3	4.28	0.125	77	REACH 2	Area A
Area A-4	1.79	0.100	77	REACH 2	Area A
Area A-5	1.51	0.100	77	REACH 3	Area A
Area A-6	1.34	0.100	77	REACH 3	Area A

Total Area: 15.35 (ac)

Brown

Cielo Vista
Existing Onsite Area A
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.0700	0.150				0.124
SHALLOW	580	0.2300	0.050				0.021
					Time of Concentration		.145
Area A-2							
SHEET	100	0.4200	0.150				0.060
SHALLOW	230	0.4200	0.050				0.006
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.1200	0.150				0.100
SHALLOW	670	0.2100	0.050				0.025
					Time of Concentration		.125
Area A-4							
SHEET	100	0.3500	0.150				0.065
SHALLOW	270	0.3500	0.050				0.008
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.3000	0.150				0.069
SHALLOW	250	0.2200	0.050				0.009
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.2900	0.150				0.070
SHALLOW	240	0.2900	0.050				0.008
					Time of Concentration		0.100

Cielo Vista
Existing Onsite Area A
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	1.13 10.02
Area A-2	0.40 9.95
Area A-3	1.02 10.00
Area A-4	0.44 9.95
Area A-5	0.37 9.95
Area A-6	0.33 9.95
REACHES	
REACH 1	1.52 10.01
Down	1.52 10.02
REACH 2	2.97 10.02
Down	2.97 10.02
REACH 3	3.66 10.02
Down	3.66 10.03
OUTLET	3.66

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area B
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area B-1	Area B	REACH 1	2.69	77	0.1
Area B-2	Area B	REACH 2	3.76	77	0.1
Area B-3	Area B	REACH 1	1.01	77	0.1
Area B-4	Area B	REACH 2	3.26	77	0.1
Area B-5	Area B	REACH 3	1.52	77	0.1
Area B-6	Area B	REACH 3	1.06	77	0.1
Area B-7	Area B	REACH 3	0.78	77	0.1

Total area: 14.08 (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>

Brown

Cielo Vista
Existing Onsite Area B
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area B-1	2.69	0.100	77	REACH 1	Area B
Area B-2	3.76	0.100	77	REACH 2	Area B
Area B-3	1.01	0.100	77	REACH 1	Area B
Area B-4	3.26	0.100	77	REACH 2	Area B
Area B-5	1.52	0.100	77	REACH 3	Area B
Area B-6	1.06	0.100	77	REACH 3	Area B
Area B-7	.78	0.100	77	REACH 3	Area B

Total Area: 14.08 (ac)

Brown

Cielo Vista
Existing Onsite Area B
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area B-1							
SHEET	100	0.1800	0.150				0.085
SHALLOW	190	0.1800	0.050				0.008
					Time of Concentration		0.1
Area B-2							
SHEET	100	0.2600	0.150				0.073
SHALLOW	70	0.2600	0.050				0.002
					Time of Concentration		0.1
Area B-3							
SHEET	64	0.3900	0.150				0.044
					Time of Concentration		0.1
Area B-4							
SHEET	100	0.3000	0.150				0.069
SHALLOW	180	0.3000	0.050				0.006
					Time of Concentration		0.1
Area B-5							
SHEET	100	0.3200	0.150				0.067
SHALLOW	80	0.3200	0.050				0.002
					Time of Concentration		0.1
Area B-6							
SHEET	100	0.2100	0.150				0.080
SHALLOW	170	0.2100	0.050				0.006
					Time of Concentration		0.1
Area B-7							
SHEET	100	0.1700	0.130				0.077
SHALLOW	200	0.1900	0.050				0.008
					Time of Concentration		0.1

Brown

Cielo Vista
Existing Onsite Area B
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area B-1	0.66
	9.95
Area B-2	0.92
	9.95
Area B-3	0.25
	9.95
Area B-4	0.80
	9.95
Area B-5	0.37
	9.95
Area B-6	0.26
	9.95
Area B-7	0.19
	9.95
REACHES	
REACH 1	0.91
	9.95
Down	0.91
	9.96
REACH 2	2.63
	9.95
Down	2.63
	9.97
REACH 3	3.46
	9.96
Down	3.46
	9.97
OUTLET	3.46

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area C
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloC.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area C-1	Area C	REACH 1	2.29	77	.11
Area C-2	Area C	REACH 2	1.54	77	0.1
Area C-3	Area C	REACH 3	3.44	77	0.1
Area C-4	Area C	REACH 3	1.91	77	0.1
Area C-5	Area C	REACH 4	2.2	77	0.1
Area C-6	Area C	REACH 3A	2.5	77	0.1
Area C-7	Area C	REACH 4	4.32	77	.108
Area C-8	Area C	Outlet	1.31	77	0.269

Total area: 19.51 (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>

Brown

Cielo Vista
Existing Onsite Area C
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area C-1	2.29	0.110	77	REACH 1	Area C
Area C-2	1.54	0.100	77	REACH 2	Area C
Area C-3	3.44	0.100	77	REACH 3	Area C
Area C-4	1.91	0.100	77	REACH 3	Area C
Area C-5	2.20	0.100	77	REACH 4	Area C
Area C-6	2.50	0.100	77	REACH 3A	Area C
Area C-7	4.32	0.108	77	REACH 4	Area C
Area C-8	1.31	0.269	77	Outlet	Area C

Total Area: 19.51 (ac)

Cielo Vista
Existing Onsite Area C
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area C-1							
SHEET	100	0.1300	0.150				0.096
SHALLOW	300	0.1300	0.050				0.014
					Time of Concentration		.11
Area C-2							
SHEET	100	0.4000	0.150				0.062
SHALLOW	67	0.4000	0.050				0.002
					Time of Concentration		0.1
Area C-3							
SHEET	100	0.3100	0.150				0.068
SHALLOW	360	0.3100	0.050				0.011
					Time of Concentration		0.1
Area C-4							
SHEET	100	0.3200	0.150				0.067
SHALLOW	50	0.3200	0.050				0.002
					Time of Concentration		0.1
Area C-5							
SHEET	100	0.2400	0.150				0.076
SHALLOW	130	0.2400	0.050				0.005
					Time of Concentration		0.1
Area C-6							
SHEET	100	0.3100	0.150				0.068
SHALLOW	365	0.3100	0.050				0.011
					Time of Concentration		0.1
Area C-7							
SHEET	100	0.1400	0.150				0.094
SHALLOW	300	0.1400	0.050				0.014
					Time of Concentration		.108
Area C-8							
SHEET	100	0.0100	0.150				0.269
					Time of Concentration		0.269

Brown

Cielo Vista
Existing Onsite Area C
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area C-1	0.55
	9.97
Area C-2	0.38
	9.95
Area C-3	0.85
	9.95
Area C-4	0.47
	9.95
Area C-5	0.54
	9.95
Area C-6	0.62
	9.95
Area C-7	1.05
	9.96
Area C-8	0.26
	10.08
REACHES	
REACH 1	0.55
	9.97
Down	0.55
	9.97
REACH 2	0.93
	9.96
Down	0.93
	9.97
REACH 3	2.24
	9.96
Down	2.24
	9.97
REACH 3A	0.62
	9.95
Down	0.62
	9.96
REACH 4	4.45
	9.96
Down	4.45
	9.97

Cielo Vista
Existing Onsite Area C
Orange County, California

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
OUTLET	4.63

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area D
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloD.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area D-1	Area D	REACH 1	0.87	89	.1
Area D-2	Area D	Outlet	0.42	86	0.1
Area D-3	Area D	REACH 1	0.54	89	.104
Area D-4	Area D	Outlet	0.31	86	0.1

Total area: 2.14 (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>

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area D-1	.87	0.100	89	REACH 1	Area D
Area D-2	.42	0.100	86	Outlet	Area D
Area D-3	.54	0.104	89	REACH 1	Area D
Area D-4	.31	0.100	86	Outlet	Area D

Total Area: 2.14 (ac)

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area D-1							
SHEET	100	0.2200	0.130				0.070
SHALLOW	810	0.2200	0.050				0.030
					Time of Concentration		.1
Area D-2							
SHEET	100	0.2900	0.150				0.070
SHALLOW	90	0.2900	0.050				0.003
					Time of Concentration		0.1
Area D-3							
SHEET	100	0.1600	0.150				0.089
SHALLOW	360	0.1600	0.050				0.015
					Time of Concentration		.104
Area D-4							
SHEET	90	0.2200	0.130				0.064
					Time of Concentration		0.1

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area D-1	0.71
	9.93
Area D-2	0.27
	9.93
Area D-3	0.43
	9.93
Area D-4	0.20
	9.93
REACHES	
REACH 1	1.14
	9.93
Down	1.14
	9.94
OUTLET	1.61

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area E
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloE.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area E-1	Area E	REACH 1	2.21	77	0.1
Area E-2	Area E	REACH 1	1.92	77	0.1
Area E-3	Area E	REACH 1	3.38	77	0.1
Area E-4	Area E	REACH 2	1.11	77	.11
Area E-5	Area E	REACH 2	1.34	77	0.100
Area E-6	Area E	REACH 2A	0.84	89	0.1

Total area: 10.80 (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>

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area E-1	2.21	0.100	77	REACH 1	Area E
Area E-2	1.92	0.100	77	REACH 1	Area E
Area E-3	3.38	0.100	77	REACH 1	Area E
Area E-4	1.11	0.110	77	REACH 2	Area E
Area E-5	1.34	0.100	77	REACH 2	Area E
Area E-6	.84	0.100	89	REACH 2A	Area E

Total Area: 10.80 (ac)

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area E-1							
SHEET	100	0.2700	0.150				0.072
SHALLOW	810	0.2700	0.050				0.027
					Time of Concentration		0.1
Area E-2							
SHEET	100	0.1300	0.150				0.096
SHALLOW	55	0.1300	0.050				0.003
					Time of Concentration		0.1
Area E-3							
SHEET	100	0.3000	0.150				0.069
SHALLOW	390	0.3000	0.050				0.012
					Time of Concentration		0.1
Area E-4							
SHEET	100	0.1700	0.150				0.087
SHALLOW	540	0.1700	0.050				0.023
					Time of Concentration		.11
Area E-5							
SHEET	100	0.2100	0.150				0.080
SHALLOW	180	0.2100	0.050				0.007
					Time of Concentration		0.100
Area E-6							
SHEET	100	0.1000	0.011				0.013
SHALLOW	460	0.1000	0.050				0.025
					Time of Concentration		0.1

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area E-1	0.54
	9.95
Area E-2	0.47
	9.95
Area E-3	0.83
	9.95
Area E-4	0.27
	9.97
Area E-5	0.33
	9.95
Area E-6	0.68
	9.93
REACHES	
REACH 1	1.85
	9.95
Down	1.84
	9.97
REACH 2A	0.68
	9.93
Down	0.68
	9.94
REACH 2	3.08
	9.97
Down	3.08
	9.97
OUTLET	3.08

Post-Development TR55 Hydrology Calculations

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloA.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	0.51	80	0.1
Area A-2	Area A	REACH 1	1.46	70	0.1
Area A-3	Area A	REACH 2	1.24	80	.21
Area A-4	Area A	REACH 2	1.14	98	0.1
Area A-5	Area A	REACH 2	1.94	80	0.1
Area A-6	Area A	REACH 2	3.62	94	0.1
Area A-7	Area A	BASIN A	2.78	86	0.1
Area AA-1	Area A	BASIN AA	2.27	80	0.1
Area AA-2	Area A	BASIN AA	6.22	94	0.1

Total area: 21.18 (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>

Brown

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	.51	0.100	80	REACH 1	Area A
Area A-2	1.46	0.100	70	REACH 1	Area A
Area A-3	1.24	0.210	80	REACH 2	Area A
Area A-4	1.14	0.100	98	REACH 2	Area A
Area A-5	1.94	0.100	80	REACH 2	Area A
Area A-6	3.62	0.100	94	REACH 2	Area A
Area A-7	2.78	0.100	86	BASIN A	Area A
Area AA-1	2.27	0.100	80	BASIN AA	Area A
Area AA-2	6.22	0.100	94	BASIN AA	Area A

Total Area: 21.18 (ac)

Brown

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	190	0.5000	0.050				0.005
					Time of Concentration		0.1
Area A-2							
SHEET	100	0.1900	0.130				0.074
SHALLOW	240	0.1900	0.050				0.009
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.0200	0.150				0.204
SHALLOW	54	0.0250	0.050				0.006
					Time of Concentration		.21
Area A-4							
SHEET	100	0.0050	0.011				0.044
SHALLOW	70	0.0050	0.025				0.014
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.5000	0.150				0.056
SHALLOW	210	0.2100	0.050				0.008
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.0200	0.011				0.025
SHALLOW	508	0.0660	0.025				0.027
					Time of Concentration		0.1
Area A-7							
SHEET	100	0.0200	0.011				0.025
SHALLOW	642	0.0690	0.025				0.033
					Time of Concentration		0.1
Area AA-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	53	0.1900	0.050				0.002
					Time of Concentration		0.1

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area AA-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	573	0.0250	0.025				0.050
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area A
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	0.18 9.94
Area A-2	0.10 10.03
Area A-3	0.39 10.04
Area A-4	1.59 9.93
Area A-5	0.70 9.94
Area A-6	4.13 9.93
Area A-7	1.78 9.93
Area AA-1	0.82 9.94
Area AA-2	7.09 9.93
REACHES	
REACH 1	0.26 10.02
Down	0.26 10.02
REACH 2	6.85 9.93
Down	6.85 9.93
BASIN A	8.63 9.93
Down	8.63 9.94
BASIN AA	7.89 9.93
Down	7.89 9.94
REACH 3	16.51 9.94

Cielo Vista
Developed Area A
Orange County, California

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
Down	16.50 9.94
OUTLET	16.50

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloA-DETENTION.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	0.51	80	0.1
Area A-2	Area A	REACH 1	1.46	70	0.1
Area A-3	Area A	REACH 2	1.24	80	.21
Area A-4	Area A	REACH 2	1.14	98	0.1
Area A-5	Area A	REACH 2	1.94	80	0.1
Area A-6	Area A	REACH 2	3.62	94	0.1
Area A-7	Area A	BASIN A	2.78	86	0.1
Area AA-1	Area A	BASIN AA	2.27	80	0.1
Area AA-2	Area A	BASIN AA	6.22	94	0.1

Total area: 21.18 (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>

Brown

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	.51	0.100	80	REACH 1	Area A
Area A-2	1.46	0.100	70	REACH 1	Area A
Area A-3	1.24	0.210	80	REACH 2	Area A
Area A-4	1.14	0.100	98	REACH 2	Area A
Area A-5	1.94	0.100	80	REACH 2	Area A
Area A-6	3.62	0.100	94	REACH 2	Area A
Area A-7	2.78	0.100	86	BASIN A	Area A
Area AA-1	2.27	0.100	80	BASIN AA	Area A
Area AA-2	6.22	0.100	94	BASIN AA	Area A

Total Area: 21.18 (ac)

Brown

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	190	0.5000	0.050				0.005
					Time of Concentration		0.1
Area A-2							
SHEET	100	0.1900	0.130				0.074
SHALLOW	240	0.1900	0.050				0.009
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.0200	0.150				0.204
SHALLOW	54	0.0250	0.050				0.006
					Time of Concentration		.21
Area A-4							
SHEET	100	0.0050	0.011				0.044
SHALLOW	70	0.0050	0.025				0.014
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.5000	0.150				0.056
SHALLOW	210	0.2100	0.050				0.008
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.0200	0.011				0.025
SHALLOW	508	0.0660	0.025				0.027
					Time of Concentration		0.1
Area A-7							
SHEET	100	0.0200	0.011				0.025
SHALLOW	642	0.0690	0.025				0.033
					Time of Concentration		0.1
Area AA-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	53	0.1900	0.050				0.002
					Time of Concentration		0.1

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area AA-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	573	0.0250	0.025				0.050
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area A
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	0.18
	9.94
Area A-2	0.10
	10.03
Area A-3	0.39
	10.04
Area A-4	1.59
	9.93
Area A-5	0.70
	9.94
Area A-6	4.13
	9.93
Area A-7	1.78
	9.93
Area AA-1	0.82
	9.94
Area AA-2	7.09
	9.93
REACHES	
REACH 1	0.26
	10.02
Down	0.26
	10.02
REACH 2	6.85
	9.93
Down	6.85
	9.90
BASIN A	8.64
	9.93
Down	8.64
	9.93
BASIN AA	7.89
	9.93
Down	7.89
	9.93
REACH 3	16.52
	9.93

Cielo Vista
Developed Area A
Orange County, California

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
Down	16.52 9.91
OUTLET	16.52

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area B
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area B-1	Area B	B1	5.24	83	0.1
Area B-2	Area B	B2	1.81	83	0.1
Area B-3	Area B	B2	0.41	80	0.1
Area B-4	Area B	B2	2.37	83	0.1
Area B-5	Area B	B3	2.07	85	0.1
Area B-6	Area B	BASIN B	0.62	80	.327

Total area: 12.52 (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>

Brown

Cielo Vista
Developed Area B
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area B-1	5.24	0.100	83	B1	Area B
Area B-2	1.81	0.100	83	B2	Area B
Area B-3	.41	0.100	80	B2	Area B
Area B-4	2.37	0.100	83	B2	Area B
Area B-5	2.07	0.100	85	B3	Area B
Area B-6	.62	0.327	80	BASIN B	Area B

Total Area: 12.52 (ac)

Brown

Cielo Vista
Developed Area B
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area B-1							
SHEET	100	0.0200	0.011				0.025
SHALLOW	392	0.0150	0.025				0.044
					Time of Concentration		0.1
Area B-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	306	0.0540	0.025				0.018
					Time of Concentration		0.1
Area B-3							
SHEET	50	0.5000	0.150				0.032
					Time of Concentration		0.1
Area B-4							
SHEET	100	0.0200	0.011				0.025
SHALLOW	344	0.0110	0.025				0.045
					Time of Concentration		0.1
Area B-5							
SHEET	100	0.0200	0.011				0.025
SHALLOW	430	0.0850	0.025				0.020
					Time of Concentration		0.1
Area B-6							
SHEET	90	0.0050	0.150				0.327
					Time of Concentration		.327

Brown

Cielo Vista
Developed Area B
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area B-1	2.57
	9.94
Area B-2	0.89
	9.94
Area B-3	0.15
	9.94
Area B-4	1.16
	9.94
Area B-5	1.22
	9.94
Area B-6	0.16
	10.11
REACHES	
B1	2.57
	9.94
Down	2.57
	9.94
B2	4.77
	9.94
Down	4.77
	9.94
B3	5.98
	9.94
Down	5.98
	9.95
BASIN B	6.07
	9.95
Down	6.07
	9.96
B4	6.07
	9.96
Down	6.07
	9.96
OUTLET	6.07

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area BB
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloBB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area BB-1	Area BB	BASIN BB1	0.36	96	0.1
Area BB-2	Area BB	BASIN BB1	0.32	80	0.1
Area BB-4	Area BB	BASIN BB2	0.28	95	0.1
Area BB-5	Area BB	BASIN BB2	0.41	80	0.1
Area BB-6	Area BB	BASIN BB2	0.87	77	0.1
Area BB-3	Area BB	BASIN BB1	0.76	77	0.1

Total area: 3 (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>

Brown

Cielo Vista
Developed Area BB
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area BB-1	.36	0.100	96	BASIN BB1	Area BB
Area BB-2	.32	0.100	80	BASIN BB1	Area BB
Area BB-4	.28	0.100	95	BASIN BB2	Area BB
Area BB-5	.41	0.100	80	BASIN BB2	Area BB
Area BB-6	.87	0.100	77	BASIN BB2	Area BB
Area BB-3	.76	0.100	77	BASIN BB1	Area BB

Total Area: 3 (ac)

Cielo Vista
Developed Area BB
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area BB-1							
SHEET	87	0.0900	0.011				0.012
					Time of Concentration		0.1
Area BB-2							
SHEET	70	0.4200	0.150				0.045
					Time of Concentration		0.1
Area BB-4							
SHEET	100	0.1000	0.011				0.013
SHALLOW	92	0.1000	0.025				0.004
					Time of Concentration		0.1
Area BB-5							
SHEET	72	0.4600	0.150				0.045
					Time of Concentration		0.1
Area BB-6							
SHEET	100	0.1700	0.130				0.077
SHALLOW	271	0.1700	0.050				0.011
					Time of Concentration		0.1
Area BB-3							
SHEET	100	0.1800	0.130				0.076
SHALLOW	220	0.2400	0.050				0.008
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area BB
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area BB-1	0.46
	9.93
Area BB-2	0.12
	9.94
Area BB-4	0.34
	9.93
Area BB-5	0.15
	9.94
Area BB-6	0.21
	9.95
Area BB-3	0.19
	9.95
REACHES	
BASIN BB1	0.75
	9.94
Down	0.75
	9.94
BASIN BB2	0.70
	9.93
Down	0.70
	9.94
BB3	1.45
	9.94
Down	1.45
	9.94
OUTLET	1.45

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area C
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloC.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area C-1	Area C	REACH 1	3.3	77	0.1
Area C-2	Area C	BASIN C	1.63	80	.119
Area C-3	Area C	BASIN C	1.91	77	0.1
Area C-4	Area C	BASIN C	0.52	86	0.1
Area C-5	Area C	BASIN C	1.13	86	.255

Total area: 8.49 (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>

Brown

Cielo Vista
Developed Area C
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area C-1	3.30	0.100	77	REACH 1	Area C
Area C-2	1.63	0.119	80	BASIN C	Area C
Area C-3	1.91	0.100	77	BASIN C	Area C
Area C-4	.52	0.100	86	BASIN C	Area C
Area C-5	1.13	0.255	86	BASIN C	Area C

Total Area: 8.49 (ac)

Brown

Cielo Vista
Developed Area C
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area C-1							
SHEET	100	0.1800	0.130				0.076
SHALLOW	510	0.1800	0.050				0.021
					Time of Concentration		0.1
Area C-2							
SHEET	100	0.1400	0.150				0.094
SHALLOW	550	0.1400	0.050				0.025
					Time of Concentration		.119
Area C-3							
SHEET	100	0.1700	0.130				0.077
SHALLOW	260	0.1700	0.050				0.011
					Time of Concentration		0.1
Area C-4							
SHEET	100	0.1300	0.011				0.012
SHALLOW	200	0.1300	0.050				0.010
					Time of Concentration		0.1
Area C-5							
SHEET	100	0.0100	0.130				0.240
SHALLOW	90	0.0100	0.050				0.015
					Time of Concentration		.255

Brown

Cielo Vista
Developed Area C
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area C-1	0.81
	9.95
Area C-2	0.57
	9.96
Area C-3	0.47
	9.95
Area C-4	0.33
	9.93
Area C-5	0.59
	10.06
REACHES	
REACH 1	0.81
	9.95
Down	0.81
	9.97
BASIN C	2.66
	10.01
Down	2.66
	10.02
OUTLET	2.66

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area D
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloD.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area D-1	Area D	Outlet	2.4	77	0.1
Area D-2	Area D	Outlet	0.27	80	0.1
Area D-3	Area D	Outlet	0.26	80	0.1
Area D-4	Area D	Outlet	1.61	77	0.1
Area D-5	Area D	Outlet	0.88	77	0.1

Total area: 5.42 (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>

Brown

Cielo Vista
Developed Area D
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area D-1	2.40	0.100	77	Outlet	Area D
Area D-2	.27	0.100	80	Outlet	Area D
Area D-3	.26	0.100	80	Outlet	Area D
Area D-4	1.61	0.100	77	Outlet	Area D
Area D-5	.88	0.100	77	Outlet	Area D

Total Area: 5.42 (ac)

Cielo Vista
Developed Area D
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area D-1							
SHEET	100	0.1200	0.130				0.089
SHALLOW	127	0.1200	0.050				0.006
					Time of Concentration		0.1
Area D-2							
SHEET	100	0.3000	0.150				0.069
					Time of Concentration		0.1
Area D-3							
SHEET	100	0.3000	0.150				0.069
					Time of Concentration		0.1
Area D-4							
SHEET	100	0.2500	0.130				0.066
SHALLOW	407	0.2500	0.050				0.014
					Time of Concentration		0.1
Area D-5							
SHEET	100	0.2200	0.130				0.070
SHALLOW	595	0.2200	0.050				0.022
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area D
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area D-1	0.59 9.95
Area D-2	0.10 9.94
Area D-3	0.09 9.94
Area D-4	0.40 9.95
Area D-5	0.22 9.95
REACHES	
OUTLET	1.39

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area E
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloE.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area E-1	Area E	REACH 2A	2.03	77	0.1
Area E-2	Area E	REACH 2	1.51	80	0.1
Area E-3	Area E	REACH 1A	0.96	89	0.1
Area E-4	Area E	REACH 1B	1.09	80	0.1
Area E-5	Area E	BASIN E	4.71	87	0.1
Area E-6	Area E	REACH 1A	0.5	77	0.1

Total area: 10.80 (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>

Brown

Cielo Vista
Developed Area E
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area E-1	2.03	0.100	77	REACH 2A	Area E
Area E-2	1.51	0.100	80	REACH 2	Area E
Area E-3	.96	0.100	89	REACH 1A	Area E
Area E-4	1.09	0.100	80	REACH 1B	Area E
Area E-5	4.71	0.100	87	BASIN E	Area E
Area E-6	.50	0.100	77	REACH 1A	Area E

Total Area: 10.80 (ac)

Brown

Cielo Vista
Developed Area E
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area E-1							
SHEET	100	0.3400	0.130				0.059
SHALLOW	780	0.3400	0.050				0.023
					Time of Concentration		0.1
Area E-2							
SHEET	100	0.5000	0.150				0.056
					Time of Concentration		0.1
Area E-3							
SHEET	100	0.1000	0.011				0.013
SHALLOW	610	0.1000	0.050				0.033
					Time of Concentration		0.1
Area E-4							
SHEET	100	0.3200	0.150				0.067
SHALLOW	150		0.050				
					Time of Concentration		0.1
Area E-5							
SHEET	100	0.0200	0.011				0.025
SHALLOW	550	0.0500	0.025				0.034
					Time of Concentration		0.1
Area E-6							
SHEET	80	0.3500	0.150				0.054
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area E
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area E-1	0.50
	9.95
Area E-2	0.54
	9.94
Area E-3	0.78
	9.93
Area E-4	0.39
	9.94
Area E-5	3.28
	9.93
Area E-6	0.12
	9.95
REACHES	
BASIN E	3.66
	9.93
Down	3.66
	9.93
REACH 1	3.66
	9.93
Down	3.66
	9.94
REACH 1A	0.90
	9.93
Down	0.90
	9.94
REACH 1B	0.39
	9.94
Down	0.39
	9.95
REACH 2A	0.50
	9.95
Down	0.50
	9.97
REACH 2	5.58
	9.94
Down	5.58
	9.94

Cielo Vista
Developed Area E
Orange County, California

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
OUTLET	5.58

Attachment H. ..... O. C. Hydrology 2-Year Frequency (North Site)

CONCEPTUAL


```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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        Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                      Analysis prepared by:

                    Charles Hartman & Associates
                   27127 Calle Arroyo, Suite 1904
                   San Juan Capistrano, CA 92675
                         949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* NORTH                                                                 *
* AREA E & F      EXISTING 2-YR (NORTH)                                 *
 **************************************************************************

  FILE NAME: CIELOXN.DAT
  TIME/DATE OF STUDY: 10:55 03/29/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:    CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE     600.00 TO NODE     601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D        0.43      0.20      1.000    83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE     601.00 TO NODE     602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D        2.20      0.20      1.000    83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     2.20      SUBAREA RUNOFF(CFS) =     2.67
 EFFECTIVE AREA(ACRES) =       2.63   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =         2.6        PEAK FLOW RATE(CFS) =        3.19

****************************************************************************
 FLOW PROCESS FROM NODE     601.00 TO NODE     602.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =     805.00  DOWNSTREAM(FEET) =     638.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.2651
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =        3.19
 FLOW VELOCITY(FEET/SEC) =    6.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =    1.74   Tc(MIN.) =   11.46
 LONGEST FLOWPATH FROM NODE     600.00 TO NODE     602.00 =      960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     602.00 TO NODE     602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.46
 RAINFALL INTENSITY(INCH/HR) =   1.41
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       2.63
 TOTAL STREAM AREA(ACRES) =       2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =        3.19

****************************************************************************
 FLOW PROCESS FROM NODE     602.10 TO NODE     602.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =     780.00  DOWNSTREAM(FEET) =     638.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     8.501
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D        1.63      0.20      1.000    83    8.50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =       2.16
 TOTAL AREA(ACRES) =       1.63   PEAK FLOW RATE(CFS) =       2.16

****************************************************************************
 FLOW PROCESS FROM NODE     602.00 TO NODE     602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =     8.50
 RAINFALL INTENSITY(INCH/HR) =   1.67
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.63
 TOTAL STREAM AREA(ACRES) =       1.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =        2.16

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1         3.19   11.46    1.407  0.20( 0.20) 1.00       2.6     600.00
     2         2.16    8.50    1.669  0.20( 0.20) 1.00       1.6     602.10
```



```
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1         5.04    8.50    1.669  0.20( 0.20) 1.00       3.6     602.10
     2         4.96   11.46    1.407  0.20( 0.20) 1.00       4.3     600.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.04    Tc(MIN.) =     8.50
 EFFECTIVE AREA(ACRES) =       3.58   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        4.3
 LONGEST FLOWPATH FROM NODE     600.00 TO NODE     602.00 =      960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =     8.50
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D        4.19      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     4.19      SUBAREA RUNOFF(CFS) =     5.54
 EFFECTIVE AREA(ACRES) =       7.77   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =         8.5        PEAK FLOW RATE(CFS) =       10.28

****************************************************************************
 FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =     638.00  DOWNSTREAM(FEET) =     613.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   670.00   CHANNEL SLOPE =  0.0373
 CHANNEL FLOW THRU SUBAREA(CFS) =       10.28
 FLOW VELOCITY(FEET/SEC) =    4.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =    2.30   Tc(MIN.) =   10.80
 LONGEST FLOWPATH FROM NODE     600.00 TO NODE     603.00 =     1630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     603.00 TO NODE     603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    10.80
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D        2.20      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     2.20      SUBAREA RUNOFF(CFS) =     2.49
 EFFECTIVE AREA(ACRES) =       9.97   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        10.7        PEAK FLOW RATE(CFS) =       11.26
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.80
 EFFECTIVE AREA(ACRES) =       9.97  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =      11.26

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER      (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        11.26   10.80    1.455  0.20( 0.20) 1.00      10.0     602.10
     2        10.19   13.82    1.263  0.20( 0.20) 1.00      10.7     600.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

$T_c = 10.8$ min

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                        27127 Calle Arroyo, Suite 1904
                        San Juan Capistrano, CA 92675
                                949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-YEAR                                                                 *
* DEVELOPED                                                              *
* NORTH                                                                  *
 **************************************************************************

  FILE NAME: CIELODN.DAT
  TIME/DATE OF STUDY: 10:59 04/08/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE     600.00 TO NODE     601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.43      0.20      1.000     83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =       0.52
  TOTAL AREA(ACRES) =       0.43   PEAK FLOW RATE(CFS) =       0.52

**************************************************************************
  FLOW PROCESS FROM NODE     601.00 TO NODE     602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.61      0.20      1.000     83
```



```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.61      SUBAREA RUNOFF(CFS) =     1.95
  EFFECTIVE AREA(ACRES) =      2.04   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =        2.0       PEAK FLOW RATE(CFS) =       2.47

**************************************************************************
  FLOW PROCESS FROM NODE     601.00 TO NODE     602.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    665.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.4000
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.47
  FLOW VELOCITY(FEET/SEC) =   5.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     680.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   10.74
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.460
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        1.51      0.20      0.850     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     1.51      SUBAREA RUNOFF(CFS) =     1.75
  EFFECTIVE AREA(ACRES) =      3.55   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.94
  TOTAL AREA(ACRES) =        3.5       PEAK FLOW RATE(CFS) =       4.07

**************************************************************************
  FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    618.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1035.00   CHANNEL SLOPE =  0.0454
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.07
  FLOW VELOCITY(FEET/SEC) =   4.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   4.03   Tc(MIN.) =   14.76
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     603.00 TO NODE     603.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.76
  RAINFALL INTENSITY(INCH/HR) =   1.22
  AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.94
  EFFECTIVE STREAM AREA(ACRES) =       3.55
  TOTAL STREAM AREA(ACRES) =       3.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.07

**************************************************************************
  FLOW PROCESS FROM NODE     500.00 TO NODE     501.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    680.00  DOWNSTREAM(FEET) =    674.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.341
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        1.23      0.20      0.600    75    9.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =       1.62
 TOTAL AREA(ACRES) =       1.23   PEAK FLOW RATE(CFS) =       1.62

****************************************************************************
 FLOW PROCESS FROM NODE     501.00 TO NODE     501.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =     9.34
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        1.09      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     1.09      SUBAREA RUNOFF(CFS) =     1.36
 EFFECTIVE AREA(ACRES) =      2.32   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.79
 TOTAL AREA(ACRES) =       2.3       PEAK FLOW RATE(CFS) =       2.97

****************************************************************************
 FLOW PROCESS FROM NODE     501.00 TO NODE     502.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  674.00  DOWNSTREAM ELEVATION(FEET) =  646.00
 STREET LENGTH(FEET) =  340.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL) =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL) =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.11
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.26
   HALFSTREET FLOOD WIDTH(FEET) =    5.66
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.32
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.40
 STREET FLOW TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =   10.41
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        3.47      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    4.27
 EFFECTIVE AREA(ACRES) =      5.79   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.68
 TOTAL AREA(ACRES) =       5.8       PEAK FLOW RATE(CFS) =       7.04

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.03
 FLOW VELOCITY(FEET/SEC.) =  5.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.60
 LONGEST FLOWPATH FROM NODE     500.00 TO NODE     502.00 =     670.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     603.00 TO NODE     603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    10.41
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        0.40      0.20      0.850    75
```



```
 COMMERCIAL                 D        0.96      0.20      0.100    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.321
 SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    1.74
 EFFECTIVE AREA(ACRES) =      7.15   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =       7.2       PEAK FLOW RATE(CFS) =       8.78

****************************************************************************
 FLOW PROCESS FROM NODE     503.00 TO NODE     603.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.41
 RAINFALL INTENSITY(INCH/HR) =   1.49
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.61
 EFFECTIVE STREAM AREA(ACRES) =       7.15
 TOTAL STREAM AREA(ACRES) =       7.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.78

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        4.07   14.76    1.216  0.20( 0.19) 0.94       3.5     600.00
     2        8.78   10.41    1.486  0.20( 0.12) 0.61       7.2     500.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.40   10.41    1.486  0.20( 0.14) 0.69       9.7     500.00
     2       11.11   14.76    1.216  0.20( 0.14) 0.72      10.7     600.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      12.40    Tc(MIN.) =    10.41
 EFFECTIVE AREA(ACRES) =       9.65   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =      10.7
 LONGEST FLOWPATH FROM NODE     600.00 TO NODE     603.00 =    1715.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       10.7  TC(MIN.) =     10.41
 EFFECTIVE AREA(ACRES) =       9.65  AREA-AVERAGED Fm(INCH/HR)=  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.693
 PEAK FLOW RATE(CFS)   =      12.40

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.40   10.41    1.486  0.20( 0.14) 0.69       9.7     500.00
     2       11.11   14.76    1.216  0.20( 0.14) 0.72      10.7     600.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

Attachment I. .....O.C. Hydrology 2-Year Frequency (South Site)

CONCEPTUAL


```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
      (c) Copyright 1983-2007 Advanced Engineering Software (aes)
          Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                        Analysis prepared by:

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                             949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* AREA B                  EXISTING 2-YEAR (SOUTH "A")                   *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 15:06 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D       1.86      0.20      1.000     83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.04
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      2.04

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
        LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D      13.03      0.20      1.000     83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   14.30
 EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      16.34
 FLOW VELOCITY(FEET/SEC) =   8.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   13.03
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.03
 RAINFALL INTENSITY(INCH/HR) =   1.31
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.89
 TOTAL STREAM AREA(ACRES) =      14.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D       1.65      0.20      1.000    83   10.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.90
 TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      1.90

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.52
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D      13.18      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   15.15
 EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      17.05

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```



```
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    755.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      17.05
 FLOW VELOCITY(FEET/SEC) =   9.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =   13.05
 LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.05
 RAINFALL INTENSITY(INCH/HR) =   1.31
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.83
 TOTAL STREAM AREA(ACRES) =      14.83
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.05

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       16.34   13.03    1.306  0.20( 0.20) 1.00      14.9     200.00
     2       17.05   13.05    1.305  0.20( 0.20) 1.00      14.8     202.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
     2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      33.38    Tc(MIN.) =    13.03
 EFFECTIVE AREA(ACRES) =      29.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       29.7
 LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       29.7  TC(MIN.) =     13.03
 EFFECTIVE AREA(ACRES) =     29.70  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =      33.38

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
     2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

A = 29.7

Q = 33.4 CFS

```
**************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-year                                                                  *
* AREA C                EXISTING 2-YEAR (SOUTH "E")                       *
*                                                                         *
 *************************************************************************

  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 15:07 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE     300.00 TO NODE     301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D       2.17      0.20      1.000     83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.62
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      2.62

**************************************************************************
  FLOW PROCESS FROM NODE     301.00 TO NODE     302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D       16.79      0.20      1.000     83
```



```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   20.27
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      22.89

**************************************************************************
  FLOW PROCESS FROM NODE     301.00 TO NODE     302.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.89
  FLOW VELOCITY(FEET/SEC) =   8.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   12.02
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       19.0  TC(MIN.) =     12.02
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      22.89
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

A = 19.0 acre

Q = 22.9 cfs

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                        27127 Calle Arroyo, Suite 1904
                        San Juan Capistrano, CA 92675
                                949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA B DEVELOPED  PROPOSED 2-YEAR (SOUTH B)                            *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:19 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE     100.00 TO NODE     101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.79      0.20      0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =       2.70
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      2.70

**************************************************************************
  FLOW PROCESS FROM NODE     101.00 TO NODE     102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.45      0.20      0.600    75
```



```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.45      SUBAREA RUNOFF(CFS) =     2.37
  EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.07

**************************************************************************
  FLOW PROCESS FROM NODE     101.00 TO NODE     102.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
  FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.07
  PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =   15.83
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     102.00 TO NODE     102.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.83
  RAINFALL INTENSITY(INCH/HR) =   1.17
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.24
  TOTAL STREAM AREA(ACRES) =       5.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.07

**************************************************************************
  FLOW PROCESS FROM NODE     102.10 TO NODE     102.20 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.37      0.20      0.600    75    9.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =       3.05
  TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      3.05

**************************************************************************
  FLOW PROCESS FROM NODE     102.20 TO NODE     102.20 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.65
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 D        0.41      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     0.41      SUBAREA RUNOFF(CFS) =     0.51
  EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
  TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       3.56

**************************************************************************
  FLOW PROCESS FROM NODE     202.20 TO NODE     102.00 IS CODE =   1
--------------------------------------------------------------------------
```

```
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.65
 RAINFALL INTENSITY(INCH/HR) =   1.55
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.64
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.56

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        5.07   15.83    1.168  0.20( 0.12) 0.60       5.2     100.00
     2        3.56    9.65    1.552  0.20( 0.13) 0.64       2.8     102.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.79    9.65    1.552  0.20( 0.12) 0.62       6.0     102.10
     2        7.67   15.83    1.168  0.20( 0.12) 0.61       8.0     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =     9.65
 EFFECTIVE AREA(ACRES) =       5.97   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =        8.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        1.80     0.20     0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     1.80      SUBAREA RUNOFF(CFS) =     2.32
 EFFECTIVE AREA(ACRES) =       7.77   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =        9.8       PEAK FLOW RATE(CFS) =      10.00

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.00
 PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.14
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.14
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
```



```
 "3-4 DWELLINGS/ACRE"       D        2.07     0.20     0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     2.07      SUBAREA RUNOFF(CFS) =     2.59
 EFFECTIVE AREA(ACRES) =       9.84   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      12.29

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.81
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.29
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   10.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.40
 RAINFALL INTENSITY(INCH/HR) =   1.49
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.61
 EFFECTIVE STREAM AREA(ACRES) =       9.84
 TOTAL STREAM AREA(ACRES) =      11.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.29

****************************************************************************
 FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
 ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 PUBLIC PARK                D        0.41     0.20     0.850    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      0.77
 TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      0.77

****************************************************************************
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.28     0.20     0.100    75
 COMMERCIAL                 D        0.36     0.20     0.100    75
 PUBLIC PARK                D        0.32     0.20     0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =     0.96      SUBAREA RUNOFF(CFS) =     1.90
 EFFECTIVE AREA(ACRES) =       1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
 TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.67

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.00 IS CODE =  81
--------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.78      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     2.78      SUBAREA RUNOFF(CFS) =     5.36
 EFFECTIVE AREA(ACRES) =      4.15   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =       4.2       PEAK FLOW RATE(CFS) =       8.03

********************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
--------------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.26
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.57
 EFFECTIVE STREAM AREA(ACRES) =       4.15
 TOTAL STREAM AREA(ACRES) =       4.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.03

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.29   10.40    1.487  0.20( 0.12) 0.61       9.8     102.10
     1       10.98   16.59    1.137  0.20( 0.12) 0.61      11.9     100.00
     2        8.03    5.00    2.264  0.20( 0.11) 0.57       4.2     104.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.00    2.264  0.20( 0.12) 0.59       8.9     104.10
     2       17.42   10.40    1.487  0.20( 0.12) 0.60      14.0     102.10
     3       14.80   16.59    1.137  0.20( 0.12) 0.60      16.0     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.42    Tc(MIN.) =    10.40
 EFFECTIVE AREA(ACRES) =      13.99   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       16.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
--------------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.42
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.44
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
--------------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.44
```



```
 RAINFALL INTENSITY(INCH/HR) =   1.48
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      13.99
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.42

********************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
--------------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      5.16
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =      5.16

********************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
--------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
 MAINLINE Tc(MIN.) =    8.32
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK               D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =     2.04      SUBAREA RUNOFF(CFS) =     2.79
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =       5.7       PEAK FLOW RATE(CFS) =       7.95

********************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
--------------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   649.00  DOWNSTREAM(FEET) =   604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.95
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.71
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
--------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
 MAINLINE Tc(MIN.) =    8.71
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.646
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        4.25      0.20      0.600    75
 PUBLIC PARK                D        1.62      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.650
 SUBAREA AREA(ACRES) =     8.02      SUBAREA RUNOFF(CFS) =    10.94
```

```
 EFFECTIVE AREA(ACRES) =     13.71   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.67
 TOTAL AREA(ACRES) =       13.7       PEAK FLOW RATE(CFS) =      18.66

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.65
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.67
 EFFECTIVE STREAM AREA(ACRES) =      13.71
 TOTAL STREAM AREA(ACRES) =      13.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       17.30    5.04    2.253  0.20( 0.12) 0.59       8.9     104.10
     1       17.42   10.44    1.484  0.20( 0.12) 0.60      14.0     102.10
     1       14.80   16.63    1.135  0.20( 0.12) 0.60      16.0     100.00
     2       18.66    8.71    1.646  0.20( 0.13) 0.67      13.7     105.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       32.43    5.04    2.253  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    8.71    1.646  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.44    1.484  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   16.63    1.135  0.20( 0.13) 0.63      29.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =      26.07   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =       29.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.49
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1956.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   576.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  43.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2006.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```



```
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
 FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.26
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.09
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
 FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.21
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =      29.8  TC(MIN.) =      9.21
 EFFECTIVE AREA(ACRES) =     26.07  AREA-AVERAGED Fm(INCH/HR)=  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
 PEAK FLOW RATE(CFS)   =      36.04

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       32.43    5.54    2.134  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    9.21    1.594  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.94    1.445  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   17.17    1.115  0.20( 0.13) 0.63      29.8     100.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

♀

A=29.8 ac
Q=36.1

Q increased from 33.4 cfs

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2007 Advanced Engineering Software (aes)
            Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

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                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                               *
* AREA C DEVELOPED  PROPOSED 2-YEAR (SOUTH C)                          *
*                                                                      *
 **************************************************************************

  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:53 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       1.76      0.20     1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      2.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 D       3.42      0.20     0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```



```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     4.31
  EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.49

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.49
  FLOW VELOCITY(FEET/SEC) =   5.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 D       1.63      0.20     0.850    75
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       0.52      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
  SUBAREA AREA(ACRES) =     2.15      SUBAREA RUNOFF(CFS) =     2.36
  EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.03

**************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       1.13      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.13      SUBAREA RUNOFF(CFS) =     1.22
  EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =       9.25

**************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    605.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.25
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.50
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.5  TC(MIN.) =     12.50
  EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
  PEAK FLOW RATE(CFS)   =       9.25
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

A = 8.5

$Q_2 = 9.2$

Attachment J. ..... Onsite/Offsite 2-year Runoff Comparison by TRWE
(Excerpt included. See attached separate report by others)

CONCEPTUAL

TORY R. WALKER ENGINEERING, INC.
WATER RESOURCES PLANNING & ENGINEERING

TECHNICAL MEMORANDUM

TO: Larry Netherton
Sage Community Group, Inc.

FROM: Tory Walker, PE, CFM, LEED GA
Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.

DATE: April 9, 2013

RE: Summary of Unit Hydrograph Analysis for Hydromodification Compliance of Cielo Vista, Yorba Linda, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed Cielo Vista development project in the City of Yorba Linda using the Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the Orange County Hydrology Manual. Total hydrographs for the 2-year storm event were prepared for existing and developed conditions for all on and off-site contributing drainage areas in order to demonstrate that the project meets the current Orange County hydromodification requirements.

METHODOLOGY FOR UNIT HYDROGRAPH ANALYSIS

Design Storm

The 2-year, 24-hour design rainfall was determined using the Unit Hydrograph Method Design Storm from Section B.4 of the Orange County Hydrology Manual (OCHM). As required by the OCHM, the precipitation values were corrected to account for the tendency of the average rainfall intensity to decrease with respect to increased area for single event storms. In order to provide the peak flow at the confluence of Creek B, Creek C, and Creek D at the Western Boundary (see Hydrology Map in Attachments), a single design storm was created for use in all three creeks by using correction factors based on the total area of the Creek B, C, and D catchments. A separate design storm was created for Creek A as no confluence analysis was required for this creek at the southern boundary. Rainfall distributions are listed in the Appendix.

Losses

Catchment losses and effective rainfall were computed using the Curve Number Method as described in Section C of the OCHM. This method requires the determination of soil and cover type parameters for each catchment. Curve Numbers (CN) in this report reflect the assumption of Antecedent Moisture Condition I (AMC I), which is required for the 2 year return period storm. For detailed information and maps on soil type, cover type, and CN selection please refer to the following sections and the Attachments for this memo.

122 Civic Center Drive, Suite 206, Vista, CA 92084 | Ph: 760.414.9212 Fx: 760.414.9277 | www.Trwengineering.Com

Unit Hydrograph Method

The Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the OCHM was used for the hydrologic calculations for this project. S-Curves were developed for each catchment based on watershed characteristics. The unit hydrograph was then convoluted with the effective rainfall for each catchment to determine the total hydrograph. The total hydrograph at the confluence of Creeks B, C, and D was calculated by summation of the individual flow ordinates for each creek's hydrograph.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In existing conditions, hydrologic soil groups D and C dominate each catchment with only small patches of type B soil in some areas (refer to Attachments for Soil Type Maps). Both group D and group C soils have slow infiltration rates when saturated. This is especially true for D soils, which consist chiefly of clay soils with a high swelling potential, clay pan or clay layer at or near the surface, or shallow soils over nearly impervious materials. Group D soils have a very slow rate of water transmission. As a result, losses due to infiltration will be relatively low for all catchments.

Cover type for each catchment consists primarily of natural open space with only a small portion of residential development located in the lower reaches. In fact, Creek A and Creek B were determined to be entirely natural open space. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial". Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM.

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is included in the Attachments.

Peak Flow Determination

The existing conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 1 and 2 below. It is important to note that the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

TABLE 1 - Existing Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek B	224	131.0
Creek C	717	327.9
Creek D	473	275.6
TOTAL: Confluence of Creeks B, C, & D	1414	647.0

TABLE 2 - Existing Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek A	674	296.6

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In developed conditions, the distribution of hydrologic soil groups is assumed to remain the same as the existing conditions described in the previous section (refer to Attachments for Soil Type Maps).

The proposed project site is approximately 4% of the total of all drainage areas, and as a result the cover type for each catchment remains primarily natural open space with only a small portion of residential development located in the lower reaches. The main difference from existing conditions is that residential development is now present in Creek A and Creek B.

Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial."

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is presented in the Attachments.

Peak Flow Determination

The proposed conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 3 and 4. As was noted in existing conditions, the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

It is evident from Tables 3 and 4 that the development of the project site has a negligible effect on the peak flows of all four creeks. The largest peak flow increase is a mere 0.5 cfs in Creek A. These minute increases in peak flow are attributable to two factors. First, the area being developed is relatively small when compared to the size of each catchment. Second, the fact that the infiltration capacity of each catchment has already been greatly exceeded during the peak of the storm makes the addition of impervious area somewhat irrelevant.

Thus, while the increase in total runoff volume may be more significant, the project's impact on the maximum peak flows of the hydrographs for all creeks is minimal.

TABLE 3 - Developed Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek B	224	131.1	0.1
Creek C	717	328.0	0.0
Creek D	473	275.6	0.0
TOTAL: Confluence of Creeks B, C, & D	1414	647.2	0.1

TABLE 4 - Developed Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek A	674	297.1	0.5

SUMMARY

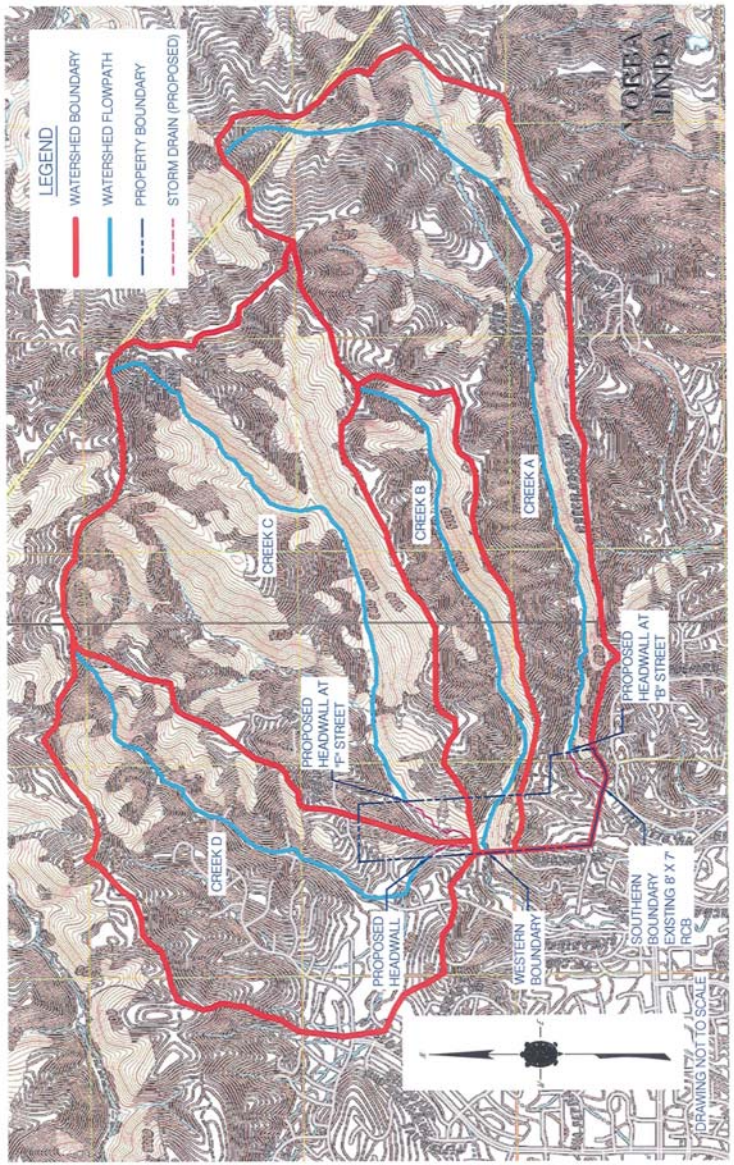
This study has demonstrated that the increase in peak flow for all receiving creeks due to development of the proposed Cielo Vista site is less than 1%, thus complying with the current Orange County hydromodification criteria.

ATTACHMENTS

1. Hydrology Map
2. Rainfall, Curve Number, and Unit Hydrograph Calculations

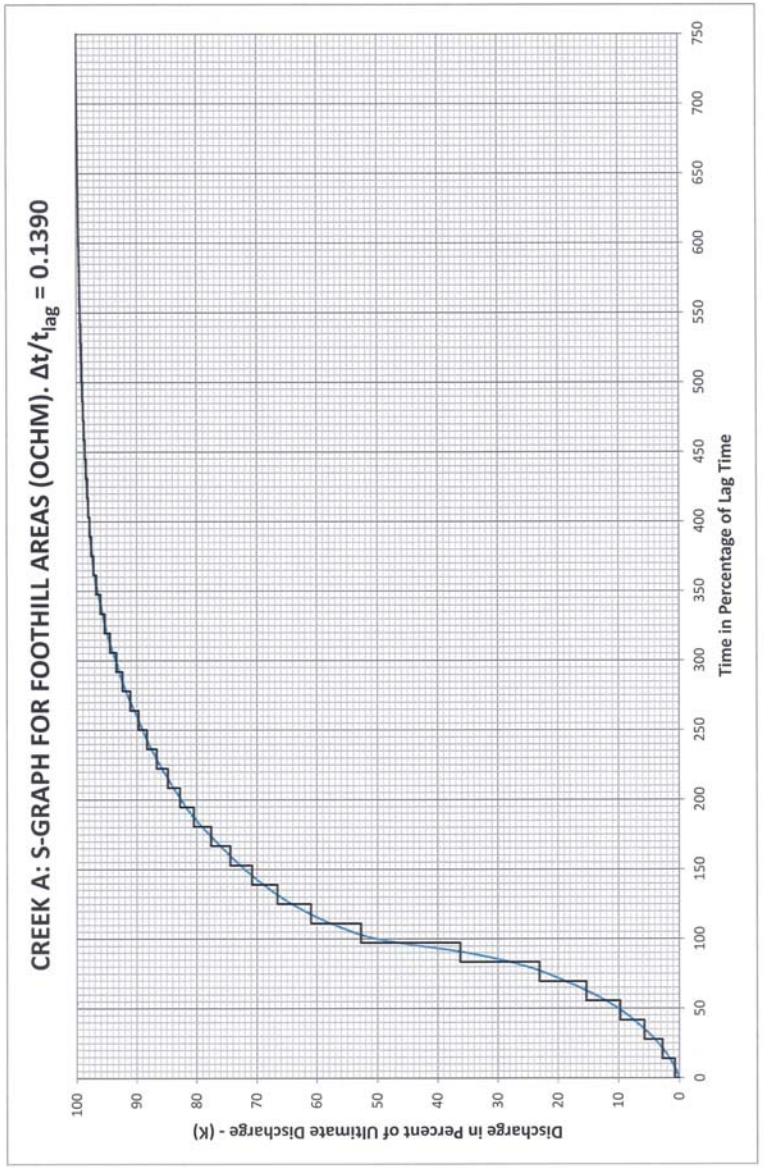
Cielo Vista Hydromodification Memo
April 9, 2013

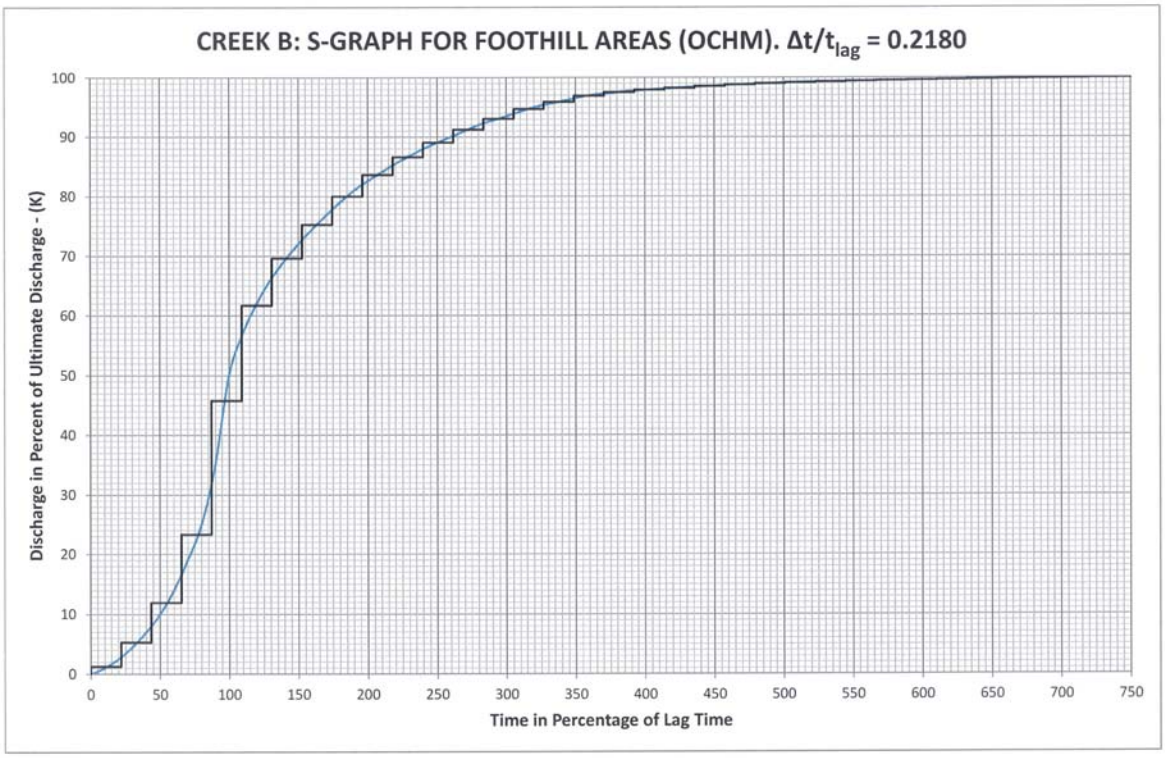
ATTACHMENT 1. Hydrology Map

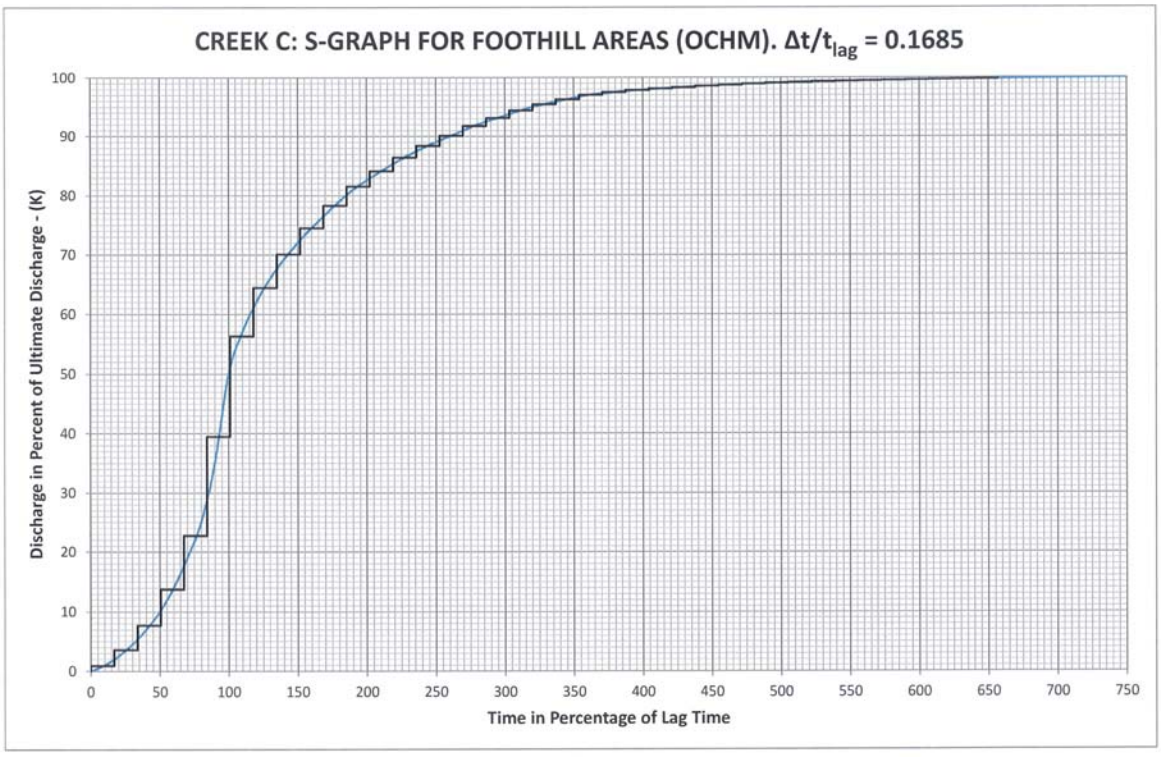


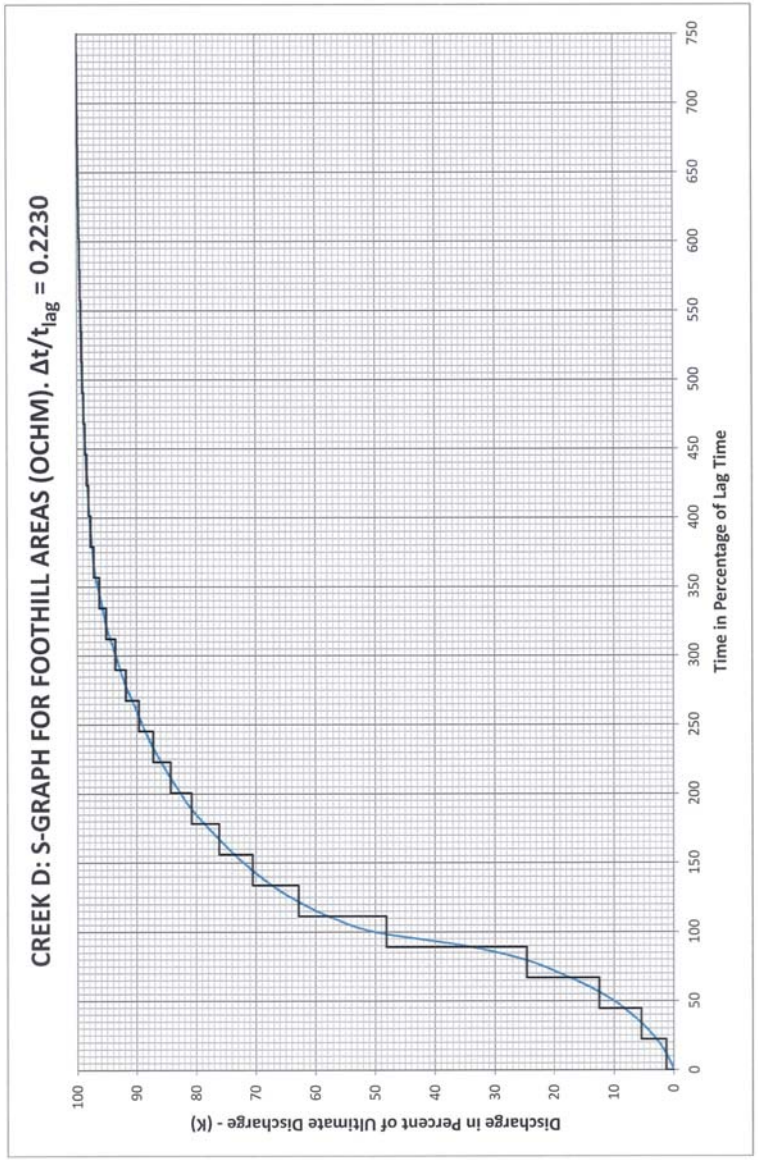
ATTACHMENT 2. Hydrograph Calculations

Lag Time Determination*							
n	0.045						
C_t	1.08						
m	0.38						
Δt	5	min					
Basin ID	**Area (mi2)**	**L (mi)**	**L_ca (mi)**	**S2 (ft/mi)**	**Tlag (hrs)**	**Tlag (min)**	**Δt/tlag**
CREEK A	1.053	2.778	1.373	322.6	0.599	36.0	13.90%
CREEK B	0.351	1.588	0.870	450.9	0.382	22.9	21.80%
CREEK C	1.120	2.008	1.297	413.6	0.495	29.7	16.85%
CREEK D	0.739	1.626	0.769	415.9	0.374	22.4	22.30%
*All variables as defined in Section E.3 of the Orange County Hydrology Manual							




CREEK B: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2180
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK C: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1685
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750



2-yr, 24-hr Design Storm Rainfall per Section B.4 of the Orange County Hydrology Manual:

			Corrections per Basin (dimensionless)		Corrected Precipitation Per Basin (in/hr)		Design Storm Incremental precipitation per basin[1]	
time (min)	I (in/hr)	P (in)	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D
5	2.264	0.189	96.10	92.15	2.18	2.09	0.0031	0.0031
10	1.521	0.253	96.10	92.15	1.46	1.40	0.0031	0.0031
15	1.205	0.301	96.10	92.15	1.16	1.11	0.0031	0.0031
20	1.021	0.340	96.10	92.15	0.98	0.94	0.0031	0.0032
25	0.899	0.374	96.10	92.15	0.86	0.83	0.0032	0.0032
30	0.809	0.405	96.10	92.15	0.78	0.75	0.0032	0.0032
35	0.741	0.432	96.10	92.15	0.71	0.68	0.0032	0.0032
40	0.686	0.457	96.10	92.15	0.66	0.63	0.0032	0.0032
45	0.641	0.481	96.10	92.15	0.62	0.59	0.0032	0.0032
50	0.604	0.503	96.10	92.15	0.58	0.56	0.0032	0.0032
55	0.572	0.524	96.10	92.15	0.55	0.53	0.0032	0.0032
60	0.544	0.544	96.10	92.15	0.52	0.50	0.0032	0.0032
65	0.519	0.563	96.25	92.44	0.50	0.48	0.0032	0.0032
70	0.498	0.581	96.40	92.74	0.48	0.46	0.0032	0.0033
75	0.478	0.598	96.54	93.03	0.46	0.45	0.0033	0.0033
80	0.461	0.615	96.69	93.33	0.45	0.43	0.0033	0.0033
85	0.445	0.631	96.84	93.62	0.43	0.42	0.0033	0.0033
90	0.431	0.646	96.98	93.91	0.42	0.40	0.0033	0.0033
95	0.418	0.661	97.13	94.21	0.41	0.39	0.0033	0.0033
100	0.406	0.676	97.28	94.50	0.39	0.38	0.0033	0.0033
105	0.394	0.690	97.42	94.80	0.38	0.37	0.0033	0.0033
110	0.384	0.704	97.57	95.09	0.37	0.37	0.0033	0.0033
115	0.374	0.717	97.72	95.38	0.37	0.36	0.0033	0.0034
120	0.365	0.730	97.86	95.68	0.36	0.35	0.0034	0.0034
125	0.357	0.743	98.01	95.97	0.35	0.34	0.0034	0.0034
130	0.349	0.756	98.15	96.27	0.34	0.34	0.0034	0.0034
135	0.341	0.768	98.30	96.56	0.34	0.33	0.0034	0.0034
140	0.334	0.780	98.45	96.85	0.33	0.32	0.0034	0.0034
145	0.328	0.792	98.59	97.15	0.32	0.32	0.0034	0.0034
150	0.321	0.803	98.74	97.44	0.32	0.31	0.0034	0.0034
155	0.315	0.815	98.89	97.73	0.31	0.31	0.0034	0.0034
160	0.310	0.826	99.03	98.03	0.31	0.30	0.0034	0.0035
165	0.304	0.837	99.18	98.32	0.30	0.30	0.0035	0.0035
170	0.299	0.847	99.33	98.62	0.30	0.29	0.0035	0.0035
175	0.294	0.858	99.47	98.91	0.29	0.29	0.0035	0.0035
180	0.289	0.868	99.62	99.20	0.29	0.29	0.0035	0.0035
185	0.285	0.878	99.63	99.22	0.28	0.28	0.0035	0.0035
190	0.281	0.888	99.63	99.23	0.28	0.28	0.0035	0.0035
195	0.276	0.898	99.64	99.24	0.28	0.27	0.0035	0.0035

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

200	0.272	0.908	99.64	99.25	0.27	0.27	0.0036	0.0036
205	0.269	0.918	99.65	99.26	0.27	0.27	0.0036	0.0036
210	0.265	0.927	99.65	99.28	0.26	0.26	0.0036	0.0036
215	0.261	0.936	99.66	99.29	0.26	0.26	0.0036	0.0036
220	0.258	0.946	99.67	99.30	0.26	0.26	0.0036	0.0036
225	0.255	0.955	99.67	99.31	0.25	0.25	0.0036	0.0036
230	0.251	0.964	99.68	99.32	0.25	0.25	0.0036	0.0036
235	0.248	0.973	99.68	99.33	0.25	0.25	0.0037	0.0037
240	0.245	0.981	99.69	99.35	0.24	0.24	0.0037	0.0037
245	0.242	0.990	99.69	99.36	0.24	0.24	0.0037	0.0037
250	0.240	0.999	99.70	99.37	0.24	0.24	0.0037	0.0037
255	0.237	1.007	99.71	99.38	0.24	0.24	0.0037	0.0037
260	0.234	1.015	99.71	99.39	0.23	0.23	0.0037	0.0037
265	0.232	1.024	99.72	99.41	0.23	0.23	0.0037	0.0037
270	0.229	1.032	99.72	99.42	0.23	0.23	0.0038	0.0038
275	0.227	1.040	99.73	99.43	0.23	0.23	0.0038	0.0038
280	0.225	1.048	99.73	99.44	0.22	0.22	0.0038	0.0038
285	0.222	1.056	99.74	99.45	0.22	0.22	0.0038	0.0038
290	0.220	1.064	99.75	99.47	0.22	0.22	0.0038	0.0038
295	0.218	1.072	99.75	99.48	0.22	0.22	0.0038	0.0038
300	0.216	1.079	99.76	99.49	0.22	0.21	0.0038	0.0038
305	0.214	1.087	99.76	99.50	0.21	0.21	0.0039	0.0039
310	0.212	1.094	99.77	99.51	0.21	0.21	0.0039	0.0039
315	0.210	1.102	99.77	99.52	0.21	0.21	0.0039	0.0039
320	0.208	1.109	99.78	99.54	0.21	0.21	0.0039	0.0039
325	0.206	1.117	99.78	99.55	0.21	0.21	0.0039	0.0039
330	0.204	1.124	99.79	99.56	0.20	0.20	0.0040	0.0040
335	0.203	1.131	99.80	99.57	0.20	0.20	0.0040	0.0040
340	0.201	1.138	99.80	99.58	0.20	0.20	0.0040	0.0040
345	0.199	1.145	99.81	99.60	0.20	0.20	0.0040	0.0040
350	0.198	1.153	99.81	99.61	0.20	0.20	0.0040	0.0040
355	0.196	1.160	99.82	99.62	0.20	0.20	0.0040	0.0040
360	0.194	1.166	99.82	99.63	0.19	0.19	0.0041	0.0041
365	0.193	1.173	99.82	99.63	0.19	0.19	0.0041	0.0041
370	0.191	1.180	99.83	99.63	0.19	0.19	0.0041	0.0041
375	0.190	1.187	99.83	99.63	0.19	0.19	0.0041	0.0041
380	0.188	1.194	99.83	99.64	0.19	0.19	0.0041	0.0041
385	0.187	1.200	99.83	99.64	0.19	0.19	0.0042	0.0042
390	0.186	1.207	99.83	99.64	0.19	0.19	0.0042	0.0042
395	0.184	1.213	99.83	99.64	0.18	0.18	0.0042	0.0042
400	0.183	1.220	99.83	99.64	0.18	0.18	0.0042	0.0042
405	0.182	1.226	99.83	99.64	0.18	0.18	0.0043	0.0043
410	0.180	1.233	99.83	99.64	0.18	0.18	0.0043	0.0043
415	0.179	1.239	99.83	99.64	0.18	0.18	0.0043	0.0043
420	0.178	1.246	99.83	99.64	0.18	0.18	0.0043	0.0043
425	0.177	1.252	99.83	99.64	0.18	0.18	0.0043	0.0043
430	0.176	1.258	99.83	99.64	0.18	0.17	0.0044	0.0044

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

435	0.174	1.264	99.83	99.64	0.17	0.17	0.0044	0.0044
440	0.173	1.271	99.83	99.65	0.17	0.17	0.0044	0.0044
445	0.172	1.277	99.83	99.65	0.17	0.17	0.0044	0.0044
450	0.171	1.283	99.83	99.65	0.17	0.17	0.0045	0.0045
455	0.170	1.289	99.83	99.65	0.17	0.17	0.0045	0.0045
460	0.169	1.295	99.83	99.65	0.17	0.17	0.0045	0.0045
465	0.168	1.301	99.83	99.65	0.17	0.17	0.0045	0.0045
470	0.167	1.307	99.83	99.65	0.17	0.17	0.0046	0.0046
475	0.166	1.313	99.83	99.65	0.17	0.17	0.0046	0.0046
480	0.165	1.319	99.83	99.65	0.16	0.16	0.0046	0.0046
485	0.164	1.324	99.83	99.65	0.16	0.16	0.0046	0.0046
490	0.163	1.330	99.83	99.65	0.16	0.16	0.0047	0.0047
495	0.162	1.336	99.84	99.65	0.16	0.16	0.0047	0.0047
500	0.161	1.342	99.84	99.66	0.16	0.16	0.0047	0.0047
505	0.160	1.347	99.84	99.66	0.16	0.16	0.0048	0.0048
510	0.159	1.353	99.84	99.66	0.16	0.16	0.0048	0.0048
515	0.158	1.359	99.84	99.66	0.16	0.16	0.0048	0.0048
520	0.157	1.364	99.84	99.66	0.16	0.16	0.0048	0.0048
525	0.157	1.370	99.84	99.66	0.16	0.16	0.0049	0.0049
530	0.156	1.375	99.84	99.66	0.16	0.16	0.0049	0.0049
535	0.155	1.381	99.84	99.66	0.15	0.15	0.0049	0.0049
540	0.154	1.386	99.84	99.66	0.15	0.15	0.0050	0.0050
545	0.153	1.392	99.84	99.66	0.15	0.15	0.0050	0.0050
550	0.152	1.397	99.84	99.66	0.15	0.15	0.0050	0.0050
555	0.152	1.403	99.84	99.66	0.15	0.15	0.0051	0.0051
560	0.151	1.408	99.84	99.67	0.15	0.15	0.0051	0.0051
565	0.150	1.413	99.84	99.67	0.15	0.15	0.0052	0.0052
570	0.149	1.419	99.84	99.67	0.15	0.15	0.0052	0.0052
575	0.149	1.424	99.84	99.67	0.15	0.15	0.0052	0.0052
580	0.148	1.429	99.84	99.67	0.15	0.15	0.0053	0.0053
585	0.147	1.434	99.84	99.67	0.15	0.15	0.0053	0.0053
590	0.146	1.440	99.84	99.67	0.15	0.15	0.0053	0.0053
595	0.146	1.445	99.84	99.67	0.15	0.15	0.0054	0.0054
600	0.145	1.450	99.84	99.67	0.14	0.14	0.0054	0.0054
605	0.144	1.455	99.84	99.67	0.14	0.14	0.0055	0.0055
610	0.144	1.460	99.84	99.67	0.14	0.14	0.0055	0.0055
615	0.143	1.465	99.84	99.67	0.14	0.14	0.0056	0.0056
620	0.142	1.470	99.85	99.68	0.14	0.14	0.0056	0.0056
625	0.142	1.475	99.85	99.68	0.14	0.14	0.0057	0.0057
630	0.141	1.480	99.85	99.68	0.14	0.14	0.0057	0.0057
635	0.140	1.485	99.85	99.68	0.14	0.14	0.0058	0.0058
640	0.140	1.490	99.85	99.68	0.14	0.14	0.0058	0.0058
645	0.139	1.495	99.85	99.68	0.14	0.14	0.0059	0.0059
650	0.138	1.500	99.85	99.68	0.14	0.14	0.0059	0.0059
655	0.138	1.505	99.85	99.68	0.14	0.14	0.0060	0.0060
660	0.137	1.510	99.85	99.68	0.14	0.14	0.0060	0.0060
665	0.137	1.515	99.85	99.68	0.14	0.14	0.0061	0.0061

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

670	0.136	1.520	99.85	99.68	0.14	0.14	0.0061	0.0061
675	0.136	1.525	99.85	99.68	0.14	0.14	0.0062	0.0062
680	0.135	1.529	99.85	99.69	0.13	0.13	0.0062	0.0062
685	0.134	1.534	99.85	99.69	0.13	0.13	0.0063	0.0063
690	0.134	1.539	99.85	99.69	0.13	0.13	0.0064	0.0064
695	0.133	1.544	99.85	99.69	0.13	0.13	0.0065	0.0065
700	0.133	1.548	99.85	99.69	0.13	0.13	0.0065	0.0065
705	0.132	1.553	99.85	99.69	0.13	0.13	0.0066	0.0066
710	0.132	1.558	99.85	99.69	0.13	0.13	0.0067	0.0067
715	0.131	1.562	99.85	99.69	0.13	0.13	0.0068	0.0068
720	0.131	1.567	99.85	99.69	0.13	0.13	0.0068	0.0068
725	0.130	1.572	99.85	99.69	0.13	0.13	0.0070	0.0070
730	0.130	1.576	99.85	99.69	0.13	0.13	0.0070	0.0071
735	0.129	1.581	99.85	99.69	0.13	0.13	0.0072	0.0072
740	0.129	1.586	99.85	99.70	0.13	0.13	0.0072	0.0073
745	0.128	1.590	99.86	99.70	0.13	0.13	0.0073	0.0074
750	0.128	1.595	99.86	99.70	0.13	0.13	0.0074	0.0074
755	0.127	1.599	99.86	99.70	0.13	0.13	0.0075	0.0076
760	0.127	1.604	99.86	99.70	0.13	0.13	0.0076	0.0076
765	0.126	1.608	99.86	99.70	0.13	0.13	0.0077	0.0078
770	0.126	1.613	99.86	99.70	0.13	0.13	0.0078	0.0079
775	0.125	1.617	99.86	99.70	0.13	0.12	0.0080	0.0080
780	0.125	1.621	99.86	99.70	0.12	0.12	0.0081	0.0081
785	0.124	1.626	99.86	99.70	0.12	0.12	0.0082	0.0083
790	0.124	1.630	99.86	99.70	0.12	0.12	0.0083	0.0083
795	0.123	1.635	99.86	99.70	0.12	0.12	0.0085	0.0085
800	0.123	1.639	99.86	99.71	0.12	0.12	0.0086	0.0086
805	0.122	1.643	99.86	99.71	0.12	0.12	0.0088	0.0088
810	0.122	1.648	99.86	99.71	0.12	0.12	0.0089	0.0089
815	0.122	1.652	99.86	99.71	0.12	0.12	0.0091	0.0091
820	0.121	1.656	99.86	99.71	0.12	0.12	0.0092	0.0093
825	0.121	1.661	99.86	99.71	0.12	0.12	0.0095	0.0095
830	0.120	1.665	99.86	99.71	0.12	0.12	0.0096	0.0096
835	0.120	1.669	99.86	99.71	0.12	0.12	0.0099	0.0099
840	0.120	1.673	99.86	99.71	0.12	0.12	0.0100	0.0101
845	0.119	1.678	99.86	99.71	0.12	0.12	0.0116	0.0128
850	0.119	1.682	99.86	99.71	0.12	0.12	0.0117	0.0129
855	0.118	1.686	99.86	99.71	0.12	0.12	0.0120	0.0131
860	0.118	1.690	99.86	99.72	0.12	0.12	0.0122	0.0133
865	0.118	1.695	99.86	99.72	0.12	0.12	0.0125	0.0136
870	0.117	1.699	99.87	99.72	0.12	0.12	0.0127	0.0137
875	0.117	1.703	99.87	99.72	0.12	0.12	0.0131	0.0140
880	0.116	1.707	99.87	99.72	0.12	0.12	0.0134	0.0142
885	0.116	1.711	99.87	99.72	0.12	0.12	0.0139	0.0147
890	0.116	1.715	99.87	99.72	0.12	0.12	0.0142	0.0149
895	0.115	1.719	99.87	99.72	0.12	0.11	0.0148	0.0154
900	0.115	1.723	99.87	99.72	0.11	0.11	0.0152	0.0157

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

905	0.115	1.727	99.87	99.72	0.11	0.11	0.0160	0.0165
910	0.114	1.732	99.87	99.72	0.11	0.11	0.0165	0.0169
915	0.114	1.736	99.87	99.72	0.11	0.11	0.0176	0.0178
920	0.113	1.740	99.87	99.73	0.11	0.11	0.0182	0.0184
925	0.113	1.744	99.87	99.73	0.11	0.11	0.0190	0.0182
930	0.113	1.748	99.87	99.73	0.11	0.11	0.0200	0.0192
935	0.112	1.752	99.87	99.73	0.11	0.11	0.0226	0.0217
940	0.112	1.756	99.87	99.73	0.11	0.11	0.0243	0.0233
945	0.112	1.760	99.87	99.73	0.11	0.11	0.0291	0.0279
950	0.111	1.764	99.87	99.73	0.11	0.11	0.0326	0.0313
955	0.111	1.767	99.87	99.73	0.11	0.11	0.0459	0.0440
960	0.111	1.771	99.87	99.73	0.11	0.11	0.0623	0.0597
965	0.110	1.775	99.87	99.73	0.11	0.11	0.1813	0.1738
970	0.110	1.779	99.87	99.73	0.11	0.11	0.0377	0.0362
975	0.110	1.783	99.87	99.73	0.11	0.11	0.0264	0.0253
980	0.109	1.787	99.87	99.74	0.11	0.11	0.0212	0.0203
985	0.109	1.791	99.87	99.74	0.11	0.11	0.0189	0.0190
990	0.109	1.795	99.87	99.74	0.11	0.11	0.0170	0.0173
995	0.108	1.799	99.88	99.74	0.11	0.11	0.0156	0.0161
1000	0.108	1.803	99.88	99.74	0.11	0.11	0.0145	0.0152
1005	0.108	1.806	99.88	99.74	0.11	0.11	0.0136	0.0144
1010	0.108	1.810	99.88	99.74	0.11	0.11	0.0129	0.0139
1015	0.107	1.814	99.88	99.74	0.11	0.11	0.0124	0.0134
1020	0.107	1.818	99.88	99.74	0.11	0.11	0.0119	0.0130
1025	0.107	1.822	99.88	99.74	0.11	0.11	0.0102	0.0102
1030	0.106	1.825	99.88	99.74	0.11	0.11	0.0098	0.0098
1035	0.106	1.829	99.88	99.74	0.11	0.11	0.0094	0.0094
1040	0.106	1.833	99.88	99.75	0.11	0.11	0.0090	0.0090
1045	0.105	1.837	99.88	99.75	0.11	0.11	0.0087	0.0087
1050	0.105	1.840	99.88	99.75	0.11	0.10	0.0084	0.0084
1055	0.105	1.844	99.88	99.75	0.10	0.10	0.0081	0.0082
1060	0.105	1.848	99.88	99.75	0.10	0.10	0.0079	0.0079
1065	0.104	1.852	99.88	99.75	0.10	0.10	0.0077	0.0077
1070	0.104	1.855	99.88	99.75	0.10	0.10	0.0075	0.0075
1075	0.104	1.859	99.88	99.75	0.10	0.10	0.0073	0.0073
1080	0.103	1.863	99.88	99.75	0.10	0.10	0.0071	0.0072
1085	0.103	1.866	99.88	99.75	0.10	0.10	0.0069	0.0069
1090	0.103	1.870	99.88	99.75	0.10	0.10	0.0067	0.0067
1095	0.103	1.874	99.88	99.75	0.10	0.10	0.0066	0.0066
1100	0.102	1.877	99.88	99.76	0.10	0.10	0.0064	0.0064
1105	0.102	1.881	99.88	99.76	0.10	0.10	0.0063	0.0063
1110	0.102	1.884	99.88	99.76	0.10	0.10	0.0062	0.0062
1115	0.102	1.888	99.88	99.76	0.10	0.10	0.0060	0.0060
1120	0.101	1.892	99.89	99.76	0.10	0.10	0.0059	0.0059
1125	0.101	1.895	99.89	99.76	0.10	0.10	0.0058	0.0058
1130	0.101	1.899	99.89	99.76	0.10	0.10	0.0057	0.0057
1135	0.101	1.902	99.89	99.76	0.10	0.10	0.0056	0.0056

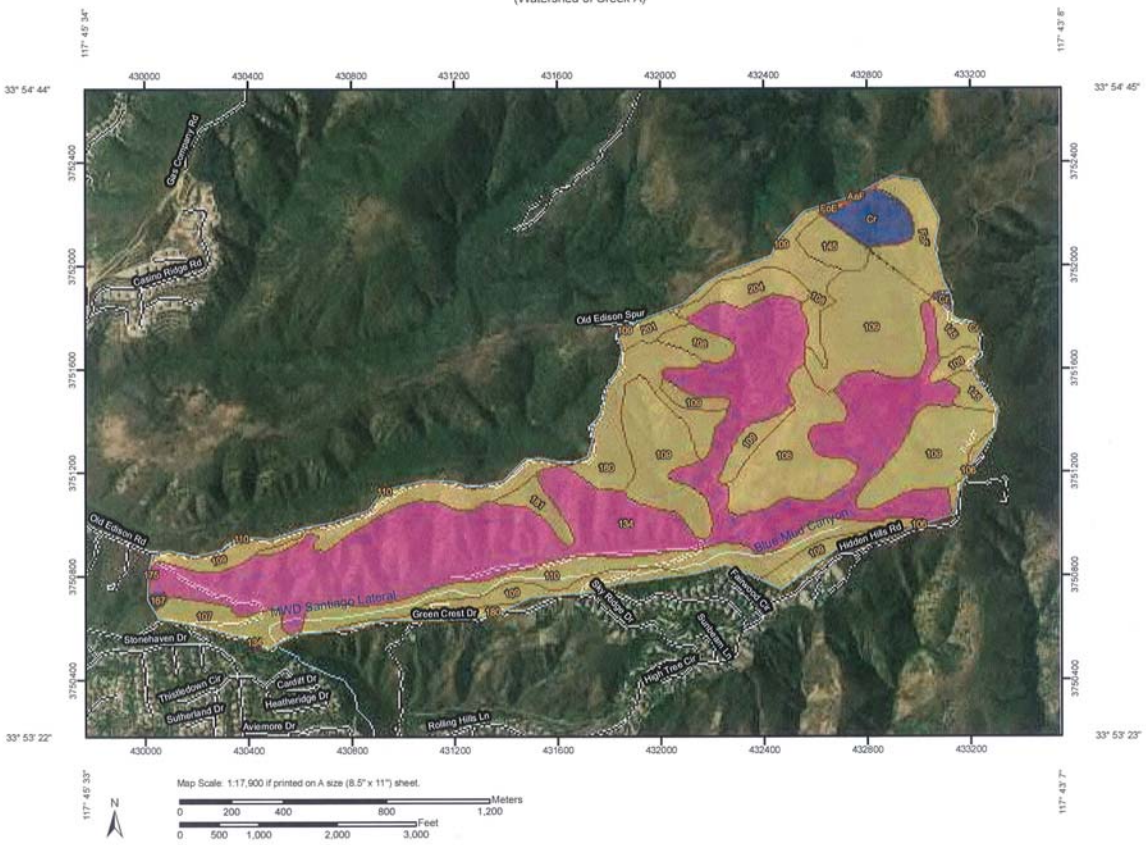
[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

1140	0.100	1.906	99.89	99.76	0.10	0.10	0.0055	0.0055
1145	0.100	1.910	99.89	99.76	0.10	0.10	0.0055	0.0054
1150	0.100	1.913	99.89	99.76	0.10	0.10	0.0054	0.0054
1155	0.100	1.917	99.89	99.77	0.10	0.10	0.0053	0.0053
1160	0.099	1.920	99.89	99.77	0.10	0.10	0.0052	0.0052
1165	0.099	1.924	99.89	99.77	0.10	0.10	0.0051	0.0051
1170	0.099	1.927	99.89	99.77	0.10	0.10	0.0051	0.0051
1175	0.099	1.931	99.89	99.77	0.10	0.10	0.0050	0.0050
1180	0.098	1.934	99.89	99.77	0.10	0.10	0.0049	0.0049
1185	0.098	1.938	99.89	99.77	0.10	0.10	0.0049	0.0049
1190	0.098	1.941	99.89	99.77	0.10	0.10	0.0048	0.0048
1195	0.098	1.945	99.89	99.77	0.10	0.10	0.0047	0.0047
1200	0.097	1.948	99.89	99.77	0.10	0.10	0.0047	0.0047
1205	0.097	1.952	99.89	99.77	0.10	0.10	0.0046	0.0046
1210	0.097	1.955	99.89	99.77	0.10	0.10	0.0046	0.0046
1215	0.097	1.958	99.89	99.78	0.10	0.10	0.0045	0.0045
1220	0.096	1.962	99.89	99.78	0.10	0.10	0.0045	0.0045
1225	0.096	1.965	99.89	99.78	0.10	0.10	0.0044	0.0044
1230	0.096	1.969	99.89	99.78	0.10	0.10	0.0044	0.0044
1235	0.096	1.972	99.89	99.78	0.10	0.10	0.0043	0.0043
1240	0.096	1.975	99.89	99.78	0.10	0.10	0.0043	0.0043
1245	0.095	1.979	99.90	99.78	0.10	0.10	0.0042	0.0042
1250	0.095	1.982	99.90	99.78	0.10	0.09	0.0042	0.0042
1255	0.095	1.986	99.90	99.78	0.09	0.09	0.0042	0.0042
1260	0.095	1.989	99.90	99.78	0.09	0.09	0.0041	0.0041
1265	0.094	1.992	99.90	99.78	0.09	0.09	0.0041	0.0041
1270	0.094	1.996	99.90	99.78	0.09	0.09	0.0040	0.0040
1275	0.094	1.999	99.90	99.79	0.09	0.09	0.0040	0.0040
1280	0.094	2.002	99.90	99.79	0.09	0.09	0.0040	0.0040
1285	0.094	2.006	99.90	99.79	0.09	0.09	0.0039	0.0039
1290	0.093	2.009	99.90	99.79	0.09	0.09	0.0039	0.0039
1295	0.093	2.012	99.90	99.79	0.09	0.09	0.0039	0.0039
1300	0.093	2.016	99.90	99.79	0.09	0.09	0.0038	0.0038
1305	0.093	2.019	99.90	99.79	0.09	0.09	0.0038	0.0038
1310	0.093	2.022	99.90	99.79	0.09	0.09	0.0038	0.0038
1315	0.092	2.026	99.90	99.79	0.09	0.09	0.0037	0.0037
1320	0.092	2.029	99.90	99.79	0.09	0.09	0.0037	0.0037
1325	0.092	2.032	99.90	99.79	0.09	0.09	0.0037	0.0037
1330	0.092	2.035	99.90	99.79	0.09	0.09	0.0036	0.0036
1335	0.092	2.039	99.90	99.80	0.09	0.09	0.0036	0.0036
1340	0.091	2.042	99.90	99.80	0.09	0.09	0.0036	0.0036
1345	0.091	2.045	99.90	99.80	0.09	0.09	0.0036	0.0036
1350	0.091	2.048	99.90	99.80	0.09	0.09	0.0035	0.0035
1355	0.091	2.052	99.90	99.80	0.09	0.09	0.0035	0.0035
1360	0.091	2.055	99.90	99.80	0.09	0.09	0.0035	0.0035
1365	0.090	2.058	99.90	99.80	0.09	0.09	0.0035	0.0035
1370	0.090	2.061	99.91	99.80	0.09	0.09	0.0034	0.0034

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

1375	0.090	2.064	99.91	99.80	0.09	0.09	0.0034	0.0034
1380	0.090	2.068	99.91	99.80	0.09	0.09	0.0034	0.0034
1385	0.090	2.071	99.91	99.80	0.09	0.09	0.0034	0.0034
1390	0.090	2.074	99.91	99.80	0.09	0.09	0.0033	0.0033
1395	0.089	2.077	99.91	99.81	0.09	0.09	0.0033	0.0033
1400	0.089	2.080	99.91	99.81	0.09	0.09	0.0033	0.0033
1405	0.089	2.083	99.91	99.81	0.09	0.09	0.0033	0.0033
1410	0.089	2.087	99.91	99.81	0.09	0.09	0.0033	0.0033
1415	0.089	2.090	99.91	99.81	0.09	0.09	0.0032	0.0032
1420	0.088	2.093	99.91	99.81	0.09	0.09	0.0032	0.0032
1425	0.088	2.096	99.91	99.81	0.09	0.09	0.0032	0.0032
1430	0.088	2.099	99.91	99.81	0.09	0.09	0.0032	0.0032
1435	0.088	2.102	99.91	99.81	0.09	0.09	0.0032	0.0032
1440	0.088	2.105	99.91	99.81	0.09	0.09	0.0031	0.0031

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:17,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.5	0.4%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	12.8	2.1%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	56.1	9.1%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	142.3	23.2%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	41.0	6.7%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	238.5	38.9%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	19.3	3.1%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	0.9	0.2%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.2	0.0%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	48.1	7.8%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	6.1	1.0%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	4.9	0.8%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.4	1.7%
Subtotals for Soil Survey Area			**583.0**	**95.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaF	Alo clay, 30 to 50 percent slopes	D	0.5	0.1%
Cr	CIENEBA-ROCK OUTCROP COMPLEX	B	13.9	2.3%
FoE	FONTANA CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	0.7	0.1%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	15.9	2.6%
Subtotals for Soil Survey Area			**30.9**	**5.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

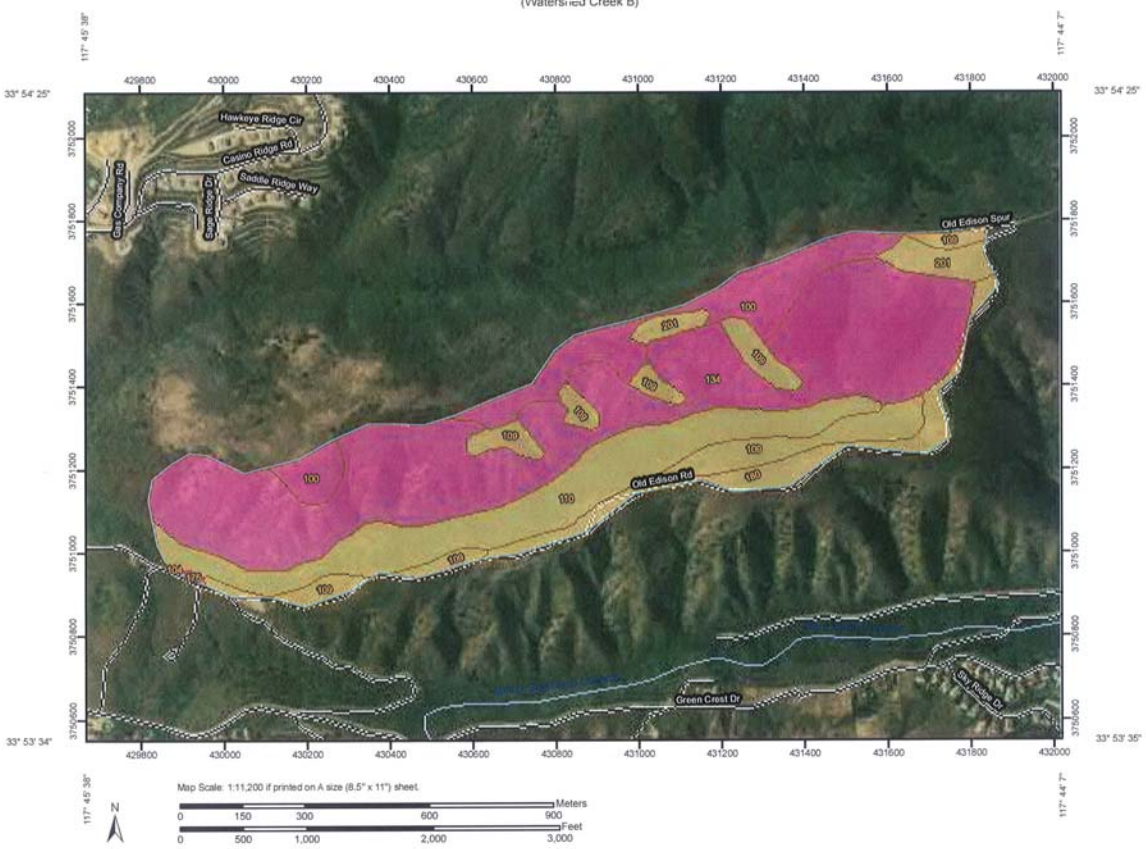
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:11,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	24.2	11.8%
104	ALO VARIANT CLAY, 15 TO 30 PERCENT SLOPES	D	0.1	0.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	24.8	12.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	37.6	18.3%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	99.4	48.3%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.3	0.1%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	12.8	6.2%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	6.9	3.3%
Totals for Area of Interest			**206.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

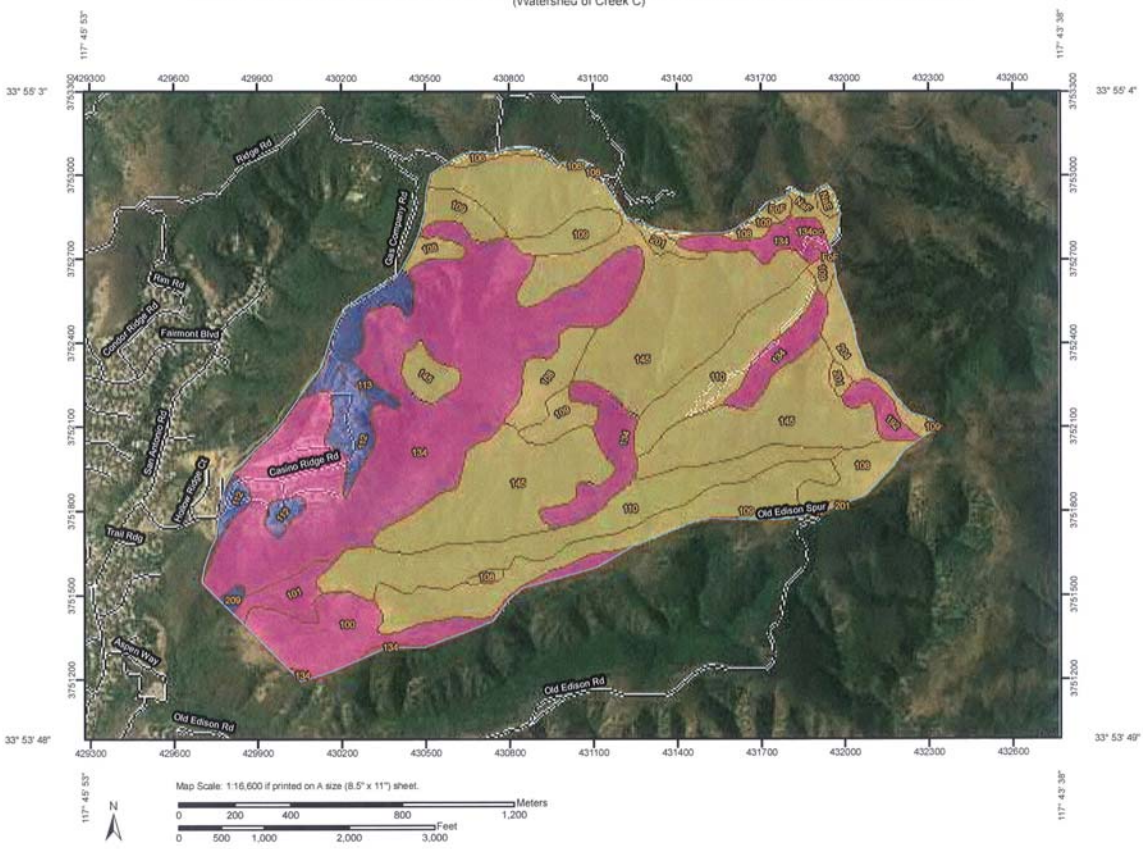
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:16,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	33.6	4.8%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	8.9	1.3%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.7	0.4%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	32.2	4.6%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	70.4	10.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	75.8	10.8%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	30.2	4.3%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	3.1	0.4%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	212.0	30.2%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	201.0	28.6%
192	ROCK OUTCROP-CIENEBA COMPLEX, 30 TO 75 PERCENT SLOPES	D	6.4	0.9%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	5.2	0.7%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.2	1.5%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	1.4	0.2%
Subtotals for Soil Survey Area			**693.1**	**98.6%**
Totals for Area of Interest			**702.7**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
134oc	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	3.0	0.4%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	1.5	0.2%
NaE	NACIMIENTO CLAY LOAM, 9 TO 30 PERCENT SLOPES	C	1.6	0.2%

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NaF	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	3.4	0.5%
Subtotals for Soil Survey Area			**9.6**	**1.4%**
Totals for Area of Interest			**702.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed of Creek D)
USDA Natural Resources Conservation Service
Web Soil Survey
National Cooperative Soil Survey
2/14/2013
Page 1 of 4
Map Scale: 1:13,900 if printed on A size (8.5" x 11") sheet.
Meters
Feet
N
117° 46' 20"
117° 46' 56"
117° 46' 21"
117° 44' 57"
33° 55' 15"
33° 55' 16"
33° 53' 41"
33° 53' 41"
Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed of Creek D)
MAP LEGEND
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Map Units
Soil Ratings
A
A/D
B
B/D
C
C/D
D
Not rated or not available
Political Features
Cities
Water Features
Streams and Canals
Transportation
Rails
Interstate Highways
US Routes
Major Roads
Local Roads
MAP INFORMATION
Map Scale: 1:13,900 if printed on A size (8.5" x 11") sheet.
The soil surveys that comprise your AOI were mapped at 1:24,000.
Please rely on the bar scale on each map sheet for accurate map measurements.
Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008
Date(s) aerial images were photographed: 6/7/2005
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Attachment K. .....Santa Ana River Hydrologic Unit

CONCEPTUAL

Attachment K .....Santa Ana River Hydrologic Unit

CONCEPTUAL

SANTA ANA RIVER HYDROLOGIC UNIT
SITE
SAN BERNARDINO
RIVERSIDE
ORANGE
1
2
5
N
0 5 10 Miles
Map Features
Water bodies
Riverwatch
Los Angeles/San Gabriel River Hydrologic Unit
Santa Ana River Hydrologic Unit
San Jacinto Valley Hydrologic Unit

SOUTH SITE "S-1"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0,9	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0,05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	6,57	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0,78	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.74	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	15,001	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	↓	sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-2"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0,05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0,85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	10.22	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.72	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.69	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	21,759	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	↓	sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-3"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	12.33	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.74	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.71	
4	Calculate runoff volume, V_{design}= *(C x $d_{remainder}$ x A x 43560 x (1/12))*	V_{design}=	27,011	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) **(Appendix VII)**	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-4"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.85	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.45	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.49	
4	Calculate runoff volume, V_{design}= *(C x $d_{remainder}$ x A x 43560 x (1/12))*	V_{design}=	2,797	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) **(Appendix VII)**	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

SOUTH SITE "S-5"

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.66	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.65	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.64	
4	Calculate runoff volume, V_{design}= *(C x $d_{remainder}$ x A x 43560 x (1/12))*	V_{design}=	3,278	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) **(Appendix VII)**	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft

NO INFILTRATION

APPLY FOR ALTERNATIVE COMPLIANCE APPROACH

"NORTH SITE"

Worksheet B: Simple Design Capture Volume Sizing Method

N1 + N2 + N3 + N4 = 8.18

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0,90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.05	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.85	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	8.18	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.73	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.70	
4	Calculate runoff volume, V_{design}= *(C x $d_{remainder}$ x A x 43560 x (1/12))*	V_{design}=	17,668	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) **(Appendix VII)**	$K_{measured}$=	1.5	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	0.6	
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=	0.9	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3.6	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	4,908	sq-ft

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

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25		
		Level of pretreatment/ expected sediment loads	0.25		
		Redundancy	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					0.6
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					~ 1.5 ~
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					0.9

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

ASSUMED INFILTRATION TO BE 0.9 INCH/HOUR FOR CEQA LEVEL REVIEW.

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

Attachment M. .....TR55 Calculations (Onsite Comparison Only Per BMP Site Plan)

CONCEPTUAL

HCOC CALCULATIONS

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site PRE
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north pre.w55

Date: 7/24/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	.177
Area N-2	Area D	Outlet	1.03	85	0.1
Area N-3	Area D	Outlet	1.5	85	0.1
Area N-4	Area D	Outlet	1.08	85	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 0.707"

Brown

Cielo Vista
North Site PRE
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.37 10.01
Area N-2	0.61 9.94
Area N-3	0.88 9.94
Area N-4	0.64 9.94
REACHES	
OUTLET	4.32

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: North Site POST
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo north post.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area N-1	Area D	Outlet	4.51	85	0.1
Area N-2	Area D	Outlet	1.03	94	0.1
Area N-3	Area D	Outlet	1.5	94	0.1
Area N-4	Area D	Outlet	1.08	98	0.1

Total area: 8.12 (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>

RUNOFF AMOUNT = 1,051"

Brown

Cielo Vista
North Site POST
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area N-1	2.66
	9.94
Area N-2	1.17
	9.93
Area N-3	1.71
	9.93
Area N-4	1.51
	9.93
REACHES	
OUTLET	7.03

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: SOUTH Site PRE
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo SOUTH pre.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area S-1	Area D	Outlet	6.57	70	.137
Area S-2	Area D	Outlet	10.22	70	0.1
Area S-3	Area D	Outlet	12.33	70	0.1
Area S-4	Area D	Outlet	1.85	70	.165
Area S-5	Area S	Outlet	1.66	70	.139

Total area: 32.63 (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>

RUNOFF AMOUNT = 0.234"

Brown

Cielo Vista
SOUTH Site PRE
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area S-1	0.38 10.05
Area S-2	0.67 10.03
Area S-3	0.81 10.03
Area S-4	0.10 10.07
Area S-5	0.10 10.05
REACHES	
OUTLET	2.03

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: SOUTH Site POST
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\Cielo SOUTH post.w55

Date: 7/9/2013
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area S-1	Area D	Outlet	6.57	86	0.1
Area S-2	Area D	Outlet	10.22	86	0.1
Area S-3	Area D	Outlet	12.33	86	0.1
Area S-4	Area D	Outlet	1.85	94	0.1
Area S-5	Area S	Outlet	1.66	86	.147

Total area: 32.63 (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>

RUNOFF AMOUNT = 0.909 "

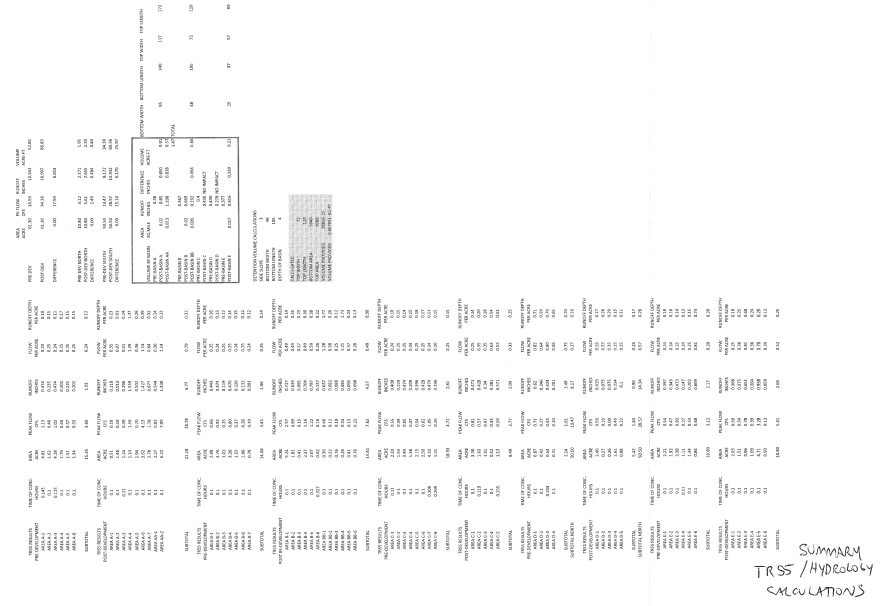
Brown

Cielo Vista
SOUTH Site POST
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area S-1	4.22
	9.93
Area S-2	6.56
	9.93
Area S-3	7.91
	9.93
Area S-4	2.11
	9.93
Area S-5	0.98
	9.97
REACHES	
OUTLET	21.71

Attachment N. .....TR55 Calculations (per Drainage Subareas Shown in separate H&H Report by CHA)



SUMMARY
TR55 / HYDROLOGY
CALCULATIONS

CONCEPTUAL

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloA.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	4.81	77	.145
Area A-2	Area A	REACH 1	1.62	77	0.1
Area A-3	Area A	REACH 2	4.28	77	.125
Area A-4	Area A	REACH 2	1.79	77	0.1
Area A-5	Area A	REACH 3	1.51	77	0.1
Area A-6	Area A	REACH 3	1.34	77	0.100

Total area: 15.35 (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>

Brown

Cielo Vista
Existing Onsite Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	4.81	0.145	77	REACH 1	Area A
Area A-2	1.62	0.100	77	REACH 1	Area A
Area A-3	4.28	0.125	77	REACH 2	Area A
Area A-4	1.79	0.100	77	REACH 2	Area A
Area A-5	1.51	0.100	77	REACH 3	Area A
Area A-6	1.34	0.100	77	REACH 3	Area A

Total Area: 15.35 (ac)

Brown

Cielo Vista
Existing Onsite Area A
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.0700	0.150				0.124
SHALLOW	580	0.2300	0.050				0.021
					Time of Concentration		.145
Area A-2							
SHEET	100	0.4200	0.150				0.060
SHALLOW	230	0.4200	0.050				0.006
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.1200	0.150				0.100
SHALLOW	670	0.2100	0.050				0.025
					Time of Concentration		.125
Area A-4							
SHEET	100	0.3500	0.150				0.065
SHALLOW	270	0.3500	0.050				0.008
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.3000	0.150				0.069
SHALLOW	250	0.2200	0.050				0.009
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.2900	0.150				0.070
SHALLOW	240	0.2900	0.050				0.008
					Time of Concentration		0.100

Brown

Cielo Vista
Existing Onsite Area A
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	1.13
	10.02
Area A-2	0.40
	9.95
Area A-3	1.02
	10.00
Area A-4	0.44
	9.95
Area A-5	0.37
	9.95
Area A-6	0.33
	9.95
REACHES	
REACH 1	1.52
	10.01
Down	1.52
	10.02
REACH 2	2.97
	10.02
Down	2.97
	10.02
REACH 3	3.66
	10.02
Down	3.66
	10.03
OUTLET	3.66

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area B
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area B-1	Area B	REACH 1	2.69	77	0.1
Area B-2	Area B	REACH 2	3.76	77	0.1
Area B-3	Area B	REACH 1	1.01	77	0.1
Area B-4	Area B	REACH 2	3.26	77	0.1
Area B-5	Area B	REACH 3	1.52	77	0.1
Area B-6	Area B	REACH 3	1.06	77	0.1
Area B-7	Area B	REACH 3	0.78	77	0.1

Total area: 14.08 (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>

Cielo Vista
Existing Onsite Area B
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area B-1	2.69	0.100	77	REACH 1	Area B
Area B-2	3.76	0.100	77	REACH 2	Area B
Area B-3	1.01	0.100	77	REACH 1	Area B
Area B-4	3.26	0.100	77	REACH 2	Area B
Area B-5	1.52	0.100	77	REACH 3	Area B
Area B-6	1.06	0.100	77	REACH 3	Area B
Area B-7	.78	0.100	77	REACH 3	Area B

Total Area: 14.08 (ac)

Brown

Cielo Vista
Existing Onsite Area B
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area B-1							
SHEET	100	0.1800	0.150				0.085
SHALLOW	190	0.1800	0.050				0.008
					Time of Concentration		0.1
Area B-2							
SHEET	100	0.2600	0.150				0.073
SHALLOW	70	0.2600	0.050				0.002
					Time of Concentration		0.1
Area B-3							
SHEET	64	0.3900	0.150				0.044
					Time of Concentration		0.1
Area B-4							
SHEET	100	0.3000	0.150				0.069
SHALLOW	180	0.3000	0.050				0.006
					Time of Concentration		0.1
Area B-5							
SHEET	100	0.3200	0.150				0.067
SHALLOW	80	0.3200	0.050				0.002
					Time of Concentration		0.1
Area B-6							
SHEET	100	0.2100	0.150				0.080
SHALLOW	170	0.2100	0.050				0.006
					Time of Concentration		0.1
Area B-7							
SHEET	100	0.1700	0.130				0.077
SHALLOW	200	0.1900	0.050				0.008
					Time of Concentration		0.1

Brown

Cielo Vista
Existing Onsite Area B
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area B-1	0.66
	9.95
Area B-2	0.92
	9.95
Area B-3	0.25
	9.95
Area B-4	0.80
	9.95
Area B-5	0.37
	9.95
Area B-6	0.26
	9.95
Area B-7	0.19
	9.95
REACHES	
REACH 1	0.91
	9.95
Down	0.91
	9.96
REACH 2	2.63
	9.95
Down	2.63
	9.97
REACH 3	3.46
	9.96
Down	3.46
	9.97
OUTLET	3.46

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area C
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloC.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area C-1	Area C	REACH 1	2.29	77	.11
Area C-2	Area C	REACH 2	1.54	77	0.1
Area C-3	Area C	REACH 3	3.44	77	0.1
Area C-4	Area C	REACH 3	1.91	77	0.1
Area C-5	Area C	REACH 4	2.2	77	0.1
Area C-6	Area C	REACH 3A	2.5	77	0.1
Area C-7	Area C	REACH 4	4.32	77	.108
Area C-8	Area C	Outlet	1.31	77	0.269

Total area: 19.51 (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>

Cielo Vista
Existing Onsite Area C
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area C-1	2.29	0.110	77	REACH 1	Area C
Area C-2	1.54	0.100	77	REACH 2	Area C
Area C-3	3.44	0.100	77	REACH 3	Area C
Area C-4	1.91	0.100	77	REACH 3	Area C
Area C-5	2.20	0.100	77	REACH 4	Area C
Area C-6	2.50	0.100	77	REACH 3A	Area C
Area C-7	4.32	0.108	77	REACH 4	Area C
Area C-8	1.31	0.269	77	Outlet	Area C

Total Area: 19.51 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area C-1							
SHEET	100	0.1300	0.150				0.096
SHALLOW	300	0.1300	0.050				0.014
					Time of Concentration		.11
Area C-2							
SHEET	100	0.4000	0.150				0.062
SHALLOW	67	0.4000	0.050				0.002
					Time of Concentration		0.1
Area C-3							
SHEET	100	0.3100	0.150				0.068
SHALLOW	360	0.3100	0.050				0.011
					Time of Concentration		0.1
Area C-4							
SHEET	100	0.3200	0.150				0.067
SHALLOW	50	0.3200	0.050				0.002
					Time of Concentration		0.1
Area C-5							
SHEET	100	0.2400	0.150				0.076
SHALLOW	130	0.2400	0.050				0.005
					Time of Concentration		0.1
Area C-6							
SHEET	100	0.3100	0.150				0.068
SHALLOW	365	0.3100	0.050				0.011
					Time of Concentration		0.1
Area C-7							
SHEET	100	0.1400	0.150				0.094
SHALLOW	300	0.1400	0.050				0.014
					Time of Concentration		.108
Area C-8							
SHEET	100	0.0100	0.150				0.269
					Time of Concentration		0.269

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area C-1	0.55
	9.97
Area C-2	0.38
	9.95
Area C-3	0.85
	9.95
Area C-4	0.47
	9.95
Area C-5	0.54
	9.95
Area C-6	0.62
	9.95
Area C-7	1.05
	9.96
Area C-8	0.26
	10.08
REACHES	
REACH 1	0.55
	9.97
Down	0.55
	9.97
REACH 2	0.93
	9.96
Down	0.93
	9.97
REACH 3	2.24
	9.96
Down	2.24
	9.97
REACH 3A	0.62
	9.95
Down	0.62
	9.96
REACH 4	4.45
	9.96
Down	4.45
	9.97

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
OUTLET	4.63

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area D
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloD.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area D-1	Area D	REACH 1	0.87	89	.1
Area D-2	Area D	Outlet	0.42	86	0.1
Area D-3	Area D	REACH 1	0.54	89	.104
Area D-4	Area D	Outlet	0.31	86	0.1

Total area: 2.14 (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>

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area D-1	.87	0.100	89	REACH 1	Area D
Area D-2	.42	0.100	86	Outlet	Area D
Area D-3	.54	0.104	89	REACH 1	Area D
Area D-4	.31	0.100	86	Outlet	Area D

Total Area: 2.14 (ac)

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area D-1							
SHEET	100	0.2200	0.130				0.070
SHALLOW	810	0.2200	0.050				0.030
					Time of Concentration		.1
Area D-2							
SHEET	100	0.2900	0.150				0.070
SHALLOW	90	0.2900	0.050				0.003
					Time of Concentration		0.1
Area D-3							
SHEET	100	0.1600	0.150				0.089
SHALLOW	360	0.1600	0.050				0.015
					Time of Concentration		.104
Area D-4							
SHEET	90	0.2200	0.130				0.064
					Time of Concentration		0.1

Brown

Cielo Vista
Existing Onsite Area D
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area D-1	0.71
	9.93
Area D-2	0.27
	9.93
Area D-3	0.43
	9.93
Area D-4	0.20
	9.93
REACHES	
REACH 1	1.14
	9.93
Down	1.14
	9.94
OUTLET	1.61

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Existing Onsite Area E
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PredevcieloE.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area E-1	Area E	REACH 1	2.21	77	0.1
Area E-2	Area E	REACH 1	1.92	77	0.1
Area E-3	Area E	REACH 1	3.38	77	0.1
Area E-4	Area E	REACH 2	1.11	77	.11
Area E-5	Area E	REACH 2	1.34	77	0.100
Area E-6	Area E	REACH 2A	0.84	89	0.1

Total area: 10.80 (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>

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area E-1	2.21	0.100	77	REACH 1	Area E
Area E-2	1.92	0.100	77	REACH 1	Area E
Area E-3	3.38	0.100	77	REACH 1	Area E
Area E-4	1.11	0.110	77	REACH 2	Area E
Area E-5	1.34	0.100	77	REACH 2	Area E
Area E-6	.84	0.100	89	REACH 2A	Area E

Total Area: 10.80 (ac)

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area E-1							
SHEET	100	0.2700	0.150				0.072
SHALLOW	810	0.2700	0.050				0.027
					Time of Concentration		0.1
Area E-2							
SHEET	100	0.1300	0.150				0.096
SHALLOW	55	0.1300	0.050				0.003
					Time of Concentration		0.1
Area E-3							
SHEET	100	0.3000	0.150				0.069
SHALLOW	390	0.3000	0.050				0.012
					Time of Concentration		0.1
Area E-4							
SHEET	100	0.1700	0.150				0.087
SHALLOW	540	0.1700	0.050				0.023
					Time of Concentration		.11
Area E-5							
SHEET	100	0.2100	0.150				0.080
SHALLOW	180	0.2100	0.050				0.007
					Time of Concentration		0.100
Area E-6							
SHEET	100	0.1000	0.011				0.013
SHALLOW	460	0.1000	0.050				0.025
					Time of Concentration		0.1

Post-Development TR55 Hydrology Calculations

Brown

Cielo Vista
Existing Onsite Area E
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area E-1	0.54
	9.95
Area E-2	0.47
	9.95
Area E-3	0.83
	9.95
Area E-4	0.27
	9.97
Area E-5	0.33
	9.95
Area E-6	0.68
	9.93
REACHES	
REACH 1	1.85
	9.95
Down	1.84
	9.97
REACH 2A	0.68
	9.93
Down	0.68
	9.94
REACH 2	3.08
	9.97
Down	3.08
	9.97
OUTLET	3.08

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WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloA.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	0.51	80	0.1
Area A-2	Area A	REACH 1	1.46	70	0.1
Area A-3	Area A	REACH 2	1.24	80	.21
Area A-4	Area A	REACH 2	1.14	98	0.1
Area A-5	Area A	REACH 2	1.94	80	0.1
Area A-6	Area A	REACH 2	3.62	94	0.1
Area A-7	Area A	BASIN A	2.78	86	0.1
Area AA-1	Area A	BASIN AA	2.27	80	0.1
Area AA-2	Area A	BASIN AA	6.22	94	0.1

Total area: 21.18 (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>

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	.51	0.100	80	REACH 1	Area A
Area A-2	1.46	0.100	70	REACH 1	Area A
Area A-3	1.24	0.210	80	REACH 2	Area A
Area A-4	1.14	0.100	98	REACH 2	Area A
Area A-5	1.94	0.100	80	REACH 2	Area A
Area A-6	3.62	0.100	94	REACH 2	Area A
Area A-7	2.78	0.100	86	BASIN A	Area A
Area AA-1	2.27	0.100	80	BASIN AA	Area A
Area AA-2	6.22	0.100	94	BASIN AA	Area A

Total Area: 21.18 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	190	0.5000	0.050				0.005
					Time of Concentration		0.1
Area A-2							
SHEET	100	0.1900	0.130				0.074
SHALLOW	240	0.1900	0.050				0.009
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.0200	0.150				0.204
SHALLOW	54	0.0250	0.050				0.006
					Time of Concentration		.21
Area A-4							
SHEET	100	0.0050	0.011				0.044
SHALLOW	70	0.0050	0.025				0.014
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.5000	0.150				0.056
SHALLOW	210	0.2100	0.050				0.008
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.0200	0.011				0.025
SHALLOW	508	0.0660	0.025				0.027
					Time of Concentration		0.1
Area A-7							
SHEET	100	0.0200	0.011				0.025
SHALLOW	642	0.0690	0.025				0.033
					Time of Concentration		0.1
Area AA-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	53	0.1900	0.050				0.002
					Time of Concentration		0.1

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area AA-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	573	0.0250	0.025				0.050
					Time of Concentration		0.1

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	0.18 9.94
Area A-2	0.10 10.03
Area A-3	0.39 10.04
Area A-4	1.59 9.93
Area A-5	0.70 9.94
Area A-6	4.13 9.93
Area A-7	1.78 9.93
Area AA-1	0.82 9.94
Area AA-2	7.09 9.93
REACHES	
REACH 1	0.26 10.02
Down	0.26 10.02
REACH 2	6.85 9.93
Down	6.85 9.93
BASIN A	8.63 9.93
Down	8.63 9.94
BASIN AA	7.89 9.93
Down	7.89 9.94
REACH 3	16.51 9.94

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
Down	16.50 9.94
OUTLET	16.50

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area A
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloA-DETENTION.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area A-1	Area A	REACH 1	0.51	80	0.1
Area A-2	Area A	REACH 1	1.46	70	0.1
Area A-3	Area A	REACH 2	1.24	80	.21
Area A-4	Area A	REACH 2	1.14	98	0.1
Area A-5	Area A	REACH 2	1.94	80	0.1
Area A-6	Area A	REACH 2	3.62	94	0.1
Area A-7	Area A	BASIN A	2.78	86	0.1
Area AA-1	Area A	BASIN AA	2.27	80	0.1
Area AA-2	Area A	BASIN AA	6.22	94	0.1

Total area: 21.18 (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>

Brown

Cielo Vista
Developed Area A
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area A-1	.51	0.100	80	REACH 1	Area A
Area A-2	1.46	0.100	70	REACH 1	Area A
Area A-3	1.24	0.210	80	REACH 2	Area A
Area A-4	1.14	0.100	98	REACH 2	Area A
Area A-5	1.94	0.100	80	REACH 2	Area A
Area A-6	3.62	0.100	94	REACH 2	Area A
Area A-7	2.78	0.100	86	BASIN A	Area A
Area AA-1	2.27	0.100	80	BASIN AA	Area A
Area AA-2	6.22	0.100	94	BASIN AA	Area A

Total Area: 21.18 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area A-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	190	0.5000	0.050				0.005
					Time of Concentration		0.1
Area A-2							
SHEET	100	0.1900	0.130				0.074
SHALLOW	240	0.1900	0.050				0.009
					Time of Concentration		0.1
Area A-3							
SHEET	100	0.0200	0.150				0.204
SHALLOW	54	0.0250	0.050				0.006
					Time of Concentration		.21
Area A-4							
SHEET	100	0.0050	0.011				0.044
SHALLOW	70	0.0050	0.025				0.014
					Time of Concentration		0.1
Area A-5							
SHEET	100	0.5000	0.150				0.056
SHALLOW	210	0.2100	0.050				0.008
					Time of Concentration		0.1
Area A-6							
SHEET	100	0.0200	0.011				0.025
SHALLOW	508	0.0660	0.025				0.027
					Time of Concentration		0.1
Area A-7							
SHEET	100	0.0200	0.011				0.025
SHALLOW	642	0.0690	0.025				0.033
					Time of Concentration		0.1
Area AA-1							
SHEET	100	0.5000	0.150				0.056
SHALLOW	53	0.1900	0.050				0.002
					Time of Concentration		0.1

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area AA-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	573	0.0250	0.025				0.050
					Time of Concentration		0.1

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area A-1	0.18 9.94
Area A-2	0.10 10.03
Area A-3	0.39 10.04
Area A-4	1.59 9.93
Area A-5	0.70 9.94
Area A-6	4.13 9.93
Area A-7	1.78 9.93
Area AA-1	0.82 9.94
Area AA-2	7.09 9.93
REACHES	
REACH 1	0.26 10.02
Down	0.26 10.02
REACH 2	6.85 9.93
Down	6.85 9.90
BASIN A	8.64 9.93
Down	8.64 9.93
BASIN AA	7.89 9.93
Down	7.89 9.93
REACH 3	16.52 9.93

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
Down	16.52 9.91
OUTLET	16.52

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area B
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area B-1	Area B	B1	5.24	83	0.1
Area B-2	Area B	B2	1.81	83	0.1
Area B-3	Area B	B2	0.41	80	0.1
Area B-4	Area B	B2	2.37	83	0.1
Area B-5	Area B	B3	2.07	85	0.1
Area B-6	Area B	BASIN B	0.62	80	.327

Total area: 12.52 (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>

Brown

Cielo Vista
Developed Area B
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area B-1	5.24	0.100	83	B1	Area B
Area B-2	1.81	0.100	83	B2	Area B
Area B-3	.41	0.100	80	B2	Area B
Area B-4	2.37	0.100	83	B2	Area B
Area B-5	2.07	0.100	85	B3	Area B
Area B-6	.62	0.327	80	BASIN B	Area B

Total Area: 12.52 (ac)

Cielo Vista
Developed Area B
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area B-1							
SHEET	100	0.0200	0.011				0.025
SHALLOW	392	0.0150	0.025				0.044
					Time of Concentration		0.1
Area B-2							
SHEET	100	0.0200	0.011				0.025
SHALLOW	306	0.0540	0.025				0.018
					Time of Concentration		0.1
Area B-3							
SHEET	50	0.5000	0.150				0.032
					Time of Concentration		0.1
Area B-4							
SHEET	100	0.0200	0.011				0.025
SHALLOW	344	0.0110	0.025				0.045
					Time of Concentration		0.1
Area B-5							
SHEET	100	0.0200	0.011				0.025
SHALLOW	430	0.0850	0.025				0.020
					Time of Concentration		0.1
Area B-6							
SHEET	90	0.0050	0.150				0.327
					Time of Concentration		.327

Cielo Vista
Developed Area B
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area B-1	2.57
	9.94
Area B-2	0.89
	9.94
Area B-3	0.15
	9.94
Area B-4	1.16
	9.94
Area B-5	1.22
	9.94
Area B-6	0.16
	10.11
REACHES	
B1	2.57
	9.94
Down	2.57
	9.94
B2	4.77
	9.94
Down	4.77
	9.94
B3	5.98
	9.94
Down	5.98
	9.95
BASIN B	6.07
	9.95
Down	6.07
	9.96
B4	6.07
	9.96
Down	6.07
	9.96
OUTLET	6.07

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area BB
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloBB.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area BB-1	Area BB	BASIN BB1	0.36	96	0.1
Area BB-2	Area BB	BASIN BB1	0.32	80	0.1
Area BB-4	Area BB	BASIN BB2	0.28	95	0.1
Area BB-5	Area BB	BASIN BB2	0.41	80	0.1
Area BB-6	Area BB	BASIN BB2	0.87	77	0.1
Area BB-3	Area BB	BASIN BB1	0.76	77	0.1

Total area: 3 (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>

Brown

Cielo Vista
Developed Area BB
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area BB-1	.36	0.100	96	BASIN BB1	Area BB
Area BB-2	.32	0.100	80	BASIN BB1	Area BB
Area BB-4	.28	0.100	95	BASIN BB2	Area BB
Area BB-5	.41	0.100	80	BASIN BB2	Area BB
Area BB-6	.87	0.100	77	BASIN BB2	Area BB
Area BB-3	.76	0.100	77	BASIN BB1	Area BB

Total Area: 3 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area BB-1							
SHEET	87	0.0900	0.011				0.012
					Time of Concentration		0.1
Area BB-2							
SHEET	70	0.4200	0.150				0.045
					Time of Concentration		0.1
Area BB-4							
SHEET	100	0.1000	0.011				0.013
SHALLOW	92	0.1000	0.025				0.004
					Time of Concentration		0.1
Area BB-5							
SHEET	72	0.4600	0.150				0.045
					Time of Concentration		0.1
Area BB-6							
SHEET	100	0.1700	0.130				0.077
SHALLOW	271	0.1700	0.050				0.011
					Time of Concentration		0.1
Area BB-3							
SHEET	100	0.1800	0.130				0.076
SHALLOW	220	0.2400	0.050				0.008
					Time of Concentration		0.1

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area BB-1	0.46
	9.93
Area BB-2	0.12
	9.94
Area BB-4	0.34
	9.93
Area BB-5	0.15
	9.94
Area BB-6	0.21
	9.95
Area BB-3	0.19
	9.95
REACHES	
BASIN BB1	0.75
	9.94
Down	0.75
	9.94
BASIN BB2	0.70
	9.93
Down	0.70
	9.94
BB3	1.45
	9.94
Down	1.45
	9.94
OUTLET	1.45

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area C
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloC.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area C-1	Area C	REACH 1	3.3	77	0.1
Area C-2	Area C	BASIN C	1.63	80	.119
Area C-3	Area C	BASIN C	1.91	77	0.1
Area C-4	Area C	BASIN C	0.52	86	0.1
Area C-5	Area C	BASIN C	1.13	86	.255

Total area: 8.49 (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>

Brown

Cielo Vista
Developed Area C
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area C-1	3.30	0.100	77	REACH 1	Area C
Area C-2	1.63	0.119	80	BASIN C	Area C
Area C-3	1.91	0.100	77	BASIN C	Area C
Area C-4	.52	0.100	86	BASIN C	Area C
Area C-5	1.13	0.255	86	BASIN C	Area C

Total Area: 8.49 (ac)

Cielo Vista
Developed Area C
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area C-1							
SHEET	100	0.1800	0.130				0.076
SHALLOW	510	0.1800	0.050				0.021
					Time of Concentration		0.1
Area C-2							
SHEET	100	0.1400	0.150				0.094
SHALLOW	550	0.1400	0.050				0.025
					Time of Concentration		.119
Area C-3							
SHEET	100	0.1700	0.130				0.077
SHALLOW	260	0.1700	0.050				0.011
					Time of Concentration		0.1
Area C-4							
SHEET	100	0.1300	0.011				0.012
SHALLOW	200	0.1300	0.050				0.010
					Time of Concentration		0.1
Area C-5							
SHEET	100	0.0100	0.130				0.240
SHALLOW	90	0.0100	0.050				0.015
					Time of Concentration		.255

Cielo Vista
Developed Area C
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area C-1	0.81
	9.95
Area C-2	0.57
	9.96
Area C-3	0.47
	9.95
Area C-4	0.33
	9.93
Area C-5	0.59
	10.06
REACHES	
REACH 1	0.81
	9.95
Down	0.81
	9.97
BASIN C	2.66
	10.01
Down	2.66
	10.02
OUTLET	2.66

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area D
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloD.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area D-1	Area D	Outlet	2.4	77	0.1
Area D-2	Area D	Outlet	0.27	80	0.1
Area D-3	Area D	Outlet	0.26	80	0.1
Area D-4	Area D	Outlet	1.61	77	0.1
Area D-5	Area D	Outlet	0.88	77	0.1

Total area: 5.42 (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>

Brown

Cielo Vista
Developed Area D
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area D-1	2.40	0.100	77	Outlet	Area D
Area D-2	.27	0.100	80	Outlet	Area D
Area D-3	.26	0.100	80	Outlet	Area D
Area D-4	1.61	0.100	77	Outlet	Area D
Area D-5	.88	0.100	77	Outlet	Area D

Total Area: 5.42 (ac)

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area D-1							
SHEET	100	0.1200	0.130				0.089
SHALLOW	127	0.1200	0.050				0.006
					Time of Concentration		0.1
Area D-2							
SHEET	100	0.3000	0.150				0.069
					Time of Concentration		0.1
Area D-3							
SHEET	100	0.3000	0.150				0.069
					Time of Concentration		0.1
Area D-4							
SHEET	100	0.2500	0.130				0.066
SHALLOW	407	0.2500	0.050				0.014
					Time of Concentration		0.1
Area D-5							
SHEET	100	0.2200	0.130				0.070
SHALLOW	595	0.2200	0.050				0.022
					Time of Concentration		0.1

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area D-1	0.59
	9.95
Area D-2	0.10
	9.94
Area D-3	0.09
	9.94
Area D-4	0.40
	9.95
Area D-5	0.22
	9.95
REACHES	
OUTLET	1.39

WinTR-55 Current Data Description

--- Identification Data ---

User: Brown
Project: Cielo Vista
SubTitle: Developed Area E
State: California
County: Orange
Filename: C:\Users\Gary.I7-25\AppData\Roaming\WinTR-55\PostdevcieloE.w55

Date: 8/24/2012
Units: English
Areal Units: Acres

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Area E-1	Area E	REACH 2A	2.03	77	0.1
Area E-2	Area E	REACH 2	1.51	80	0.1
Area E-3	Area E	REACH 1A	0.96	89	0.1
Area E-4	Area E	REACH 1B	1.09	80	0.1
Area E-5	Area E	BASIN E	4.71	87	0.1
Area E-6	Area E	REACH 1A	0.5	77	0.1

Total area: 10.80 (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>

Brown

Cielo Vista
Developed Area E
Orange County, California

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Area E-1	2.03	0.100	77	REACH 2A	Area E
Area E-2	1.51	0.100	80	REACH 2	Area E
Area E-3	.96	0.100	89	REACH 1A	Area E
Area E-4	1.09	0.100	80	REACH 1B	Area E
Area E-5	4.71	0.100	87	BASIN E	Area E
Area E-6	.50	0.100	77	REACH 1A	Area E

Total Area: 10.80 (ac)

Brown

Cielo Vista
Developed Area E
Orange County, California

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Area E-1							
SHEET	100	0.3400	0.130				0.059
SHALLOW	780	0.3400	0.050				0.023
					Time of Concentration		0.1
Area E-2							
SHEET	100	0.5000	0.150				0.056
					Time of Concentration		0.1
Area E-3							
SHEET	100	0.1000	0.011				0.013
SHALLOW	610	0.1000	0.050				0.033
					Time of Concentration		0.1
Area E-4							
SHEET	100	0.3200	0.150				0.067
SHALLOW	150		0.050				
					Time of Concentration		0.1
Area E-5							
SHEET	100	0.0200	0.011				0.025
SHALLOW	550	0.0500	0.025				0.034
					Time of Concentration		0.1
Area E-6							
SHEET	80	0.3500	0.150				0.054
					Time of Concentration		0.1

Brown

Cielo Vista
Developed Area E
Orange County, California

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
SUBAREAS	
Area E-1	0.50
	9.95
Area E-2	0.54
	9.94
Area E-3	0.78
	9.93
Area E-4	0.39
	9.94
Area E-5	3.28
	9.93
Area E-6	0.12
	9.95
REACHES	
BASIN E	3.66
	9.93
Down	3.66
	9.93
REACH 1	3.66
	9.93
Down	3.66
	9.94
REACH 1A	0.90
	9.93
Down	0.90
	9.94
REACH 1B	0.39
	9.94
Down	0.39
	9.95
REACH 2A	0.50
	9.95
Down	0.50
	9.97
REACH 2	5.58
	9.94
Down	5.58
	9.94

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period ANALYSIS: (cfs) (hr)
OUTLET	5.58

CEQA DRAINAGE STUDY

for

CIELO VISTA

County of Orange, California

Prepared for:

Sage Community Group
3 Corporate Plaza
Newport Beach, CA, 92660

August 9, 2013

Tory R Walker, R.C.E. 45005
President

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WATER RESOURCES PLANNING & ENGINEERING

W.O. 037-02

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CHAPTER 1 - EXECUTIVE SUMMARY

1.1 Introduction

The Cielo Vista project site is located on an approximate 84 acre site in the undeveloped foothills of Yorba Linda, adjacent to Stonehaven Drive to the south and San Antonio Road to the west of the project bounds in unincorporated Orange County, California (see Figure 1).

Figure 1. Approximate Project Location Map (No Scale)

Runoff from the project site drains in a westerly direction via four (4) natural channels, discharging to two (2) existing storm drain systems within the adjacent Stonehaven Drive to the south and San Antonio Road to the west.

This study analyzes developed condition 100-year peak flowrates from the project site in existing and proposed developed conditions to the two (2) points of outlet from the project site. This study also discusses possible erosion control measures, sediment &

debris mitigation and peak flow mitigation that are required for the ultimate development of the residential development.

Since the site lies outside any FEMA floodplain zones, no Letters of Map Revision will be required. Treatment of storm water runoff from the site has been addressed in a separate report - the "Water Quality Management Plan for Cielo Vista" dated March, 2013 by Charles Hartman & Associates.

Per County of Orange drainage criteria, the Unit Hydrograph method should be used to determine peak design flowrates when the contributing drainage area is greater than 1.0 square mile.

Methodology used for the computation of design rainfall events, loss rates, and rainfall intensity values are consistent with criteria set forth in the "1986 Orange County Hydrology Manual." A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report.

Proposed potential erosion, sediment and debris mitigation measures for the project site are discussed in Chapter 3 of this report.

1.2 – Summary of Existing Conditions

The existing 84-acre sloped site is vegetated with light scrub and annual grasses. Natural runoff from the undeveloped site area flows in a westerly direction towards two (2) receiving storm drain systems located at Stonehaven Drive to the south and San Antonio Road to the west of the project site. The project site is downstream of four (4) significant offsite natural tributary areas that drain via overland flow through natural flow paths, which are ultimately intercepted by the aforementioned drainage systems.

Runoff from the northern portions of the project site, inclusive of three (3) large offsite tributaries, confluence onsite prior to discharging at the western project bounds. These flows then continue to drain via overland flow, where they are then intercepted by the drainage channel located adjacent to San Antonio Road.

Wire Springs Canyon, a large offsite natural tributary area located to the west of the project site, drains to the receiving southern portion of the project site, discharging to the receiving 8-feet x 7-feet box culvert storm drain located within Stonehaven Drive (per DWG No. E06501 – 701 – 2).

Both the Stonehaven Drive and San Antonio Road facilities are owned and maintained by the Orange County Flood Control District and outlet to the Santa Ana River, approximately two (2) miles south of the project site.

Table 1 summarizes pre-developed condition drainage areas and resultant 100-year peak flow rates at the western (San Antonio Road system) and southern (Stonebridge Drive system) discharge locations.

TABLE 1 – Summary of Existing Conditions Peak Flows

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Western Boundary	1414	2426
Southern Boundary	674	1125
TOTAL	2088	3551

1.3 – Summary of Developed Conditions

The proposed Cielo Vista project consists of single family residential lots, with servicing roads, sidewalks and public open space. The project is effectively split into two (2) portions, a 42.7 acre northern site and a 41.3 acre southern site.

In development conditions, the natural drainage patterns will be maintained such that flows to the downstream facilities will remain similar to those experienced in the current existing condition.

Runoff from the developed areas of the subject site will be collected in a drainage system within planned local streets and routed through one of three water quality basins prior to draining to the existing discharge locations. All developed runoff will be treated in full compliance with regional storm water quality regulations prior to mixing with natural, offsite flows.

Offsite runoff tributary to the northern site is intercepted by two (2) proposed storm drain systems. Runoff from the northern tributary area is intercepted by a proposed headwall located to the north of Aspen Way. These flows are then conveyed through the project site, draining to the natural existing flow path located within the project site property. Flows generated by the natural tributary area to the northeast of the project site will be intercepted by a proposed headwall located at the northern end of the proposed “F” Street. These flows will then be conveyed via storm drain in a southerly direction, confluencing with flows from the aforementioned Aspen Way tributary flows.

Runoff generated by the Wire Springs Canyon tributary will be intercepted via a proposed headwall located at the eastern end of the proposed “B” Street within the southern site. These flows will be conveyed in a westerly direction via storm drain, ultimately discharging to the existing 8-foot x 7-foot box culvert located within Stonehaven Drive to the south of the project site.

Table 2 summarizes post developed condition drainage areas and resultant 100-year peak flow rates at the western (San Antonio Road system) and southern (Stonebridge Drive system) discharge locations.

TABLE 2 – Summary of Developed Conditions Peak Flows

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Western Boundary	1414	2426
Southern Boundary	674	1126
TOTAL	2088	3552

For additional information in regards to the hydrologic and hydraulic analysis undertaken within this report, please refer to Chapter 2 of this report.

1.4 – Summary of Results

Tables 3 and 4 below summarize the developed versus existing conditions drainage areas and resultant 100-year peak flow rates at the discharge locations.

TABLE 3 – Summary of Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Existing Condition	1414	2425.9
Developed Condition	1414	2426.1
DIFFERENCE	0.0	+ 0.2

TABLE 4 – Summary of Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Existing Condition	674	1125.3
Developed Condition	674	1126.0
DIFFERENCE	0.0	+ 0.7

As presented in Tables 3 and 4, it is evident that due to the anticipated development of the proposed Cielo Vista project site, there will be a small increase in peak 100-year flow rates at both the Western and Southern discharge locations. It should be noted that these peak flow increases are negligible when compared to the total flow rate (0.2 cfs and 0.7 cfs for the western and southern boundaries respectively).

Per the hydraulic analysis undertaken in Chapter 2 of this report, it is clear that the existing 8-feet x 7-feet box culvert within Stonehaven Drive has sufficient capacity to convey this marginal increase in developed condition peak flow, with no risk of downstream flooding due to the additional 0.7 cfs increase due to the proposed development of the project site at the southern boundary.

As the velocity of the water in the 8-feet x 7-feet box culvert is approximately 22.5 ft/s, appropriate entrance conditions must be designed for to insure that such inlet control conditions are properly conveyed inside the culvert.

Similarly, the increase of 0.7 cfs at the western boundary of the project site is an insignificant increase in peak flow.

If mitigation of the incrementally larger peak flow rates is desired (which seems unnecessary with peak flow increases of less than 0.1%), we recommend the following:

To mitigate peak flows at the western and southern boundaries, the receiving storm drain within the project site (the headwall intercepts proposed at the end of “B” and “F” Streets) could be downsized by a 6-inch reduction in capacity. The small reduction in storm flow conveyance would effectively reduce the peak flow by throttling down flow, effectively detaining peak flows by the use of a hydraulic reduction.

The ponding caused by such hydraulic reduction in capacity would be maintained on the project site, ensuring that no offsite property is impacted by attenuating the peak flow. All developed pad elevations would be constructed at a minimum of 3-foot (or greater) above this anticipated peak water surface elevation to ensure that no residential structure would be flooded within the project site due to this detention. A further discussion on detention is provided in Chapter 4 of this report.

In order to satisfy County of Orange hydraulic and water quality concerns in regards to erosion and sediment control, potential design elements are discussed in Chapter 3 of this report.

It should be noted that in order for the project to receive final approval, these requirements must be met in order to receive County approval for construction. Given the initial stage that the current Cielo Vista project is at, detailed design and analysis of such mitigation measures are not appropriate at this CEQA level. The fact that the project will be able to conform to these requirements in further stages of development is without question. These mitigation measures will ensure the project site is in full conformance with regional water quality requirements at the time of final development.

1.5 – References

1986 Orange County Hydrology Manual
USDA Web Soil Survey
Improvement Plans for Tract 13800: Drawing No. E06501 – 701 – 2
Tentative Tract Map No. 17341

CHAPTER 2 – HYDROLOGIC & HYDRAULIC ANALYSIS

2.1 – Methodology

2.1.1 Design Storm

The 24-hour, 100-year design rainfall was determined using the Unit Hydrograph Method Design Storm from Section B.4 of the Orange County Hydrology Manual (OCHM). As required by the OCHM, the precipitation values were corrected to account for the tendency of the average rainfall intensity to decrease with respect to increased area for single event storms. In order to provide the peak flow at the confluence of Creek B, Creek C, and Creek D at the Western Boundary (see Hydrology Map in Appendix), a single design storm was created for use in all three creeks by using correction factors based on the total area of the Creek B, C, and D catchments. A separate design storm was created for Creek A as no confluence analysis was required for this creek at the southern boundary. Rainfall distributions are listed in the Appendix.

2.1.2 Losses

Catchment losses and effective rainfall were computed using the Curve Number Method as described in Section C of the OCHM. This method requires the determination of soil and cover type parameters for each catchment. Curve Numbers (CN) in this report reflect the assumption of Antecedent Moisture Condition III (AMC III), which is required for the 100 year return period storm. For detailed information and maps on soil type, cover type, and CN selection please refer to Sections 2.2, 2.3, and the Appendix of this study.

2.1.3 Unit Hydrograph Method

The Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the OCHM was used for the hydrologic calculations for this project. S-Curves were developed for each catchment based on watershed characteristics. The unit hydrograph was then convoluted with the effective rainfall for each catchment to determine the total hydrograph. The total hydrograph at the confluence of Creeks B, C, and D was calculated by summation of the individual flow ordinates for each creek's hydrograph.

2.2 – Existing Conditions Hydrologic Analysis

2.2.1 Soil Group, Cover Type, and CN Selection

In existing conditions, hydrologic soil groups D and C dominate each catchment with only small patches of type B soil in some areas (refer to Appendix for Soil Type Maps).

Both group D and group C soils have slow infiltration rates when saturated. This is especially true for D soils, which consist chiefly of clay soils with a high swelling potential, clay pan or clay layer at or near the surface, or shallow soils over nearly impervious materials. Group D soils have a very slow rate of water transmission. As a result, losses due to infiltration will be relatively low for all catchments.

Cover type for each catchment consists primarily of natural open space with only a small portion of residential development located in the lower reaches. In fact, Creek A and Creek B were determined to be entirely natural open space. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial". Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM.

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is presented in the Appendix.

2.2.2 Peak Flow Determination

The existing conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 5 and 6 below. It is important to note that the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 200 cfs lower than the total summation of the partial peak flows.

TABLE 5 - Existing Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Creek B	224	459.2
Creek C	717	1235.3
Creek D	473	968.1
TOTAL: Confluence of Creeks B, C, & D	1414	2425.9

TABLE 6 - Existing Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Creek A	674	1125.3

2.3 – Developed Conditions Hydrologic Analysis

2.3.1 Soil Group, Cover Type, and CN Selection

In developed conditions, the distribution of hydrologic soil groups is assumed to remain the same as the existing conditions described in Section 2.2 (refer to Appendix for Soil Type Maps).

The proposed project site is approximately 4% of the total of all drainage areas, and as a result the cover type for each catchment remains primarily natural open space with only a small portion of residential development located in the lower reaches. The main difference from existing conditions is that residential development is now present in Creek A and Creek B.

Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial."

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is presented in the Appendix.

2.3.2 Peak Flow Determination

The proposed conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 7 and 8 below. As was noted in existing conditions, the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 200 cfs lower than the total summation of the partial peak flows.

It is evident from Tables 7 and 8 that the development of the project site has a negligible effect on the peak flows of all four creeks. The largest peak flow increase is a mere 0.7 cfs in Creek A. These minute increases in peak flow are attributable to two factors. First, the area being developed is relatively small when compared to the size of each catchment. Second, the assumption of AMC III and the fact that the infiltration capacity of each catchment has already been greatly exceeded during the peak of the storm makes the addition of impervious area somewhat irrelevant.

Thus, while the increase in total runoff volume may be more significant, the project's impact on the maximum peak flows of the hydrographs for all creeks is minimal.

TABLE 7 - Developed Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek B	224	459.4	0.20
Creek C	717	1235.3	0.01
Creek D	473	968.1	0.00
TOTAL: Confluence of Creeks B, C, & D	1414	2426.1	0.21

TABLE 8 - Developed Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek A	674	1126.0	0.69

2.4 – Hydraulic Analysis

A limited normal depth analysis was performed for the existing 8-feet x 7-feet (height x width) box culvert within Stonehaven Drive to demonstrate sufficient capacity for the developed conditions 100-year peak flow. This culvert intercepts the entire flow from Creek A at the southern boundary of the project. The culvert was modeled using XPSTORM software and all culvert dimensions are per drawing no. E06501 – 701 – 2 (XPSTORM model output given in Appendix). The analysis demonstrates a normal depth of 7.3 ft for a 100-year peak flow of 1126 cfs. As this is 0.7 ft below the culvert height, the culvert is clearly adequate for conveyance of the 100-year peak flow as all flow remains in the pipe and no pressure flow is experienced.
An important aspect of the analysis must be emphasized. The normal velocity of the 100-year peak flow in the 8-feet x 7-feet box culvert is 22.5 ft/s, a very large value. Therefore, there could be inlet control conditions at the entrance of the culvert, where even if the capacity is enough, energy forces at the entrance reduce the actual flow getting into the culvert.

In order to avoid inlet problems, a very well designed entrance must be incorpertaed into the design., with gradual transitions, no bends, rounded entrance consitions and careful consideration of the geometry of the entrance. Such design is out of the scope of a CEQA study, but it must be mentioned so that final design accounts for proper transition of the flow in the creek into the flow inside the culvert. An additional routing at the entrance of the culvert will further reduce peak flow due to ponding attenuation and will insure that the culvert can convey the resulting flow.

Continuing with general assumptions, limited normal depth calculations were completed for the proposed receiving storm drain within the project site that intercepts Creek A and conveys flow to the aforementioned 8-feet x 7-feet box culvert (the storm drain with headwall intercept proposed at the southeast end of “B” Street). Based on topography

for the project site, the pipe slope was approximated as 3.5% (the length and slope of the proposed storm drain were estimated based on Tentative Tract Map No. 17341). A conservative tailwater condition of 7.3 ft of depth, or 0.3 ft above the top of pipe, was assumed for the downstream end of the pipe where it joins to the 8' x 7' box culvert.

Analysis using XPSTORM software determined that an 84" diameter storm drain is sufficient to convey the 100-year peak discharge of 1126 cfs at the intercept of Creek A as long as a proper geometric transition is provided (XPSTORM model output given in Appendix).

The HGL is 1.0 ft below the top of pipe at the pipe entrance and no pressure flow is experienced from this point until approaching the downstream junction with the 8' x 7' box culvert. Near the junction with the box culvert, the HGL exceeds the top of the 84" pipe by 0.3 ft, but because the receiving culvert has an additional 0.7 ft of freeboard above the HGL, all flow is maintained within the system.

CHAPTER 3 – EROSION & SEDIMENT MITIGATION

3.1 – Erosion Control Measures

The development of the Cielo Vista project site will likely result in increases of point discharge and velocities at storm drain discharge locations throughout the project site. Storm drain discharges into unlined natural channels or natural watercourses often have the potential to cause significant erosive impairment.

In order to mitigate the erosive energy of these concentrated flows, energy dissipation is often employed at the storm drain outlets. These storm drain outlet mitigation measures are typically armored rock aprons (referred to as riprap) or by the construction of specially designed concrete energy dissipation outlet structures. These energy mitigating devices and structures reduce flow velocities to typically below five (5) feet per second or less; flows less than this velocity are considered to be non-erosive.

Riprap aprons are constructed of rock or grouted rock at a zero grade for a distance that is often related to the outlet pipe diameter. These aprons do not dissipate significant energy except through increased roughness for a short distance. However, they do serve to spread the flow, helping to transition to the natural drainageway or to sheet flow where no natural drainageway exists. However, if they are too short, or otherwise ineffective, they simply move the location of potential erosion downstream. The key design elements of the riprap apron are the riprap size as well as the length, width, and depth of the apron.

In order to ensure the project site does not increase the potential for erosive conditions, erosion control measures such as riprap aprons will be located at all points of concentrated discharge where flow velocity exceeds five (5) feet per second. These points of discharge will not be limited to storm drain outlets but will also include brow ditches and other forms of storm water conveyance where concentrated flow could be of concern.

The rip rap aprons will be designed and sized in conformance with regional sizing criteria found in the “County of Orange Local Drainage Manual”, dated August 2005. Other designs and sizing criteria can be found in the FHWA’s “Hydraulic Engineering Circular Number 14, Third Edition” – HEC14, including a “Riprap Basin” that could also be used.

3.2 – Sediment & Debris Controls

3.2.1 Sediment

Due to the large natural offsite areas tributary to the Cielo Vista project site, sediment and debris mitigation is of paramount concern. Sediment laden flows can cause significant hydraulic restrictions on receiving storm drain infrastructure; also, sediment has been deemed a pollutant of concern in practically all regional water quality management plans.

Sediment basins provide an excellent solution to contain excess sediment and minor debris from entering the storm drain system and also reduce pollution of the receiving downstream water body.

In order to intercept flows laden with sediment, construction of sediment stilling basins upstream of the hydraulic conveyance system is a common engineering practice. These basins are constructed with sufficient volume to allow flows to pond within the basin, allowing the sediment within the storm water to settle out to the base of the pond. Flows then drain typically via a perforated outlet structure, to a receiving storm drain or other hydraulic conveyance system. Alternatively, should some sediment transport through the site be desired, a different type of debris trap will be designed.

Due to the upstream watersheds susceptibility to brush fire, sedimentation can be a significant concern, due to denuded tributary areas. “Bulking” calculations are to be performed during design in accordance with the Los Angeles County methodology, as is typical for the region.

Sediment basins will be located upstream of all proposed storm water conveyance systems within the proposed Cielo Vista project site.

3.2.2 Debris

Due to significant naturally vegetated tributaries and associated steep slopes with these areas, allowances for larger offsite debris must be made for within the Cielo Vista project site.

Larger debris such as tree branches, trunks and other larger debris capable of constraining hydraulic points of interception (and also the hydraulic conveyance system itself) often require the construction of additional Best Management Practices (BMPs) in addition to the aforementioned sediment basins.

Typically, larger debris can be mitigated via the use of debris fences upstream of the receiving headwall/sediment basins. Debris fences are constructed of a series of anchor piles driven into the ground, interlinked with adjacent piles by the use of wooden planks or other form of connecting member. The fences allow for sediment, smaller debris and water flow to bypass the structure, only providing resistance to larger pieces of debris capable of damaging the storm drain or causing a hazard to property and/or human life.

Due to the early planning stage of the project site, it is not appropriate to design the required sediment and debris containment structures for the Cielo Vista project site in this CEQA stage. It should be noted that in final engineering design, in order to receive County approval, onsite debris mitigation control measures will be designed in accordance with all jurisdictional requirements at that time.

CHAPTER 4 – DETENTION

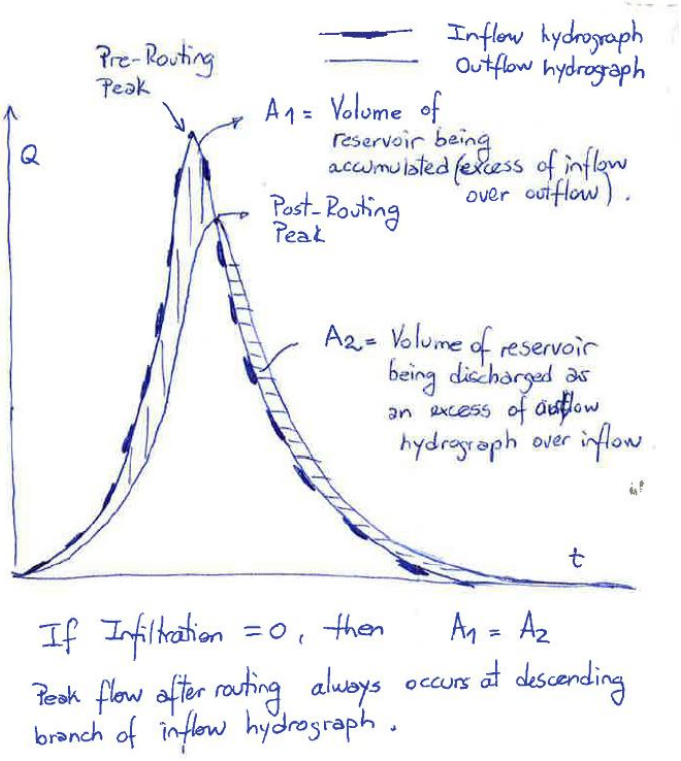
4.1 – Detention Mitigation Discussion

Attenuation of Peak Flow by Modified Puls Routing (Reservoir Routing)

If the water elevation at a reservoir can be assumed horizontal (which is typically the case for most reservoirs or ponding structures), and there is a discharge structure that releases a given amount of water at a given depth, the peak flow of a hydrograph will be reduced by the routing of the hydrograph through a reservoir (Modified Puls).

Even for a relatively small reservoir, a portion of the volume of the hydrograph must be used to fill the reservoir in order to have enough hydraulic depth to release the specific flow associated with such depth. At any given time interval, the continuity equation must be satisfied:

$$0.5 \cdot \Delta t \cdot (Q_{i,t} + Q_{i+\Delta t}) - 0.5 \cdot \Delta t \cdot (Q_{o,t} + Q_{o+\Delta t}) = S_{i+\Delta t} - S_i \qquad (1)$$



The change in storage S is positive if the average inflow Q_i for the time interval is larger than the average outflow Q_O. As the storage S is a function of the depth of the reservoir h, and the outlet discharge is also a function of the depth of the reservoir h, the unknown discharge at the end of the time interval can be obtained as a function of the incoming flows, the initial discharge in the time interval and the final depth of the reservoir at the end of the time interval. Therefore, the outflow hydrograph can be

determined knowing the outlet structure, the geometry of the reservoir (volume vs. depth) and the incoming hydrograph.

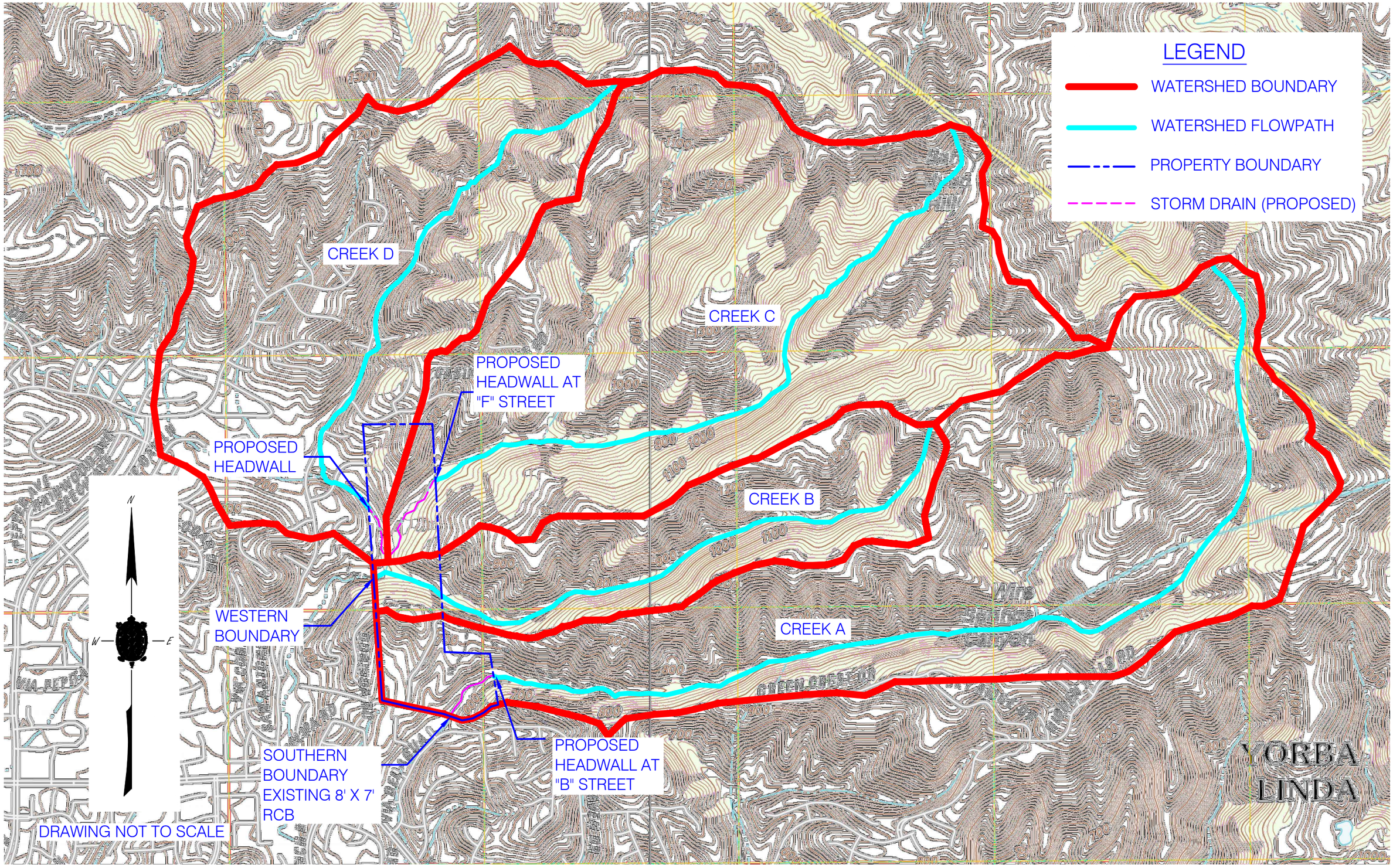
From hydraulic principles, the area between the inflow and outflow hydrographs represents the volume stored in the reservoir (which is maxima at the intersection of the outlet hydrograph and the descending portion of the inflow hydrograph, and therefore, corresponds with the discharge peak of the outlet hydrograph). If infiltration is negligible, the areas between hydrograph before and after the peak of the outlet hydrographs are the same.

From the inspection of the figure, a slight attenuation of the peak flow requires a relatively small volume of a reservoir (small area A_1), whereas a very large attenuation requires a larger reservoir. For a reservoir without discharge much larger in volume than the incoming hydrograph, theoretically the volume accumulated in the reservoir is the incoming hydrograph volume, and the release is zero. This is the case of large dams at low elevation providing complete attenuation to middle storms via ponding in the reservoir, if a water release is not allowed.

This project will use the principle of routing to generate enough attenuation of the incoming hydrographs to compensate for the relatively small increase in peak flow generated by the land use change of natural terrain into residential lots. As the duration of the peak is brief, and the outflow can be very close to the inflow for small to medium flows, a reservoir of a relatively small volume (for example 10% of the incoming hydrograph inflow or even less) can reduce the peak flow by a significant amount (more than 20% of the peak flow, in the previous example), and generate an outlet hydrograph that when joined with the post-development hydrograph of the developed areas still reduces peak flows below pre-development conditions, even if no detention facility is provided in the residential portion of the development.

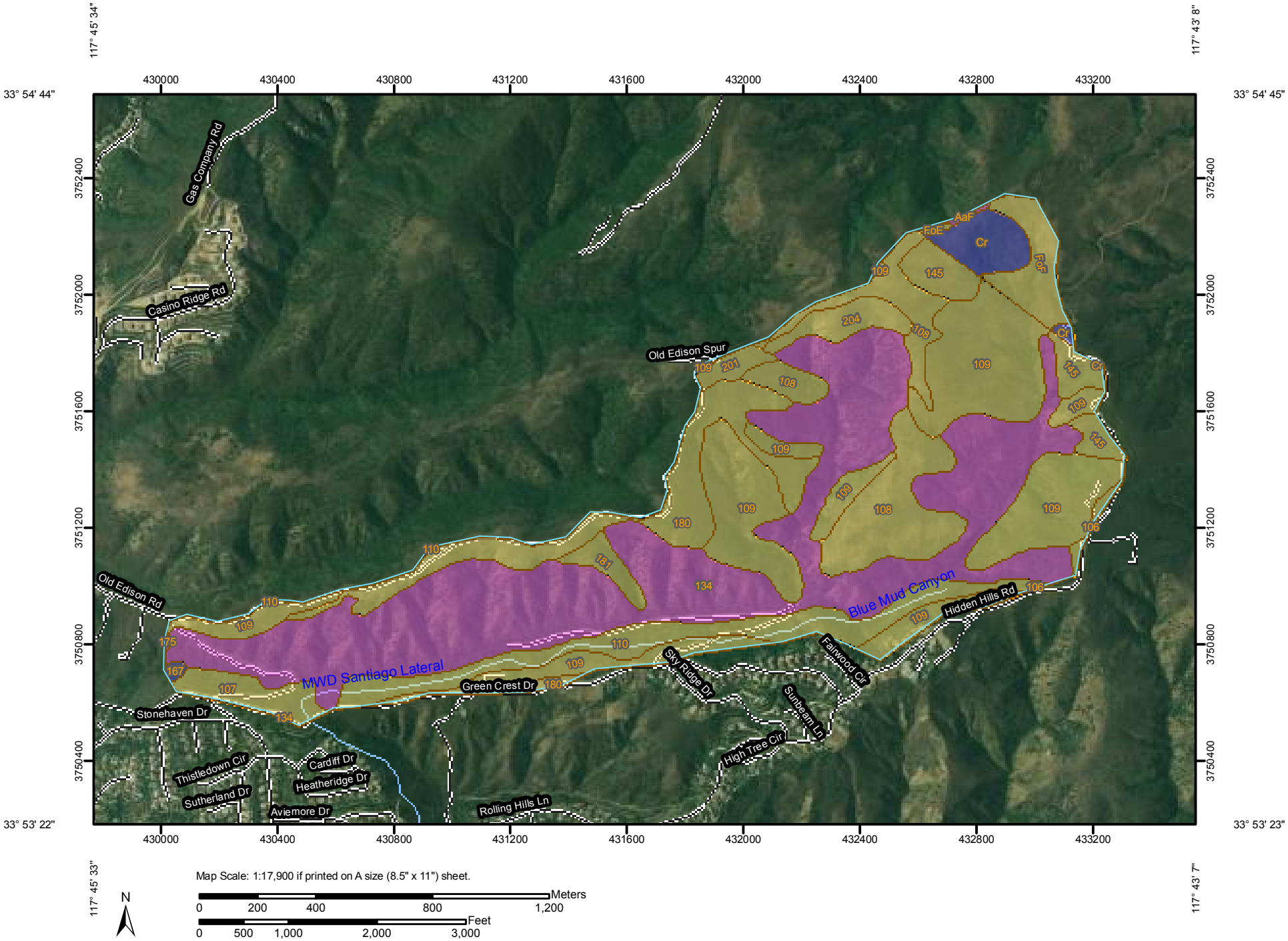
APPENDIX

HYDROLOGY MAPS


LEGEND
WATERSHED BOUNDARY
WATERSHED FLOWPATH
PROPERTY BOUNDARY
STORM DRAIN (PROPOSED)
CREEK D
CREEK C
CREEK B
CREEK A
PROPOSED HEADWALL AT "F" STREET
PROPOSED HEADWALL
WESTERN BOUNDARY
SOUTHERN BOUNDARY EXISTING 8' X 7' RCB
PROPOSED HEADWALL AT "B" STREET
N
W
E
DRAWING NOT TO SCALE
YORBA LINDA

HYDROGRAPH CALCULATIONS

Hydrologic Soil Group—Orange County and Part of Riverside County, California, and San Bernardino County Southwestern Part, California
(Watershed of Creek A)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:17,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.5	0.4%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	12.8	2.1%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	56.1	9.1%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	142.3	23.2%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	41.0	6.7%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	238.5	38.9%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	19.3	3.1%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	0.9	0.2%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.2	0.0%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	48.1	7.8%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	6.1	1.0%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	4.9	0.8%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.4	1.7%
Subtotals for Soil Survey Area			**583.0**	**95.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AaF	Alo clay, 30 to 50 percent slopes	D	0.5	0.1%
Cr	CIENEBA-ROCK OUTCROP COMPLEX	B	13.9	2.3%
FoE	FONTANA CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	0.7	0.1%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	15.9	2.6%
Subtotals for Soil Survey Area			**30.9**	**5.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

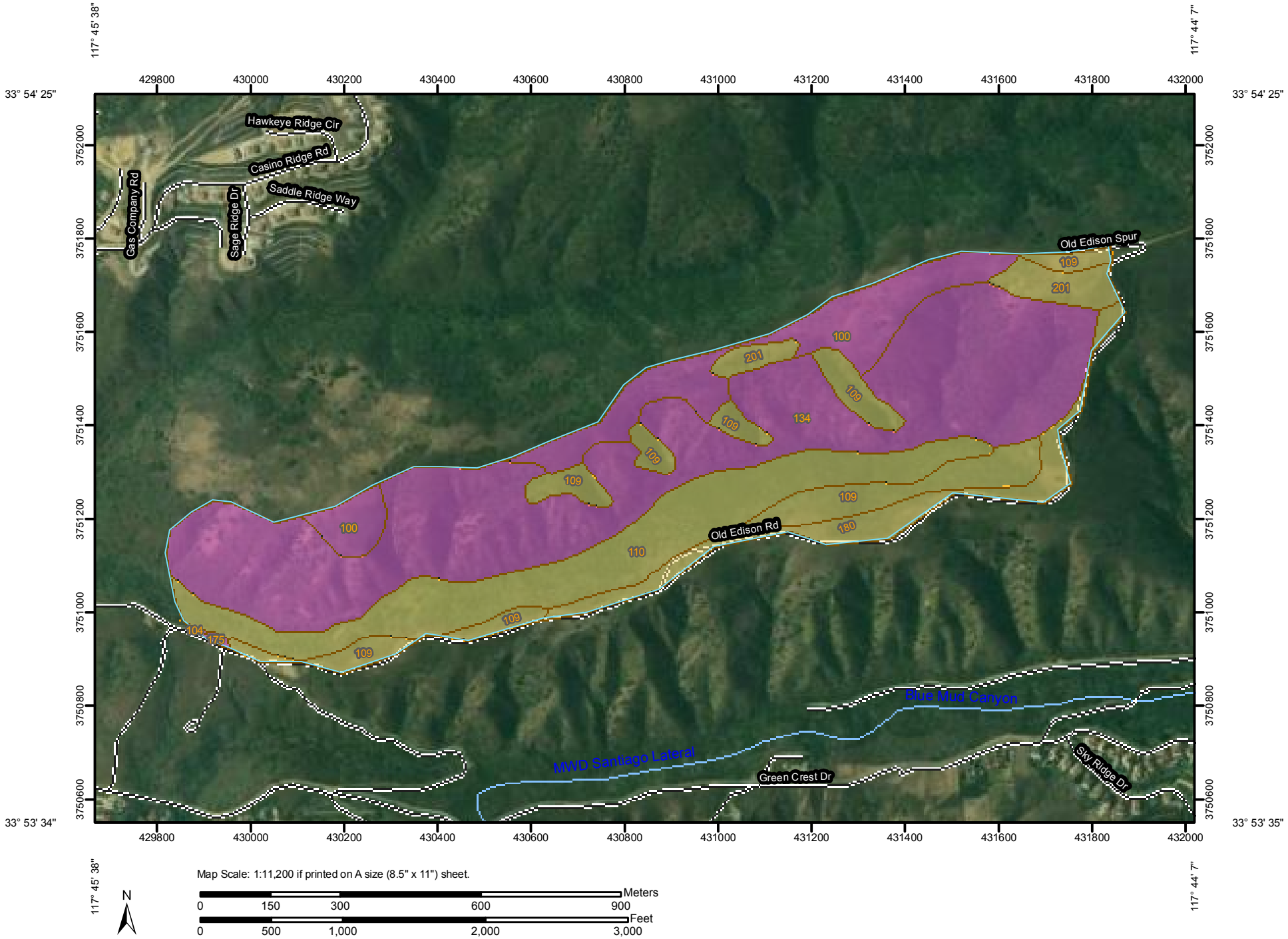
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed Creek B)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:11,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	24.2	11.8%
104	ALO VARIANT CLAY, 15 TO 30 PERCENT SLOPES	D	0.1	0.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	24.8	12.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	37.6	18.3%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	99.4	48.3%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.3	0.1%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	12.8	6.2%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	6.9	3.3%
Totals for Area of Interest			**206.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

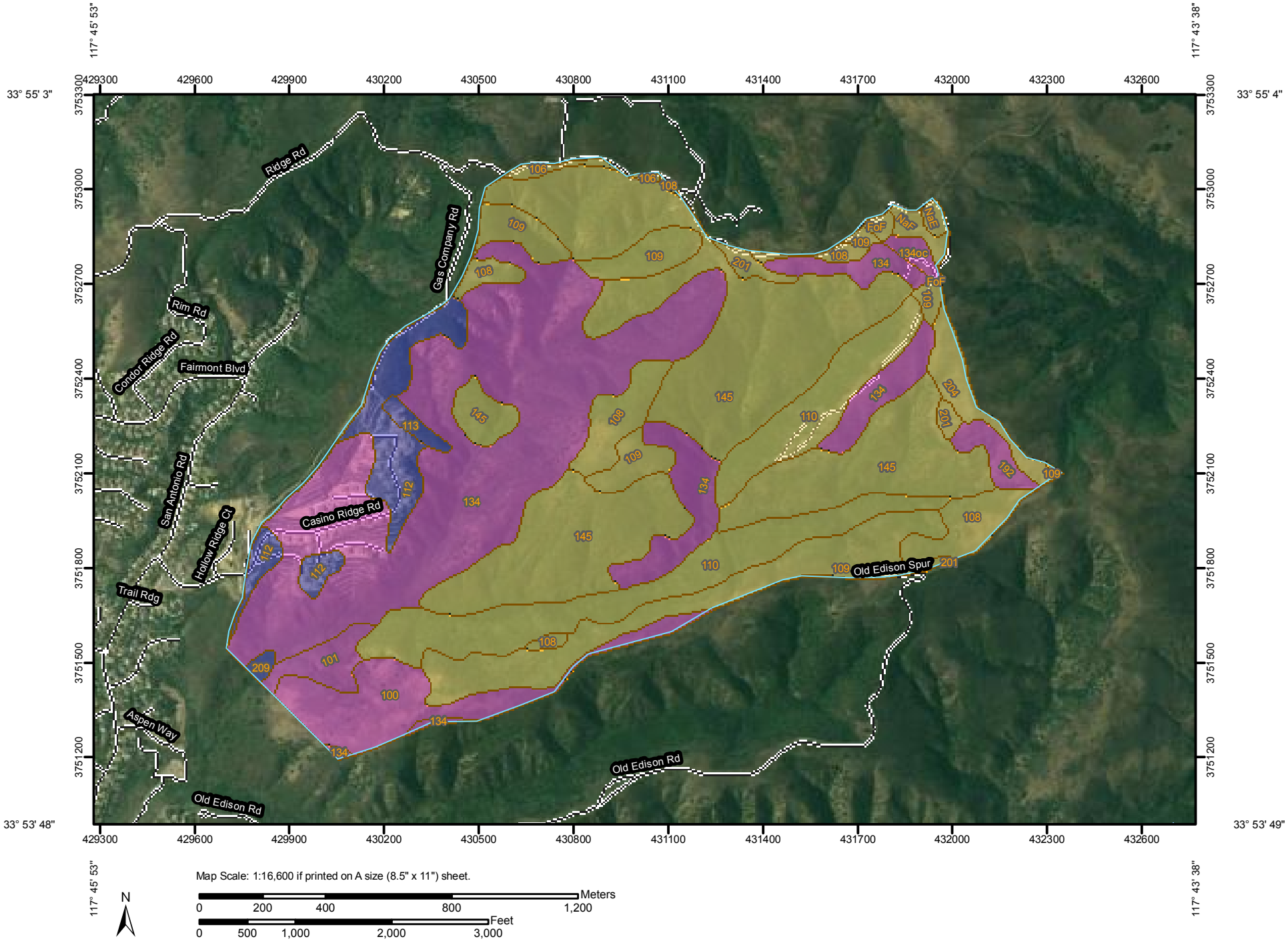
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California, and San Bernardino County Southwestern Part, California
(Watershed of Creek C)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:16,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	33.6	4.8%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	8.9	1.3%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.7	0.4%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	32.2	4.6%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	70.4	10.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	75.8	10.8%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	30.2	4.3%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	3.1	0.4%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	212.0	30.2%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	201.0	28.6%
192	ROCK OUTCROP-CIENEBA COMPLEX, 30 TO 75 PERCENT SLOPES	D	6.4	0.9%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	5.2	0.7%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.2	1.5%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	1.4	0.2%
Subtotals for Soil Survey Area			**693.1**	**98.6%**
Totals for Area of Interest			**702.7**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
134oc	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	3.0	0.4%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	1.5	0.2%
NaE	NACIMIENTO CLAY LOAM, 9 TO 30 PERCENT SLOPES	C	1.6	0.2%

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
NaF	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	3.4	0.5%
Subtotals for Soil Survey Area			**9.6**	**1.4%**
Totals for Area of Interest			**702.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

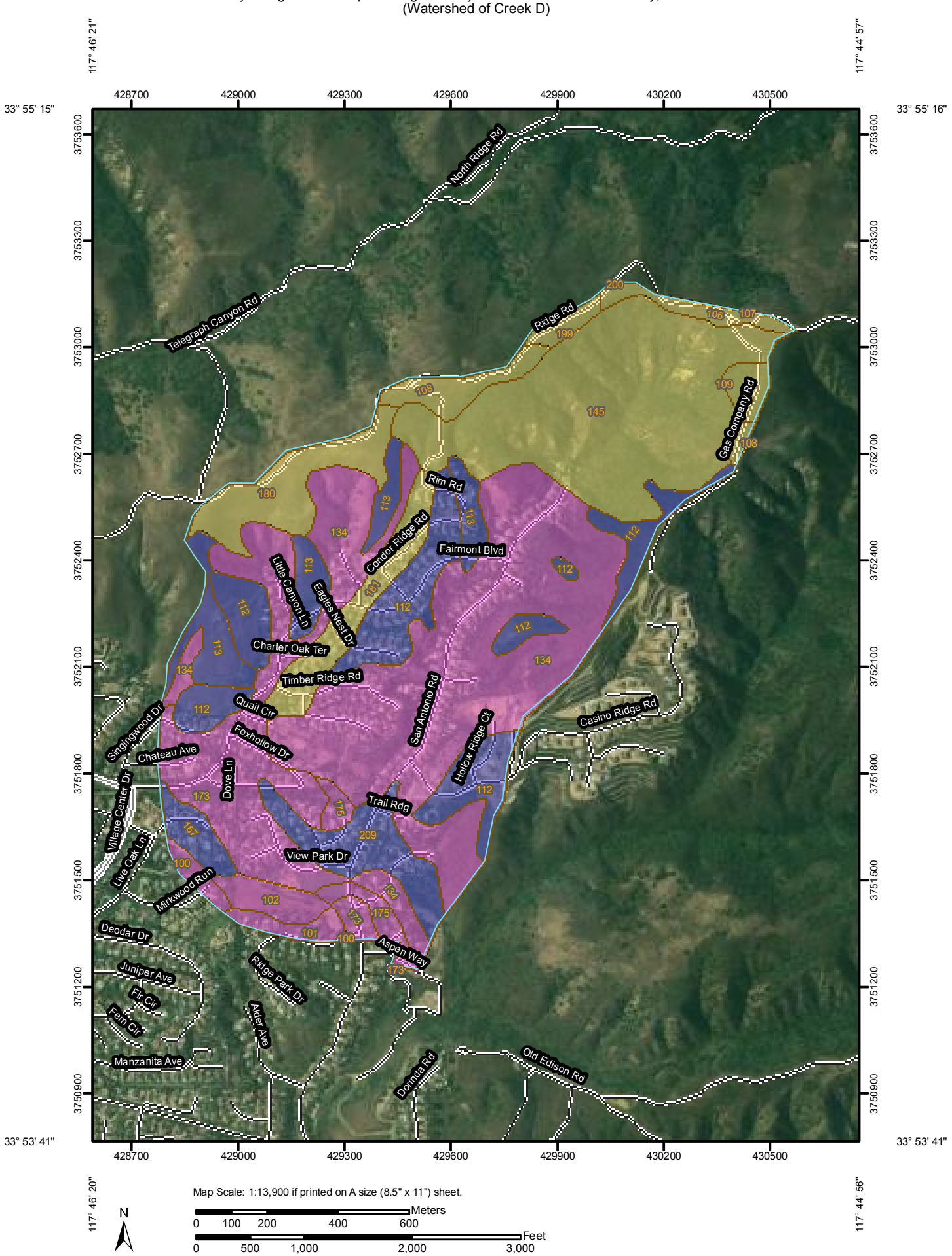
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed of Creek D)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	3.2	0.7%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	4.3	0.9%
102	ALO CLAY, 30 TO 50 PERCENT SLOPES	D	6.7	1.5%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	5.5	1.2%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	0.0	0.0%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	9.3	2.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	4.2	0.9%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	52.7	11.6%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	23.7	5.2%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	150.9	33.1%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	89.0	19.5%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	6.1	1.3%
173	MYFORD SANDY LOAM, 2 TO 9 PERCENT SLOPES	D	37.1	8.1%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	6.3	1.4%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	19.8	4.3%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	16.1	3.5%
199	SOPER LOAM, 15 TO 30 PERCENT SLOPES	C	3.1	0.7%
200	SOPER LOAM, 30 TO 50 PERCENT SLOPES	C	0.0	0.0%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	18.4	4.0%
Totals for Area of Interest			**456.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Lag Time Determination*							
n	0.045						
C_t	1.08						
m	0.38						
Δt	5	min					
Basin ID	**Area (mi2)**	**L (mi)**	**L_ca (mi)**	**S2 (ft/mi)**	**Tlag (hrs)**	**Tlag (min)**	**Δt/tlag**
CREEK A	1.053	2.778	1.373	322.6	0.599	36.0	13.90%
CREEK B	0.351	1.588	0.870	450.9	0.382	22.9	21.80%
CREEK C	1.120	2.008	1.297	413.6	0.495	29.7	16.85%
CREEK D	0.739	1.626	0.769	415.9	0.374	22.4	22.30%
*All variables as defined in Section E.3 of the Orange County Hydrology Manual							

24hr-100yr Design Storm Rainfall per Section B.4 of the Orange County Hydrology Manual:

			Corrections per Basin (dimensionless)		Corrected Precipitation Per Basin (in/hr)		Design Storm Incremental precipitation per basin[1]	
time (min)	I (in/hr)	P (in)	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D
5	6.187	0.516	96.10	92.15	5.95	5.70	0.0086	0.0086
10	4.159	0.693	96.10	92.15	4.00	3.83	0.0086	0.0086
15	3.297	0.824	96.10	92.15	3.17	3.04	0.0087	0.0087
20	2.796	0.932	96.10	92.15	2.69	2.58	0.0087	0.0087
25	2.460	1.025	96.10	92.15	2.36	2.27	0.0087	0.0087
30	2.216	1.108	96.10	92.15	2.13	2.04	0.0087	0.0087
35	2.029	1.184	96.10	92.15	1.95	1.87	0.0088	0.0088
40	1.879	1.253	96.10	92.15	1.81	1.73	0.0088	0.0088
45	1.757	1.318	96.10	92.15	1.69	1.62	0.0088	0.0088
50	1.654	1.378	96.10	92.15	1.59	1.52	0.0088	0.0088
55	1.566	1.435	96.10	92.15	1.50	1.44	0.0089	0.0089
60	1.490	1.490	96.10	92.15	1.43	1.37	0.0089	0.0089
65	1.423	1.542	96.25	92.44	1.37	1.32	0.0089	0.0089
70	1.364	1.591	96.40	92.74	1.31	1.26	0.0089	0.0090
75	1.311	1.639	96.54	93.03	1.27	1.22	0.0090	0.0090
80	1.263	1.685	96.69	93.33	1.22	1.18	0.0090	0.0090
85	1.220	1.729	96.84	93.62	1.18	1.14	0.0090	0.0091
90	1.181	1.771	96.98	93.91	1.15	1.11	0.0091	0.0091
95	1.145	1.813	97.13	94.21	1.11	1.08	0.0091	0.0091
100	1.112	1.853	97.28	94.50	1.08	1.05	0.0091	0.0091
105	1.081	1.892	97.42	94.80	1.05	1.02	0.0092	0.0092
110	1.053	1.930	97.57	95.09	1.03	1.00	0.0092	0.0092
115	1.026	1.967	97.72	95.38	1.00	0.98	0.0092	0.0092
120	1.001	2.003	97.86	95.68	0.98	0.96	0.0092	0.0093
125	0.978	2.038	98.01	95.97	0.96	0.94	0.0093	0.0093
130	0.957	2.073	98.15	96.27	0.94	0.92	0.0093	0.0093
135	0.936	2.106	98.30	96.56	0.92	0.90	0.0093	0.0094
140	0.917	2.139	98.45	96.85	0.90	0.89	0.0094	0.0094
145	0.899	2.172	98.59	97.15	0.89	0.87	0.0094	0.0094
150	0.881	2.203	98.74	97.44	0.87	0.86	0.0094	0.0094
155	0.865	2.234	98.89	97.73	0.86	0.85	0.0095	0.0095
160	0.849	2.265	99.03	98.03	0.84	0.83	0.0095	0.0095
165	0.834	2.295	99.18	98.32	0.83	0.82	0.0095	0.0096
170	0.820	2.324	99.33	98.62	0.81	0.81	0.0096	0.0096
175	0.807	2.353	99.47	98.91	0.80	0.80	0.0096	0.0096
180	0.794	2.382	99.62	99.20	0.79	0.79	0.0096	0.0097
185	0.781	2.410	99.63	99.22	0.78	0.78	0.0097	0.0097
190	0.770	2.437	99.63	99.23	0.77	0.76	0.0097	0.0097
195	0.758	2.464	99.64	99.24	0.76	0.75	0.0098	0.0098

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

200	0.747	2.491	99.64	99.25	0.74	0.74	0.0098	0.0098
205	0.737	2.518	99.65	99.26	0.73	0.73	0.0098	0.0098
210	0.727	2.544	99.65	99.28	0.72	0.72	0.0099	0.0099
215	0.717	2.569	99.66	99.29	0.71	0.71	0.0099	0.0099
220	0.708	2.595	99.67	99.30	0.71	0.70	0.0099	0.0099
225	0.699	2.620	99.67	99.31	0.70	0.69	0.0100	0.0100
230	0.690	2.644	99.68	99.32	0.69	0.69	0.0100	0.0100
235	0.681	2.669	99.68	99.33	0.68	0.68	0.0101	0.0101
240	0.673	2.693	99.69	99.35	0.67	0.67	0.0101	0.0101
245	0.665	2.717	99.69	99.36	0.66	0.66	0.0101	0.0101
250	0.658	2.740	99.70	99.37	0.66	0.65	0.0102	0.0102
255	0.650	2.763	99.71	99.38	0.65	0.65	0.0102	0.0102
260	0.643	2.786	99.71	99.39	0.64	0.64	0.0102	0.0103
265	0.636	2.809	99.72	99.41	0.63	0.63	0.0103	0.0103
270	0.629	2.832	99.72	99.42	0.63	0.63	0.0103	0.0103
275	0.623	2.854	99.73	99.43	0.62	0.62	0.0104	0.0104
280	0.616	2.876	99.73	99.44	0.61	0.61	0.0104	0.0104
285	0.610	2.898	99.74	99.45	0.61	0.61	0.0105	0.0105
290	0.604	2.919	99.75	99.47	0.60	0.60	0.0105	0.0105
295	0.598	2.941	99.75	99.48	0.60	0.60	0.0106	0.0106
300	0.592	2.962	99.76	99.49	0.59	0.59	0.0106	0.0106
305	0.587	2.983	99.76	99.50	0.59	0.58	0.0107	0.0107
310	0.581	3.004	99.77	99.51	0.58	0.58	0.0107	0.0107
315	0.576	3.024	99.77	99.52	0.57	0.57	0.0108	0.0108
320	0.571	3.045	99.78	99.54	0.57	0.57	0.0108	0.0108
325	0.566	3.065	99.78	99.55	0.56	0.56	0.0108	0.0109
330	0.561	3.085	99.79	99.56	0.56	0.56	0.0109	0.0109
335	0.556	3.105	99.80	99.57	0.55	0.55	0.0109	0.0110
340	0.551	3.125	99.80	99.58	0.55	0.55	0.0110	0.0110
345	0.547	3.144	99.81	99.60	0.55	0.54	0.0110	0.0111
350	0.542	3.164	99.81	99.61	0.54	0.54	0.0111	0.0111
355	0.538	3.183	99.82	99.62	0.54	0.54	0.0111	0.0112
360	0.534	3.202	99.82	99.63	0.53	0.53	0.0112	0.0112
365	0.529	3.221	99.82	99.63	0.53	0.53	0.0113	0.0113
370	0.525	3.240	99.83	99.63	0.52	0.52	0.0113	0.0113
375	0.521	3.258	99.83	99.63	0.52	0.52	0.0114	0.0114
380	0.517	3.277	99.83	99.64	0.52	0.52	0.0114	0.0114
385	0.514	3.295	99.83	99.64	0.51	0.51	0.0115	0.0115
390	0.510	3.313	99.83	99.64	0.51	0.51	0.0115	0.0115
395	0.506	3.331	99.83	99.64	0.51	0.50	0.0116	0.0116
400	0.502	3.349	99.83	99.64	0.50	0.50	0.0116	0.0116
405	0.499	3.367	99.83	99.64	0.50	0.50	0.0117	0.0117
410	0.495	3.385	99.83	99.64	0.49	0.49	0.0117	0.0118
415	0.492	3.402	99.83	99.64	0.49	0.49	0.0118	0.0118
420	0.489	3.420	99.83	99.64	0.49	0.49	0.0119	0.0119
425	0.485	3.437	99.83	99.64	0.48	0.48	0.0120	0.0120
430	0.482	3.454	99.83	99.64	0.48	0.48	0.0120	0.0120

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

435	0.479	3.471	99.83	99.64	0.48	0.48	0.0121	0.0121
440	0.476	3.488	99.83	99.65	0.47	0.47	0.0121	0.0121
445	0.473	3.505	99.83	99.65	0.47	0.47	0.0122	0.0122
450	0.470	3.522	99.83	99.65	0.47	0.47	0.0123	0.0123
455	0.467	3.539	99.83	99.65	0.47	0.46	0.0124	0.0124
460	0.464	3.555	99.83	99.65	0.46	0.46	0.0124	0.0124
465	0.461	3.572	99.83	99.65	0.46	0.46	0.0125	0.0125
470	0.458	3.588	99.83	99.65	0.46	0.46	0.0125	0.0125
475	0.455	3.604	99.83	99.65	0.45	0.45	0.0126	0.0126
480	0.453	3.620	99.83	99.65	0.45	0.45	0.0127	0.0127
485	0.450	3.636	99.83	99.65	0.45	0.45	0.0128	0.0128
490	0.447	3.652	99.83	99.65	0.45	0.45	0.0128	0.0128
495	0.445	3.668	99.84	99.65	0.44	0.44	0.0129	0.0129
500	0.442	3.684	99.84	99.66	0.44	0.44	0.0130	0.0130
505	0.440	3.700	99.84	99.66	0.44	0.44	0.0131	0.0131
510	0.437	3.715	99.84	99.66	0.44	0.44	0.0132	0.0132
515	0.435	3.731	99.84	99.66	0.43	0.43	0.0133	0.0133
520	0.432	3.746	99.84	99.66	0.43	0.43	0.0133	0.0133
525	0.430	3.762	99.84	99.66	0.43	0.43	0.0134	0.0134
530	0.428	3.777	99.84	99.66	0.43	0.43	0.0135	0.0135
535	0.425	3.792	99.84	99.66	0.42	0.42	0.0136	0.0136
540	0.423	3.807	99.84	99.66	0.42	0.42	0.0137	0.0137
545	0.421	3.822	99.84	99.66	0.42	0.42	0.0138	0.0138
550	0.419	3.837	99.84	99.66	0.42	0.42	0.0139	0.0139
555	0.416	3.852	99.84	99.66	0.42	0.42	0.0140	0.0140
560	0.414	3.867	99.84	99.67	0.41	0.41	0.0141	0.0141
565	0.412	3.881	99.84	99.67	0.41	0.41	0.0142	0.0142
570	0.410	3.896	99.84	99.67	0.41	0.41	0.0143	0.0143
575	0.408	3.911	99.84	99.67	0.41	0.41	0.0144	0.0144
580	0.406	3.925	99.84	99.67	0.41	0.40	0.0145	0.0145
585	0.404	3.939	99.84	99.67	0.40	0.40	0.0146	0.0146
590	0.402	3.954	99.84	99.67	0.40	0.40	0.0147	0.0147
595	0.400	3.968	99.84	99.67	0.40	0.40	0.0148	0.0148
600	0.398	3.982	99.84	99.67	0.40	0.40	0.0149	0.0149
605	0.396	3.996	99.84	99.67	0.40	0.40	0.0151	0.0151
610	0.394	4.010	99.84	99.67	0.39	0.39	0.0152	0.0152
615	0.393	4.024	99.84	99.67	0.39	0.39	0.0153	0.0153
620	0.391	4.038	99.85	99.68	0.39	0.39	0.0154	0.0154
625	0.389	4.052	99.85	99.68	0.39	0.39	0.0156	0.0156
630	0.387	4.066	99.85	99.68	0.39	0.39	0.0157	0.0157
635	0.385	4.080	99.85	99.68	0.38	0.38	0.0159	0.0158
640	0.384	4.094	99.85	99.68	0.38	0.38	0.0159	0.0159
645	0.382	4.107	99.85	99.68	0.38	0.38	0.0161	0.0161
650	0.380	4.121	99.85	99.68	0.38	0.38	0.0162	0.0162
655	0.379	4.134	99.85	99.68	0.38	0.38	0.0164	0.0164
660	0.377	4.148	99.85	99.68	0.38	0.38	0.0165	0.0165
665	0.375	4.161	99.85	99.68	0.37	0.37	0.0167	0.0167

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

670	0.374	4.174	99.85	99.68	0.37	0.37	0.0169	0.0168
675	0.372	4.188	99.85	99.68	0.37	0.37	0.0171	0.0171
680	0.371	4.201	99.85	99.69	0.37	0.37	0.0172	0.0172
685	0.369	4.214	99.85	99.69	0.37	0.37	0.0174	0.0174
690	0.368	4.227	99.85	99.69	0.37	0.37	0.0175	0.0175
695	0.366	4.240	99.85	99.69	0.37	0.36	0.0178	0.0178
700	0.365	4.253	99.85	99.69	0.36	0.36	0.0179	0.0179
705	0.363	4.266	99.85	99.69	0.36	0.36	0.0182	0.0182
710	0.362	4.279	99.85	99.69	0.36	0.36	0.0183	0.0183
715	0.360	4.292	99.85	99.69	0.36	0.36	0.0186	0.0186
720	0.359	4.305	99.85	99.69	0.36	0.36	0.0187	0.0187
725	0.357	4.317	99.85	99.69	0.36	0.36	0.0192	0.0194
730	0.356	4.330	99.85	99.69	0.36	0.35	0.0194	0.0195
735	0.355	4.343	99.85	99.69	0.35	0.35	0.0197	0.0198
740	0.353	4.355	99.85	99.70	0.35	0.35	0.0198	0.0200
745	0.352	4.368	99.86	99.70	0.35	0.35	0.0202	0.0203
750	0.350	4.380	99.86	99.70	0.35	0.35	0.0204	0.0205
755	0.349	4.393	99.86	99.70	0.35	0.35	0.0207	0.0209
760	0.348	4.405	99.86	99.70	0.35	0.35	0.0209	0.0210
765	0.346	4.418	99.86	99.70	0.35	0.35	0.0213	0.0214
770	0.345	4.430	99.86	99.70	0.34	0.34	0.0215	0.0216
775	0.344	4.442	99.86	99.70	0.34	0.34	0.0219	0.0220
780	0.343	4.454	99.86	99.70	0.34	0.34	0.0221	0.0223
785	0.341	4.467	99.86	99.70	0.34	0.34	0.0226	0.0227
790	0.340	4.479	99.86	99.70	0.34	0.34	0.0228	0.0230
795	0.339	4.491	99.86	99.70	0.34	0.34	0.0234	0.0235
800	0.338	4.503	99.86	99.71	0.34	0.34	0.0236	0.0237
805	0.337	4.515	99.86	99.71	0.34	0.34	0.0242	0.0243
810	0.335	4.527	99.86	99.71	0.33	0.33	0.0245	0.0245
815	0.334	4.539	99.86	99.71	0.33	0.33	0.0251	0.0252
820	0.333	4.550	99.86	99.71	0.33	0.33	0.0254	0.0255
825	0.332	4.562	99.86	99.71	0.33	0.33	0.0261	0.0261
830	0.331	4.574	99.86	99.71	0.33	0.33	0.0265	0.0265
835	0.330	4.586	99.86	99.71	0.33	0.33	0.0272	0.0273
840	0.328	4.598	99.86	99.71	0.33	0.33	0.0276	0.0277
845	0.327	4.609	99.86	99.71	0.33	0.33	0.0318	0.0352
850	0.326	4.621	99.86	99.71	0.33	0.33	0.0322	0.0355
855	0.325	4.632	99.86	99.71	0.32	0.32	0.0330	0.0361
860	0.324	4.644	99.86	99.72	0.32	0.32	0.0335	0.0365
865	0.323	4.655	99.86	99.72	0.32	0.32	0.0344	0.0372
870	0.322	4.667	99.87	99.72	0.32	0.32	0.0350	0.0377
875	0.321	4.678	99.87	99.72	0.32	0.32	0.0361	0.0386
880	0.320	4.690	99.87	99.72	0.32	0.32	0.0368	0.0391
885	0.319	4.701	99.87	99.72	0.32	0.32	0.0382	0.0403
890	0.318	4.712	99.87	99.72	0.32	0.32	0.0390	0.0409
895	0.317	4.724	99.87	99.72	0.32	0.32	0.0407	0.0424
900	0.316	4.735	99.87	99.72	0.32	0.31	0.0417	0.0433

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

905	0.315	4.746	99.87	99.72	0.31	0.31	0.0440	0.0452
910	0.314	4.757	99.87	99.72	0.31	0.31	0.0452	0.0463
915	0.313	4.769	99.87	99.72	0.31	0.31	0.0483	0.0489
920	0.312	4.780	99.87	99.73	0.31	0.31	0.0500	0.0505
925	0.311	4.791	99.87	99.73	0.31	0.31	0.0522	0.0501
930	0.310	4.802	99.87	99.73	0.31	0.31	0.0550	0.0528
935	0.309	4.813	99.87	99.73	0.31	0.31	0.0621	0.0596
940	0.308	4.824	99.87	99.73	0.31	0.31	0.0667	0.0640
945	0.307	4.835	99.87	99.73	0.31	0.31	0.0798	0.0765
950	0.306	4.846	99.87	99.73	0.31	0.31	0.0895	0.0859
955	0.305	4.856	99.87	99.73	0.30	0.30	0.1259	0.1207
960	0.304	4.867	99.87	99.73	0.30	0.30	0.1707	0.1637
965	0.303	4.878	99.87	99.73	0.30	0.30	0.4955	0.4751
970	0.302	4.889	99.87	99.73	0.30	0.30	0.1035	0.0993
975	0.302	4.900	99.87	99.73	0.30	0.30	0.0725	0.0695
980	0.301	4.910	99.87	99.74	0.30	0.30	0.0583	0.0559
985	0.300	4.921	99.87	99.74	0.30	0.30	0.0520	0.0523
990	0.299	4.932	99.87	99.74	0.30	0.30	0.0467	0.0475
995	0.298	4.942	99.88	99.74	0.30	0.30	0.0428	0.0442
1000	0.297	4.953	99.88	99.74	0.30	0.30	0.0398	0.0417
1005	0.296	4.963	99.88	99.74	0.30	0.30	0.0375	0.0397
1010	0.295	4.974	99.88	99.74	0.30	0.29	0.0355	0.0381
1015	0.295	4.984	99.88	99.74	0.29	0.29	0.0339	0.0368
1020	0.294	4.995	99.88	99.74	0.29	0.29	0.0326	0.0358
1025	0.293	5.005	99.88	99.74	0.29	0.29	0.0281	0.0281
1030	0.292	5.016	99.88	99.74	0.29	0.29	0.0268	0.0269
1035	0.291	5.026	99.88	99.74	0.29	0.29	0.0257	0.0258
1040	0.291	5.037	99.88	99.75	0.29	0.29	0.0248	0.0248
1045	0.290	5.047	99.88	99.75	0.29	0.29	0.0239	0.0240
1050	0.289	5.057	99.88	99.75	0.29	0.29	0.0231	0.0232
1055	0.288	5.067	99.88	99.75	0.29	0.29	0.0224	0.0225
1060	0.287	5.078	99.88	99.75	0.29	0.29	0.0217	0.0218
1065	0.287	5.088	99.88	99.75	0.29	0.29	0.0211	0.0212
1070	0.286	5.098	99.88	99.75	0.29	0.29	0.0205	0.0207
1075	0.285	5.108	99.88	99.75	0.28	0.28	0.0200	0.0202
1080	0.284	5.118	99.88	99.75	0.28	0.28	0.0195	0.0197
1085	0.284	5.128	99.88	99.75	0.28	0.28	0.0189	0.0189
1090	0.283	5.139	99.88	99.75	0.28	0.28	0.0185	0.0184
1095	0.282	5.149	99.88	99.75	0.28	0.28	0.0181	0.0180
1100	0.281	5.159	99.88	99.76	0.28	0.28	0.0177	0.0177
1105	0.281	5.169	99.88	99.76	0.28	0.28	0.0173	0.0173
1110	0.280	5.179	99.88	99.76	0.28	0.28	0.0170	0.0170
1115	0.279	5.189	99.88	99.76	0.28	0.28	0.0166	0.0166
1120	0.278	5.198	99.89	99.76	0.28	0.28	0.0163	0.0163
1125	0.278	5.208	99.89	99.76	0.28	0.28	0.0160	0.0160
1130	0.277	5.218	99.89	99.76	0.28	0.28	0.0158	0.0158
1135	0.276	5.228	99.89	99.76	0.28	0.28	0.0155	0.0155

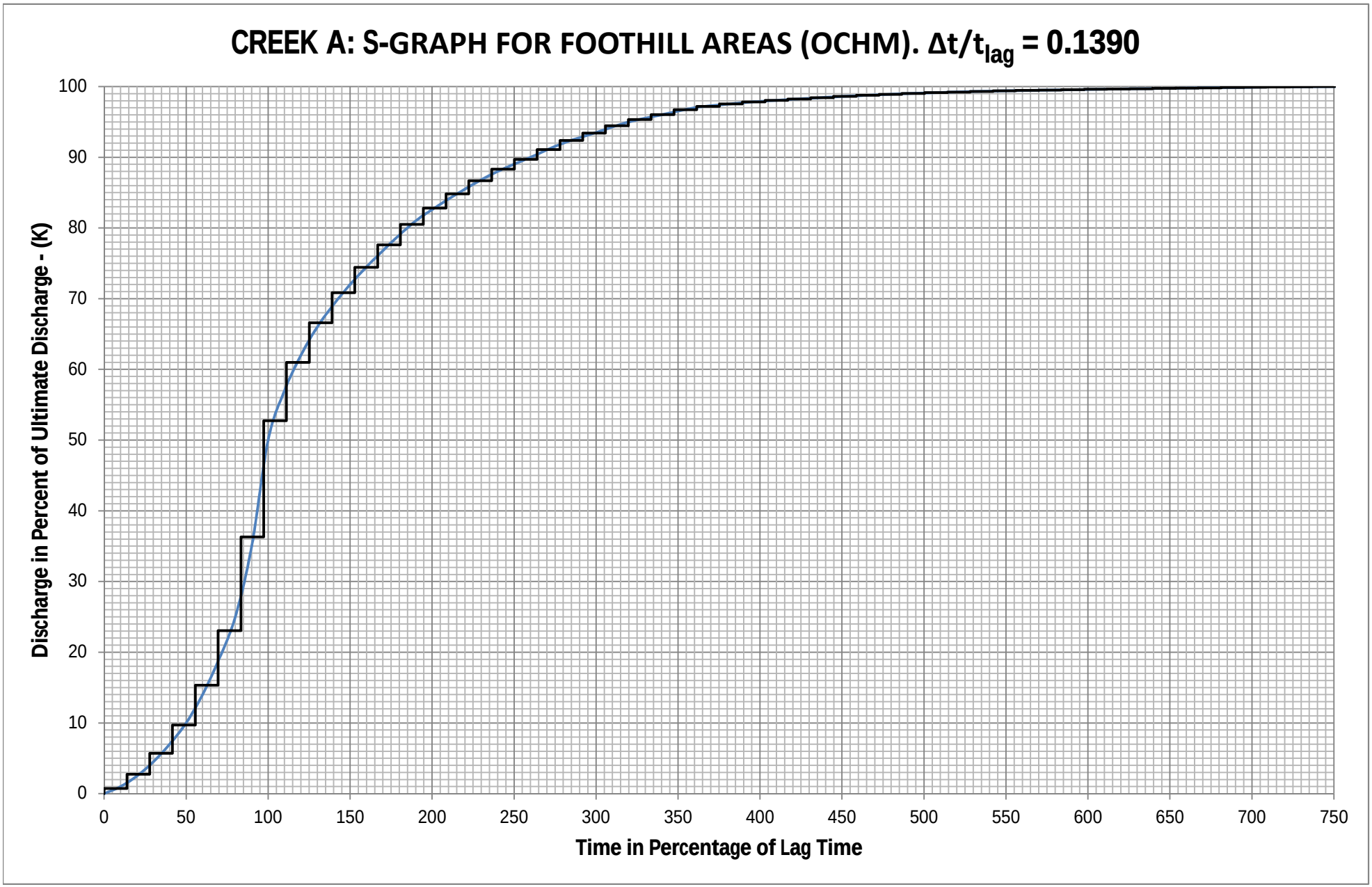
[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

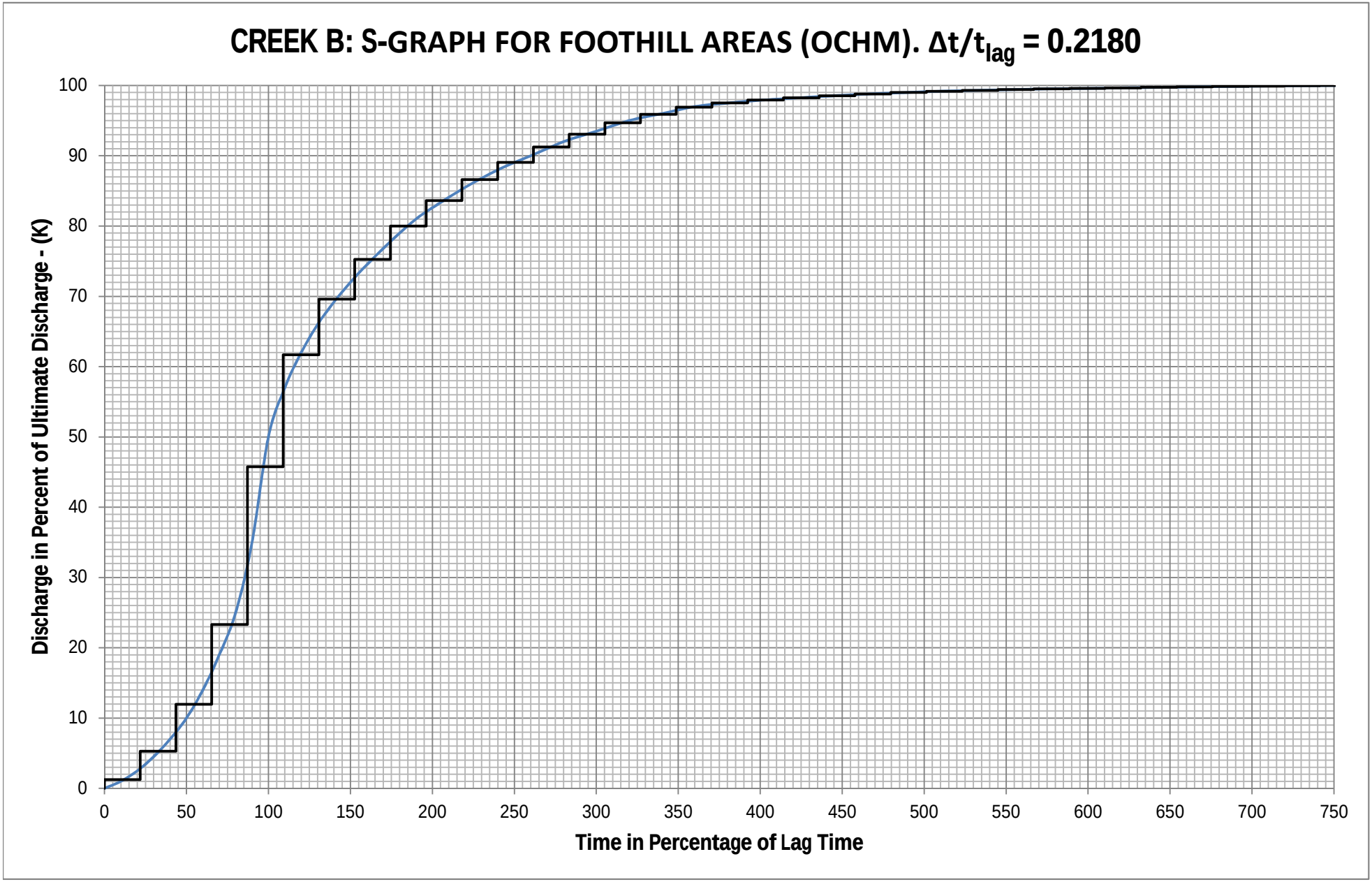
1140	0.276	5.238	99.89	99.76	0.28	0.28	0.0152	0.0152
1145	0.275	5.248	99.89	99.76	0.27	0.27	0.0150	0.0150
1150	0.274	5.257	99.89	99.76	0.27	0.27	0.0148	0.0148
1155	0.274	5.267	99.89	99.77	0.27	0.27	0.0145	0.0145
1160	0.273	5.277	99.89	99.77	0.27	0.27	0.0143	0.0143
1165	0.272	5.287	99.89	99.77	0.27	0.27	0.0141	0.0141
1170	0.272	5.296	99.89	99.77	0.27	0.27	0.0139	0.0139
1175	0.271	5.306	99.89	99.77	0.27	0.27	0.0137	0.0137
1180	0.270	5.316	99.89	99.77	0.27	0.27	0.0136	0.0136
1185	0.270	5.325	99.89	99.77	0.27	0.27	0.0134	0.0134
1190	0.269	5.335	99.89	99.77	0.27	0.27	0.0132	0.0132
1195	0.268	5.344	99.89	99.77	0.27	0.27	0.0131	0.0130
1200	0.268	5.354	99.89	99.77	0.27	0.27	0.0129	0.0129
1205	0.267	5.363	99.89	99.77	0.27	0.27	0.0127	0.0127
1210	0.266	5.373	99.89	99.77	0.27	0.27	0.0126	0.0126
1215	0.266	5.382	99.89	99.78	0.27	0.27	0.0124	0.0124
1220	0.265	5.392	99.89	99.78	0.26	0.26	0.0123	0.0123
1225	0.265	5.401	99.89	99.78	0.26	0.26	0.0122	0.0122
1230	0.264	5.411	99.89	99.78	0.26	0.26	0.0120	0.0120
1235	0.263	5.420	99.89	99.78	0.26	0.26	0.0119	0.0119
1240	0.263	5.429	99.89	99.78	0.26	0.26	0.0118	0.0118
1245	0.262	5.439	99.90	99.78	0.26	0.26	0.0117	0.0117
1250	0.262	5.448	99.90	99.78	0.26	0.26	0.0116	0.0116
1255	0.261	5.457	99.90	99.78	0.26	0.26	0.0114	0.0114
1260	0.260	5.467	99.90	99.78	0.26	0.26	0.0113	0.0113
1265	0.260	5.476	99.90	99.78	0.26	0.26	0.0112	0.0112
1270	0.259	5.485	99.90	99.78	0.26	0.26	0.0111	0.0111
1275	0.259	5.494	99.90	99.79	0.26	0.26	0.0110	0.0110
1280	0.258	5.503	99.90	99.79	0.26	0.26	0.0109	0.0109
1285	0.257	5.513	99.90	99.79	0.26	0.26	0.0108	0.0108
1290	0.257	5.522	99.90	99.79	0.26	0.26	0.0107	0.0107
1295	0.256	5.531	99.90	99.79	0.26	0.26	0.0106	0.0106
1300	0.256	5.540	99.90	99.79	0.26	0.26	0.0105	0.0105
1305	0.255	5.549	99.90	99.79	0.25	0.25	0.0104	0.0105
1310	0.255	5.558	99.90	99.79	0.25	0.25	0.0104	0.0104
1315	0.254	5.567	99.90	99.79	0.25	0.25	0.0103	0.0103
1320	0.253	5.576	99.90	99.79	0.25	0.25	0.0102	0.0102
1325	0.253	5.585	99.90	99.79	0.25	0.25	0.0101	0.0101
1330	0.252	5.594	99.90	99.79	0.25	0.25	0.0100	0.0100
1335	0.252	5.603	99.90	99.80	0.25	0.25	0.0100	0.0100
1340	0.251	5.612	99.90	99.80	0.25	0.25	0.0099	0.0099
1345	0.251	5.621	99.90	99.80	0.25	0.25	0.0098	0.0098
1350	0.250	5.630	99.90	99.80	0.25	0.25	0.0097	0.0097
1355	0.250	5.639	99.90	99.80	0.25	0.25	0.0097	0.0097
1360	0.249	5.648	99.90	99.80	0.25	0.25	0.0096	0.0096
1365	0.249	5.657	99.90	99.80	0.25	0.25	0.0095	0.0095
1370	0.248	5.665	99.91	99.80	0.25	0.25	0.0095	0.0095

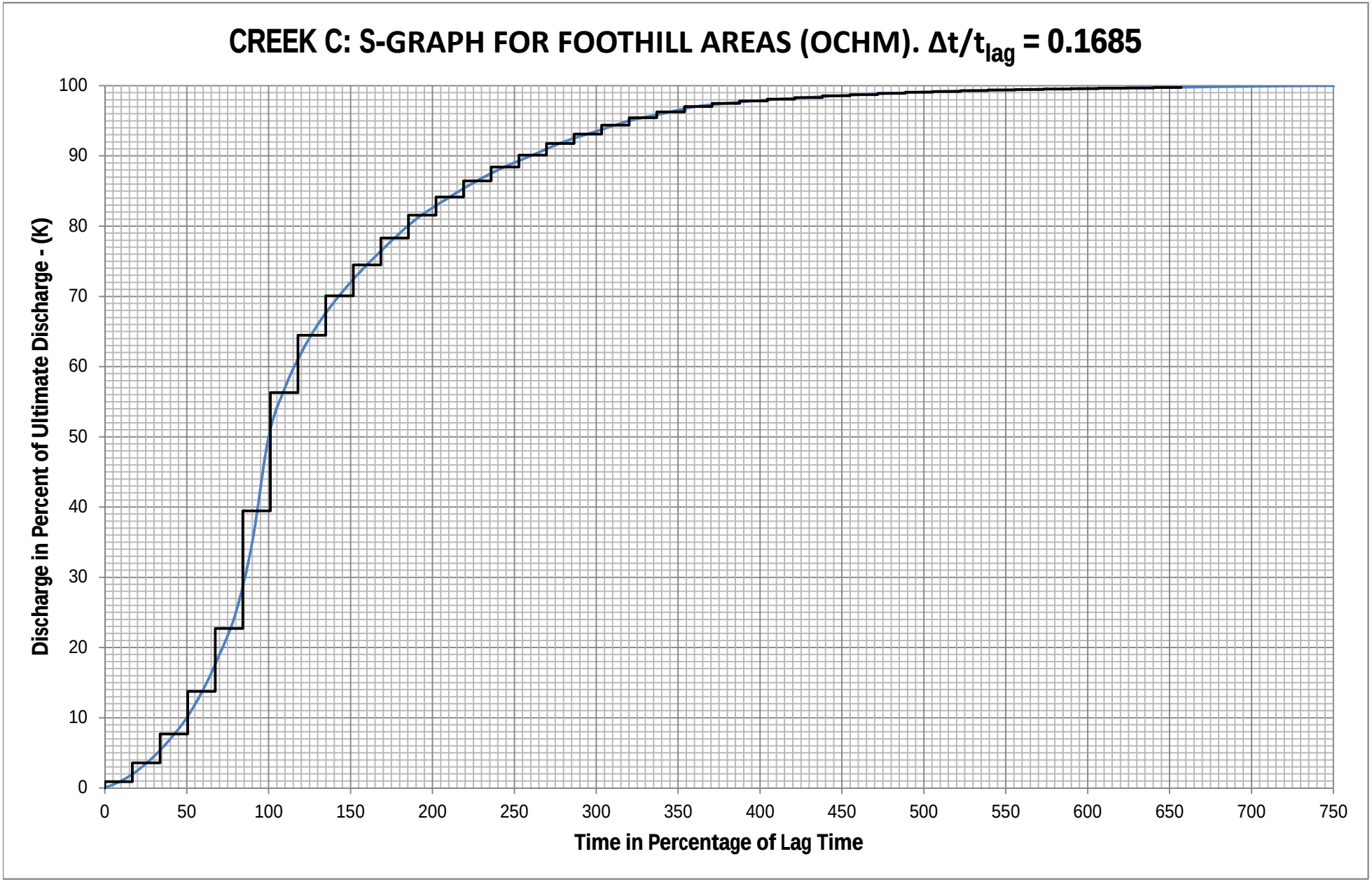
[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

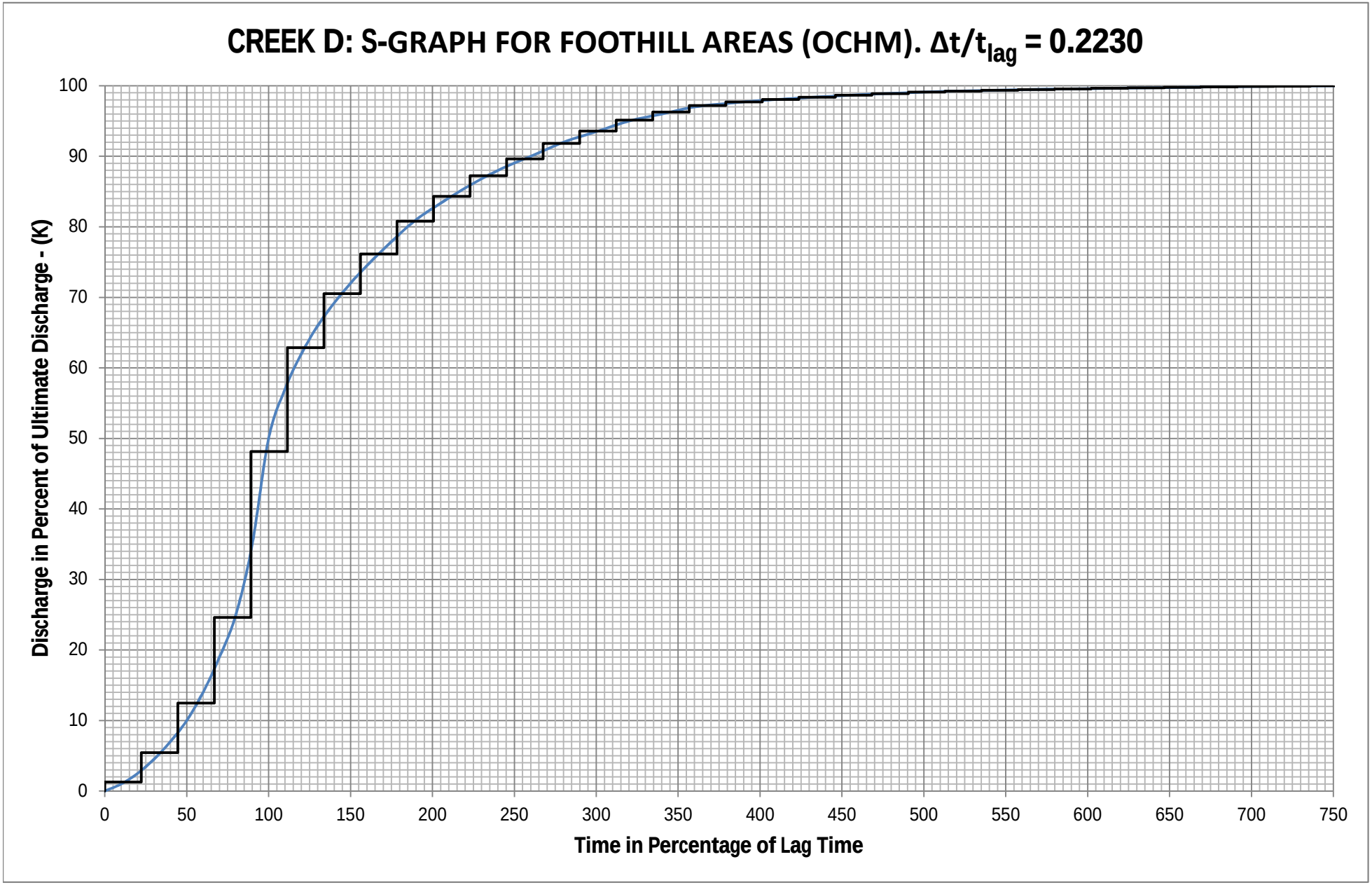
1375	0.248	5.674	99.91	99.80	0.25	0.25	0.0094	0.0094
1380	0.247	5.683	99.91	99.80	0.25	0.25	0.0093	0.0093
1385	0.247	5.692	99.91	99.80	0.25	0.25	0.0093	0.0093
1390	0.246	5.701	99.91	99.80	0.25	0.25	0.0092	0.0092
1395	0.246	5.709	99.91	99.81	0.25	0.25	0.0091	0.0092
1400	0.245	5.718	99.91	99.81	0.24	0.24	0.0091	0.0091
1405	0.245	5.727	99.91	99.81	0.24	0.24	0.0090	0.0090
1410	0.244	5.736	99.91	99.81	0.24	0.24	0.0090	0.0090
1415	0.244	5.744	99.91	99.81	0.24	0.24	0.0089	0.0089
1420	0.243	5.753	99.91	99.81	0.24	0.24	0.0089	0.0089
1425	0.243	5.762	99.91	99.81	0.24	0.24	0.0088	0.0088
1430	0.242	5.770	99.91	99.81	0.24	0.24	0.0087	0.0088
1435	0.242	5.779	99.91	99.81	0.24	0.24	0.0087	0.0087
1440	0.241	5.787	99.91	99.81	0.24	0.24	0.0086	0.0087

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.


CREEK A: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1390
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK B: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2180
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK C: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1685
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK D: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2230
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750

Pre-Project Condition

Creek A - Existing Conditions					P_100yr	5.7825	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.10	2.195	3.788	0.393		
Chaparral, Narrow Leaf	Fair	B	89	0.93	1.236	4.525	4.222		
Grass, Annual or Perennial	Fair	B	87	1.35	1.494	4.309	5.839		
Chaparral, Narrow Leaf	Good	C	92	8.63	0.870	4.856	41.882		
Chaparral, Narrow Leaf	Fair	C	95	12.94	0.526	5.196	67.220		
Grass, Annual or Perennial	Fair	C	93	34.42	0.753	4.968	171.005		
Chaparral, Narrow Leaf	Good	D	95	4.22	0.526	5.196	21.924		
Chaparral, Narrow Leaf	Fair	D	97	9.85	0.309	5.427	53.438		
Grass, Annual or Perennial	Fair	D	96	27.56	0.417	5.311	146.357		
			TOTAL	100.00		[1]**Q_global**	5.123	in	
						S	0.597		
						[2]CN	94.4		
Max Loss Rate	0.230	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0192	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual
[2]Overall Watershed CN

Creek B - Existing Conditions					P_100yr	5.7857	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	C	92	6.00	0.870	4.859	29.143		
Chaparral, Narrow Leaf	Fair	C	95	11.14	0.526	5.199	57.909		
Grass, Annual or Perennial	Fair	C	93	10.87	0.753	4.971	54.051		
Chaparral, Narrow Leaf	Good	D	95	7.57	0.526	5.199	39.340		
Chaparral, Narrow Leaf	Fair	D	97	17.66	0.309	5.430	95.883		
Grass, Annual or Perennial	Fair	D	96	46.77	0.417	5.314	248.519		
			TOTAL	100.00		[1]**Q_global**	5.248	in	
						S	0.479		
						[2]CN	95.4		
Max Loss Rate	0.214	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0178	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual
[2]Overall Watershed CN

Creek C - Existing Conditions					P_100yr	5.7820	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.25	2.195	3.787	0.929		
Chaparral, Narrow Leaf	Fair	B	89	0.74	1.236	4.524	3.330		
Grass, Annual or Perennial	Fair	B	87	1.42	1.494	4.309	6.130		
[3]Single Family Residential Impervious Area	Impervious	B	99.8	0.84	0.020	5.758	4.845		
[3]Single Family Residential Landscaping	Good	B	75	1.26	3.333	3.097	3.909		
Chaparral, Narrow Leaf	Good	C	92	13.76	0.870	4.855	66.815		
Chaparral, Narrow Leaf	Fair	C	95	20.64	0.526	5.195	107.237		
Grass, Annual or Perennial	Fair	C	93	33.00	0.753	4.968	163.925		
Chaparral, Narrow Leaf	Good	D	95	3.22	0.526	5.195	16.737		
Chaparral, Narrow Leaf	Fair	D	97	5.98	0.309	5.427	32.469		
Grass, Annual or Perennial	Fair	D	96	15.19	0.417	5.310	80.655		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	1.48	0.020	5.758	8.513		
[3]Single Family Residential Landscaping	Good	D	91	2.22	0.989	4.744	10.521		
			TOTAL	100.00		[1]**Q_global**	5.060	in	
						S	0.659		

						[2]CN	93.8		
Max Loss Rate	0.238	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0199	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek D - Existing Conditions					P_100yr	5.7839	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.11	2.195	3.789	0.416		
Chaparral, Narrow Leaf	Fair	B	89	0.44	1.236	4.526	1.990		
Grass, Annual or Perennial	Fair	B	87	6.65	1.494	4.311	28.651		
[3]Single Family Residential Impervious Area	Impervious	B	99.8	3.38	0.020	5.760	19.443		
[3]Single Family Residential Landscaping	Good	B	75	5.06	3.333	3.099	15.690		
Chaparral, Narrow Leaf	Good	C	92	4.91	0.870	4.857	23.847		
Chaparral, Narrow Leaf	Fair	C	95	7.36	0.526	5.197	38.273		
Grass, Annual or Perennial	Fair	C	93	25.66	0.753	4.969	127.496		
[3]Single Family Residential Impervious Area	Impervious	C	99.8	1.27	0.020	5.760	7.337		
[3]Single Family Residential Landscaping	Good	C	87	1.91	1.494	4.311	8.236		
Chaparral, Narrow Leaf	Good	D	95	0.73	0.526	5.197	3.817		
Chaparral, Narrow Leaf	Fair	D	97	2.94	0.309	5.429	15.948		
Grass, Annual or Perennial	Fair	D	96	15.67	0.417	5.312	83.253		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	9.56	0.020	5.760	55.079		
[3]Single Family Residential Landscaping	Good	D	91	14.34	0.989	4.746	68.073		
			TOTAL	100.00		**[1]Q_global**	4.975	in	
						S	0.746		
						[2]CN	93.1		
Max Loss Rate	0.236	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0197	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Existing Conditions Effective Rainfall

Storm: P24-100

Δt: 5 min

Color coded effecive rainfall corresponds to the convolution of effective rainfall with the unit hydrograph.

[1]Per Section C.6.6. of the Orange County Hydrology Manual,
Effective Rainfall = maximum of Rainfall*Yield Fraction or Rainfall - Max Loss, whichever is greater.
where Yield Fraction = Q_global/P_100yr

[2]Rainfall from the 24hr-100yr design storm used for Creek A

[3]Rainfall from the 24hr-100yr design storm used for Creek B, Creek C, and Creek D

	Creek A			**Creek B**			**Creek C**			**Creek D**	
Time (min)	[2]Rainfall (in)	[1]Effective Rainfall (in)		[3]Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)
5	0.0086	0.0076		0.0086	0.0078		0.0086	0.0075		0.0086	0.0074
10	0.0086	0.0076		0.0086	0.0078		0.0086	0.0076		0.0086	0.0074
15	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
20	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
25	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
30	0.0087	0.0077		0.0087	0.0079		0.0087	0.0077		0.0087	0.0075
35	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
40	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
45	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
50	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
55	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0076
60	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
65	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
70	0.0089	0.0079		0.0090	0.0081		0.0090	0.0078		0.0090	0.0077
75	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0077
80	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0078
85	0.009	0.0080		0.0091	0.0082		0.0091	0.0079		0.0091	0.0078
90	0.009	0.0080		0.0091	0.0082		0.0091	0.0079		0.0091	0.0078
95	0.009	0.0081		0.0091	0.0083		0.0091	0.0080		0.0091	0.0078
100	0.009	0.0081		0.0091	0.0083		0.0091	0.0080		0.0091	0.0079
105	0.009	0.0081		0.0092	0.0083		0.0092	0.0080		0.0092	0.0079
110	0.009	0.0081		0.0092	0.0083		0.0092	0.0080		0.0092	0.0079
115	0.009	0.0082		0.0092	0.0084		0.0092	0.0081		0.0092	0.0079
120	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
125	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
130	0.009	0.0082		0.0093	0.0085		0.0093	0.0082		0.0093	0.0080
135	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
140	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
145	0.009	0.0083		0.0094	0.0086		0.0094	0.0083		0.0094	0.0081
150	0.009	0.0084		0.0094	0.0086		0.0094	0.0083		0.0094	0.0081
155	0.009	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0082
160	0.010	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0082
165	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0082
170	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0082

175	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0083
180	0.010	0.0085		0.0097	0.0088		0.0097	0.0084		0.0097	0.0083
185	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0083
190	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0084
195	0.010	0.0086		0.0098	0.0089		0.0098	0.0085		0.0098	0.0084
200	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0084
205	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0085
210	0.010	0.0087		0.0099	0.0090		0.0099	0.0086		0.0099	0.0085
215	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0085
220	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0086
225	0.010	0.0088		0.0100	0.0091		0.0100	0.0087		0.0100	0.0086
230	0.010	0.0089		0.0100	0.0091		0.0100	0.0088		0.0100	0.0086
235	0.010	0.0089		0.0101	0.0091		0.0101	0.0088		0.0101	0.0087
240	0.010	0.0089		0.0101	0.0092		0.0101	0.0088		0.0101	0.0087
245	0.010	0.0090		0.0101	0.0092		0.0101	0.0089		0.0101	0.0087
250	0.010	0.0090		0.0102	0.0092		0.0102	0.0089		0.0102	0.0088
255	0.010	0.0091		0.0102	0.0093		0.0102	0.0090		0.0102	0.0088
260	0.010	0.0091		0.0103	0.0093		0.0103	0.0090		0.0103	0.0088
265	0.010	0.0091		0.0103	0.0094		0.0103	0.0090		0.0103	0.0089
270	0.010	0.0092		0.0103	0.0094		0.0103	0.0091		0.0103	0.0089
275	0.010	0.0092		0.0104	0.0094		0.0104	0.0091		0.0104	0.0089
280	0.010	0.0092		0.0104	0.0095		0.0104	0.0091		0.0104	0.0090
285	0.010	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
290	0.011	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
295	0.011	0.0094		0.0106	0.0096		0.0106	0.0093		0.0106	0.0091
300	0.011	0.0094		0.0106	0.0096		0.0106	0.0093		0.0106	0.0091
305	0.011	0.0094		0.0107	0.0097		0.0107	0.0093		0.0107	0.0092
310	0.011	0.0095		0.0107	0.0097		0.0107	0.0094		0.0107	0.0092
315	0.011	0.0095		0.0108	0.0098		0.0108	0.0094		0.0108	0.0093
320	0.011	0.0096		0.0108	0.0098		0.0108	0.0094		0.0108	0.0093
325	0.011	0.0096		0.0109	0.0098		0.0109	0.0095		0.0109	0.0093
330	0.011	0.0096		0.0109	0.0099		0.0109	0.0095		0.0109	0.0094
335	0.011	0.0097		0.0110	0.0099		0.0110	0.0096		0.0110	0.0094
340	0.011	0.0097		0.0110	0.0100		0.0110	0.0096		0.0110	0.0094
345	0.011	0.0098		0.0111	0.0100		0.0111	0.0097		0.0111	0.0095
350	0.011	0.0098		0.0111	0.0101		0.0111	0.0097		0.0111	0.0095
355	0.011	0.0099		0.0112	0.0101		0.0112	0.0098		0.0112	0.0096
360	0.011	0.0099		0.0112	0.0101		0.0112	0.0098		0.0112	0.0096
365	0.011	0.0100		0.0113	0.0102		0.0113	0.0099		0.0113	0.0097
370	0.011	0.0100		0.0113	0.0102		0.0113	0.0099		0.0113	0.0097
375	0.011	0.0101		0.0114	0.0103		0.0114	0.0099		0.0114	0.0098
380	0.011	0.0101		0.0114	0.0103		0.0114	0.0100		0.0114	0.0098
385	0.011	0.0102		0.0115	0.0104		0.0115	0.0100		0.0115	0.0099
390	0.012	0.0102		0.0115	0.0104		0.0115	0.0101		0.0115	0.0099
395	0.012	0.0103		0.0116	0.0105		0.0116	0.0101		0.0116	0.0100
400	0.012	0.0103		0.0116	0.0106		0.0116	0.0102		0.0116	0.0100
405	0.012	0.0104		0.0117	0.0106		0.0117	0.0102		0.0117	0.0101
410	0.012	0.0104		0.0118	0.0107		0.0118	0.0103		0.0118	0.0101

415	0.012	0.0105		0.0118	0.0107		0.0118	0.0104		0.0118	0.0102
420	0.012	0.0105		0.0119	0.0108		0.0119	0.0104		0.0119	0.0102
425	0.012	0.0106		0.0120	0.0108		0.0120	0.0105		0.0120	0.0103
430	0.012	0.0106		0.0120	0.0109		0.0120	0.0105		0.0120	0.0103
435	0.012	0.0107		0.0121	0.0110		0.0121	0.0106		0.0121	0.0104
440	0.012	0.0107		0.0121	0.0110		0.0121	0.0106		0.0121	0.0104
445	0.012	0.0108		0.0122	0.0111		0.0122	0.0107		0.0122	0.0105
450	0.012	0.0109		0.0123	0.0111		0.0123	0.0107		0.0123	0.0105
455	0.012	0.0109		0.0124	0.0112		0.0124	0.0108		0.0124	0.0106
460	0.012	0.0110		0.0124	0.0112		0.0124	0.0109		0.0124	0.0107
465	0.012	0.0111		0.0125	0.0113		0.0125	0.0109		0.0125	0.0107
470	0.013	0.0111		0.0125	0.0114		0.0125	0.0110		0.0125	0.0108
475	0.013	0.0112		0.0126	0.0115		0.0126	0.0111		0.0126	0.0109
480	0.013	0.0112		0.0127	0.0115		0.0127	0.0111		0.0127	0.0109
485	0.013	0.0113		0.0128	0.0116		0.0128	0.0112		0.0128	0.0110
490	0.013	0.0114		0.0128	0.0116		0.0128	0.0112		0.0128	0.0110
495	0.013	0.0115		0.0129	0.0117		0.0129	0.0113		0.0129	0.0111
500	0.013	0.0115		0.0130	0.0118		0.0130	0.0114		0.0130	0.0112
505	0.013	0.0116		0.0131	0.0119		0.0131	0.0115		0.0131	0.0113
510	0.013	0.0117		0.0132	0.0119		0.0132	0.0115		0.0132	0.0113
515	0.013	0.0118		0.0133	0.0120		0.0133	0.0116		0.0133	0.0114
520	0.013	0.0118		0.0133	0.0121		0.0133	0.0117		0.0133	0.0115
525	0.013	0.0119		0.0134	0.0122		0.0134	0.0118		0.0134	0.0116
530	0.014	0.0120		0.0135	0.0122		0.0135	0.0118		0.0135	0.0116
535	0.014	0.0121		0.0136	0.0124		0.0136	0.0119		0.0136	0.0117
540	0.014	0.0121		0.0137	0.0124		0.0137	0.0120		0.0137	0.0118
545	0.014	0.0122		0.0138	0.0125		0.0138	0.0121		0.0138	0.0119
550	0.014	0.0123		0.0139	0.0126		0.0139	0.0121		0.0139	0.0119
555	0.014	0.0124		0.0140	0.0127		0.0140	0.0122		0.0140	0.0120
560	0.014	0.0125		0.0141	0.0128		0.0141	0.0123		0.0141	0.0121
565	0.014	0.0126		0.0142	0.0129		0.0142	0.0124		0.0142	0.0122
570	0.014	0.0126		0.0143	0.0129		0.0143	0.0125		0.0143	0.0123
575	0.014	0.0128		0.0144	0.0131		0.0144	0.0126		0.0144	0.0124
580	0.014	0.0128		0.0145	0.0131		0.0145	0.0127		0.0145	0.0124
585	0.015	0.0130		0.0146	0.0133		0.0146	0.0128		0.0146	0.0126
590	0.015	0.0130		0.0147	0.0133		0.0147	0.0129		0.0147	0.0126
595	0.015	0.0132		0.0148	0.0135		0.0148	0.0130		0.0148	0.0128
600	0.015	0.0132		0.0149	0.0135		0.0149	0.0131		0.0149	0.0128
605	0.015	0.0134		0.0151	0.0137		0.0151	0.0132		0.0151	0.0130
610	0.015	0.0134		0.0152	0.0137		0.0152	0.0133		0.0152	0.0130
615	0.015	0.0136		0.0153	0.0139		0.0153	0.0134		0.0153	0.0132
620	0.015	0.0137		0.0154	0.0140		0.0154	0.0135		0.0154	0.0132
625	0.016	0.0138		0.0156	0.0141		0.0156	0.0136		0.0156	0.0134
630	0.016	0.0139		0.0157	0.0142		0.0157	0.0137		0.0157	0.0135
635	0.016	0.0140		0.0158	0.0144		0.0158	0.0139		0.0158	0.0136
640	0.016	0.0141		0.0159	0.0145		0.0159	0.0139		0.0159	0.0137
645	0.016	0.0143		0.0161	0.0146		0.0161	0.0141		0.0161	0.0139
650	0.016	0.0144		0.0162	0.0147		0.0162	0.0142		0.0162	0.0140

655	0.016	0.0146		0.0164	0.0149		0.0164	0.0144		0.0164	0.0141
660	0.017	0.0147		0.0165	0.0150		0.0165	0.0145		0.0165	0.0142
665	0.017	0.0148		0.0167	0.0152		0.0167	0.0146		0.0167	0.0144
670	0.017	0.0149		0.0168	0.0153		0.0168	0.0147		0.0168	0.0145
675	0.017	0.0151		0.0171	0.0155		0.0171	0.0149		0.0171	0.0147
680	0.017	0.0152		0.0172	0.0156		0.0172	0.0150		0.0172	0.0148
685	0.017	0.0154		0.0174	0.0158		0.0174	0.0152		0.0174	0.0150
690	0.018	0.0155		0.0175	0.0159		0.0175	0.0153		0.0175	0.0151
695	0.018	0.0158		0.0178	0.0161		0.0178	0.0156		0.0178	0.0153
700	0.018	0.0159		0.0179	0.0162		0.0179	0.0157		0.0179	0.0154
705	0.018	0.0161		0.0182	0.0165		0.0182	0.0159		0.0182	0.0156
710	0.018	0.0162		0.0183	0.0166		0.0183	0.0160		0.0183	0.0157
715	0.019	0.0165		0.0186	0.0169		0.0186	0.0163		0.0186	0.0160
720	0.019	0.0166		0.0187	0.0170		0.0187	0.0164		0.0187	0.0161
725	0.019	0.0170		0.0194	0.0176		0.0194	0.0170		0.0194	0.0167
730	0.019	0.0172		0.0195	0.0177		0.0195	0.0171		0.0195	0.0168
735	0.020	0.0174		0.0198	0.0180		0.0198	0.0174		0.0198	0.0171
740	0.020	0.0176		0.0200	0.0181		0.0200	0.0175		0.0200	0.0172
745	0.020	0.0179		0.0203	0.0184		0.0203	0.0178		0.0203	0.0175
750	0.020	0.0180		0.0205	0.0186		0.0205	0.0179		0.0205	0.0176
755	0.021	0.0184		0.0209	0.0189		0.0209	0.0182		0.0209	0.0179
760	0.021	0.0185		0.0210	0.0191		0.0210	0.0184		0.0210	0.0181
765	0.021	0.0189		0.0214	0.0194		0.0214	0.0187		0.0214	0.0184
770	0.022	0.0190		0.0216	0.0196		0.0216	0.0189		0.0216	0.0186
775	0.022	0.0194		0.0220	0.0200		0.0220	0.0193		0.0220	0.0190
780	0.022	0.0196		0.0223	0.0202		0.0223	0.0195		0.0223	0.0191
785	0.023	0.0200		0.0227	0.0206		0.0227	0.0199		0.0227	0.0195
790	0.023	0.0202		0.0230	0.0208		0.0230	0.0201		0.0230	0.0197
795	0.023	0.0207		0.0235	0.0213		0.0235	0.0205		0.0235	0.0202
800	0.024	0.0209		0.0237	0.0215		0.0237	0.0208		0.0237	0.0204
805	0.024	0.0214		0.0243	0.0220		0.0243	0.0212		0.0243	0.0209
810	0.024	0.0217		0.0245	0.0223		0.0245	0.0215		0.0245	0.0211
815	0.025	0.0222		0.0252	0.0228		0.0252	0.0220		0.0252	0.0216
820	0.0254	0.0225		0.0255	0.0231		0.0255	0.0223		0.0255	0.0219
825	0.0261	0.0231		0.0261	0.0237		0.0261	0.0229		0.0261	0.0225
830	0.0265	0.0234		0.0265	0.0240		0.0265	0.0232		0.0265	0.0228
835	0.0272	0.0241		0.0273	0.0247		0.0273	0.0239		0.0273	0.0235
840	0.0276	0.0245		0.0277	0.0251		0.0277	0.0242		0.0277	0.0238
845	0.0318	0.0282		0.0352	0.0319		0.0352	0.0308		0.0352	0.0302
850	0.0322	0.0285		0.0355	0.0322		0.0355	0.0310		0.0355	0.0305
855	0.0330	0.0293		0.0361	0.0328		0.0361	0.0316		0.0361	0.0311
860	0.0335	0.0297		0.0365	0.0331		0.0365	0.0319		0.0365	0.0314
865	0.0344	0.0305		0.0372	0.0338		0.0372	0.0326		0.0372	0.0320
870	0.0350	0.0310		0.0377	0.0342		0.0377	0.0330		0.0377	0.0324
875	0.0361	0.0320		0.0386	0.0350		0.0386	0.0338		0.0386	0.0332
880	0.0368	0.0326		0.0391	0.0355		0.0391	0.0342		0.0391	0.0337
885	0.0382	0.0338		0.0403	0.0366		0.0403	0.0353		0.0403	0.0347
890	0.0390	0.0345		0.0409	0.0371		0.0409	0.0358		0.0409	0.0352

895	0.0407	0.0361		0.0424	0.0385		0.0424	0.0371		0.0424	0.0365
900	0.0417	0.0369		0.0433	0.0392		0.0433	0.0379		0.0433	0.0372
905	0.0440	0.0389		0.0452	0.0410		0.0452	0.0396		0.0452	0.0389
910	0.0452	0.0401		0.0463	0.0420		0.0463	0.0405		0.0463	0.0398
915	0.0483	0.0428		0.0489	0.0444		0.0489	0.0428		0.0489	0.0421
920	0.0500	0.0443		0.0505	0.0458		0.0505	0.0442		0.0505	0.0434
925	0.0522	0.0463		0.0501	0.0454		0.0501	0.0438		0.0501	0.0431
930	0.0550	0.0487		0.0528	0.0479		0.0528	0.0462		0.0528	0.0454
935	0.0621	0.0550		0.0596	0.0540		0.0596	0.0521		0.0596	0.0512
940	0.0667	0.0591		0.0640	0.0580		0.0640	0.0560		0.0640	0.0550
945	0.0798	0.0707		0.0765	0.0694		0.0765	0.0669		0.0765	0.0658
950	0.0895	0.0793		0.0859	0.0779		0.0859	0.0751		0.0859	0.0739
955	0.1259	0.1116		0.1207	0.1095		0.1207	0.1057		0.1207	0.1039
960	0.1707	0.1515		0.1637	0.1485		0.1637	0.1438		0.1637	0.1440
965	0.4955	0.4763		0.4751	0.4573		0.4751	0.4553		0.4751	0.4555
970	0.1035	0.0917		0.0993	0.0901		0.0993	0.0869		0.0993	0.0854
975	0.0725	0.0642		0.0695	0.0630		0.0695	0.0608		0.0695	0.0598
980	0.0583	0.0516		0.0559	0.0507		0.0559	0.0489		0.0559	0.0481
985	0.0520	0.0461		0.0523	0.0474		0.0523	0.0457		0.0523	0.0450
990	0.0467	0.0413		0.0475	0.0431		0.0475	0.0416		0.0475	0.0409
995	0.0428	0.0379		0.0442	0.0401		0.0442	0.0387		0.0442	0.0380
1000	0.0398	0.0353		0.0417	0.0378		0.0417	0.0365		0.0417	0.0358
1005	0.0375	0.0332		0.0397	0.0360		0.0397	0.0347		0.0397	0.0341
1010	0.0355	0.0315		0.0381	0.0346		0.0381	0.0334		0.0381	0.0328
1015	0.0339	0.0301		0.0368	0.0334		0.0368	0.0322		0.0368	0.0317
1020	0.0326	0.0289		0.0358	0.0325		0.0358	0.0313		0.0358	0.0308
1025	0.0281	0.0249		0.0281	0.0255		0.0281	0.0246		0.0281	0.0242
1030	0.0268	0.0238		0.0269	0.0244		0.0269	0.0235		0.0269	0.0231
1035	0.0257	0.0228		0.0258	0.0234		0.0258	0.0226		0.0258	0.0222
1040	0.025	0.0219		0.0248	0.0225		0.0248	0.0217		0.0248	0.0214
1045	0.024	0.0212		0.0240	0.0218		0.0240	0.0210		0.0240	0.0206
1050	0.023	0.0205		0.0232	0.0210		0.0232	0.0203		0.0232	0.0200
1055	0.022	0.0198		0.0225	0.0204		0.0225	0.0197		0.0225	0.0193
1060	0.022	0.0192		0.0218	0.0198		0.0218	0.0191		0.0218	0.0188
1065	0.021	0.0187		0.0212	0.0193		0.0212	0.0186		0.0212	0.0183
1070	0.021	0.0182		0.0207	0.0188		0.0207	0.0181		0.0207	0.0178
1075	0.020	0.0177		0.0202	0.0183		0.0202	0.0176		0.0202	0.0173
1080	0.020	0.0173		0.0197	0.0178		0.0197	0.0172		0.0197	0.0169
1085	0.019	0.0167		0.0189	0.0171		0.0189	0.0165		0.0189	0.0162
1090	0.018	0.0164		0.0184	0.0167		0.0184	0.0161		0.0184	0.0159
1095	0.018	0.0160		0.0180	0.0164		0.0180	0.0158		0.0180	0.0155
1100	0.018	0.0157		0.0177	0.0160		0.0177	0.0154		0.0177	0.0152
1105	0.017	0.0153		0.0173	0.0157		0.0173	0.0151		0.0173	0.0149
1110	0.017	0.0150		0.0170	0.0154		0.0170	0.0148		0.0170	0.0146
1115	0.017	0.0147		0.0166	0.0151		0.0166	0.0146		0.0166	0.0143
1120	0.016	0.0145		0.0163	0.0148		0.0163	0.0143		0.0163	0.0140
1125	0.016	0.0142		0.0160	0.0145		0.0160	0.0140		0.0160	0.0138
1130	0.016	0.0140		0.0158	0.0143		0.0158	0.0138		0.0158	0.0136

1135	0.015	0.0137		0.0155	0.0140		0.0155	0.0136		0.0155	0.0133
1140	0.015	0.0135		0.0152	0.0138		0.0152	0.0133		0.0152	0.0131
1145	0.015	0.0133		0.0150	0.0136		0.0150	0.0131		0.0150	0.0129
1150	0.015	0.0131		0.0148	0.0134		0.0148	0.0129		0.0148	0.0127
1155	0.015	0.0129		0.0145	0.0132		0.0145	0.0127		0.0145	0.0125
1160	0.014	0.0127		0.0143	0.0130		0.0143	0.0125		0.0143	0.0123
1165	0.014	0.0125		0.0141	0.0128		0.0141	0.0124		0.0141	0.0121
1170	0.014	0.0123		0.0139	0.0126		0.0139	0.0122		0.0139	0.0120
1175	0.014	0.0122		0.0137	0.0125		0.0137	0.0120		0.0137	0.0118
1180	0.014	0.0120		0.0136	0.0123		0.0136	0.0119		0.0136	0.0117
1185	0.013	0.0119		0.0134	0.0121		0.0134	0.0117		0.0134	0.0115
1190	0.013	0.0117		0.0132	0.0120		0.0132	0.0116		0.0132	0.0114
1195	0.013	0.0116		0.0130	0.0118		0.0130	0.0114		0.0130	0.0112
1200	0.013	0.0114		0.0129	0.0117		0.0129	0.0113		0.0129	0.0111
1205	0.013	0.0113		0.0127	0.0116		0.0127	0.0111		0.0127	0.0110
1210	0.013	0.0112		0.0126	0.0114		0.0126	0.0110		0.0126	0.0108
1215	0.012	0.0110		0.0124	0.0113		0.0124	0.0109		0.0124	0.0107
1220	0.012	0.0109		0.0123	0.0112		0.0123	0.0108		0.0123	0.0106
1225	0.012	0.0108		0.0122	0.0110		0.0122	0.0107		0.0122	0.0105
1230	0.012	0.0107		0.0120	0.0109		0.0120	0.0105		0.0120	0.0104
1235	0.012	0.0106		0.0119	0.0108		0.0119	0.0104		0.0119	0.0102
1240	0.012	0.0104		0.0118	0.0107		0.0118	0.0103		0.0118	0.0101
1245	0.012	0.0103		0.0117	0.0106		0.0117	0.0102		0.0117	0.0100
1250	0.012	0.0102		0.0116	0.0105		0.0116	0.0101		0.0116	0.0099
1255	0.011	0.0101		0.0114	0.0104		0.0114	0.0100		0.0114	0.0098
1260	0.011	0.0100		0.0113	0.0103		0.0113	0.0099		0.0113	0.0097
1265	0.011	0.0099		0.0112	0.0102		0.0112	0.0098		0.0112	0.0097
1270	0.011	0.0098		0.0111	0.0101		0.0111	0.0097		0.0111	0.0096
1275	0.011	0.0098		0.0110	0.0100		0.0110	0.0096		0.0110	0.0095
1280	0.011	0.0097		0.0109	0.0099		0.0109	0.0096		0.0109	0.0094
1285	0.011	0.0096		0.0108	0.0098		0.0108	0.0095		0.0108	0.0093
1290	0.011	0.0095		0.0107	0.0097		0.0107	0.0094		0.0107	0.0092
1295	0.011	0.0094		0.0106	0.0096		0.0106	0.0093		0.0106	0.0091
1300	0.011	0.0093		0.0105	0.0096		0.0105	0.0092		0.0105	0.0091
1305	0.010	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
1310	0.010	0.0092		0.0104	0.0094		0.0104	0.0091		0.0104	0.0089
1315	0.010	0.0091		0.0103	0.0093		0.0103	0.0090		0.0103	0.0088
1320	0.010	0.0090		0.0102	0.0093		0.0102	0.0089		0.0102	0.0088
1325	0.010	0.0090		0.0101	0.0092		0.0101	0.0089		0.0101	0.0087
1330	0.010	0.0089		0.0100	0.0091		0.0100	0.0088		0.0100	0.0086
1335	0.010	0.0088		0.0100	0.0090		0.0100	0.0087		0.0100	0.0086
1340	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0085
1345	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0084
1350	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0084
1355	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0083
1360	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0083
1365	0.010	0.0084		0.0095	0.0087		0.0095	0.0083		0.0095	0.0082
1370	0.009	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0081

1375	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
1380	0.009	0.0083		0.0093	0.0085		0.0093	0.0082		0.0093	0.0080
1385	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
1390	0.009	0.0082		0.0092	0.0084		0.0092	0.0081		0.0092	0.0079
1395	0.009	0.0081		0.0092	0.0083		0.0092	0.0080		0.0092	0.0079
1400	0.009	0.0080		0.0091	0.0083		0.0091	0.0080		0.0091	0.0078
1405	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0078
1410	0.0090	0.0079		0.0090	0.0081		0.0090	0.0079		0.0090	0.0077
1415	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
1420	0.0089	0.0078		0.0089	0.0080		0.0089	0.0078		0.0089	0.0076
1425	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
1430	0.0087	0.0077		0.0088	0.0079		0.0088	0.0077		0.0088	0.0075
1435	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
1440	0.0086	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0074

CONFLUENCE OF CREEK B, CREEK C, AND CREEK D

A: 2.209 sq-miles

Δt : 5 min

P24-100

time (min) ↓	Creek B Hyd. (cfs)	Creek C Hyd. (cfs)	Creek D Hyd. (cfs)	TOTAL Hyd. (cfs)
0	0.00	0.00	0.00	0.00
5	0.27	0.60	0.55	1.41
10	1.12	2.35	2.31	5.78
15	2.54	5.04	5.30	12.88
20	4.96	9.02	10.46	24.44
25	9.74	14.92	20.48	45.13
30	13.14	25.91	26.78	65.83
35	14.86	36.99	30.10	81.95
40	16.11	42.45	32.57	91.13
45	17.16	46.23	34.65	98.04
50	17.98	49.25	36.24	103.47
55	18.67	51.90	37.60	108.17
60	19.25	54.20	38.72	112.17
65	19.77	56.04	39.77	115.58
70	20.22	57.71	40.63	118.56
75	20.62	59.19	41.42	121.23
80	20.94	60.48	42.03	123.46
85	21.23	61.75	42.55	125.53
90	21.42	62.82	42.90	127.14
95	21.58	63.85	43.19	128.61
100	21.71	64.73	43.46	129.90
105	21.84	65.49	43.72	131.05
110	21.96	66.19	43.95	132.11
115	22.08	66.69	44.19	132.96
120	22.19	67.13	44.39	133.70
125	22.29	67.52	44.59	134.40
130	22.38	67.89	44.78	135.05
135	22.48	68.27	44.96	135.71
140	22.57	68.61	45.14	136.32
145	22.66	68.95	45.32	136.93
150	22.75	69.29	45.50	137.53
155	22.84	69.59	45.69	138.12
160	22.93	69.89	45.86	138.69
165	23.02	70.19	46.04	139.26
170	23.11	70.48	46.22	139.81
175	23.20	70.77	46.38	140.35
180	23.28	71.05	46.54	140.87
185	23.36	71.33	46.71	141.40
190	23.44	71.62	46.87	141.92
195	23.52	71.90	47.04	142.46
200	23.61	72.19	47.20	143.00
205	23.69	72.48	47.37	143.54
210	23.78	72.77	47.54	144.09
215	23.87	73.05	47.72	144.64
220	23.95	73.34	47.89	145.18
225	24.04	73.62	48.07	145.73
230	24.13	73.90	48.24	146.27
235	24.22	74.17	48.43	146.82
240	24.31	74.44	48.61	147.36
245	24.40	74.72	48.79	147.92
250	24.49	75.00	48.98	148.47
255	24.59	75.29	49.17	149.04
260	24.68	75.58	49.35	149.61
265	24.78	75.87	49.55	150.19
270	24.88	76.16	49.74	150.77
275	24.97	76.46	49.94	151.37
280	25.07	76.75	50.13	151.96
285	25.17	77.06	50.34	152.57
290	25.27	77.36	50.54	153.17
295	25.38	77.67	50.75	153.80
300	25.48	77.99	50.95	154.42
305	25.59	78.30	51.16	155.05
310	25.69	78.62	51.37	155.69
315	25.80	78.95	51.59	156.34
320	25.91	79.28	51.80	156.98
325	26.02	79.61	52.03	157.65
330	26.13	79.94	52.24	158.31
335	26.24	80.28	52.47	159.00
340	26.35	80.63	52.70	159.68
345	26.47	80.97	52.93	160.38
350	26.58	81.33	53.16	161.07
355	26.70	81.68	53.40	161.79
360	26.82	82.04	53.64	162.50
365	26.94	82.41	53.88	163.24
370	27.07	82.78	54.12	163.97
375	27.19	83.15	54.38	164.72
380	27.31	83.53	54.62	165.47
385	27.44	83.92	54.88	166.24
390	27.57	84.30	55.13	167.01
395	27.70	84.70	55.40	167.80
400	27.83	85.10	55.66	168.59
405	27.97	85.50	55.94	169.41
410	28.10	85.91	56.20	170.22
415	28.24	86.33	56.48	171.05
420	28.38	86.75	56.76	171.89
425	28.53	87.17	57.05	172.74
430	28.67	87.61	57.33	173.60

435	28.81	88.04	57.63	174.48
440	28.96	88.49	57.91	175.36
445	29.11	88.94	58.22	176.27
450	29.26	89.40	58.52	177.18
455	29.42	89.86	58.83	178.11
460	29.57	90.33	59.14	179.04
465	29.73	90.81	59.47	180.01
470	29.89	91.29	59.78	180.97
475	30.06	91.79	60.12	181.96
480	30.22	92.29	60.44	182.95
485	30.39	92.79	60.79	183.97
490	30.56	93.31	61.12	184.99
495	30.74	93.83	61.48	186.05
500	30.91	94.36	61.83	187.10
505	31.10	94.90	62.19	188.19
510	31.27	95.45	62.55	189.27
515	31.46	96.01	62.93	190.40
520	31.65	96.57	63.30	191.52
525	31.84	97.15	63.69	192.68
530	32.04	97.73	64.08	193.84
535	32.24	98.33	64.48	195.05
540	32.44	98.93	64.88	196.25
545	32.65	99.55	65.30	197.49
550	32.85	100.18	65.71	198.73
555	33.07	100.81	66.14	200.02
560	33.28	101.46	66.57	201.31
565	33.51	102.12	67.02	202.65
570	33.73	102.80	67.46	203.98
575	33.96	103.48	67.93	205.37
580	34.19	104.18	68.39	206.76
585	34.43	104.89	68.87	208.20
590	34.67	105.61	69.35	209.64
595	34.92	106.35	69.86	211.13
600	35.17	107.11	70.35	212.63
605	35.43	107.88	70.88	214.19
610	35.69	108.66	71.39	215.74
615	35.96	109.46	71.94	217.37
620	36.23	110.28	72.48	218.99
625	36.52	111.11	73.05	220.68
630	36.80	111.96	73.61	222.37
635	37.09	112.83	74.21	224.14
640	37.39	113.72	74.80	225.91
645	37.70	114.63	75.42	227.75
650	38.01	115.56	76.04	229.60
655	38.33	116.51	76.69	231.53
660	38.65	117.48	77.33	233.47
665	38.99	118.48	78.02	235.49
670	39.33	119.49	78.69	237.52
675	39.69	120.54	79.41	239.64
680	40.05	121.61	80.12	241.78
685	40.42	122.70	80.88	244.01
690	40.80	123.83	81.63	246.25
695	41.19	124.98	82.42	248.60
700	41.59	126.16	83.21	250.96
705	42.00	127.38	84.05	253.43
710	42.42	128.63	84.88	255.93
715	42.86	129.91	85.77	258.54
720	43.30	131.23	86.65	261.18
725	43.78	132.61	87.62	264.00
730	44.28	134.08	88.62	266.98
735	44.83	135.62	89.74	270.20
740	45.43	137.26	90.94	273.63
745	46.15	139.02	92.40	277.57
750	46.81	141.04	93.70	281.54
755	47.43	143.09	94.95	285.47
760	48.03	144.97	96.15	289.15
765	48.66	146.82	97.42	292.90
770	49.29	148.70	98.66	296.65
775	49.95	150.62	99.99	300.56
780	50.60	152.60	101.30	304.50
785	51.30	154.62	102.71	308.64
790	52.00	156.71	104.11	312.83
795	52.75	158.87	105.62	317.25
800	53.51	161.11	107.13	321.74
805	54.31	163.43	108.76	326.50
810	55.13	165.85	110.38	331.35
815	56.00	168.36	112.14	336.51
820	56.89	170.98	113.92	341.78
825	57.85	173.71	115.85	347.41
830	58.82	176.57	117.80	353.19
835	59.88	179.56	119.93	359.37
840	60.95	182.69	122.08	365.73
845	62.33	186.45	124.87	373.66
850	64.18	191.27	128.62	384.07
855	66.56	196.95	133.51	397.02
860	69.69	203.76	140.03	413.48
865	74.71	212.15	150.43	437.30
870	78.58	224.56	157.76	460.90
875	81.17	237.00	162.86	481.03
880	83.41	245.03	167.31	495.75
885	85.61	251.89	171.72	509.23
890	87.69	258.41	175.84	521.93
895	89.84	264.93	180.16	534.93
900	91.99	271.55	184.46	548.01
905	94.35	278.26	189.22	561.83
910	96.79	285.39	194.11	576.29
915	99.54	293.00	199.67	592.21

920	102.46	301.28	205.51	609.25
925	105.72	310.20	212.09	628.00
930	109.00	319.64	218.66	647.31
935	112.81	330.19	226.35	669.35
940	116.88	342.20	234.45	693.53
945	121.31	356.09	243.38	720.77
950	128.13	371.72	257.55	757.41
955	139.24	394.00	280.44	813.68
960	155.50	431.21	313.88	900.59
965	189.63	507.22	386.30	1083.15
970	240.35	615.76	495.14	1351.25
975	295.03	719.35	614.02	1628.39
980	362.69	845.14	764.14	1971.96
985	**459**	998.55	**968**	**2426**
990	374.40	**1235**	742.53	2352.25
995	273.38	1178.49	548.48	2000.35
1000	231.04	850.78	465.68	1547.50
1005	207.04	710.83	416.71	1334.59
1010	184.56	632.83	369.68	1187.07
1015	168.35	582.70	337.67	1088.72
1020	154.76	536.50	309.59	1000.86
1025	144.37	490.20	289.62	924.19
1030	133.75	459.14	266.40	859.29
1035	124.28	429.48	247.23	800.99
1040	112.97	401.72	223.46	738.15
1045	101.96	380.52	199.97	682.45
1050	90.47	348.72	177.69	616.88
1055	83.27	323.59	164.34	571.20
1060	77.84	299.39	154.51	531.74
1065	73.87	277.44	146.40	497.70
1070	69.95	260.04	138.70	468.68
1075	66.77	237.67	132.42	436.87
1080	63.63	223.61	125.86	413.10
1085	60.84	211.74	120.83	393.42
1090	58.50	202.68	115.86	377.04
1095	56.19	195.01	111.66	362.86
1100	54.28	186.70	107.73	348.70
1105	52.31	179.67	103.99	335.97
1110	50.70	173.25	100.89	324.85
1115	49.30	165.96	98.10	313.35
1120	47.98	160.33	95.37	303.69
1125	46.65	155.55	92.53	294.73
1130	45.33	150.51	90.04	285.88
1135	44.12	146.43	87.19	277.74
1140	42.79	142.79	85.03	270.61
1145	41.81	139.12	83.20	264.14
1150	40.95	135.96	81.52	258.43
1155	40.14	133.07	79.94	253.15
1160	39.39	130.34	78.45	248.18
1165	38.67	127.69	77.04	243.41
1170	38.00	125.05	75.71	238.76
1175	37.36	122.22	74.44	234.02
1180	36.75	119.76	73.23	229.74
1185	36.16	117.29	72.08	225.54
1190	35.61	114.38	70.98	220.97
1195	35.08	112.26	69.93	217.27
1200	34.57	110.43	68.93	213.93
1205	34.09	108.71	67.97	210.77
1210	33.62	107.07	67.05	207.74
1215	33.17	105.51	66.16	204.84
1220	32.74	104.01	65.30	202.05
1225	32.33	102.57	64.48	199.37
1230	31.93	101.19	63.68	196.79
1235	31.54	99.86	62.91	194.31
1240	31.16	98.59	62.17	191.92
1245	30.80	97.36	61.45	189.61
1250	30.45	96.18	60.75	187.38
1255	30.11	95.05	60.08	185.24
1260	29.78	93.95	59.42	183.16
1265	29.46	92.90	58.79	181.15
1270	29.15	91.87	58.17	179.20
1275	28.85	90.88	57.58	177.31
1280	28.56	89.91	56.99	175.47
1285	28.28	88.98	56.43	173.68
1290	28.00	88.07	55.88	171.95
1295	27.73	87.19	55.35	170.27
1300	27.47	86.33	54.83	168.63
1305	27.22	85.49	54.32	167.03
1310	26.97	84.68	53.82	165.48
1315	26.73	83.89	53.34	163.96
1320	26.49	83.12	52.87	162.49
1325	26.26	82.38	52.41	161.05
1330	26.04	81.64	51.97	159.65
1335	25.82	80.93	51.53	158.28
1340	25.60	80.24	51.10	156.94
1345	25.39	79.56	50.69	155.64
1350	25.19	78.89	50.28	154.36
1355	24.99	78.25	49.88	153.12
1360	24.79	77.61	49.49	151.90
1365	24.60	77.00	49.11	150.70
1370	24.41	76.39	48.74	149.54
1375	24.23	75.80	48.37	148.40
1380	24.05	75.22	48.01	147.28
1385	23.87	74.65	47.66	146.19
1390	23.70	74.10	47.32	145.12
1395	23.53	73.56	46.98	144.07
1400	23.37	73.02	46.65	143.04

1405	23.20	72.50	46.33	142.03
1410	23.04	71.99	46.01	141.04
1415	22.89	71.49	45.70	140.07
1420	22.73	71.00	45.39	139.12
1425	22.58	70.51	45.09	138.19
1430	22.44	70.04	44.80	137.27
1435	22.29	69.58	44.51	136.38
1440	22.15	69.12	44.22	135.49
1445	21.74	68.08	43.40	133.22
1450	20.76	65.89	41.37	128.02
1455	19.21	62.79	38.14	120.14
1460	16.69	58.44	32.76	107.90
1465	11.83	52.22	22.60	86.64
1470	8.38	40.96	16.22	65.57
1475	6.66	29.72	12.88	49.26
1480	5.41	24.19	10.42	40.02
1485	4.37	20.39	8.39	33.15
1490	3.58	17.38	6.85	27.81
1495	2.93	14.77	5.56	23.26
1500	2.39	12.54	4.52	19.44
1505	1.91	10.79	3.57	16.27
1510	1.51	9.22	2.80	13.54
1515	1.16	7.87	2.13	11.16
1520	0.90	6.71	1.63	9.23
1525	0.68	5.59	1.23	7.49
1530	0.54	4.67	1.01	6.22
1535	0.45	3.82	0.84	5.11
1540	0.38	3.11	0.71	4.20
1545	0.32	2.54	0.58	3.44
1550	0.27	2.03	0.48	2.78
1555	0.22	1.73	0.39	2.34
1560	0.18	1.49	0.33	2.00
1565	0.15	1.31	0.27	1.73
1570	0.13	1.15	0.23	1.50
1575	0.11	0.99	0.19	1.28
1580	0.09	0.86	0.16	1.11
1585	0.07	0.75	0.13	0.95
1590	0.06	0.63	0.10	0.79
1595	0.04	0.55	0.07	0.67
1600	0.03	0.48	0.04	0.56
1605	0.02	0.42	0.02	0.46
1610	0.01	0.37	0.00	0.38
1615	0.00	0.32	0.00	0.32
1620	0.00	0.27	0.00	0.27
1625	0.00	0.24	0.00	0.24
1630	0.00	0.20	0.00	0.20
1635	0.00	0.17	0.00	0.17
1640	0.00	0.13	0.00	0.13
1645	0.00	0.10	0.00	0.10
1650	0.00	0.07	0.00	0.07
1655	0.00	0.04	0.00	0.04
1660	0.00	0.02	0.00	0.02
1665	0.00	0.00	0.00	0.00
1670	0.00	0.00	0.00	0.00
1675	0.00	0.00	0.00	0.00
1680	0.00	0.00	0.00	0.00
1685	0.00	0.00	0.00	0.00
1690	0.00	0.00	0.00	0.00
1695	0.00	0.00	0.00	0.00
1700	0.00	0.00	0.00	0.00
1705	0.00	0.00	0.00	0.00
1710	0.00	0.00	0.00	0.00

CREEK A

A: 1.053 sq-miles **Δt :** 5 min

K : 8153.0

P24-100

| 5 min-Eff. Rain → | | | 0.008 | 0.008 | 0.008

| | | |

1095	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.13	0.15	0.16	0.18	0.24	0.26	0.27	0.38	0.50	0.52	0.57	0.82	0.94	1.12	1.42	2.55	4.10	18.95	5.18	3.64	3.69	3.92	3.53	3.90	4.00	3.79	4.22	4.49	4.77	4.68	5.58	5.93	6.39	7.37	9.35	13.29	25.79	20.22	11.41	8.15	5.65	4.05	2.69	0.94	0.00	0.02	0.05	0.05	0.06	210.80
1100	0.07	0.09	0.10	0.10	0.11	0.11	0.11	0.14	0.16	0.16	0.18	0.26	0.27	0.29	0.40	0.52	0.55	0.64	0.89	1.12	1.26	2.00	3.46	12.90	3.65	3.63	2.93	3.29	3.51	3.23	3.63	3.76	3.60	4.03	4.32	4.11	4.48	5.35	5.71	6.17	7.12	9.06	12.90	25.06	19.68	11.12	7.95	5.47	3.95	2.63	0.92	0.00	0.02	0.05	0.06	197.37
1105	0.06	0.07	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.14	0.16	0.17	0.19	0.26	0.29	0.30	0.41	0.55	0.62	0.69	1.06	1.26	1.77	2.71	10.87	2.48	2.55	2.92	2.61	2.95	3.22	3.01	3.42	3.57	3.44	3.87	3.71	3.93	4.29	5.15	5.51	5.96	6.90	8.79	12.54	24.39	19.18	10.85	7.69	5.34	3.87	2.57	0.90	0.00	0.03	0.06	188.03
1110	0.06	0.06	0.07	0.09	0.10	0.11	0.11	0.12	0.12	0.15	0.17	0.18	0.20	0.28	0.30	0.31	0.44	0.62	0.67	0.82	1.19	1.77	2.40	8.53	2.09	1.74	2.05	2.61	2.34	2.71	3.00	2.83	3.24	3.41	3.30	3.33	3.55	3.77	4.13	4.97	5.32	5.78	6.69	8.54	12.20	23.77	18.71	10.50	7.52	5.22	3.78	2.52	0.89	0.00	0.03	0.03	179.52
1115	0.03	0.06	0.07	0.07	0.10	0.11	0.11	0.11	0.12	0.12	0.15	0.18	0.18	0.21	0.29	0.31	0.33	0.49	0.67	0.80	0.92	1.67	2.40	7.56	1.64	1.46	1.40	1.83	2.34	2.15	2.52	2.82	2.69	3.10	3.27	2.84	3.19	3.41	3.63	3.99	4.80	5.16	5.60	6.50	8.31	11.89	23.19	18.11	10.26	7.35	5.11	3.71	2.47	0.87	0.00	172.78
1120	0.00	0.03	0.07	0.07	0.07	0.10	0.11	0.11	0.12	0.12	0.12	0.13	0.16	0.18	0.19	0.22	0.30	0.33	0.37	0.53	0.80	0.90	1.30	2.27	7.56	1.46	1.15	1.18	1.25	1.65	2.14	2.00	2.37	2.68	2.57	2.97	2.82	2.72	3.06	3.28	3.50	3.85	4.65	5.00	5.45	6.33	8.10	11.60	22.44	17.70	10.03	7.19	5.01	3.63	2.42	0.85	167.19
1125	0.84	0.00	0.03	0.07	0.07	0.07	0.10	0.11	0.12	0.12	0.12	0.13	0.13	0.17	0.19	0.20	0.23	0.32	0.37	0.50	0.63	0.90	1.26	1.76	7.13	1.46	1.02	0.92	1.05	1.12	1.51	1.99	1.88	2.25	2.56	2.46	2.56	2.69	2.61	2.94	3.16	3.38	3.73	4.51	4.86	5.30	6.17	7.90	11.23	21.93	17.31	9.82	7.05	4.91	3.56	2.38	161.70
1130	2.33	0.82	0.00	0.03	0.07	0.07	0.07	0.10	0.12	0.12	0.12	0.13	0.13	0.14	0.18	0.20	0.21	0.24	0.36	0.40	0.48	0.71	1.26	1.72	5.55	1.37	1.02	0.82	0.83	0.94	1.03	1.40	1.88	1.78	2.15	2.46	2.12	2.45	2.58	2.51	2.84	3.06	3.28	3.50	3.85	4.67	5.33	6.02	7.65	10.97	21.45	16.94	9.62	6.91	4.82	3.50	155.83
1135	3.44	2.29	0.81	0.00	0.03	0.07	0.07	0.08	0.11	0.12	0.12	0.13	0.13	0.14	0.15	0.18	0.21	0.22	0.27	0.39	0.48	0.54	1.00	1.72	5.40	1.07	0.96	0.82	0.73	0.74	0.86	0.96	1.32	1.78	1.70	2.06	2.11	2.03	2.35	2.49	2.42	2.74	2.96	3.18	3.52	4.27	4.61	5.04	5.83	7.47	10.73	20.99	16.59	9.43	6.78	4.73	151.34
1140	4.64	3.38	2.26	0.80	0.00	0.03	0.07	0.07	0.08	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.19	0.22	0.25	0.29	0.47	0.54	0.76	1.35	5.40	1.04	0.75	0.77	0.73	0.66	0.68	0.80	0.90	1.25	1.70	1.64	1.78	2.02	1.95	2.26	2.40	2.34	2.66	2.87	3.09	3.42	4.16	4.50	4.88	5.69	7.31	10.50	20.56	16.26	9.25	6.65	147.18
1145	6.53	4.56	3.32	2.22	0.78	0.00	0.03	0.07	0.08	0.08	0.11	0.13	0.13	0.14	0.15	0.15	0.16	0.20	0.25	0.29	0.47	0.54	0.76	1.03	4.26	1.04	0.73	0.60	0.69	0.66	0.60	0.63	0.76	0.85	1.20	1.63	1.41	1.70	1.94	1.87	2.18	2.32	2.27	2.58	2.79	3.01	3.34	4.06	4.36	4.77	5.57	7.15	10.28	20.15	15.95	9.08	142.42
1150	8.91	6.42	4.49	3.26	2.18	0.77	0.00	0.03	0.08	0.08	0.08	0.12	0.13	0.14	0.15	0.15	0.16	0.17	0.23	0.27	0.32	0.39	0.73	1.03	3.24	0.82	0.73	0.58	0.54	0.62	0.60	0.56	0.59	0.72	0.81	1.15	1.40	1.35	1.63	1.87	1.81	2.11	2.25	2.20	2.51	2.72	2.93	3.26	3.93	4.26	4.66	5.45	7.01	10.08	19.77	15.66	138.07
1155	15.38	8.76	6.31	4.41	3.21	2.15	0.76	0.00	0.04	0.08	0.08	0.09	0.12	0.14	0.15	0.15	0.16	0.17	0.19	0.24	0.32	0.36	0.55	1.00	3.24	0.82	0.57	0.58	0.52	0.48	0.57	0.56	0.53	0.56	0.69	0.78	0.99	1.34	1.29	1.57	1.80	1.75	2.04	2.18	2.14	2.44	2.65	2.86	3.15	3.84	4.16	4.56	5.34	6.87	9.89	19.40	134.76
1160	19.06	15.11	8.61	6.21	4.34	3.16	2.12	0.75	0.00	0.04	0.08	0.08	0.09	0.13	0.15	0.15	0.16	0.17	0.19	0.20	0.29	0.36	0.51	0.74	3.14	0.62	0.44	0.46	0.52	0.47	0.44	0.53	0.53	0.50	0.54	0.66	0.67	0.95	1.29	1.24	1.51	1.74	1.69	1.98	2.12	2.08	2.38	2.58	2.77	3.08	3.75	4.07	4.47	5.23	6.74	9.71	131.58
1165	9.53	18.73	14.86	8.47	6.11	4.27	3.12	2.09	0.74	0.00	0.04	0.08	0.09	0.09	0.14	0.15	0.16	0.17	0.19	0.20	0.24	0.33	0.51	0.69	2.33	0.60	0.44	0.35	0.41	0.47	0.43	0.41	0.50	0.50	0.48	0.52	0.57	0.64	0.91	1.24	1.20	1.46	1.68	1.64	1.92	2.06	2.03	2.32	2.50	2.70	3.01	3.67	3.99	4.38	5.13	6.61	128.09
1170	6.50	9.37	18.41	14.61	8.34	6.01	4.21	3.07	2.06	0.73	0.00	0.04	0.09	0.09	0.10	0.14	0.16	0.17	0.19	0.20	0.24	0.27	0.46	0.69	2.16	0.45	0.42	0.35	0.31	0.37	0.43	0.40	0.39	0.47	0.48	0.46	0.45	0.54	0.62	0.87	1.20	1.16	1.42	1.63	1.59	1.87	2.01	1.98	2.24	2.44	2.64	2.95	3.60	3.91	4.30	5.04	125.28
1175	4.95	6.38	9.21	18.11	14.38	8.21	5.92	4.15	3.03	2.03	0.72	0.00	0.04	0.09	0.10	0.10	0.15	0.17	0.19	0.20	0.24	0.27	0.38	0.63	2.16	0.42	0.31	0.34	0.31	0.28	0.34	0.40	0.38	0.37	0.45	0.46	0.39	0.43	0.52	0.59	0.84	1.16	1.12	1.37	1.59	1.55	1.82	1.96	1.91	2.19	2.39	2.59	2.89	3.53	3.84	4.22	122.75
1180	4.14	4.86	6.28	9.06	17.82	14.16	8.08	5.84	4.09	2.98	2.00	0.71	0.00	0.04	0.10	0.10	0.11	0.15	0.19	0.20	0.24	0.27	0.38	0.52	1.97	0.42	0.29	0.25	0.30	0.28	0.26	0.32	0.38	0.36	0.35	0.43	0.39	0.38	0.41	0.50	0.57	0.81	1.12	1.09	1.34	1.55	1.51	1.78	1.90	1.87	2.14	2.34	2.53	2.83	3.46	3.77	120.21
1185	3.70	4.07	4.78	6.17	8.91	17.55	13.95	7.97	5.75	4.03	2.94	1.97	0.70	0.00	0.04	0.10	0.10	0.11	0.17	0.20	0.24	0.27	0.38	0.51	1.63	0.38	0.29	0.23	0.23	0.27	0.26	0.24	0.30	0.36	0.34	0.34	0.37	0.38	0.36	0.39	0.48	0.55	0.79	1.09	1.06	1.30	1.51	1.47	1.72	1.85	1.83	2.10	2.29	2.48	2.78	3.40	117.70
1190	3.34	3.63	4.00	4.70	6.07	8.78	17.28	13.74	7.85	5.67	3.98	2.90	1.95	0.69	0.00	0.05	0.10	0.11	0.13	0.19	0.24	0.27	0.38	0.51	1.62	0.31	0.27	0.23	0.21	0.20	0.25	0.24	0.23	0.28	0.34	0.33	0.29	0.36	0.36	0.35	0.38	0.47	0.54	0.77	1.06	1.03	1.27	1.47	1.43	1.68	1.81	1.79	2.06	2.25	2.44	2.72	115.58
1195	2.68	3.28	3.57	3.94	4.63	5.98	8.64	17.03	13.54	7.74	5.60	3.92	2.87	1.92	0.68	0.00	0.05	0.11	0.12	0.14	0.22	0.27	0.38	0.51	1.62	0.31	0.22	0.21	0.21	0.19	0.19	0.23	0.23	0.21	0.27	0.33	0.28	0.28	0.34	0.35	0.34	0.37	0.45	0.52	0.74	1.03	1.00	1.24	1.42	1.39	1.65	1.77	1.75	2.01	2.20	2.39	113.58
1200	2.35	2.63	3.22	3.51	3.87	4.55	5.89	8.52	16.79	13.36	7.64	5.52	3.87	2.83	1.90	0.67	0.00	0.05	0.12	0.13	0.17	0.25	0.38	0.51	1.62	0.31	0.22	0.18	0.19	0.19	0.17	0.17	0.22	0.21	0.20	0.26	0.28	0.27	0.27	0.33	0.34	0.32	0.36	0.44	0.51	0.72	1.00	0.98	1.20	1.39	1.36	1.61	1.74	1.72	1.98	2.16	111.66
1205	2.12	2.31	2.59	3.17	3.46	3.81	4.49	5.80	8.40	16.55	13.17	7.53	5.45	3.82	2.79	1.88	0.66	0.00	0.06	0.13	0.16	0.19	0.35	0.51	1.62	0.31	0.22	0.18	0.18	0.16	0.17	0.17	0.16	0.16	0.21	0.20	0.20	0.22	0.27	0.26	0.26	0.32	0.32	0.31	0.34	0.43	0.49	0.71	0.98	0.95	1.17	1.36	1.34	1.58	1.70	1.69	1.94	109.80
1210	1.90	2.09	2.27	2.54	3.12	3.41	3.76	4.42	5.72	8.28	16.33	13.00	7.44	5.38	3.78	2.76	1.85	0.66	0.00	0.06	0.16	0.18	0.26	0.48	1.62	0.31	0.22	0.18	0.16	0.14	0.16	0.16	0.15	0.15	0.20	0.20	0.17	0.21	0.26	0.25	0.25	0.31	0.31	0.31	0.33	0.42	0.48	0.69	0.95	0.93	1.14	1.33	1.31	1.55	1.67	1.65	107.98
1215	1.62	1.87	2.05	2.23	2.50	3.07	3.35	3.70	4.36	5.64	8.17	16.11	12.83	7.34	5.31	3.73	2.73	1.83	0.65	0.00	0.07	0.18	0.25	0.35	1.51	0.31	0.22	0.18	0.16	0.14	0.13	0.15	0.15	0.14	0.15	0.19	0.17	0.16	0.20	0.25	0.24	0.24	0.30	0.31	0.30	0.33	0.40	0.47	0.67	0.92	0.91	1.12	1.30	1.28	1.52	1.64	106.10
1220	1.61	1.60	1.84	2.02	2.20	2.46	3.00	3.30	3.65	4.30	5.56	8.06	15.90	12.67	7.25	5.25	3.69	2.74	1.81	0.64	0.00	0.08	0.25	0.34	1.51	0.31	0.22	0.18	0.16	0.14	0.13	0.12	0.14	0.14	0.16	0.16	0.16	0.20	0.24	0.23	0.23	0.29	0.30	0.29	0.32	0.39	0.45	0.65	0.90	0.89	1.10	1.28	1.26	1.49	1.64	1.63	104.08
1225	1.46	1.58	1.57	1.81	1.99	2.16	2.43	2.90	3.26	3.60	4.24	5.49	7.95	15.70	12.51	7.16	5.19	3.64	2.66	1.79	0.63	0.00	0.12	0.34	1.08	0.21	0.20	0.18	0.16	0.14	0.13	0.12	0.11	0.13	0.14	0.13	0.12	0.16	0.16	0.15	0.19	0.23	0.22	0.22	0.28	0.29	0.28	0.31	0.38	0.44	0.64	0.88	0.87	1.07	1.25	1.23	102.38
1230	1.21	1.44	1.56	1.54	1.78	1.96	2.13	2.39	2.94	3.21	3.55	4.18	5.42	7.85	15.50	12.36	7.08	5.13	3.60	2.63	1.77	0.63	0.00	0.16	1.08	0.21	0.15	0.16	0.16	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.13	0.11	0.12	0.15	0.15	0.14	0.18	0.22	0.22	0.22	0.27	0.28	0.27	0.30	0.37	0.43	0.62	0.87	0.85	1.05	1.23	100.71
1235	1.21	1.19	1.41	1.53	1.52	1.75	1.93	2.10	2.36	2.90	3.17	3.50	4.13	5.35	7.75	15.31	12.21	6.99	5.07	3.56	2.61	1.75	0.62	0.00	0.49	0.21	0.15	0.12	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.12	0.11	0.11	0.11	0.14	0.14	0.14	0.18	0.22	0.21	0.21	0.27	0.27	0.27	0.29	0.36	0.42	0.61	0.85	0.84	1.03	98.66
1240	1.02	1.19	1.17	1.39	1.51	1.50	1.73	1.90	2.07	2.32	2.86	3.13	3.45	4.07	5.28	7.66	15.13	12.07	6.91	5.01	3.52	2.58	1.73	0.62	0.00	0.10	0.15	0.12	0.11	0.13	0.13	0.12	0.11	0.11	0.10	0.10	0.10	0.11	0.10	0.11	0.14	0.14	0.13	0.17	0.21	0.21	0.21	0.26	0.27	0.26	0.29	0.36	0.42	0.60	0.83	0.82	96.80
1245	0.81	1.00	1.17	1.15	1.37	1.48	1.47	1.70	1.87	2.04	2.29	2.82	3.09	3.41	4.02	5.22	7.57	14.95	11.93	6.84	4.96	3.48	2.55	1.72	0.61	0.00	0.07	0.12	0.10	0.10	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.08	0.10	0.10	0.10	0.13	0.13	0.13	0.17	0.21	0.20	0.25	0.26	0.25	0.28	0.35	0.41	0.59	0.82	95.43
1250	0.80	0.79	0.98	1.15	1.13	1.35	1.46	1.45	1.68	1.84	2.01	2.26	2.78	3.05	3.37	3.97	5.16	7.48	14.78	11.80	6.76	4.90	3.45	2.52	1.70	0.60	0.00	0.05	0.10	0.09	0.09	0.11	0.11	0.11	0.10	0.10	0.08	0.08	0.09	0.10	0.10	0.13	0.13	0.13	0.16	0.20	0.20	0.19	0.24	0.25	0.25	0.27	0.34	0.40	0.58	94.15
1255	0.57	0.79	0.78	0.96	1.13	1.12	1.33	1.44	1.43	1.65	1.82	1.99	2.23	2.75	3.01	3.33	3.93	5.10	7.39	14.62	11.67	6.69	4.85	3.41	2.50	1.68	0.60	0.00	0.05	0.09	0.09	0.08	0.11	0.11	0.10	0.10	0.08	0.08	0.08	0.09	0.10	0.09	0.10	0.13	0.13	0.12	0.16	0.20	0.19	0.19	0.24	0.25	0.24	0.27	0.34	0.39	92.93
1260	0.39	0.56	0.78	0.77	0.95	1.11	1.10	1.31	1.42	1.41	1.63	1.80	1.96	2.20	2.71	2.97	3.29	3.88	5.04	7.31	14.46	11.54	6.62	4.80	3.38	2.47	1.66	0.59	0.00	0.04	0.09	0.08	0.08	0.10	0.10	0.10	0.08	0.08	0.08	0.07	0.09	0.09	0.09	0.09	0.12	0.12	0.12	0.15	0.19	0.19	0.19	0.23	0.24	0.24	0.26	0.33	91.76
1265	0.32	0.38	0.55	0.76	0.75	0.93	1.10	1.08	1.29	1.40	1.39	1.61	1.77	1.93	2.18	2.68	2.94	3.25	3.84	4.98	7.23	14.30	11.42	6.55	4.75	3.34	2.45	1.65	0.59	0.00	0.04	0.08	0.08	0.07	0.10	0.10	0.08	0.08	0.08	0.07	0.07	0.08	0.09	0.09	0.09	0.12	0.12	0.12	0.15	0.19	0.18	0.18	0.23	0.24	0.23	0.26	90.64
1270	0.25	0.32	0.37	0.54	0.75	0.74	0.92	1.08	1.07	1.27	1.38	1.37	1.59	1.75	1.91	2.15	2.65	2.90	3.21	3.79	4.93	7.15	14.15	11.30	6.48	4.70	3.31	2.43	1.63	0.58	0.00	0.04	0.08	0.07	0.07	0.09	0.08	0.08	0.08	0.07	0.07	0.08	0.09	0.08	0.09	0.12	0.12	0.11	0.15	0.18	0.18	0.18	0.23	0.23	0.23	89.56
1275	0.23	0.25	0.31	0.37	0.53	0.74	0.73	0.91	1.06	1.05	1.25	1.36	1.36	1.57	1.73	1.89	2.12	2.62	2.87	3.18	3.75	4.87	7.08	14.00	11.18	6.42	4.66	3.28	2.40	1.62	0.57	0.00	0.03	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.11	0.11	0.11	0.14	0.18	0.17	0.18	0.22	0.23	88.51
1280	0.23	0.22	0.25	0.31	0.36	0.52	0.73	0.72	0.89	1.05	1.04	1.24	1.34	1.34	1.55	1.71	1.86	2.10	2.59	2.84	3.14	3.71	4.82	7.00	13.86	11.07	6.35	4.61	3.25	2.38	1.60	0.57	0.00	0.03	0.07	0.07	0.06	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.11	0.11	0.11	0.14	0.17	0.17	0.17	0.22	87.51
1285	0.21	0.22	0.22	0.24	0.30	0.35	0.51	0.72	0.71	0.88	1.03	1.02	1.22	1.33	1.32	1.53	1.69	1.84	2.08	2.56	2.81	3.11	3.67	4.77	6.93	13.72	10.96	6.29	4.57	3.22	2.36	1.59	0.56	0.00	0.03	0.07	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.08	0.08	0.08	0.08	0.11	0.11	0.11	0.14	0.17	0.17	0.17	0.16	86.54
1290	0.17	0.21	0.22	0.21	0.24	0.30	0.35	0.51	0.71	0.70	0.87	1.02	1.01	1.21	1.31	1.31	1.51	1.67	1.82	2.05	2.53	2.78	3.07	3.63	4.72	6.86	13.59	10.86	6.23	4.52	3.19	2.34	1.57	0.56	0.00	0.03	0.06	0.05	0.05	0.07	0.07	0.07	0.07	0.06	0.06	0.07	0.08	0.08	0.08	0.11	0.11	0.10	0.13	0.17	0.16	0.16	85.59
1295	0.16	0.16	0.21	0.21	0.23	0.29	0.34	0.50	0.70	0.69	0.86	1.01	1.00	1.19	1.29	1.29	1.49	1.65	1.80	2.03	2.50	2.75	3.04	3.60	4.68	6.80	13.45	10.75	6.18	4.48	3.16	2.32	1.56	0.55	0.00	0.03	0.05	0.05	0.05	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.07	0.08	0.07	0.08	0.10	0.10	0.10	0.13	0.16	0.16	84.69
1300	0.16	0.16	0.16	0.20	0.21	0.23	0.29	0.34	0.49	0.69	0.68	0.85	1.00	0.99	1.18	1.28	1.48	1.48	1.63	1.78	2.01	2.48	2.72	3.01	3.56	4.63	6.73	13.33	10.65	6.12	4.44	3.13	2.30	1.55	0.55	0.00	0.02	0.05	0.05	0.05	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.10	0.10	0.10	0.13	0.13	83.81
1305	0.13	0.16	0.16	0.16	0.20	0.21	0.20	0.23	0.29	0.33	0.48	0.68	0.67	0.84	0.98	0.97	1.16	1.26	1.26	1.46	1.61	1.76	1.99	2.45	2.69	2.98	3.53	4.59	6.67	13.20	10.56	6.06	4.40	3.10	2.28	1.53	0.55	0.00	0.02	0.05	0.05	0.05	0.06	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.10	0.10	0.10	0.13	82.96
1310	0.10	0.12	0.16	0.15	0.15	0.20	0.20	0.20	0.22	0.28	0.33	0.48	0.67	0.66	0.83	0.97	0.96	1.15	1.25	1.25	1.45	1.59	1.74	1.97	2.43	2.66	2.95	3.49	4.54	6.60	13.08	10.46	6.01	4.36	3.08	2.26	1.52	0.54	0.00	0.02	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.10	0.10	82.13
1315	0.10	0.09	0.12	0.15	0.15	0.15	0.19	0.20	0.20	0.22	0.28	0.33	0.47	0.66	0.66	0.82	0.96	0.95	1.13	1.24	1.23	1.43	1.58	1.73	1.95	2.40	2.64	2.92	3.46	4.50	6.54	12.96	10.37	5.96	4.33	3.05	2.24	1.51	0.54	0.00	0.02	0.05	0.04	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.10	81.32
1320	0.09	0.09	0.09	0.12	0.15	0.15	0.15	0.19	0.20	0.20	0.22	0.27	0.32	0.47	0.65	0.65	0.81	0.95	0.94	1.12	1.22	1.22	1.41	1.56	1.71	1.93	2.38	2.61	2.90	3.43

| | | |

CREEK B

A: 0.351 sq-miles **Δt :** 5 min

K : 2714.2

P24-100

| 5 min-Eff. Rain → | | |

| | | |

| | | |

| | | |

CREEK C

A: 1.120 sq-miles **Δt :** 5 min

K : 8670.3

P24-100

| 5 min-Eff. Rain → | | |

| | | |

| | | |

| | | |

CREEK D

A: 0.739 sq-miles **Δt :** 5 min

K : 5716.2

P24-100

| 5 min-Eff. Rain → | | | 0.007 | 0.007 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008

| | | |

| | | |

| | | |

Post-Project Condition

Creek A - Developed Conditions					P_100yr	5.7825	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.10	2.195	3.788	0.393		
Chaparral, Narrow Leaf	Fair	B	89	0.93	1.236	4.525	4.222		
Grass, Annual or Perennial	Fair	B	87	1.35	1.494	4.309	5.839		
Chaparral, Narrow Leaf	Good	C	92	8.63	0.870	4.856	41.882		
Chaparral, Narrow Leaf	Fair	C	95	12.94	0.526	5.196	67.220		
Grass, Annual or Perennial	Fair	C	93	34.42	0.753	4.968	171.005		
Chaparral, Narrow Leaf	Good	D	95	4.22	0.526	5.196	21.924		
Chaparral, Narrow Leaf	Fair	D	97	9.85	0.309	5.427	53.438		
Grass, Annual or Perennial	Fair	D	96	22.66	0.417	5.311	120.340		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	1.96	0.020	5.759	11.284		
[3]Single Family Residential Landscaping	Fair	D	96	2.94	0.417	5.311	15.610		
			TOTAL	100.00		**[1]Q_global**	5.132	in	
						S	0.589		
						[2]CN	94.4		
Max Loss Rate	0.230	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0192	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek B - Developed Conditions					P_100yr	5.7857	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	C	92	5.85	0.870	4.859	28.445		
Chaparral, Narrow Leaf	Fair	C	95	10.87	0.526	5.199	56.522		
Grass, Annual or Perennial	Fair	C	93	10.61	0.753	4.971	52.756		
Chaparral, Narrow Leaf	Good	D	95	7.39	0.526	5.199	38.397		
Chaparral, Narrow Leaf	Fair	D	97	17.23	0.309	5.430	93.587		
Grass, Annual or Perennial	Fair	D	96	45.65	0.417	5.314	242.566		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	0.96	0.020	5.762	5.521		
[3]Single Family Residential Landscaping	Fair	D	96	1.44	0.417	5.314	7.637		
			TOTAL	100.00		**[1]Q_global**	5.254	in	
						S	0.473		
						[2]CN	95.5		
Max Loss Rate	0.214	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0178	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek C - Developed Conditions					P_100yr	5.7820	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.25	2.195	3.787	0.931		
Chaparral, Narrow Leaf	Fair	B	89	0.74	1.236	4.524	3.337		
Grass, Annual or Perennial	Fair	B	87	1.43	1.494	4.309	6.142		
[3]Single Family Residential Impervious Area	Impervious	B	99.8	0.84	0.020	5.758	4.854		
[3]Single Family Residential Landscaping	Good	B	75	1.26	3.333	3.097	3.917		

Chaparral, Narrow Leaf	Good	C	92	13.79	0.870	4.855	66.943		
Chaparral, Narrow Leaf	Fair	C	95	20.68	0.526	5.195	107.443		
Grass, Annual or Perennial	Fair	C	93	33.06	0.753	4.968	164.240		
Chaparral, Narrow Leaf	Good	D	95	3.23	0.526	5.195	16.769		
Chaparral, Narrow Leaf	Fair	D	97	5.99	0.309	5.427	32.532		
Grass, Annual or Perennial	Fair	D	96	14.56	0.417	5.310	77.325		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	1.67	0.020	5.758	9.599		
[3]Single Family Residential Landscaping	Good	D	91	2.22	0.989	4.744	10.541		
[3]Single Family Residential Landscaping	Fair	D	96	0.28	0.417	5.310	1.479		
			TOTAL	100.00		**[1]Q_global**	5.061	in	
						S	0.659		
						[2]CN	93.8		
Max Loss Rate	0.238	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0199	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek D - Developed Conditions					P_100yr	5.7839	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC III)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	82	0.11	2.195	3.789	0.417		
Chaparral, Narrow Leaf	Fair	B	89	0.44	1.236	4.526	1.994		
Grass, Annual or Perennial	Fair	B	87	6.66	1.494	4.311	28.709		
[3]Single Family Residential Impervious Area	Impervious	B	99.8	3.38	0.020	5.760	19.482		
[3]Single Family Residential Landscaping	Good	B	75	5.07	3.333	3.099	15.721		
Chaparral, Narrow Leaf	Good	C	92	4.92	0.870	4.857	23.895		
Chaparral, Narrow Leaf	Fair	C	95	7.38	0.526	5.197	38.350		
Grass, Annual or Perennial	Fair	C	93	25.71	0.753	4.969	127.753		
[3]Single Family Residential Impervious Area	Impervious	C	99.8	1.28	0.020	5.760	7.352		
[3]Single Family Residential Landscaping	Good	C	87	1.91	1.494	4.311	8.253		
Chaparral, Narrow Leaf	Good	D	95	0.74	0.526	5.197	3.825		
Chaparral, Narrow Leaf	Fair	D	97	2.94	0.309	5.429	15.981		
Grass, Annual or Perennial	Fair	D	96	15.03	0.417	5.312	79.823		
[3]Single Family Residential Impervious Area	Impervious	D	99.8	9.77	0.020	5.760	56.286		
[3]Single Family Residential Landscaping	Good	D	91	14.37	0.989	4.746	68.210		
[3]Single Family Residential Landscaping	Fair	D	96	0.29	0.417	5.312	1.517		
			TOTAL	100.00		**[1]Q_global**	4.976	in	
						S	0.746		
						[2]CN	93.1		
Max Loss Rate	0.236	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0197	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Developed Conditions Effective Rainfall

Storm: P24-100

Δt: 5 min

Color coded effecive rainfall corresponds to the convolution of effective rainfall with the unit hydrograph.

[1]Per Section C.6.6. of the Orange County Hydrology Manual,
Effective Rainfall = maximum of Rainfall*Yield Fraction or Rainfall - Max Loss, whichever is greater.
where Yield Fraction = Q_global/P_100yr

[2]Rainfall values from the 24hr-100yr design storm used for Creek A

[3]Rainfall values from the 24hr-100yr design storm used for Creek B, Creek C, and Creek D

	Creek A			**Creek B**			**Creek C**			**Creek D**	
Time (min)	[2]Rainfall (in)	[1]Effective Rainfall (in)		[3]Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)
5	0.0086	0.0076		0.0086	0.0078		0.0086	0.0075		0.0086	0.0074
10	0.0086	0.0077		0.0086	0.0078		0.0086	0.0076		0.0086	0.0074
15	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
20	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
25	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
30	0.0087	0.0077		0.0087	0.0079		0.0087	0.0077		0.0087	0.0075
35	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
40	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
45	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
50	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
55	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0076
60	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
65	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
70	0.0089	0.0079		0.0090	0.0081		0.0090	0.0078		0.0090	0.0077
75	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0077
80	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0078
85	0.009	0.0080		0.0091	0.0082		0.0091	0.0079		0.0091	0.0078
90	0.009	0.0080		0.0091	0.0082		0.0091	0.0079		0.0091	0.0078
95	0.009	0.0081		0.0091	0.0083		0.0091	0.0080		0.0091	0.0078
100	0.009	0.0081		0.0091	0.0083		0.0091	0.0080		0.0091	0.0079
105	0.009	0.0081		0.0092	0.0083		0.0092	0.0080		0.0092	0.0079
110	0.009	0.0081		0.0092	0.0084		0.0092	0.0080		0.0092	0.0079
115	0.009	0.0082		0.0092	0.0084		0.0092	0.0081		0.0092	0.0079
120	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
125	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
130	0.009	0.0083		0.0093	0.0085		0.0093	0.0082		0.0093	0.0080
135	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
140	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
145	0.009	0.0084		0.0094	0.0086		0.0094	0.0083		0.0094	0.0081
150	0.009	0.0084		0.0094	0.0086		0.0094	0.0083		0.0094	0.0081
155	0.009	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0082
160	0.010	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0082
165	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0082
170	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0082

175	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0083
180	0.010	0.0086		0.0097	0.0088		0.0097	0.0084		0.0097	0.0083
185	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0083
190	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0084
195	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0084
200	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0084
205	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0085
210	0.010	0.0087		0.0099	0.0090		0.0099	0.0086		0.0099	0.0085
215	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0085
220	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0086
225	0.010	0.0089		0.0100	0.0091		0.0100	0.0087		0.0100	0.0086
230	0.010	0.0089		0.0100	0.0091		0.0100	0.0088		0.0100	0.0086
235	0.010	0.0089		0.0101	0.0091		0.0101	0.0088		0.0101	0.0087
240	0.010	0.0090		0.0101	0.0092		0.0101	0.0088		0.0101	0.0087
245	0.010	0.0090		0.0101	0.0092		0.0101	0.0089		0.0101	0.0087
250	0.010	0.0090		0.0102	0.0092		0.0102	0.0089		0.0102	0.0088
255	0.010	0.0091		0.0102	0.0093		0.0102	0.0090		0.0102	0.0088
260	0.010	0.0091		0.0103	0.0093		0.0103	0.0090		0.0103	0.0088
265	0.010	0.0091		0.0103	0.0094		0.0103	0.0090		0.0103	0.0089
270	0.010	0.0092		0.0103	0.0094		0.0103	0.0091		0.0103	0.0089
275	0.010	0.0092		0.0104	0.0094		0.0104	0.0091		0.0104	0.0089
280	0.010	0.0092		0.0104	0.0095		0.0104	0.0091		0.0104	0.0090
285	0.010	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
290	0.011	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
295	0.011	0.0094		0.0106	0.0096		0.0106	0.0093		0.0106	0.0091
300	0.011	0.0094		0.0106	0.0096		0.0106	0.0093		0.0106	0.0091
305	0.011	0.0095		0.0107	0.0097		0.0107	0.0093		0.0107	0.0092
310	0.011	0.0095		0.0107	0.0097		0.0107	0.0094		0.0107	0.0092
315	0.011	0.0095		0.0108	0.0098		0.0108	0.0094		0.0108	0.0093
320	0.011	0.0096		0.0108	0.0098		0.0108	0.0094		0.0108	0.0093
325	0.011	0.0096		0.0109	0.0099		0.0109	0.0095		0.0109	0.0093
330	0.011	0.0097		0.0109	0.0099		0.0109	0.0095		0.0109	0.0094
335	0.011	0.0097		0.0110	0.0099		0.0110	0.0096		0.0110	0.0094
340	0.011	0.0097		0.0110	0.0100		0.0110	0.0096		0.0110	0.0094
345	0.011	0.0098		0.0111	0.0100		0.0111	0.0097		0.0111	0.0095
350	0.011	0.0098		0.0111	0.0101		0.0111	0.0097		0.0111	0.0095
355	0.011	0.0099		0.0112	0.0101		0.0112	0.0098		0.0112	0.0096
360	0.011	0.0099		0.0112	0.0102		0.0112	0.0098		0.0112	0.0096
365	0.011	0.0100		0.0113	0.0102		0.0113	0.0099		0.0113	0.0097
370	0.011	0.0100		0.0113	0.0103		0.0113	0.0099		0.0113	0.0097
375	0.011	0.0101		0.0114	0.0103		0.0114	0.0099		0.0114	0.0098
380	0.011	0.0101		0.0114	0.0104		0.0114	0.0100		0.0114	0.0098
385	0.011	0.0102		0.0115	0.0104		0.0115	0.0100		0.0115	0.0099
390	0.012	0.0102		0.0115	0.0105		0.0115	0.0101		0.0115	0.0099
395	0.012	0.0103		0.0116	0.0105		0.0116	0.0101		0.0116	0.0100
400	0.012	0.0103		0.0116	0.0106		0.0116	0.0102		0.0116	0.0100
405	0.012	0.0104		0.0117	0.0106		0.0117	0.0102		0.0117	0.0101
410	0.012	0.0104		0.0118	0.0107		0.0118	0.0103		0.0118	0.0101

415	0.012	0.0105		0.0118	0.0107		0.0118	0.0104		0.0118	0.0102
420	0.012	0.0105		0.0119	0.0108		0.0119	0.0104		0.0119	0.0102
425	0.012	0.0106		0.0120	0.0109		0.0120	0.0105		0.0120	0.0103
430	0.012	0.0106		0.0120	0.0109		0.0120	0.0105		0.0120	0.0103
435	0.012	0.0107		0.0121	0.0110		0.0121	0.0106		0.0121	0.0104
440	0.012	0.0108		0.0121	0.0110		0.0121	0.0106		0.0121	0.0104
445	0.012	0.0108		0.0122	0.0111		0.0122	0.0107		0.0122	0.0105
450	0.012	0.0109		0.0123	0.0111		0.0123	0.0107		0.0123	0.0105
455	0.012	0.0110		0.0124	0.0112		0.0124	0.0108		0.0124	0.0106
460	0.012	0.0110		0.0124	0.0113		0.0124	0.0109		0.0124	0.0107
465	0.012	0.0111		0.0125	0.0113		0.0125	0.0109		0.0125	0.0107
470	0.013	0.0111		0.0125	0.0114		0.0125	0.0110		0.0125	0.0108
475	0.013	0.0112		0.0126	0.0115		0.0126	0.0111		0.0126	0.0109
480	0.013	0.0113		0.0127	0.0115		0.0127	0.0111		0.0127	0.0109
485	0.013	0.0113		0.0128	0.0116		0.0128	0.0112		0.0128	0.0110
490	0.013	0.0114		0.0128	0.0117		0.0128	0.0112		0.0128	0.0110
495	0.013	0.0115		0.0129	0.0118		0.0129	0.0113		0.0129	0.0111
500	0.013	0.0115		0.0130	0.0118		0.0130	0.0114		0.0130	0.0112
505	0.013	0.0116		0.0131	0.0119		0.0131	0.0115		0.0131	0.0113
510	0.013	0.0117		0.0132	0.0119		0.0132	0.0115		0.0132	0.0113
515	0.013	0.0118		0.0133	0.0120		0.0133	0.0116		0.0133	0.0114
520	0.013	0.0118		0.0133	0.0121		0.0133	0.0117		0.0133	0.0115
525	0.013	0.0119		0.0134	0.0122		0.0134	0.0118		0.0134	0.0116
530	0.014	0.0120		0.0135	0.0123		0.0135	0.0118		0.0135	0.0116
535	0.014	0.0121		0.0136	0.0124		0.0136	0.0119		0.0136	0.0117
540	0.014	0.0121		0.0137	0.0124		0.0137	0.0120		0.0137	0.0118
545	0.014	0.0123		0.0138	0.0125		0.0138	0.0121		0.0138	0.0119
550	0.014	0.0123		0.0139	0.0126		0.0139	0.0121		0.0139	0.0119
555	0.014	0.0124		0.0140	0.0127		0.0140	0.0122		0.0140	0.0120
560	0.014	0.0125		0.0141	0.0128		0.0141	0.0123		0.0141	0.0121
565	0.014	0.0126		0.0142	0.0129		0.0142	0.0124		0.0142	0.0122
570	0.014	0.0127		0.0143	0.0129		0.0143	0.0125		0.0143	0.0123
575	0.014	0.0128		0.0144	0.0131		0.0144	0.0126		0.0144	0.0124
580	0.014	0.0128		0.0145	0.0131		0.0145	0.0127		0.0145	0.0124
585	0.015	0.0130		0.0146	0.0133		0.0146	0.0128		0.0146	0.0126
590	0.015	0.0130		0.0147	0.0133		0.0147	0.0129		0.0147	0.0126
595	0.015	0.0132		0.0148	0.0135		0.0148	0.0130		0.0148	0.0128
600	0.015	0.0132		0.0149	0.0135		0.0149	0.0131		0.0149	0.0128
605	0.015	0.0134		0.0151	0.0137		0.0151	0.0132		0.0151	0.0130
610	0.015	0.0135		0.0152	0.0138		0.0152	0.0133		0.0152	0.0130
615	0.015	0.0136		0.0153	0.0139		0.0153	0.0134		0.0153	0.0132
620	0.015	0.0137		0.0154	0.0140		0.0154	0.0135		0.0154	0.0132
625	0.016	0.0138		0.0156	0.0141		0.0156	0.0136		0.0156	0.0134
630	0.016	0.0139		0.0157	0.0142		0.0157	0.0137		0.0157	0.0135
635	0.016	0.0141		0.0158	0.0144		0.0158	0.0139		0.0158	0.0136
640	0.016	0.0142		0.0159	0.0145		0.0159	0.0139		0.0159	0.0137
645	0.016	0.0143		0.0161	0.0146		0.0161	0.0141		0.0161	0.0139
650	0.016	0.0144		0.0162	0.0147		0.0162	0.0142		0.0162	0.0140

655	0.016	0.0146		0.0164	0.0149		0.0164	0.0144		0.0164	0.0141
660	0.017	0.0147		0.0165	0.0150		0.0165	0.0145		0.0165	0.0142
665	0.017	0.0149		0.0167	0.0152		0.0167	0.0146		0.0167	0.0144
670	0.017	0.0150		0.0168	0.0153		0.0168	0.0147		0.0168	0.0145
675	0.017	0.0152		0.0171	0.0155		0.0171	0.0149		0.0171	0.0147
680	0.017	0.0153		0.0172	0.0156		0.0172	0.0150		0.0172	0.0148
685	0.017	0.0155		0.0174	0.0158		0.0174	0.0152		0.0174	0.0150
690	0.018	0.0156		0.0175	0.0159		0.0175	0.0153		0.0175	0.0151
695	0.018	0.0158		0.0178	0.0161		0.0178	0.0156		0.0178	0.0153
700	0.018	0.0159		0.0179	0.0163		0.0179	0.0157		0.0179	0.0154
705	0.018	0.0161		0.0182	0.0165		0.0182	0.0159		0.0182	0.0156
710	0.018	0.0163		0.0183	0.0166		0.0183	0.0160		0.0183	0.0157
715	0.019	0.0165		0.0186	0.0169		0.0186	0.0163		0.0186	0.0160
720	0.019	0.0166		0.0187	0.0170		0.0187	0.0164		0.0187	0.0161
725	0.019	0.0170		0.0194	0.0176		0.0194	0.0170		0.0194	0.0167
730	0.019	0.0172		0.0195	0.0177		0.0195	0.0171		0.0195	0.0168
735	0.020	0.0175		0.0198	0.0180		0.0198	0.0174		0.0198	0.0171
740	0.020	0.0176		0.0200	0.0182		0.0200	0.0175		0.0200	0.0172
745	0.020	0.0179		0.0203	0.0185		0.0203	0.0178		0.0203	0.0175
750	0.020	0.0181		0.0205	0.0186		0.0205	0.0179		0.0205	0.0176
755	0.021	0.0184		0.0209	0.0189		0.0209	0.0182		0.0209	0.0179
760	0.021	0.0186		0.0210	0.0191		0.0210	0.0184		0.0210	0.0181
765	0.021	0.0189		0.0214	0.0195		0.0214	0.0187		0.0214	0.0184
770	0.022	0.0191		0.0216	0.0196		0.0216	0.0189		0.0216	0.0186
775	0.022	0.0195		0.0220	0.0200		0.0220	0.0193		0.0220	0.0190
780	0.022	0.0197		0.0223	0.0202		0.0223	0.0195		0.0223	0.0191
785	0.023	0.0201		0.0227	0.0206		0.0227	0.0199		0.0227	0.0195
790	0.023	0.0203		0.0230	0.0208		0.0230	0.0201		0.0230	0.0197
795	0.023	0.0207		0.0235	0.0213		0.0235	0.0205		0.0235	0.0202
800	0.024	0.0210		0.0237	0.0215		0.0237	0.0208		0.0237	0.0204
805	0.024	0.0215		0.0243	0.0220		0.0243	0.0212		0.0243	0.0209
810	0.024	0.0217		0.0245	0.0223		0.0245	0.0215		0.0245	0.0211
815	0.025	0.0223		0.0252	0.0228		0.0252	0.0220		0.0252	0.0216
820	0.0254	0.0225		0.0255	0.0231		0.0255	0.0223		0.0255	0.0219
825	0.0261	0.0232		0.0261	0.0237		0.0261	0.0229		0.0261	0.0225
830	0.0265	0.0235		0.0265	0.0241		0.0265	0.0232		0.0265	0.0228
835	0.0272	0.0242		0.0273	0.0248		0.0273	0.0239		0.0273	0.0235
840	0.0276	0.0245		0.0277	0.0251		0.0277	0.0242		0.0277	0.0238
845	0.0318	0.0282		0.0352	0.0319		0.0352	0.0308		0.0352	0.0303
850	0.0322	0.0286		0.0355	0.0322		0.0355	0.0310		0.0355	0.0305
855	0.0330	0.0293		0.0361	0.0328		0.0361	0.0316		0.0361	0.0311
860	0.0335	0.0297		0.0365	0.0331		0.0365	0.0319		0.0365	0.0314
865	0.0344	0.0306		0.0372	0.0338		0.0372	0.0326		0.0372	0.0320
870	0.0350	0.0310		0.0377	0.0342		0.0377	0.0330		0.0377	0.0324
875	0.0361	0.0321		0.0386	0.0351		0.0386	0.0338		0.0386	0.0332
880	0.0368	0.0326		0.0391	0.0355		0.0391	0.0342		0.0391	0.0337
885	0.0382	0.0339		0.0403	0.0366		0.0403	0.0353		0.0403	0.0347
890	0.0390	0.0346		0.0409	0.0372		0.0409	0.0358		0.0409	0.0352

895	0.0407	0.0361		0.0424	0.0385		0.0424	0.0371		0.0424	0.0365
900	0.0417	0.0370		0.0433	0.0393		0.0433	0.0379		0.0433	0.0372
905	0.0440	0.0390		0.0452	0.0410		0.0452	0.0396		0.0452	0.0389
910	0.0452	0.0402		0.0463	0.0421		0.0463	0.0405		0.0463	0.0398
915	0.0483	0.0428		0.0489	0.0444		0.0489	0.0428		0.0489	0.0421
920	0.0500	0.0444		0.0505	0.0459		0.0505	0.0442		0.0505	0.0434
925	0.0522	0.0463		0.0501	0.0455		0.0501	0.0438		0.0501	0.0431
930	0.0550	0.0488		0.0528	0.0479		0.0528	0.0462		0.0528	0.0454
935	0.0621	0.0551		0.0596	0.0541		0.0596	0.0521		0.0596	0.0512
940	0.0667	0.0592		0.0640	0.0581		0.0640	0.0560		0.0640	0.0550
945	0.0798	0.0708		0.0765	0.0695		0.0765	0.0669		0.0765	0.0658
950	0.0895	0.0795		0.0859	0.0780		0.0859	0.0751		0.0859	0.0739
955	0.1259	0.1117		0.1207	0.1097		0.1207	0.1057		0.1207	0.1039
960	0.1707	0.1515		0.1637	0.1486		0.1637	0.1438		0.1637	0.1440
965	0.4955	0.4763		0.4751	0.4573		0.4751	0.4553		0.4751	0.4554
970	0.1035	0.0919		0.0993	0.0902		0.0993	0.0869		0.0993	0.0854
975	0.0725	0.0643		0.0695	0.0631		0.0695	0.0608		0.0695	0.0598
980	0.0583	0.0517		0.0559	0.0507		0.0559	0.0489		0.0559	0.0481
985	0.0520	0.0462		0.0523	0.0475		0.0523	0.0457		0.0523	0.0450
990	0.0467	0.0414		0.0475	0.0432		0.0475	0.0416		0.0475	0.0409
995	0.0428	0.0380		0.0442	0.0401		0.0442	0.0387		0.0442	0.0380
1000	0.0398	0.0353		0.0417	0.0378		0.0417	0.0365		0.0417	0.0358
1005	0.0375	0.0332		0.0397	0.0360		0.0397	0.0347		0.0397	0.0341
1010	0.0355	0.0315		0.0381	0.0346		0.0381	0.0334		0.0381	0.0328
1015	0.0339	0.0301		0.0368	0.0335		0.0368	0.0322		0.0368	0.0317
1020	0.0326	0.0289		0.0358	0.0325		0.0358	0.0313		0.0358	0.0308
1025	0.0281	0.0249		0.0281	0.0255		0.0281	0.0246		0.0281	0.0242
1030	0.0268	0.0238		0.0269	0.0244		0.0269	0.0235		0.0269	0.0231
1035	0.0257	0.0228		0.0258	0.0234		0.0258	0.0226		0.0258	0.0222
1040	0.025	0.0220		0.0248	0.0226		0.0248	0.0217		0.0248	0.0214
1045	0.024	0.0212		0.0240	0.0218		0.0240	0.0210		0.0240	0.0206
1050	0.023	0.0205		0.0232	0.0211		0.0232	0.0203		0.0232	0.0200
1055	0.022	0.0199		0.0225	0.0204		0.0225	0.0197		0.0225	0.0193
1060	0.022	0.0193		0.0218	0.0198		0.0218	0.0191		0.0218	0.0188
1065	0.021	0.0187		0.0212	0.0193		0.0212	0.0186		0.0212	0.0183
1070	0.021	0.0182		0.0207	0.0188		0.0207	0.0181		0.0207	0.0178
1075	0.020	0.0178		0.0202	0.0183		0.0202	0.0176		0.0202	0.0173
1080	0.020	0.0173		0.0197	0.0179		0.0197	0.0172		0.0197	0.0169
1085	0.019	0.0168		0.0189	0.0171		0.0189	0.0165		0.0189	0.0162
1090	0.018	0.0164		0.0184	0.0167		0.0184	0.0161		0.0184	0.0159
1095	0.018	0.0160		0.0180	0.0164		0.0180	0.0158		0.0180	0.0155
1100	0.018	0.0157		0.0177	0.0160		0.0177	0.0154		0.0177	0.0152
1105	0.017	0.0154		0.0173	0.0157		0.0173	0.0151		0.0173	0.0149
1110	0.017	0.0151		0.0170	0.0154		0.0170	0.0148		0.0170	0.0146
1115	0.017	0.0148		0.0166	0.0151		0.0166	0.0146		0.0166	0.0143
1120	0.016	0.0145		0.0163	0.0148		0.0163	0.0143		0.0163	0.0140
1125	0.016	0.0142		0.0160	0.0146		0.0160	0.0140		0.0160	0.0138
1130	0.016	0.0140		0.0158	0.0143		0.0158	0.0138		0.0158	0.0136

1135	0.015	0.0138		0.0155	0.0141		0.0155	0.0136		0.0155	0.0133
1140	0.015	0.0135		0.0152	0.0138		0.0152	0.0133		0.0152	0.0131
1145	0.015	0.0133		0.0150	0.0136		0.0150	0.0131		0.0150	0.0129
1150	0.015	0.0131		0.0148	0.0134		0.0148	0.0129		0.0148	0.0127
1155	0.015	0.0129		0.0145	0.0132		0.0145	0.0127		0.0145	0.0125
1160	0.014	0.0127		0.0143	0.0130		0.0143	0.0125		0.0143	0.0123
1165	0.014	0.0125		0.0141	0.0128		0.0141	0.0124		0.0141	0.0122
1170	0.014	0.0124		0.0139	0.0126		0.0139	0.0122		0.0139	0.0120
1175	0.014	0.0122		0.0137	0.0125		0.0137	0.0120		0.0137	0.0118
1180	0.014	0.0120		0.0136	0.0123		0.0136	0.0119		0.0136	0.0117
1185	0.013	0.0119		0.0134	0.0122		0.0134	0.0117		0.0134	0.0115
1190	0.013	0.0117		0.0132	0.0120		0.0132	0.0116		0.0132	0.0114
1195	0.013	0.0116		0.0130	0.0118		0.0130	0.0114		0.0130	0.0112
1200	0.013	0.0114		0.0129	0.0117		0.0129	0.0113		0.0129	0.0111
1205	0.013	0.0113		0.0127	0.0116		0.0127	0.0111		0.0127	0.0110
1210	0.013	0.0112		0.0126	0.0114		0.0126	0.0110		0.0126	0.0108
1215	0.012	0.0110		0.0124	0.0113		0.0124	0.0109		0.0124	0.0107
1220	0.012	0.0109		0.0123	0.0112		0.0123	0.0108		0.0123	0.0106
1225	0.012	0.0108		0.0122	0.0111		0.0122	0.0107		0.0122	0.0105
1230	0.012	0.0107		0.0120	0.0109		0.0120	0.0105		0.0120	0.0104
1235	0.012	0.0106		0.0119	0.0108		0.0119	0.0104		0.0119	0.0102
1240	0.012	0.0105		0.0118	0.0107		0.0118	0.0103		0.0118	0.0101
1245	0.012	0.0104		0.0117	0.0106		0.0117	0.0102		0.0117	0.0100
1250	0.012	0.0103		0.0116	0.0105		0.0116	0.0101		0.0116	0.0099
1255	0.011	0.0101		0.0114	0.0104		0.0114	0.0100		0.0114	0.0098
1260	0.011	0.0101		0.0113	0.0103		0.0113	0.0099		0.0113	0.0097
1265	0.011	0.0100		0.0112	0.0102		0.0112	0.0098		0.0112	0.0097
1270	0.011	0.0099		0.0111	0.0101		0.0111	0.0097		0.0111	0.0096
1275	0.011	0.0098		0.0110	0.0100		0.0110	0.0096		0.0110	0.0095
1280	0.011	0.0097		0.0109	0.0099		0.0109	0.0096		0.0109	0.0094
1285	0.011	0.0096		0.0108	0.0098		0.0108	0.0095		0.0108	0.0093
1290	0.011	0.0095		0.0107	0.0097		0.0107	0.0094		0.0107	0.0092
1295	0.011	0.0094		0.0106	0.0097		0.0106	0.0093		0.0106	0.0091
1300	0.011	0.0094		0.0105	0.0096		0.0105	0.0092		0.0105	0.0091
1305	0.010	0.0093		0.0105	0.0095		0.0105	0.0092		0.0105	0.0090
1310	0.010	0.0092		0.0104	0.0094		0.0104	0.0091		0.0104	0.0089
1315	0.010	0.0091		0.0103	0.0093		0.0103	0.0090		0.0103	0.0088
1320	0.010	0.0090		0.0102	0.0093		0.0102	0.0089		0.0102	0.0088
1325	0.010	0.0090		0.0101	0.0092		0.0101	0.0089		0.0101	0.0087
1330	0.010	0.0089		0.0100	0.0091		0.0100	0.0088		0.0100	0.0086
1335	0.010	0.0088		0.0100	0.0091		0.0100	0.0087		0.0100	0.0086
1340	0.010	0.0088		0.0099	0.0090		0.0099	0.0087		0.0099	0.0085
1345	0.010	0.0087		0.0098	0.0089		0.0098	0.0086		0.0098	0.0084
1350	0.010	0.0086		0.0097	0.0089		0.0097	0.0085		0.0097	0.0084
1355	0.010	0.0086		0.0097	0.0088		0.0097	0.0085		0.0097	0.0083
1360	0.010	0.0085		0.0096	0.0087		0.0096	0.0084		0.0096	0.0083
1365	0.010	0.0085		0.0095	0.0087		0.0095	0.0083		0.0095	0.0082
1370	0.009	0.0084		0.0095	0.0086		0.0095	0.0083		0.0095	0.0081

1375	0.009	0.0083		0.0094	0.0085		0.0094	0.0082		0.0094	0.0081
1380	0.009	0.0083		0.0093	0.0085		0.0093	0.0082		0.0093	0.0080
1385	0.009	0.0082		0.0093	0.0084		0.0093	0.0081		0.0093	0.0080
1390	0.009	0.0082		0.0092	0.0084		0.0092	0.0081		0.0092	0.0079
1395	0.009	0.0081		0.0092	0.0083		0.0092	0.0080		0.0092	0.0079
1400	0.009	0.0081		0.0091	0.0083		0.0091	0.0080		0.0091	0.0078
1405	0.009	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0078
1410	0.0090	0.0080		0.0090	0.0082		0.0090	0.0079		0.0090	0.0077
1415	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0077
1420	0.0089	0.0079		0.0089	0.0081		0.0089	0.0078		0.0089	0.0076
1425	0.0088	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0076
1430	0.0087	0.0078		0.0088	0.0080		0.0088	0.0077		0.0088	0.0075
1435	0.0087	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0075
1440	0.0086	0.0077		0.0087	0.0079		0.0087	0.0076		0.0087	0.0074

CONFLUENCE OF CREEK B, CREEK C, AND CREEK D

A: 2.209 sq-miles

Δt : 5 min

P24-100

time (min) ↓	Creek B Hyd. (cfs)	Creek C Hyd. (cfs)	Creek D Hyd. (cfs)	TOTAL Hyd. (cfs)
0	0.00	0.00	0.00	0.00
5	0.27	0.60	0.55	1.41
10	1.12	2.35	2.31	5.78
15	2.55	5.04	5.30	12.89
20	4.96	9.02	10.46	24.44
25	9.75	14.92	20.48	45.14
30	13.16	25.91	26.78	65.85
35	14.88	36.99	30.10	81.97
40	16.13	42.45	32.57	91.16
45	17.18	46.23	34.65	98.07
50	18.00	49.26	36.24	103.50
55	18.69	51.91	37.60	108.20
60	19.27	54.20	38.72	112.20
65	19.79	56.05	39.77	115.61
70	20.24	57.72	40.63	118.59
75	20.64	59.19	41.42	121.26
80	20.97	60.49	42.03	123.49
85	21.25	61.76	42.55	125.56
90	21.44	62.83	42.90	127.17
95	21.60	63.85	43.20	128.65
100	21.73	64.74	43.46	129.93
105	21.87	65.49	43.72	131.08
110	21.99	66.20	43.96	132.14
115	22.11	66.70	44.19	132.99
120	22.21	67.14	44.39	133.74
125	22.31	67.53	44.59	134.43
130	22.41	67.90	44.78	135.09
135	22.50	68.27	44.97	135.74
140	22.59	68.62	45.14	136.36
145	22.69	68.95	45.33	136.97
150	22.77	69.29	45.50	137.57
155	22.87	69.60	45.69	138.15
160	22.96	69.90	45.87	138.72
165	23.05	70.20	46.05	139.29
170	23.14	70.49	46.22	139.84
175	23.22	70.77	46.38	140.38
180	23.30	71.06	46.54	140.91
185	23.39	71.34	46.71	141.44
190	23.47	71.62	46.87	141.96
195	23.55	71.91	47.04	142.50
200	23.63	72.19	47.20	143.03
205	23.72	72.48	47.38	143.58
210	23.80	72.77	47.54	144.12
215	23.89	73.06	47.72	144.67
220	23.98	73.34	47.89	145.21
225	24.07	73.63	48.07	145.77
230	24.16	73.90	48.25	146.31
235	24.25	74.18	48.43	146.85
240	24.34	74.45	48.61	147.40
245	24.43	74.73	48.80	147.96
250	24.52	75.01	48.98	148.51
255	24.62	75.29	49.17	149.08
260	24.71	75.58	49.36	149.65
265	24.81	75.87	49.55	150.23
270	24.90	76.16	49.74	150.81
275	25.00	76.46	49.94	151.41
280	25.10	76.76	50.14	152.00
285	25.20	77.06	50.34	152.61
290	25.30	77.37	50.54	153.21
295	25.41	77.68	50.75	153.84
300	25.51	77.99	50.95	154.45
305	25.62	78.31	51.17	155.09
310	25.72	78.63	51.37	155.72
315	25.83	78.96	51.59	156.38
320	25.94	79.28	51.80	157.02
325	26.05	79.61	52.03	157.69
330	26.16	79.95	52.25	158.35
335	26.27	80.29	52.48	159.04
340	26.38	80.63	52.70	159.72
345	26.50	80.98	52.93	160.42
350	26.62	81.33	53.16	161.11
355	26.74	81.69	53.40	161.83
360	26.85	82.05	53.64	162.54
365	26.98	82.42	53.88	163.28
370	27.10	82.78	54.13	164.01
375	27.22	83.16	54.38	164.76
380	27.35	83.54	54.62	165.51
385	27.48	83.92	54.88	166.28
390	27.60	84.31	55.14	167.05
395	27.74	84.70	55.40	167.84
400	27.87	85.10	55.66	168.63
405	28.00	85.51	55.94	169.45
410	28.14	85.92	56.20	170.26
415	28.28	86.33	56.49	171.10
420	28.41	86.75	56.76	171.93
425	28.56	87.18	57.05	172.79
430	28.70	87.61	57.33	173.64
435	28.85	88.05	57.63	174.53
440	28.99	88.50	57.92	175.41
445	29.15	88.95	58.22	176.32
450	29.30	89.40	58.52	177.22
455	29.45	89.87	58.84	178.16
460	29.61	90.34	59.14	179.09
465	29.77	90.82	59.47	180.05
470	29.93	91.30	59.78	181.01
475	30.09	91.79	60.12	182.01
480	30.26	92.29	60.44	182.99
485	30.43	92.80	60.79	184.02
490	30.60	93.31	61.13	185.04
495	30.77	93.84	61.48	186.09

500	30.95	94.37	61.83	187.15
505	31.13	94.91	62.20	188.24
510	31.31	95.46	62.55	189.32
515	31.50	96.01	62.93	190.45
520	31.69	96.58	63.30	191.57
525	31.88	97.16	63.70	192.73
530	32.07	97.74	64.08	193.89
535	32.28	98.34	64.48	195.10
540	32.47	98.94	64.88	196.30
545	32.68	99.56	65.30	197.54
550	32.89	100.18	65.71	198.78
555	33.11	100.82	66.15	200.07
560	33.32	101.47	66.57	201.36
565	33.54	102.13	67.02	202.70
570	33.77	102.80	67.46	204.03
575	34.00	103.49	67.93	205.42
580	34.23	104.19	68.39	206.81
585	34.47	104.90	68.88	208.25
590	34.71	105.62	69.35	209.69
595	34.96	106.36	69.86	211.18
600	35.21	107.12	70.36	212.68
605	35.47	107.88	70.88	214.24
610	35.73	108.67	71.40	215.80
615	36.00	109.47	71.95	217.42
620	36.27	110.28	72.48	219.04
625	36.56	111.12	73.06	220.74
630	36.84	111.97	73.62	222.43
635	37.14	112.84	74.22	224.19
640	37.43	113.73	74.80	225.96
645	37.74	114.64	75.43	227.81
650	38.05	115.57	76.04	229.66
655	38.38	116.52	76.70	231.59
660	38.70	117.49	77.34	233.53
665	39.04	118.49	78.02	235.55
670	39.38	119.50	78.70	237.58
675	39.74	120.55	79.42	239.70
680	40.09	121.62	80.13	241.84
685	40.47	122.71	80.88	244.07
690	40.84	123.84	81.63	246.31
695	41.24	124.99	82.43	248.66
700	41.63	126.17	83.21	251.02
705	42.05	127.39	84.06	253.50
710	42.47	128.64	84.89	255.99
715	42.91	129.92	85.78	258.61
720	43.35	131.24	86.65	261.24
725	43.83	132.62	87.62	264.07
730	44.33	134.09	88.62	267.04
735	44.89	135.63	89.74	270.26
740	45.48	137.27	90.94	273.69
745	46.20	139.04	92.41	277.64
750	46.86	141.05	93.70	281.61
755	47.48	143.11	94.95	285.54
760	48.09	144.98	96.15	289.22
765	48.72	146.83	97.42	292.98
770	49.34	148.71	98.67	296.72
775	50.00	150.64	99.99	300.63
780	50.66	152.61	101.31	304.58
785	51.36	154.63	102.72	308.71
790	52.06	156.72	104.12	312.91
795	52.81	158.89	105.63	317.33
800	53.57	161.12	107.13	321.82
805	54.38	163.45	108.76	326.59
810	55.19	165.86	110.38	331.43
815	56.07	168.37	112.15	336.59
820	56.96	170.99	113.92	341.87
825	57.91	173.72	115.86	347.50
830	58.89	176.58	117.80	353.27
835	59.95	179.57	119.94	359.46
840	61.02	182.71	122.09	365.82
845	62.40	186.47	124.88	373.75
850	64.26	191.28	128.63	384.16
855	66.64	196.97	133.51	397.12
860	69.77	203.77	140.04	413.58
865	74.80	212.17	150.44	437.41
870	78.67	224.58	157.77	461.02
875	81.26	237.01	162.87	481.15
880	83.50	245.05	167.32	495.87
885	85.71	251.91	171.73	509.35
890	87.79	258.43	175.85	522.06
895	89.94	264.95	180.17	535.06
900	92.10	271.58	184.47	548.15
905	94.46	278.28	189.23	561.97
910	96.90	285.41	194.12	576.43
915	99.66	293.03	199.68	592.36
920	102.58	301.30	205.52	609.41
925	105.84	310.22	212.09	628.15
930	109.13	319.67	218.67	647.47
935	112.94	330.22	226.36	669.52
940	117.01	342.23	234.46	693.70
945	121.45	356.12	243.39	720.95
950	128.28	371.75	257.57	757.60
955	139.40	394.03	280.45	813.89
960	155.68	431.24	313.89	900.82
965	189.83	507.25	386.32	1083.40
970	240.57	615.79	495.15	1351.52
975	295.28	719.38	614.03	1628.68
980	362.96	845.17	764.14	1972.26
985	**459**	998.57	**968**	**2426**
990	374.62	**1235**	742.53	2352.48
995	273.59	1178.51	548.49	2000.58
1000	231.23	850.81	465.69	1547.73
1005	207.22	710.86	416.72	1334.80
1010	184.73	632.85	369.69	1187.27
1015	168.50	582.72	337.68	1088.91
1020	154.91	536.53	309.60	1001.04
1025	144.51	490.23	289.63	924.36
1030	133.88	459.17	266.41	859.45
1035	124.40	429.51	247.23	801.14
1040	113.09	401.74	223.47	738.29
1045	102.07	380.55	199.97	682.59

1050	90.57	348.74	177.70	617.00
1055	83.36	323.61	164.35	571.32
1060	77.93	299.41	154.52	531.85
1065	73.95	277.46	146.40	497.81
1070	70.03	260.05	138.70	468.79
1075	66.85	237.69	132.42	436.96
1080	63.70	223.63	125.86	413.19
1085	60.91	211.76	120.84	393.51
1090	58.56	202.69	115.87	377.12
1095	56.25	195.02	111.67	362.94
1100	54.34	186.71	107.73	348.78
1105	52.37	179.68	103.99	336.05
1110	50.76	173.26	100.90	324.92
1115	49.35	165.97	98.10	313.42
1120	48.04	160.35	95.38	303.76
1125	46.70	155.56	92.54	294.80
1130	45.39	150.52	90.04	285.95
1135	44.17	146.44	87.19	277.80
1140	42.84	142.80	85.03	270.67
1145	41.86	139.13	83.21	264.20
1150	40.99	135.97	81.53	258.49
1155	40.19	133.08	79.94	253.21
1160	39.43	130.35	78.46	248.24
1165	38.72	127.70	77.05	243.47
1170	38.04	125.06	75.72	238.82
1175	37.40	122.23	74.45	234.08
1180	36.79	119.76	73.24	229.79
1185	36.21	117.30	72.08	225.59
1190	35.65	114.39	70.98	221.02
1195	35.12	112.27	69.93	217.32
1200	34.61	110.44	68.93	213.98
1205	34.13	108.72	67.97	210.82
1210	33.66	107.08	67.05	207.79
1215	33.21	105.52	66.16	204.89
1220	32.78	104.02	65.31	202.10
1225	32.36	102.58	64.48	199.42
1230	31.96	101.20	63.68	196.84
1235	31.57	99.87	62.91	194.36
1240	31.20	98.59	62.17	191.96
1245	30.84	97.36	61.45	189.65
1250	30.49	96.19	60.75	187.43
1255	30.15	95.06	60.08	185.28
1260	29.82	93.96	59.43	183.20
1265	29.50	92.90	58.79	181.19
1270	29.19	91.88	58.18	179.24
1275	28.89	90.88	57.58	177.35
1280	28.60	89.92	57.00	175.51
1285	28.31	88.98	56.43	173.73
1290	28.03	88.07	55.88	171.99
1295	27.77	87.19	55.35	170.31
1300	27.50	86.34	54.83	168.67
1305	27.25	85.50	54.32	167.07
1310	27.00	84.69	53.83	165.52
1315	26.76	83.90	53.35	164.00
1320	26.52	83.13	52.88	162.53
1325	26.29	82.38	52.42	161.09
1330	26.07	81.65	51.97	159.69
1335	25.85	80.94	51.53	158.32
1340	25.63	80.24	51.11	156.98
1345	25.42	79.56	50.69	155.67
1350	25.22	78.90	50.28	154.40
1355	25.02	78.25	49.88	153.15
1360	24.82	77.62	49.49	151.93
1365	24.63	77.00	49.11	150.74
1370	24.44	76.40	48.74	149.58
1375	24.26	75.81	48.37	148.43
1380	24.08	75.23	48.01	147.32
1385	23.90	74.66	47.66	146.22
1390	23.73	74.10	47.32	145.15
1395	23.56	73.56	46.98	144.10
1400	23.39	73.03	46.65	143.07
1405	23.23	72.51	46.33	142.07
1410	23.07	72.00	46.01	141.08
1415	22.91	71.49	45.70	140.11
1420	22.76	71.00	45.39	139.16
1425	22.61	70.52	45.09	138.22
1430	22.46	70.05	44.80	137.31
1435	22.32	69.58	44.51	136.41
1440	22.17	69.13	44.23	135.53
1445	21.77	68.08	43.40	133.25
1450	20.78	65.90	41.37	128.05
1455	19.23	62.80	38.14	120.17
1460	16.71	58.45	32.77	107.92
1465	11.84	52.22	22.60	86.66
1470	8.39	40.96	16.23	65.58
1475	6.66	29.72	12.88	49.27
1480	5.42	24.19	10.43	40.03
1485	4.38	20.39	8.39	33.15
1490	3.59	17.38	6.85	27.82
1495	2.93	14.77	5.56	23.26
1500	2.39	12.54	4.52	19.45
1505	1.91	10.79	3.57	16.27
1510	1.51	9.22	2.80	13.54
1515	1.16	7.87	2.13	11.16
1520	0.90	6.71	1.63	9.23
1525	0.68	5.59	1.23	7.49
1530	0.54	4.67	1.01	6.23
1535	0.45	3.82	0.84	5.12
1540	0.38	3.11	0.71	4.20
1545	0.32	2.54	0.58	3.44
1550	0.27	2.03	0.48	2.78
1555	0.22	1.73	0.39	2.34
1560	0.18	1.49	0.33	2.00
1565	0.15	1.31	0.27	1.73
1570	0.13	1.15	0.23	1.50
1575	0.11	0.99	0.19	1.28
1580	0.09	0.86	0.16	1.11
1585	0.07	0.75	0.13	0.95
1590	0.06	0.63	0.10	0.79
1595	0.04	0.55	0.07	0.67

1600	0.03	0.48	0.04	0.56
1605	0.02	0.42	0.02	0.46
1610	0.01	0.37	0.00	0.38
1615	0.00	0.32	0.00	0.32
1620	0.00	0.27	0.00	0.27
1625	0.00	0.24	0.00	0.24
1630	0.00	0.20	0.00	0.20
1635	0.00	0.17	0.00	0.17
1640	0.00	0.13	0.00	0.13
1645	0.00	0.10	0.00	0.10
1650	0.00	0.07	0.00	0.07
1655	0.00	0.04	0.00	0.04
1660	0.00	0.02	0.00	0.02
1665	0.00	0.00	0.00	0.00
1670	0.00	0.00	0.00	0.00
1675	0.00	0.00	0.00	0.00
1680	0.00	0.00	0.00	0.00
1685	0.00	0.00	0.00	0.00
1690	0.00	0.00	0.00	0.00
1695	0.00	0.00	0.00	0.00
1700	0.00	0.00	0.00	0.00
1705	0.00	0.00	0.00	0.00
1710	0.00	0.00	0.00	0.00

CREEK A

A: 1.053 sq-miles **Δt :** 5 min

K : 8153.0

P24-100

| 5 min-Eff. Rain → | | |

| | | |

1095	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.14	0.15	0.16	0.18	0.24	0.27	0.27	0.38	0.50	0.53	0.57	0.83	0.94	1.12	1.42	2.55	4.10	18.95	5.19	3.64	3.69	3.93	3.53	3.91	4.00	3.80	4.23	4.50	4.78	4.69	5.59	5.95	6.41	7.38	9.37	13.32	25.84	20.26	11.43	8.16	5.66	4.05	2.69	0.94	0.00	0.02	0.05	0.05	0.06	211.14
1100	0.07	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.14	0.16	0.16	0.18	0.26	0.27	0.29	0.40	0.53	0.55	0.64	0.89	1.12	1.26	2.00	3.46	12.90	3.66	3.63	2.93	3.30	3.52	3.24	3.64	3.77	3.61	4.04	4.32	4.12	4.48	5.36	5.72	6.18	7.13	9.07	12.92	25.11	19.72	11.14	7.96	5.48	3.96	2.63	0.92	0.00	0.02	0.05	0.05	0.06	197.69
1105	0.06	0.07	0.09	0.10	0.10	0.11	0.11	0.11	0.12	0.14	0.16	0.17	0.19	0.26	0.29	0.30	0.41	0.55	0.62	0.69	1.06	1.26	1.77	2.71	10.87	2.49	2.56	2.92	2.62	2.96	3.23	3.01	3.42	3.57	3.44	3.88	3.72	3.94	4.30	5.16	5.52	5.97	6.91	8.81	12.56	24.43	19.21	10.86	7.71	5.35	3.87	2.58	0.90	0.00	0.03	0.06	188.35
1110	0.06	0.06	0.07	0.09	0.10	0.11	0.11	0.11	0.12	0.12	0.15	0.17	0.18	0.20	0.28	0.30	0.32	0.44	0.62	0.67	0.82	1.19	1.77	2.40	8.53	2.10	1.74	2.06	2.61	2.35	2.71	3.00	2.84	3.25	3.41	3.31	3.34	3.56	3.78	4.14	4.98	5.33	5.79	6.71	8.56	12.22	23.81	18.74	10.52	7.53	5.23	3.79	2.52	0.89	0.00	0.03	0.03	179.83
1115	0.03	0.06	0.07	0.07	0.10	0.11	0.11	0.11	0.12	0.12	0.15	0.18	0.18	0.21	0.29	0.32	0.33	0.49	0.67	0.80	0.93	1.67	2.40	7.56	1.65	1.47	1.40	1.84	2.34	2.15	2.52	2.83	2.69	3.10	3.28	2.85	3.19	3.41	3.63	3.99	4.81	5.17	5.61	6.52	8.33	11.91	23.23	18.14	10.28	7.36	5.12	3.71	2.47	0.87	0.00	173.07
1120	0.00	0.03	0.07	0.07	0.07	0.10	0.11	0.11	0.12	0.12	0.12	0.13	0.16	0.18	0.19	0.22	0.31	0.33	0.37	0.53	0.80	0.90	1.30	2.27	7.56	1.46	1.15	1.18	1.25	1.65	2.15	2.00	2.37	2.68	2.57	2.98	2.82	2.72	3.06	3.28	3.50	3.86	4.66	5.01	5.46	6.34	8.12	11.62	22.48	17.73	10.05	7.21	5.02	3.64	2.43	0.85	167.47
1125	0.84	0.00	0.03	0.07	0.07	0.07	0.10	0.11	0.12	0.12	0.12	0.13	0.13	0.17	0.19	0.20	0.23	0.32	0.37	0.40	0.63	0.90	1.27	1.76	7.13	1.46	1.02	0.93	1.05	1.12	1.51	2.00	1.88	2.25	2.56	2.47	2.56	2.70	2.61	2.95	3.17	3.39	3.74	4.52	4.87	5.31	6.18	7.92	11.25	21.97	17.34	9.84	7.06	4.92	3.57	2.38	161.98
1130	2.34	0.82	0.00	0.03	0.07	0.07	0.08	0.10	0.12	0.12	0.12	0.13	0.13	0.14	0.18	0.20	0.21	0.24	0.36	0.40	0.48	0.71	1.27	1.72	5.55	1.38	1.02	0.82	0.83	0.95	1.03	1.41	1.88	1.79	2.15	2.46	2.12	2.45	2.59	2.51	2.84	3.06	3.28	3.63	4.39	4.74	5.17	6.03	7.66	10.99	21.48	16.97	9.63	6.92	4.82	3.50	156.10
1135	3.44	2.30	0.81	0.00	0.03	0.07	0.07	0.08	0.11	0.12	0.12	0.13	0.13	0.14	0.15	0.18	0.21	0.22	0.27	0.39	0.48	0.54	1.00	1.72	5.40	1.07	0.96	0.82	0.73	0.74	0.87	0.96	1.32	1.78	1.71	2.07	2.12	2.03	2.35	2.49	2.42	2.75	2.97	3.18	3.53	4.28	4.62	5.05	5.84	7.49	10.75	21.03	16.62	9.44	6.79	4.74	151.60
1140	4.65	3.38	2.26	0.80	0.00	0.03	0.07	0.07	0.08	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.19	0.22	0.25	0.29	0.47	0.54	0.76	1.35	5.40	1.04	0.75	0.77	0.73	0.66	0.68	0.81	0.90	1.25	1.70	1.64	1.78	2.02	1.95	2.26	2.40	2.34	2.66	2.88	3.09	3.43	4.17	4.51	4.89	5.70	7.32	10.52	20.60	16.29	9.26	6.66	147.43
1145	6.54	4.57	3.32	2.22	0.78	0.00	0.03	0.07	0.08	0.08	0.11	0.13	0.13	0.14	0.15	0.15	0.16	0.20	0.25	0.29	0.35	0.52	0.76	1.03	4.26	1.04	0.73	0.60	0.69	0.66	0.60	0.63	0.76	0.85	1.20	1.64	1.41	1.70	1.94	1.87	2.18	2.32	2.27	2.58	2.80	3.01	3.34	4.07	4.36	4.77	5.58	7.17	10.30	20.19	15.98	9.09	142.67
1150	8.93	6.43	4.49	3.27	2.19	0.77	0.00	0.03	0.08	0.08	0.08	0.12	0.13	0.14	0.15	0.15	0.16	0.17	0.23	0.27	0.32	0.39	0.74	1.03	3.24	0.82	0.73	0.59	0.54	0.62	0.60	0.56	0.60	0.72	0.82	1.15	1.41	1.35	1.63	1.87	1.81	2.11	2.25	2.20	2.51	2.72	2.93	3.26	3.94	4.26	4.67	5.46	7.02	10.10	19.81	15.69	138.31
1155	15.41	8.78	6.32	4.42	3.22	2.15	0.76	0.00	0.04	0.08	0.08	0.09	0.12	0.14	0.15	0.15	0.16	0.17	0.19	0.25	0.32	0.36	0.55	1.00	3.24	0.62	0.57	0.59	0.52	0.48	0.57	0.56	0.53	0.57	0.69	0.78	0.99	1.35	1.29	1.57	1.80	1.75	2.04	2.18	2.14	2.44	2.65	2.86	3.16	3.85	4.17	4.57	5.35	6.88	9.91	19.44	134.99
1160	19.09	15.14	8.63	6.22	4.35	3.17	2.12	0.75	0.00	0.04	0.08	0.08	0.09	0.13	0.15	0.15	0.16	0.17	0.19	0.20	0.29	0.36	0.51	0.74	3.14	0.62	0.44	0.46	0.52	0.47	0.44	0.53	0.53	0.50	0.54	0.66	0.67	0.95	1.29	1.25	1.51	1.74	1.69	1.98	2.12	2.08	2.38	2.59	2.77	3.08	3.76	4.08	4.48	5.24	6.75	9.72	131.81
1165	9.55	18.76	14.88	8.49	6.12	4.28	3.12	2.09	0.74	0.00	0.04	0.08	0.09	0.09	0.14	0.15	0.16	0.17	0.19	0.20	0.24	0.33	0.51	0.69	2.33	0.61	0.44	0.35	0.41	0.47	0.43	0.41	0.50	0.50	0.48	0.52	0.57	0.65	0.91	1.24	1.20	1.46	1.69	1.64	1.93	2.07	2.03	2.32	2.51	2.71	3.02	3.68	4.00	4.39	5.14	6.63	128.31
1170	6.51	9.38	18.44	14.64	8.35	6.02	4.22	3.08	2.06	0.73	0.00	0.04	0.09	0.09	0.10	0.14	0.16	0.17	0.19	0.20	0.24	0.27	0.46	0.69	2.16	0.45	0.42	0.35	0.31	0.37	0.43	0.40	0.39	0.47	0.48	0.46	0.45	0.54	0.62	0.87	1.20	1.16	1.42	1.64	1.60	1.88	2.01	1.98	2.25	2.45	2.65	2.95	3.61	3.92	4.30	5.05	125.50
1175	4.96	6.39	9.23	18.14	14.41	8.22	5.93	4.16	3.03	2.03	0.72	0.00	0.04	0.09	0.10	0.10	0.15	0.17	0.19	0.20	0.24	0.27	0.38	0.63	2.16	0.42	0.32	0.34	0.31	0.28	0.34	0.40	0.38	0.37	0.45	0.46	0.40	0.43	0.52	0.60	0.84	1.16	1.13	1.38	1.59	1.55	1.83	1.96	1.92	2.20	2.39	2.59	2.89	3.53	3.84	4.22	122.97
1180	4.15	4.87	6.29	9.08	17.85	14.18	8.10	5.85	4.10	2.99	2.00	0.71	0.00	0.04	0.10	0.10	0.11	0.15	0.19	0.20	0.24	0.27	0.38	0.52	1.97	0.42	0.29	0.25	0.30	0.28	0.26	0.32	0.38	0.36	0.35	0.43	0.40	0.38	0.41	0.50	0.57	0.82	1.12	1.09	1.34	1.55	1.51	1.78	1.90	1.87	2.15	2.34	2.54	2.84	3.47	3.77	120.42
1185	3.71	4.08	4.79	6.18	8.93	17.58	13.97	7.98	5.76	4.04	2.95	1.98	0.70	0.00	0.04	0.10	0.11	0.11	0.17	0.20	0.24	0.27	0.38	0.51	1.63	0.38	0.29	0.23	0.23	0.27	0.26	0.24	0.30	0.36	0.34	0.34	0.37	0.38	0.36	0.39	0.48	0.56	0.79	1.09	1.06	1.30	1.51	1.48	1.73	1.86	1.83	2.10	2.30	2.49	2.78	3.40	117.91
1190	3.34	3.64	4.01	4.71	6.09	8.79	17.31	13.77	7.87	5.68	3.98	2.91	1.95	0.69	0.00	0.05	0.10	0.11	0.13	0.19	0.22	0.27	0.38	0.51	1.62	0.31	0.27	0.23	0.21	0.20	0.25	0.24	0.23	0.28	0.34	0.33	0.29	0.36	0.36	0.36	0.35	0.38	0.47	0.54	0.77	1.06	1.03	1.27	1.47	1.43	1.69	1.82	1.79	2.06	2.25	2.44	2.73	115.79
1195	2.68	3.28	3.58	3.94	4.63	5.99	8.66	17.06	13.57	7.76	5.61	3.93	2.87	1.93	0.68	0.00	0.05	0.11	0.12	0.14	0.22	0.27	0.38	0.51	1.62	0.31	0.22	0.21	0.21	0.19	0.19	0.23	0.23	0.21	0.27	0.33	0.28	0.28	0.34	0.35	0.34	0.37	0.45	0.52	0.75	1.03	1.01	1.24	1.43	1.40	1.65	1.78	1.76	2.02	2.21	2.40	113.78
1200	2.35	2.63	3.23	3.52	3.88	4.56	5.90	8.53	16.82	13.38	7.65	5.53	3.88	2.83	1.90	0.67	0.00	0.05	0.12	0.13	0.17	0.25	0.38	0.51	1.62	0.31	0.22	0.18	0.19	0.19	0.17	0.17	0.22	0.21	0.20	0.26	0.28	0.27	0.27	0.33	0.34	0.33	0.36	0.44	0.51	0.73	1.00	0.98	1.20	1.39	1.37	1.61	1.74	1.72	1.98	2.17	111.85
1205	2.13	2.31	2.59	3.18	3.47	3.82	4.49	5.81	8.41	16.58	13.20	7.55	5.46	3.83	2.80	1.88	0.67	0.00	0.06	0.13	0.16	0.19	0.35	0.51	1.62	0.31	0.22	0.18	0.16	0.17	0.17	0.16	0.16	0.21	0.20	0.20	0.22	0.27	0.26	0.26	0.32	0.33	0.32	0.35	0.43	0.49	0.71	0.98	0.95	1.17	1.36	1.34	1.58	1.71	1.69	1.94	109.99
1210	1.91	2.09	2.27	2.55	3.13	3.41	3.76	4.43	5.73	8.29	16.36	13.02	7.45	5.39	3.78	2.77	1.86	0.66	0.00	0.06	0.16	0.18	0.26	0.48	1.62	0.31	0.22	0.18	0.16	0.14	0.16	0.16	0.15	0.15	0.20	0.20	0.17	0.21	0.26	0.25	0.25	0.31	0.32	0.31	0.34	0.42	0.48	0.69	0.95	0.93	1.14	1.33	1.31	1.55	1.67	1.66	108.17
1215	1.63	1.88	2.06	2.24	2.51	3.08	3.36	3.71	4.36	5.65	8.18	16.14	12.85	7.36	5.32	3.74	2.73	1.84	0.65	0.00	0.07	0.18	0.25	0.35	1.51	0.31	0.22	0.18	0.16	0.14	0.13	0.15	0.15	0.14	0.15	0.19	0.17	0.16	0.20	0.25	0.24	0.24	0.30	0.31	0.30	0.33	0.41	0.47	0.67	0.93	0.91	1.12	1.31	1.28	1.52	1.64	106.29
1220	1.61	1.60	1.84	2.02	2.25	2.47	3.03	3.31	3.65	4.30	5.57	8.07	15.93	12.69	7.26	5.26	3.69	2.76	1.81	0.64	0.07	0.18	0.25	0.34	1.11	0.29	0.22	0.18	0.16	0.14	0.13	0.12	0.14	0.14	0.16	0.16	0.16	0.16	0.20	0.24	0.23	0.29	0.30	0.29	0.30	0.33	0.40	0.65	0.91	0.89	1.10	1.28	1.26	1.49	1.64	104.27
1225	1.47	1.59	1.57	1.81	1.99	2.17	2.43	2.99	3.26	3.60	4.24	5.50	7.97	15.73	12.53	7.18	5.20	3.65	2.67	1.79	0.64	0.00	0.12	0.34	1.08	0.21	0.20	0.18	0.16	0.14	0.13	0.12	0.11	0.13	0.14	0.13	0.12	0.16	0.16	0.15	0.19	0.23	0.23	0.22	0.28	0.29	0.28	0.31	0.38	0.44	0.64	0.89	0.87	1.08	1.26	1.24	102.56
1230	1.21	1.44	1.56	1.55	1.78	1.96	2.13	2.40	2.94	3.22	3.55	4.19	5.43	7.87	15.53	12.38	7.09	5.13	3.61	2.64	1.77	0.63	0.00	0.16	1.08	0.21	0.15	0.16	0.16	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.13	0.11	0.12	0.15	0.15	0.14	0.18	0.22	0.22	0.22	0.27	0.28	0.27	0.30	0.37	0.43	0.62	0.87	0.85	1.06	1.23	100.89
1235	1.21	1.19	1.42	1.53	1.52	1.76	1.93	2.10	2.36	2.90	3.17	3.51	4.13	5.36	7.77	15.34	12.23	7.01	5.08	3.57	2.61	1.75	0.62	0.00	0.49	0.21	0.15	0.12	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.12	0.11	0.11	0.11	0.14	0.14	0.14	0.18	0.22	0.21	0.21	0.27	0.27	0.27	0.29	0.37	0.42	0.61	0.85	0.84	1.04	98.84
1240	1.02	1.19	1.17	1.39	1.51	1.50	1.73	1.90	2.07	2.33	2.86	3.13	3.46	4.08	5.29	7.67	15.16	12.09	6.93	5.02	3.53	2.58	1.74	0.62	0.00	0.10	0.15	0.12	0.11	0.13	0.13	0.12	0.11	0.11	0.10	0.10	0.10	0.11	0.10	0.14	0.14	0.14	0.17	0.21	0.21	0.21	0.26	0.27	0.26	0.29	0.36	0.42	0.60	0.83	0.82	96.98
1245	0.81	1.00	1.17	1.15	1.37	1.49	1.48	1.71	1.87	2.04	2.30	2.82	3.09	3.42	4.03	5.23	7.58	14.98	11.95	6.85	4.96	3.49	2.56	1.72	0.61	0.00	0.07	0.12	0.10	0.10	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.09	0.10	0.10	0.10	0.14	0.14	0.13	0.17	0.21	0.20	0.25	0.26	0.25	0.28	0.35	0.41	0.59	0.82	95.60
1250	0.80	0.79	0.98	1.15	1.14	1.35	1.46	1.45	1.68	1.85	2.02	2.27	2.79	3.05	3.37	3.98	5.17	7.49	14.81	11.82	6.77	4.91	3.45	2.53	1.70	0.60	0.00	0.05	0.10	0.09	0.09	0.11	0.11	0.11	0.10	0.10	0.08	0.08	0.09	0.10	0.10	0.10	0.13	0.13	0.13	0.16	0.20	0.20	0.20	0.25	0.25	0.25	0.28	0.34	0.40	0.58	94.32
1255	0.57	0.79	0.78	0.97	1.13	1.12	1.33	1.44	1.43	1.66	1.82	1.99	2.24	2.75	3.01	3.33	3.93	5.11	7.41	14.64	11.69	6.70	4.86	3.42	2.50	1.68	0.60	0.00	0.05	0.09	0.09	0.08	0.11	0.11	0.10	0.10	0.08	0.08	0.08	0.09	0.10	0.09	0.10	0.13	0.13	0.12	0.16	0.20	0.19	0.19	0.24	0.25	0.24	0.27	0.34	0.39	93.10
1260	0.39	0.56	0.78	0.77	0.95	1.11	1.10	1.31	1.42	1.41	1.63	1.80	1.96	2.21	2.72	2.98	3.29	3.89	5.05	7.33	14.48	11.56	6.63	4.81	3.38	2.48	1.67	0.59	0.00	0.04	0.09	0.08	0.08	0.10	0.10	0.10	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.12	0.12	0.12	0.15	0.19	0.19	0.19	0.23	0.24	0.24	0.26	0.33	91.93
1265	0.32	0.38	0.55	0.76	0.75	0.94	1.10	1.09	1.29	1.40	1.39	1.61	1.77	1.94	2.18	2.69	2.94	3.26	3.84	4.99	7.24	14.33	11.44	6.56	4.76	3.35	2.45	1.65	0.59	0.00	0.04	0.08	0.08	0.08	0.07	0.07	0.07	0.08	0.09	0.09	0.09	0.09	0.12	0.12	0.12	0.15	0.19	0.18	0.18	0.23	0.24	0.23	0.26	0.90.80	
1270	0.26	0.32	0.37	0.54	0.75	0.74	0.92	1.08	1.07	1.27	1.38	1.38	1.59	1.75	1.91	2.15	2.65	2.91	3.22	3.80	4.94	7.17	14.18	11.32	6.49	4.71	3.32	2.43	1.64	0.58	0.00	0.04	0.08	0.07	0.07	0.09	0.08	0.08	0.08	0.07	0.07	0.08	0.09	0.08	0.09	0.12	0.12	0.15	0.15	0.18	0.18	0.18	0.23	0.23	0.23	89.72
1275	0.23	0.25	0.31	0.37	0.53	0.74	0.73	0.91	1.07	1.05	1.26	1.36	1.36	1.57	1.73	1.89	2.13	2.62	2.87	3.18	3.76	4.88	7.09	14.03	11.20	6.43	4.66	3.28	2.41	1.62	0.58	0.00	0.03	0.07	0.07	0.07	0.08	0.08	0.08	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.11	0.11	0.11	0.14	0.18	0.17	0.18	0.22	0.23	88.67
1280	0.23	0.22	0.25	0.31	0.36	0.52	0.73	0.72	0.90	1.05	1.04	1.24	1.35	1.34	1.55	1.71	1.87	2.10	2.59	2.84	3.15	3.72	4.83	7.02	13.89	11.09	6.37	4.62	3.25	2.38	1.61	0.57	0.00	0.03	0.07	0.07	0.06	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.11	0.11	0.11	0.14	0.17	0.17	0.17	0.22	87.67
1285	0.21	0.22	0.22	0.24	0.30	0.36	0.51	0.72	0.71	0.88	1.04	1.03	1.22	1.33	1.32	1.53	1.69	1.85	2.08	2.56	2.81	3.11	3.68	4.78	6.95	13.75	10.98	6.30	4.58	3.22	2.36	1.59	0.57	0.00	0.03	0.07	0.06	0.06	0.07	0.07	0.07	0.07	0.06	0.08	0.08	0.08	0.08	0.11	0.11	0.11	0.14	0.17	0.17	0.17	0.22	86.69
1290	0.17	0.21	0.22	0.21	0.24	0.30	0.35	0.51	0.71	0.70	0.87	1.02	1.01	1.21	1.31	1.51	1.52	1.67	1.83	2.06	2.54	2.78	3.08	3.64	4.73	6.88	13.61	10.88	6.24	4.53	3.19	2.34	1.58	0.56	0.00	0.03	0.06	0.05	0.05	0.07	0.07	0.07	0.07	0.06	0.06	0.07	0.08	0.08	0.08	0.11	0.11	0.10	0.13	0.17	0.16	85.75
1295	0.16	0.16	0.21	0.21	0.23	0.29	0.34	0.50	0.70	0.69	0.86	1.01	1.00	1.19	1.30	1.29	1.50	1.65	1.80	2.03	2.51	2.75	3.05	3.60	4.69	6.81	13.48	10.77	6.19	4.49	3.16	2.32	1.56	0.56	0.00	0.03	0.05	0.05	0.05	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.07	0.08	0.07	0.08	0.10	0.10	0.13	0.16	0.16	84.84
1300	0.16	0.16	0.16	0.20	0.21	0.21	0.23	0.29	0.34	0.49	0.69	0.68	0.85	1.00	0.99	1.18	1.28	1.48	1.63	1.79	2.01	2.48	2.72	3.02	3.57	4.64	6.74	13.35	10.67	6.13	4.45	3.14	2.30	1.55	0.55	0.00	0.02	0.05	0.05	0.05	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.10	0.10	0.13	0.13	83.96
1305	0.13	0.16	0.16	0.16	0.20	0.21	0.20	0.23	0.29	0.33	0.49	0.68	0.67	0.84	0.98	0.98	1.16	1.27	1.26	1.46	1.61	1.77	1.99	2.46	2.69	2.99	3.53	4.59	6.68	13.23	10.57	6.07	4.41	3.11	2.28	1.54	0.55	0.00	0.02	0.05	0.05	0.06	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.10	0.10	0.10	0.13	83.10
1310	0.10	0.13	0.16	0.15	0.16	0.20	0.20	0.20	0.22	0.28	0.33	0.48	0.67	0.66	0.83	0.97	0.96	1.15	1.25	1.25	1.45	1.60	1.75	1.97	2.43	2.67	2.96	3.50	4.55	6.62	13.10	10.48	6.02	4.37	3.08	2.26	1.52	0.54	0.00	0.02	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.10	0.10	82.28
1315	0.10	0.10	0.12	0.15	0.15	0.15	0.19	0.20	0.20	0.22	0.28	0.33	0.47	0.66	0.66	0.82	0.96	0.95	1.14	1.24	1.23	1.43	1.58	1.73	1.95	2.41	2.64	2.93	3.47	4.51	6.55	12.99	10.38	5.97	4.33	3.05	2.24	1.51	0.54	0.00	0.02	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.10	0.10	81.47
1320	0.09	0.10	0.09	0.12	0.15	0.15	0.15	0.19	0.20	0.20	0.22	0.27	0.32	0.47	0.65	0.65	0.81	0.95	0.94	1.12	1.22	1.22	1.42	1.56	1.71	1.93	2.38	2.62	2.90	3.43	4.47	6.50	12.87	10.29	5.92	4.30	3.03	2.22	1.

| | | |

CREEK B

A: 0.351 sq-miles **Δt :** 5 min

K : 2714.2

P24-100

| 5 min-Eff. Rain → | | |

| | | |

| | | |

| | | |

CREEK C

A: 1.120 sq-miles **Δt :** 5 min

K : 8670.3

P24-100

5 min-Eff. Rain →			0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	
			0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012	TOTAL
S curve	5 min UH	time (min)	0.012	0.012	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015	0.015	0.016	0.016	0.016	0.016	0.016	0.017	0.017	0.017	0.017	0.018	0.018	0.018	0.018	0.019	0.019	0.019	0.019	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.023	0.023	0.024	0.024	Hyd.
			0.031	0.031	0.032	0.032	0.033	0.033	0.034	0.034	0.035	0.036	0.037	0.038	0.040	0.041	0.043	0.044	0.044	0.046	0.052	0.056	0.067	0.075	0.106	0.144	**0.455**	0.087	0.061	0.049	0.046	0.042	0.039	0.036	0.035	0.033	0.032	0.031	0.025	0.024	0.023	0.022	0.021	0.020	0.020	0.019	0.019	0.018	0.018	0.017	0.017	0.016	0.016	0.015	0.015	0.015	0.015	0.014	
↓	↓	↓	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	
			0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008																																											
0	0.0	0	0.00																																																		0.00
0.91	79.1	5	0.60	0.00																																															0.60
2.68	232.2	10	1.75	0.60	0.00																																														2.35
4.11	356.1	15	2.69	1.76	0.60	0.00																																													5.04
6.06	525.0	20	3.96	2.69	1.76	0.60	0.00																																												9.02
8.98	778.3	25	5.87	3.97	2.70	1.77	0.60	0.00																																											14.92
16.74	1451.8	30	10.96	5.89	3.99	2.71	1.77	0.61	0.00																																											25.91
16.82	1458	35	11.00	10.98	5.91	3.99	2.72	1.78	0.61	0.00																																										36.99
8.19	710	40	5.36	11.03	11.02	5.92	4.01	2.73	1.78	0.61	0.00																																									42.45
5.59	484.3	45	3.65	5.37	11.07	11.04	5.94	4.02	2.74	1.79	0.61	0.00																																									46.23
4.41	382.1	50	2.88	3.66	5.39	11.09	11.09	5.96	4.03	2.74	1.79	0.61	0.00																																								49.26
3.83	332.1	55	2.51	2.89	3.68	5.40	11.14	11.11	5.98	4.04	2.75	1.80	0.62	0.00																																							51.91
3.27	283.5	60	2.14	2.51	2.90	3.68	5.42	11.16	11.16	5.99	4.06	2.76	1.81	0.62	0.00																																							54.20
2.56	222.3	65	1.68	2.14	2.52	2.91	3.70	5.43	11.20	11.18	6.02	4.07	2.77	1.81	0.62	0.00																																							56.05
2.29	198.8	70	1.50	1.68	2.15	2.53	2.92	3.71	5.46	11.23	11.22	6.03	4.08	2.78	1.82	0.62	0.00																																						57.72
1.99	172.2	75	1.30	1.50	1.69	2.16	2.54	2.92	3.72	5.47	11.27	11.25	6.05	4.09	2.79	1.82	0.62	0.00																																						59.19
1.70	147.2	80	1.11	1.30	1.51	1.69	2.17	2.54	2.94	3.73	5.49	11.30	11.29	6.07	4.11	2.79	1.83	0.62	0.00																																					60.49
1.65	143.4	85	1.08	1.11	1.31	1.51	1.70	2.17	2.55	2.94	3.74	5.50	11.34	11.32	6.09	4.12	2.81	1.83	0.63	0.00																																					61.76
1.34	116.5	90	0.88	1.08	1.12	1.31	1.52	1.70	2.18	2.56	2.95	3.75	5.52	11.37	11.36	6.11	4.14	2.81	1.84	0.63	0.00																																				62.83
1.26	109.6	95	0.83	0.88	1.09	1.12	1.32	1.52	1.71	2.18	2.57	2.96	3.77	5.54	11.41	11.39	6.13	4.14	2.82	1.84	0.63	0.00																																				63.85
1.05	91.0	100	0.69	0.83	0.88	1.09	1.12	1.32	1.53	1.71	2.19	2.57	2.97	3.77	5.56	11.44	11.44	6.14	4.16	2.83	1.85	0.63	0.00																																				64.74
0.84	73.0	105	0.55	0.69	0.83	0.89	1.10	1.13	1.32	1.53	1.72	2.20	2.58	2.98	3.79	5.57	11.49	11.46	6.17	4.17	2.84	1.86	0.64	0.00																																				65.49
0.76	65.7	110	0.50	0.55	0.69	0.83	0.89	1.10	1.13	1.33	1.54	1.72	2.21	2.59	2.99	3.80	5.59	11.51	11.51	6.18	4.19	2.85	1.86	0.64	0.00																																				66.20
0.44	38.2	115	0.29	0.50	0.55	0.69	0.84	0.89	1.10	1.13	1.33	1.54	1.73	2.21	2.60	3.00	3.81	5.61	11.56	11.53	6.21	4.20	2.86	1.87	0.64	0.00																																				66.70
0.35	30.0	120	0.23	0.29	0.50	0.56	0.69	0.84	0.90	1.10	1.14	1.33	1.55	1.73	2.22	2.60	3.01	3.82	5.63	11.59	11.58	6.22	4.22	2.87	1.88	0.64	0.00																																				67.14
0.26	22.8	125	0.17	0.23	0.29	0.50	0.56	0.70	0.84	0.90	1.11	1.14	1.34	1.55	1.74	2.22	2.62	3.02	3.84	5.64	11.64	11.61	6.25	4.23	2.88	1.88	0.64	0.00																																				67.53
0.24	20.5	130	0.15	0.17	0.23	0.29	0.50	0.56	0.70	0.84	0.90	1.11	1.14	1.34	1.56	1.74	2.23	2.62	3.03	3.85	5.67	11.66	11.66	6.27	4.24	2.89	1.89	0.65	0.00																																				67.90
0.23	20.2	135	0.15	0.15	0.17	0.23	0.29	0.50	0.56	0.70	0.85	0.90	1.12	1.15	1.35	1.56	1.75	2.24	2.63	3.04	3.86	5.68	11.71	11.69	6.29	4.25	2.90	1.89	0.65	0.00																																				68.27
0.19	16.1	140	0.12	0.15	0.16	0.17	0.23	0.29	0.50	0.56	0.70	0.85	0.91	1.12	1.15	1.35	1.57	1.76	2.25	2.64	3.05	3.87	5.70	11.74	11.74	6.31	4.27	2.91	1.90	0.65	0.00																																				68.62
0.17	14.6	145	0.11	0.12	0.15	0.16	0.17	0.23	0.29	0.51	0.56	0.70	0.85	0.91	1.12	1.15	1.36	1.57	1.76	2.25	2.65	3.06	3.89	5.72	11.79	11.76	6.34	4.28	2.92	1.91	0.65	0.00																																				68.95
0.16	14.3	150	0.11	0.11	0.12	0.15	0.16	0.17	0.23	0.29	0.51	0.57	0.71	0.85	0.91	1.12	1.16	1.36	1.58	1.77	2.26	2.66	3.07	3.90	5.74	11.82	11.82	6.35	4.30	2.93	1.92	0.65	0.00																																				69.29
0.12	10.1	155	0.08	0.11	0.11	0.12	0.15	0.16	0.18	0.23	0.30	0.51	0.57	0.71	0.86	0.91	1.13	1.16	1.37	1.58	1.77	2.27	2.67	3.08	3.92	5.75	11.87	11.84	6.38	4.31	2.94	1.92	0.66	0.00																																				69.60
0.10	8.8	160	0.07	0.08	0.11	0.11	0.12	0.15	0.16	0.18	0.23	0.30	0.51	0.57	0.71	0.86	0.92	1.13	1.17	1.37	1.59	1.78	2.28	2.67	3.09	3.92	5.78	11.90	11.90	6.39	4.33	2.95	1.93	0.66	0.00																																				69.90
0.10	8.6	165	0.06	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.23	0.30	0.51	0.57	0.71	0.86	0.92	1.14	1.17	1.37	1.59	1.79	2.28	2.68	3.10	3.94	5.79	11.95	11.93	6.42	4.34	2.96	1.93	0.66	0.00																																				70.20
0.07	6.4	170	0.05	0.06	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.23	0.30	0.51	0.57	0.72	0.86	0.92	1.14	1.17	1.38	1.60	1.79	2.29	2.69	3.11	3.95	5.82	11.98	11.98	6.44	4.36	2.97	1.94	0.66	0.00																																				70.49
0.07	5.8	175	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.23	0.30	0.52	0.58	0.72	0.87	0.93	1.14	1.18	1.38	1.60	1.80	2.30	2.70	3.12	3.97	5.83	12.03	12.01	6.47	4.37	2.98	1.95	0.67	0.00																																				70.77
0.07	5.7	180	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.72	0.87	0.93	1.15	1.18	1.39	1.61	1.80	2.31	2.71	3.13	3.98	5.86	12.06	12.06	6.48	4.39	2.99	1.96	0.67	0.00																																		71.06
0.054	4.7	185	0.04	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.72	0.87	0.93	1.15	1.18	1.39	1.61	1.81	2.31	2.72	3.14	4.00	5.87	12.12	12.09	6.51	4.40	3.00	1.96	0.67	0.00																																		71.34
0.051	4.4	190	0.03	0.04	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.12	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.73	0.88	0.94	1.15	1.19	1.40	1.62	1.81	2.32	2.73	3.15	4.01	5.90	12.14	12.15	6.53	4.42	3.01	1.97	0.67	0.00																																		71.62
0.051	4.4	195	0.03	0.03	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.13	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.73	0.88	0.94	1.16	1.19	1.40	1.62	1.82	2.33	2.74	3.16	4.02	5.91	12.20	12.18	6.56	4.44	3.02	1.98	0.68	0.00																																		71.91
0.051	4.4	200	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.13	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.73	0.88	0.94	1.16	1.20	1.40	1.63	1.83	2.34	2.75	3.18	4.03	5.94	12.23	12.24	6.58	4.46	3.03	1.99	0.68	0.00																																		72.19
0.051	4.4	205	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.13	0.16	0.16	0.18	0.24	0.30	0.52	0.58	0.73	0.88	0.94	1.16	1.20	1.40	1.63	1.83	2.34	2.75	3.18	4.03	5.94	12.23	12.24	6.58	4.46	3.03	1.99	0.68	0.00																																		72.19
0.051	4.4	210	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.13	0.16	0.16	0.18	0.24	0.30	0.53	0.59	0.73	0.89	0.94	1.17	1.20	1.41	1.63	1.83	2.35	2.76	3.18	4.05	5.96	12.29	12.27	6.61	4.47	3.05	1.99	0.68	0.00																																		72.48
0.049	4.2	215	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.07	0.07	0.08	0.11	0.11	0.13	0.16	0.16	0.18	0.24	0.31	0.53	0.59	0.74	0.89	0.95	1.17	1.21	1.41	1.64	1.84	2.36	2.77	3.20	4.06	5.99	12.32	12.32	6.62	4.49	3.05	2.00	0.68	0.00																																	72.77
0.036	3.1	220	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.16	0.18	0.24	0.31	0.53	0.59	0.74	0.89	0.95	1.18	1.21	1.42	1.64	1.85	2.36	2.78	3.21	4.08	6.00	12.38	12.35	6.66	4.50	3.07	2.01	0.69	0.00																																	73.06
0.034	2.9	225	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.16	0.18	0.24	0.31	0.53	0.59	0.74	0.89	0.95	1.18	1.21	1.42	1.65	1.85	2.37	2.79	3.22	4.09	6.03	12.41	12.42	6.67	4.52	3.08	2.02	0.69	0.00																																73.34
0.030	2.6	230	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.16	0.18	0.24	0.31	0.53	0.59	0.74	0.90	0.96	1.18	1.22	1.43	1.66	1.86	2.38	2.80	3.23	4.11	6.04	12.47	12.45	6.71	4.53	3.09	2.02	0.69	0.00																																73.63
0.004	0.4	230	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.16	0.18	0.24	0.31	0.53	0.60	0.75	0.90	0.96	1.19	1.22	1.43	1.66	1.87	2.39	2.81	3.24	4.12	6.07	12.50	12.51	6.72	4.56	3.10	2.03	0.69	0.00																																73.90
0.000	0.0	235	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.16	0.18	0.24	0.31	0.54	0.60	0.75	0.90	0.96	1.19	1.23	1.44	1.67	1.87	2.40	2.82	3.25	4.14	6.09	12.56	12.54	6.76	4.57	3.11	2.04	0.70	0.00																																74.18
0.000	0.0	240	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.17	0.19	0.24	0.31	0.54	0.60	0.75	0.91	0.97	1.19	1.23	1.44	1.68	1.88	2.41	2.83	3.27	4.15	6.12	12.59	12.60	6.77	4.59	3.12	2.05	0.70	0.00																																74.45
0.000	0.0	245	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.17	0.19	0.25	0.31	0.54	0.60	0.75	0.91	0.97	1.20	1.23	1.45	1.68	1.89	2.41	2.84	3.28	4.17	6.13	12.66	12.63	6.81	4.60	3.14	2.05	0.70	0.00																																74.73
0.000	0.0	250	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.11	0.12	0.13	0.16	0.17	0.19	0.25	0.31	0.54	0.60	0.76	0.91	0.98	1.20	1.24	1.45	1.69	1.89	2.42	2.85	3.29	4.18	6.16	12.69	12.70	6.83	4.63	3.15	2.06	0.70	0.00																																75.01
0.000	0.0	255	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.16	0.17	0.19	0.25	0.32	0.54	0.61	0.76	0.92	0.98	1.21	1.24	1.46	1.69	1.90	2.43	2.86	3.30	4.20	6.18	12.75	12.73	6.86	4.64	3.16	2.07	0.71	0.00																																75.29
0.000	0.0	260	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.16	0.17	0.19	0.25	0.32	0.55	0.61	0.76	0.92	0.98	1.21	1.25	1.47	1.70	1.91	2.44	2.87	3.32	4.21	6.21	12.79	12.80	6.88	4.66	3.17	2.08	0.71	0.00																																75.58
0.000	0.0	265	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.55	0.61	0.76	0.92	0.98	1.22	1.25	1.47	1.70	1.92	2.45	2.88	3.33	4.24	6.23	12.85	12.83	6.91	4.68	3.19	2.08	0.71	0.00																																75.87
0.000	0.0	270	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.55	0.61	0.77	0.93	0.99	1.22	1.26	1.48	1.71	1.92	2.46	2.89	3.34	4.25	6.26	12.89	12.90	6.93	4.70	3.20	2.10	0.72	0.00																																76.16
0.000	0.0	275	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.55	0.62	0.77	0.93	0.99	1.23	1.26	1.48	1.72	1.93	2.47	2.90	3.35	4.27	6.28	12.95	12.93	6.97	4.71	3.21	2.10	0.72	0.00																																76.46
280	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.55	0.62	0.77	0.93	1.00	1.23	1.27	1.49	1.73	1.93	2.48	2.91	3.37	4.28	6.31	12.99	13.00	6.99	4.74	3.22	2.11	0.72	0.00																																76.76
285	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.55	0.62	0.77	0.94	1.00	1.24	1.27	1.49	1.73	1.94	2.49	2.93	3.38	4.30	6.33	13.06	13.04	7.03	4.75	3.24	2.12	77.06
290	2.13	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.07	0.07	0.08	0.12	0.12	0.13	0.17	0.17	0.19	0.25	0.32	0.56	0.62	0.78	0.94	1.00	1.24	1.28	1.50	1.74	1.95	2

| | | |

| | | |

| | | |

CREEK D

A: 0.739 sq-miles **Δt :** 5 min

K : 5716.2

P24-100

| 5 min-Eff. Rain → | | | 0.007 | 0.007 | 0.007 | 0.007 | 0.008 | 0.008 | 0.008

| | | |

| | | |

| | | |

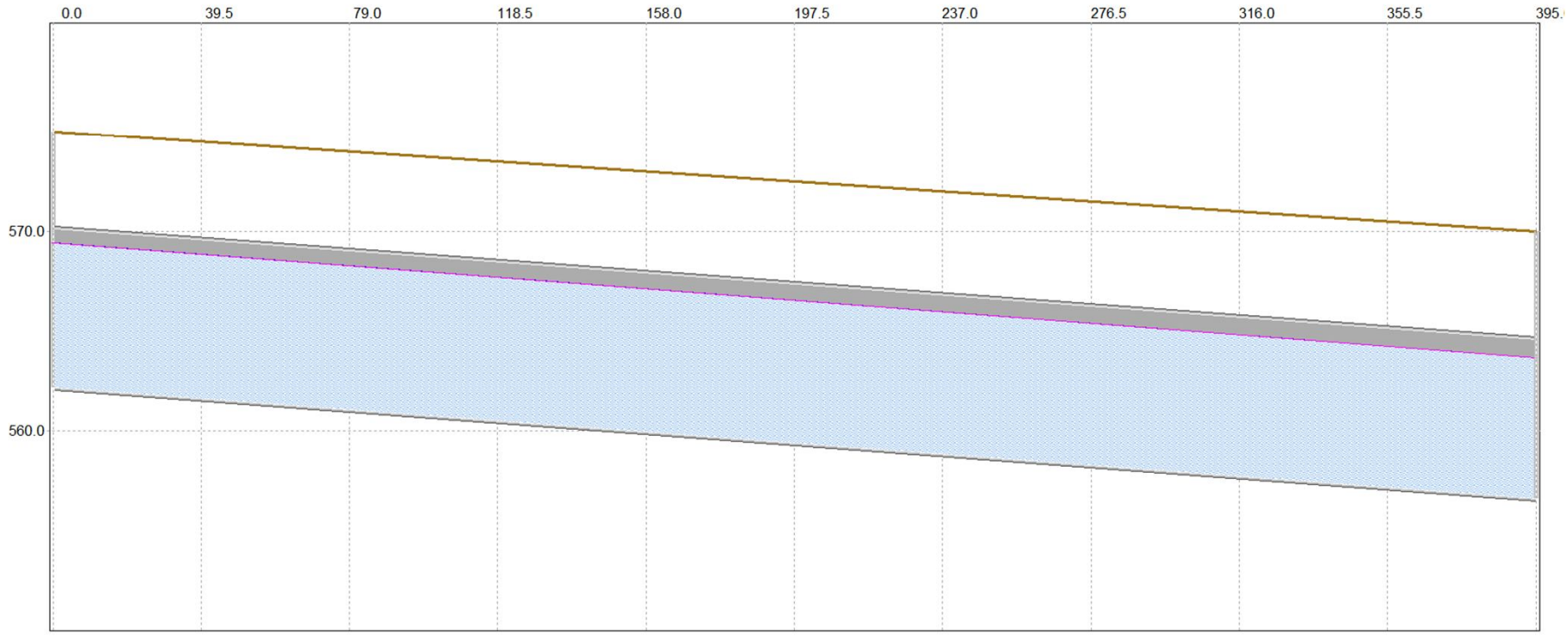
HYDRAULIC ANALYSIS

EXISTING 8' x 7' RCB (Height x Width) at Stonehaven Drive

U/S Invert	562.19	ft
D/S Invert	556.63	ft
Length	395	ft
Slope	1.41	%

XPSTORM NORMAL DEPTH DETERMINATION:

		RCB
Link Descr		8' x 7' RCB
Max Flow	cfs	1126.536
Max Depth	ft	7.271

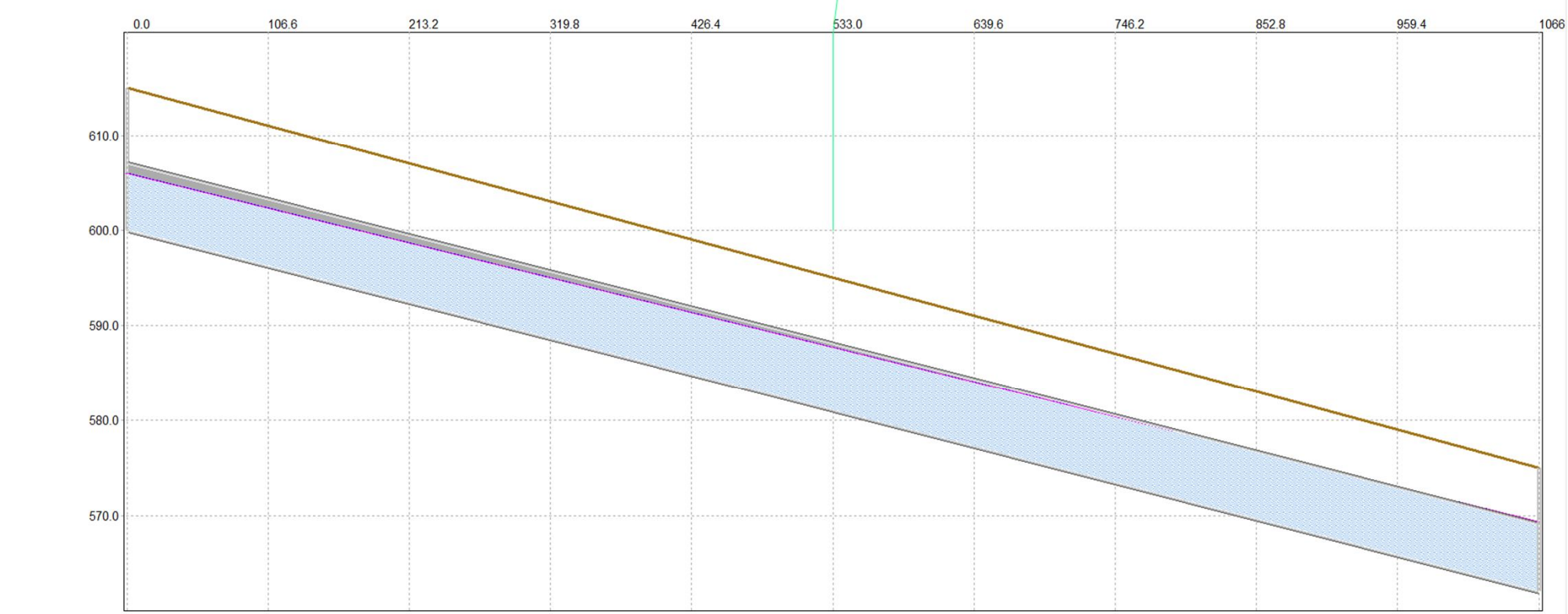


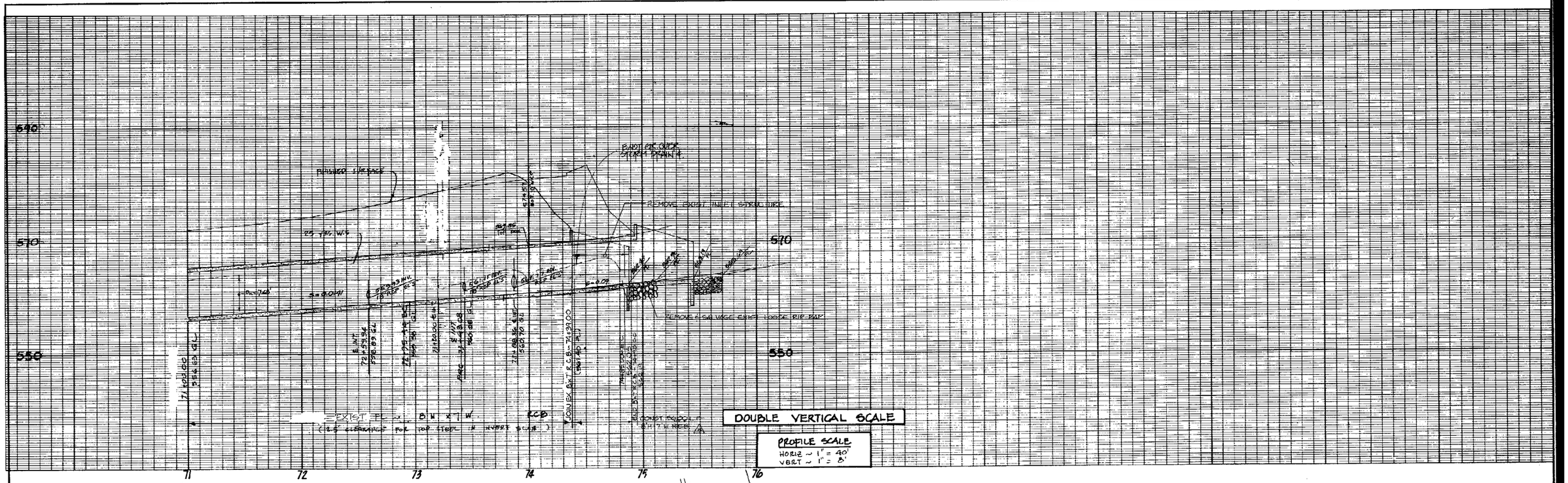
PROPOSED 84" RCP SD within project site at south-eastern end of "B" Street

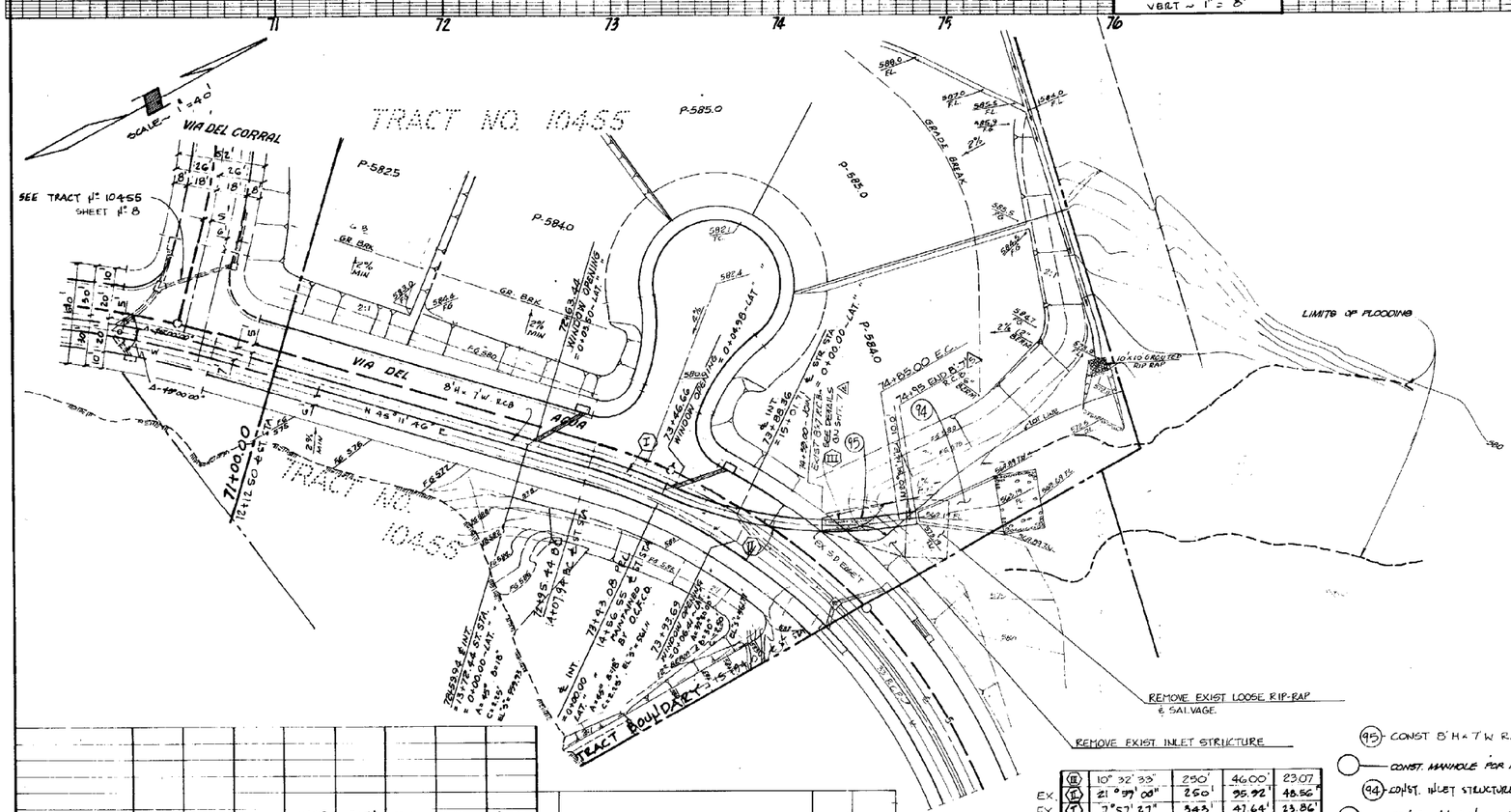
Diameter	7	ft
U/S Invert	600.0	ft
D/S Invert	562.19	ft
Length	1066	ft
Slope	3.5	%

XPSTORM NORMAL DEPTH DETERMINATION:

		SD_1
Scenario		Proposed SD
Link Desc		84" RCP SD
Max Flow	cfs	1126.177
Max Dept	ft	7.259







STA. TO STA.	Q	n	Sf	S	Dn	Vn	Dc	Vc
71+00.00 - 74+57.00	12.00	0.014	—	0.0105	7.65'	12.61	FULL	21.40

HYDRAULIC DATA

REVISION DESCRIPTION	DATE	APP'D
EXTENDED R.C.B. 10' @ 26 BA. FULL.		
ADDED STA 73+85.88 = FULL.	4/11/94	ASH

	Δ	R	L	T
EX. (III)	10° 32' 33"	250'	46.00'	23.07'
EX. (II)	21° 09' 00"	260'	95.92'	48.56'
(I)	7° 57' 27"	343'	47.64'	23.86'
I.D.	A	R	L	T

℄ R.C.B. CURVE DATA

(95) CONST. 8'H x 7'W R.C.B. PER DETAIL(S) SHT. 7

CONST. MANHOLE FOR REINF. CONC. BOX CONDUIT PER E.M.A. STD. Nº 302 (DELETED)

(94) CONST. INLET STRUCTURE PER DETAIL ON SHEET Nº 6

CONST. JUNCTION STRUCTURE TYPE II PER E.M.A. STD. Nº 314 WITH 4 LF. RCP (SIZE PER PLAN) STUB OUT AND SEAL WITH MORTAR AND BRICK.

CONSTRUCTION NOTES

DRAWING OF RECORD

JAMES H PARDUE RCE 42758 EXP 3-31-94 DATE 9-8636

TR 13600 IMPS

STORM DRAIN PLAN
EXTENSION

DWG. NO. E06501-701-2

SHEET 6 OF 7 SHEETS (1)

22-151

Bid Record 4778

D.O. 4405

SEE SHT. 2

LEGEND

PROPOSED	DESCRIPTION
BVC	BEGIN VERTICAL CURVE
DW	DOMESTIC WATER
EVC	END VERTICAL CURVE
EX	EXISTING
FH	FIRE HYDRANT
GP	GARAGE PAD
MH	MANHOLE
PROP	PROPOSED
R	RADIUS
SS	SANITARY SEWER
TF	TOP OF FOOTING
TS	TOP OF STEP
TW	TOP OF WALL
VC	VERTICAL CURVE
WQB	WATER QUALITY BASIN

STREET CENTER LINE
LOT LINE
TRACT BOUNDARY

CATCH BASIN
STORM DRAIN
SD JUNCTION STRUCTURE
SEWER MANHOLE
77 / 651.3 LOT NO. / PAD ELEV.
FIRE HYDRANT
EXISTING OIL WELL HEADS (TO BE REMOVED/ABANDONED)
SECTION LABEL (SEE SHT. 4)
650 PROPOSED CONTOUR
650 EXISTING CONTOUR

GRAPHIC SCALE
0 80 160 240
(IN FEET)
1 inch = 80 ft.
SCALE: 1"=80'

PREPARED FOR :
SAGE COMMUNITY GROUP
3 CORPORATE PLAZA, SUITE 102
NEWPORT BEACH, CA 92660
PHONE: (949) 644-3514

PREPARED BY:
CHARLES HARTMAN & ASSOC
ENGINEERING • SURVEYING
27127 CALLE ARROYO • SUITE 1904
SAN JUAN CAPISTRANO, CA. 92675 • (949) 661-6060 • CHARLES@CHARLESHARTMAN.COM

TITLE:
TENTATIVE TRACT MAP - SOUTH
LOT
CIELO VISTA - VTTM NO. 17341
ORANGE COUNTY

DATE:
December 9, 2010

SHEET:
3
OF 4

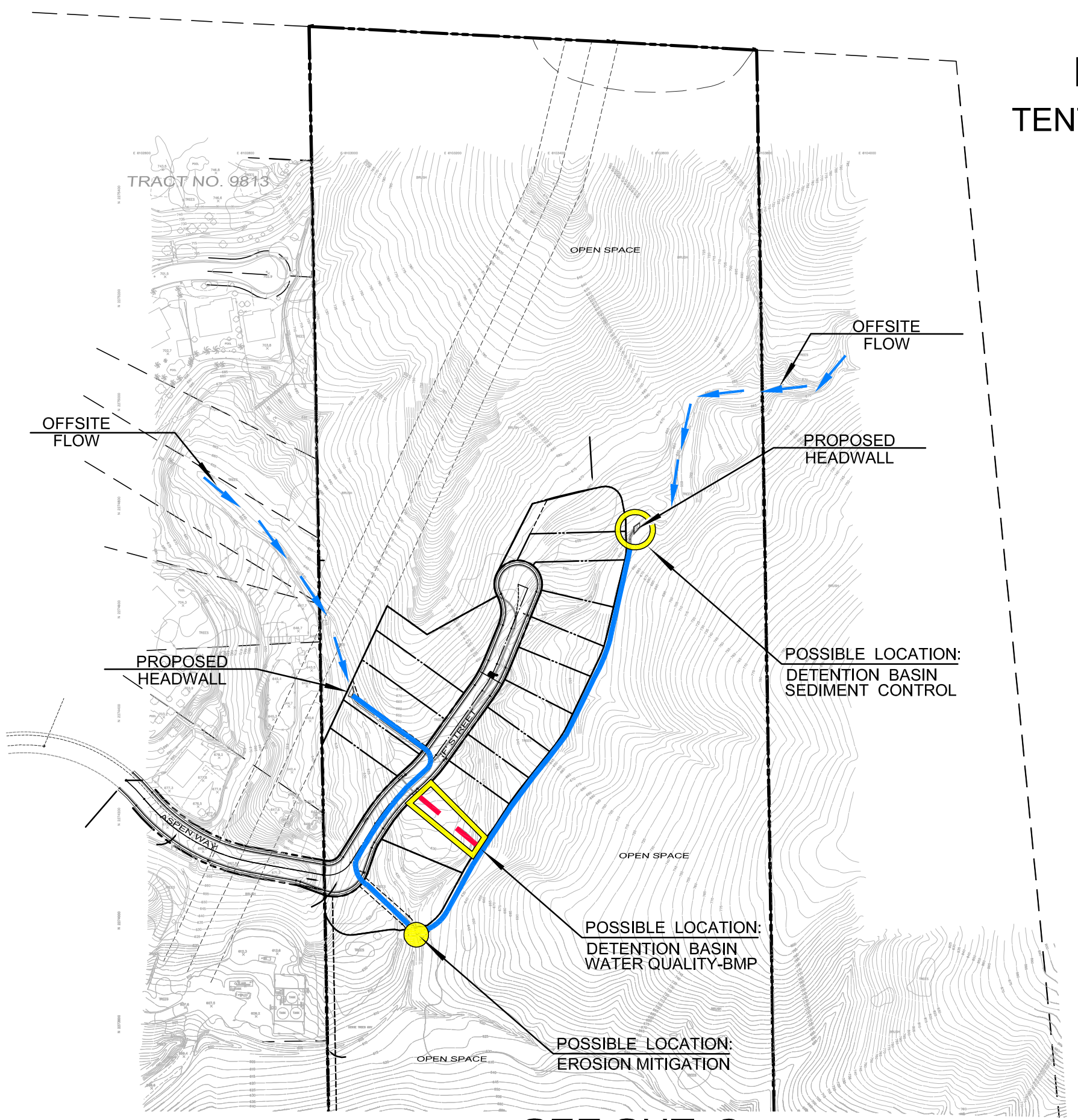
SITE PLANS

PLANNING AREA 2

TENTATIVE TRACT MAP - NORTH

for

CIELO VISTA - VTTM NO. 17341



LEGEND

ONSITE STORM DRAIN

OFFSITE STORM DRAIN

SEE SHT. 2

N

SCALE: 1"=80'

GRAPHIC SCALE

(IN FEET)
1 inch = 80 ft.

DATE: AUGUST 9 2013

SHEET: 1 OF 2

P:\PROJ\09-013\Dwg\Exhibit\Tory Walker - Storm Drain Exhibit.dwg, 8/9/2013 3:30:10 PM

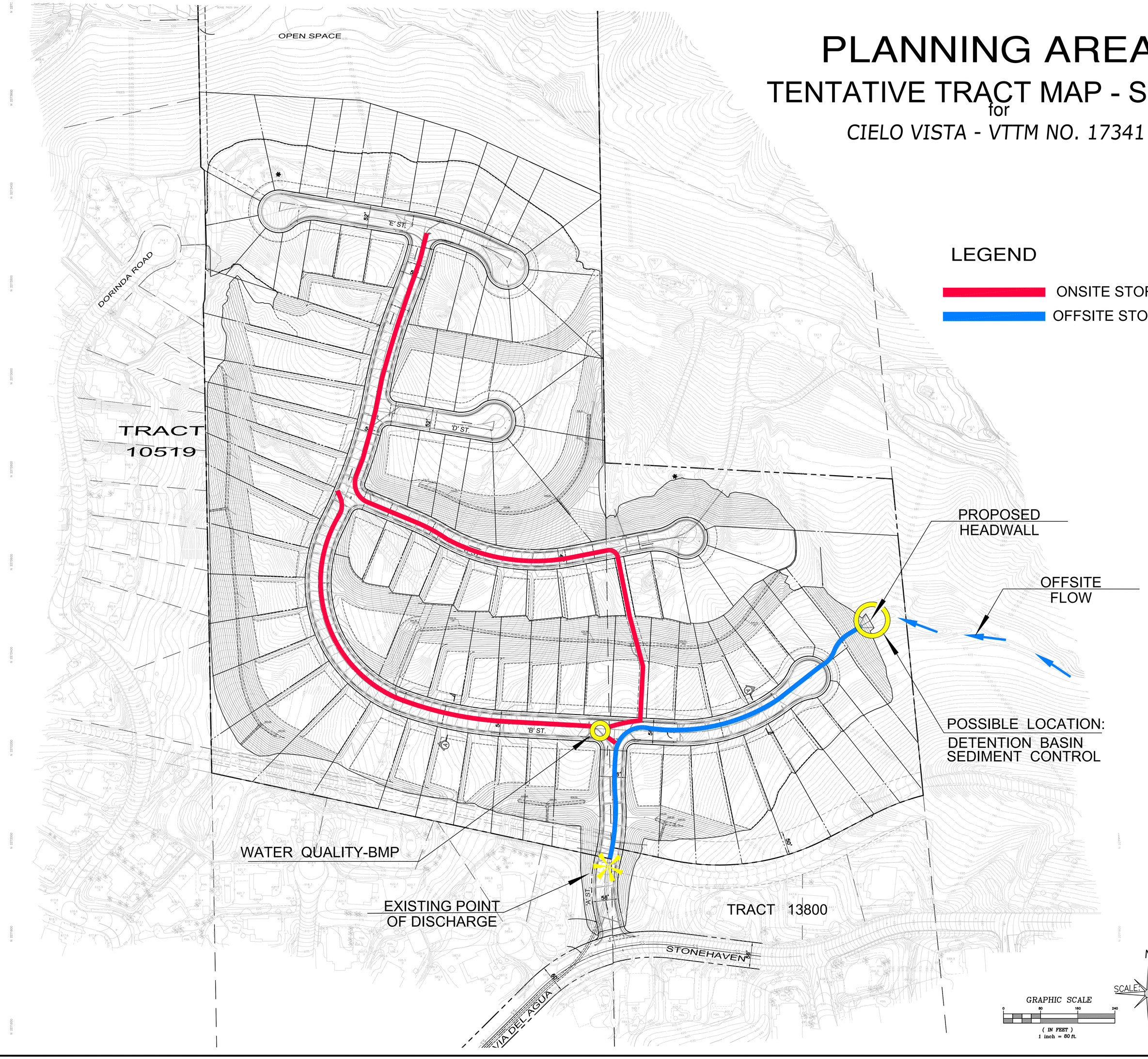
SEE SHT. 1

PLANNING AREA 1

TENTATIVE TRACT MAP - SOUTH

for

CIELO VISTA - VTTM NO. 17341



DATE: AUGUST 9 2013

SHEET: 2 OF 2

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HYDROLOGY STUDY (ONSITE)

FOR

Cielo Vista Subdivision
Permit # PA10-0004
TENATATIVE TRACT 1734, YORBA LINDA, CA

COUNTY OF ORANGE

PREPARED FOR:

Sage Community Group
43 Corporate Plaza
Newport Beach, CA 92660
949-644-3514

PREPARED BY:

CHARLES HARTMAN & ASSOCIATES
27127 CALLE ARROYO, SUITE 1904
SAN JUAN CAPISTRANO, CA 92675
(949) 661-6695

March 28, 2013

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2. County Storm Drain Facilities
3. Hydrocad Routing (25-Year Frequency) Basin "C"
4. Hydrology Map Onsite Existing Conditions
5. Hydrology Map Onsite Proposed Conditions

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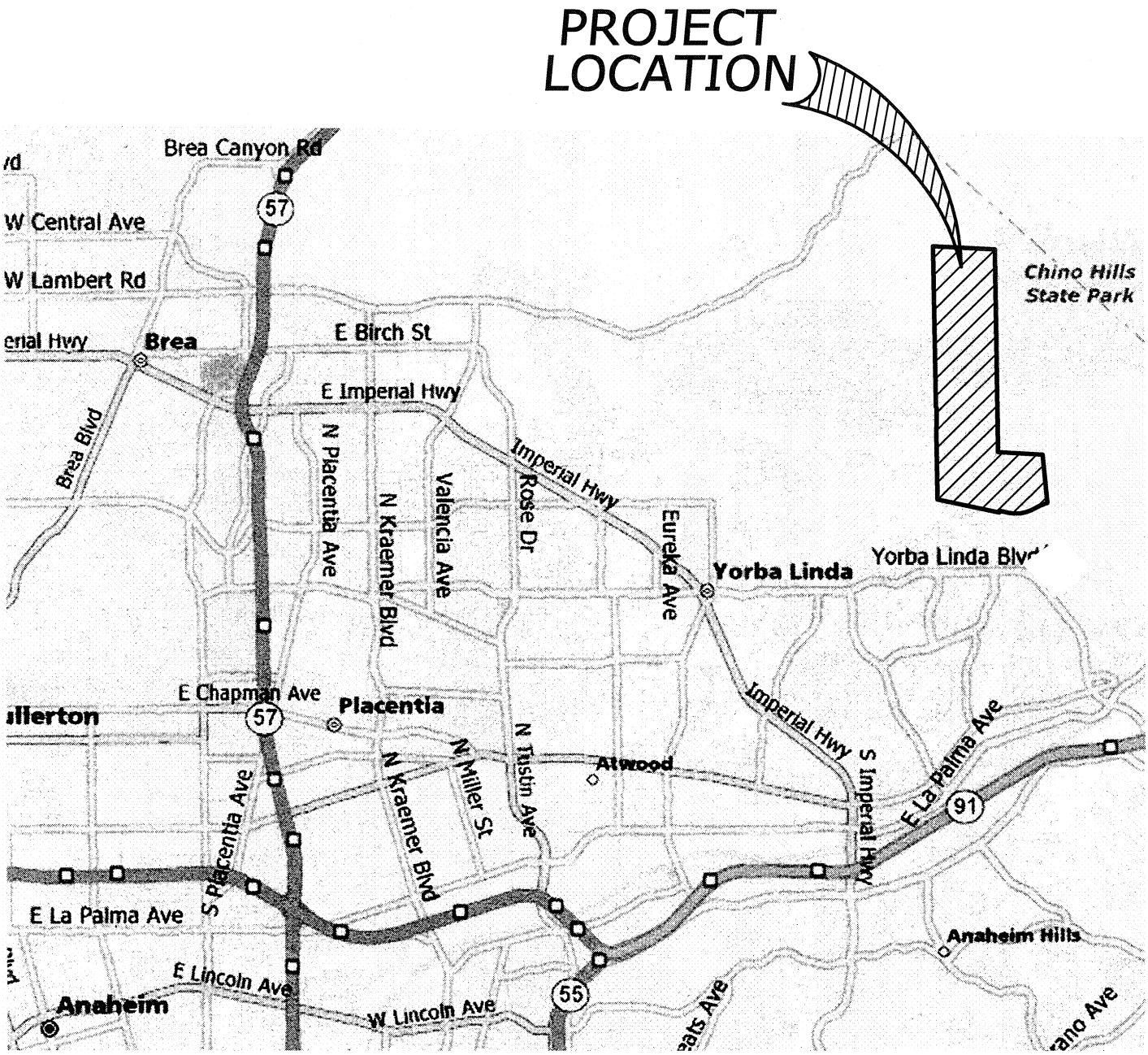
1. Rational Method Analysis
    a. Existing 2-year Frequency (North)
    b. Proposed 2-year Frequency (North)

    c. Existing 25-year Frequency (North)
    d. Proposed 25-year Frequency (North)

    e. Existing 2-year Frequency (South)
    f. Proposed 2-year Frequency (South)

    g. Existing 25-Year Frequency (South)
    h. Proposed 25-Year Frequency (South)

2. Reference Plans for Tract 13800 (sheets 1 through 7)
3. CEQA Drainage Study for Cielo Vista by TRWE, Inc, 3/27/2013 (Attached)

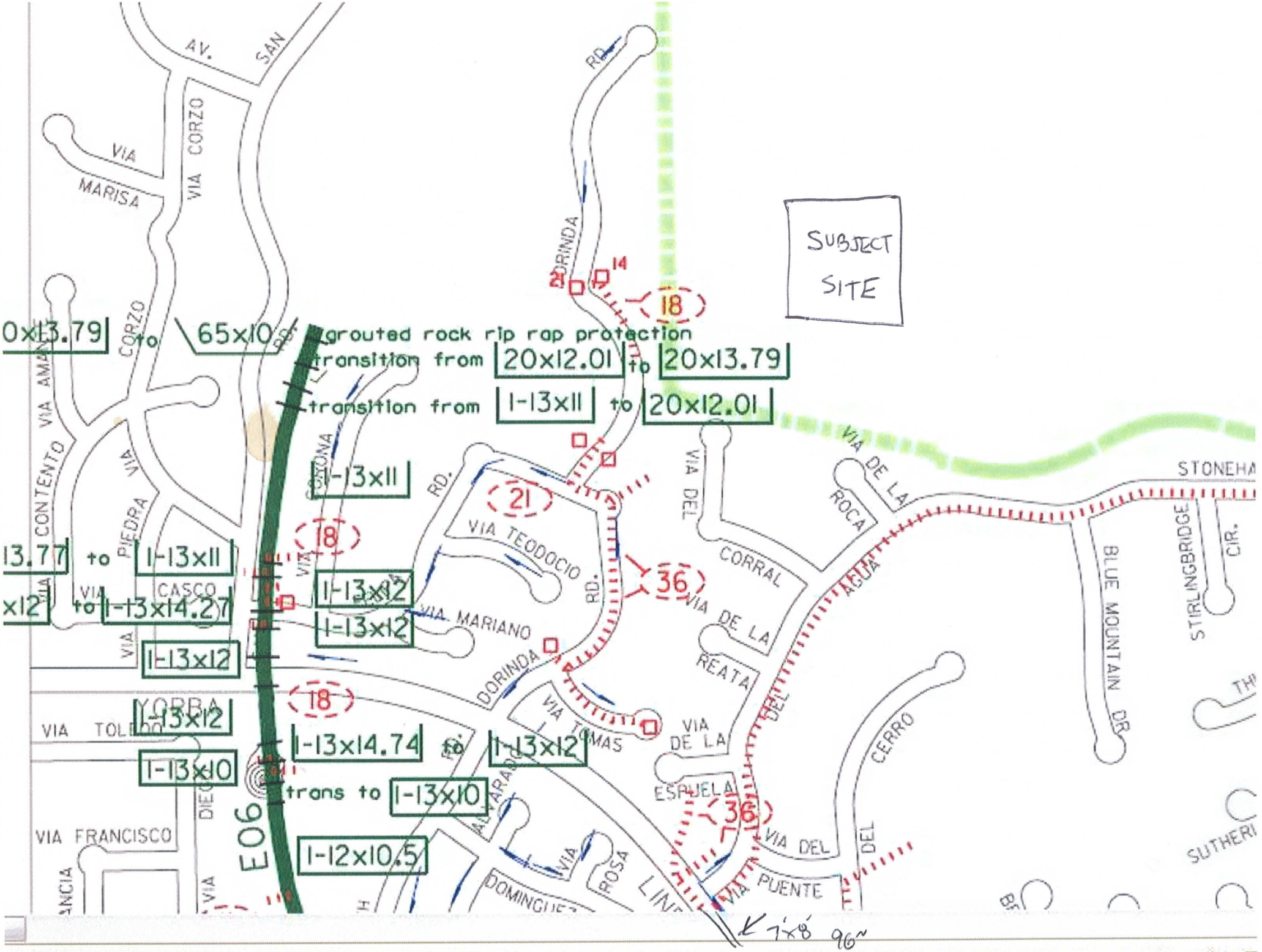


Vicinity Map

NOT TO SCALE

N

SCALE: N.T.S.


SUBJECT SITE
grouted rock rip rap protection
transition from 20x12.01 to 20x13.79
transition from 1-13x11 to 20x12.01
65x10
1-13x11
1-13x12
1-13x14.27
1-13x12
1-13x12
1-13x14.74 to 1-13x12
1-13x10
trans to 1-13x10
1-12x10.5
E06
18
21
36
14
VIA CORZO
VIA MARISA
VIA CONTENTO
VIA PIEDRA
VIA CASCO
VIA MARIANO
VIA TEODOCIO
VIA TOMAS
VIA DE LA REATA
VIA DEL CORRAL
VIA DE LA ROCA
VIA DEL AGUA
VIA DEL CERRO
VIA ESPUELA
VIA PUENTE
VIA FRANCISCO
DORINDA RD.
CORONA RD.
ALVARADO
BLUE MOUNTAIN DR.
STIRLINGBRIDGE CIR.
7'x8' 96~

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
10.830	65	Residential (1S)
10.830	**65**	**TOTAL AREA**

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	100.00	99.80	50.0	0.0040	0.013	18.0	0.0	0.0

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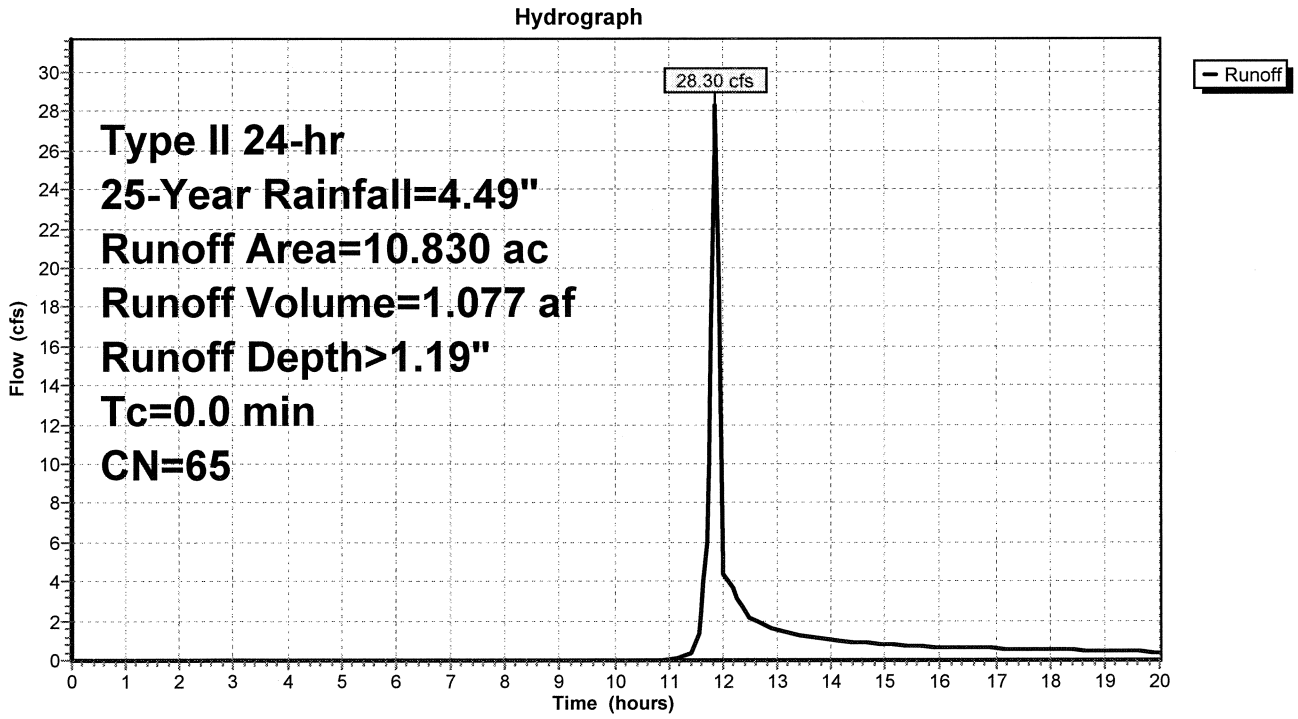
Summary for Subcatchment 1S: Area A

Runoff = 28.30 cfs @ 11.88 hrs, Volume= 1.077 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=4.49"

	Area (ac)	CN	Description
*	10.830	65	Residential
	10.830		100.00% Pervious Area

Subcatchment 1S: Area A



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Summary for Pond 3P: (new Pond)

Inflow Area = 10.830 ac, 0.00% Impervious, Inflow Depth > 1.19" for 25-Year event
Inflow = 28.30 cfs @ 11.88 hrs, Volume= 1.077 af
Outflow = 13.64 cfs @ 11.95 hrs, Volume= 1.060 af, Atten= 52%, Lag= 4.7 min
Primary = 13.64 cfs @ 11.95 hrs, Volume= 1.060 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 103.26' @ 11.95 hrs Surf.Area= 0.102 ac Storage= 0.241 af

Plug-Flow detention time= 16.2 min calculated for 1.060 af (98% of inflow)
Center-of-Mass det. time= 10.1 min (817.2 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.246 af	**30.20'W x 70.20'L x 3.30'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**18.0" Round Culvert** L= 50.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 100.00' / 99.80' S= 0.0040 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=13.59 cfs @ 11.95 hrs HW=103.24' (Free Discharge)
↑**1=Culvert** (Barrel Controls 13.59 cfs @ 7.69 fps)

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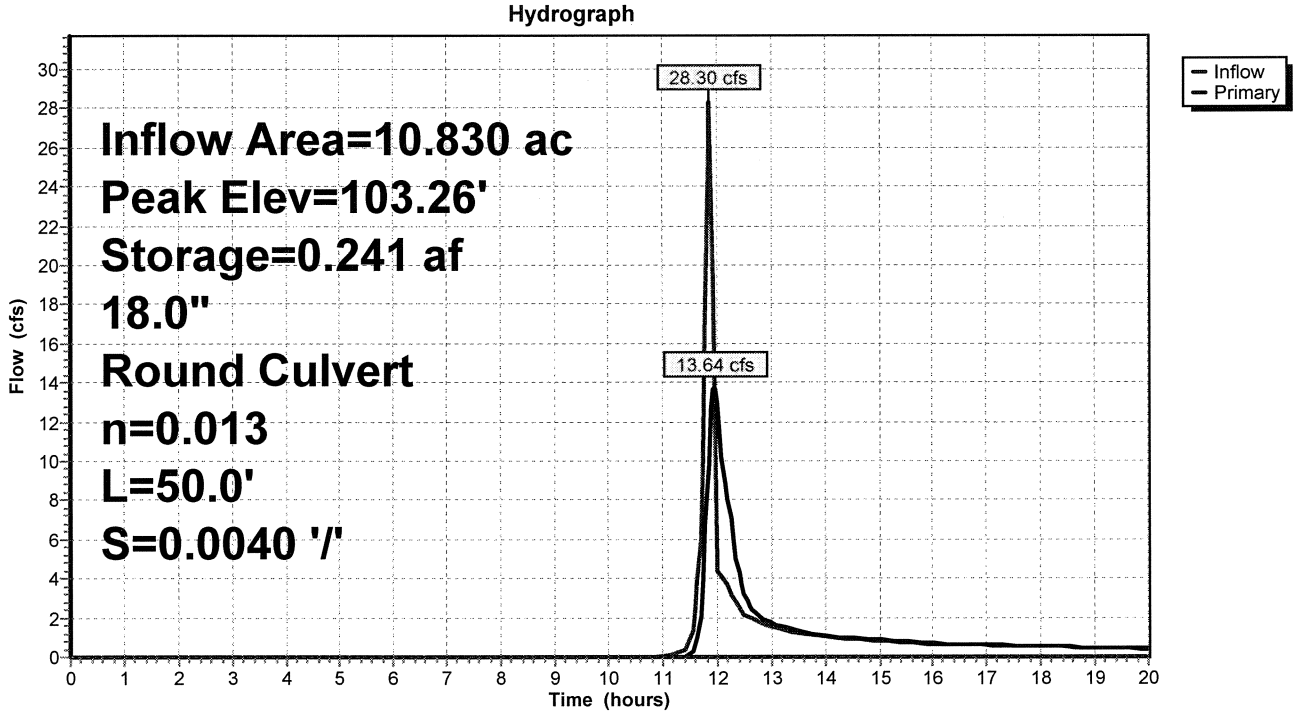
Pond 3P: (new Pond)



CIELO VISTA RUNOFF SUMMARY TABLE

	2-YEAR EXISTING	2-YEAR DEVELOPED	25-YEAR EXISTING	25-YEAR DEVELOPED
NORTH SITE				
AREA 'C'	11.26 CFS (10.7 AC)	12.4 CFS (10.7 AC)	27.04 CFS (10.7 AC)	28.31 CFS (10.7 AC)
SOUTH SITE				
AREA 'A'	33.38 CFS (29.7 AC)	36.04 CFS (29.8 AC)	77.53 CFS (29.7 AC)	81.02 CFS (29.8 AC)
AREA 'E'	22.89 CFS (19.0 AC)	9.25 CFS (8.5 AC)	52.94 CFS (19.0 AC)	21.89 CFS (8.5 AC)

EXISTING CONDITION
AREA 'C' =10.7 ACRE
Q2 = 11.3 CFS

EXISTING CONDITION
AREA 'E' =19.0 ACRE
Q2 = 22.9 CFS

EXISTING CONDITION
AREA 'A' =29.8 ACRE
Q2 = 33.4 CFS

TRACT 15501

TRACT 10455

TRACT 13800

TRACT 1285

NORTHWEST AREA

WIRE SPRINGS CYN
BLUE MUD CYN
(CREEK 'A')

EX. CREEK 'B'

EX. CREEK 'C'

EX. CREEK 'D'

TRACT BOUNDARY PROPERTY LIMITS

Confluence CD

Confluence BCD

VIA DEL AGUA

STONEHAVEN

LEGEND

- A1 / 0.25 — SUB-AREA I.D. / SUB-AREA ACREAGE
- PROPOSED STORM DRAIN PIPE
- DRAINAGE AREA BOUNDARY
- NODE NUMBER / Q25=0
- Qs 25-YR SURFACE FLOW
- Qp 25-YR PIPE FLOW
- E.O.R. EMERGENCY OVERLAND RELIEF ROUTE
- PONDING AREA AND WATER SURFACE ELEVATION 226.55 WS

GRAPHIC SCALE
(IN FEET)
1 inch =100 ft.

SCALE: 1"=100'

NO.	BY	INT	REVISIONS	R'APP'D	APP'D	DATE
1						
2						
3						
4						
5						
6						
7						

PREPARED FOR:
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3 CORPORATE PLAZA, SUITE 102
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PREPARED BY:
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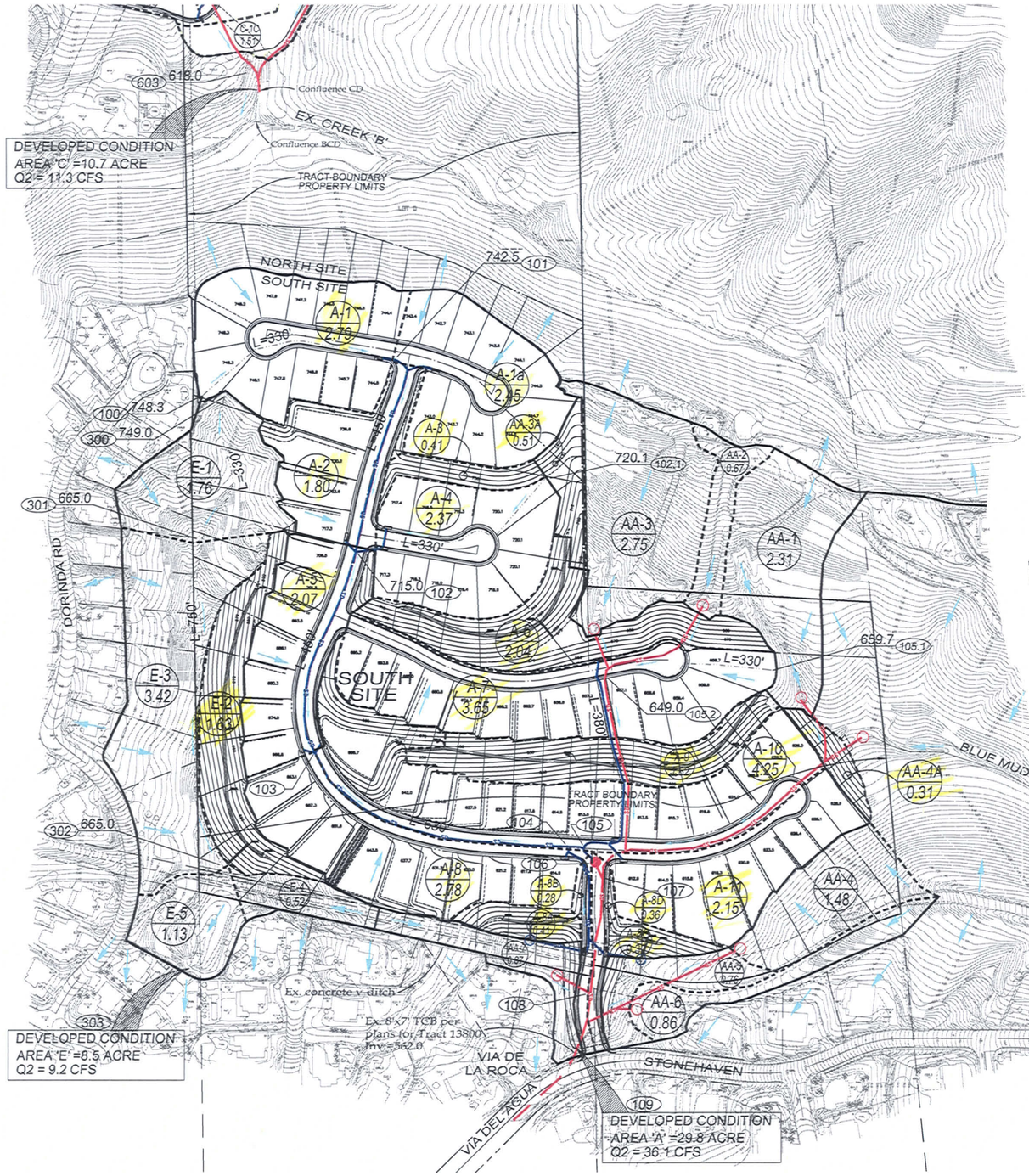
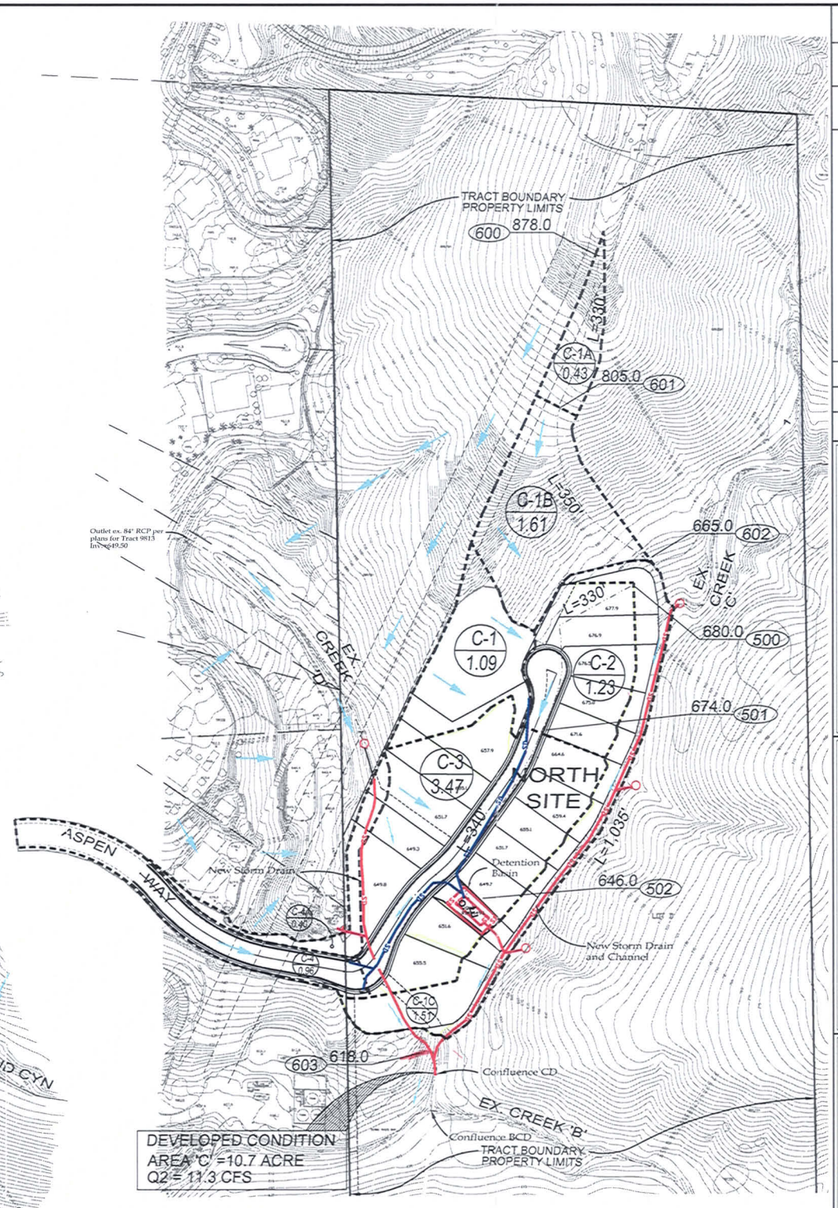
SAN JUAN CAPISTRANO, CA 92675 (949) 661-6555 - (949) 661-6554 FAX

TITLE:
HYDROLOGY STUDY - ONSITE
FOR
CIELO VISTA
CITY OF YORBA LINDA

DATE
April 5, 2013

SHEET
21
OF 2





LEGEND

A1 / 0.25	SUB-AREA I.D. / SUB-AREA ACREAGE	Qs	25-YR SURFACE FLOW
		Qp	25-YR PIPE FLOW
	PROPOSED STORM DRAIN PIPE	E.O.R.	EMERGENCY OVERLAND RELIEF ROUTE
	DRAINAGE AREA BOUNDARY		PONDING AREA AND WATER SURFACE ELEVATION
4 / Q25=0	NODE NUMBER	226.55 WS	

GRAPHIC SCALE
0 100 200 300
(IN FEET)
1 inch =100 ft.

SCALE: 1"=100'

NO.	BY	INT	REVISIONS	R'APP'D	APP'D	DATE
1						
2						
3						
4						
5						
6						

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TITLE: HYDROLOGY STUDY - ONSITE
FOR
CIELO VISTA
CITY OF YORBA LINDA

DATE: April 5, 2013

SHEET 2 OF 2

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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            Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-YEAR                                                                 *
* NORTH                                                                  *
* AREA E & F      EXISTING 2-YR (NORTH)                                  *
 **************************************************************************

  FILE NAME: CIELOXN.DAT
  TIME/DATE OF STUDY: 10:55 03/29/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        0.43      0.20      1.000     83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        2.20      0.20      1.000     83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    2.67
 EFFECTIVE AREA(ACRES) =      2.63   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       3.19

****************************************************************************
 FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    638.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.2651
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       3.19
 FLOW VELOCITY(FEET/SEC) =   6.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.74   Tc(MIN.) =   11.46
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.46
 RAINFALL INTENSITY(INCH/HR) =   1.41
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       2.63
 TOTAL STREAM AREA(ACRES) =       2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.19

****************************************************************************
 FLOW PROCESS FROM NODE    602.10 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    780.00  DOWNSTREAM(FEET) =    638.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.501
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        1.63      0.20      1.000    83    8.50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      2.16
 TOTAL AREA(ACRES) =      1.63   PEAK FLOW RATE(CFS) =      2.16

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.50
 RAINFALL INTENSITY(INCH/HR) =   1.67
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.63
 TOTAL STREAM AREA(ACRES) =       1.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.16

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1        3.19   11.46    1.407  0.20( 0.20) 1.00       2.6     600.00
     2        2.16    8.50    1.669  0.20( 0.20) 1.00       1.6     602.10
```

```
 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        5.04    8.50    1.669  0.20( 0.20) 1.00        3.6      602.10
     2        4.96   11.46    1.407  0.20( 0.20) 1.00        4.3      600.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.04    Tc(MIN.) =     8.50
 EFFECTIVE AREA(ACRES) =       3.58   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        4.3
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.50
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.669
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        4.19      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    4.19      SUBAREA RUNOFF(CFS) =    5.54
 EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      10.28

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    638.00  DOWNSTREAM(FEET) =    613.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   670.00   CHANNEL SLOPE =  0.0373
 CHANNEL FLOW THRU SUBAREA(CFS) =      10.28
 FLOW VELOCITY(FEET/SEC) =   4.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.30   Tc(MIN.) =   10.80
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.80
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        2.20      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    2.49
 EFFECTIVE AREA(ACRES) =      9.97   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       10.7       PEAK FLOW RATE(CFS) =      11.26
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.80
 EFFECTIVE AREA(ACRES) =      9.97  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =      11.26

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       11.26   10.80    1.455  0.20( 0.20) 1.00       10.0      602.10
     2       10.19   13.82    1.263  0.20( 0.20) 1.00       10.7      600.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

✓ $T_c = 10.8$ min

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* DEVELOPED                                                             *
* NORTH                                                                 *
 ************************************************************************

  FILE NAME: CIELODN.DAT
  TIME/DATE OF STUDY: 10:59 04/08/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.43      0.20      1.000    83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.546
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.61      0.20      1.000    83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.61      SUBAREA RUNOFF(CFS) =    1.95
 EFFECTIVE AREA(ACRES) =      2.04   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        2.0       PEAK FLOW RATE(CFS) =       2.47

****************************************************************************
 FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    665.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.4000
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       2.47
 FLOW VELOCITY(FEET/SEC) =   5.69 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =   10.74
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     680.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.74
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.460
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        1.51      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    1.51      SUBAREA RUNOFF(CFS) =    1.75
 EFFECTIVE AREA(ACRES) =      3.55   AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.94
 TOTAL AREA(ACRES) =        3.5       PEAK FLOW RATE(CFS) =       4.07

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    618.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1035.00   CHANNEL SLOPE =  0.0454
 CHANNEL FLOW THRU SUBAREA(CFS) =       4.07
 FLOW VELOCITY(FEET/SEC) =   4.28 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   4.03   Tc(MIN.) =   14.76
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   14.76
 RAINFALL INTENSITY(INCH/HR) =   1.22
 AREA-AVERAGED Fm(INCH/HR) =  0.19
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.94
 EFFECTIVE STREAM AREA(ACRES) =       3.55
 TOTAL STREAM AREA(ACRES) =       3.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.07

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    680.00  DOWNSTREAM(FEET) =    674.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.341
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        1.23      0.20      0.600    75    9.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      1.62
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      1.62

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    501.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.34
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.581
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.09      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.09      SUBAREA RUNOFF(CFS) =    1.36
  EFFECTIVE AREA(ACRES) =      2.32   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       2.97

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  674.00  DOWNSTREAM ELEVATION(FEET) =  646.00
  STREET LENGTH(FEET) =   340.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.11
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.32
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.40
  STREET FLOW TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =   10.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        3.47      0.20      0.600    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    3.47      SUBAREA RUNOFF(CFS) =    4.27
  EFFECTIVE AREA(ACRES) =      5.79    AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.68
  TOTAL AREA(ACRES) =        5.8        PEAK FLOW RATE(CFS) =       7.04

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.03
  FLOW VELOCITY(FEET/SEC.) =  5.54   DEPTH*VELOCITY(FT*FT/SEC.) =   1.60
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.486
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        0.40      0.20      0.850    75
```

```
  COMMERCIAL                  D        0.96      0.20     0.100    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.321
  SUBAREA AREA(ACRES) =    1.36      SUBAREA RUNOFF(CFS) =    1.74
  EFFECTIVE AREA(ACRES) =      7.15   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =        7.2       PEAK FLOW RATE(CFS) =       8.78

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.41
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       7.15
  TOTAL STREAM AREA(ACRES) =       7.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.78

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1        4.07   14.76    1.216  0.20( 0.19) 0.94       3.5     600.00
      2        8.78   10.41    1.486  0.20( 0.12) 0.61       7.2     500.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1       12.40   10.41    1.486  0.20( 0.14) 0.69       9.7     500.00
      2       11.11   14.76    1.216  0.20( 0.14) 0.72      10.7     600.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.40    Tc(MIN.) =    10.41
  EFFECTIVE AREA(ACRES) =       9.65   AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
  TOTAL AREA(ACRES) =       10.7
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.41
  EFFECTIVE AREA(ACRES) =      9.65  AREA-AVERAGED Fm(INCH/HR)=  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.693
  PEAK FLOW RATE(CFS)    =      12.40

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1       12.40   10.41    1.486  0.20( 0.14) 0.69       9.7     500.00
      2       11.11   14.76    1.216  0.20( 0.14) 0.72      10.7     600.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

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

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

--------------------------------------------------------------------------
  FILE NAME: CIELOXN.DAT
  TIME/DATE OF STUDY: 14:42 03/29/2013  EXISTING 25-YR (NORTH)
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.313
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.43      0.20      1.000    83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      1.20

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.313
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        2.20      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    6.16
  EFFECTIVE AREA(ACRES) =      2.63   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
```

```
 TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       7.37

****************************************************************************
 FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    805.00  DOWNSTREAM(FEET) =    638.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   630.00   CHANNEL SLOPE =  0.2651
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       7.37
 FLOW VELOCITY(FEET/SEC) =   7.32 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.43   Tc(MIN.) =   11.14
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.14
 RAINFALL INTENSITY(INCH/HR) =   3.06
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       2.63
 TOTAL STREAM AREA(ACRES) =       2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.37

****************************************************************************
 FLOW PROCESS FROM NODE    602.10 TO NODE    602.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    780.00  DOWNSTREAM(FEET) =    638.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.501
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.572
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        1.63      0.20      1.000    83    8.50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      4.95
 TOTAL AREA(ACRES) =      1.63   PEAK FLOW RATE(CFS) =      4.95

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    602.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.50
 RAINFALL INTENSITY(INCH/HR) =   3.57
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.63
 TOTAL STREAM AREA(ACRES) =       1.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.95

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.37   11.14    3.065  0.20( 0.20) 1.00       2.6     600.00
     2        4.95    8.50    3.572  0.20( 0.20) 1.00       1.6     602.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       11.56    8.50    3.572  0.20( 0.20) 1.00       3.6     602.10
    2       11.57   11.14    3.065  0.20( 0.20) 1.00       4.3     600.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.57    Tc(MIN.) =    11.14
 EFFECTIVE AREA(ACRES) =       4.26   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        4.3
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   11.14
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.065
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        4.19      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    4.19      SUBAREA RUNOFF(CFS) =   10.80
 EFFECTIVE AREA(ACRES) =      8.45   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      21.78

 ** PEAK FLOW RATE TABLE **
  STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       23.75    8.50    3.572  0.20( 0.20) 1.00       7.8     602.10
    2       21.78   11.14    3.065  0.20( 0.20) 1.00       8.5     600.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      23.75  Tc(MIN.) =    8.50
 AREA-AVERAGED Fm(INCH/HR) =  0.20  AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00  EFFECTIVE AREA(ACRES) =       7.83

****************************************************************************
 FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    638.00  DOWNSTREAM(FEET) =    613.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   670.00   CHANNEL SLOPE =  0.0373
 CHANNEL FLOW THRU SUBAREA(CFS) =      23.75
 FLOW VELOCITY(FEET/SEC) =   6.06 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.84   Tc(MIN.) =   10.34
 LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1630.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.34
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.197
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        2.20      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    2.20      SUBAREA RUNOFF(CFS) =    5.93
 EFFECTIVE AREA(ACRES) =     10.03   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       10.7       PEAK FLOW RATE(CFS) =      27.04
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.34
 EFFECTIVE AREA(ACRES) =     10.03  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =      27.04

 ** PEAK FLOW RATE TABLE **
  STREAM       Q       Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       27.04   10.34    3.197  0.20( 0.20) 1.00      10.0     602.10
```

2	24.97	13.03	2.805	0.20(0.20)	1.00	10.7	600.00

END OF RATIONAL METHOD ANALYSIS

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                          Analysis prepared by:

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                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 25-YEAR                                                              *
* DEVELOPED                                                            *
* NORTH                                                                *
 **************************************************************************

  FILE NAME: CIELODN.DAT
  TIME/DATE OF STUDY: 10:55 04/08/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    878.00  DOWNSTREAM(FEET) =    805.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.711
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.313
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.43      0.20      1.000    83    9.71
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.43   PEAK FLOW RATE(CFS) =      1.20

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.71
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.313
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.61      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.61      SUBAREA RUNOFF(CFS) =     4.51
  EFFECTIVE AREA(ACRES) =      2.04   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =         2.0       PEAK FLOW RATE(CFS) =        5.72

****************************************************************************
  FLOW PROCESS FROM NODE     601.00 TO NODE     602.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     805.00  DOWNSTREAM(FEET) =     665.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.4000
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =        5.72
  FLOW VELOCITY(FEET/SEC) =   6.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.85   Tc(MIN.) =   10.56
  LONGEST FLOWPATH FROM NODE     600.00 TO NODE     602.00 =     680.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.56
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.160
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        1.51      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     1.51      SUBAREA RUNOFF(CFS) =     4.06
  EFFECTIVE AREA(ACRES) =      3.55   AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.94
  TOTAL AREA(ACRES) =         3.5       PEAK FLOW RATE(CFS) =        9.50

****************************************************************************
  FLOW PROCESS FROM NODE     602.00 TO NODE     603.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     665.00  DOWNSTREAM(FEET) =     618.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1035.00   CHANNEL SLOPE =  0.0454
  CHANNEL FLOW THRU SUBAREA(CFS) =        9.50
  FLOW VELOCITY(FEET/SEC) =   5.26 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.28   Tc(MIN.) =   13.84
  LONGEST FLOWPATH FROM NODE     600.00 TO NODE     603.00 =    1715.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     603.00 TO NODE     603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.84
  RAINFALL INTENSITY(INCH/HR) =   2.71
  AREA-AVERAGED Fm(INCH/HR) =  0.19
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.94
  EFFECTIVE STREAM AREA(ACRES) =       3.55
  TOTAL STREAM AREA(ACRES) =       3.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.50

****************************************************************************
  FLOW PROCESS FROM NODE     500.00 TO NODE     501.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =     680.00  DOWNSTREAM(FEET) =     674.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =     9.341
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.387
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
```

```
     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN   (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        1.23      0.20      0.600     75     9.34
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.62
  TOTAL AREA(ACRES) =      1.23   PEAK FLOW RATE(CFS) =      3.62

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    501.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.34
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.387
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.09      0.20      1.000     83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.09      SUBAREA RUNOFF(CFS) =     3.13
  EFFECTIVE AREA(ACRES) =      2.32   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.79
  TOTAL AREA(ACRES) =        2.3       PEAK FLOW RATE(CFS) =       6.74

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  674.00  DOWNSTREAM ELEVATION(FEET) =  646.00
  STREET LENGTH(FEET) =   340.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.57
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =    9.22
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.07
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.99
  STREET FLOW TRAVEL TIME(MIN.) =   0.93   Tc(MIN.) =   10.27
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.209
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        3.47      0.20      0.600     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     3.47      SUBAREA RUNOFF(CFS) =     9.65
  EFFECTIVE AREA(ACRES) =      5.79    AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.68
  TOTAL AREA(ACRES) =        5.8        PEAK FLOW RATE(CFS) =      16.02

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  10.74
  FLOW VELOCITY(FEET/SEC.) =  6.54   DEPTH*VELOCITY(FT*FT/SEC.) =   2.32
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =     670.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    603.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.27
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.209
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)   CN
  PUBLIC PARK                D        0.40      0.20      0.850     75
```

```
  COMMERCIAL                  D        0.96      0.20     0.100    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.321
  SUBAREA AREA(ACRES) =     1.36      SUBAREA RUNOFF(CFS) =     3.85
  EFFECTIVE AREA(ACRES) =      7.15   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =        7.2       PEAK FLOW RATE(CFS) =      19.87

****************************************************************************
  FLOW PROCESS FROM NODE    503.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.27
  RAINFALL INTENSITY(INCH/HR) =   3.21
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       7.15
  TOTAL STREAM AREA(ACRES) =       7.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      19.87

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        9.50   13.84    2.711  0.20( 0.19) 0.94       3.5     600.00
      2       19.87   10.27    3.209  0.20( 0.12) 0.61       7.2     500.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       28.31   10.27    3.209  0.20( 0.14) 0.70       9.8     500.00
      2       26.16   13.84    2.711  0.20( 0.14) 0.72      10.7     600.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      28.31    Tc(MIN.) =    10.27
  EFFECTIVE AREA(ACRES) =       9.79   AREA-AVERAGED Fm(INCH/HR) =  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.70
  TOTAL AREA(ACRES) =       10.7
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =    1715.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       10.7  TC(MIN.) =     10.27
  EFFECTIVE AREA(ACRES) =      9.79  AREA-AVERAGED Fm(INCH/HR)=  0.14
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.696
  PEAK FLOW RATE(CFS)    =      28.31

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       28.31   10.27    3.209  0.20( 0.14) 0.70       9.8     500.00
      2       26.16   13.84    2.711  0.20( 0.14) 0.72      10.7     600.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
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                          Analysis prepared by:

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                       27127 Calle Arroyo, Suite 1904
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 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA B                  EXISTING 2-YEAR (SOUTH "A")                    *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 15:06 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE   FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)     (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.86      0.20      1.000    83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.04
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      2.04

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       13.03      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   14.30
  EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      16.34
  FLOW VELOCITY(FEET/SEC) =   8.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   13.03
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.03
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.89
  TOTAL STREAM AREA(ACRES) =      14.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.34

****************************************************************************
  FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        1.65      0.20     1.000    83   10.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.90
  TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      1.90

****************************************************************************
  FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       13.18      0.20     1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   15.15
  EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      17.05

****************************************************************************
  FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    755.00  DOWNSTREAM(FEET) =    564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.05
  FLOW VELOCITY(FEET/SEC) =   9.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =   13.05
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.05
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.83
  TOTAL STREAM AREA(ACRES) =      14.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1       16.34   13.03    1.306  0.20( 0.20) 1.00       14.9     200.00
      2       17.05   13.05    1.305  0.20( 0.20) 1.00       14.8     202.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00       29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00       29.7     202.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.38    Tc(MIN.) =    13.03
  EFFECTIVE AREA(ACRES) =      29.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       29.7
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       29.7  TC(MIN.) =     13.03
  EFFECTIVE AREA(ACRES) =     29.70  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      33.38

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00       29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00       29.7     202.10
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 29.7

Q = 33.4 CFS

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-year                                                                  *
* AREA C          EXISTING 2-YEAR (SOUTH "E")                             *
*                                                                         *
 *************************************************************************

  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 15:07 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       2.17      0.20      1.000    83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.62
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      2.62

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D      16.79      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   20.27
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      22.89

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.89
  FLOW VELOCITY(FEET/SEC) =   8.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   12.02
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       19.0  TC(MIN.) =     12.02
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      22.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 19.0 acre

Q = 22.9 cfs

```
**************************************************************************
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                          Analysis prepared by:

                         Charles Hartman & Associates
                        27127 Calle Arroyo, Suite 1904
                        San Juan Capistrano, CA 92675
                                949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* AREA B DEVELOPED  PROPOSED 2-YEAR (SOUTH B)                           *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:19 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.79      0.20       0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.70
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      2.70

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.45      0.20       0.600    75
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =    2.37
 EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.07
 PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =   15.83
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   15.83
 RAINFALL INTENSITY(INCH/HR) =   1.17
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       5.24
 TOTAL STREAM AREA(ACRES) =       5.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"         D       2.37     0.20      0.600     75    9.65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      3.05
 TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      3.05

****************************************************************************
 FLOW PROCESS FROM NODE    102.20 TO NODE    102.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                  D       0.41     0.20      0.850     75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.51
 EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       3.56

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.65
  RAINFALL INTENSITY(INCH/HR) =   1.55
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.64
  EFFECTIVE STREAM AREA(ACRES) =       2.78
  TOTAL STREAM AREA(ACRES) =       2.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.56

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        5.07   15.83    1.168  0.20( 0.12) 0.60       5.2     100.00
      2        3.56    9.65    1.552  0.20( 0.13) 0.64       2.8     102.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.79    9.65    1.552  0.20( 0.12) 0.62       6.0     102.10
      2        7.67   15.83    1.168  0.20( 0.12) 0.61       8.0     100.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =     9.65
  EFFECTIVE AREA(ACRES) =       5.97   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =        8.0
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =    9.65
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        1.80      0.20      0.600    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     1.80      SUBAREA RUNOFF(CFS) =     2.32
  EFFECTIVE AREA(ACRES) =       7.77   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =         9.8       PEAK FLOW RATE(CFS) =       10.00

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.00
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       D        2.07        0.20     0.600     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.07      SUBAREA RUNOFF(CFS) =     2.59
  EFFECTIVE AREA(ACRES) =      9.84   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.29
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   10.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.40
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       9.84
  TOTAL STREAM AREA(ACRES) =      11.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
  ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                D        0.41      0.20       0.850    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        0.28      0.20       0.100    75
  COMMERCIAL                 D        0.36      0.20       0.100    75
  PUBLIC PARK                D        0.32      0.20       0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =     0.96      SUBAREA RUNOFF(CFS) =     1.90
  EFFECTIVE AREA(ACRES) =      1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.67

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.78      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    5.36
 EFFECTIVE AREA(ACRES) =      4.15   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.26
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.57
 EFFECTIVE STREAM AREA(ACRES) =       4.15
 TOTAL STREAM AREA(ACRES) =       4.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.03

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       12.29   10.40    1.487  0.20( 0.12) 0.61       9.8      102.10
     1       10.98   16.59    1.137  0.20( 0.12) 0.61      11.9      100.00
     2        8.03    5.00    2.264  0.20( 0.11) 0.57       4.2      104.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       17.30    5.00    2.264  0.20( 0.12) 0.59       8.9      104.10
     2       17.42   10.40    1.487  0.20( 0.12) 0.60      14.0      102.10
     3       14.80   16.59    1.137  0.20( 0.12) 0.60      16.0      100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.42    Tc(MIN.) =    10.40
 EFFECTIVE AREA(ACRES) =      13.99   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       16.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.42
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.44
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.44
```

```
 RAINFALL INTENSITY(INCH/HR) =   1.48
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      13.99
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.42

****************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      5.16
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.32
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    2.79
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       7.95

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   649.00  DOWNSTREAM(FEET) =   604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.95
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.71
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.71
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.646
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        4.25      0.20      0.600    75
 PUBLIC PARK                 D        1.62      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.650
 SUBAREA AREA(ACRES) =    8.02      SUBAREA RUNOFF(CFS) =   10.94
```

```
 EFFECTIVE AREA(ACRES) =     13.71   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.67
 TOTAL AREA(ACRES) =       13.7       PEAK FLOW RATE(CFS) =      18.66

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.65
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.67
 EFFECTIVE STREAM AREA(ACRES) =      13.71
 TOTAL STREAM AREA(ACRES) =      13.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.04    2.253  0.20( 0.12) 0.59       8.9     104.10
     1       17.42   10.44    1.484  0.20( 0.12) 0.60      14.0     102.10
     1       14.80   16.63    1.135  0.20( 0.12) 0.60      16.0     100.00
     2       18.66    8.71    1.646  0.20( 0.13) 0.67      13.7     105.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.43    5.04    2.253  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    8.71    1.646  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.44    1.484  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   16.63    1.135  0.20( 0.13) 0.63      29.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =      26.07   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =       29.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.49
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1956.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   576.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  43.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2006.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.26
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.21
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      29.8  TC(MIN.) =      9.21
  EFFECTIVE AREA(ACRES) =     26.07  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
  PEAK FLOW RATE(CFS)    =      36.04

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc    Intensity    Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR)  (INCH/HR)           (ACRES)     NODE
      1       32.43    5.54    2.134   0.20( 0.13) 0.63       16.8      104.10
      2       36.04    9.21    1.594   0.20( 0.13) 0.63       26.1      105.10
      3       34.08   10.94    1.445   0.20( 0.13) 0.63       27.7      102.10
      4       27.17   17.17    1.115   0.20( 0.13) 0.63       29.8      100.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A=29.8 acr
Q = 36.1

Q Increased from 33.4 CFS

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA C DEVELOPED   PROPOSED 2-YEAR (SOUTH C)                           *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:53 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.76      0.20      1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      2.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        3.42      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     4.31
  EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.49

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.49
  FLOW VELOCITY(FEET/SEC) =   5.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK               D        1.63      0.20      0.850    75
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        0.52      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
  SUBAREA AREA(ACRES) =     2.15      SUBAREA RUNOFF(CFS) =     2.36
  EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"              D        1.13      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.13      SUBAREA RUNOFF(CFS) =     1.22
  EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =       9.25

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    605.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.25
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.50
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     12.50
  EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
  PEAK FLOW RATE(CFS)    =       9.25
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

A = 8.5

Q_2 = 9.2

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

--------------------------------------------------------------------------
  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 14:44 03/29/2013   EXISTING 25-YR (SOUTH B)
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.043
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.86      0.20      1.000    83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      4.76
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      4.76

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.043
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       13.03      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   33.35
  EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
```

```
 TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      38.11

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      38.11
 FLOW VELOCITY(FEET/SEC) =  11.33 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.39   Tc(MIN.) =   12.67
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.67
 RAINFALL INTENSITY(INCH/HR) =   2.85
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.89
 TOTAL STREAM AREA(ACRES) =      14.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      38.11

****************************************************************************
 FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.167
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                D        1.65      0.20      1.000    83   10.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      4.41
 TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      4.41

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.52
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.167
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                D       13.18      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   35.19
 EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      39.60

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    755.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
```

```
 CHANNEL FLOW THRU SUBAREA(CFS) =      39.60
 FLOW VELOCITY(FEET/SEC) =  11.45 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.01   Tc(MIN.) =   12.53
 LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.53
 RAINFALL INTENSITY(INCH/HR) =   2.87
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.83
 TOTAL STREAM AREA(ACRES) =      14.83
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      39.60

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       38.11   12.67    2.850  0.20( 0.20) 1.00      14.9     200.00
     2       39.60   12.53    2.868  0.20( 0.20) 1.00      14.8     202.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       77.53   12.53    2.868  0.20( 0.20) 1.00      29.5     202.10
     2       77.43   12.67    2.850  0.20( 0.20) 1.00      29.7     200.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      77.53    Tc(MIN.) =    12.53
 EFFECTIVE AREA(ACRES) =      29.55   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       29.7
 LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       29.7  TC(MIN.) =     12.53
 EFFECTIVE AREA(ACRES) =     29.55  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =      77.53

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       77.53   12.53    2.868  0.20( 0.20) 1.00      29.5     202.10
     2       77.43   12.67    2.850  0.20( 0.20) 1.00      29.7     200.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

♀

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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

--------------------------------------------------------------------------
  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 14:44 03/29/2013   EXISTING 25-YR (SOUTH C)
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ======= ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.303
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        2.17      0.20      1.000    83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      6.06
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      6.06

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.303
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       16.79      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   46.88
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
```

```
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      52.94

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      52.94
  FLOW VELOCITY(FEET/SEC) =  10.72 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.78   Tc(MIN.) =   11.55
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       19.0  TC(MIN.) =     11.55
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      52.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

--------------------------------------------------------------------------
  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:45 03/29/2013  PROPOSED 25-YR (SOUTH B)
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ======= ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.569
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.79      0.20      0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      6.15
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      6.15

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.569
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.45      0.20      0.600    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =    5.40
  EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
```

```
 TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      11.55

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.46
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.55
 PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   15.70
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   15.70
 RAINFALL INTENSITY(INCH/HR) =   2.52
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       5.24
 TOTAL STREAM AREA(ACRES) =       5.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.55

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.325
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.37      0.20      0.600    75    9.65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      6.84
 TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      6.84

****************************************************************************
 FLOW PROCESS FROM NODE    102.20 TO NODE    102.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.325
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        0.41      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    1.16
 EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       8.00

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
```

```
 TIME OF CONCENTRATION(MIN.) =    9.65
 RAINFALL INTENSITY(INCH/HR) =   3.32
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.64
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.00

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       11.55   15.70    2.524  0.20( 0.12) 0.60       5.2     100.00
     2        8.00    9.65    3.325  0.20( 0.13) 0.64       2.8     102.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.46    9.65    3.325  0.20( 0.12) 0.62       6.0     102.10
     2       17.55   15.70    2.524  0.20( 0.12) 0.61       8.0     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.55    Tc(MIN.) =    15.70
 EFFECTIVE AREA(ACRES) =       8.02   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =        8.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   15.70
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.524
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        1.80      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    3.89
 EFFECTIVE AREA(ACRES) =      9.82   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =        9.8       PEAK FLOW RATE(CFS) =      21.23

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       22.48    9.65    3.325  0.20( 0.12) 0.61       7.8     102.10
     2       21.23   15.70    2.524  0.20( 0.12) 0.61       9.8     100.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      22.48  Tc(MIN.) =    9.65
 AREA-AVERAGED Fm(INCH/HR) =  0.12  AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.61  EFFECTIVE AREA(ACRES) =       7.80

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.70
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      22.48
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =   10.05
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.05
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.249
```

```
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.07      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     2.07      SUBAREA RUNOFF(CFS) =     5.83
 EFFECTIVE AREA(ACRES) =      9.87   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      27.78

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      27.78
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =   10.26
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.26
 RAINFALL INTENSITY(INCH/HR) =   3.21
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.61
 EFFECTIVE STREAM AREA(ACRES) =       9.87
 TOTAL STREAM AREA(ACRES) =      11.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      27.78

****************************************************************************
 FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
 ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 PUBLIC PARK                 D        0.41      0.20      0.850    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA RUNOFF(CFS) =      1.72
 TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      1.72

****************************************************************************
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.28      0.20      0.100    75
 COMMERCIAL                  D        0.36      0.20      0.100    75
 PUBLIC PARK                 D        0.32      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =     0.96      SUBAREA RUNOFF(CFS) =     4.11
 EFFECTIVE AREA(ACRES) =      1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
```

TOTAL AREA(ACRES) = 1.4 PEAK FLOW RATE(CFS) = 5.82

****
FLOW PROCESS FROM NODE 104.20 TO NODE 104.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========
MAINLINE Tc(MIN.) = 5.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
RESIDENTIAL "3-4 DWELLINGS/ACRE"	D	2.78	0.20	0.600	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.600
SUBAREA AREA(ACRES) = 2.78 SUBAREA RUNOFF(CFS) = 11.77
EFFECTIVE AREA(ACRES) = 4.15 AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.57
TOTAL AREA(ACRES) = 4.2 PEAK FLOW RATE(CFS) = 17.59

****
FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.00
RAINFALL INTENSITY(INCH/HR) = 4.82
AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.57
EFFECTIVE STREAM AREA(ACRES) = 4.15
TOTAL STREAM AREA(ACRES) = 4.15
PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.59

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	27.78	10.26	3.211	0.20(0.12)	0.61	9.9	102.10
1	25.32	16.33	2.469	0.20(0.12)	0.61	11.9	100.00
2	17.59	5.00	4.824	0.20(0.11)	0.57	4.2	104.10

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	38.19	5.00	4.824	0.20(0.12)	0.59	9.0	104.10
2	39.35	10.26	3.211	0.20(0.12)	0.60	14.0	102.10
3	34.12	16.33	2.469	0.20(0.12)	0.60	16.0	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 39.35 Tc(MIN.) = 10.26
EFFECTIVE AREA(ACRES) = 14.02 AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.60
TOTAL AREA(ACRES) = 16.0
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 1896.00 FEET.

****
FLOW PROCESS FROM NODE 104.00 TO NODE 105.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========
ELEVATION DATA: UPSTREAM(FEET) = 606.00 DOWNSTREAM(FEET) = 605.00
FLOW LENGTH(FEET) = 30.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 24.0 INCH PIPE IS 19.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.60
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 39.35
PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 10.30
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 1926.00 FEET.

****
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========

```
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.30
 RAINFALL INTENSITY(INCH/HR) =   3.20
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      14.02
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      39.35

****************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.616
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =     11.48
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =     11.48

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.32
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.616
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    6.33
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =      17.81

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   649.00  DOWNSTREAM(FEET) =   604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.99
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.81
 PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    8.64
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.64
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.540
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        4.25      0.20      0.600    75
 PUBLIC PARK                D        1.62      0.20      0.850    75
```

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.650
SUBAREA AREA(ACRES) = 8.02 SUBAREA RUNOFF(CFS) = 24.61
EFFECTIVE AREA(ACRES) = 13.71 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.67
TOTAL AREA(ACRES) = 13.7 PEAK FLOW RATE(CFS) = 42.04

****
FLOW PROCESS FROM NODE 105.00 TO NODE 105.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 8.64
RAINFALL INTENSITY(INCH/HR) = 3.54
AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.67
EFFECTIVE STREAM AREA(ACRES) = 13.71
TOTAL STREAM AREA(ACRES) = 13.71
PEAK FLOW RATE(CFS) AT CONFLUENCE = 42.04

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	38.19	5.03	4.805	0.20(0.12)	0.59	9.0	104.10
1	39.35	10.30	3.205	0.20(0.12)	0.60	14.0	102.10
1	34.12	16.36	2.466	0.20(0.12)	0.60	16.0	100.00
2	42.04	8.64	3.540	0.20(0.13)	0.67	13.7	105.10

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	71.79	5.03	4.805	0.20(0.13)	0.63	16.9	104.10
2	81.02	8.64	3.540	0.20(0.13)	0.63	26.1	105.10
3	77.24	10.30	3.205	0.20(0.13)	0.63	27.7	102.10
4	62.90	16.36	2.466	0.20(0.13)	0.63	29.8	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 81.02 Tc(MIN.) = 8.64
EFFECTIVE AREA(ACRES) = 26.13 AREA-AVERAGED Fm(INCH/HR) = 0.13
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.63
TOTAL AREA(ACRES) = 29.8
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 105.00 = 1926.00 FEET.

****
FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========
ELEVATION DATA: UPSTREAM(FEET) = 606.00 DOWNSTREAM(FEET) = 605.00
FLOW LENGTH(FEET) = 30.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 33.0 INCH PIPE IS 23.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 17.82
ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 81.02
PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 8.66
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 1956.00 FEET.

****
FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========
ELEVATION DATA: UPSTREAM(FEET) = 605.00 DOWNSTREAM(FEET) = 576.00
FLOW LENGTH(FEET) = 50.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 52.73
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 81.02
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 8.68
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 2006.00 FEET.

****
FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 31

```
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.55
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      81.02
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    8.95
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  27.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.00
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      81.02
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    9.04
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       29.8  TC(MIN.) =      9.04
  EFFECTIVE AREA(ACRES) =     26.13  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
  PEAK FLOW RATE(CFS)   =      81.02

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       71.79    5.45    4.596  0.20( 0.13) 0.63      16.9     104.10
      2       81.02    9.04    3.451  0.20( 0.13) 0.63      26.1     105.10
      3       77.24   10.70    3.135  0.20( 0.13) 0.63      27.7     102.10
      4       62.90   16.79    2.430  0.20( 0.13) 0.63      29.8     100.00
========================================================================
========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

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

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

--------------------------------------------------------------------------
  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:46 03/29/2013 PROPOSED 25-YR (SOUTH C)
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.366
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.76      0.20      1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.01
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      5.01

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.366
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        3.42      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     9.84
  EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =      14.85
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**************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
--------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    615.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
 CHANNEL FLOW THRU SUBAREA(CFS) =      14.85
 FLOW VELOCITY(FEET/SEC) =   7.15 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   11.19
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

**************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN.) =   11.19
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.057
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        1.63      0.20      0.850    75
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        0.52      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
 SUBAREA AREA(ACRES) =    2.15      SUBAREA RUNOFF(CFS) =    5.57
 EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
 TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =      18.99

**************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
--------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN.) =   11.19
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.057
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        1.13      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.13      SUBAREA RUNOFF(CFS) =    2.91
 EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =      21.89

**************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
--------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    605.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
 CHANNEL FLOW THRU SUBAREA(CFS) =      21.89
 FLOW VELOCITY(FEET/SEC) =   6.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.72   Tc(MIN.) =   11.91
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     11.91
 EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
 PEAK FLOW RATE(CFS)    =      21.89
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
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IMPROVEMENT PLANS FOR TRACT 13800
PORTION OF TENTATIVE TRACT 13338

GENERAL NOTES

1. ALL WORK SHALL CONFORM TO STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, THE ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY STANDARD PLANS; AND THE STANDARD SPECIFICATIONS OF THE CITY OF YORBA LINDA, LATEST EDITIONS.
2. ALL EXISTING IMPROVEMENTS INCLUDING CURB AND GUTTERS, SIDEWALKS, ASPHALT CONCRETE OR P.C.C. PAVING, WHICH ARE BEING JOINED OR MATCHED IN CONNECTION WITH THIS PROJECT, SHALL BE JOINED OR MATCHED IN A MANNER SATISFACTORY TO THE CITY ENGINEER, INCLUDING NECESSARY SAWCUTTING, REMOVAL, REPLACEMENT AND CAPPING.
3. ANY EXISTING TRAVEL WAYS IN WHICH EXCAVATION IS MADE IN CONJUNCTION WITH THIS PROJECT SHALL BE COVERED BY A SEPARATE PERMIT. THIS AREA SHALL BE PROPERLY POSTED AND LIGHTED IN CONFORMANCE WITH THE STATE MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS IN ORDER TO ELIMINATE ANY HAZARDS. STREETS SHALL BE SURFACED WITH A MINIMUM OF 4" OF ASPHALT AT THE END OF EACH WORKING DAY.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND SHALL NOTIFY THE CITY ENGINEER (951-7170) 48 HOURS PRIOR TO STARTING EACH PHASE OF CONSTRUCTION AND PRIOR TO REQUIRING INSPECTION.
5. ALL UTILITIES SHALL BE INSTALLED PROIR TO PAVING OF STREETS; ALL TRENCHES SHALL BE FULLY COMPACTED TO THE SATISFACTION OF THE CITY ENGINEER. MANHOLE AND VALVE BOX FRAMES SHALL BE ADJUSTED TO FINISHED GRADES AFTER COMPLETION OF CONSTRUCTION.
6. THE CONTRACTOR SHALL DETERMINE THE LINE LOCATION OF ANY UNDERGROUND UTILITY PRIOR TO LAYING ANY LINES WHICH ARE TO CONNECT TO EXISTING SEWERS OR STORM DRAINS. THESE LINES SHALL BE EXPOSED AND JOINT ELEVATIONS VERIFIED. ANY CHANGE IN GRADE OR DEVIATON FROM THE PLANS MUST BE APPROVED BY THE CITY ENGINEER.
7. A MINIMUM OF TWO WEEKS AFTER THE COMPLETION OF THE A.C. SURFACING OR AS DIRECTED BY THE CITY ENGINEER, AN ASPHALT EMULSION SEAL COAT, SSI-H, SHALL BE APPLIED AT THE APPROXIMATE RATE OF 0.1 GAL. PER SQ. YD.
8. STREET NAME SIGNS AND TRAFFIC CONTROL SIGNS, TYPE AND LOCATIONS SHALL BE DESIGNATED BY THE CITY ENGINEER.
9. STAKES FOR CURB CONSTRUCTION ARE TO BE OFFSET FROM FACE OF CURBS.
10. THE ENGINEER SHALL FURNISH GRADE SHEETS TO THE CITY INSPECTOR FOR CONSTRUCTION OF IMPROVEMENTS.
11. IF DRIVEWAY DEPRESSIONS ARE MADE IN ANY CURB, DRIVEWAY APPROACHES ARE THEN TO BE MADE PART OF THE IMPROVEMENT PLAN AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PL NO.101-0-0C OF THE OCEMA STANDARD PLANS.
12. ADVERTISING SIGNS WILL NOT BE PERMITTED WITHIN STREET RIGHT-OF-WAY.
13. TREES SHALL BE PLANTED WITHIN THE STREET RIGHT-OF-WAY IN ACCORDANCE WITH CITY OF YORBA LINDA REQUIREMENTS.
14. STREET LIGHTS ARE TO BE INSTALLED BY SOUTHERN CALIFORNIA EDISON COMPANY PER PLAN APPROVED BY THE CITY OF YOUBA LINDA.
15. STRUCTURAL SECTION OF PAVEMENT SHALL BE DETERMINED BY THE CITY'S SOILS ENGINEER AND APPROVED BY THE CITY ENGINEER.
16. PRIME COAT SHALL CONSIST OF M.C.-70 LIQUID ASPHALT APPLIED AT THE RATE OF 0.25 GAL. PER SQ. YD. AT LEAST 12 HOURS PRIOR TO ASPHALT PAVING OPERATIONS.
17. ALL EXISTING PAVEMENT WITHIN THIS PROJECT SHALL EITHER BE REMOVED OR STRUCTURALLY TESTED TO VERIFY THE STRUCTURAL CAPABILITIES AND SHALL RESULTS BE APPROVED BY THE CITY ENGINEER.
18. COMPACTION TESTING SHALL BE PERFORMED BY THE CITY'S SOILS ENGINEER AT THE DIRECTION OF THE CITY ENGINEER.
19. INTERIOR AND EXTERIOR STREET IMPROVEMENTS SHALL BE CONSTRUCTED PRIOR TO THE ISSUANCE OF BUILDING PERMITS TO THE SATISFACTION OF THE CITY ENGINEER
20. SEWER MAIN AND LATERALS SHALL BE CONSTRUCTED, BACKFILL COMPACTED AND TESTED PRIOR TO CONSTRUCTION OF THE CURB AND GUTTER.
21. THE CURB AND GUTTER SHALL BE "ETCHED" SHOWING LATERAL LOCATIONS: "S" FOR SEWER, "G" FOR GAS, AND "E" FOR ELECTRICAL.
22. DRIVEWAYS SHALL BE LOCATED PER APPROVED PLOT PLAN BY DEVELOPER'S ENGINEER. STAKES SHALL BE SET ON CENTERLINE OF APPROACH WITH OVERALL MARKED ON WITNESS STAKE. W=BOTTOM OF "X" WIDTH.
23. STREET CENTERLINE AND INTER. VERTICAL CONTROL STAKING (GRID FLEXATIONS) SHALL BE PROVIDED ABY DEVELOPER'S ENGINEER AS REQUIRED BY CITY INSPECTOR.
24. TRAFFIC CONTROL AND SAFETY DEVICES SHALL BE PLACED AND MAINTAINED PER THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION, MANUAL OF WARNING SIGNS, LIGHTS, AND DEVICES FOR USE IN PERFORMANCE OF WORK UPON HIGHWAYS AND TO THE SATISFACTION OF THE CITY ENGINEER.
25. NOTICE TO CONTRACTORS: EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN OF THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THESE PLANS BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL THE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
26. PRIVATE ENGINEER'S NOTICE: PRIOR TO CONSTRUCTION, SEWER AND WATER CONTRACTORS SHALL ASCERTAIN THE CORRECTNESS OF WATER SERVICES AND SEWER LATERAL LOCATIONS WITH THE DEVELOPER. ANY DEVIATION FROM LOCATIONS SHOWN ON THESE PLANS SHALL BE REPORTED TO THE ENGINEER FOR ADJUSTMENT PRIOR TO CALLING FOR ANY CONSTRUCTION STAKING REQUIRED.
27. THE FINAL OR SURFACE LAYER OF ASPHALT CONCRETE SHALL NOT BE PLACED UNTIL ALL ON-SITE IMPROVEMENTS HAVE BEEN COMPLETED, INCLUDING ALL GRADING AND UNTIL ALL UNACCEPTABLE CONCRETE WORK HAS BEEN REMOVED AND REPLACED UNLESS APPROVED OTHERWISE BY THE ENGINEER, PER OCEMA STD. #1805.
28. STREET LIGHTS SHALL BE A MINIMUM OF FIVE FEET (5') AWAY FROM UTILITIES (i.e. FIRE HYDRANTS)

WATER NOTES

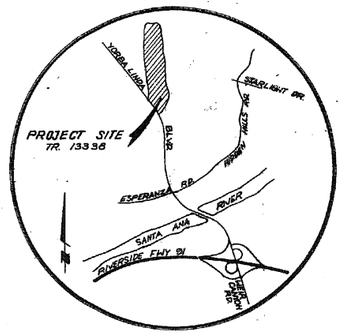
1. THE WATER SYSTEM SHALL BE INSTALLED IN CONFORMANCE WITH THE YORBA LINDA WATER DISTRICT "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER MAINS".
2. ALL SERVICES TO BE 1" PLASTIC WITH 1" METER, UNLESS OTHERWISE NOTED.
3. FIRE HYDRANTS TO BE MUELLER MODERN CENTURION A-442, OR WATEROUS PACER WB-67, MAIN VALVE OPENING TO BE 5½", HOSE OUTLETS TO BE TWO 2½", AND PUMPER CONNECTION TO BE 4"
4. ALL WATER MAINS TO BE CLASS 150-ASBESTOS CEMENT, UNLESS NOTED TO BE CLASS 200 SIZED AS SHOWN
5. METERS TO BE INSTALLED BY YORBA LINDA WATER DISTRICT.
6. IN ACCORDANCE WITH ASSEMBLY BILL 1366, THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE OF CALIFORNIA, DIVISION OF INDUSTRIAL SAFETY PRIOR TO ANY TRENCH EXCAVATION. A COPY OF SAID PERMIT SHALL BE KEPT AT THE JOB SITE AND AVAILABLE TO DISTRICT REPRESENTATIVE UPON REQUEST.
7. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
8. CONTRACTOR SHALL NOTIFY WATER DISTRICT INSPECTOR 48 HOURS PRIOR TO STARTING ANY PHASE OF CONSTRUCTION.
9. WATER VALVES ARE TO BE PLACED OUT OF SPANDREL AREA.
10. ALL WATER MAINS SHALL MAINTAIN DEPTH OF 54" TO FLOWLINE FROM TOP OF CURB.
11. MINIMUM DISTANCE BETWEEN STREET LIGHT STANDARD AND FIRE HYDRANT IS FIVE FEET
12. REFLECTIVE BLUE-DOTS TO BE PLACED AS PER YORBA LINDA WATER DISTRICT STANDARDS
13. ALL WATER MAIN CROSSINGS OF SEWER LINES SHALL CONFORM TO THE REQUIREMENTS OF THE STATE OF CALIFORNIA DEPARTAMENT OF HEALTH.

SEWER NOTES

1. ALL SEWER WORK SHALL COMPLY WITH THE GENERAL PROVISIONS, STANDARD SPECIFICATIONS AND STANDARD PLANS FOR SEWER CONSTRUCTION OF THE YORBA LINDA WATER DISTRICT, LATEST EDITION.
2. THE CONTRACTOR SHALL NOTIFY THE CITY ENGINEER AT LEAST 24 HOURS PRIOR TO THE NEED OF ANY INSPECTION.
3. VITRIFIED CLAY PIPE SEWERS SHALL HAVE JOINTS OF THE MECHANICAL COMPRESSION TYPE, SUCH AS "WEDGELOCK", "SPEED SEAL MAINLINE" OR "BANDSEAL" OR APPROVED EQUAL.
4. THE USE OF PORTLAND CEMENT IN ANY FORM WILL NOT BE PERMITTED FOR JOINTS.
5. MANHOLE COVERS SHALL BE LEFT AT LEAST 6" BELOW SUBGRADE AND BROUGHT TO FINAL GRADE UPON COMPLETION OF PAVING. FINAL MANHOLE SEATING SHALL BE 1/8" BELOW ASPHALT SURFACE.
6. FOUR INCH (4") A.B.S. SEWER HOUSE CONNECTIONS SHALL BE LAID TO GRADE AS ESTABLISHED BY THE ENGINEER FOR THE SUBDIVIDER SO THAT THE 4" A.B.S. WILL HAVE A MINIMUM COVER OF FIVE AND ONE-HALF (5.5 FEET) TO THE FLOWLINE AT PROPERTY LINE.
7. FINAL TESTING FOR PIPELINE LEAKAGE SHALL BE MADE IN THE PRESENCE OF THE INSPECTOR FOR THE CITY, AFTER BACKFILL HAS BEEN COMPLETED BY THE CONTRACTOR AND INSPECTED, APPROVED AND ACCEPTED BY THE CITY ENGINEER.
8. ALL SEWER LINES SHALL BE BALLED IN THE PRESENCE OF THE INSPECTOR FOR THE CITY AFTER FINAL TESTING AND MANHOLE COVERS HAVE BEEN BROUGHT TO GRADE UPON COMPLETION OF PAVING. BALLING MUST BE COMPLETED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO OCCUPANCY RELEASES BEING ISSUED.
9. WHERE THE SEWER HOUSE CONNECTION COVER IS LESS THAN 5.5 FEET AND DOES NOT COMPLY WITH NOTE NO. 6 ABOVE, THE CONTRACTOR SHALL SUBSTITUTE C.I.P. (A.S.M.A21.6, WITH RUBBER RING JOINTS) FOR A.B.S. OR CONCRETE ENCASE THE 4" A.B.S. PER DISTRICT STANDARD. THE C.I.P. OR CONCRETE ENCASED A.B.S. SHALL BE LAID AFTER THE WATER LINE IS INSTALLED AND SHALL BE LAID A MINIMUM DISTANCE OF 9 FEET EACH SIDE OF THE WATER LINE CROSSING WITH A 6" VERTICAL CLEARANCE BETWEEN THE WATER LINE AND THE HOUSE CONNECTION.
10. THE SUBDIVIDER'S ENGINEER SHALL SET A TOP OF CURB STAKE AT ALL SEWER LATERAL CONNECTIONS.
11. A 4" X 4" REDWOOD POST PAINTED WHITE (4' - 6' WITH 3' -0" ABOVE GROUND) SHALL BE SET AS A MANHOLE REFERENCE, WHEN SEWER IS NOT CONSTRUCTED IN THE STREET RIGHT-OF-WAY, AT THE DIRECTION OF THE ENGINEER.
12. ALL TRENCH BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% REL. DENSITY.
13. THE SUBDIVIDER'S ENGINEER SHALL FURNISH A COMPLETE SET OF "AS-BUILT" PLANS ON ORIGINAL LINENS OR MYLAR TO THE CITY ENGINEER AT THE COMPLETION OF THE SEWER WORK AND PRIOR TO PAVING STREETS SHOWING LOCATION OF WYES AND END OF HOUSE LATERALS AT PROPERTY LINE.
14. THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 4-10, "SAFETY AND ACCIDENT PREVENTION" OF THE YORBA LINDA WATER DISTRICT'S SPECIFICATIONS.
15. IF THE BOTTOM OF THE WATER MAIN DOES NOT CLEAR THE TOP OF THE SANITARY SEWER BY 3', CONCRETE ENCASEMENT OF THE SEWER WITH STEEL REINFORCING WILL BE REQUIRED, AND EXTENDING 5' EACH SIDE OF WATER MAIN MEASURED AT RIGHT ANGLES OF THE WATER MAIN.
16. SEWER LATERAL CONNECTIONS SHALL ENTER THE MAINLINE AT A POINT DOWNSTREAM OF A MANHOLE. SEWER LATERAL CONNECTIONS AT PROPERTY LINE SHALL NOT BE MADE UNTIL MAINLINE HAS BEEN AIR TESTED AND ACCEPTED FOR LEAKAGE BY THE CITY OF YORBA LINDA.
17. THE DEVELOPER SHALL FURNISH CONTRACTOR AND CITY INSPECTOR "WYE" STATIONING WITH ALL MAINLINE SEWER CUT SHEETS.
18. SEWER STATIONING SHOWN THUS: 0 + 00.00
19. ACRYLONITRILE-BUTADIENE-STYRENE (A.B.S.) PLASTIC SEWER PIPE SHALL CONFORM TO THE REQUIREMENTS OF SECTIONS , 207-15, 207-16 OF THE STANDARD SPECIFCATIONS FOR PUBLIC WORKS CONSTRUCTION.
20. SOLID WALL PLASTIC PPE SHALL HAVE AN SDR RATIO OF OUTSIDE DIAMETER TO THICKNESS OF 23.5.
21. PLASTIC PIPE SHALL BE BEDDED IN STRICT ACCORDANCE WITH THE BEDDING DETAILS HEREON. CASE 2 BEDDING SHALL BE USED FOR PIPE WITH FROM 4' TO 17' COVER. BEDDING MATERIAL SHALL BE NO. 4 AGGREGATE OR 1/2" CRUSHED ROCK. IF COVER IS LESS THAN 9', SAND MAY BE SUBSTITUTED. CASE 4 BEDDING SHALL BE USED FOR COVER GREATER THAN 17', SEE DETAIL SHEET 2.
22. HOUSE CONNECTIONS CUT THROUGH THE PIPE WILL NOT BE ACCEPTED.
23. A SEAL, WATERSTOP, OR COUPLING SHALL BE PLACED OR GROUTED INTO THE MANHOLE TO ACCEPT THE PLASTIC SEWER PIPE.
24. ALL EXPOSED ENDS OF A.B.S. COMPOSITE PIPE SHALL BE THOROUGHLY COATED WITH SOLVENT CEMENT PRIOR TO JOINING.
25. ALL MAINLINE PLASTIC (A.B.S.) PIPE SHALL BE MANDRELL TESTED PER SECTION 305-1.4.6 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. THE TEST SHALL COMMENCE AT LEAST 48 HOURS AFTER BACKFILL.
26. STANDARD 12.5' LENGTHS OF A.B.S. COMPOSITE PIPE SHALL NOT BE PLACED ON A CURVE WITH A RADIUS LESS THAN 540'. SMALLER RADIUS CURVES SHALL CONSTRUCTED USING 3 DEGREE DEFLECTION FITTINGS.

STORM DRAIN NOTES

1. ALL CONCRETE IN REINFORCED CONCRETE STRUCTURES MUST BE 3250 P.P.S.I. IN 28 DAYS. TYPE V PORTLAND CEMENT CONCRETE, CLASS A.
2. ALL PIPE LENGTHS ARE HORIZONTAL PROJECTIONS. UNLESS OTHERWISE SHOWN.
3. FOR TRENCH EXCAVATIONS IN NATIVE SOIL, SHORING SHALL BE PROVIDED TO SATISFY STATE OF CALIFORNIA SAFETY REQUIREMENTS.
4. PIPE CONSTRUCTION IN FILL AREA MUST BE COORDINATED WITH THE GRADING TO INSURE THAT WHEN THE FILL OPERATION HAS BEEN COMPLETED AT GRADE A MINIMUM OF ONE FOOT ABOVE THE TOP OF PIPE OR TO FIVE FEET (MAXIMUM) ABOVE THE PROPOSED SUBGRADE OF THE PIPE, THE STORM DRAIN TRENCH SHALL BE EXCAVATED AND THE PIPE INSTALLED.
5. ALL WORK MUST BE IN CONFORMANCE WITH THE ORANGE COUNTY E.M.A. STANDARD SPECIFICATIONS WHICH MAY BE PURCHASED FROM THE COUNTY AND KEPT ON THE JOB SITE AT ALL TIMES.
6. THE CONTRACTOR MUST NOTIFY THE CITY OF YORBA LINDA INSPECTOR AT LEAST (2) WORKING DAYS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
7. ALL FILLS MUST BE COMPACTED TO 90% RELATIVE COMPACTION AS DETERMINED BY THE CALIFORNIA TEST METHOD NO. 216-F, 1963 "FIVE LAYER METHOD". ALL BACKFILL MATERIAL MUST BE FREE OF VEGETABLE MATTER.
8. ALL SURVEYING REQUIRED FOR VERTICAL AND HORIZONTAL ALIGNMENT MUST BE PROVIDED BY THE CONTRACTOR OR DEVELOPER AND SUFFICIENT REFERENCE STAKING MUST BE IN ACCORDANCE WITH THE REQUEST OF THE CITY OF YORBA LINDA INSPECTOR.
9. ALL REINFORCED CONCRETE PIPE MUST BE BEDDED IN ACCORDANCE PIPE BEDDING DETAIL PER O.C.E.M.A. STD. PLAN 1310
10. PRIOR TO THE PLACEMENT OF STORM DRAIN IMPROVEMENTS, THE DEVELOPER'S SOILS ENGINEER SHALL CERTIFY IN WRITING TO THE CITY ENGINEER THAT THE STORM DRAINS' SUBGRADE IS OF ADEQUATE STRENGTH TO SUPPORT THE STRUCTURES AND ANY ANTICIPATED LOADS.
11. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, THE DEVELOPER'S CONTRACTOR SHALL OBTAIN A PERMIT FROM THE STATE DIVISION OF INDUSTRIAL SAFETY. A COPY OF THE PERMIT SHALL BE KEPT ON THE JOB SITE AT ALL TIMES.
12. WHENEVER APPLICABLE, THE DEVELOPER SHALL OBTAIN A PERMIT FROM THE STATE DEPT. OF FISH AND GAME IN ACCORDANCE WITH SECTION 1602 OF THE CALIFORNIA FISH AND GAME CODE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
13. ALL STEEL THAT IS TO BE CONTINUOUS SHALL BE LAPPED A MINIMUM OF 45 BAR DIAMETERS.
14. ALL MATERIALS TESTING FOR THE DRAINAGE FACILITIES SHALL BE PROVIDED BY THE CONTRACTOR OR DEVELOPER IN ACCORDANCE WITH THE NUMBER, LOCATION AND FREQUENCY REQUESTED BY THE CITY ENGINEER.
15. CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4" MIN.
16. A PERMIT FOR WORK WITHIN EXISTING STREET RIGHT OF WAY IS REQUIRED FROM THE CITY OF YORBA LINDA FOR ANY ENCROACHMENT NECESSARY FOR CONSTRUCTION IN THE STREET RIGHT OF WAY.
17. LENGTH OF MANHOLE STRUCTURES MAY BE INCREASED TO MEET PIPE ENDS AT OPTION OF CONTRACTOR AS LONG AS REINFORCING STEEL IS CONTINUED AS REQUIRED. ANY CHANGE IN SPUR LOCATION MUST BE APPROVED BY THE ENGINEER.
18. FLOOR OF MANHOLE STRUCTURE SHALL BE STEEL TROWELED TO SPRING LINE.
19. BODY OF MANHOLE STRUCTURE, INCLUDING SPUR, MUST BE POURED IN ONE CONTINUOUS OPERATION, EXCEPT THAT CONSTRUCTION JOINT AT THE SPRING LINE WITH A LONGITUDINAL KEYWAY IS PERMITTED.
20. ALL REINFORCING BARS MUST BE SECURELY HELD IN PLACE IN THE FORMS. TWO WAY MATS OF STEEL MUST BE WIRED TOGETHER BOTH WAYS AT ALTERNATE INTERSECTIONS.
21. STORM DRAIN BACKFILL FOR ALL FACILITIES WITHIN STREET RIGHT OF WAY IS TO BE PLACED AND COMPACTED UNDER CITY OF YORBA LINDA INSPECTION AND MEET OR EXCEED O.C.E.M.A. MINIMUM STANDARDS.
22. ALL PIPE TO BE BANDED AND GROUTED.
23. AREA DRAIN PIPE SHALL BE :
    A. ACRYLONITRILE BUTADIENE STYRENE (A.B.S.) SOLID WALL PIPE CONFORMING TO A.S.T.M. D 2751, SDR35.
    OR B. POLYVINYL CHLORIDE PLASTIC (P.V.C.) PIPE CONFORMING TO A.S.T.M. D 3034, SDR 35.
    OR C. ASBESTOS CEMENT PIPE (A.C.P.) CONFORMING TO A.S.T.M. C-663.
    OR D. APPROVED EQUAL.
24. R.C.P. SHALL COMPLY WITH ALL A.S.T.M. APPLICABLE STANDARDS.



VICINITY MAP
NO SCALE

LEGEND:

- FIRE HYDRANT ASSEMBLY
- A.C.P. WATER MAIN and BLOW-OFF VALVE
- A.C.P. WATER MAIN and GATE VALVE
- SEWER MAIN and MANHOLE
- STREET LIGHT
- STREET NAME SIGN
- STOP SIGN
- BARRICADE
- (5) LOT NUMBER

NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THIS PLAN BY THE CITY OF YORBA LINDA DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OR COMPLETENESS OF THE LOCATION OR EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY PIPE OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL DUE PRECAUTIONARY MEANS TO PROTECT THE UTILITY LINES NOT OF RECORD OR NOT SHOWN ON THIS PLAN

NOTE:

CONTRACTOR AGREES THAT WE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS ABD THAT THE CONTRACTOR SHALL DEFEND INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY REAL OR ALLEGED IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

REGISTERED PROFESSIONAL ENGINEER TOM McGANNON NO. 23956 EXP. 12-31-89 CIVIL STATE OF CALIFORNIA

DESIGNED BY: G.R./F.A.
DRAWN BY: M.G./F.A.
CHECKED BY: _____

APPROVED FOR STREET LIGHT LOCATION ONLY:
CITY ENGINEER 12/16/88 DATE

DRAWING OF RECORD
JAMES H PARDUE RCE 42758 4-20-90 DATE
EXP 3-31-90 J-8036

YORBA LINDA WATER DISTRICT
APPROVED FOR WATER IMPROVEMENTS: (J-8851)
William P. Workman 2-15-89
GENERAL MANAGER DATE

APPROVED FOR FIRE HYDRANT LOCATION ONLY:
1/24/89 DATE
REVISED 3-1-89
LOTS 14-18, 28, 29, 32 & 33 SHALL HAVE AN AUTOMATIC RESIDENTIAL FIRE SPRINKLER SYSTEM

REVISIONS

NO.	DESCRIPTION:	APPRD.	DATE:
7	ADDED "NOTE 14, THROUGH 19" TO GENERAL NOTES, ADDED "NOTE 26" TO WATER NOTES, ADDED "NOTE 27" TO SEWER NOTES, REVISED "NOTE 23" TO STORM DRAIN NOTES		4/26/89
6	ADDED SIDEWALK TO 6'-0" SIDE OF SEVENLIGHT, DELETED 2 & 4		2/21/89
5	ELIMINATED 6'-0" R.C.B. 10' W/ 6'-0" SIDEWALK		2/15/89
4	ADDED CONNECTION SCHEDULE (SHEET 3) & 3-D VIEW		1/24/89
3	SHOW WATER METER & SERVICE LOCATION SHT 3 & 5-23-89		
2	MINOR TIME ADJUSTMENT		
1	ADDED SHTS 6&7 11-18-88		

BASIS OF BEARINGS

THE BEARING OF N.05°32'30"W AS SHOWN FOR THE EASTERLY LINE OF PARCEL MAP NO. 87-457, AS FILED IN BOOK 250, PAGES 44 AND 45 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF ORANGE, WAS USED AS THE BASIS OF BEARINGS FOR THIS MAP.

BENCH MARK

O.C. B.M. # 27-53-83 STD. O.C.S.B.M. DISC. ABOUT 38 FT. NORTH OF THE CENTER-LINE OF ESPERANCA RD., ABOUT 690 FT. EAST OF THE WEIR CANYON OVER-CROSSING BRIDGE ABOUT 440 FT. WEST OF THE CENTERLINE OF NEW RIVER BLVD., 3.3 FT. BACK OF THE CURB FACE, ON THE NORTHWEST CORNER OF AN 8.3 FT. BY 42 FT. CATCH BASIN ADJUSTED 1976 ELEV. 378.741

SOILS/GEOLOGISTS

GEO SOILS, INC.
1446 EAST CHESTNUT AVENUE
SANTA ANA, CA 92701
(714) 647-0277

CITY ENGINEER

APPROVED BY YORBA LINDA CITY ENGINEER 11/16/88
ROY F. STEPHENSON RCE DATE

OWNER

BRIGHTON HOMES
505 NORTH TUSTIN #250
SANTA ANA, CA 92705
(714) 667-9999

ENGINEER

HUNSAKER & ASSOCIATES IRVINE, INC.
THREE HUGHES, IRVINE CA. 92718
(714) 583-1010
1-29-88 DATE
Tom R. McGannon EXP. 12-31-89
TOM R. McGANNON R.C.E. 23956

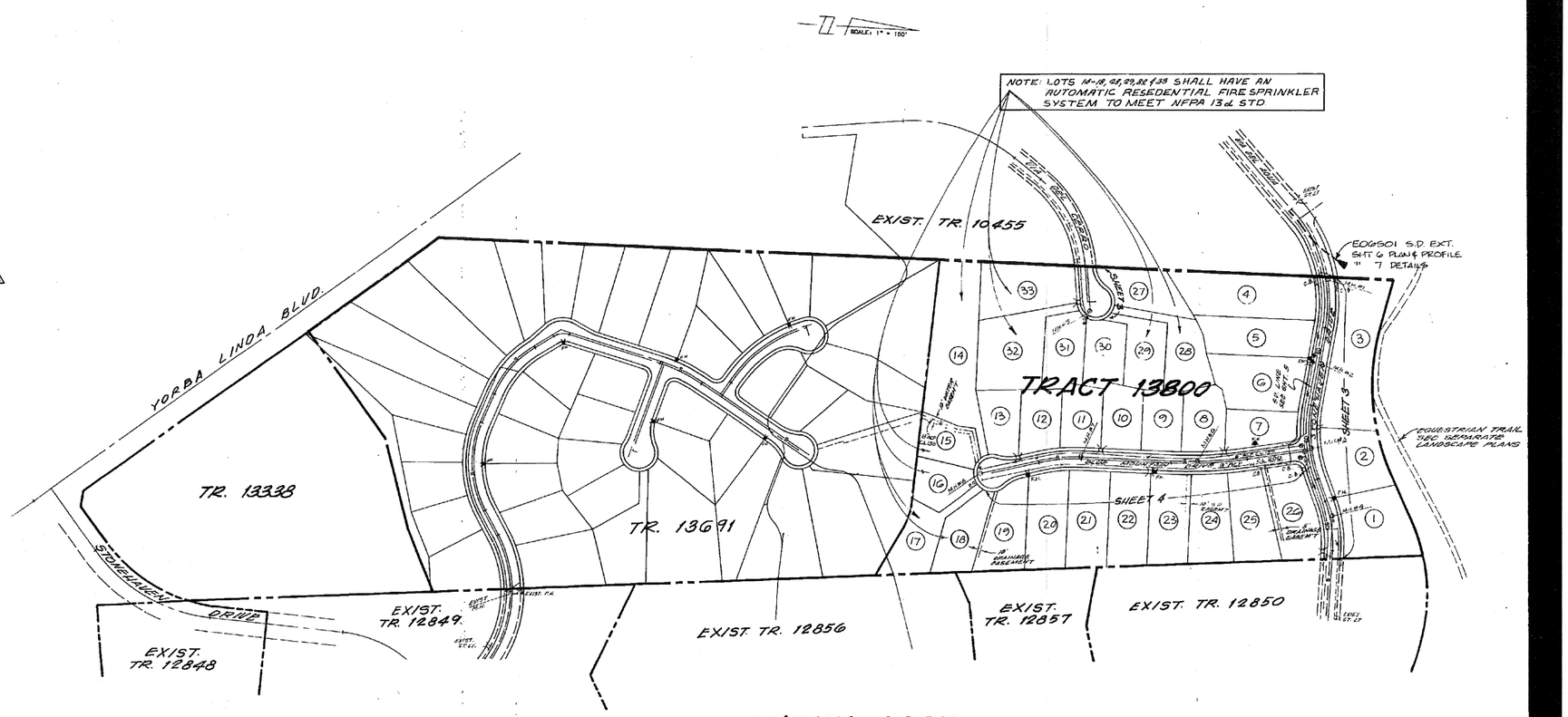
CITY OF YORBA LINDA

IMPROVEMENT PLANS FOR TRACT 13800
A PORTION OF T.TR.NO. 13338
SHEET 1 OF 7

TITLE SHEET / STREET-SEWER-WATER IMPRV - 3830.0[PF: 10667 1015 03-Feb-88 01:49 PM / 094-10667-880

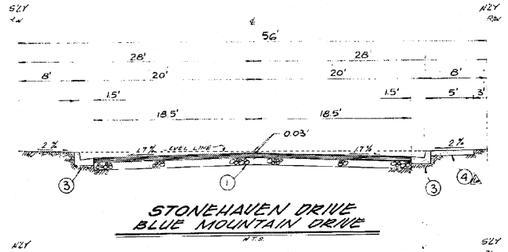
ESTIMATE OF QUANTITIES

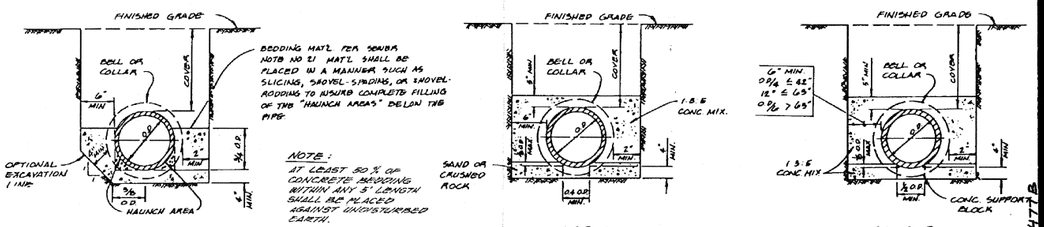
NO.	DESCRIPTION	AMOUNT	UNIT
	STREETS		
1	CONSTRUCT " A.C. ON " A.B.	69,769	S.F.
2	CONSTRUCT " A.C. ON "A.B.	—	
3	CONSTRUCT TYPE A2-6 CURB & GUTTER PER O.C.E.M.A. 1001-0-0C, TYPE A2-6 (6" C.F.) W=1.5'	3,536	L.F.
4	CONSTRUCT CONCRETE SIDEWALK PER O.C.E.M.A. STD. PLAN 1205	4,863	L.F.
5	CONSTRUCT SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M.A. STD PLAN 1111 & A.P.W.A. 102-0-0C	2	EA.
6	CONSTRUCT CROSS GUTTER PER O.C.E.M.A. 106-0-0C	—	
7	CONSTRUCT DRIVEWAY APPROACH PER O.C.E.M.A. 101-0-0C	3,416	S.F.
8	INSTALL STREET NAME SIGN PER CITY OF YORBA LINDA STDS.		
9	INSTALL STOP SIGN PER CITY OF YORBA LINDA STDS.		
10	INSTALL 5,800 LUMEN STREET LIGHT	10	EA.
11	CONSTRUCT LOCAL DEPRESSION PER O.C.E.M.A. STD. PLAN 1308		
12	REMOVE EXISTTING BARRICADE	4	EA.
13	INSTALL BARRICADE PER O.C.E.M.A. STD. PLAN 1401	—	
14	CONST. PARKWAY CULVERT - TYPE "B" PER O.C.E.M.A. STD 1309	2	EA.
15	6" TO 8" CURB TRANSITION	16	L.F.
16	REMOVE EXIST. A.C.	2,965	S.F.
17	REMOVE EXIST. S/W	697	S.F.
18	REMOVE EXIST. CURB and GUTTER	182	L.F.
19	INSTALL W-53 "NOT A THROUGH STREET" SIGN	1	EA.
66	INSTALL 6" GATE VALVE	5	EA.
67	INSTALL 8" ACP WATER MAIN CL. 200	1103	EA.
68	2" LANDSCAPE SERVICE	1	EA.
	SEWER		
30	CONSTRUCT 8" A.B.S. TRUSS PIPE SEWER PER Y.L.W.D. STD. PLANS	2281	L.F.
31	CONSTRUCT 48" M.H. PER Y.L.W.D. STD. SP-3	8	EA.
32	CONSTRUCT CLEAN-OUT PER Y.L.W.D. STD. PLAN SP-5	—	
33	CONSTRUCT 4" A.B.S. HOUSE LATERAL PER Y.L.W.D. STD. PLANS SP-2A & SP-2B	1094	L.F.
34	INSTALL 8" D.I.P. PER Y.L.W.D. STDS.	—	
35	CONSTRUCT 4" A.B.S. HOUSE LATERAL WITH BACKFLOW DEVICE PER Y.L.W.D. STDS. SP-2A AND SP-2B	—	
36	REMOVE EXISTING PLUG and JOIN	3	EA.
37	JOIN EXISTING MANHOLE	—	
38	INSTALL A.B.S. PLUG	—	
39	CONSTRUCT 48" DROP M.H. PER Y.L.W.D. STD. SP-5	—	
40	CONSTRUCT CONCRETE ENCASEMENT PER Y.L.W.D. STD S.P. 9 TYPE 1A	—	
41	CONSTRUCT MANHOLE BASE PER Y.L.W.D. SP2C	1	EA.
42	INSTALL BACK WATER VALVE		
43	INSTALL DIAL SYSTEM		
	WATER		
50	INSTALL 8" A.C.P. WATER MAIN CL. 150	1591	L.F.
51	INSTALL 2" TEMPORARY BLOW-OFF VALVE	1	EA.
52	INSTALL 8"x6" REDUCER	—	
53	INSTALL 8" GATE VALVE	5	EA.
54	INSTALL FIRE HYDRANT AND ASSEMBLY	3	EA
55	REMOVE EXISTING BLOW-OFF AND JOIN	3	EA
56	INSTALL 8"x8" TEE	2	EA.
57	INSTALL 8"x2" BLOW-OFF VALVE	2	EA.
58	INSTALL 1" SERVICE	33	EA.
59	INSTALL AIR-VACUUM AND AIR RELEASE VALVE ASS'Y	—	
60	8"-90° BEND	3	EA.
61	INSTALL 8"-45° BEND	1	EA
62	INSTALL 8"-22½° BEND	—	
63	INSTALL 8"-11¼° BEND	2	EA
64	INSTALL BLUE REFLECTOR PER YLWD STD.	5	EA.
65	INSTALL 8"x6" TEE	5	EA.
	STORM DRAIN		
70	INSTALL 18" R.C.P. (SEE PROFILE FOR D-LOAD)		
71	INSTALL 21" R.C.P. (SEE PROFILE FOR D-LOAD)		
72	INSTALL 24" R.C.P. (SEE PROFILE FOR D-LOAD)		
73	INSTALL 27" R.C.P. (SEE PROFILE FOR D-LOAD)		
74	INSTALL 30" R.C.P. (SEE PROFILE FOR D-LOAD)		
75	INSTALL 33" R.C.P. (SEE PROFILE FOR D-LOAD)		
76	INSTALL " R.C.P. (SEE PROFILE FOR D-LOAD)		
77	INSTALL " R.C.P. (SEE PROFILE FOR D-LOAD)		
78	INSTALL " R.C.P. (SEE PROFILE FOR D-LOAD)		
79	INSTALL " R.C.P. (SEE PROFILE FOR D-LOAD)		
80	CONSTRUCT INLET TYPE I PER O.C.E.M.A. STD. 1301		
81	CONSTRUCT INLET TYPE II PER O.C.E.M.A. STD. 1302		
82	CONSTRUCT INLET TYPE III PER O.C.E.M.A. STD. 1303		
83	CONSTRUCT INLET TYPE V PER O.C.E.M.A. STD. 1305		
84			
85	CONSTRUCT J.S. TYPE I PER O.C.E.M.A. STD. 1310		
86	CONSTRUCT J.S. TYPE II PER O.C.E.M.A. STD. 1311		
87	CONSTRUCT J.S. TYPE III PER O.C.E.M.A. STD. 1312		
88	CONSTRUCT J.S. TYPE IV PER O.C.E.M.A. STD. 1313		
89	CONSTRUCT J.S. TYPE VI PER O.C.E.M.A. STD. 1315		
90	CONST. CONC. SLOPE ANCHOR PER O.C.E.M.A. STD. 1333		
91	CONSTRUCT REINFORCED CONCRETE COLLAR PER O.C.E.M.A. STD. 1317		
94	CONST. INLET STRUCTURE PER DETAIL ON SHT 7	1	EA.
95	CONST. 8'H x 7'W. R.C.B PER DETAIL(S) SHT 7	46	L.F.



INDEX MAP

SCALE: 1" = 150'





BEDDING DETAILS

N.T.S.

DRAWING OF RECORD

JAMES H PARDUE RCE 42758 EXP 3-31-91 DATE 8/6/86

DESIGNED BY: G.P. / P.A.
DRAWN BY: M.G. / P.A.
CHECKED BY:

REVISIONS

	APPD	DATE	DESCRIPTION
2	BM	4/6/88	ADD SIDEWALK TO E'LY SIDE OF BLUE MTN
1	BM	4/6/88	ADD ITEM 19 SHT 2 THROUGH SHT REV. QUANTITIES

REGISTERED PROFESSIONAL ENGINEER TOM McGANNON NO. 23956 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:

Tom R. McGannon 7-29-88

TOM R. McGANNON R.C.E. 23956 DATE EXP. 12-31-89

CITY OF YORBA LINDA

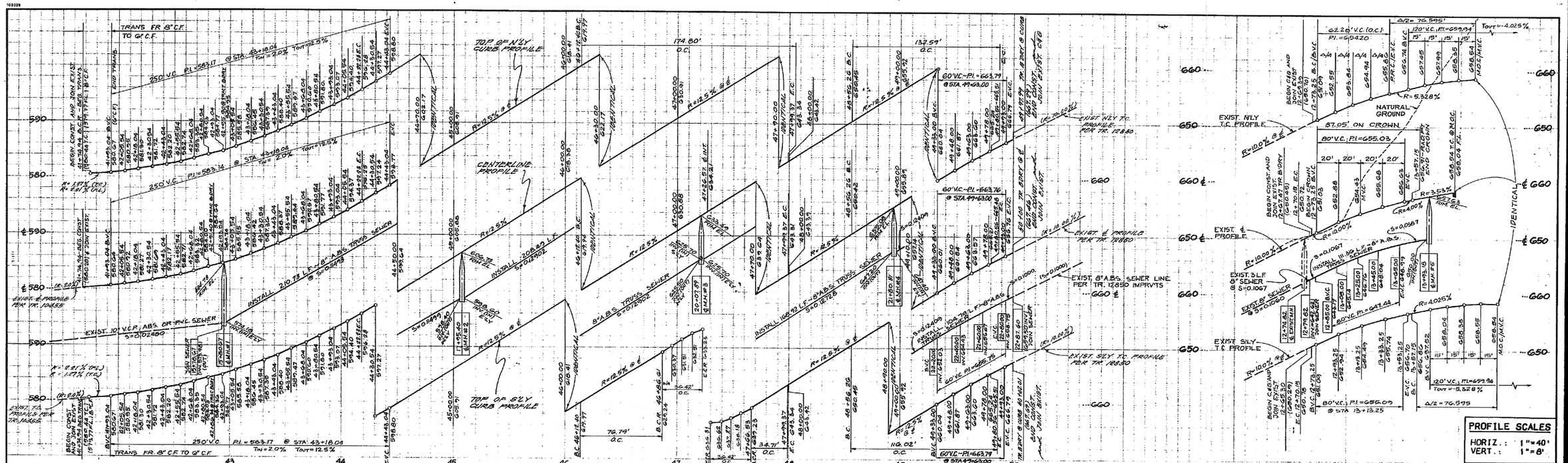
LOCATION MAP, INDEX MAP TYP. STREET SECTIONS QUANTITIES & DETAILS

IMPROVEMENT PLANS FOR TRACT 13800

SHEET 2 OF 7

PLOT - INDEX-DETAILS-QUANTITIES-SEC'N. - 3830.01 PF: 10657 1016 04-Feb-88 11:15 AM / 094-10657-650

103229



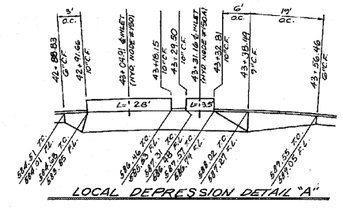
WATER CONSTRUCTION NOTES

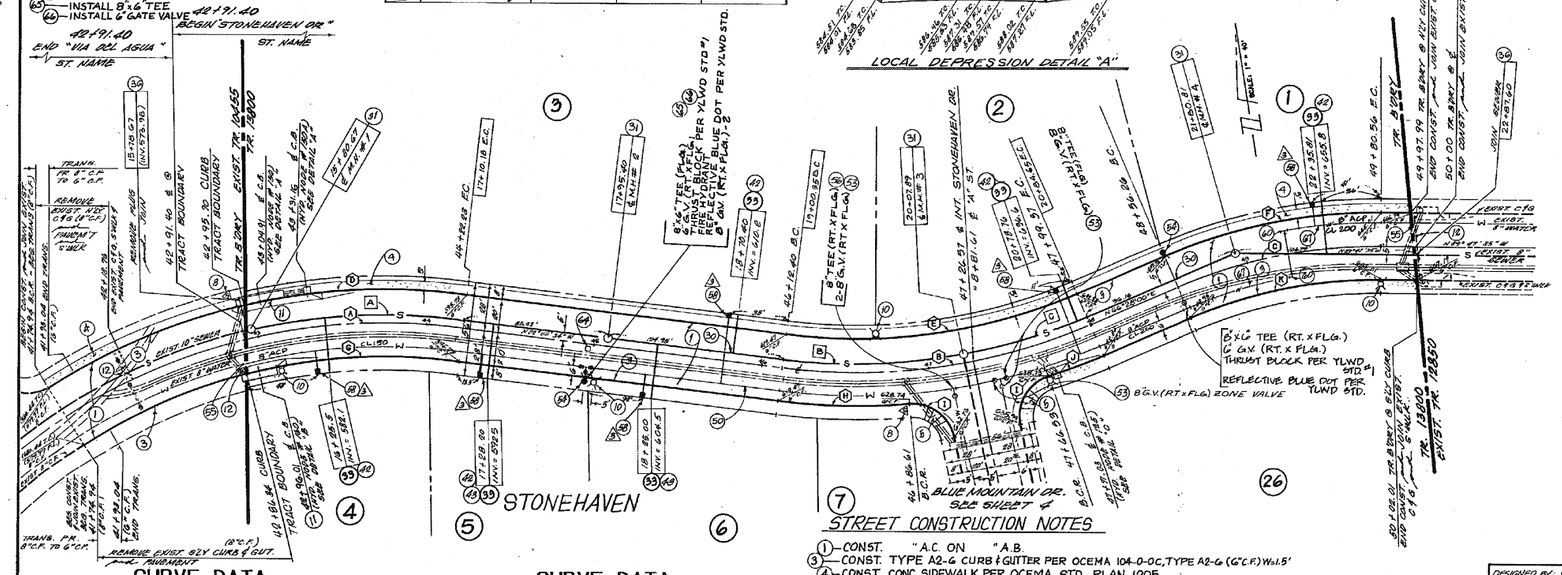
(50) INSTALL 8" A.C.P. WATER MAIN, CL. 150
(53) INSTALL 8" GATE VALVE
(54) INSTALL FIRE HYDRANT AND ASSEMBLY PER YLWD STD.
(58) INSTALL 1" SERVICE & METER
(55) REMOVE EXISTING BLOW-OFF AND JOIN AFTER ALL TESTS
(57) INSTALL 8"x2" BLOW-OFF ASSEMBLY
(60) INSTALL 8"-90° BEND (RT.)
(56) INSTALL 8"x8" TEE
(69) INSTALL BLUE REFLECTOR PER YLWD STD.
(62) INSTALL 8"x6" TEE
(66) INSTALL 6" GATE VALVE

42+91.40 BEGIN STONEHAVEN DR." ST. NAME
42+91.40 END "VIA DEL AGUA" ST. NAME

SEWER CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	90°44'09"	355.00	129.51	65.48
B	17°51'37"	345.00	107.54	54.21
C	12°44'49"	345.00	76.76	38.54
D	0°30'39"	305.00	2.72	1.36





CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	21°25'02"	350.00	130.83	66.19
B	30°36'25"	350.00	186.97	95.77
C	23°44'25"	300.00	124.30	63.05
D	20°40'51"	370.00	133.55	67.51
E	30°36'26"	330.00	176.28	90.30
F	23°44'25"	320.00	132.59	67.25
G	22°18'44"	330.00	128.13	64.88

CURVE DATA

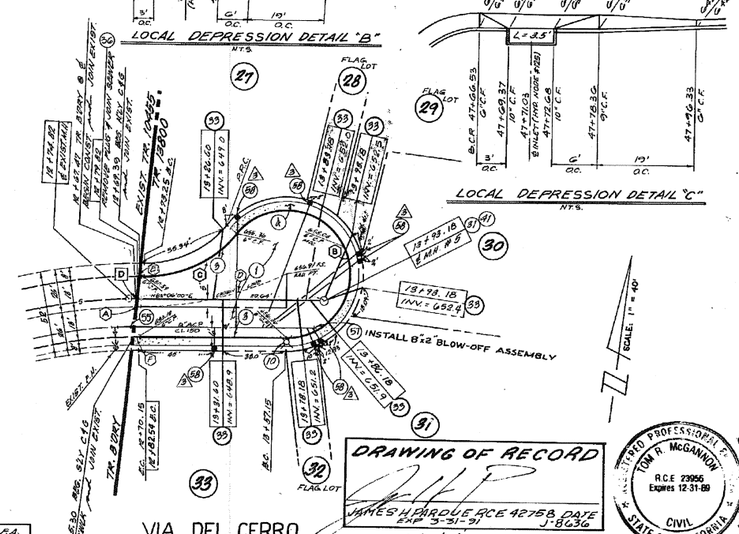
	DELTA	RADIUS	LENGTH	TANGENT
H	12°08'56"	370.00	78.45	39.37
I	63°27'30"	25.00	35.42	22.30
J	05°22'30"	370.00	34.71	17.37
K	23°44'25"	280.00	115.02	58.85

STREET CONSTRUCTION NOTES

(1) CONST. "A.C. ON "A.B.
(3) CONST. TYPE A2-6 CURB & GUTTER PER OCEMA 104-0-0C, TYPE A2-6 (6"C.F.) W=1.5'
(4) CONST. CONC. SIDEWALK PER OCEMA STD. PLAN 1205
(5) CONST. SIDEWALK RETURN & ACCESS RAMP PER OCEMA STD. PLAN 1111 & OCEMA 102-0-0C
(8) INSTALL STREET NAME SIGN PER CITY OF YORBA LINDA STDS.
(10) INSTALL 5,800 LUMEN STREET LIGHT
(11) CONST. LOCAL DEPRESSION PER O.C.E.M.A. STD. PLAN 1205
(12) REMOVE EXISTING BARRICADE

SEWER CONSTRUCTION NOTES

(30) CONST. 8" A.B.S. TRUSS PIPE SEWER PER Y.L.W.D. STD PLANS
(31) CONST. 48" M.H. PER Y.L.W.D. STD. SP-3
(33) CONST. 4" A.B.S. HOUSE LATERALS PER Y.L.W.D. STD PLANS SP-2A & SP-2B
(36) REMOVE EXIST. PLUG and JOIN
(41) CONST. MANHOLE BASE PER Y.L.W.D. SP-3C
(42) INSTALL BACK WATER VALVE
(43) INSTALL DIAL SYSTEM



DESIGNED BY: G.P. / F.A.
DRAWN BY: M.G. / F.A.
CHECKED BY:

REVISIONS

NO.	APP'D	DATE	DESCRIPTIONS
A			SHOW WATER METER LOCATION & SERVICE

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	0°30'46"	300.00	2.68'	1.34'
B	230°58'38"	38.00	153.19'	——
C	50°58'38"	70.00	62.28'	33.37'
D	24°48'52"	186.00	87.05'	44.34'
E	0°08'44"	318.00	0.81'	0.40'
F	0°25'38"	223.00	1.66'	0.83'

DRAWING OF RECORD
JAMES H. HARDLE RCE 42758 DATE 7-29-88
8349 11/10/88

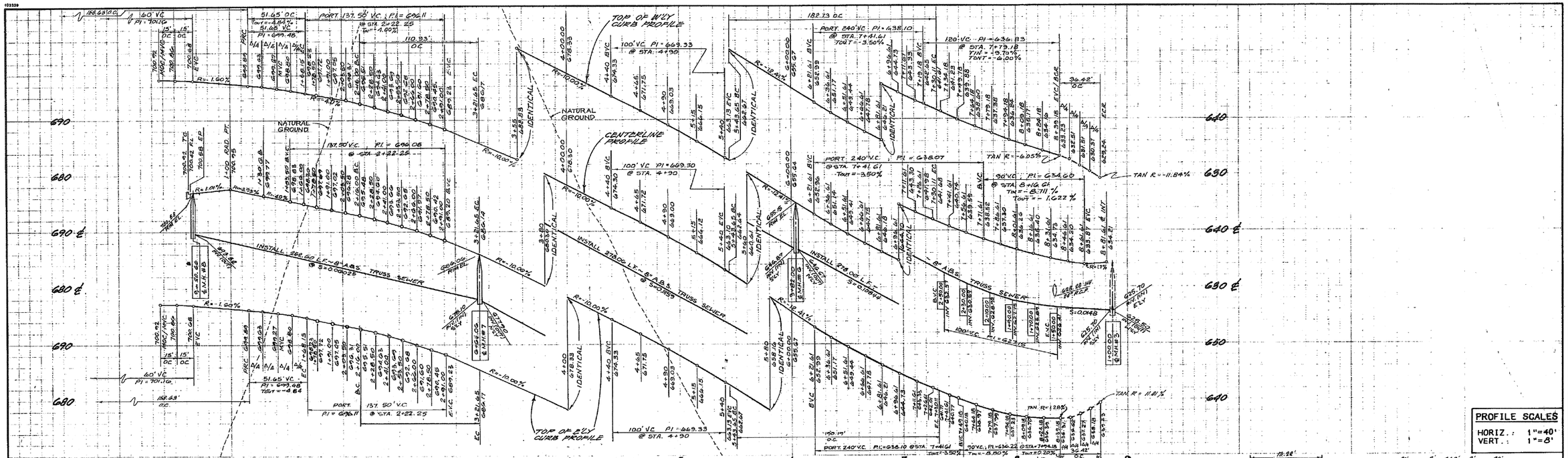
REGISTERED PROFESSIONAL ENGINEER TOM R. McGANNON R.C.E. 23956 Expires 12-31-89 CIVIL STATE OF CALIFORNIA

PLANS PREPARED UNDER THE SUPERVISION OF:
Tom R. McGannon 7-29-88
TOM R. McGANNON R.C.E. 23956 DATE
EXP. 12-31-89

TR. 13800
STONEHAVEN & VIA DEL CERRO

SHEET 3 OF SHEETS 7

BASE SHEET "STONEHAVEN" L "VIA DEL CERRO" - 6/8(10.5) PF: 13338 1019 05-Jul-88 02:32 PM / 535-13336-800



WATER CONSTRUCTION NOTES

(52) INSTALL 8" A.C.P. WATER MAIN CL 150
(53) INSTALL 8" GATE VALVE
(54) INSTALL FIRE HYDRANT AND ASSEMBLY PER YLWD STD
(56) INSTALL 1" SERVICE & METER
(57) INSTALL 8"x2" BLOW-OFF ASSEMBLY
(60) INSTALL 8"x8" TEE
(61) INSTALL 2" TEMPORARY BLOW-OFF ASSEMBLY TO BE REMOVED AND JOINED AFTER ALL TESTS
(62) INSTALL 8"-45° BEND
(63) INSTALL 8"x11 1/4° BEND

WATER CONSTRUCTION NOTES

(64) INSTALL BLUE REFLECTOR PER YLWD STD.
(65) INSTALL 8"x6" TEE
(66) INSTALL 6" GATE VALVE
(67) INSTALL 8" ACP WATER MAIN CL. 200

PROFILE SCALES
HORIZ.: 1"=40'
VERT.: 1"=8'

DRAWING OF RECORD
4-20-90
JAMES V. PAROLIS RCE 42758 DATE J-8636

SEWER CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	7° 13' 29"	995.00	125.46	62.82
B	3° 27' 31"	995.00	60.06	30.04
C	15°08' 00"	405.00	106.97	53.80

SEWER CONSTRUCTION NOTES

(30) CONST. 8" A.B.S. TRUSS PIPE SEWER PER Y.L.W.D. STD. PLANS
(31) CONST. 48" M.H. PER Y.L.W.D. STD. SP-3
(33) CONST. 4" A.B.S. HOUSE LATERALS PER Y.L.W.D. STD. PLANS SP-2A & SP-2B
(41) CONST. MANHOLE BASE PER Y.L.W.D. STD. SP-2C
(42) INSTALL BACK WATER VALVE.
(43) INSTALL DUAL SYSTEM.

STREET CONSTRUCTION NOTES

(1) CONST. "A.C. ON " A.B.
(2) CONST. TYPE A2-6 CURB & GUTTER PER OCEMA 104-0-0C, TYPE A2-6 (6"C.F.) W=1.5'
(4) CONST. CONCRETE SIDEWALK PER OCEMA STD PLAN 1805
(9) INSTALL STOP SIGN PER CITY OF YORBA LINDA STDS.
(10) INSTALL 5,800 LUMEN STREET LIGHT
(11) CONST. LOCAL DEPRESSION PER O.C.E.M.A. STD. PLAN 1308
(20) CONST. PARKWAY CULVERT - TYPE "A" PER O.C.E.M.A. STD. 1307
(19) INSTALL W-53 "NOT A THROUGH STREET" SIGN

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
A	10°41' 00"	1000.00	186.46	93.50
B	15°08' 00"	400.00	105.65	53.13
C	10°41' 00"	1020.00	190.19	95.37
D	15°08' 00"	380.00	100.37	50.48
E	29°35' 31"	100.00	51.65	26.41
F	239°11' 02"	38.00	158.63	66.91

CURVE DATA

	DELTA	RADIUS	LENGTH	TANGENT
G	15°08' 00"	420.00	110.93	55.79
H	10°41' 00"	980.00	182.73	91.63
I	85° 27' 30"	25.00	36.48	22.30

REVISIONS.

NO.	APP'D	DATE	DESCRIPTIONS
1			MOVED FIRE HYDRANT, CONNECTION TO MAIN, PRESSURE REDUCER VALVE (PRV) & WATER SERVICE
2			SHOW WATER METER & SERVICE LOCATION
3	KM	5/1/90	ADDED SIDEWALK TO ELY SIDE OF BLUE MTN. DR.
4	BM	7/16/90	ADDED "NOT A THROUGH STREET" SIGN

DESIGNED BY: G.P./P.A.
DRAWN BY: M.G./P.A.
CHECKED BY:

TR. 13800
BLUE MOUNTAIN DRIVE

PLANS PREPARED UNDER THE SUPERVISION OF:
Tom R. McGannon 7-29-88
TOM R. McGANNON R.C.E. 23956 DATE
EXP 12-31-89

R.C.E. 23956 Expires 12-31-89 CIVIL

8/31/88

SHEET 4 OF SHEETS 7

BASE SHEET "A" STREET TR. 13338 - 6760(0.6)PF: 13338 1016 05-Jul-88 02:29 PM / 535-13336-600

FINISHED GRADE OVER ℄ PIPE

590 / 580 / 570 / 560

S=0.1173

570.60 INV. 18" RCP LINE "A-2"

S=0.1189

570.83 INV. 18" RCP LINE "A-1"

S=0.1189

BEGIN PIPE 1400.18 JOIN EX. 33" RCP 568.96 INV.

END PIPE 1412.06 570.37 INV.

BEGIN PIPE 1416.56 570.83 INV.

INSTALL 11.88 LF ~ 33" RCP TRUE LENGTH = 11.96' (1750-D)

INSTALL 399.62 LF ~ 33" RCP TRUE LENGTH = 402.36' (1750-D)

3+00.00 IDENTICAL 592.35 INV.

6+37.94 INV. 18" RCP LINE "A-3"

5+18.18 ℄ MH ~ JS TYPE I RIM = 624.20

END PIPE 5+16.18 617.71 INV.

BEGIN PIPE 5+18.68 618.18 INV.

5+30.00 IDENTICAL 601.27 INV.

S=0.1061

5+99.33 ℄ INT. ~ JS TYPE III

5+56.32 SEWER MAIN 8" ABS ~ 625.84 INV.

S=0.1181

S=0.1181

625.51 INV. 18" RCP LINE "A-4"

S=0.1081

END PIPE 5+36.56 626.21 INV.

BEGIN PIPE 6+02.43 622.80 INV.

TRUE LENGTH = 76.31' (1750-D)

INSTALL 75.88 LF ~ 18" RCP

BVC 6+98.09 634.14

6+61.08 636.47

EVC 6+78.08 638.43

7+00.00 IDENTICAL 641.25 INV.

S=0.1180

S=0.1180

30' VC ~ PI STA = 6+61.08 EL = 636.66

END PIPE 8+16.40 JOIN EX. 18" RCP CONST. COLLAR ~ 634.99 INV.

(8+21.40) EX. JS TYPE I 635.58 INV.

INSTALL 213.97 LF ~ 18" RCP TRUE LENGTH = 215.86 (2000-D)

LINE "A"

1 2 3 4 5 6 7 8

LINE "A-4"

590 / 580 / 570

WATER MAIN 8" AC 580.23 INV. 584.80 T/C

EX. JS TYPE III LINE "A"

S=0.0708

"A-1" S=0.0202 ℄

S=0.0638

2.0' CLR.

(1100 D) INSTALL 12 LF 18" RCP

ABS TOP 574.59

SEWER MAIN 8" ABS TOP 574.59

"A-2" S=0.5752

2.42'

2.42'

8.50'

630 / 620 / 610

WATER MAIN 8" AC 635.55 INV.

635.85' T/C

S=0.4608

3.90'

EX. JS TYPE III 626.21 INV.

BEGIN PIPE 18" RCP 626.50 INV.

END PIPE 18" RCP 631.85 INV.

TRUE LENGTH = 30.28' (1750-D)

INSTALL 11.61 LF ~ 18" RCP TRUE LENGTH = 12.78' (2000-D)

END PIPE 18" RCP 573.80 INV.

CONSTRUCT CONC. COLLAR 575.67 INV.

BEGIN PIPE 18" RCP 570.80 INV.

20.39' 8.0'

INST. 28.39 LF ~ 18" RCP

℄ JS TYPE I 570.37 INV.

BEGIN PIPE 18" RCP 570.60 INV.

END PIPE 18" RCP 577.90 INV.

LINES "A-1" & "A-2"

EX. DOWN DRAIN

633.83 T/C

S=0.1978

1.11' CLR.

20.00

℄ MH ~ JS TYPE I LINE "A"

633.53 T/C

S=0.00500

WATER MAIN 8" AC 631.97 INV. 636.47 T/C

1.00' CLR.

S=0.0472

S=0.0164

SEWER MAIN 8" ABS TOP = 627.17

℄ JS TYPE I 617.71 INV.

BEGIN PIPE 24" RCP 617.94 INV.

END PIPE 24" RCP 626.35 INV.

BEGIN PIPE 24" RCP 627.53 INV.

CONST. CONC. COLLAR 628.53 INV.

END PIPE 24" RCP 628.55 INV.

BEGIN PIPE 24" RCP 629.33 INV.

END PIPE 24" RCP 630.12 INV.

INSTALL 58.6 LF 24" R.C.P. (1000-D)

TRUE LENGTH = 44.39' (2000-D)

INST. 49.55 LF ~ 24" RCP

INST. 90.00 LF ~ 24" RCP

TRUE LENGTH = 90.03' (1000-D)

LINE "A-3"

INSTALL 12.69 LF ~ 18" RCP TRUE LENGTH = 14.64' (1750-D)

PROFILE SCALE
1" = 40' HORIZ.
1" = 8' VERT.

℄ OF 100' MWD ESM'T.

50' / 50'

TRACT BOUNDARY 13838

EXIST. TR. 10455

EXIST. TR. 12850

8+16.40 JOIN EX. 18" RCP

EX. JS PER S.D. PLAN T.R. 12850 IMP.

EX. 18" RCP LATERAL

6+76.08 BC

6+85.57 EC

5+99.33 ℄ INT. 1B TYPE III ℄ A=60°

5+18.93 ℄ MH JS TYPE I ℄ A=60°

9+44.86 BC

9+54.69 EC

8+00.38 EC

N 66° 28' 00" E 40.51'

N 89° 47' 00" W 21.02'

EX. 18" RCP PER S.D. PLAN T.R. 12850 IMP.

STONEHAVEN DRIVE

N 82° 55' 34" W 190.17'

STIRLINGBRIDGE

EX. 18" RCP LATERAL

EX TERRACE & DOWN DRAINS PER ROUGH GRAD. TR. 13838

EX. 33" RCP PER S.D. PLAN T.R. 12850 IMP.

EX. 8' HL x 7' WH RCB PER S.D. PLAN No. E06901-70/2 SEE SHTS 6 & 7

PTN. LINE "A-1" 31.10' N 13° 37' 25" E

1+19.31 JS TYPE I ℄ A = 60°

1400.18 JOIN EX. 33" RCP

LINE "A-2" 149.51' N 46° 22' 35" W

ST. STA. 43+04.91 ℄ INLET TYPE II L=28' N=3°

ST. STA. 43+31.16 ℄ INLET TYPE II L=33.5' N=8° PTN. LINE "A-1" 19'

ST. STA. 49+36.01 ℄ INLET TYPE II L=28' N=6.5°

PTN. OF LINE "A-3" 45.97' N 38° 30' 00" W

PTN. OF LINE "A-3" 40.00' N 78° 23' 00" E

ST. STA. 47+11.98 ℄ INLET TYPE II L=33.5' N=8°

LINE "A-4" 15.11' N 89° 00' 00" W

ST. STA. 9+54.43 ℄ INLET TYPE II L=33.5' N=8°

PTN. OF LINE "A-3" 88.5' N 71° 37' 00" W

ST. STA. 7+60.18 ℄ INLET TYPE II L=28' N=6°

CONSTRUCTION NOTES

(20) INSTALL 18" RCP (SEE PROFILE FOR D-LOAD)
(22) INSTALL 24" RCP (SEE PROFILE FOR D-LOAD)
(24) INSTALL 30" RCP (SEE PROFILE FOR D-LOAD)
(25) INSTALL 33" RCP (SEE PROFILE FOR D-LOAD)
(81) CONST. INLET TYPE II PER O.C.E.M.A. STD. 1302
(85) CONSTRUCT JS TYPE I PER O.C.E.M.A. STD. 1310
(251) CONSTRUCT JS TYPE III PER O.C.E.M.A. STD 1312
(91) CONSTRUCT REINFORCED CONCRETE COLLAR PER O.C.E.M.A. STD 1317

DATA

	DELTA/BEARING	RADIUS	LEN./DIST.	TANGENT
A	25° 12' 24"	343.00	150.90	76.59
B	30° 21' 00"	357.00	189.11	96.83
C	23° 44' 25"	300.00	124.30	63.05

DRAWING OF RECORD
JAMES H PARDUE RCE 12758 DATE 4-20-90
EXP 3-31-91
J-8636

8/24/11/6/88

REGISTERED PROFESSIONAL ENGINEER TOM McGANNON NO. 23956 EXP 12-31-89 CIVIL STATE OF CALIFORNIA

DESIGNED BY: PB "671"
DRAWN BY: PB "671"
CHECKED BY: MLC "271"

PLANS PREPARED UNDER THE SUPERVISION OF:
Tom R. McGannon 8-31-88
TOM McGANNON RCE 23956 DATE

SHEET 5 OF SHEETS 7

TR. 13800
LINE "A" S.D.

SCALE: 1" = 40'

DWG. 1425 477B

DOUBLE VERTICAL SCALE

PROFILE SCALE
HORIZ ~ 1" = 40'
VERT ~ 1" = 8'

REMOVE EXIST. INLET STRUCTURE

REMOVE EXIST LOOSE RIP-RAP & SALVAGE.

REMOVE & SALVAGE EXIST. INVERT RIP RAP

71+00.00 - 74+57.00	1200	0.014	—	0.0205	7.65'	22.61	FULL	21.40
STA. TO STA.	Q	n	Sf	S	Dn	Vn	Dc	Vc

HYDRAULIC DATA

EX. (11)	10° 32' 33"	250'	46.00'	23.07'
EX. (12)	21° 37' 00"	250'	95.92'	48.56'
(14)	7° 57' 27"	343'	47.64'	23.86'
I.D.	A	R	L	T

℄ RCB. CURVE DATA

(95) CONST B' H x T' W R.C.B. PER DETAIL (6) SHT. 7

CONST. MANHOLE FOR REINF. CONC. BOX CONDUIT PER E.M.A. STD. No 506 (DELETED)

(94) CONST. INLET STRUCTURE PER DETAIL OF SHEET № 6

CONST. JUNCTION STRUCTURE TYPE II PER E.M.A. STD. № 314 WITH 4 LF. RCP (SIZE PER PLAN) STUB OUT AND SEAL WITH MORTAR AND BRICK.

CONSTRUCTION NOTES

(A)	EXTENDED R.C.B. 10' & 26 BY MLL.	
(1)	ADDED SHTS 6 & 7 BY MLL	
(0)	REVISION DESCRIPTION	DATE / APP'D

DRAWING OF RECORD

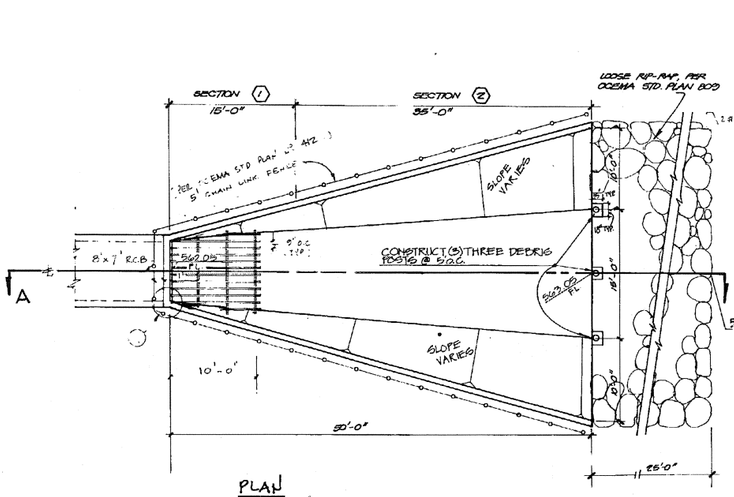
JAMES H PARDUE RCE 42758 EXP 3-31-91 DATE J-8636

TR 13800 IMP'S
STORM DRAIN PLAN
-EXTENSION-
DWG. NO. E06501-701-2

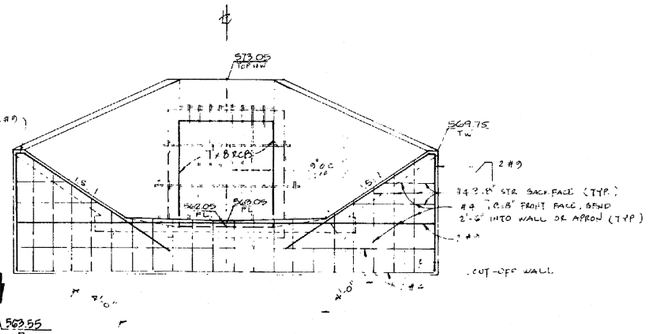
SHEET 6 OF 7 SHEETS (1)

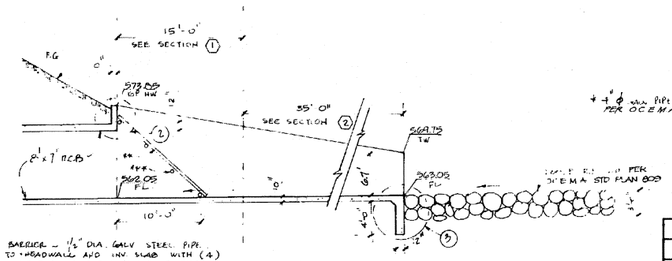
26-151

DOC 441105 BK 4778



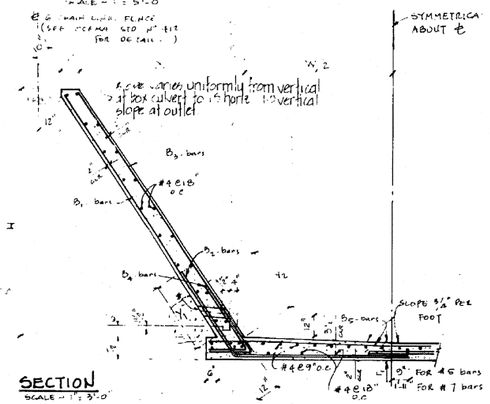
PLAN
SCALE - 1/8" = 1'-0"





ELEVATION

SCALE - 1" = 5'-0"



SECTION
SCALE - 1" = 5'-0"

+ 4" ϕ WEEP PIPE @ MID-PANEL 2'-0" O.C. PER OCEMA STD PLAN 325.

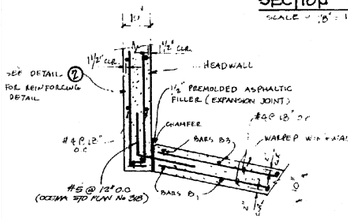
STRUCTURAL NOTES

1. DIMENSIONS FROM FACE OF CONCRETE TO STEEL ARE TO FACE OF BAR AND SHALL BE 1½ INCHES UNLESS OTHERWISE SHOWN.
2. CONCRETE DIMENSIONS SHALL BE MEASURED HORIZONTALLY OR VERTICALLY ON THE PROFILE, AND PARALLEL TO OR AT RIGHT ANGLES (OR RADIALLY) TO CENTERLINE OF CONDUIT ON THE PLAN EXCEPT AS OTHERWISE SHOWN.
3. ALL BAR BENDS AND HOOKS SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" CHAPTER 7 (ACI 318-77)
4. PLACING OF REINFORCEMENT SHALL CONFORM TO "THE AMERICAN CONCRETE INSTITUTE'S "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" CHAPTER 7 (ACI 318-77)
5. TRANSVERSE CONSTRUCTION JOINTS SHALL NOT BE PLACED WITHIN 30 INCHES OF MANHOLE OR JUNCTION STRUCTURE OPENINGS.
6. TRANSVERSE CONSTRUCTION JOINTS IN WALLS AND SLABS SHALL BE IN THE SAME PLANE. NO STAGGERING OF JOINTS WILL BE PERMITTED. TRANSVERSE CONSTRUCTION JOINTS SHALL BE NORMAL OR RADIAL TO THE CENTERLINE OF CONSTRUCTION.
7. THE TRANSVERSE REINFORCING STEEL SHALL TERMINATE ONE AND ONE-HALF INCHES FROM THE CONCRETE SURFACES UNLESS OTHERWISE SHOWN ON THE STRUCTURAL DETAILS.
8. EXPOSED EDGES OF CONCRETE MEMBERS SHALL BE 3/4" CHAMFERED.
9. NO SPLICES IN TRANSVERSE STEEL REINFORCEMENT WILL BE PERMITTED OTHER THAN SHOWN ON THE DRAWING WITHOUT APPROVAL OF THE ENGINEER. NO MORE THAN TWO SPLICES WILL BE PERMITTED IN ANY LONGITUDINAL BAR BETWEEN TRANSVERSE JOINTS. SPLICES SHALL BE STAGGERED.
10. LONGITUDINAL STEEL SHALL BE LAPPED 40 BAR DIAMETERS AT SPLICES. TRANSVERSE STEEL SHALL BE LAPPED 45 BAR DIAMETERS AT SPLICES.
11. EXPANSION JOINTS SHALL BE PLACED AT THE JUNCTION OF INLET AND OUTLET SECTIONS WITH CLOSED CONDUIT SECTIONS, PER O.C.E.M.A. STD. PLAN 318.
12. LONGITUDINAL STEEL SHALL BE CONTINUOUS AND EXTEND THROUGH ALL CONSTRUCTION JOINTS, UNLESS OTHERWISE SHOWN
13. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, TRANSVERSE JOINT KEYWAYS (IN BOTH SLABS AND WALLS), AS DETAILED ON THE DRAWINGS SHALL BE PLACED AT THE END OF EACH POUR, BUT THE SPACING THEREOF SHALL NOT EXCEED 50 FEET OR BE LESS THAN 10 FEET.
14. UNLESS OTHERWISE SHOWN ON THE DETAILS, IN CURVED SECTIONS TRANSVERSE BARS SHALL BE PLACED RADIALLY, STRAIGHT TRANSVERSE BARS IN TOP AND BOTTOM SLABS SHALL BE SPACED AS SHOWN ON THE TYPICAL SECTIONS: SPACING SHALL BE AT THE CENTERLINE OF CONSTRUCTION FOR SINGLE-BARREL BOXES. STRAIGHT BARS AND L-BARS IN WALLS SHALL BE SPACED AS SHOWN ON THE TYPICAL SECTIONS, WITH THE SPACING MEASURED BETWEEN THE VERTICAL LEGS OF BARS.
15. CONCRETE SHALL BE SCO D 3250 FOR INVERT AND SCO C-3250 FOR WALLS AND DECKS.
16. CONSTRUCTION WILL BE BY THE ALTERNATE PANEL METHOD AND NO CONTINUOUS PLACEMENT THROUGH JOINTS WILL BE PERMITTED.
17. COUNTY INSPECTOR SHALL CERTIFY LINE AND GRADE PRIOR TO ANY CONCRETE PLACEMENT.
18. SHOTCRETE MAY BE USED IN WINGWALLS AT CONTRACTOR'S OPTION

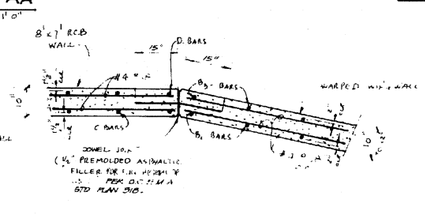
WARPED WINGWALLS

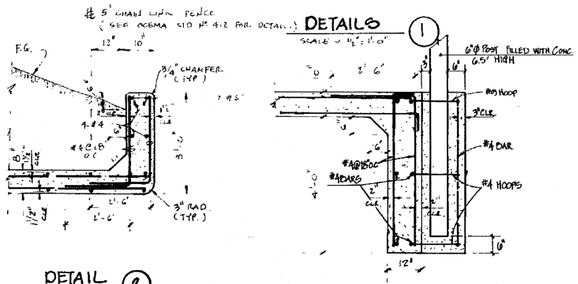
SECTION	W/2	X	H	T1	T2	T3	T4	BARS B1	BARS B2	BARS B3	BARS B4	BARS B5
WALL DIMENSIONS AND REINFORCING												
(1)	5'-6" to 6'-6"	0' to 4'-0"	1'-0" to 8'-0"	9" min	12" min	3'-9"	3'-4"	#7 @ 12" O.C.	#7 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.	#6 @ 6" O.C.
(2)	5'-6" to 7'-6"	4'-0" to 7'-6"	8'-0" to 5'-0"	9" min	12" min	3'-9"	4'-0"	#6 @ 15" O.C.	#6 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.	#6 @ 6" O.C.

DESIGN CRITERIA
LIVE LOAD = HS 20-44
EARTH DENSITY = 130 #/FT³
LATERAL E.F.P. = 36 PSI.
f'c = 3250 PSI.
fa = 1462 PSI.
n = 8.8
fy = 60 KSI.



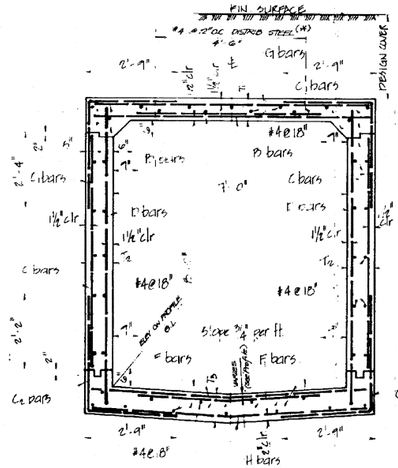
SECTION 'AA'
SCALE - 3/8" = 1'-0"





DETAIL (2)
SCALE - 1½" = 1'-0"

DETAIL (3)
SCALE - 1½" = 1'-0"

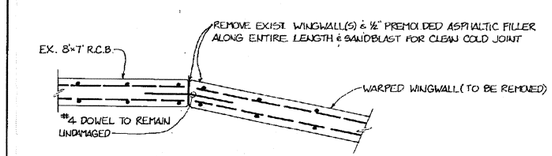


TYPICAL R.C.B SECTION

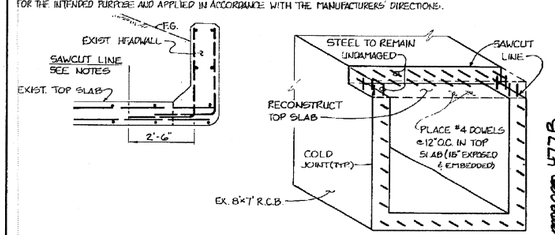
SCALE - 1½" = 1'-0"

DESIGN COVER				
BAR	A (*) 1.5' to 5.0'	B 5.1' to 8.0'	C 8.1' to 10.0'	D 10.1' to 13.0'
B	#6 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.
B1	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.
C	#5 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.
C1	#5 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.	#6 @ 6" O.C.
C2	#8 @ 6" O.C.	#6 @ 6" O.C.	#6 @ 6" O.C.	#6 @ 6" O.C.
D	#6 @ 6" O.C.	#6 @ 6" O.C.	#6 @ 6" O.C.	#6 @ 6" O.C.
E	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.
F	#4 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.
F1	#4 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.
G	#5 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.
H	#5 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.	#6 @ 12" O.C.
T1	1'	1'-6"	2'	2'-6"
T2	1'	1'-6"	2'	2'-6"
T3	1'	1'-6"	2'	2'-6"

STRUCTURAL SECTION	
STATION TO STATION	CLASS
49+30.75 TO 53+30.00	B
53+30.00 TO 55+40.00	A
55+40.00 TO 59+20.00	B
59+20.00 TO 60+20.00	C
60+20.00 TO 72+60.00	B
72+20.00 TO 73+40.00	C
73+40.00 TO 74+60.00	D
74+60.00 TO 74+80.00	D
74+80.00 TO 75+05.00	B
75+05.00 TO 75+32.78	B



CONCRETE REMOVAL NOTES:
1. WHERE EXIST. STEEL IS TO BE EXTENDED INTO NEW CONSTRUCTION A 1½" DEEP SAWCUT SHALL BE MADE TAKING CARE NOT TO DAMAGE THE EXIST. STEEL.
2. AFTER MAKING SAWCUTS THE CONC. SHALL BE REMOVED WITH HAND OPERATED EQUIPMENT. USE OF EXPLOSIVES, WRECKING BALLS, STOMPERS, OR OTHER EQUIPMENT WHICH WOULD CAUSE DAMAGE TO THE REMAINING CONC. WILL NOT BE PERMITTED. THE ENGINEER SHALL BE THE SOLE JUDGE OF THE USAGE OF ANY EQUIPMENT FOR THE CONC. REM. OPERATION.
3. ANY SAWCUTS OR IRREGULARITIES IN THE SURFACES OF THE REMAINING WALL OR JOINT SHALL BE FILLED W/EPOXY GROUT MIXTURE TO OBTAIN A SMOOTH PLANE SURFACE. THE ENDS OF EXPOSED REINF. SHALL BE PAINTED W/AN EPOXY COATING TO INHIBIT THE FORMATION OF RUST. ALL EPOXY USED SHALL BE A COMMERCIAL QUALITY, TWO COMPONENT MIXTURE, SPECIALLY MANUFACTURED FOR THE INTENDED PURPOSE AND APPLIED IN ACCORDANCE WITH THE MANUFACTURERS' DIRECTIONS.



(A) CONNECTION DETAILS & NOTES
N.T.S.

(A)	ADDED CONNECTION DETAILS & NOTES 4-5 BY M.L.L.	6/14/79	6/14/79
(1)	ADDED SHTS. 6 & 7 11-15 BB-FILL.	6-1-81	6-1-81
(0)	REVISION DESCRIPTION	DATE	APP'D

DRAWING OF RECORD

JAMES H. PARROTT, RCE 42758 EXP 3-31-83 DATE 1-8-82

TR. 13800 I.M.P.'S
STORM DRAIN PLAN
EXTENSION
DWG. NO. E06501-701-2

SHEET 7 OF 7 SHEETS (1)

DOC. 14105 BK. 8888 PG. 477B

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2007 Advanced Engineering Software (aes)
            Ver. 14.3  Release Date: 09/09/2007  License ID 1215

                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA C DEVELOPED                                                       *
*                                                                        *
 ************************************************************************

  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:53 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)   (FT)    (n)
===  =====  =========  ==================  ======  ===== ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.76      0.20      1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      2.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        3.42      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     4.31
  EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.49

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    615.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.49
  FLOW VELOCITY(FEET/SEC) =   5.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        1.63      0.20      0.850    75
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        0.52      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
  SUBAREA AREA(ACRES) =     2.15      SUBAREA RUNOFF(CFS) =     2.36
  EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.60
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.13      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =     1.13      SUBAREA RUNOFF(CFS) =     1.22
  EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
  TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =       9.25

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    605.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.25
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.50
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     12.50
  EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
  PEAK FLOW RATE(CFS)    =       9.25
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

```
**************************************************************************
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* AREA B                                                                *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 15:06 03/28/2013
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ======  =====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D        1.86      0.20      1.000    83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =       2.04
  TOTAL AREA(ACRES) =       1.86   PEAK FLOW RATE(CFS) =       2.04

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                 D       13.03      0.20      1.000    83
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   14.30
 EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
 CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      16.34
 FLOW VELOCITY(FEET/SEC) =   8.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   13.03
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   13.03
 RAINFALL INTENSITY(INCH/HR) =   1.31
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =      14.89
 TOTAL STREAM AREA(ACRES) =      14.89
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.34

****************************************************************************
 FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D        1.65      0.20      1.000    83   10.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.90
 TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      1.90

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.52
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D       13.18      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   15.15
 EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      17.05

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    755.00  DOWNSTREAM(FEET) =    564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.05
  FLOW VELOCITY(FEET/SEC) =   9.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =   13.05
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.05
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.83
  TOTAL STREAM AREA(ACRES) =      14.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       16.34   13.03    1.306  0.20( 0.20) 1.00       14.9      200.00
      2       17.05   13.05    1.305  0.20( 0.20) 1.00       14.8      202.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00       29.7      200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00       29.7      202.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.38    Tc(MIN.) =    13.03
  EFFECTIVE AREA(ACRES) =      29.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =      29.7
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      29.7  TC(MIN.) =     13.03
  EFFECTIVE AREA(ACRES) =     29.70  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      33.38

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00       29.7      200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00       29.7      202.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-YEAR                                                                  *
* AREA B DEVELOPED                                                        *
*                                                                         *
 **************************************************************************

  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:19 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ======  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.79      0.20      0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.70
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      2.70

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"       D        2.45      0.20      0.600    75
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.45      SUBAREA RUNOFF(CFS) =     2.37
  EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
  TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.07

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
  FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.32
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.07
  PIPE TRAVEL TIME(MIN.) =   0.61     Tc(MIN.) =    15.83
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.83
  RAINFALL INTENSITY(INCH/HR) =   1.17
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.60
  EFFECTIVE STREAM AREA(ACRES) =       5.24
  TOTAL STREAM AREA(ACRES) =       5.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.07

****************************************************************************
  FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.37      0.20      0.600    75    9.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      3.05
  TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      3.05

****************************************************************************
  FLOW PROCESS FROM NODE    102.20 TO NODE    102.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.65
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                 D        0.41      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.51
  EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
  TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       3.56

****************************************************************************
  FLOW PROCESS FROM NODE    202.20 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.65
 RAINFALL INTENSITY(INCH/HR) =   1.55
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.64
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.56

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        5.07   15.83    1.168  0.20( 0.12) 0.60        5.2      100.00
     2        3.56    9.65    1.552  0.20( 0.13) 0.64        2.8      102.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        7.79    9.65    1.552  0.20( 0.12) 0.62        6.0      102.10
     2        7.67   15.83    1.168  0.20( 0.12) 0.61        8.0      100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =     9.65
 EFFECTIVE AREA(ACRES) =       5.97   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =        8.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        1.80      0.20      0.600     75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    2.32
 EFFECTIVE AREA(ACRES) =       7.77   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =        9.8       PEAK FLOW RATE(CFS) =      10.00

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.00
 PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.14
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.14
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       D        2.07      0.20     0.600     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.07      SUBAREA RUNOFF(CFS) =     2.59
  EFFECTIVE AREA(ACRES) =      9.84   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.29
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   10.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.40
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       9.84
  TOTAL STREAM AREA(ACRES) =      11.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
  ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        0.41      0.20      0.850     75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  D        0.28      0.20      0.100     75
  COMMERCIAL                  D        0.36      0.20      0.100     75
  PUBLIC PARK                 D        0.32      0.20      0.850     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =     0.96      SUBAREA RUNOFF(CFS) =     1.90
  EFFECTIVE AREA(ACRES) =      1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.67

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.78      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    5.36
 EFFECTIVE AREA(ACRES) =      4.15   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.26
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.57
 EFFECTIVE STREAM AREA(ACRES) =       4.15
 TOTAL STREAM AREA(ACRES) =       4.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.03

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       12.29   10.40    1.487  0.20( 0.12) 0.61       9.8      102.10
     1       10.98   16.59    1.137  0.20( 0.12) 0.61      11.9      100.00
     2        8.03    5.00    2.264  0.20( 0.11) 0.57       4.2      104.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       17.30    5.00    2.264  0.20( 0.12) 0.59       8.9      104.10
     2       17.42   10.40    1.487  0.20( 0.12) 0.60      14.0      102.10
     3       14.80   16.59    1.137  0.20( 0.12) 0.60      16.0      100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.42    Tc(MIN.) =    10.40
 EFFECTIVE AREA(ACRES) =      13.99   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       16.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.42
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.44
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.44
```

```
 RAINFALL INTENSITY(INCH/HR) =   1.48
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      13.99
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.42

****************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      5.16
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.32
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                 D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    2.79
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       7.95

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   649.00  DOWNSTREAM(FEET) =   604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.95
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.71
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.71
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.646
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        4.25      0.20      0.600    75
 PUBLIC PARK                 D        1.62      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.650
 SUBAREA AREA(ACRES) =    8.02      SUBAREA RUNOFF(CFS) =   10.94
```

```
 EFFECTIVE AREA(ACRES) =     13.71   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.67
 TOTAL AREA(ACRES) =       13.7       PEAK FLOW RATE(CFS) =      18.66

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.65
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.67
 EFFECTIVE STREAM AREA(ACRES) =      13.71
 TOTAL STREAM AREA(ACRES) =      13.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.04    2.253  0.20( 0.12) 0.59       8.9     104.10
     1       17.42   10.44    1.484  0.20( 0.12) 0.60      14.0     102.10
     1       14.80   16.63    1.135  0.20( 0.12) 0.60      16.0     100.00
     2       18.66    8.71    1.646  0.20( 0.13) 0.67      13.7     105.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.43    5.04    2.253  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    8.71    1.646  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.44    1.484  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   16.63    1.135  0.20( 0.13) 0.63      29.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =      26.07   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =       29.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.49
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1956.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   576.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  43.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2006.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.26
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.21
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       29.8  TC(MIN.) =      9.21
  EFFECTIVE AREA(ACRES) =     26.07  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
  PEAK FLOW RATE(CFS)    =      36.04

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       32.43    5.54    2.134  0.20( 0.13) 0.63      16.8     104.10
      2       36.04    9.21    1.594  0.20( 0.13) 0.63      26.1     105.10
      3       34.08   10.94    1.445  0.20( 0.13) 0.63      27.7     102.10
      4       27.17   17.17    1.115  0.20( 0.13) 0.63      29.8     100.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

```
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-year                                                                 *
* AREA C                                                                 *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 15:07 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  =====  ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        2.17      0.20      1.000    83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.62
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      2.62

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               D       16.79      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   20.27
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      22.89

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.89
  FLOW VELOCITY(FEET/SEC) =   8.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   12.02
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       19.0  TC(MIN.) =     12.02
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      22.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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```
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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                *
* AREA C DEVELOPED                                                      *
*                                                                       *
 ************************************************************************

  FILE NAME: CIELODC.DAT
  TIME/DATE OF STUDY: 14:53 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    749.00  DOWNSTREAM(FEET) =    665.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.442
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               D        1.76      0.20      1.000    83    9.44
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.17
  TOTAL AREA(ACRES) =      1.76   PEAK FLOW RATE(CFS) =      2.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.44
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.572
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        3.42      0.20      0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =     3.42      SUBAREA RUNOFF(CFS) =     4.31
 EFFECTIVE AREA(ACRES) =      5.18   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
 TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       6.49

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    665.00  DOWNSTREAM(FEET) =    615.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   750.00   CHANNEL SLOPE =  0.0667
 CHANNEL FLOW THRU SUBAREA(CFS) =       6.49
 FLOW VELOCITY(FEET/SEC) =   5.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   2.16   Tc(MIN.) =   11.60
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1080.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   11.60
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK               D        1.63      0.20      0.850    75
 NATURAL FAIR COVER
 "OPEN BRUSH"              D        0.52      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.886
 SUBAREA AREA(ACRES) =     2.15      SUBAREA RUNOFF(CFS) =     2.36
 EFFECTIVE AREA(ACRES) =      7.33   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
 TOTAL AREA(ACRES) =        7.3       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   11.60
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"              D        1.13      0.20      1.000    83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =     1.13      SUBAREA RUNOFF(CFS) =     1.22
 EFFECTIVE AREA(ACRES) =      8.46   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.91
 TOTAL AREA(ACRES) =        8.5       PEAK FLOW RATE(CFS) =       9.25

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    615.00  DOWNSTREAM(FEET) =    605.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   260.00   CHANNEL SLOPE =  0.0385
 CHANNEL FLOW THRU SUBAREA(CFS) =       9.25
 FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =   12.50
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1340.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        8.5  TC(MIN.) =     12.50
 EFFECTIVE AREA(ACRES) =      8.46  AREA-AVERAGED Fm(INCH/HR)=  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.910
 PEAK FLOW RATE(CFS)   =       9.25
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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                          Analysis prepared by:

                        Charles Hartman & Associates
                       27127 Calle Arroyo, Suite 1904
                       San Juan Capistrano, CA 92675
                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA B                                                                 *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELOXB.DAT
  TIME/DATE OF STUDY: 15:06 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    740.50  DOWNSTREAM(FEET) =    706.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.281
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        1.86      0.20      1.000    83   11.28
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.04
  TOTAL AREA(ACRES) =      1.86   PEAK FLOW RATE(CFS) =      2.04

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.28
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.419
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       13.03      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.03      SUBAREA RUNOFF(CFS) =   14.30
  EFFECTIVE AREA(ACRES) =     14.89   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      16.34

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    706.00  DOWNSTREAM(FEET) =    564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   944.00   CHANNEL SLOPE =  0.1501
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      16.34
  FLOW VELOCITY(FEET/SEC) =   8.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   13.03
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =    1274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.03
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.89
  TOTAL STREAM AREA(ACRES) =      14.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.34

****************************************************************************
  FLOW PROCESS FROM NODE    202.10 TO NODE    202.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    804.00  DOWNSTREAM(FEET) =    755.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.517
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        1.65      0.20      1.000    83   10.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.90
  TOTAL AREA(ACRES) =      1.65   PEAK FLOW RATE(CFS) =      1.90

****************************************************************************
  FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.477
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       13.18      0.20      1.000    83
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   13.18      SUBAREA RUNOFF(CFS) =   15.15
  EFFECTIVE AREA(ACRES) =     14.83   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      17.05

****************************************************************************
  FLOW PROCESS FROM NODE    202.20 TO NODE    202.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     755.00  DOWNSTREAM(FEET) =     564.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1380.00   CHANNEL SLOPE =  0.1382
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       17.05
  FLOW VELOCITY(FEET/SEC) =   9.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =   13.05
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.05
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =      14.83
  TOTAL STREAM AREA(ACRES) =      14.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.05

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       16.34   13.03    1.306  0.20( 0.20) 1.00      14.9     200.00
      2       17.05   13.05    1.305  0.20( 0.20) 1.00      14.8     202.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.38    Tc(MIN.) =    13.03
  EFFECTIVE AREA(ACRES) =      29.70   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       29.7
  LONGEST FLOWPATH FROM NODE    202.10 TO NODE    202.00 =    1710.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       29.7  TC(MIN.) =     13.03
  EFFECTIVE AREA(ACRES) =     29.70  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      33.38

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       33.38   13.03    1.306  0.20( 0.20) 1.00      29.7     200.00
      2       33.37   13.05    1.305  0.20( 0.20) 1.00      29.7     202.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

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

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                              949.661.6695

 ************************* DESCRIPTION OF STUDY *************************
* 2-YEAR                                                                 *
* AREA B DEVELOPED                                                       *
*                                                                        *
 **************************************************************************

  FILE NAME: CIELODB.DAT
  TIME/DATE OF STUDY: 14:19 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-   HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY     (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   736.00
  ELEVATION DATA: UPSTREAM(FEET) =    748.30  DOWNSTREAM(FEET) =    742.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.217
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.79      0.20      0.600    75   15.22
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      2.70
  TOTAL AREA(ACRES) =      2.79   PEAK FLOW RATE(CFS) =      2.70

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   15.22
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.195
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "3-4 DWELLINGS/ACRE"        D        2.45      0.20      0.600    75
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =     2.45      SUBAREA RUNOFF(CFS) =     2.37
 EFFECTIVE AREA(ACRES) =      5.24   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =        5.2       PEAK FLOW RATE(CFS) =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   736.00  DOWNSTREAM(FEET) =   700.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.07
 PIPE TRAVEL TIME(MIN.) =   0.61    Tc(MIN.) =   15.83
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   15.83
 RAINFALL INTENSITY(INCH/HR) =   1.17
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =       5.24
 TOTAL STREAM AREA(ACRES) =       5.24
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.07

****************************************************************************
 FLOW PROCESS FROM NODE    102.10 TO NODE    102.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    720.10  DOWNSTREAM(FEET) =    715.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.649
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"         D        2.37      0.20      0.600    75    9.65
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      3.05
 TOTAL AREA(ACRES) =      2.37   PEAK FLOW RATE(CFS) =      3.05

****************************************************************************
 FLOW PROCESS FROM NODE    102.20 TO NODE    102.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                  D        0.41      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.41      SUBAREA RUNOFF(CFS) =    0.51
 EFFECTIVE AREA(ACRES) =      2.78   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.64
 TOTAL AREA(ACRES) =        2.8       PEAK FLOW RATE(CFS) =       3.56

****************************************************************************
 FLOW PROCESS FROM NODE    202.20 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.65
 RAINFALL INTENSITY(INCH/HR) =   1.55
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.64
 EFFECTIVE STREAM AREA(ACRES) =       2.78
 TOTAL STREAM AREA(ACRES) =       2.78
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.56

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        5.07   15.83    1.168  0.20( 0.12) 0.60        5.2      100.00
     2        3.56    9.65    1.552  0.20( 0.13) 0.64        2.8      102.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        7.79    9.65    1.552  0.20( 0.12) 0.62        6.0      102.10
     2        7.67   15.83    1.168  0.20( 0.12) 0.61        8.0      100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =     9.65
 EFFECTIVE AREA(ACRES) =       5.97   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =        8.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =    1186.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.65
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.552
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        D        1.80      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    2.32
 EFFECTIVE AREA(ACRES) =      7.77   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
 TOTAL AREA(ACRES) =        9.8       PEAK FLOW RATE(CFS) =      10.00

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   700.00  DOWNSTREAM(FEET) =   661.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.32
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.00
 PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.14
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =    1636.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.14
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.509
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
```

```
  "3-4 DWELLINGS/ACRE"       D        2.07      0.20     0.600     75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA AREA(ACRES) =     2.07      SUBAREA RUNOFF(CFS) =     2.59
  EFFECTIVE AREA(ACRES) =      9.84   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.61
  TOTAL AREA(ACRES) =       11.9       PEAK FLOW RATE(CFS) =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   686.00  DOWNSTREAM(FEET) =   661.00
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.29
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   10.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.40
  RAINFALL INTENSITY(INCH/HR) =   1.49
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.61
  EFFECTIVE STREAM AREA(ACRES) =       9.84
  TOTAL STREAM AREA(ACRES) =      11.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.29

****************************************************************************
  FLOW PROCESS FROM NODE    104.10 TO NODE    104.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
  ELEVATION DATA: UPSTREAM(FEET) =    627.00  DOWNSTREAM(FEET) =    580.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        0.41      0.20     0.850    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.77
  TOTAL AREA(ACRES) =      0.41   PEAK FLOW RATE(CFS) =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE    104.20 TO NODE    104.20 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  D        0.28      0.20     0.100    75
  COMMERCIAL                  D        0.36      0.20     0.100    75
  PUBLIC PARK                 D        0.32      0.20     0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.96      SUBAREA RUNOFF(CFS) =     1.90
  EFFECTIVE AREA(ACRES) =      1.37   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.50
  TOTAL AREA(ACRES) =        1.4       PEAK FLOW RATE(CFS) =       2.67

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    104.20 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.78      0.20      0.600    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA AREA(ACRES) =    2.78      SUBAREA RUNOFF(CFS) =    5.36
 EFFECTIVE AREA(ACRES) =      4.15   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =        4.2       PEAK FLOW RATE(CFS) =       8.03

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.26
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.57
 EFFECTIVE STREAM AREA(ACRES) =       4.15
 TOTAL STREAM AREA(ACRES) =       4.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.03

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.29   10.40    1.487  0.20( 0.12) 0.61       9.8     102.10
     1       10.98   16.59    1.137  0.20( 0.12) 0.61      11.9     100.00
     2        8.03    5.00    2.264  0.20( 0.11) 0.57       4.2     104.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.00    2.264  0.20( 0.12) 0.59       8.9     104.10
     2       17.42   10.40    1.487  0.20( 0.12) 0.60      14.0     102.10
     3       14.80   16.59    1.137  0.20( 0.12) 0.60      16.0     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.42    Tc(MIN.) =    10.40
 EFFECTIVE AREA(ACRES) =      13.99   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.60
 TOTAL AREA(ACRES) =       16.0
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1896.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.02
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.42
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   10.44
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.44
```

```
 RAINFALL INTENSITY(INCH/HR) =   1.48
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.60
 EFFECTIVE STREAM AREA(ACRES) =      13.99
 TOTAL STREAM AREA(ACRES) =      16.04
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.42

****************************************************************************
 FLOW PROCESS FROM NODE    105.10 TO NODE    105.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    659.70  DOWNSTREAM(FEET) =    649.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.320
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        3.65      0.20      0.600    75    8.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      5.16
 TOTAL AREA(ACRES) =      3.65   PEAK FLOW RATE(CFS) =      5.16

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.20 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.32
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                D        2.04      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    2.04      SUBAREA RUNOFF(CFS) =    2.79
 EFFECTIVE AREA(ACRES) =      5.69   AREA-AVERAGED Fm(INCH/HR) =  0.14
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.69
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       7.95

****************************************************************************
 FLOW PROCESS FROM NODE    105.20 TO NODE    105.30 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   649.00  DOWNSTREAM(FEET) =   604.00
 FLOW LENGTH(FEET) =   380.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.95
 PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    8.71
 LONGEST FLOWPATH FROM NODE    105.10 TO NODE    105.30 =     710.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.30 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.71
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.646
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        2.15      0.20      0.600    75
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"       D        4.25      0.20      0.600    75
 PUBLIC PARK                D        1.62      0.20      0.850    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.650
 SUBAREA AREA(ACRES) =    8.02      SUBAREA RUNOFF(CFS) =   10.94
```

```
 EFFECTIVE AREA(ACRES) =     13.71   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.67
 TOTAL AREA(ACRES) =       13.7       PEAK FLOW RATE(CFS) =      18.66

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.65
 AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.67
 EFFECTIVE STREAM AREA(ACRES) =      13.71
 TOTAL STREAM AREA(ACRES) =      13.71
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.66

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.30    5.04    2.253  0.20( 0.12) 0.59       8.9     104.10
     1       17.42   10.44    1.484  0.20( 0.12) 0.60      14.0     102.10
     1       14.80   16.63    1.135  0.20( 0.12) 0.60      16.0     100.00
     2       18.66    8.71    1.646  0.20( 0.13) 0.67      13.7     105.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.43    5.04    2.253  0.20( 0.13) 0.63      16.8     104.10
     2       36.04    8.71    1.646  0.20( 0.13) 0.63      26.1     105.10
     3       34.08   10.44    1.484  0.20( 0.13) 0.63      27.7     102.10
     4       27.17   16.63    1.135  0.20( 0.13) 0.63      29.8     100.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =      26.07   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =       29.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1926.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   606.00  DOWNSTREAM(FEET) =   605.00
 FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.49
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.75
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1956.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   605.00  DOWNSTREAM(FEET) =   576.00
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  43.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      36.04
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2006.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   576.00  DOWNSTREAM(FEET) =   567.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.26
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2286.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.00  DOWNSTREAM(FEET) =   566.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.34
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    9.21
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2356.00 FEET.
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       29.8  TC(MIN.) =      9.21
  EFFECTIVE AREA(ACRES) =     26.07  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.633
  PEAK FLOW RATE(CFS)   =      36.04

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       32.43    5.54    2.134  0.20( 0.13) 0.63       16.8      104.10
      2       36.04    9.21    1.594  0.20( 0.13) 0.63       26.1      105.10
      3       34.08   10.94    1.445  0.20( 0.13) 0.63       27.7      102.10
      4       27.17   17.17    1.115  0.20( 0.13) 0.63       29.8      100.00
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

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

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                              949.661.6695

 ************************** DESCRIPTION OF STUDY **************************
* 2-year                                                                  *
* AREA C                                                                  *
*                                                                         *
 *************************************************************************

  FILE NAME: CIELOXC.DAT
  TIME/DATE OF STUDY: 15:07 03/28/2013
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    765.00  DOWNSTREAM(FEET) =    694.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.765
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        2.17      0.20      1.000    83    9.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.62
  TOTAL AREA(ACRES) =      2.17   PEAK FLOW RATE(CFS) =      2.62

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    9.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.542
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                D       16.79      0.20      1.000    83
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =   16.79      SUBAREA RUNOFF(CFS) =   20.27
  EFFECTIVE AREA(ACRES) =     18.96   AREA-AVERAGED Fm(INCH/HR) =  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  1.00
  TOTAL AREA(ACRES) =       19.0       PEAK FLOW RATE(CFS) =      22.89

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    694.00  DOWNSTREAM(FEET) =    609.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1146.00   CHANNEL SLOPE =  0.0742
  CHANNEL FLOW THRU SUBAREA(CFS) =      22.89
  FLOW VELOCITY(FEET/SEC) =   8.47 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   12.02
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1476.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       19.0  TC(MIN.) =     12.02
  EFFECTIVE AREA(ACRES) =     18.96  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =      22.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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TORY R. WALKER ENGINEERING, INC.
WATER RESOURCES PLANNING & ENGINEERING

TECHNICAL MEMORANDUM

TO: Larry Netherton
Sage Community Group, Inc.

FROM: Tory Walker, PE, CFM, LEED GA
Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.

DATE: April 9, 2013

RE: Summary of Unit Hydrograph Analysis for Hydromodification Compliance of Cielo Vista, Yorba Linda, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed Cielo Vista development project in the City of Yorba Linda using the Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the Orange County Hydrology Manual. Total hydrographs for the 2-year storm event were prepared for existing and developed conditions for all on and off-site contributing drainage areas in order to demonstrate that the project meets the current Orange County hydromodification requirements.

METHODOLOGY FOR UNIT HYDROGRAPH ANALYSIS

Design Storm

The 2-year, 24-hour design rainfall was determined using the Unit Hydrograph Method Design Storm from Section B.4 of the Orange County Hydrology Manual (OCHM). As required by the OCHM, the precipitation values were corrected to account for the tendency of the average rainfall intensity to decrease with respect to increased area for single event storms. In order to provide the peak flow at the confluence of Creek B, Creek C, and Creek D at the Western Boundary (see Hydrology Map in Attachments), a single design storm was created for use in all three creeks by using correction factors based on the total area of the Creek B, C, and D catchments. A separate design storm was created for Creek A as no confluence analysis was required for this creek at the southern boundary. Rainfall distributions are listed in the Appendix.

Losses

Catchment losses and effective rainfall were computed using the Curve Number Method as described in Section C of the OCHM. This method requires the determination of soil and cover type parameters for each catchment. Curve Numbers (CN) in this report reflect the assumption of Antecedent Moisture Condition I (AMC I), which is required for the 2 year return period storm. For detailed information and maps on soil type, cover type, and CN selection please refer to the following sections and the Attachments for this memo.

Unit Hydrograph Method

The Unit Hydrograph Method for Catchment Runoff Hydrographs as described in the OCHM was used for the hydrologic calculations for this project. S-Curves were developed for each catchment based on watershed characteristics. The unit hydrograph was then convoluted with the effective rainfall for each catchment to determine the total hydrograph. The total hydrograph at the confluence of Creeks B, C, and D was calculated by summation of the individual flow ordinates for each creek's hydrograph.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In existing conditions, hydrologic soil groups D and C dominate each catchment with only small patches of type B soil in some areas (refer to Attachments for Soil Type Maps). Both group D and group C soils have slow infiltration rates when saturated. This is especially true for D soils, which consist chiefly of clay soils with a high swelling potential, clay pan or clay layer at or near the surface, or shallow soils over nearly impervious materials. Group D soils have a very slow rate of water transmission. As a result, losses due to infiltration will be relatively low for all catchments.

Cover type for each catchment consists primarily of natural open space with only a small portion of residential development located in the lower reaches. In fact, Creek A and Creek B were determined to be entirely natural open space. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial". Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM.

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is included in the Attachments.

Peak Flow Determination

The existing conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 1 and 2 below. It is important to note that the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

TABLE 1 - Existing Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek B	224	131.0
Creek C	717	327.9
Creek D	473	275.6
TOTAL: Confluence of Creeks B, C, & D	1414	647.0

TABLE 2 - Existing Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)
Creek A	674	296.6

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

Soil Group, Cover Type, and CN Selection

In developed conditions, the distribution of hydrologic soil groups is assumed to remain the same as the existing conditions described in the previous section (refer to Attachments for Soil Type Maps).

The proposed project site is approximately 4% of the total of all drainage areas, and as a result the cover type for each catchment remains primarily natural open space with only a small portion of residential development located in the lower reaches. The main difference from existing conditions is that residential development is now present in Creek A and Creek B.

Residential areas within the study were best represented as Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping per the OCHM. Areas with natural cover were classified as either "Chaparral, Narrow Leaf" or "Grass Annual or Perennial."

After determining the distribution of soil and cover types in each catchment, CN's were selected based on the values given in the OCHM. A table showing the breakdown of soil group, cover type, and CN selection is presented in the Attachments.

Peak Flow Determination

The proposed conditions peak flows obtained from the Unit Hydrograph Method for Catchment Runoff Hydrographs are presented in Tables 3 and 4. As was noted in existing conditions, the peak flow for the confluence of Creeks B, C, & D is not equal to the sum of the individual peak flows for each creek. This is because the peak flow in the hydrograph of Creek C occurs 5 minutes after the peak flows in Creeks B and D. Consequently, the peak discharge at the confluence is approximately 90 cfs lower than the total summation of the partial peak flows.

It is evident from Tables 3 and 4 that the development of the project site has a negligible effect on the peak flows of all four creeks. The largest peak flow increase is a mere 0.5 cfs in Creek A. These minute increases in peak flow are attributable to two factors. First, the area being developed is relatively small when compared to the size of each catchment. Second, the fact that the infiltration capacity of each catchment has already been greatly exceeded during the peak of the storm makes the addition of impervious area somewhat irrelevant.

Thus, while the increase in total runoff volume may be more significant, the project's impact on the maximum peak flows of the hydrographs for all creeks is minimal.

TABLE 3 - Developed Conditions Peak Flows – Western Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek B	224	131.1	0.1
Creek C	717	328.0	0.0
Creek D	473	275.6	0.0
TOTAL: Confluence of Creeks B, C, & D	1414	647.2	0.1

TABLE 4 - Developed Conditions Peak Flows – Southern Boundary

Discharge Location	Drainage Area (Ac)	2-Year Peak Flow (cfs)	Increase Over Existing Conditions (cfs)
Creek A	674	297.1	0.5

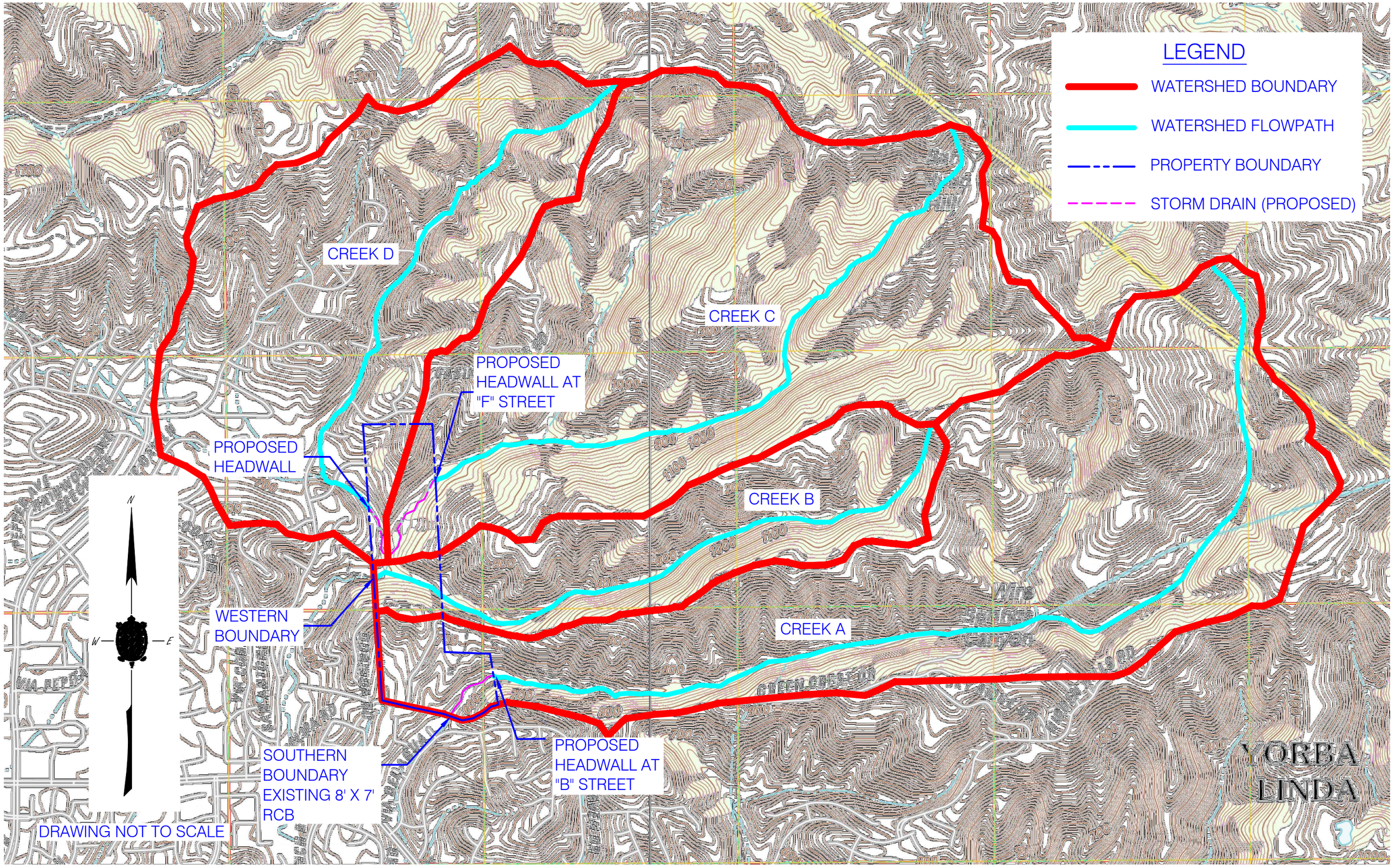
SUMMARY

This study has demonstrated that the increase in peak flow for all receiving creeks due to development of the proposed Cielo Vista site is less than 1%, thus complying with the current Orange County hydromodification criteria.

ATTACHMENTS

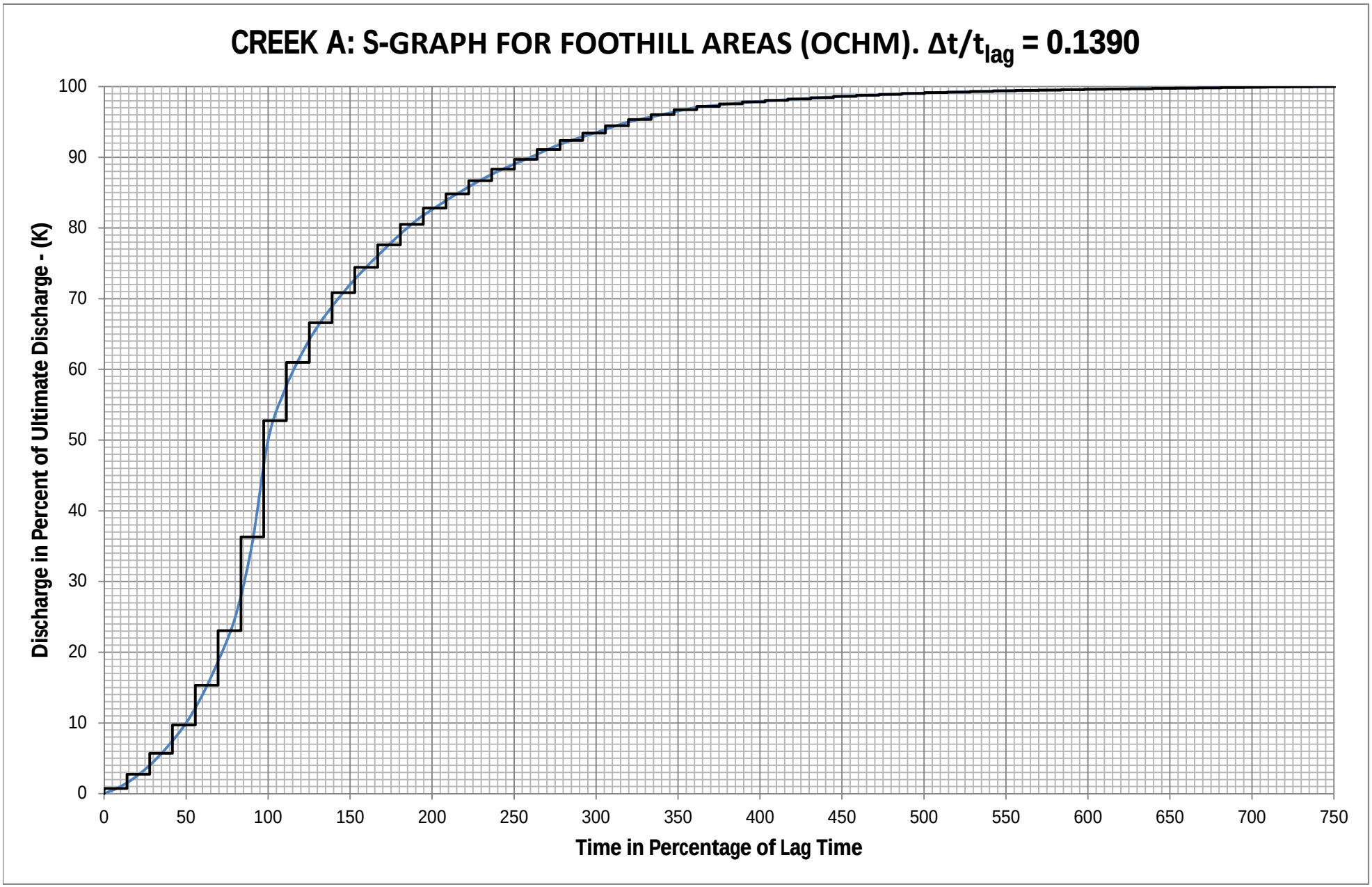
1. Hydrology Map
2. Rainfall, Curve Number, and Unit Hydrograph Calculations

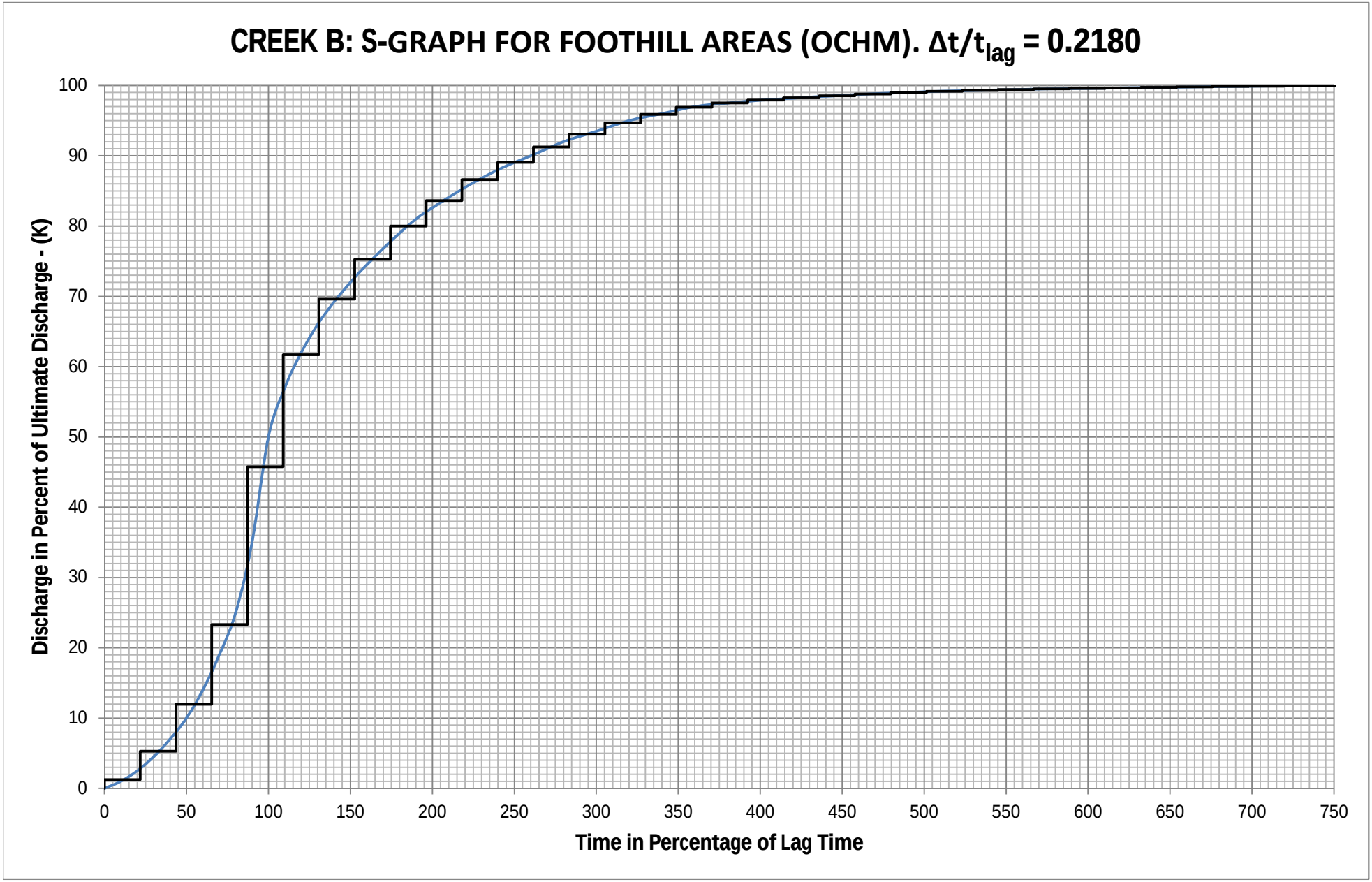
ATTACHMENT 1. Hydrology Map

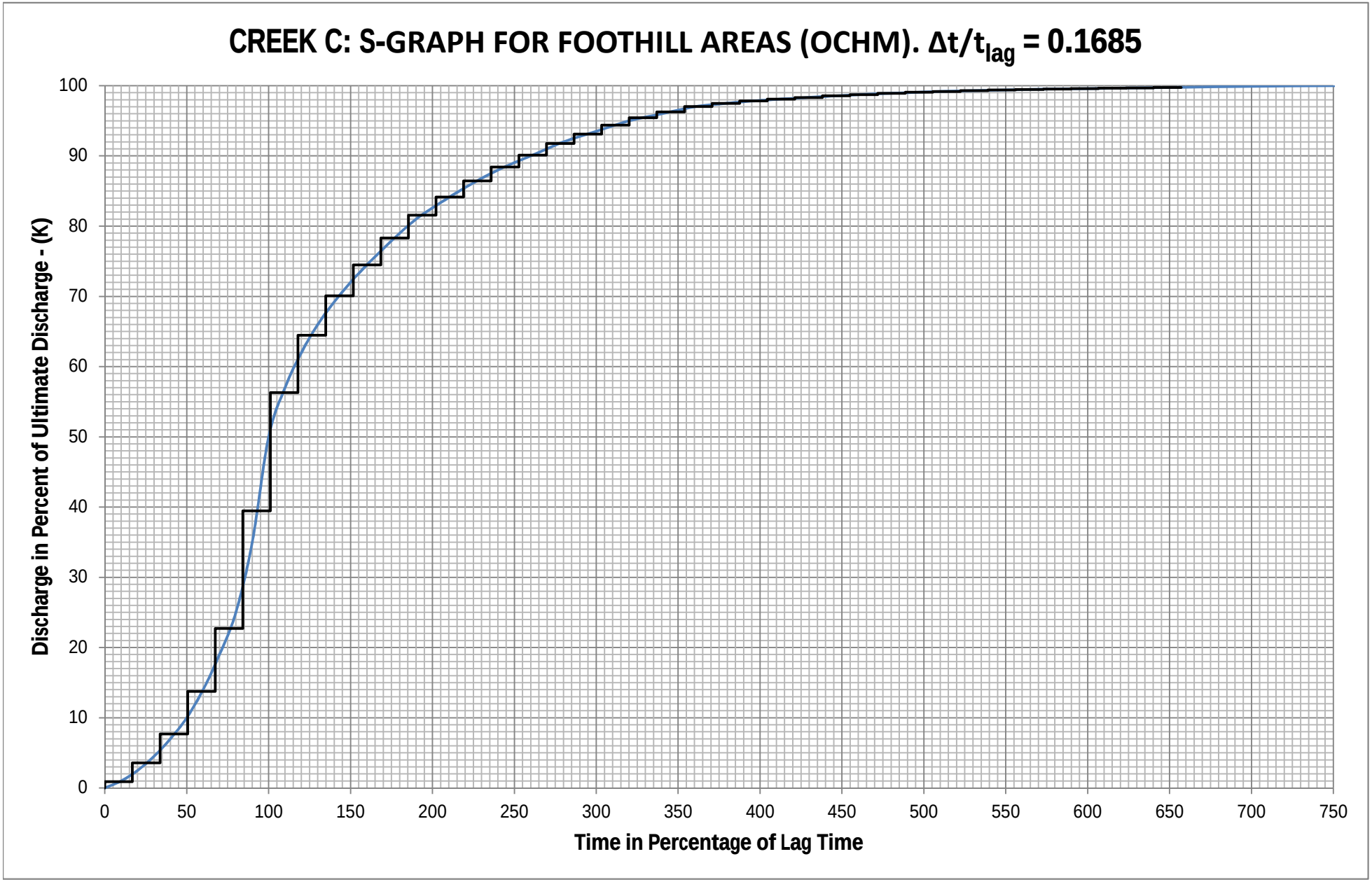

LEGEND
WATERSHED BOUNDARY
WATERSHED FLOWPATH
PROPERTY BOUNDARY
STORM DRAIN (PROPOSED)
CREEK D
CREEK C
CREEK B
CREEK A
PROPOSED HEADWALL AT "F" STREET
PROPOSED HEADWALL
WESTERN BOUNDARY
SOUTHERN BOUNDARY EXISTING 8' X 7' RCB
PROPOSED HEADWALL AT "B" STREET
N
W
E
DRAWING NOT TO SCALE
YORBA LINDA

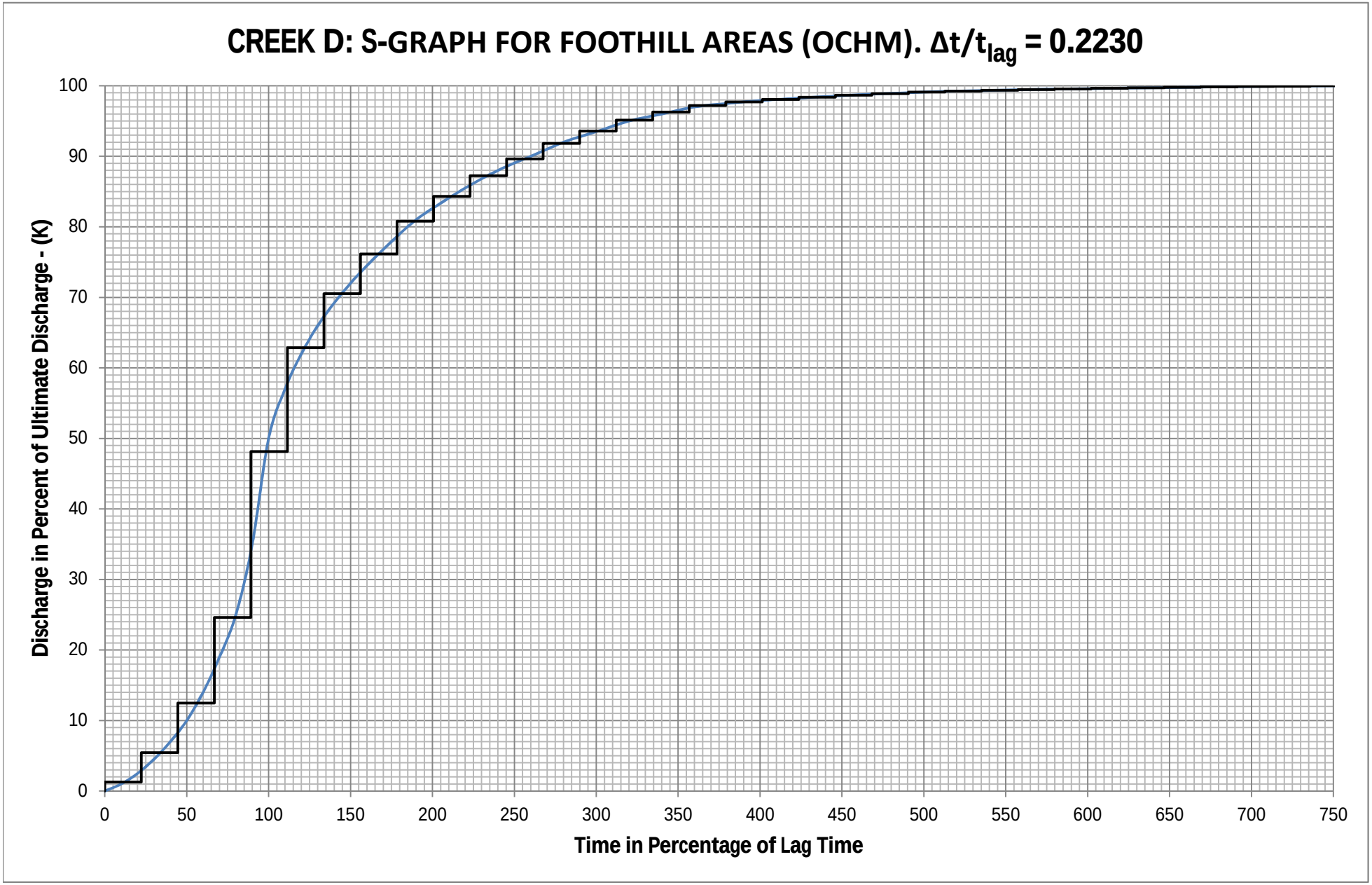
ATTACHMENT 2. Hydrograph Calculations

Lag Time Determination*							
n	0.045						
C_t	1.08						
m	0.38						
Δt	5	min					
Basin ID	**Area (mi2)**	**L (mi)**	**L_ca (mi)**	**S2 (ft/mi)**	**Tlag (hrs)**	**Tlag (min)**	**Δt/tlag**
CREEK A	1.053	2.778	1.373	322.6	0.599	36.0	13.90%
CREEK B	0.351	1.588	0.870	450.9	0.382	22.9	21.80%
CREEK C	1.120	2.008	1.297	413.6	0.495	29.7	16.85%
CREEK D	0.739	1.626	0.769	415.9	0.374	22.4	22.30%
*All variables as defined in Section E.3 of the Orange County Hydrology Manual							


CREEK A: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1390
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK B: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2180
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK C: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.1685
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


CREEK D: S-GRAPH FOR FOOTHILL AREAS (OCHM). Δt/t_lag = 0.2230
Discharge in Percent of Ultimate Discharge - (K)
Time in Percentage of Lag Time
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750

2-yr, 24-hr Design Storm Rainfall per Section B.4 of the Orange County Hydrology Manual:

			Corrections per Basin (dimensionless)		Corrected Precipitation Per Basin (in/hr)		Design Storm Incremental precipitation per basin[1]	
time (min)	I (in/hr)	P (in)	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D	CREEK A	CREEK B+C+D
5	2.264	0.189	96.10	92.15	2.18	2.09	0.0031	0.0031
10	1.521	0.253	96.10	92.15	1.46	1.40	0.0031	0.0031
15	1.205	0.301	96.10	92.15	1.16	1.11	0.0031	0.0031
20	1.021	0.340	96.10	92.15	0.98	0.94	0.0031	0.0032
25	0.899	0.374	96.10	92.15	0.86	0.83	0.0032	0.0032
30	0.809	0.405	96.10	92.15	0.78	0.75	0.0032	0.0032
35	0.741	0.432	96.10	92.15	0.71	0.68	0.0032	0.0032
40	0.686	0.457	96.10	92.15	0.66	0.63	0.0032	0.0032
45	0.641	0.481	96.10	92.15	0.62	0.59	0.0032	0.0032
50	0.604	0.503	96.10	92.15	0.58	0.56	0.0032	0.0032
55	0.572	0.524	96.10	92.15	0.55	0.53	0.0032	0.0032
60	0.544	0.544	96.10	92.15	0.52	0.50	0.0032	0.0032
65	0.519	0.563	96.25	92.44	0.50	0.48	0.0032	0.0032
70	0.498	0.581	96.40	92.74	0.48	0.46	0.0032	0.0033
75	0.478	0.598	96.54	93.03	0.46	0.45	0.0033	0.0033
80	0.461	0.615	96.69	93.33	0.45	0.43	0.0033	0.0033
85	0.445	0.631	96.84	93.62	0.43	0.42	0.0033	0.0033
90	0.431	0.646	96.98	93.91	0.42	0.40	0.0033	0.0033
95	0.418	0.661	97.13	94.21	0.41	0.39	0.0033	0.0033
100	0.406	0.676	97.28	94.50	0.39	0.38	0.0033	0.0033
105	0.394	0.690	97.42	94.80	0.38	0.37	0.0033	0.0033
110	0.384	0.704	97.57	95.09	0.37	0.37	0.0033	0.0033
115	0.374	0.717	97.72	95.38	0.37	0.36	0.0033	0.0034
120	0.365	0.730	97.86	95.68	0.36	0.35	0.0034	0.0034
125	0.357	0.743	98.01	95.97	0.35	0.34	0.0034	0.0034
130	0.349	0.756	98.15	96.27	0.34	0.34	0.0034	0.0034
135	0.341	0.768	98.30	96.56	0.34	0.33	0.0034	0.0034
140	0.334	0.780	98.45	96.85	0.33	0.32	0.0034	0.0034
145	0.328	0.792	98.59	97.15	0.32	0.32	0.0034	0.0034
150	0.321	0.803	98.74	97.44	0.32	0.31	0.0034	0.0034
155	0.315	0.815	98.89	97.73	0.31	0.31	0.0034	0.0034
160	0.310	0.826	99.03	98.03	0.31	0.30	0.0034	0.0035
165	0.304	0.837	99.18	98.32	0.30	0.30	0.0035	0.0035
170	0.299	0.847	99.33	98.62	0.30	0.29	0.0035	0.0035
175	0.294	0.858	99.47	98.91	0.29	0.29	0.0035	0.0035
180	0.289	0.868	99.62	99.20	0.29	0.29	0.0035	0.0035
185	0.285	0.878	99.63	99.22	0.28	0.28	0.0035	0.0035
190	0.281	0.888	99.63	99.23	0.28	0.28	0.0035	0.0035
195	0.276	0.898	99.64	99.24	0.28	0.27	0.0035	0.0035

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

200	0.272	0.908	99.64	99.25	0.27	0.27	0.0036	0.0036
205	0.269	0.918	99.65	99.26	0.27	0.27	0.0036	0.0036
210	0.265	0.927	99.65	99.28	0.26	0.26	0.0036	0.0036
215	0.261	0.936	99.66	99.29	0.26	0.26	0.0036	0.0036
220	0.258	0.946	99.67	99.30	0.26	0.26	0.0036	0.0036
225	0.255	0.955	99.67	99.31	0.25	0.25	0.0036	0.0036
230	0.251	0.964	99.68	99.32	0.25	0.25	0.0036	0.0036
235	0.248	0.973	99.68	99.33	0.25	0.25	0.0037	0.0037
240	0.245	0.981	99.69	99.35	0.24	0.24	0.0037	0.0037
245	0.242	0.990	99.69	99.36	0.24	0.24	0.0037	0.0037
250	0.240	0.999	99.70	99.37	0.24	0.24	0.0037	0.0037
255	0.237	1.007	99.71	99.38	0.24	0.24	0.0037	0.0037
260	0.234	1.015	99.71	99.39	0.23	0.23	0.0037	0.0037
265	0.232	1.024	99.72	99.41	0.23	0.23	0.0037	0.0037
270	0.229	1.032	99.72	99.42	0.23	0.23	0.0038	0.0038
275	0.227	1.040	99.73	99.43	0.23	0.23	0.0038	0.0038
280	0.225	1.048	99.73	99.44	0.22	0.22	0.0038	0.0038
285	0.222	1.056	99.74	99.45	0.22	0.22	0.0038	0.0038
290	0.220	1.064	99.75	99.47	0.22	0.22	0.0038	0.0038
295	0.218	1.072	99.75	99.48	0.22	0.22	0.0038	0.0038
300	0.216	1.079	99.76	99.49	0.22	0.21	0.0038	0.0038
305	0.214	1.087	99.76	99.50	0.21	0.21	0.0039	0.0039
310	0.212	1.094	99.77	99.51	0.21	0.21	0.0039	0.0039
315	0.210	1.102	99.77	99.52	0.21	0.21	0.0039	0.0039
320	0.208	1.109	99.78	99.54	0.21	0.21	0.0039	0.0039
325	0.206	1.117	99.78	99.55	0.21	0.21	0.0039	0.0039
330	0.204	1.124	99.79	99.56	0.20	0.20	0.0040	0.0040
335	0.203	1.131	99.80	99.57	0.20	0.20	0.0040	0.0040
340	0.201	1.138	99.80	99.58	0.20	0.20	0.0040	0.0040
345	0.199	1.145	99.81	99.60	0.20	0.20	0.0040	0.0040
350	0.198	1.153	99.81	99.61	0.20	0.20	0.0040	0.0040
355	0.196	1.160	99.82	99.62	0.20	0.20	0.0040	0.0040
360	0.194	1.166	99.82	99.63	0.19	0.19	0.0041	0.0041
365	0.193	1.173	99.82	99.63	0.19	0.19	0.0041	0.0041
370	0.191	1.180	99.83	99.63	0.19	0.19	0.0041	0.0041
375	0.190	1.187	99.83	99.63	0.19	0.19	0.0041	0.0041
380	0.188	1.194	99.83	99.64	0.19	0.19	0.0041	0.0041
385	0.187	1.200	99.83	99.64	0.19	0.19	0.0042	0.0042
390	0.186	1.207	99.83	99.64	0.19	0.19	0.0042	0.0042
395	0.184	1.213	99.83	99.64	0.18	0.18	0.0042	0.0042
400	0.183	1.220	99.83	99.64	0.18	0.18	0.0042	0.0042
405	0.182	1.226	99.83	99.64	0.18	0.18	0.0043	0.0043
410	0.180	1.233	99.83	99.64	0.18	0.18	0.0043	0.0043
415	0.179	1.239	99.83	99.64	0.18	0.18	0.0043	0.0043
420	0.178	1.246	99.83	99.64	0.18	0.18	0.0043	0.0043
425	0.177	1.252	99.83	99.64	0.18	0.18	0.0043	0.0043
430	0.176	1.258	99.83	99.64	0.18	0.17	0.0044	0.0044

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

435	0.174	1.264	99.83	99.64	0.17	0.17	0.0044	0.0044
440	0.173	1.271	99.83	99.65	0.17	0.17	0.0044	0.0044
445	0.172	1.277	99.83	99.65	0.17	0.17	0.0044	0.0044
450	0.171	1.283	99.83	99.65	0.17	0.17	0.0045	0.0045
455	0.170	1.289	99.83	99.65	0.17	0.17	0.0045	0.0045
460	0.169	1.295	99.83	99.65	0.17	0.17	0.0045	0.0045
465	0.168	1.301	99.83	99.65	0.17	0.17	0.0045	0.0045
470	0.167	1.307	99.83	99.65	0.17	0.17	0.0046	0.0046
475	0.166	1.313	99.83	99.65	0.17	0.17	0.0046	0.0046
480	0.165	1.319	99.83	99.65	0.16	0.16	0.0046	0.0046
485	0.164	1.324	99.83	99.65	0.16	0.16	0.0046	0.0046
490	0.163	1.330	99.83	99.65	0.16	0.16	0.0047	0.0047
495	0.162	1.336	99.84	99.65	0.16	0.16	0.0047	0.0047
500	0.161	1.342	99.84	99.66	0.16	0.16	0.0047	0.0047
505	0.160	1.347	99.84	99.66	0.16	0.16	0.0048	0.0048
510	0.159	1.353	99.84	99.66	0.16	0.16	0.0048	0.0048
515	0.158	1.359	99.84	99.66	0.16	0.16	0.0048	0.0048
520	0.157	1.364	99.84	99.66	0.16	0.16	0.0048	0.0048
525	0.157	1.370	99.84	99.66	0.16	0.16	0.0049	0.0049
530	0.156	1.375	99.84	99.66	0.16	0.16	0.0049	0.0049
535	0.155	1.381	99.84	99.66	0.15	0.15	0.0049	0.0049
540	0.154	1.386	99.84	99.66	0.15	0.15	0.0050	0.0050
545	0.153	1.392	99.84	99.66	0.15	0.15	0.0050	0.0050
550	0.152	1.397	99.84	99.66	0.15	0.15	0.0050	0.0050
555	0.152	1.403	99.84	99.66	0.15	0.15	0.0051	0.0051
560	0.151	1.408	99.84	99.67	0.15	0.15	0.0051	0.0051
565	0.150	1.413	99.84	99.67	0.15	0.15	0.0052	0.0052
570	0.149	1.419	99.84	99.67	0.15	0.15	0.0052	0.0052
575	0.149	1.424	99.84	99.67	0.15	0.15	0.0052	0.0052
580	0.148	1.429	99.84	99.67	0.15	0.15	0.0053	0.0053
585	0.147	1.434	99.84	99.67	0.15	0.15	0.0053	0.0053
590	0.146	1.440	99.84	99.67	0.15	0.15	0.0053	0.0053
595	0.146	1.445	99.84	99.67	0.15	0.15	0.0054	0.0054
600	0.145	1.450	99.84	99.67	0.14	0.14	0.0054	0.0054
605	0.144	1.455	99.84	99.67	0.14	0.14	0.0055	0.0055
610	0.144	1.460	99.84	99.67	0.14	0.14	0.0055	0.0055
615	0.143	1.465	99.84	99.67	0.14	0.14	0.0056	0.0056
620	0.142	1.470	99.85	99.68	0.14	0.14	0.0056	0.0056
625	0.142	1.475	99.85	99.68	0.14	0.14	0.0057	0.0057
630	0.141	1.480	99.85	99.68	0.14	0.14	0.0057	0.0057
635	0.140	1.485	99.85	99.68	0.14	0.14	0.0058	0.0058
640	0.140	1.490	99.85	99.68	0.14	0.14	0.0058	0.0058
645	0.139	1.495	99.85	99.68	0.14	0.14	0.0059	0.0059
650	0.138	1.500	99.85	99.68	0.14	0.14	0.0059	0.0059
655	0.138	1.505	99.85	99.68	0.14	0.14	0.0060	0.0060
660	0.137	1.510	99.85	99.68	0.14	0.14	0.0060	0.0060
665	0.137	1.515	99.85	99.68	0.14	0.14	0.0061	0.0061

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

670	0.136	1.520	99.85	99.68	0.14	0.14	0.0061	0.0061
675	0.136	1.525	99.85	99.68	0.14	0.14	0.0062	0.0062
680	0.135	1.529	99.85	99.69	0.13	0.13	0.0062	0.0062
685	0.134	1.534	99.85	99.69	0.13	0.13	0.0063	0.0063
690	0.134	1.539	99.85	99.69	0.13	0.13	0.0064	0.0064
695	0.133	1.544	99.85	99.69	0.13	0.13	0.0065	0.0065
700	0.133	1.548	99.85	99.69	0.13	0.13	0.0065	0.0065
705	0.132	1.553	99.85	99.69	0.13	0.13	0.0066	0.0066
710	0.132	1.558	99.85	99.69	0.13	0.13	0.0067	0.0067
715	0.131	1.562	99.85	99.69	0.13	0.13	0.0068	0.0068
720	0.131	1.567	99.85	99.69	0.13	0.13	0.0068	0.0068
725	0.130	1.572	99.85	99.69	0.13	0.13	0.0070	0.0070
730	0.130	1.576	99.85	99.69	0.13	0.13	0.0070	0.0071
735	0.129	1.581	99.85	99.69	0.13	0.13	0.0072	0.0072
740	0.129	1.586	99.85	99.70	0.13	0.13	0.0072	0.0073
745	0.128	1.590	99.86	99.70	0.13	0.13	0.0073	0.0074
750	0.128	1.595	99.86	99.70	0.13	0.13	0.0074	0.0074
755	0.127	1.599	99.86	99.70	0.13	0.13	0.0075	0.0076
760	0.127	1.604	99.86	99.70	0.13	0.13	0.0076	0.0076
765	0.126	1.608	99.86	99.70	0.13	0.13	0.0077	0.0078
770	0.126	1.613	99.86	99.70	0.13	0.13	0.0078	0.0079
775	0.125	1.617	99.86	99.70	0.13	0.12	0.0080	0.0080
780	0.125	1.621	99.86	99.70	0.12	0.12	0.0081	0.0081
785	0.124	1.626	99.86	99.70	0.12	0.12	0.0082	0.0083
790	0.124	1.630	99.86	99.70	0.12	0.12	0.0083	0.0083
795	0.123	1.635	99.86	99.70	0.12	0.12	0.0085	0.0085
800	0.123	1.639	99.86	99.71	0.12	0.12	0.0086	0.0086
805	0.122	1.643	99.86	99.71	0.12	0.12	0.0088	0.0088
810	0.122	1.648	99.86	99.71	0.12	0.12	0.0089	0.0089
815	0.122	1.652	99.86	99.71	0.12	0.12	0.0091	0.0091
820	0.121	1.656	99.86	99.71	0.12	0.12	0.0092	0.0093
825	0.121	1.661	99.86	99.71	0.12	0.12	0.0095	0.0095
830	0.120	1.665	99.86	99.71	0.12	0.12	0.0096	0.0096
835	0.120	1.669	99.86	99.71	0.12	0.12	0.0099	0.0099
840	0.120	1.673	99.86	99.71	0.12	0.12	0.0100	0.0101
845	0.119	1.678	99.86	99.71	0.12	0.12	0.0116	0.0128
850	0.119	1.682	99.86	99.71	0.12	0.12	0.0117	0.0129
855	0.118	1.686	99.86	99.71	0.12	0.12	0.0120	0.0131
860	0.118	1.690	99.86	99.72	0.12	0.12	0.0122	0.0133
865	0.118	1.695	99.86	99.72	0.12	0.12	0.0125	0.0136
870	0.117	1.699	99.87	99.72	0.12	0.12	0.0127	0.0137
875	0.117	1.703	99.87	99.72	0.12	0.12	0.0131	0.0140
880	0.116	1.707	99.87	99.72	0.12	0.12	0.0134	0.0142
885	0.116	1.711	99.87	99.72	0.12	0.12	0.0139	0.0147
890	0.116	1.715	99.87	99.72	0.12	0.12	0.0142	0.0149
895	0.115	1.719	99.87	99.72	0.12	0.11	0.0148	0.0154
900	0.115	1.723	99.87	99.72	0.11	0.11	0.0152	0.0157

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

905	0.115	1.727	99.87	99.72	0.11	0.11	0.0160	0.0165
910	0.114	1.732	99.87	99.72	0.11	0.11	0.0165	0.0169
915	0.114	1.736	99.87	99.72	0.11	0.11	0.0176	0.0178
920	0.113	1.740	99.87	99.73	0.11	0.11	0.0182	0.0184
925	0.113	1.744	99.87	99.73	0.11	0.11	0.0190	0.0182
930	0.113	1.748	99.87	99.73	0.11	0.11	0.0200	0.0192
935	0.112	1.752	99.87	99.73	0.11	0.11	0.0226	0.0217
940	0.112	1.756	99.87	99.73	0.11	0.11	0.0243	0.0233
945	0.112	1.760	99.87	99.73	0.11	0.11	0.0291	0.0279
950	0.111	1.764	99.87	99.73	0.11	0.11	0.0326	0.0313
955	0.111	1.767	99.87	99.73	0.11	0.11	0.0459	0.0440
960	0.111	1.771	99.87	99.73	0.11	0.11	0.0623	0.0597
965	0.110	1.775	99.87	99.73	0.11	0.11	0.1813	0.1738
970	0.110	1.779	99.87	99.73	0.11	0.11	0.0377	0.0362
975	0.110	1.783	99.87	99.73	0.11	0.11	0.0264	0.0253
980	0.109	1.787	99.87	99.74	0.11	0.11	0.0212	0.0203
985	0.109	1.791	99.87	99.74	0.11	0.11	0.0189	0.0190
990	0.109	1.795	99.87	99.74	0.11	0.11	0.0170	0.0173
995	0.108	1.799	99.88	99.74	0.11	0.11	0.0156	0.0161
1000	0.108	1.803	99.88	99.74	0.11	0.11	0.0145	0.0152
1005	0.108	1.806	99.88	99.74	0.11	0.11	0.0136	0.0144
1010	0.108	1.810	99.88	99.74	0.11	0.11	0.0129	0.0139
1015	0.107	1.814	99.88	99.74	0.11	0.11	0.0124	0.0134
1020	0.107	1.818	99.88	99.74	0.11	0.11	0.0119	0.0130
1025	0.107	1.822	99.88	99.74	0.11	0.11	0.0102	0.0102
1030	0.106	1.825	99.88	99.74	0.11	0.11	0.0098	0.0098
1035	0.106	1.829	99.88	99.74	0.11	0.11	0.0094	0.0094
1040	0.106	1.833	99.88	99.75	0.11	0.11	0.0090	0.0090
1045	0.105	1.837	99.88	99.75	0.11	0.11	0.0087	0.0087
1050	0.105	1.840	99.88	99.75	0.11	0.10	0.0084	0.0084
1055	0.105	1.844	99.88	99.75	0.10	0.10	0.0081	0.0082
1060	0.105	1.848	99.88	99.75	0.10	0.10	0.0079	0.0079
1065	0.104	1.852	99.88	99.75	0.10	0.10	0.0077	0.0077
1070	0.104	1.855	99.88	99.75	0.10	0.10	0.0075	0.0075
1075	0.104	1.859	99.88	99.75	0.10	0.10	0.0073	0.0073
1080	0.103	1.863	99.88	99.75	0.10	0.10	0.0071	0.0072
1085	0.103	1.866	99.88	99.75	0.10	0.10	0.0069	0.0069
1090	0.103	1.870	99.88	99.75	0.10	0.10	0.0067	0.0067
1095	0.103	1.874	99.88	99.75	0.10	0.10	0.0066	0.0066
1100	0.102	1.877	99.88	99.76	0.10	0.10	0.0064	0.0064
1105	0.102	1.881	99.88	99.76	0.10	0.10	0.0063	0.0063
1110	0.102	1.884	99.88	99.76	0.10	0.10	0.0062	0.0062
1115	0.102	1.888	99.88	99.76	0.10	0.10	0.0060	0.0060
1120	0.101	1.892	99.89	99.76	0.10	0.10	0.0059	0.0059
1125	0.101	1.895	99.89	99.76	0.10	0.10	0.0058	0.0058
1130	0.101	1.899	99.89	99.76	0.10	0.10	0.0057	0.0057
1135	0.101	1.902	99.89	99.76	0.10	0.10	0.0056	0.0056

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

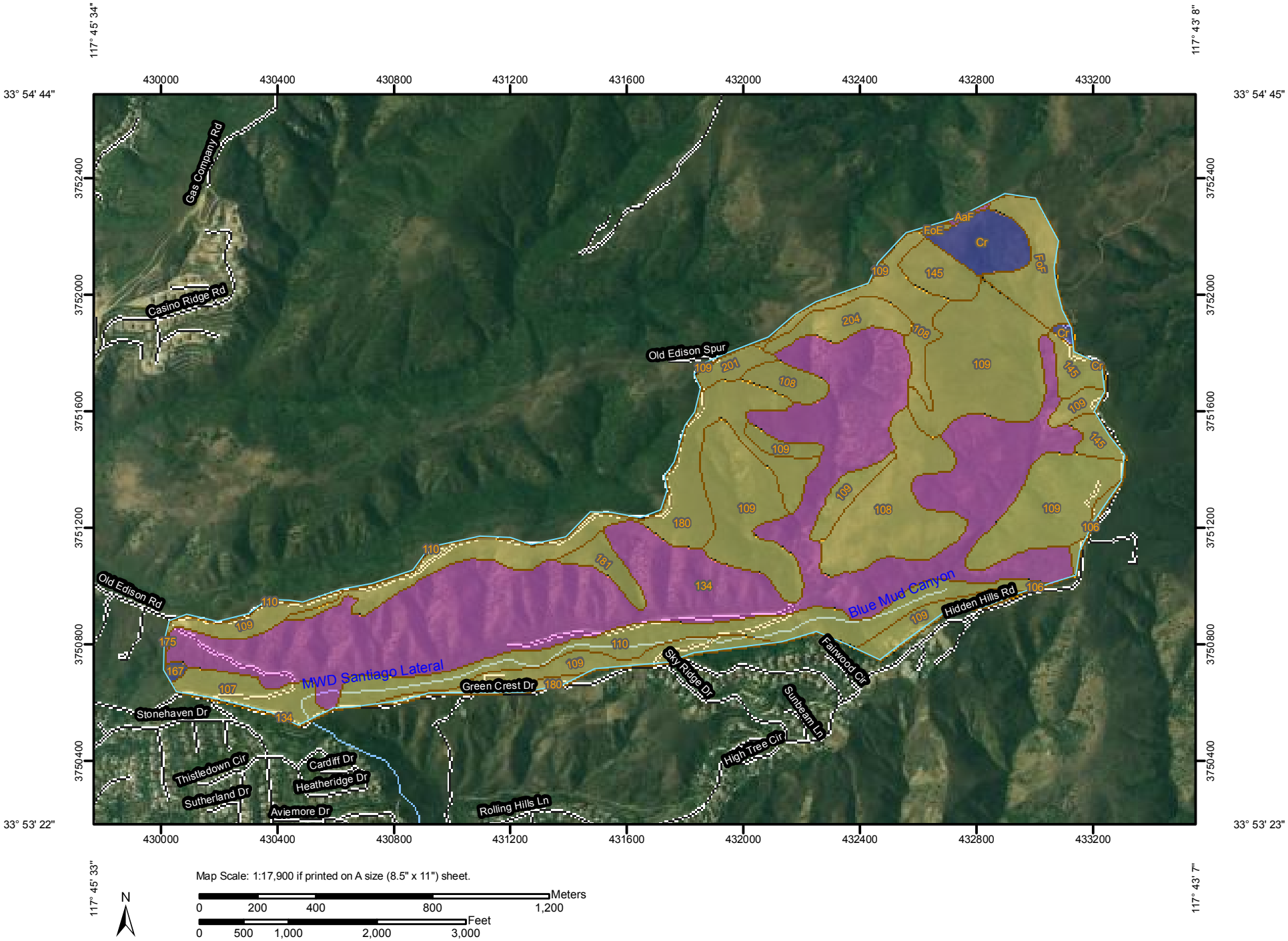
1140	0.100	1.906	99.89	99.76	0.10	0.10	0.0055	0.0055
1145	0.100	1.910	99.89	99.76	0.10	0.10	0.0055	0.0054
1150	0.100	1.913	99.89	99.76	0.10	0.10	0.0054	0.0054
1155	0.100	1.917	99.89	99.77	0.10	0.10	0.0053	0.0053
1160	0.099	1.920	99.89	99.77	0.10	0.10	0.0052	0.0052
1165	0.099	1.924	99.89	99.77	0.10	0.10	0.0051	0.0051
1170	0.099	1.927	99.89	99.77	0.10	0.10	0.0051	0.0051
1175	0.099	1.931	99.89	99.77	0.10	0.10	0.0050	0.0050
1180	0.098	1.934	99.89	99.77	0.10	0.10	0.0049	0.0049
1185	0.098	1.938	99.89	99.77	0.10	0.10	0.0049	0.0049
1190	0.098	1.941	99.89	99.77	0.10	0.10	0.0048	0.0048
1195	0.098	1.945	99.89	99.77	0.10	0.10	0.0047	0.0047
1200	0.097	1.948	99.89	99.77	0.10	0.10	0.0047	0.0047
1205	0.097	1.952	99.89	99.77	0.10	0.10	0.0046	0.0046
1210	0.097	1.955	99.89	99.77	0.10	0.10	0.0046	0.0046
1215	0.097	1.958	99.89	99.78	0.10	0.10	0.0045	0.0045
1220	0.096	1.962	99.89	99.78	0.10	0.10	0.0045	0.0045
1225	0.096	1.965	99.89	99.78	0.10	0.10	0.0044	0.0044
1230	0.096	1.969	99.89	99.78	0.10	0.10	0.0044	0.0044
1235	0.096	1.972	99.89	99.78	0.10	0.10	0.0043	0.0043
1240	0.096	1.975	99.89	99.78	0.10	0.10	0.0043	0.0043
1245	0.095	1.979	99.90	99.78	0.10	0.10	0.0042	0.0042
1250	0.095	1.982	99.90	99.78	0.10	0.09	0.0042	0.0042
1255	0.095	1.986	99.90	99.78	0.09	0.09	0.0042	0.0042
1260	0.095	1.989	99.90	99.78	0.09	0.09	0.0041	0.0041
1265	0.094	1.992	99.90	99.78	0.09	0.09	0.0041	0.0041
1270	0.094	1.996	99.90	99.78	0.09	0.09	0.0040	0.0040
1275	0.094	1.999	99.90	99.79	0.09	0.09	0.0040	0.0040
1280	0.094	2.002	99.90	99.79	0.09	0.09	0.0040	0.0040
1285	0.094	2.006	99.90	99.79	0.09	0.09	0.0039	0.0039
1290	0.093	2.009	99.90	99.79	0.09	0.09	0.0039	0.0039
1295	0.093	2.012	99.90	99.79	0.09	0.09	0.0039	0.0039
1300	0.093	2.016	99.90	99.79	0.09	0.09	0.0038	0.0038
1305	0.093	2.019	99.90	99.79	0.09	0.09	0.0038	0.0038
1310	0.093	2.022	99.90	99.79	0.09	0.09	0.0038	0.0038
1315	0.092	2.026	99.90	99.79	0.09	0.09	0.0037	0.0037
1320	0.092	2.029	99.90	99.79	0.09	0.09	0.0037	0.0037
1325	0.092	2.032	99.90	99.79	0.09	0.09	0.0037	0.0037
1330	0.092	2.035	99.90	99.79	0.09	0.09	0.0036	0.0036
1335	0.092	2.039	99.90	99.80	0.09	0.09	0.0036	0.0036
1340	0.091	2.042	99.90	99.80	0.09	0.09	0.0036	0.0036
1345	0.091	2.045	99.90	99.80	0.09	0.09	0.0036	0.0036
1350	0.091	2.048	99.90	99.80	0.09	0.09	0.0035	0.0035
1355	0.091	2.052	99.90	99.80	0.09	0.09	0.0035	0.0035
1360	0.091	2.055	99.90	99.80	0.09	0.09	0.0035	0.0035
1365	0.090	2.058	99.90	99.80	0.09	0.09	0.0035	0.0035
1370	0.090	2.061	99.91	99.80	0.09	0.09	0.0034	0.0034

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

1375	0.090	2.064	99.91	99.80	0.09	0.09	0.0034	0.0034
1380	0.090	2.068	99.91	99.80	0.09	0.09	0.0034	0.0034
1385	0.090	2.071	99.91	99.80	0.09	0.09	0.0034	0.0034
1390	0.090	2.074	99.91	99.80	0.09	0.09	0.0033	0.0033
1395	0.089	2.077	99.91	99.81	0.09	0.09	0.0033	0.0033
1400	0.089	2.080	99.91	99.81	0.09	0.09	0.0033	0.0033
1405	0.089	2.083	99.91	99.81	0.09	0.09	0.0033	0.0033
1410	0.089	2.087	99.91	99.81	0.09	0.09	0.0033	0.0033
1415	0.089	2.090	99.91	99.81	0.09	0.09	0.0032	0.0032
1420	0.088	2.093	99.91	99.81	0.09	0.09	0.0032	0.0032
1425	0.088	2.096	99.91	99.81	0.09	0.09	0.0032	0.0032
1430	0.088	2.099	99.91	99.81	0.09	0.09	0.0032	0.0032
1435	0.088	2.102	99.91	99.81	0.09	0.09	0.0032	0.0032
1440	0.088	2.105	99.91	99.81	0.09	0.09	0.0031	0.0031

[1]Precipitation increments are sorted according to the OCHM, such that the maximum 5 minute intensity occurs between 960 to 965 minutes.

Hydrologic Soil Group—Orange County and Part of Riverside County, California, and San Bernardino County Southwestern Part, California
(Watershed of Creek A)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:17,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.5	0.4%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	12.8	2.1%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	56.1	9.1%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	142.3	23.2%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	41.0	6.7%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	238.5	38.9%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	19.3	3.1%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	0.9	0.2%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.2	0.0%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	48.1	7.8%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	6.1	1.0%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	4.9	0.8%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.4	1.7%
Subtotals for Soil Survey Area			**583.0**	**95.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AaF	Alo clay, 30 to 50 percent slopes	D	0.5	0.1%
Cr	CIENEBA-ROCK OUTCROP COMPLEX	B	13.9	2.3%
FoE	FONTANA CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	0.7	0.1%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	15.9	2.6%
Subtotals for Soil Survey Area			**30.9**	**5.0%**
Totals for Area of Interest			**613.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

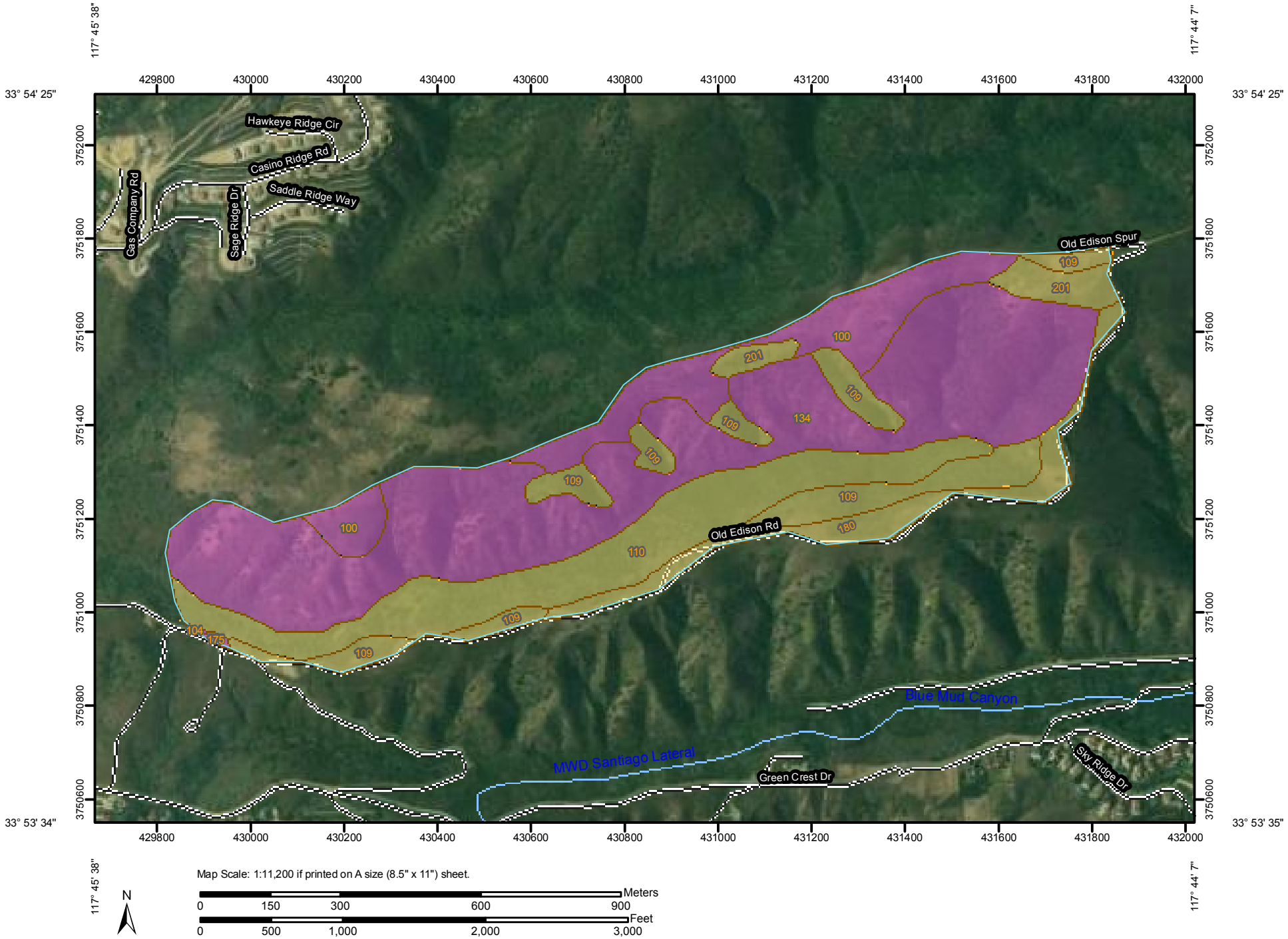
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed Creek B)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:11,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	24.2	11.8%
104	ALO VARIANT CLAY, 15 TO 30 PERCENT SLOPES	D	0.1	0.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	24.8	12.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	37.6	18.3%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	99.4	48.3%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	0.3	0.1%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	12.8	6.2%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	6.9	3.3%
Totals for Area of Interest			**206.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

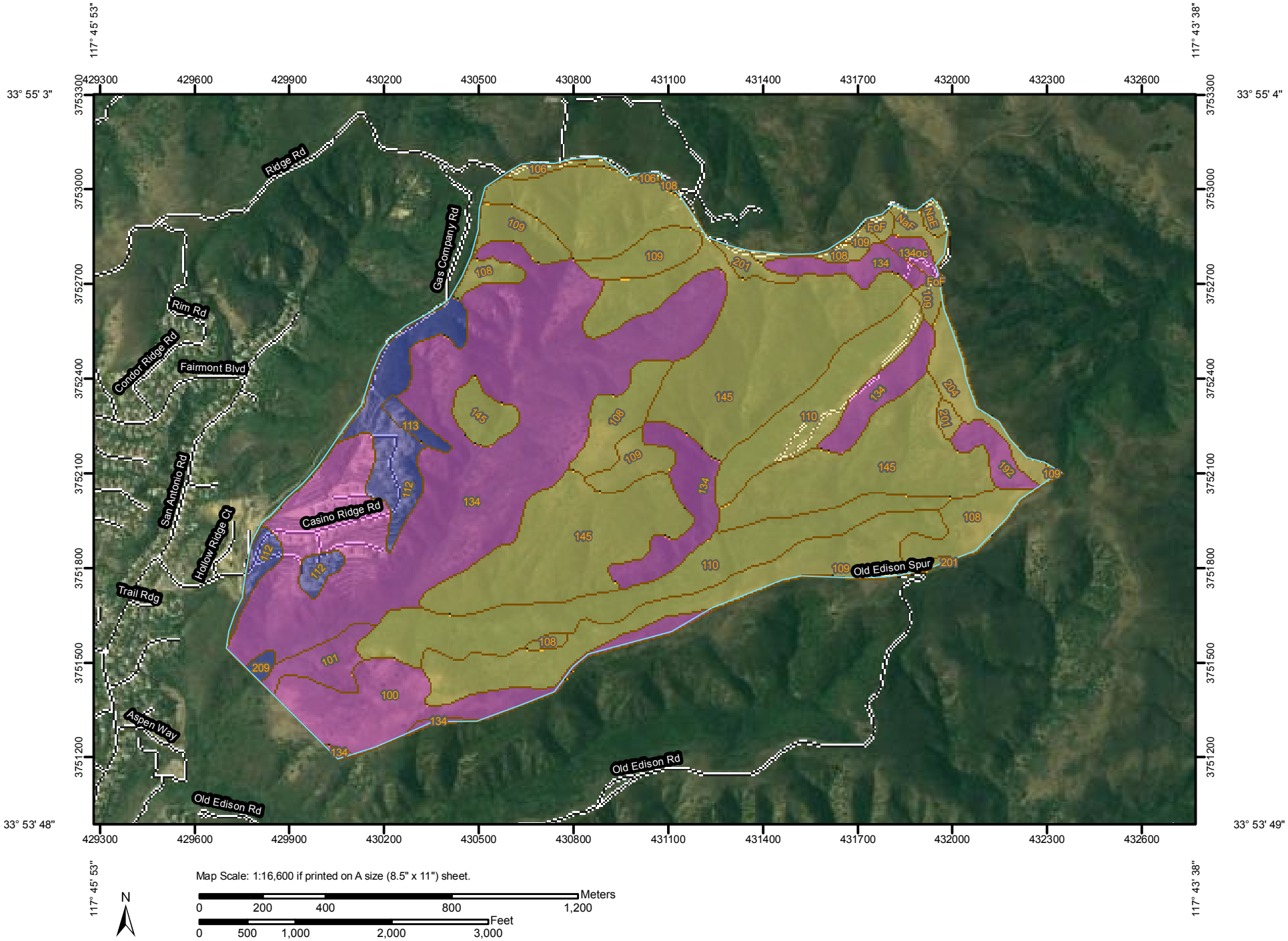
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California, and San Bernardino County Southwestern Part, California
(Watershed of Creek C)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:16,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 4, Jan 3, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	33.6	4.8%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	8.9	1.3%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	2.7	0.4%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	32.2	4.6%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	70.4	10.0%
110	ANAHEIM CLAY LOAM, 50 TO 75 PERCENT SLOPES	C	75.8	10.8%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	30.2	4.3%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	3.1	0.4%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	212.0	30.2%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	201.0	28.6%
192	ROCK OUTCROP-CIENEBA COMPLEX, 30 TO 75 PERCENT SLOPES	D	6.4	0.9%
201	SOPER GRAVELLY LOAM, 15 TO 30 PERCENT SLOPES	C	5.2	0.7%
204	SOPER-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	10.2	1.5%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	1.4	0.2%
Subtotals for Soil Survey Area			**693.1**	**98.6%**
Totals for Area of Interest			**702.7**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
134oc	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	3.0	0.4%
FoF	FONTANA CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	1.5	0.2%
NaE	NACIMIENTO CLAY LOAM, 9 TO 30 PERCENT SLOPES	C	1.6	0.2%

Hydrologic Soil Group— Summary by Map Unit — San Bernardino County Southwestern Part, California (CA677)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
NaF	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	3.4	0.5%
Subtotals for Soil Survey Area			**9.6**	**1.4%**
Totals for Area of Interest			**702.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

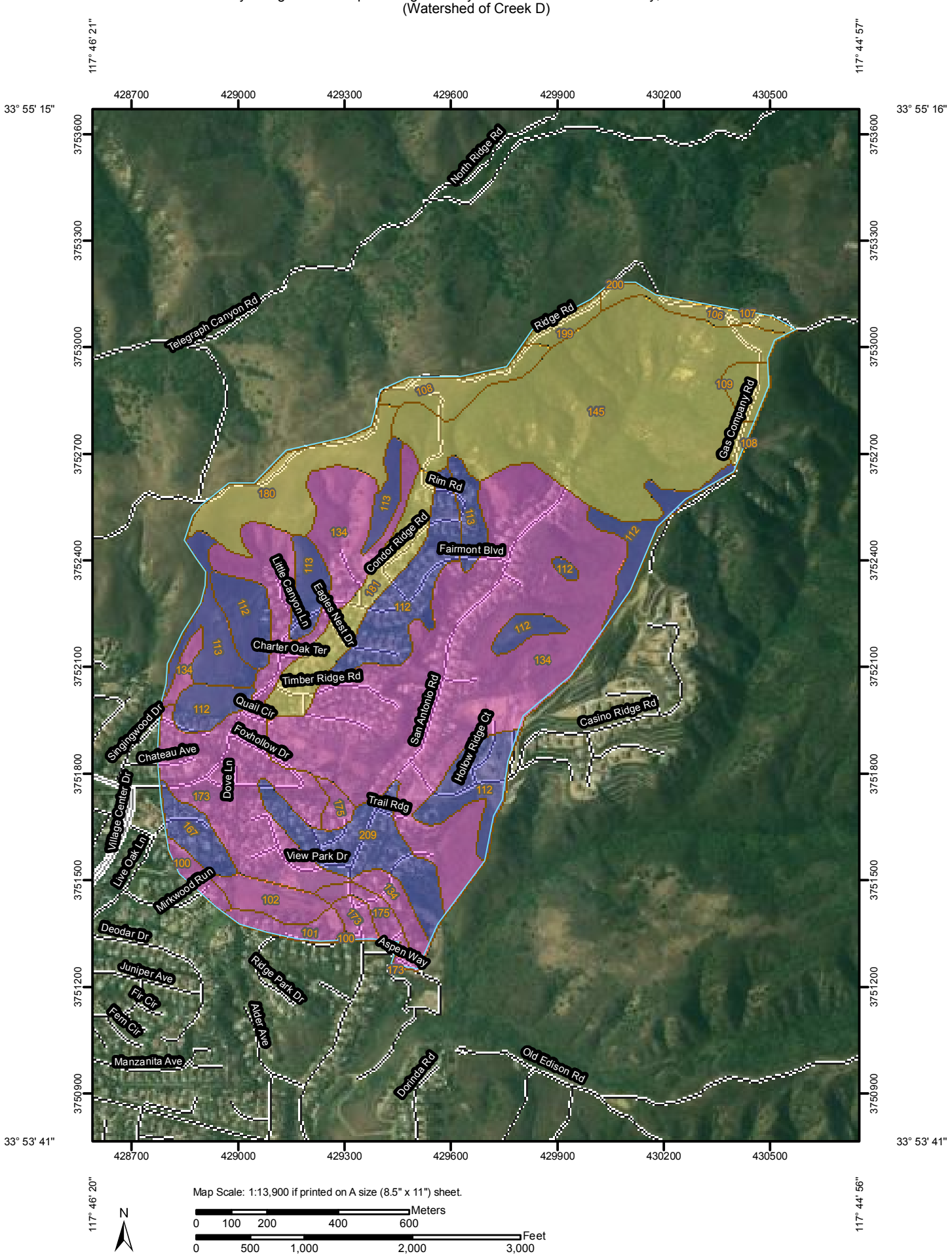
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(Watershed of Creek D)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:13,900 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 5, Sep 10, 2008

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Orange County and Part of Riverside County, California (CA678)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
100	ALO CLAY, 9 TO 15 PERCENT SLOPES	D	3.2	0.7%
101	ALO CLAY, 15 TO 30 PERCENT SLOPES	D	4.3	0.9%
102	ALO CLAY, 30 TO 50 PERCENT SLOPES	D	6.7	1.5%
106	ANAHEIM LOAM, 15 TO 30 PERCENT SLOPES	C	5.5	1.2%
107	ANAHEIM LOAM, 30 TO 50 PERCENT SLOPES	C	0.0	0.0%
108	ANAHEIM CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	9.3	2.0%
109	ANAHEIM CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	4.2	0.9%
112	BALCOM CLAY LOAM, 15 TO 30 PERCENT SLOPES	B	52.7	11.6%
113	BALCOM CLAY LOAM, 30 TO 50 PERCENT SLOPES	B	23.7	5.2%
134	CALLEGUAS CLAY LOAM, 50 TO 75 PERCENT SLOPES, ERODED	D	150.9	33.1%
145	CIENEBA-ROCK OUTCROP COMPLEX, 30 TO 75 PERCENT SLOPES	C	89.0	19.5%
167	MOCHO LOAM, 2 TO 9 PERCENT SLOPES	B	6.1	1.3%
173	MYFORD SANDY LOAM, 2 TO 9 PERCENT SLOPES	D	37.1	8.1%
175	MYFORD SANDY LOAM, 9 TO 15 PERCENT SLOPES	D	6.3	1.4%
180	NACIMIENTO CLAY LOAM, 15 TO 30 PERCENT SLOPES	C	19.8	4.3%
181	NACIMIENTO CLAY LOAM, 30 TO 50 PERCENT SLOPES	C	16.1	3.5%
199	SOPER LOAM, 15 TO 30 PERCENT SLOPES	C	3.1	0.7%
200	SOPER LOAM, 30 TO 50 PERCENT SLOPES	C	0.0	0.0%
209	SORRENTO CLAY LOAM, 2 TO 9 PERCENT SLOPES	B	18.4	4.0%
Totals for Area of Interest			**456.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Pre-Project Condition

Creek A - Existing Conditions					P_2yr	2.104	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.10	12.727	0.016	0.002		
Chaparral, Narrow Leaf	Fair	B	53	0.93	8.868	0.012	0.011		
Grass, Annual or Perennial	Fair	B	50	1.35	10.000	0.001	0.001		
Chaparral, Narrow Leaf	Good	C	58	8.63	7.241	0.054	0.470		
Chaparral, Narrow Leaf	Fair	C	64	12.94	5.625	0.145	1.878		
Grass, Annual or Perennial	Fair	C	62	34.42	6.129	0.110	3.788		
Chaparral, Narrow Leaf	Good	D	66	4.22	5.152	0.185	0.781		
Chaparral, Narrow Leaf	Fair	D	71	9.85	4.085	0.308	3.037		
Grass, Annual or Perennial	Fair	D	68	27.56	4.706	0.230	6.349		
			TOTAL	100.00		[1]**Q_global**	0.163	in	
						S	5.401		
						[2]CN	64.9		
Max Loss Rate	0.230	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0192	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual
[2]Overall Watershed CN

Creek B - Existing Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	C	58	6.00	7.241	0.054	0.324		
Chaparral, Narrow Leaf	Fair	C	64	11.14	5.625	0.144	1.607		
Grass, Annual or Perennial	Fair	C	62	10.87	6.129	0.109	1.189		
Chaparral, Narrow Leaf	Good	D	66	7.57	5.152	0.184	1.394		
Chaparral, Narrow Leaf	Fair	D	71	17.66	4.085	0.307	5.423		
Grass, Annual or Perennial	Fair	D	68	46.77	4.706	0.229	10.725		
			TOTAL	100.00		[1]**Q_global**	0.207	in	
						S	4.920		
						[2]CN	67.0		
Max Loss Rate	0.214	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0178	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual
[2]Overall Watershed CN

Creek C - Existing Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.25	12.727	0.016	0.004		
Chaparral, Narrow Leaf	Fair	B	53	0.74	8.868	0.012	0.009		
Grass, Annual or Perennial	Fair	B	50	1.42	10.000	0.001	0.001		
[3]Single Family Residential Impervious Area	Impervious	B	95	0.84	0.526	1.579	1.329		
[3]Single Family Residential Landscaping	Good	B	36	1.26	17.778	0.130	0.164		
Chaparral, Narrow Leaf	Good	C	58	13.76	7.241	0.054	0.743		
Chaparral, Narrow Leaf	Fair	C	64	20.64	5.625	0.144	2.979		
Grass, Annual or Perennial	Fair	C	62	33.00	6.129	0.109	3.609		
Chaparral, Narrow Leaf	Good	D	66	3.22	5.152	0.184	0.594		
Chaparral, Narrow Leaf	Fair	D	71	5.98	4.085	0.307	1.838		
Grass, Annual or Perennial	Fair	D	68	15.19	4.706	0.229	3.483		
[3]Single Family Residential Impervious Area	Impervious	D	95	1.48	0.526	1.579	2.335		
[3]Single Family Residential Landscaping	Good	D	57	2.22	7.544	0.043	0.096		
			TOTAL	100.00		[1]**Q_global**	0.172	in	
						S	5.290		

						[2]CN	65.4		
Max Loss Rate	0.238	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0199	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek D - Existing Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.11	12.727	0.016	0.002		
Chaparral, Narrow Leaf	Fair	B	53	0.44	8.868	0.012	0.005		
Grass, Annual or Perennial	Fair	B	50	6.65	10.000	0.001	0.007		
[3]Single Family Residential Impervious Area	Impervious	B	95	3.38	0.526	1.579	5.331		
[3]Single Family Residential Landscaping	Good	B	36	5.06	17.778	0.130	0.656		
Chaparral, Narrow Leaf	Good	C	58	4.91	7.241	0.054	0.265		
Chaparral, Narrow Leaf	Fair	C	64	7.36	5.625	0.144	1.063		
Grass, Annual or Perennial	Fair	C	62	25.66	6.129	0.109	2.806		
[3]Single Family Residential Impervious Area	Impervious	C	95	1.27	0.526	1.579	2.012		
[3]Single Family Residential Landscaping	Good	C	50	1.91	10.000	0.001	0.002		
Chaparral, Narrow Leaf	Good	D	66	0.73	5.152	0.184	0.135		
Chaparral, Narrow Leaf	Fair	D	71	2.94	4.085	0.307	0.902		
Grass, Annual or Perennial	Fair	D	68	15.67	4.706	0.229	3.594		
[3]Single Family Residential Impervious Area	Impervious	D	95	9.56	0.526	1.579	15.102		
[3]Single Family Residential Landscaping	Good	D	57	14.34	7.544	0.043	0.618		
			TOTAL	100.00		**[1]Q_global**	0.325	in	
						S	3.961		
						[2]CN	71.6		
Max Loss Rate	0.236	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0197	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Existing Conditions Effective Rainfall

Storm: P24-2

Δt: 5 min

Color coded effecive rainfall corresponds to the convolution of effective rainfall with the unit hydrograph.

[1]Per Section C.6.6. of the Orange County Hydrology Manual,
Effective Rainfall = maximum of Rainfall*Yield Fraction or Rainfall - Max Loss, whichever is greater.
where Yield Fraction = Q_global/P_2yr

[2]Rainfall from the 24hr-2yr design storm used for Creek A

[3]Rainfall from the 24hr-2yr design storm used for Creek B, Creek C, and Creek D

	Creek A			**Creek B**			**Creek C**			**Creek D**	
Time (min)	[2]Rainfall (in)	[1]Effective Rainfall (in)		[3]Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)
5	0.0031	0.0002		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
10	0.0031	0.0002		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
15	0.0031	0.0002		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
20	0.0031	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
25	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
30	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
35	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
40	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
45	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
50	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
55	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
60	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
65	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
70	0.0032	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
75	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
80	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
85	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
90	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
95	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
100	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
105	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
110	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
115	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
120	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
125	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
130	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
135	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
140	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
145	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
150	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
155	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
160	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
165	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
170	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005

175	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
180	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
185	0.004	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
190	0.004	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
195	0.004	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
200	0.004	0.0003		0.0036	0.0003		0.0036	0.0003		0.0036	0.0005
205	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
210	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
215	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
220	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
225	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
230	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
235	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
240	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
245	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
250	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
255	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
260	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
265	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
270	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
275	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
280	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
285	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
290	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
295	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
300	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
305	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
310	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
315	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
320	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
325	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
330	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
335	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
340	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
345	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
350	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
355	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
360	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
365	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
370	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
375	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
380	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
385	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0006
390	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0006
395	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
400	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
405	0.004	0.0003		0.0043	0.0004		0.0043	0.0003		0.0043	0.0007
410	0.004	0.0003		0.0043	0.0004		0.0043	0.0003		0.0043	0.0007

415	0.004	0.0003		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
420	0.004	0.0003		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
425	0.004	0.0003		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
430	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
435	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
440	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
445	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
450	0.004	0.0003		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
455	0.004	0.0003		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
460	0.005	0.0003		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
465	0.005	0.0004		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
470	0.005	0.0004		0.0046	0.0004		0.0046	0.0004		0.0046	0.0007
475	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
480	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
485	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
490	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
495	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
500	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
505	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
510	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
515	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
520	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
525	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
530	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
535	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
540	0.005	0.0004		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
545	0.005	0.0004		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
550	0.005	0.0004		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
555	0.005	0.0004		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
560	0.005	0.0004		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
565	0.005	0.0004		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
570	0.005	0.0004		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
575	0.005	0.0004		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
580	0.005	0.0004		0.0053	0.0005		0.0053	0.0004		0.0053	0.0008
585	0.005	0.0004		0.0053	0.0005		0.0053	0.0004		0.0053	0.0008
590	0.005	0.0004		0.0053	0.0005		0.0053	0.0004		0.0053	0.0008
595	0.005	0.0004		0.0054	0.0005		0.0054	0.0004		0.0054	0.0008
600	0.005	0.0004		0.0054	0.0005		0.0054	0.0004		0.0054	0.0008
605	0.005	0.0004		0.0055	0.0005		0.0055	0.0004		0.0055	0.0008
610	0.006	0.0004		0.0055	0.0005		0.0055	0.0005		0.0055	0.0009
615	0.006	0.0004		0.0056	0.0005		0.0056	0.0005		0.0056	0.0009
620	0.006	0.0004		0.0056	0.0006		0.0056	0.0005		0.0056	0.0009
625	0.006	0.0004		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009
630	0.006	0.0004		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009
635	0.006	0.0004		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
640	0.006	0.0004		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
645	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009
650	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009

655	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
660	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
665	0.006	0.0005		0.0061	0.0006		0.0061	0.0005		0.0061	0.0009
670	0.006	0.0005		0.0061	0.0006		0.0061	0.0005		0.0061	0.0009
675	0.006	0.0005		0.0062	0.0006		0.0062	0.0005		0.0062	0.0010
680	0.006	0.0005		0.0062	0.0006		0.0062	0.0005		0.0062	0.0010
685	0.006	0.0005		0.0063	0.0006		0.0063	0.0005		0.0063	0.0010
690	0.006	0.0005		0.0064	0.0006		0.0064	0.0005		0.0064	0.0010
695	0.006	0.0005		0.0065	0.0006		0.0065	0.0005		0.0065	0.0010
700	0.007	0.0005		0.0065	0.0006		0.0065	0.0005		0.0065	0.0010
705	0.007	0.0005		0.0066	0.0006		0.0066	0.0005		0.0066	0.0010
710	0.007	0.0005		0.0067	0.0007		0.0067	0.0005		0.0067	0.0010
715	0.007	0.0005		0.0068	0.0007		0.0068	0.0006		0.0068	0.0010
720	0.007	0.0005		0.0068	0.0007		0.0068	0.0006		0.0068	0.0011
725	0.007	0.0005		0.0070	0.0007		0.0070	0.0006		0.0070	0.0011
730	0.007	0.0005		0.0071	0.0007		0.0071	0.0006		0.0071	0.0011
735	0.007	0.0006		0.0072	0.0007		0.0072	0.0006		0.0072	0.0011
740	0.007	0.0006		0.0073	0.0007		0.0073	0.0006		0.0073	0.0011
745	0.007	0.0006		0.0074	0.0007		0.0074	0.0006		0.0074	0.0011
750	0.007	0.0006		0.0074	0.0007		0.0074	0.0006		0.0074	0.0012
755	0.008	0.0006		0.0076	0.0007		0.0076	0.0006		0.0076	0.0012
760	0.008	0.0006		0.0076	0.0008		0.0076	0.0006		0.0076	0.0012
765	0.008	0.0006		0.0078	0.0008		0.0078	0.0006		0.0078	0.0012
770	0.008	0.0006		0.0079	0.0008		0.0079	0.0006		0.0079	0.0012
775	0.008	0.0006		0.0080	0.0008		0.0080	0.0007		0.0080	0.0012
780	0.008	0.0006		0.0081	0.0008		0.0081	0.0007		0.0081	0.0013
785	0.008	0.0006		0.0083	0.0008		0.0083	0.0007		0.0083	0.0013
790	0.008	0.0006		0.0083	0.0008		0.0083	0.0007		0.0083	0.0013
795	0.008	0.0007		0.0085	0.0008		0.0085	0.0007		0.0085	0.0013
800	0.009	0.0007		0.0086	0.0008		0.0086	0.0007		0.0086	0.0013
805	0.009	0.0007		0.0088	0.0009		0.0088	0.0007		0.0088	0.0014
810	0.009	0.0007		0.0089	0.0009		0.0089	0.0007		0.0089	0.0014
815	0.009	0.0007		0.0091	0.0009		0.0091	0.0007		0.0091	0.0014
820	0.0092	0.0007		0.0093	0.0009		0.0093	0.0008		0.0093	0.0014
825	0.0095	0.0007		0.0095	0.0009		0.0095	0.0008		0.0095	0.0015
830	0.0096	0.0007		0.0096	0.0009		0.0096	0.0008		0.0096	0.0015
835	0.0099	0.0008		0.0099	0.0010		0.0099	0.0008		0.0099	0.0015
840	0.0100	0.0008		0.0101	0.0010		0.0101	0.0008		0.0101	0.0016
845	0.0116	0.0009		0.0128	0.0013		0.0128	0.0010		0.0128	0.0020
850	0.0117	0.0009		0.0129	0.0013		0.0129	0.0011		0.0129	0.0020
855	0.0120	0.0009		0.0131	0.0013		0.0131	0.0011		0.0131	0.0020
860	0.0122	0.0009		0.0133	0.0013		0.0133	0.0011		0.0133	0.0021
865	0.0125	0.0010		0.0136	0.0013		0.0136	0.0011		0.0136	0.0021
870	0.0127	0.0010		0.0137	0.0013		0.0137	0.0011		0.0137	0.0021
875	0.0131	0.0010		0.0140	0.0014		0.0140	0.0011		0.0140	0.0022
880	0.0134	0.0010		0.0142	0.0014		0.0142	0.0012		0.0142	0.0022
885	0.0139	0.0011		0.0147	0.0014		0.0147	0.0012		0.0147	0.0023
890	0.0142	0.0011		0.0149	0.0015		0.0149	0.0012		0.0149	0.0023

895	0.0148	0.0011		0.0154	0.0015		0.0154	0.0013		0.0154	0.0024
900	0.0152	0.0012		0.0157	0.0015		0.0157	0.0013		0.0157	0.0024
905	0.0160	0.0012		0.0165	0.0016		0.0165	0.0013		0.0165	0.0025
910	0.0165	0.0013		0.0169	0.0017		0.0169	0.0014		0.0169	0.0026
915	0.0176	0.0014		0.0178	0.0018		0.0178	0.0015		0.0178	0.0028
920	0.0182	0.0014		0.0184	0.0018		0.0184	0.0015		0.0184	0.0028
925	0.0190	0.0015		0.0182	0.0018		0.0182	0.0015		0.0182	0.0028
930	0.0200	0.0016		0.0192	0.0019		0.0192	0.0016		0.0192	0.0030
935	0.0226	0.0034		0.0217	0.0039		0.0217	0.0018		0.0217	0.0034
940	0.0243	0.0051		0.0233	0.0055		0.0233	0.0035		0.0233	0.0036
945	0.0291	0.0099		0.0279	0.0100		0.0279	0.0080		0.0279	0.0082
950	0.0326	0.0134		0.0313	0.0135		0.0313	0.0114		0.0313	0.0116
955	0.0459	0.0267		0.0440	0.0262		0.0440	0.0242		0.0440	0.0244
960	0.0623	0.0431		0.0597	0.0419		0.0597	0.0399		0.0597	0.0400
965	0.1813	0.1621		0.1738	0.1560		0.1738	0.1540		0.1738	0.1542
970	0.0377	0.0185		0.0362	0.0184		0.0362	0.0163		0.0362	0.0165
975	0.0264	0.0072		0.0253	0.0075		0.0253	0.0055		0.0253	0.0056
980	0.0212	0.0020		0.0203	0.0025		0.0203	0.0017		0.0203	0.0031
985	0.0189	0.0015		0.0190	0.0019		0.0190	0.0016		0.0190	0.0029
990	0.0170	0.0013		0.0173	0.0017		0.0173	0.0014		0.0173	0.0027
995	0.0156	0.0012		0.0161	0.0016		0.0161	0.0013		0.0161	0.0025
1000	0.0145	0.0011		0.0152	0.0015		0.0152	0.0012		0.0152	0.0023
1005	0.0136	0.0011		0.0144	0.0014		0.0144	0.0012		0.0144	0.0022
1010	0.0129	0.0010		0.0139	0.0014		0.0139	0.0011		0.0139	0.0021
1015	0.0124	0.0010		0.0134	0.0013		0.0134	0.0011		0.0134	0.0021
1020	0.0119	0.0009		0.0130	0.0013		0.0130	0.0011		0.0130	0.0020
1025	0.0102	0.0008		0.0102	0.0010		0.0102	0.0008		0.0102	0.0016
1030	0.0098	0.0008		0.0098	0.0010		0.0098	0.0008		0.0098	0.0015
1035	0.0094	0.0007		0.0094	0.0009		0.0094	0.0008		0.0094	0.0015
1040	0.009	0.0007		0.0090	0.0009		0.0090	0.0007		0.0090	0.0014
1045	0.009	0.0007		0.0087	0.0009		0.0087	0.0007		0.0087	0.0013
1050	0.008	0.0007		0.0084	0.0008		0.0084	0.0007		0.0084	0.0013
1055	0.008	0.0006		0.0082	0.0008		0.0082	0.0007		0.0082	0.0013
1060	0.008	0.0006		0.0079	0.0008		0.0079	0.0006		0.0079	0.0012
1065	0.008	0.0006		0.0077	0.0008		0.0077	0.0006		0.0077	0.0012
1070	0.007	0.0006		0.0075	0.0007		0.0075	0.0006		0.0075	0.0012
1075	0.007	0.0006		0.0073	0.0007		0.0073	0.0006		0.0073	0.0011
1080	0.007	0.0006		0.0072	0.0007		0.0072	0.0006		0.0072	0.0011
1085	0.007	0.0005		0.0069	0.0007		0.0069	0.0006		0.0069	0.0011
1090	0.007	0.0005		0.0067	0.0007		0.0067	0.0005		0.0067	0.0010
1095	0.007	0.0005		0.0066	0.0006		0.0066	0.0005		0.0066	0.0010
1100	0.006	0.0005		0.0064	0.0006		0.0064	0.0005		0.0064	0.0010
1105	0.006	0.0005		0.0063	0.0006		0.0063	0.0005		0.0063	0.0010
1110	0.006	0.0005		0.0062	0.0006		0.0062	0.0005		0.0062	0.0010
1115	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
1120	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009
1125	0.006	0.0005		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
1130	0.006	0.0004		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009

1135	0.006	0.0004		0.0056	0.0006		0.0056	0.0005		0.0056	0.0009
1140	0.006	0.0004		0.0055	0.0005		0.0055	0.0005		0.0055	0.0009
1145	0.005	0.0004		0.0054	0.0005		0.0054	0.0004		0.0054	0.0008
1150	0.005	0.0004		0.0054	0.0005		0.0054	0.0004		0.0054	0.0008
1155	0.005	0.0004		0.0053	0.0005		0.0053	0.0004		0.0053	0.0008
1160	0.005	0.0004		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
1165	0.005	0.0004		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
1170	0.005	0.0004		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
1175	0.005	0.0004		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
1180	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
1185	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
1190	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
1195	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
1200	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
1205	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
1210	0.005	0.0004		0.0046	0.0004		0.0046	0.0004		0.0046	0.0007
1215	0.005	0.0004		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
1220	0.004	0.0003		0.0045	0.0004		0.0045	0.0004		0.0045	0.0007
1225	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
1230	0.004	0.0003		0.0044	0.0004		0.0044	0.0004		0.0044	0.0007
1235	0.004	0.0003		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
1240	0.004	0.0003		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
1245	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
1250	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0006
1255	0.004	0.0003		0.0042	0.0004		0.0042	0.0003		0.0042	0.0006
1260	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
1265	0.004	0.0003		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
1270	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1275	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1280	0.004	0.0003		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1285	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1290	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1295	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1300	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1305	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1310	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1315	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1320	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1325	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1330	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1335	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1340	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1345	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1350	0.004	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
1355	0.004	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
1360	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
1365	0.003	0.0003		0.0035	0.0003		0.0035	0.0003		0.0035	0.0005
1370	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005

1375	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
1380	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
1385	0.003	0.0003		0.0034	0.0003		0.0034	0.0003		0.0034	0.0005
1390	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1395	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1400	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1405	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1410	0.0033	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1415	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1420	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1425	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1430	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1435	0.0032	0.0002		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1440	0.0031	0.0002		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005

CREEK A

A: 1.053 sq-miles **Δt :** 5 min

K : 8153.0

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK B

A: 0.351 sq-miles **Δt :** 5 min

K : 2714.2

P24-2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK C

A: 1.120 sq-miles **Δt :** 5 min

K : 8670.3

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK D

A: 0.739 sq-miles **Δt :** 5 min

K : 5716.2

P24-2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001

| | | |

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| | | |

CONFLUENCE OF CREEK B, CREEK C, AND CREEK D

A: 2.209 sq-miles

Δt : 5 min

time (min) ↓	Creek B Hyd. (cfs)	Creek C Hyd. (cfs)	Creek D Hyd. (cfs)	TOTAL Hyd. (cfs)
0	0.00	0.00	0.00	0.00
5	0.01	0.02	0.04	0.07
10	0.04	0.08	0.15	0.27
15	0.10	0.17	0.35	0.62
20	0.20	0.31	0.68	1.18
25	0.38	0.51	1.34	2.22
30	0.52	0.88	1.75	3.14
35	0.58	1.25	1.96	3.80
40	0.63	1.44	2.12	4.20
45	0.68	1.57	2.26	4.50
50	0.71	1.67	2.36	4.74
55	0.73	1.76	2.45	4.95
60	0.76	1.84	2.53	5.12
65	0.78	1.90	2.59	5.27
70	0.80	1.96	2.65	5.40
75	0.81	2.01	2.70	5.52
80	0.82	2.05	2.74	5.62
85	0.84	2.09	2.78	5.70
90	0.84	2.13	2.80	5.77
95	0.85	2.17	2.82	5.83
100	0.85	2.20	2.83	5.88
105	0.86	2.22	2.85	5.93
110	0.86	2.24	2.87	5.98
115	0.87	2.26	2.88	6.01
120	0.87	2.28	2.90	6.04
125	0.88	2.29	2.91	6.08
130	0.88	2.30	2.92	6.10
135	0.88	2.32	2.93	6.13
140	0.89	2.33	2.94	6.16
145	0.89	2.34	2.96	6.19
150	0.90	2.35	2.97	6.21
155	0.90	2.36	2.98	6.24
160	0.90	2.37	2.99	6.26
165	0.91	2.38	3.00	6.29
170	0.91	2.39	3.01	6.31
175	0.91	2.40	3.03	6.34
180	0.92	2.41	3.04	6.36
185	0.92	2.42	3.05	6.39
190	0.92	2.43	3.06	6.41
195	0.93	2.44	3.07	6.43
200	0.93	2.45	3.08	6.46
205	0.93	2.46	3.09	6.48
210	0.94	2.47	3.10	6.51
215	0.94	2.48	3.11	6.53
220	0.94	2.49	3.12	6.55
225	0.95	2.50	3.14	6.58
230	0.95	2.51	3.15	6.60
235	0.95	2.52	3.16	6.63
240	0.96	2.53	3.17	6.65
245	0.96	2.53	3.18	6.68
250	0.96	2.54	3.20	6.70
255	0.97	2.55	3.21	6.73
260	0.97	2.56	3.22	6.75
265	0.98	2.57	3.23	6.78
270	0.98	2.58	3.24	6.81
275	0.98	2.59	3.26	6.83
280	0.99	2.60	3.27	6.86
285	0.99	2.61	3.28	6.89
290	0.99	2.62	3.30	6.92
295	1.00	2.63	3.31	6.94
300	1.00	2.65	3.32	6.97
305	1.01	2.66	3.34	7.00
310	1.01	2.67	3.35	7.03
315	1.02	2.68	3.37	7.06
320	1.02	2.69	3.38	7.09
325	1.02	2.70	3.39	7.12
330	1.03	2.71	3.41	7.15
335	1.03	2.72	3.42	7.18
340	1.04	2.74	3.44	7.21
345	1.04	2.75	3.45	7.24
350	1.05	2.76	3.47	7.27
355	1.05	2.77	3.48	7.31
360	1.06	2.78	3.50	7.34
365	1.06	2.80	3.52	7.37
370	1.07	2.81	3.53	7.41
375	1.07	2.82	3.55	7.44
380	1.08	2.83	3.56	7.47
385	1.08	2.85	3.58	7.51
390	1.09	2.86	3.60	7.54
395	1.09	2.87	3.61	7.58
400	1.10	2.89	3.63	7.61
405	1.10	2.90	3.65	7.65
410	1.11	2.91	3.67	7.69
415	1.11	2.93	3.69	7.73
420	1.12	2.94	3.70	7.76
425	1.12	2.96	3.72	7.80
430	1.13	2.97	3.74	7.84

435	1.13	2.99	3.76	7.88
440	1.14	3.00	3.78	7.92
445	1.15	3.02	3.80	7.96
450	1.15	3.03	3.82	8.00
455	1.16	3.05	3.84	8.05
460	1.16	3.07	3.86	8.09
465	1.17	3.08	3.88	8.13
470	1.18	3.10	3.90	8.18
475	1.18	3.11	3.92	8.22
480	1.19	3.13	3.94	8.27
485	1.20	3.15	3.97	8.31
490	1.20	3.17	3.99	8.36
495	1.21	3.18	4.01	8.41
500	1.22	3.20	4.03	8.45
505	1.22	3.22	4.06	8.50
510	1.23	3.24	4.08	8.55
515	1.24	3.26	4.11	8.60
520	1.25	3.28	4.13	8.65
525	1.25	3.30	4.16	8.71
530	1.26	3.32	4.18	8.76
535	1.27	3.34	4.21	8.81
540	1.28	3.36	4.23	8.87
545	1.29	3.38	4.26	8.93
550	1.29	3.40	4.29	8.98
555	1.30	3.42	4.32	9.04
560	1.31	3.44	4.35	9.10
565	1.32	3.47	4.37	9.16
570	1.33	3.49	4.40	9.22
575	1.34	3.51	4.43	9.28
580	1.35	3.54	4.46	9.35
585	1.36	3.56	4.50	9.41
590	1.37	3.58	4.53	9.48
595	1.38	3.61	4.56	9.55
600	1.39	3.64	4.59	9.61
605	1.40	3.66	4.63	9.68
610	1.41	3.69	4.66	9.75
615	1.42	3.72	4.70	9.83
620	1.43	3.74	4.73	9.90
625	1.44	3.77	4.77	9.98
630	1.45	3.80	4.81	10.06
635	1.46	3.83	4.84	10.14
640	1.47	3.86	4.88	10.22
645	1.48	3.89	4.92	10.30
650	1.50	3.92	4.96	10.38
655	1.51	3.96	5.01	10.47
660	1.52	3.99	5.05	10.56
665	1.54	4.02	5.09	10.65
670	1.55	4.06	5.14	10.74
675	1.56	4.09	5.19	10.84
680	1.58	4.13	5.23	10.94
685	1.59	4.17	5.28	11.04
690	1.61	4.20	5.33	11.14
695	1.62	4.24	5.38	11.25
700	1.64	4.28	5.43	11.35
705	1.65	4.32	5.49	11.47
710	1.67	4.37	5.54	11.58
715	1.69	4.41	5.60	11.70
720	1.71	4.46	5.66	11.82
725	1.72	4.50	5.72	11.95
730	1.74	4.55	5.79	12.08
735	1.77	4.61	5.86	12.23
740	1.79	4.66	5.94	12.39
745	1.82	4.72	6.03	12.57
750	1.84	4.79	6.12	12.75
755	1.87	4.86	6.20	12.93
760	1.89	4.92	6.28	13.10
765	1.92	4.99	6.36	13.27
770	1.94	5.05	6.44	13.44
775	1.97	5.12	6.53	13.61
780	1.99	5.18	6.62	13.79
785	2.02	5.25	6.71	13.98
790	2.05	5.32	6.80	14.17
795	2.08	5.40	6.90	14.38
800	2.11	5.47	7.00	14.58
805	2.14	5.55	7.10	14.80
810	2.17	5.63	7.21	15.02
815	2.21	5.72	7.33	15.25
820	2.24	5.81	7.44	15.49
825	2.28	5.90	7.57	15.75
830	2.32	6.00	7.70	16.01
835	2.36	6.10	7.84	16.30
840	2.40	6.21	7.98	16.59
845	2.46	6.33	8.16	16.95
850	2.53	6.50	8.41	17.43
855	2.62	6.69	8.73	18.04
860	2.75	6.92	9.15	18.82
865	2.95	7.21	9.83	19.99
870	3.10	7.63	10.31	21.05
875	3.20	8.06	10.65	21.91
880	3.29	8.33	10.94	22.56
885	3.38	8.56	11.23	23.17
890	3.46	8.79	11.50	23.74
895	3.54	9.01	11.78	24.33
900	3.63	9.23	12.06	24.93
905	3.72	9.46	12.38	25.56
910	3.82	9.70	12.70	26.22
915	3.93	9.96	13.06	26.95

920	4.04	10.25	13.44	27.73
925	4.17	10.55	13.87	28.60
930	4.30	10.87	14.30	29.48
935	4.51	11.24	14.81	30.56
940	4.91	11.78	15.34	32.03
945	5.70	12.95	16.22	34.86
950	7.32	15.27	18.28	40.87
955	10.73	20.01	22.83	53.56
960	16.57	29.70	32.41	78.68
965	29.47	55.15	58.71	143.32
970	48.73	94.99	99.63	243.35
975	69.68	133.96	145.05	348.69
980	95.37	181.93	201.24	478.55
985	**131**	240.50	**276**	**647**
990	98.58	**328**	190.73	617.25
995	60.32	304.68	118.31	483.31
1000	44.42	181.48	89.97	315.87
1005	36.14	130.02	75.15	241.32
1010	29.15	104.19	61.36	194.70
1015	24.68	90.06	53.02	167.76
1020	21.09	77.74	45.86	144.69
1025	18.64	65.21	41.47	125.32
1030	16.13	58.26	35.86	110.25
1035	14.07	51.78	31.74	97.59
1040	11.51	46.05	26.25	83.81
1045	9.61	43.02	21.87	74.50
1050	7.16	37.21	17.06	61.43
1055	5.86	33.76	14.75	54.38
1060	5.05	29.10	13.43	47.58
1065	4.67	24.65	12.49	41.82
1070	4.20	21.53	11.45	37.17
1075	3.89	16.34	10.74	30.97
1080	3.51	14.01	9.76	27.29
1085	3.20	12.27	9.24	24.72
1090	3.00	11.39	8.64	23.04
1095	2.78	10.84	8.24	21.86
1100	2.65	9.87	7.87	20.39
1105	2.50	9.26	7.54	19.30
1110	2.41	8.77	7.32	18.51
1115	2.34	7.86	7.11	17.31
1120	2.26	7.37	6.85	16.48
1125	2.15	7.05	6.50	15.70
1130	2.02	6.54	6.23	14.79
1135	1.90	6.26	5.79	13.95
1140	1.72	6.07	5.56	13.35
1145	1.65	5.78	5.43	12.87
1150	1.61	5.62	5.32	12.55
1155	1.58	5.50	5.22	12.30
1160	1.55	5.40	5.12	12.07
1165	1.52	5.27	5.03	11.82
1170	1.50	5.10	4.94	11.54
1175	1.47	4.81	4.86	11.15
1180	1.45	4.62	4.78	10.85
1185	1.42	4.40	4.71	10.53
1190	1.40	3.98	4.63	10.02
1195	1.38	3.82	4.56	9.77
1200	1.36	3.75	4.50	9.61
1205	1.34	3.69	4.44	9.47
1210	1.32	3.63	4.38	9.33
1215	1.31	3.58	4.32	9.21
1220	1.29	3.53	4.26	9.08
1225	1.27	3.48	4.21	8.96
1230	1.26	3.43	4.16	8.85
1235	1.24	3.39	4.11	8.74
1240	1.23	3.35	4.06	8.63
1245	1.21	3.30	4.01	8.53
1250	1.20	3.26	3.96	8.43
1255	1.19	3.23	3.92	8.33
1260	1.17	3.19	3.88	8.24
1265	1.16	3.15	3.84	8.15
1270	1.15	3.12	3.80	8.06
1275	1.14	3.08	3.76	7.98
1280	1.12	3.05	3.72	7.89
1285	1.11	3.02	3.68	7.81
1290	1.10	2.99	3.65	7.74
1295	1.09	2.96	3.61	7.66
1300	1.08	2.93	3.58	7.59
1305	1.07	2.90	3.54	7.52
1310	1.06	2.87	3.51	7.45
1315	1.05	2.85	3.48	7.38
1320	1.04	2.82	3.45	7.31
1325	1.03	2.79	3.42	7.25
1330	1.02	2.77	3.39	7.19
1335	1.02	2.75	3.36	7.12
1340	1.01	2.72	3.33	7.06
1345	1.00	2.70	3.31	7.01
1350	0.99	2.68	3.28	6.95
1355	0.98	2.65	3.25	6.89
1360	0.98	2.63	3.23	6.84
1365	0.97	2.61	3.20	6.78
1370	0.96	2.59	3.18	6.73
1375	0.95	2.57	3.16	6.68
1380	0.95	2.55	3.13	6.63
1385	0.94	2.53	3.11	6.58
1390	0.93	2.51	3.09	6.53
1395	0.93	2.49	3.06	6.49
1400	0.92	2.48	3.04	6.44

1405	0.91	2.46	3.02	6.39
1410	0.91	2.44	3.00	6.35
1415	0.90	2.42	2.98	6.31
1420	0.89	2.41	2.96	6.26
1425	0.89	2.39	2.94	6.22
1430	0.88	2.38	2.92	6.18
1435	0.88	2.36	2.90	6.14
1440	0.87	2.34	2.88	6.10
1445	0.86	2.31	2.83	6.00
1450	0.82	2.23	2.70	5.75
1455	0.76	2.13	2.49	5.37
1460	0.66	1.98	2.14	4.78
1465	0.47	1.77	1.47	3.71
1470	0.33	1.39	1.06	2.78
1475	0.26	1.01	0.84	2.11
1480	0.21	0.82	0.68	1.71
1485	0.17	0.69	0.55	1.41
1490	0.14	0.59	0.45	1.18
1495	0.12	0.50	0.36	0.98
1500	0.09	0.43	0.29	0.81
1505	0.08	0.37	0.23	0.67
1510	0.06	0.31	0.18	0.55
1515	0.05	0.27	0.14	0.45
1520	0.04	0.23	0.11	0.37
1525	0.03	0.19	0.08	0.30
1530	0.02	0.16	0.07	0.25
1535	0.02	0.13	0.05	0.20
1540	0.02	0.11	0.05	0.17
1545	0.01	0.09	0.04	0.14
1550	0.01	0.07	0.03	0.11
1555	0.01	0.06	0.03	0.09
1560	0.01	0.05	0.02	0.08
1565	0.01	0.04	0.02	0.07
1570	0.00	0.04	0.01	0.06
1575	0.00	0.03	0.01	0.05
1580	0.00	0.03	0.01	0.04
1585	0.00	0.03	0.01	0.04
1590	0.00	0.02	0.01	0.03
1595	0.00	0.02	0.00	0.02
1600	0.00	0.02	0.00	0.02
1605	0.00	0.01	0.00	0.02
1610	0.00	0.01	0.00	0.01
1615	0.00	0.01	0.00	0.01
1620	0.00	0.01	0.00	0.01
1625	0.00	0.01	0.00	0.01
1630	0.00	0.01	0.00	0.01
1635	0.00	0.01	0.00	0.01
1640	0.00	0.00	0.00	0.00
1645	0.00	0.00	0.00	0.00
1650	0.00	0.00	0.00	0.00
1655	0.00	0.00	0.00	0.00
1660	0.00	0.00	0.00	0.00
1665	0.00	0.00	0.00	0.00
1670	0.00	0.00	0.00	0.00
1675	0.00	0.00	0.00	0.00
1680	0.00	0.00	0.00	0.00
1685	0.00	0.00	0.00	0.00
1690	0.00	0.00	0.00	0.00
1695	0.00	0.00	0.00	0.00
1700	0.00	0.00	0.00	0.00
1705	0.00	0.00	0.00	0.00
1710	0.00	0.00	0.00	0.00

Post-Project Condition

Creek A - Developed Conditions					P_2yr	2.104	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.10	12.727	0.016	0.002		
Chaparral, Narrow Leaf	Fair	B	53	0.93	8.868	0.012	0.011		
Grass, Annual or Perennial	Fair	B	50	1.35	10.000	0.001	0.001		
Chaparral, Narrow Leaf	Good	C	58	8.63	7.241	0.054	0.470		
Chaparral, Narrow Leaf	Fair	C	64	12.94	5.625	0.145	1.878		
Grass, Annual or Perennial	Fair	C	62	34.42	6.129	0.110	3.788		
Chaparral, Narrow Leaf	Good	D	66	4.22	5.152	0.185	0.781		
Chaparral, Narrow Leaf	Fair	D	71	9.85	4.085	0.308	3.037		
Grass, Annual or Perennial	Fair	D	68	22.66	4.706	0.230	5.221		
[3]Single Family Residential Impervious Area	Impervious	D	95	1.96	0.526	1.582	3.100		
[3]Single Family Residential Landscaping	Fair	D	68	2.94	4.706	0.230	0.677		
			TOTAL	100.00		**[1]Q_global**	0.190	in	
						S	5.104		
						[2]CN	66.2		
Max Loss Rate	0.230	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0192	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek B - Developed Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	C	58	5.85	7.241	0.054	0.316		
Chaparral, Narrow Leaf	Fair	C	64	10.87	5.625	0.144	1.569		
Grass, Annual or Perennial	Fair	C	62	10.61	6.129	0.109	1.161		
Chaparral, Narrow Leaf	Good	D	66	7.39	5.152	0.184	1.361		
Chaparral, Narrow Leaf	Fair	D	71	17.23	4.085	0.307	5.293		
Grass, Annual or Perennial	Fair	D	68	45.65	4.706	0.229	10.468		
[3]Single Family Residential Impervious Area	Impervious	D	95	0.96	0.526	1.579	1.513		
[3]Single Family Residential Landscaping	Fair	D	68	1.44	4.706	0.229	0.330		
			TOTAL	100.00		**[1]Q_global**	0.220	in	
						S	4.791		
						[2]CN	67.6		
Max Loss Rate	0.214	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0178	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek C - Developed Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.25	12.727	0.016	0.004		
Chaparral, Narrow Leaf	Fair	B	53	0.74	8.868	0.012	0.009		
Grass, Annual or Perennial	Fair	B	50	1.43	10.000	0.001	0.001		
[3]Single Family Residential Impervious Area	Impervious	B	95	0.84	0.526	1.579	1.331		
[3]Single Family Residential Landscaping	Good	B	36	1.26	17.778	0.130	0.164		

Chaparral, Narrow Leaf	Good	C	58	13.79	7.241	0.054	0.744		
Chaparral, Narrow Leaf	Fair	C	64	20.68	5.625	0.144	2.985		
Grass, Annual or Perennial	Fair	C	62	33.06	6.129	0.109	3.616		
Chaparral, Narrow Leaf	Good	D	66	3.23	5.152	0.184	0.595		
Chaparral, Narrow Leaf	Fair	D	71	5.99	4.085	0.307	1.841		
Grass, Annual or Perennial	Fair	D	68	14.56	4.706	0.229	3.339		
[3]Single Family Residential Impervious Area	Impervious	D	95	1.67	0.526	1.579	2.633		
[3]Single Family Residential Landscaping	Good	D	57	2.22	7.544	0.043	0.096		
[3]Single Family Residential Landscaping	Fair	D	68	0.28	4.706	0.229	0.064		
			TOTAL	100.00		**[1]Q_global**	0.174	in	
						S	5.262		
						[2]CN	65.5		
Max Loss Rate	0.238	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0199	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Creek D - Developed Conditions					P_2yr	2.101	in		
Cover Type	Quality of Cover	Soil Type	CN (AMC I)	Percent of Total Area	S (in)	Q (in)	Q x Percent of Total Area		
Chaparral, Narrow Leaf	Good	B	44	0.11	12.727	0.016	0.002		
Chaparral, Narrow Leaf	Fair	B	53	0.44	8.868	0.012	0.005		
Grass, Annual or Perennial	Fair	B	50	6.66	10.000	0.001	0.007		
[3]Single Family Residential Impervious Area	Impervious	B	95	3.38	0.526	1.579	5.342		
[3]Single Family Residential Landscaping	Good	B	36	5.07	17.778	0.130	0.658		
Chaparral, Narrow Leaf	Good	C	58	4.92	7.241	0.054	0.266		
Chaparral, Narrow Leaf	Fair	C	64	7.38	5.625	0.144	1.065		
Grass, Annual or Perennial	Fair	C	62	25.71	6.129	0.109	2.811		
[3]Single Family Residential Impervious Area	Impervious	C	95	1.28	0.526	1.579	2.016		
[3]Single Family Residential Landscaping	Good	C	50	1.91	10.000	0.001	0.002		
Chaparral, Narrow Leaf	Good	D	66	0.74	5.152	0.184	0.136		
Chaparral, Narrow Leaf	Fair	D	71	2.94	4.085	0.307	0.904		
Grass, Annual or Perennial	Fair	D	68	15.03	4.706	0.229	3.446		
[3]Single Family Residential Impervious Area	Impervious	D	95	9.77	0.526	1.579	15.432		
[3]Single Family Residential Landscaping	Good	D	57	14.37	7.544	0.043	0.620		
[3]Single Family Residential Landscaping	Fair	D	68	0.29	4.706	0.229	0.065		
			TOTAL	100.00		**[1]Q_global**	0.328	in	
						S	3.943		
						[2]CN	71.7		
Max Loss Rate	0.236	in/hr	(Per Section C.6.5 and Equation C.7 of Orange County Hydrology Manual)						
Max Loss	0.0197	in	(Maximum Loss for a time interval of 5 minutes)						

[1]Total runoff per Equation C.3 of Orange County Hydrology Manual

[2]Overall Watershed CN

[3]Per Figure C-3 of the Orange County Hydrology Manual, residential areas were assumed to be Single Family Residential (3-4 dwellings/acre) with 40% impervious cover and 60% Residential Landscaping

Developed Conditions Effective Rainfall

Storm: P24-2

Δt: 5 min

Color coded effecive rainfall corresponds to the convolution of effective rainfall with the unit hydrograph.

[1]Per Section C.6.6. of the Orange County Hydrology Manual,
Effective Rainfall = maximum of Rainfall*Yield Fraction or Rainfall - Max Loss, whichever is greater.
where Yield Fraction = Q_global/P_2yr

[2]Rainfall values from the 24hr-2yr design storm used for Creek A

[3]Rainfall values from the 24hr-2yr design storm used for Creek B, Creek C, and Creek D

	Creek A			**Creek B**			**Creek C**			**Creek D**	
Time (min)	[2]Rainfall (in)	[1]Effective Rainfall (in)		[3]Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)		Rainfall (in)	[1]Effective Rainfall (in)
5	0.0031	0.0003		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
10	0.0031	0.0003		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
15	0.0031	0.0003		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005
20	0.0031	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
25	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
30	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
35	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
40	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
45	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
50	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
55	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
60	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
65	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
70	0.0032	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
75	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
80	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
85	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
90	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
95	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
100	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
105	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
110	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
115	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
120	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
125	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
130	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
135	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
140	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
145	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
150	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
155	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
160	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
165	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
170	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005

175	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
180	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
185	0.004	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
190	0.004	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0006
195	0.004	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0006
200	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
205	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
210	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
215	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
220	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
225	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
230	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
235	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
240	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
245	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
250	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
255	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
260	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
265	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
270	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
275	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
280	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
285	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
290	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
295	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
300	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
305	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
310	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
315	0.004	0.0004		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
320	0.004	0.0004		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
325	0.004	0.0004		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
330	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
335	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
340	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
345	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
350	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
355	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
360	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
365	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
370	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
375	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
380	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
385	0.004	0.0004		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
390	0.004	0.0004		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
395	0.004	0.0004		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
400	0.004	0.0004		0.0042	0.0004		0.0042	0.0004		0.0042	0.0007
405	0.004	0.0004		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
410	0.004	0.0004		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007

415	0.004	0.0004		0.0043	0.0005		0.0043	0.0004		0.0043	0.0007
420	0.004	0.0004		0.0043	0.0005		0.0043	0.0004		0.0043	0.0007
425	0.004	0.0004		0.0043	0.0005		0.0043	0.0004		0.0043	0.0007
430	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
435	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
440	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
445	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
450	0.004	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
455	0.004	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
460	0.005	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
465	0.005	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
470	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
475	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
480	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
485	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
490	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
495	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
500	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
505	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
510	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
515	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0008
520	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0008
525	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
530	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
535	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
540	0.005	0.0004		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
545	0.005	0.0005		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
550	0.005	0.0005		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
555	0.005	0.0005		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
560	0.005	0.0005		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
565	0.005	0.0005		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
570	0.005	0.0005		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
575	0.005	0.0005		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
580	0.005	0.0005		0.0053	0.0006		0.0053	0.0004		0.0053	0.0008
585	0.005	0.0005		0.0053	0.0006		0.0053	0.0004		0.0053	0.0008
590	0.005	0.0005		0.0053	0.0006		0.0053	0.0004		0.0053	0.0008
595	0.005	0.0005		0.0054	0.0006		0.0054	0.0004		0.0054	0.0008
600	0.005	0.0005		0.0054	0.0006		0.0054	0.0004		0.0054	0.0008
605	0.005	0.0005		0.0055	0.0006		0.0055	0.0005		0.0055	0.0009
610	0.006	0.0005		0.0055	0.0006		0.0055	0.0005		0.0055	0.0009
615	0.006	0.0005		0.0056	0.0006		0.0056	0.0005		0.0056	0.0009
620	0.006	0.0005		0.0056	0.0006		0.0056	0.0005		0.0056	0.0009
625	0.006	0.0005		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009
630	0.006	0.0005		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009
635	0.006	0.0005		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
640	0.006	0.0005		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
645	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009
650	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009

655	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
660	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
665	0.006	0.0005		0.0061	0.0006		0.0061	0.0005		0.0061	0.0009
670	0.006	0.0006		0.0061	0.0006		0.0061	0.0005		0.0061	0.0010
675	0.006	0.0006		0.0062	0.0006		0.0062	0.0005		0.0062	0.0010
680	0.006	0.0006		0.0062	0.0007		0.0062	0.0005		0.0062	0.0010
685	0.006	0.0006		0.0063	0.0007		0.0063	0.0005		0.0063	0.0010
690	0.006	0.0006		0.0064	0.0007		0.0064	0.0005		0.0064	0.0010
695	0.006	0.0006		0.0065	0.0007		0.0065	0.0005		0.0065	0.0010
700	0.007	0.0006		0.0065	0.0007		0.0065	0.0005		0.0065	0.0010
705	0.007	0.0006		0.0066	0.0007		0.0066	0.0005		0.0066	0.0010
710	0.007	0.0006		0.0067	0.0007		0.0067	0.0006		0.0067	0.0010
715	0.007	0.0006		0.0068	0.0007		0.0068	0.0006		0.0068	0.0011
720	0.007	0.0006		0.0068	0.0007		0.0068	0.0006		0.0068	0.0011
725	0.007	0.0006		0.0070	0.0007		0.0070	0.0006		0.0070	0.0011
730	0.007	0.0006		0.0071	0.0007		0.0071	0.0006		0.0071	0.0011
735	0.007	0.0006		0.0072	0.0008		0.0072	0.0006		0.0072	0.0011
740	0.007	0.0007		0.0073	0.0008		0.0073	0.0006		0.0073	0.0011
745	0.007	0.0007		0.0074	0.0008		0.0074	0.0006		0.0074	0.0012
750	0.007	0.0007		0.0074	0.0008		0.0074	0.0006		0.0074	0.0012
755	0.008	0.0007		0.0076	0.0008		0.0076	0.0006		0.0076	0.0012
760	0.008	0.0007		0.0076	0.0008		0.0076	0.0006		0.0076	0.0012
765	0.008	0.0007		0.0078	0.0008		0.0078	0.0006		0.0078	0.0012
770	0.008	0.0007		0.0079	0.0008		0.0079	0.0007		0.0079	0.0012
775	0.008	0.0007		0.0080	0.0008		0.0080	0.0007		0.0080	0.0013
780	0.008	0.0007		0.0081	0.0008		0.0081	0.0007		0.0081	0.0013
785	0.008	0.0007		0.0083	0.0009		0.0083	0.0007		0.0083	0.0013
790	0.008	0.0007		0.0083	0.0009		0.0083	0.0007		0.0083	0.0013
795	0.008	0.0008		0.0085	0.0009		0.0085	0.0007		0.0085	0.0013
800	0.009	0.0008		0.0086	0.0009		0.0086	0.0007		0.0086	0.0013
805	0.009	0.0008		0.0088	0.0009		0.0088	0.0007		0.0088	0.0014
810	0.009	0.0008		0.0089	0.0009		0.0089	0.0007		0.0089	0.0014
815	0.009	0.0008		0.0091	0.0010		0.0091	0.0008		0.0091	0.0014
820	0.0092	0.0008		0.0093	0.0010		0.0093	0.0008		0.0093	0.0014
825	0.0095	0.0009		0.0095	0.0010		0.0095	0.0008		0.0095	0.0015
830	0.0096	0.0009		0.0096	0.0010		0.0096	0.0008		0.0096	0.0015
835	0.0099	0.0009		0.0099	0.0010		0.0099	0.0008		0.0099	0.0015
840	0.0100	0.0009		0.0101	0.0011		0.0101	0.0008		0.0101	0.0016
845	0.0116	0.0010		0.0128	0.0013		0.0128	0.0011		0.0128	0.0020
850	0.0117	0.0011		0.0129	0.0014		0.0129	0.0011		0.0129	0.0020
855	0.0120	0.0011		0.0131	0.0014		0.0131	0.0011		0.0131	0.0020
860	0.0122	0.0011		0.0133	0.0014		0.0133	0.0011		0.0133	0.0021
865	0.0125	0.0011		0.0136	0.0014		0.0136	0.0011		0.0136	0.0021
870	0.0127	0.0011		0.0137	0.0014		0.0137	0.0011		0.0137	0.0021
875	0.0131	0.0012		0.0140	0.0015		0.0140	0.0012		0.0140	0.0022
880	0.0134	0.0012		0.0142	0.0015		0.0142	0.0012		0.0142	0.0022
885	0.0139	0.0013		0.0147	0.0015		0.0147	0.0012		0.0147	0.0023
890	0.0142	0.0013		0.0149	0.0016		0.0149	0.0012		0.0149	0.0023

895	0.0148	0.0013		0.0154	0.0016		0.0154	0.0013		0.0154	0.0024
900	0.0152	0.0014		0.0157	0.0016		0.0157	0.0013		0.0157	0.0025
905	0.0160	0.0014		0.0165	0.0017		0.0165	0.0014		0.0165	0.0026
910	0.0165	0.0015		0.0169	0.0018		0.0169	0.0014		0.0169	0.0026
915	0.0176	0.0016		0.0178	0.0019		0.0178	0.0015		0.0178	0.0028
920	0.0182	0.0016		0.0184	0.0019		0.0184	0.0015		0.0184	0.0029
925	0.0190	0.0017		0.0182	0.0019		0.0182	0.0015		0.0182	0.0028
930	0.0200	0.0018		0.0192	0.0020		0.0192	0.0016		0.0192	0.0030
935	0.0226	0.0034		0.0217	0.0039		0.0217	0.0018		0.0217	0.0034
940	0.0243	0.0051		0.0233	0.0055		0.0233	0.0035		0.0233	0.0036
945	0.0291	0.0099		0.0279	0.0101		0.0279	0.0080		0.0279	0.0082
950	0.0326	0.0134		0.0313	0.0135		0.0313	0.0114		0.0313	0.0116
955	0.0459	0.0267		0.0440	0.0262		0.0440	0.0242		0.0440	0.0243
960	0.0623	0.0431		0.0597	0.0419		0.0597	0.0399		0.0597	0.0400
965	0.1813	0.1621		0.1738	0.1560		0.1738	0.1540		0.1738	0.1541
970	0.0377	0.0185		0.0362	0.0184		0.0362	0.0163		0.0362	0.0165
975	0.0264	0.0072		0.0253	0.0075		0.0253	0.0055		0.0253	0.0056
980	0.0212	0.0020		0.0203	0.0025		0.0203	0.0017		0.0203	0.0032
985	0.0189	0.0017		0.0190	0.0020		0.0190	0.0016		0.0190	0.0030
990	0.0170	0.0015		0.0173	0.0018		0.0173	0.0014		0.0173	0.0027
995	0.0156	0.0014		0.0161	0.0017		0.0161	0.0013		0.0161	0.0025
1000	0.0145	0.0013		0.0152	0.0016		0.0152	0.0013		0.0152	0.0024
1005	0.0136	0.0012		0.0144	0.0015		0.0144	0.0012		0.0144	0.0023
1010	0.0129	0.0012		0.0139	0.0015		0.0139	0.0012		0.0139	0.0022
1015	0.0124	0.0011		0.0134	0.0014		0.0134	0.0011		0.0134	0.0021
1020	0.0119	0.0011		0.0130	0.0014		0.0130	0.0011		0.0130	0.0020
1025	0.0102	0.0009		0.0102	0.0011		0.0102	0.0008		0.0102	0.0016
1030	0.0098	0.0009		0.0098	0.0010		0.0098	0.0008		0.0098	0.0015
1035	0.0094	0.0008		0.0094	0.0010		0.0094	0.0008		0.0094	0.0015
1040	0.009	0.0008		0.0090	0.0009		0.0090	0.0007		0.0090	0.0014
1045	0.009	0.0008		0.0087	0.0009		0.0087	0.0007		0.0087	0.0014
1050	0.008	0.0008		0.0084	0.0009		0.0084	0.0007		0.0084	0.0013
1055	0.008	0.0007		0.0082	0.0009		0.0082	0.0007		0.0082	0.0013
1060	0.008	0.0007		0.0079	0.0008		0.0079	0.0007		0.0079	0.0012
1065	0.008	0.0007		0.0077	0.0008		0.0077	0.0006		0.0077	0.0012
1070	0.007	0.0007		0.0075	0.0008		0.0075	0.0006		0.0075	0.0012
1075	0.007	0.0007		0.0073	0.0008		0.0073	0.0006		0.0073	0.0011
1080	0.007	0.0006		0.0072	0.0007		0.0072	0.0006		0.0072	0.0011
1085	0.007	0.0006		0.0069	0.0007		0.0069	0.0006		0.0069	0.0011
1090	0.007	0.0006		0.0067	0.0007		0.0067	0.0006		0.0067	0.0010
1095	0.007	0.0006		0.0066	0.0007		0.0066	0.0005		0.0066	0.0010
1100	0.006	0.0006		0.0064	0.0007		0.0064	0.0005		0.0064	0.0010
1105	0.006	0.0006		0.0063	0.0007		0.0063	0.0005		0.0063	0.0010
1110	0.006	0.0006		0.0062	0.0006		0.0062	0.0005		0.0062	0.0010
1115	0.006	0.0005		0.0060	0.0006		0.0060	0.0005		0.0060	0.0009
1120	0.006	0.0005		0.0059	0.0006		0.0059	0.0005		0.0059	0.0009
1125	0.006	0.0005		0.0058	0.0006		0.0058	0.0005		0.0058	0.0009
1130	0.006	0.0005		0.0057	0.0006		0.0057	0.0005		0.0057	0.0009

1135	0.006	0.0005		0.0056	0.0006		0.0056	0.0005		0.0056	0.0009
1140	0.006	0.0005		0.0055	0.0006		0.0055	0.0005		0.0055	0.0009
1145	0.005	0.0005		0.0054	0.0006		0.0054	0.0005		0.0054	0.0008
1150	0.005	0.0005		0.0054	0.0006		0.0054	0.0004		0.0054	0.0008
1155	0.005	0.0005		0.0053	0.0006		0.0053	0.0004		0.0053	0.0008
1160	0.005	0.0005		0.0052	0.0005		0.0052	0.0004		0.0052	0.0008
1165	0.005	0.0005		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
1170	0.005	0.0005		0.0051	0.0005		0.0051	0.0004		0.0051	0.0008
1175	0.005	0.0005		0.0050	0.0005		0.0050	0.0004		0.0050	0.0008
1180	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
1185	0.005	0.0004		0.0049	0.0005		0.0049	0.0004		0.0049	0.0008
1190	0.005	0.0004		0.0048	0.0005		0.0048	0.0004		0.0048	0.0007
1195	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
1200	0.005	0.0004		0.0047	0.0005		0.0047	0.0004		0.0047	0.0007
1205	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
1210	0.005	0.0004		0.0046	0.0005		0.0046	0.0004		0.0046	0.0007
1215	0.005	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
1220	0.004	0.0004		0.0045	0.0005		0.0045	0.0004		0.0045	0.0007
1225	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
1230	0.004	0.0004		0.0044	0.0005		0.0044	0.0004		0.0044	0.0007
1235	0.004	0.0004		0.0043	0.0005		0.0043	0.0004		0.0043	0.0007
1240	0.004	0.0004		0.0043	0.0004		0.0043	0.0004		0.0043	0.0007
1245	0.004	0.0004		0.0042	0.0004		0.0042	0.0004		0.0042	0.0007
1250	0.004	0.0004		0.0042	0.0004		0.0042	0.0003		0.0042	0.0007
1255	0.004	0.0004		0.0042	0.0004		0.0042	0.0003		0.0042	0.0006
1260	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
1265	0.004	0.0004		0.0041	0.0004		0.0041	0.0003		0.0041	0.0006
1270	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1275	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1280	0.004	0.0004		0.0040	0.0004		0.0040	0.0003		0.0040	0.0006
1285	0.004	0.0004		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1290	0.004	0.0004		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1295	0.004	0.0003		0.0039	0.0004		0.0039	0.0003		0.0039	0.0006
1300	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1305	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1310	0.004	0.0003		0.0038	0.0004		0.0038	0.0003		0.0038	0.0006
1315	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1320	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1325	0.004	0.0003		0.0037	0.0004		0.0037	0.0003		0.0037	0.0006
1330	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1335	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1340	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1345	0.004	0.0003		0.0036	0.0004		0.0036	0.0003		0.0036	0.0006
1350	0.004	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0006
1355	0.004	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
1360	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
1365	0.003	0.0003		0.0035	0.0004		0.0035	0.0003		0.0035	0.0005
1370	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005

1375	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
1380	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
1385	0.003	0.0003		0.0034	0.0004		0.0034	0.0003		0.0034	0.0005
1390	0.003	0.0003		0.0033	0.0004		0.0033	0.0003		0.0033	0.0005
1395	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1400	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1405	0.003	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1410	0.0033	0.0003		0.0033	0.0003		0.0033	0.0003		0.0033	0.0005
1415	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1420	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1425	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1430	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1435	0.0032	0.0003		0.0032	0.0003		0.0032	0.0003		0.0032	0.0005
1440	0.0031	0.0003		0.0031	0.0003		0.0031	0.0003		0.0031	0.0005

CREEK A

A: 1.053 sq-miles **Δt :** 5 min

K : 8153.0

P24-2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK B

A: 0.351 sq-miles **Δt :** 5 min

K : 2714.2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK C

A: 1.120 sq-miles **Δt :** 5 min

K : 8670.3

P24-2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000

| | | |

| | | |

| | | |

CREEK D

A: 0.739 sq-miles **Δt :** 5 min

K : 5716.2

P24-2

| 5 min-Eff. Rain → | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001

| | | |

| | | |

| | | |

CONFLUENCE OF CREEK B, CREEK C, AND CREEK D

A: 2.209 sq-miles

Δt : 5 min

time (min) ↓	Creek B Hyd. (cfs)	Creek C Hyd. (cfs)	Creek D Hyd. (cfs)	TOTAL Hyd. (cfs)
0	0.00	0.00	0.00	0.00
5	0.01	0.02	0.04	0.07
10	0.05	0.08	0.15	0.28
15	0.11	0.17	0.35	0.63
20	0.21	0.31	0.69	1.21
25	0.41	0.51	1.35	2.27
30	0.55	0.89	1.76	3.20
35	0.62	1.27	1.98	3.87
40	0.68	1.46	2.14	4.28
45	0.72	1.59	2.28	4.59
50	0.75	1.69	2.38	4.83
55	0.78	1.78	2.47	5.04
60	0.81	1.86	2.55	5.22
65	0.83	1.93	2.62	5.37
70	0.85	1.98	2.67	5.50
75	0.86	2.04	2.72	5.62
80	0.88	2.08	2.76	5.72
85	0.89	2.12	2.80	5.81
90	0.90	2.16	2.82	5.88
95	0.90	2.20	2.84	5.94
100	0.91	2.23	2.86	5.99
105	0.92	2.25	2.88	6.04
110	0.92	2.28	2.89	6.09
115	0.93	2.29	2.91	6.13
120	0.93	2.31	2.92	6.16
125	0.93	2.32	2.93	6.19
130	0.94	2.33	2.95	6.22
135	0.94	2.35	2.96	6.25
140	0.95	2.36	2.97	6.28
145	0.95	2.37	2.98	6.30
150	0.95	2.38	2.99	6.33
155	0.96	2.39	3.01	6.36
160	0.96	2.40	3.02	6.38
165	0.97	2.41	3.03	6.41
170	0.97	2.42	3.04	6.43
175	0.97	2.43	3.05	6.46
180	0.98	2.44	3.06	6.48
185	0.98	2.45	3.07	6.51
190	0.98	2.46	3.08	6.53
195	0.99	2.47	3.09	6.55
200	0.99	2.48	3.11	6.58
205	0.99	2.49	3.12	6.60
210	1.00	2.50	3.13	6.63
215	1.00	2.51	3.14	6.65
220	1.00	2.52	3.15	6.68
225	1.01	2.53	3.16	6.70
230	1.01	2.54	3.17	6.73
235	1.02	2.55	3.19	6.75
240	1.02	2.56	3.20	6.78
245	1.02	2.57	3.21	6.80
250	1.03	2.58	3.22	6.83
255	1.03	2.59	3.23	6.86
260	1.03	2.60	3.25	6.88
265	1.04	2.61	3.26	6.91
270	1.04	2.62	3.27	6.93
275	1.05	2.63	3.29	6.96
280	1.05	2.64	3.30	6.99
285	1.06	2.65	3.31	7.02
290	1.06	2.66	3.33	7.05
295	1.06	2.67	3.34	7.07
300	1.07	2.68	3.35	7.10
305	1.07	2.69	3.37	7.13
310	1.08	2.70	3.38	7.16
315	1.08	2.72	3.39	7.19
320	1.09	2.73	3.41	7.22
325	1.09	2.74	3.42	7.25
330	1.10	2.75	3.44	7.28
335	1.10	2.76	3.45	7.31
340	1.11	2.77	3.47	7.35
345	1.11	2.79	3.48	7.38
350	1.11	2.80	3.50	7.41
355	1.12	2.81	3.51	7.44
360	1.12	2.82	3.53	7.48
365	1.13	2.83	3.55	7.51
370	1.13	2.85	3.56	7.54
375	1.14	2.86	3.58	7.58
380	1.15	2.87	3.59	7.61
385	1.15	2.89	3.61	7.65
390	1.16	2.90	3.63	7.68
395	1.16	2.91	3.65	7.72
400	1.17	2.93	3.66	7.76
405	1.17	2.94	3.68	7.80
410	1.18	2.96	3.70	7.83
415	1.18	2.97	3.72	7.87
420	1.19	2.98	3.74	7.91
425	1.20	3.00	3.75	7.95
430	1.20	3.01	3.77	7.99
435	1.21	3.03	3.79	8.03
440	1.21	3.04	3.81	8.07
445	1.22	3.06	3.83	8.11
450	1.23	3.08	3.85	8.15
455	1.23	3.09	3.87	8.20
460	1.24	3.11	3.89	8.24
465	1.25	3.12	3.91	8.28
470	1.25	3.14	3.93	8.33
475	1.26	3.16	3.96	8.38
480	1.27	3.18	3.98	8.42
485	1.27	3.19	4.00	8.47
490	1.28	3.21	4.02	8.52
495	1.29	3.23	4.05	8.56

500	1.30	3.25	4.07	8.61
505	1.30	3.27	4.09	8.66
510	1.31	3.28	4.12	8.71
515	1.32	3.30	4.14	8.77
520	1.33	3.32	4.17	8.82
525	1.34	3.34	4.19	8.87
530	1.34	3.36	4.22	8.92
535	1.35	3.38	4.24	8.98
540	1.36	3.40	4.27	9.04
545	1.37	3.43	4.30	9.09
550	1.38	3.45	4.33	9.15
555	1.39	3.47	4.35	9.21
560	1.40	3.49	4.38	9.27
565	1.41	3.51	4.41	9.33
570	1.41	3.54	4.44	9.39
575	1.42	3.56	4.47	9.46
580	1.43	3.59	4.50	9.52
585	1.44	3.61	4.53	9.59
590	1.45	3.63	4.57	9.65
595	1.46	3.66	4.60	9.72
600	1.48	3.69	4.63	9.79
605	1.49	3.71	4.67	9.87
610	1.50	3.74	4.70	9.94
615	1.51	3.77	4.74	10.01
620	1.52	3.80	4.77	10.09
625	1.53	3.82	4.81	10.17
630	1.54	3.85	4.85	10.24
635	1.56	3.88	4.89	10.33
640	1.57	3.91	4.92	10.41
645	1.58	3.95	4.97	10.49
650	1.59	3.98	5.01	10.58
655	1.61	4.01	5.05	10.67
660	1.62	4.04	5.09	10.76
665	1.64	4.08	5.14	10.85
670	1.65	4.11	5.18	10.95
675	1.67	4.15	5.23	11.04
680	1.68	4.19	5.28	11.14
685	1.70	4.22	5.33	11.25
690	1.71	4.26	5.38	11.35
695	1.73	4.30	5.43	11.46
700	1.75	4.34	5.48	11.57
705	1.76	4.39	5.54	11.68
710	1.78	4.43	5.59	11.80
715	1.80	4.47	5.65	11.92
720	1.82	4.52	5.71	12.04
725	1.84	4.57	5.77	12.17
730	1.86	4.62	5.84	12.31
735	1.88	4.67	5.91	12.46
740	1.91	4.73	5.99	12.62
745	1.94	4.79	6.09	12.81
750	1.96	4.86	6.17	12.99
755	1.99	4.93	6.25	13.17
760	2.02	4.99	6.33	13.34
765	2.04	5.06	6.42	13.52
770	2.07	5.12	6.50	13.69
775	2.10	5.19	6.59	13.87
780	2.12	5.25	6.67	14.05
785	2.15	5.32	6.77	14.24
790	2.18	5.40	6.86	14.44
795	2.21	5.47	6.96	14.64
800	2.25	5.55	7.06	14.85
805	2.28	5.63	7.17	15.07
810	2.31	5.71	7.27	15.30
815	2.35	5.80	7.39	15.54
820	2.39	5.89	7.51	15.78
825	2.43	5.98	7.63	16.05
830	2.47	6.08	7.76	16.31
835	2.51	6.19	7.90	16.60
840	2.56	6.29	8.04	16.90
845	2.62	6.42	8.23	17.27
850	2.70	6.59	8.48	17.76
855	2.80	6.79	8.80	18.38
860	2.93	7.02	9.23	19.18
865	3.14	7.31	9.92	20.37
870	3.30	7.74	10.40	21.44
875	3.41	8.17	10.74	22.32
880	3.50	8.45	11.03	22.98
885	3.60	8.68	11.32	23.60
890	3.68	8.91	11.60	24.19
895	3.78	9.13	11.88	24.79
900	3.87	9.36	12.17	25.39
905	3.97	9.59	12.48	26.04
910	4.07	9.84	12.80	26.71
915	4.18	10.10	13.17	27.46
920	4.31	10.39	13.56	28.25
925	4.44	10.70	13.99	29.13
930	4.58	11.02	14.43	30.03
935	4.80	11.39	14.93	31.12
940	5.19	11.93	15.47	32.59
945	5.97	13.10	16.34	35.41
950	7.57	15.41	18.40	41.38
955	10.93	20.12	22.94	53.99
960	16.73	29.78	32.49	78.99
965	29.61	55.19	58.75	143.55
970	48.86	95.01	99.66	243.53
975	69.80	133.97	145.06	348.83
980	95.49	181.94	201.25	478.67
985	**131**	240.50	**276**	**647**
990	98.70	**328**	190.74	617.38
995	60.44	304.69	118.34	483.48
1000	44.57	181.51	90.04	316.11
1005	36.34	130.09	75.24	241.66
1010	29.37	104.29	61.45	195.11
1015	24.91	90.17	53.12	168.19
1020	21.32	77.85	45.96	145.13
1025	18.86	65.32	41.57	125.75
1030	16.35	58.38	35.95	110.68
1035	14.29	51.90	31.83	98.02
1040	11.72	46.17	26.34	84.22
1045	9.81	43.13	21.95	74.89

1050	7.35	37.31	17.14	61.81
1055	6.04	33.86	14.83	54.74
1060	5.23	29.20	13.51	47.93
1065	4.84	24.75	12.56	42.16
1070	4.36	21.63	11.52	37.50
1075	4.05	16.44	10.81	31.29
1080	3.67	14.10	9.83	27.59
1085	3.35	12.36	9.31	25.02
1090	3.15	11.48	8.70	23.33
1095	2.91	10.92	8.30	22.14
1100	2.79	9.95	7.92	20.66
1105	2.63	9.33	7.60	19.57
1110	2.54	8.85	7.38	18.76
1115	2.46	7.93	7.16	17.55
1120	2.38	7.44	6.90	16.72
1125	2.27	7.12	6.55	15.94
1130	2.13	6.61	6.28	15.02
1135	2.01	6.33	5.84	14.18
1140	1.83	6.13	5.61	13.57
1145	1.76	5.84	5.48	13.08
1150	1.72	5.68	5.37	12.77
1155	1.68	5.56	5.26	12.51
1160	1.65	5.45	5.17	12.27
1165	1.62	5.33	5.07	12.02
1170	1.59	5.16	4.99	11.74
1175	1.57	4.87	4.90	11.34
1180	1.54	4.68	4.82	11.04
1185	1.52	4.46	4.75	10.72
1190	1.49	4.03	4.67	10.20
1195	1.47	3.88	4.60	9.95
1200	1.45	3.80	4.54	9.79
1205	1.43	3.74	4.47	9.65
1210	1.41	3.68	4.41	9.51
1215	1.39	3.63	4.35	9.38
1220	1.37	3.58	4.30	9.25
1225	1.36	3.53	4.24	9.13
1230	1.34	3.48	4.19	9.01
1235	1.32	3.44	4.14	8.90
1240	1.31	3.39	4.09	8.79
1245	1.29	3.35	4.04	8.69
1250	1.28	3.31	4.00	8.58
1255	1.26	3.27	3.95	8.49
1260	1.25	3.23	3.91	8.39
1265	1.24	3.20	3.87	8.30
1270	1.22	3.16	3.83	8.21
1275	1.21	3.13	3.79	8.13
1280	1.20	3.09	3.75	8.04
1285	1.19	3.06	3.71	7.96
1290	1.17	3.03	3.68	7.88
1295	1.16	3.00	3.64	7.80
1300	1.15	2.97	3.61	7.73
1305	1.14	2.94	3.57	7.66
1310	1.13	2.91	3.54	7.59
1315	1.12	2.89	3.51	7.52
1320	1.11	2.86	3.48	7.45
1325	1.10	2.83	3.45	7.38
1330	1.09	2.81	3.42	7.32
1335	1.08	2.78	3.39	7.26
1340	1.07	2.76	3.36	7.20
1345	1.06	2.74	3.33	7.14
1350	1.06	2.71	3.31	7.08
1355	1.05	2.69	3.28	7.02
1360	1.04	2.67	3.26	6.97
1365	1.03	2.65	3.23	6.91
1370	1.02	2.63	3.21	6.86
1375	1.02	2.61	3.18	6.81
1380	1.01	2.59	3.16	6.75
1385	1.00	2.57	3.14	6.70
1390	0.99	2.55	3.11	6.65
1395	0.99	2.53	3.09	6.61
1400	0.98	2.51	3.07	6.56
1405	0.97	2.49	3.05	6.51
1410	0.97	2.48	3.03	6.47
1415	0.96	2.46	3.01	6.42
1420	0.95	2.44	2.99	6.38
1425	0.95	2.42	2.97	6.34
1430	0.94	2.41	2.95	6.30
1435	0.93	2.39	2.93	6.25
1440	0.93	2.38	2.91	6.21
1445	0.91	2.34	2.85	6.11
1450	0.87	2.27	2.72	5.86
1455	0.81	2.16	2.51	5.47
1460	0.70	2.01	2.16	4.86
1465	0.50	1.80	1.49	3.78
1470	0.35	1.41	1.07	2.83
1475	0.28	1.02	0.85	2.15
1480	0.23	0.83	0.69	1.74
1485	0.18	0.70	0.55	1.44
1490	0.15	0.60	0.45	1.20
1495	0.12	0.51	0.37	1.00
1500	0.10	0.43	0.30	0.83
1505	0.08	0.37	0.23	0.69
1510	0.06	0.32	0.18	0.56
1515	0.05	0.27	0.14	0.46
1520	0.04	0.23	0.11	0.38
1525	0.03	0.19	0.08	0.30
1530	0.02	0.16	0.07	0.25
1535	0.02	0.13	0.06	0.21
1540	0.02	0.11	0.05	0.17
1545	0.01	0.09	0.04	0.14
1550	0.01	0.07	0.03	0.11
1555	0.01	0.06	0.03	0.09
1560	0.01	0.05	0.02	0.08
1565	0.01	0.05	0.02	0.07
1570	0.01	0.04	0.02	0.06
1575	0.00	0.03	0.01	0.05
1580	0.00	0.03	0.01	0.04
1585	0.00	0.03	0.01	0.04
1590	0.00	0.02	0.01	0.03
1595	0.00	0.02	0.00	0.03

1600	0.00	0.02	0.00	0.02
1605	0.00	0.01	0.00	0.02
1610	0.00	0.01	0.00	0.01
1615	0.00	0.01	0.00	0.01
1620	0.00	0.01	0.00	0.01
1625	0.00	0.01	0.00	0.01
1630	0.00	0.01	0.00	0.01
1635	0.00	0.01	0.00	0.01
1640	0.00	0.00	0.00	0.00
1645	0.00	0.00	0.00	0.00
1650	0.00	0.00	0.00	0.00
1655	0.00	0.00	0.00	0.00
1660	0.00	0.00	0.00	0.00
1665	0.00	0.00	0.00	0.00
1670	0.00	0.00	0.00	0.00
1675	0.00	0.00	0.00	0.00
1680	0.00	0.00	0.00	0.00
1685	0.00	0.00	0.00	0.00
1690	0.00	0.00	0.00	0.00
1695	0.00	0.00	0.00	0.00
1700	0.00	0.00	0.00	0.00
1705	0.00	0.00	0.00	0.00
1710	0.00	0.00	0.00	0.00