Oak Grove

PA No. PA160056

Master Drainage Plan

Prepared for:

The County of Orange

On Behalf of:

Oak Grove LLC and Silver-Bronze Corporation
One Upper Newport Plaza
Newport Beach, CA 92660

Project Name:

Oak Grove Master Drainage Plan
23432 VISTA DEL VERDE,
COTO DE CAZA, CA 92679
APN: 804-261-12, 23, & 24

Prepared by:

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1. INTRODUCTION

This analysis is intended solely to support the Oak Grove Residential project that is the subject of the current application (PA160056).

This analysis shows that the Oak Grove Residential project can be developed now creating an 'Interim Condition' that complies with SOCHM with no future development ever taking place on the CEP property. Because the underground drainage reservoir includes infiltration it can serve the function of both water quality control and flow rate reduction in the same location. Because it is located outside the FEMA Flood Plain, it can be developed without a requirement for a Flood Insurance Rate Map (FIRM) Map Revision before or after its construction.

As a separate matter, the ability to build within the entire building area on Lot 9 will require a FIRM LOMR to be issued before the building is occupied. At the time that a grading plan and permit is processed, an application for a Conditional Letter of Map Revision based on Fill (C-LOMR-F) will be submitted to the County for acceptance and to FEMA for approval. After the Grading is complete and Certified, documentation will be provided to FEMA for issuance of the LOMR. Note that FEMA typically issues LOMRs and does not reprint the FIRMs except for when major regional changes have been made.

1.1. Purpose

This Master Drainage Plan (Plan) was developed to support the approval of Tentative Tract Map (TTM) Number 17866, also known as the Oak Grove residential development, located in Coto De Caza, in the County of Orange. The Plan presents a tentative tract level drainage analysis for the improvements necessary to support the proposed development of the Oak Grove residential area.

The development area is bound by Vista Del Verde to the west, Via Pajaro to the south and west and existing low density residential area to the north. It borders an existing commercial complex to the south, a residential housing tract to the west, and a natural creek to the south-east. Figures 1-1 and 1-2 are the Vicinity Map and Project Site Map, respectively.

It is anticipated that additional hydraulic analysis may be performed during final design if alternate BMP, infiltration and basin outlet configurations are considered.

1.2. Site Description

The current project area includes only the Oak Grove Residential property and minor improvements on the adjacent CEP that are necessary to support Oak Grove. The portion of the property which is being developed currently contains commercial buildings and impervious parking areas. This area is currently zoned Community Center Commercial. The developed condition will be zoned Low Density Single Family Residential. The site is in within the Canada Gobernadora watershed of southern Orange County, which is tributary to San Juan Creek. Site drainage generally flows south to Via Pajaro. Currently on-site drainage sheet flows from impervious and pervious surfaces and is collected by various storm drain pipes that outlet into a small natural creek adjacent to Via Pajaro. The natural creek drains south eventually draining into Canada Gobernadora. Canada Gobernadora drains south into San Juan Creek which ultimately discharges into the Pacific Ocean.

The proposed project includes minor grading and drainage improvements within the current CEP as well as demolition and construction of improvements within the existing Community Center Commercial property necessary for the construction of 13 single family residential units which makes up Oak Grove.

Runoff from the project site will mimic drainage patterns in the existing condition. In order to provide water quality treatment and match existing runoff rates, the Oak Grove project includes a proposed underground infiltration reservoir and bioretention basis. The on-site soils consist of high permeability sandy loam and gravel that are suitable for infiltration of storm water. However, prior to final design an infiltration test is recommended to verify infiltration rates at the proposed structure depths and to confirm that underdrains will not be necessary. The BMPs will provide water quality treatment and flow attenuation for hydromodification purposes before discharging runoff into the natural creek adjacent to Via Pajaro.

1.3. Scope of Drainage Plan

This Plan presents hydrologic characteristics for the existing and interim condition development. Hydraulic calculations are also provided in this report but only for the interim condition. The calculations are provided to show that the permanent drainage improvements within the Oak Grove and the temporary drainage features in the CEP will convey runoff during the interim and proposed conditions. The existing condition analysis will incorporate existing condition impervious areas as well as the current drainage patterns for both Oak Grove and CEP. The interim condition will include the proposed Oak Grove residential development and the existing CEP condition.

The objectives of this study include the following:

1. Develop existing and proposed condition hydrology maps that identify drainage boundaries and subareas within the project area.

2. Prepare hydrological analysis based on the Orange County Rational Method and Small Area Unit Hydrograph Method for the 10-year, 25-year, and 100-year storm events.

3. Evaluate peak runoff attenuation by incorporating the proposed BMP stage storage curves into the Small Area Unit Hydrographs for the interim and proposed condition.

4. Provide hydraulic analysis for the proposed Oak Grove. This includes the concrete swales and riser. These calculations were based on the Orange County Hydrology Manual using the 100-year storm event.

This report does not discuss water quality or hydromodification requirements or the sizing of the proposed BMPs in regards to the water quality requirements. Detailed discussions of the water quality features are contained in the Oak Grove Water Quality Management Plan (WQMP), under a separate cover.

Figure 1-1: Vicinity Map

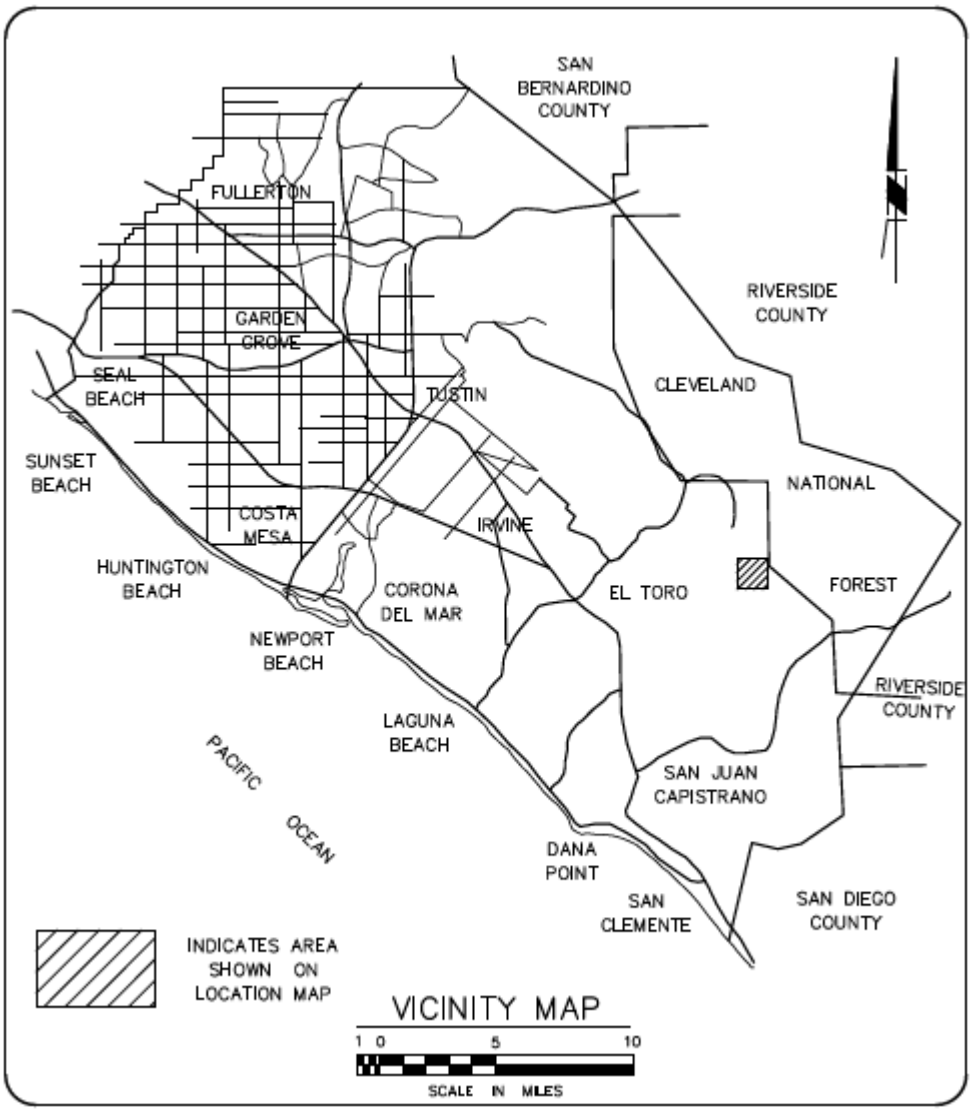
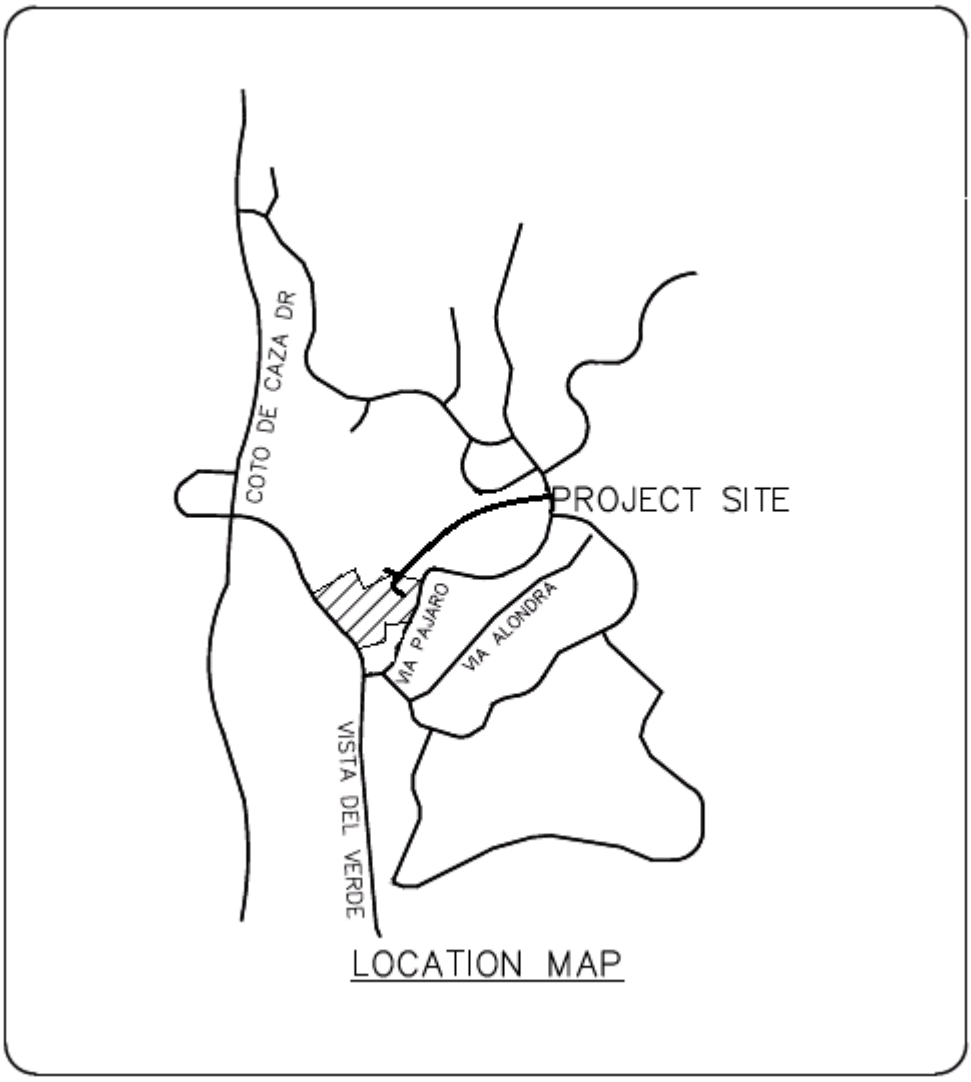


Figure 1-2: Project Site Location Map



2. HYDROLOGIC METHODOLGY

The hydrology analysis for this project was performed based on the Orange County Hydrology Manual (1986 including the 1996 Addendum). The manual recommends use of the Rational Method (RM) or the Modified Rational Method hydrology for projects with drainage area less than 1 square mile and that do not have detention basins. For watershed areas that are less than 1 square mile and contain detention basins the Small Area Unit Hydrograph method is necessary. In order to develop a Small Area Unit Hydrograph the time of concentration for the watershed is necessary. The Rational Method will be used to develop the time of concentration for each of the project subwatersheds.

The hydrologic analysis was performed using the AES and HEC-1 computer programs developed by the Hydrologic Engineering Center. The hydrologic model was applied to quantitatively estimate the surface runoff flow rates for a range of rainfall events, including the 10-, 25-, and 100-year return periods.

2.1 Rational Method

The RM hydrology model was developed using a "link-node" model to facilitate the analysis of a watershed by dividing the system into a series of inter-connected processes. A hydrologic process occurs at a "node" and these are connected by hydraulic conveyances or "links." Additional critical concentration points were identified to establish the appropriate nodes, such as at confluences, culvert crossings, or storm drain outlets. The link-node model was developed for the backbone storm drain conveyance system and computer-generated facility sizing. An overall schematic node diagram was developed to diagram the hydrologic processes and verify the basin sub areas are correctly modeled. The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (Tc), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed as follows:

Q = C I A, Where:

Q = peak discharge, in cubic feet per second (cfs)
C = runoff coefficient (unit-less)
I = average rainfall intensity for a duration equal to the Tc for the area (inch/hour)
A = drainage area (acres)

The runoff coefficient is based on land use and soil type. Soil type can be determined from the soil type map provided in the Orange County Hydrology Manual. An appropriate runoff coefficient (C) for each type of land use in the subarea was generated using the AES Hydrology Program. Runoff coefficients are generated based on the land use and impervious area associated with each land use.

The rainfall intensity is also based on land use and cover type as well as time of concentration. The time of concentration and intensities are all generated using the AES Hydrology Program. Detailed rational method analysis results for this project are included in Appendix B of this report.

2.2 Unit Hydrograph Method

The Unit Hydrograph method is used for watersheds larger than 1 square mile to estimate peak discharges and volumes of storm water runoff. This method produces a graph of discharge vs. time for the entire length of a storm. Input needed to derive a runoff hydrograph includes lag time (=0.8Tc), drainage area, appropriate S-graph, rainfall depths, soil loss rates, and depth-area-reduction factors. The AES Hydrology Program was used to model the project's drainage characteristics and evaluate the required basin size in order to attenuate peak flow rates and match the existing condition.

2.3 Watershed Hydrologic Information

The watershed consists of various soils ranging from A to D type, however the project watershed consists predominately of soil type A and C. A soil survey was developed using the natural resources conservation service's (NRCS) websoil online survey. The results have been provided in Appendix A.

The land use assumption for the existing condition was based on current undeveloped site conditions. The CEP consists of open space, decomposed granite roads, native vegetation, landscaped areas and various building structures. The Oak Grove area is currently part commercial property and existing equestrian land use. The commercial area consists of an existing school building and impervious parking area.

The CEP will remain equestrian land use that is predominately pervious. The surface covers will consist of decomposed granite access roads, dirt arenas, native landscaping, and various structures similar to the existing condition. Multiple buildings are being

removed in the proposed condition which will reduce impervious land cover. The Oak Grove development will consist of a proposed single family residential land use. This was used to establish the land use and curve number (CN) assumptions for the on-site project watershed and prepare the design hydrology for the project.

3. HYDRAULICS

In order to size the proposed drainage improvements, the peak runoff from the 100-year storm event was used. The outlet structure was sized to attenuate peak runoff in order to meet hydromodification requirements. As previously mentioned, the hydromodification analysis is provided in the stand alone WQMP.

The discharge for the vertical opening on the outlet was computed using the orifice and weir equations. Discharge through an opening on the riser was computed using the orifice equation:

$Q_o = CA\sqrt{2gH}$, Where:

Q_O = orifice discharge, in cubic feet per second (cfs)
C = orifice discharge coefficient (unit-less)
A = cross-sectional area square feet (sf)
g = gravitational acceleration (32.174 ft/s^2)
H = headwater above midpoint of the orifice opening (feet)

The discharge through the top of the riser was computed using the weir equation:

$Q_w = CLH^{1.5}$, Where:

Q_w = weir discharge, in cubic feet per second (cfs)
C = weir discharge coefficient (unit-less), 3.32 was used for sharp-crested weir.
L = crest length (feet),
H = headwater above crest (feet)

The top of the combined weir is configured to pass the non-attenuated 100-year storm event while sustaining a minimum freeboard of 0.5 feet to the top of embankment.

The sizing of the proposed concrete swales conveying on-site and off-site flow from the project site was performed based on the normal depth using Manning's equation. The swales were sized to convey the 100 year storm event. Results are provided in Appendix C.

4. DEVELOPMENT CONDITIONS

This section summarizes the drainage conditions and patterns for each phase of the development.

4.1 Coto Equestrian Preserve Existing Condition Description

The existing project watershed generally drains in a southeast direction and is divided into two sub-drainage areas, A and C. Runoff from sub-area A drains to an existing low point and into an existing storm drain adjacent to the east side Via Pajaro. This storm drain conveys runoff underneath Via Pajaro and discharges into the natural creek adjacent to the roadway. Runoff generated within sub-area C sheet flows through the existing commercial area and into the catch basins located at the corner of Via Pajaro and Vista Del Verde before draining into the natural creek adjacent to the southeast side of the project. Runoff from the site is mainly generated onsite as well as run-on from an adjacent low density residential area as shown in the Hydrology Map located in Appendix A. Topography was not developed for this off-site area so the drainage areas were estimated using available topographic imagery.

4.2 Interim condition Description

The interim condition consists of 13 single family residential units. Runoff within the Oak Grove development, sub-area D, is being drained in a similar direction as the existing condition towards the natural creek adjacent to Via Pajaro. Runoff generated within sub-area D drains into the proposed residential street and is conveyed north towards the proposed concrete swale through a proposed curb and gutter. The concrete swale discharges into the proposed underground infiltration reservoir sized to mitigate increases in runoff from the proposed development. The reservoir was sized to meet water quality, hydromodification, and flood control requirements. The water quality and hydromodification sizing criteria is covered in further detail in the stand alone Water Quality Management Plan (WQMP). The outlet was sized to convey the peak discharge from the 100-year storm event. The outlet sizing methodology is summarized in the hydraulic section below. Results for the hydraulic calculations are provided in Appendix C of this report. The outlet pipe in the proposed BMP drains into a proposed storm drain system within Via Pajaro where it confluences with existing runoff from the CEP property (sub-area A). This system traverses south and connects to an existing storm drain which drains beneath Via Pajaro and into the natural creek adjacent to Via Pajaro.

The hydrologic analysis for the interim condition is based on the proposed grading plan for the residential development area and the existing topography for the CEP area adjacent to the Oak Grove. Runoff within sub-area A that originally drained southeast towards the existing commercial center will be conveyed in a proposed temporary concrete drainage channel located along the north side of the Oak Grove development. This channel traverses southeast along the north perimeter of the Oak Grove property and discharges through a culvert into a storm drain system within Via Pajaro. This storm drain discharges into the natural creek adjacent to the east side of the development.

5. DISCUSSION OF RESULTS

This section summarizes the results of the hydrologic and hydraulic analysis, provides a brief summary of the existing flood plain evaluation, and a brief summary of the mitigation measures that will be taken.

5.1 Flood Plain Evaluation Summary

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 06059C0452J, portions of the project site are located within a Special Flood Hazard Area (SFHA) designated as Flood Zone AE. By definition, areas within Flood Zone AE are subject 1-percent chance of annual flooding. Flood Zone AE traverses the southeast corner of the project site and crosses a portion of Lot 9.

One of the proposed lots (lot 9) falls within the existing limits of FIRM Zone AE as depicted on the FIRM created by FEMA attached in Appendix C. This is the portion of the Flood Plain where development is allowed and subject to a federal requirement for the purchase of mandatory flood insurance unless the FIRM is revised to exclude this area.

The residential lot can be removed from the flood zone by placing fill on the lot and by applying to FEMA for a C-LOMR-F (a conditional letter of map revision based on fill) before the grading plan is approved. A final LOMR can be obtained from FEMA only after the grading has been completed and certified. Thereafter, any house placed on the lot will not be subject to the mandatory flood insurance requirement.

The Storm Water Basin proposed replaces an existing basin of similar size and location that is partly in the Flood Plain. However, in order to avoid additional concerns associated with constructing the new basin within the existing Flood Plan the proposed basin has been located entirely outside the SFHA and the storm water management capacity of the existing basin in the SFHA has been disregarded and can be eliminated.

The purpose of this configuration is to demonstrate that it is possible to mitigate the drainage from Oak Grove without any modification of, or construction within, the SFHA.

This approach is not intended to preclude other options that may be considered and approved by the County Flood Control department at the time that construction documents are reviewed.

5.2 Hydrologic and Hydraulic Results

Hydrology was performed for the existing, interim, and proposed condition. Table 4-1 provides a summary for the peak flows for the 100-year storm event. The unmitigated condition represents the condition without inclusion of the basin while the mitigated condition accounts for the attenuation from the basin.

Table 5-1: Oak Grove Hydrology Summary										
Discharge Points	**Drainage Area**	**Flow Rate (cfs)**								
		10-Year			**25-Year**			**100-Year**		
		Existing	**Interim/Proposed**		**Existing**	**Interim/Proposed**		**Existing**	**Interim/Proposed**	
			Unmitigated	**Mitigated**		**Unmitigated**	**Mitigated**		**Unmitigated**	**Mitigated**
No. 1	Area A	32.56	33.12*	10.66	41.15	41.03*	17.15	55.29	54.46*	20.16
	Area B	N/A	12.86	6.56	N/A	15.59	8.16	N/A	20.31	10.1
	Total	**32.56**	**45.98**	**17.22**	**41.15**	**56.62**	**25.31**	**55.29**	**74.77**	**30.26**
No.2	Area B	8.98		N/A	11.02		N/A	14.43		N/A
	Area C	N/A	3.38*	N/A	N/A	4.16*	N/A	N/A	5.46*	N/A
	Total	**8.98**	**3.38**	**N/A**	**11.02**	**4.16**	**N/A**	**14.43**	**5.46**	**N/A**

*Areas A and C will not include basins during the interim condition and therefore will only have an unmitigated flow rate.

The proposed basins will provide the necessary attenuation to reduce peak flow rates during the interim and proposed condition for the entire project.

5.2.1 Interim Hydrologic and Hydraulic Results

The proposed basin within the Oak Grove has a 20-inch diameter outlet riser. As shown in the stage storage discharge table (Generated from SOCHM) contained in Appendix C, the riser will pass up to 40.63 cfs which far exceeds the expected 20.31 cfs. The riser will convey 20.31 cfs at a height of 10.8 feet which is 3.7 feet below the top of the structure. There will be sufficient capacity to pass the 20.31 cfs produced during the 100-year storm event while maintaining adequate freeboard.

The proposed on-site channel will need to be approximately 3 feet wide and 1.5 foot deep to convey the 20.31 cfs produced in the 100-year storm event and maintain a 0.5' freeboard. While the proposed interim off-site channel would need to be 1.5 feet deep and 4.5 feet wide to convey the 52.03 cfs produced during the 100-year event. Although there is sufficient space to construct a 4.5 foot wide 1.5 foot deep channel within the CEP property, not all of the drainage area is anticipated to be tributary to this channel. Further analysis is recommended during final design to reduce the size of the swale for the off-site area. All of the results are provided in Appendix C of this report.

6. CONCLUSION

In conclusion, the Oak Grove residential development can be constructed and the runoff safely contained in the proposed streets and concrete channel without the need for underground storm drains. The proposed underground infiltration reservoir will be able to convey runoff from the 100-year storm event while providing water quality benefits and attenuation to meet the hydromodification and water quality requirements of the San Diego Regional Water Quality Board NPDES Permit.

Additionally, runoff from the residential development can be segregated from runoff from the CEP, treated and then conveyed to the existing storm drain crossing Via Pajaro without new construction on the east side of Via Pajaro. Runoff from the CEP that is currently tributary to the Oak Grove site can be safely contained and conveyed around the new development by the proposed drainage swale which conveys runoff to the existing point of discharge served by the existing storm drain crossing within Via Pajaro.

7. REFERENCES

Orange County Hydrology Manual (1986).

United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx .

United States Federal Emergency Management Agency (FEMA), Definitions of FEMA Flood Zone Designations. Website: https://msc.fema.gov (accessed October 10, 2013).

8. TECHNICAL APPENDICES

A. APPENDIX – SOILS AND HYDROLOGY MAPS

Map Scale: 1:4,520 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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 map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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 10, Sep 30, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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.

Map Unit Legend

Orange County and Part of Riverside County, California (CA678)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
133	Botella clay loam, 9 to 15 percent slopes	21.7	48.9%
135	Capistrano sandy loam, 2 to 9 percent slopes	6.0	13.5%
146	Corralitos loamy sand	5.1	11.5%
147	Corralitos loamy sand, moderately fine substratum	4.5	10.1%
175	Myford sandy loam, 9 to 15 percent slopes	0.0	0.1%
177	Myford sandy loam, 9 to 30 percent slopes, eroded	3.2	7.2%
191	Riverwash	0.3	0.8%
200	Soper loam, 30 to 50 percent slopes	3.6	8.0%
Totals for Area of Interest		**44.5**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

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.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Orange County and Part of Riverside County, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
133—Botella clay loam, 9 to 15 percent slopes														
Botella	85	C	0-8	Clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	83-90-100	62-79-100	56-72-93	44-56-73	41-47-53	19-20-21
			8-35	Silty clay loam, clay loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	90-95-100	76-87-100	74-86-100	65-77-91	41-45-49	21-23-25
			35-66	Sandy clay loam, clay loam, loam	CL	A-6, A-7	0- 0- 0	0- 0- 0	90-95-100	76-86-100	62-75-92	34-43-55	33-39-45	13-17-21
135—Capistrano sandy loam, 2 to 9 percent slopes														
Capistrano	80	A	0-27	Sandy loam	SM	A-2, A-4	0- 0- 0	0- 0- 0	95-97-100	90-93-100	65-72-82	30-36-44	21-28-35	4-8 -12
			27-65	Fine sandy loam, sandy loam, coarse sandy loam	SM	A-2, A-4	0- 0- 0	0- 0- 0	95-97-100	90-93-100	79-86-98	31-37-44	19-24-29	4-8 -12

Engineering Properties–Orange County and Part of Riverside County, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
146—Corralitos loamy sand														
Corralitos	65	A	0-9	Loamy sand	SM	A-1, A-2	0- 0- 0	0- 0- 0	95-97-100	79-87-100	59-68-81	20-25-31	0-0 -22	NP-0 -2
			9-60	Stratified sand to loamy sand	SM	A-1, A-2	0- 0- 0	0- 0- 0	95-98-100	80-90-100	40-65-90	5-18- 30	5-18 -30	NP-3 -5
147—Corralitos loamy sand, moderately fine substratum														
Corralitos	75	A	0-10	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	96-97-100	75-86-100	56-67-81	19-24-31	0-0 -20	NP-0 -2
			10-40	Loamy sand, loamy fine sand	SM	A-2	0- 0- 0	0- 0- 0	96-97-100	75-86-100	57-67-81	19-24-31	0-0 -19	NP-0 -2
			40-46	Silt loam, silty clay loam	ML	A-4, A-6	0- 0- 0	0- 0- 0	96-97-100	75-86-100	68-84-100	59-75-94	31-38 -46	13-19-25
			46-80	Stratified sand to fine sand to loamy sand	SM, SP-SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	95-98-100	75-88-100	40-60-80	5-20- 35	0-0 -0	NP

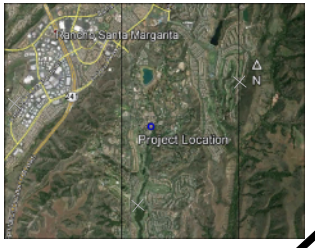
Engineering Properties–Orange County and Part of Riverside County, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
175—Myford sandy loam, 9 to 15 percent slopes														
Myford	85	D	0-12	Sandy loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	73-77-80	35-39-42	17-21 -26	2-5 -7
			12-18	Sandy clay	CL, SC	A-6, A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	78-83-88	48-53-58	47-53 -59	25-29-33
			18-28	Sandy clay loam, clay loam	CL, SC	A-6, A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	82-87-92	45-50-55	34-41 -47	14-18-22
			28-71	Sandy clay loam, clay loam	CL, SC	A-6, A-7	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	82-87-92	45-50-55	31-36 -42	13-17-21
			71-79	Sandy loam	CL-ML, ML, SC-SM, SM	A-2, A-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	74-76-79	36-38-41	20-23 -26	6-8 -10
177—Myford sandy loam, 9 to 30 percent slopes, eroded														
Myford	85	C	0-7	Sandy loam	SC-SM	A-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	73-77-80	35-39-42	17-22 -25	2-5 -7
			7-11	Sandy clay	CH	A-7-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	81-86-91	51-56-61	47-53 -59	25-28-32
			11-21	Clay loam, sandy clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	82-87-92	47-52-57	32-38 -44	13-17-21
			21-64	Sandy clay loam, clay loam	CL	A-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	82-87-92	47-52-57	30-35 -41	13-17-21
			64-79	Sandy loam	SC	A-4	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	74-76-79	36-38-41	21-23 -25	6-8 -10

Engineering Properties–Orange County and Part of Riverside County, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
191—Riverwash														
Riverwash	100		0-6	Gravelly sand	SP, SP-SM, SW, SW-SM	A-3, A-1	0- 3- 5	0- 3- 5	80-90-100	75-88-100	30-45-60	0- 5- 10	0-0 -0	NP
			6-60	Stratified gravelly coarse sand to sandy loam	SM, SP, SP-SM	A-1, A-2, A-3	0- 3- 5	0- 3- 5	80-90-100	75-88-100	40-55-70	0-10- 20	0-0 -0	NP
200—Soper loam, 30 to 50 percent slopes														
Soper	65	C	0-9	Loam	ML, SC-SM, SM, CL	A-4	0- 0- 0	0- 3- 5	90-95-100	76-86-100	63-77-94	45-56-70	27-35 -43	9-13-17
			9-30	Gravelly clay loam	SC, CL	A-6, A-7	0- 0- 0	0- 8- 13	84-89-96	74-84-96	64-77-93	50-61-74	35-41 -46	17-21-25
			30-59	Weathered bedrock	—	—	—	—	—	—	—	—	—	—

Data Source Information

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 10, Sep 30, 2016

VICINITY MAP



Existing Condition Flow Summary				
Area ID	Node	Area (Acres)	Storm Event	Flow (cfs)
A	2	1.22	10-Year	2.22
			25-Year	2.72
			100-Year	3.55
	3	3.4	10-Year	5.6
			25-Year	6.92
			100-Year	9.11
	4	7.6	10-Year	11.28
			25-Year	14.08
			100-Year	18.76
	5	14.8	10-Year	20.72
			25-Year	26.03
			100-Year	34.83
	6	25	10-Year	32.56
			25-Year	41.15
			100-Year	55.29
B	31	0.8	10-Year	1.57
			25-Year	1.92
			100-Year	2.5
	32	1.8	10-Year	3.38
			25-Year	4.16
			100-Year	5.46
	33	3.2	10-Year	5.83
			25-Year	7.16
			100-Year	9.37
	34	5.2	10-Year	8.98
			25-Year	11.02
			100-Year	14.43

NO.	DATE	DESCRIPTION
		REVISIONS

PREPARED FOR:

SILVER - BRONZE CORPORATION AND
OAK GROVE LLC
***ONE UPPER NEWPORT** PLAZA*
NEWPORT BEACH, CA 92660

REGISTERED PROFESSIONAL ENGINEER ROY L. ROBERSON NO. RCE 44160 EXP. 06/30/2019 STATE OF CALIFORNIA CIVIL

PREPARED BY:

LAND STRATEGIES, LLC
9241 IRVINE BLVD. SUITE 100
IRVINE, CA 92618
(949) 580-3000

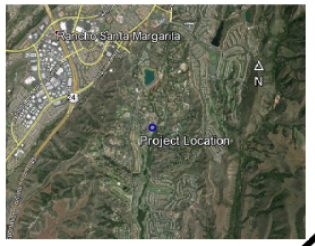
ROY L. ROBERSON R.C.E. 44160 — 12/07/2017 DATE

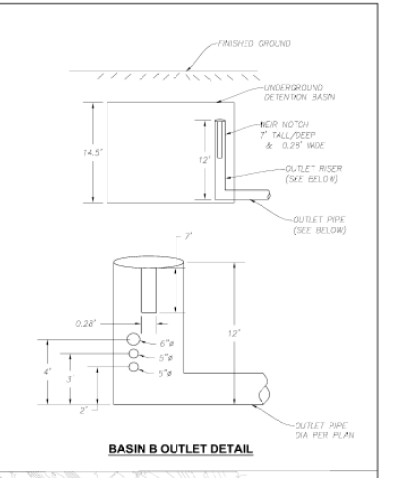
HYDROLOGY MAP EXISTING CONDITION

Oak Grove Development
23432 Vista Del Verde,
COTO DE CAZA, CA 92679

EXHIBIT **1** *OF 3*

VICINITY MAP





BASIN B OUTLET DETAIL

LEGEND

- TRIBUTARY AREA BOUNDARY
- TRIBUTARY SUB-AREA BOUNDARY
- DRAINAGE FLOW PATH
- (30) SUBAREA NODE
- (A-2 / 7.05) SUBAREA ID & AREA IN ACRES
- STORM WATER BASIN

70 35 0 70 140 210
SCALE: 1"=70'

NO.	DATE	DESCRIPTION
		REVISIONS

PREPARED FOR:

SILVER - BRONZE CORPORATION AND
OAK GROVE LLC
ONE UPPER NEWPORT PLAZA
NEWPORT BEACH, CA 92660

REGISTERED PROFESSIONAL ENGINEER ROY L. ROBERSON NO. RCE 44160 EXP. 06/30/2019 CIVIL STATE OF CALIFORNIA

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9241 IRVINE BLVD., SUITE 100
IRVINE, CA 92618
(949) 580-3000

ROY L. ROBERSON R.C.E. 44160 — 12/07/2017 DATE

HYDROLOGY MAP
INTERIM CONDITION

Oak Grove Development
23432 Vista Del Verde,
COTO DE CAZA, CA 92679

EXHIBIT **2**

OF 3

B. APPENDIX – HYDROLOGY RESULTS

EXISTING CONDITION

```
*****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* OAK GROVE HYDROLOGY                                                     *
* 10-YEAR STORM EVENT - EXISTING CONDITIONS                               *
* AUGUST 2017                                                             *
 *************************************************************************

  FILE NAME: EOAK10.DAT
  TIME/DATE OF STUDY: 18:39 08/14/2017
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  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 =  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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.306
  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"                B        0.78      0.30     1.000    66   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.44      0.25     1.000    77   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.22
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.22

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.110
  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"                B        1.26      0.30     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.92      0.25     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.63
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   2.25
  Tc(MIN.) =   15.66
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    3.59
  EFFECTIVE AREA(ACRES) =      3.40     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        3.4          PEAK FLOW RATE(CFS) =       5.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   1.82
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.60  DOWNSTREAM(FEET) =    848.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   447.00   CHANNEL SLOPE =  0.0248
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.940
```

```
 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"               A        1.79      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.94      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.25      0.25     1.000    77
 COMMERCIAL                 A        0.13      0.40     0.100    32
 COMMERCIAL                 B        0.12      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.947
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.70
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.00
 AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   2.48
 Tc(MIN.) =   18.15
 SUBAREA AREA(ACRES) =     4.23       SUBAREA RUNOFF(CFS) =    6.20
 EFFECTIVE AREA(ACRES) =      7.63     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.31  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =        7.6         PEAK FLOW RATE(CFS) =      11.28

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   3.26
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     997.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    848.50  DOWNSTREAM(FEET) =    841.80
 CHANNEL LENGTH THRU SUBAREA(FEET) =   293.00   CHANNEL SLOPE =  0.0229
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.862
 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"               A        2.55      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        3.69      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        0.48      0.25     1.000    77
 COMMERCIAL                 A        0.22      0.40     0.100    32
 COMMERCIAL                 B        0.23      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.27
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.65
 AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   1.34
 Tc(MIN.) =   19.48
 SUBAREA AREA(ACRES) =     7.17       SUBAREA RUNOFF(CFS) =    9.98
 EFFECTIVE AREA(ACRES) =     14.80     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.96
 TOTAL AREA(ACRES) =       14.8         PEAK FLOW RATE(CFS) =      20.72
```



```
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   3.95
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    841.80  DOWNSTREAM(FEET) =    835.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0136
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.747
 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"               A        1.23      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        7.82      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        0.03      0.20     1.000    83
 COMMERCIAL                 A        0.31      0.40     0.100    32
 COMMERCIAL                 B        0.76      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.905
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.41
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.64
 AVERAGE FLOW DEPTH(FEET) =   0.61   TRAVEL TIME(MIN.) =   2.29
 Tc(MIN.) =   21.77
 SUBAREA AREA(ACRES) =    10.15       SUBAREA RUNOFF(CFS) =   13.37
 EFFECTIVE AREA(ACRES) =     24.95     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       25.0         PEAK FLOW RATE(CFS) =      32.56

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.67   FLOW VELOCITY(FEET/SEC.) =   3.86
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1790.00 FEET.

+--------------------------------------------------------------------------+
| START AREA B                                                             |
| NEW SUBAREA RUN                                                          |
| AUGUST 2017                                                              |
+--------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.476
  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"                B        0.80      0.30     1.000    66   11.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.57
  TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      1.57

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.330
  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"                B        1.05      0.30     1.000    66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.41
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.33
  Tc(MIN.) =   13.18
  SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    1.92
  EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       3.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   2.64
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    846.00  DOWNSTREAM(FEET) =    838.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0356
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.222
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
```



```
  "8-10 DWELLINGS/ACRE"       B        1.39      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.31
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   1.13
  Tc(MIN.) =   14.31
  SUBAREA AREA(ACRES) =     1.39       SUBAREA RUNOFF(CFS) =    2.63
  EFFECTIVE AREA(ACRES) =      3.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.74
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       5.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.60
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    838.00  DOWNSTREAM(FEET) =    830.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   279.00   CHANNEL SLOPE =  0.0287
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.117
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       B        1.92      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.69
  AVERAGE FLOW DEPTH(FEET) =   0.34   TRAVEL TIME(MIN.) =   1.26
  Tc(MIN.) =   15.57
  SUBAREA AREA(ACRES) =     1.92       SUBAREA RUNOFF(CFS) =    3.45
  EFFECTIVE AREA(ACRES) =      5.16     AREA-AVERAGED Fm(INCH/HR) =   0.18
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.62
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =       8.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   3.86
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =    1024.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.2  TC(MIN.) =     15.57
  EFFECTIVE AREA(ACRES) =      5.16  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.615
  PEAK FLOW RATE(CFS)   =       8.98
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE HYDROLOGY                                                    *
* 25-YEAR STORM EVENT - EXISTING CONDITIONS                              *
* AUGUST 2017                                                            *
 ************************************************************************

  FILE NAME: EOAK25.DAT
  TIME/DATE OF STUDY: 18:38 08/14/2017
==========================================================================
  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 =  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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.759
  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"                B        0.78      0.30     1.000    66   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.44      0.25     1.000    77   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.72
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.72

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.541
  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"                B        1.26      0.30     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.92      0.25     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.75
  AVERAGE FLOW DEPTH(FEET) =   0.26   TRAVEL TIME(MIN.) =   2.10
  Tc(MIN.) =   15.52
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    4.44
  EFFECTIVE AREA(ACRES) =      3.40     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        3.4          PEAK FLOW RATE(CFS) =       6.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   1.99
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.60  DOWNSTREAM(FEET) =    848.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   447.00   CHANNEL SLOPE =  0.0248
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.348
```

```
 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"               A        1.79      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.94      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.25      0.25     1.000    77
 COMMERCIAL                 A        0.13      0.40     0.100    32
 COMMERCIAL                 B        0.12      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.947
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.81
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.21
 AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   2.32
 Tc(MIN.) =   17.84
 SUBAREA AREA(ACRES) =     4.23       SUBAREA RUNOFF(CFS) =    7.75
 EFFECTIVE AREA(ACRES) =      7.63     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.31  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =        7.6         PEAK FLOW RATE(CFS) =      14.08

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   3.55
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     997.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    848.50  DOWNSTREAM(FEET) =    841.80
 CHANNEL LENGTH THRU SUBAREA(FEET) =   293.00   CHANNEL SLOPE =  0.0229
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.261
 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"               A        2.55      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        3.69      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        0.48      0.25     1.000    77
 COMMERCIAL                 A        0.22      0.40     0.100    32
 COMMERCIAL                 B        0.23      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.36
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.94
 AVERAGE FLOW DEPTH(FEET) =   0.44   TRAVEL TIME(MIN.) =   1.24
 Tc(MIN.) =   19.08
 SUBAREA AREA(ACRES) =     7.17       SUBAREA RUNOFF(CFS) =   12.55
 EFFECTIVE AREA(ACRES) =     14.80     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.96
 TOTAL AREA(ACRES) =       14.8         PEAK FLOW RATE(CFS) =      26.03
```



```
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.51   FLOW VELOCITY(FEET/SEC.) =   4.27
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    841.80  DOWNSTREAM(FEET) =    835.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0136
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.129
 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"               A        1.23      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        7.82      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               D        0.03      0.20     1.000    83
 COMMERCIAL                 A        0.31      0.40     0.100    32
 COMMERCIAL                 B        0.76      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.905
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      34.47
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.92
 AVERAGE FLOW DEPTH(FEET) =   0.69   TRAVEL TIME(MIN.) =   2.13
 Tc(MIN.) =   21.20
 SUBAREA AREA(ACRES) =    10.15       SUBAREA RUNOFF(CFS) =   16.86
 EFFECTIVE AREA(ACRES) =     24.95     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       25.0         PEAK FLOW RATE(CFS) =      41.15

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.76   FLOW VELOCITY(FEET/SEC.) =   4.15
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1790.00 FEET.

+----------------------------------------------------------------------------+
| START AREA B                                                               |
| NEW SUBAREA RUN                                                            |
| AUGUST 2017                                                                |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.960
  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"                B        0.80      0.30     1.000    66   11.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.92
  TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      1.92

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.796
  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"                B        1.05      0.30     1.000    66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.55
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.25
  Tc(MIN.) =   13.10
  SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    2.36
  EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       4.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   2.85
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    846.00  DOWNSTREAM(FEET) =    838.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0356
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.677
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
```



```
  "8-10 DWELLINGS/ACRE"       B        1.39      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.56
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =   14.16
  SUBAREA AREA(ACRES) =     1.39       SUBAREA RUNOFF(CFS) =    3.20
  EFFECTIVE AREA(ACRES) =      3.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.74
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       7.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   3.89
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    838.00  DOWNSTREAM(FEET) =    830.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   279.00   CHANNEL SLOPE =  0.0287
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.557
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       B        1.92      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.92
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   1.19
  Tc(MIN.) =   15.34
  SUBAREA AREA(ACRES) =     1.92       SUBAREA RUNOFF(CFS) =    4.21
  EFFECTIVE AREA(ACRES) =      5.16     AREA-AVERAGED Fm(INCH/HR) =   0.18
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.62
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      11.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.42   FLOW VELOCITY(FEET/SEC.) =   4.14
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =    1024.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.2  TC(MIN.) =     15.34
  EFFECTIVE AREA(ACRES) =      5.16  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.615
  PEAK FLOW RATE(CFS)   =      11.02
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE HYDROLOGY                                                   *
* 100-YEAR STORM EVENT - EXISTING CONDITIONS                            *
* AUGUST 2017                                                           *
 ************************************************************************

  FILE NAME: EOAK100.DAT
  TIME/DATE OF STUDY: 18:35 08/14/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  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) III 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 =  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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.515
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.78      0.30     1.000    84   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.44      0.25     1.000    92   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.55
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.55

******************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   220.00   CHANNEL SLOPE =  0.0086
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.257
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        1.26      0.30     1.000    84
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.92      0.25     1.000    92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.92
  AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   1.91
  Tc(MIN.) =   15.32
  SUBAREA AREA(ACRES) =     2.18       SUBAREA RUNOFF(CFS) =    5.84
  EFFECTIVE AREA(ACRES) =      3.40     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        3.4          PEAK FLOW RATE(CFS) =       9.11

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =   2.15
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     550.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.60  DOWNSTREAM(FEET) =    848.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   447.00   CHANNEL SLOPE =  0.0248
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.029
```

```
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 A        1.79      0.40     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"                 B        0.94      0.30     1.000    84
 NATURAL FAIR COVER
 "OPEN BRUSH"                 C        1.25      0.25     1.000    92
 COMMERCIAL                   A        0.13      0.40     0.100    52
 COMMERCIAL                   B        0.12      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.947
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.29
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.60
 AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   2.07
 Tc(MIN.) =   17.39
 SUBAREA AREA(ACRES) =     4.23       SUBAREA RUNOFF(CFS) =   10.34
 EFFECTIVE AREA(ACRES) =      7.63     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.31  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =        7.6         PEAK FLOW RATE(CFS) =      18.76

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =   3.94
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     997.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    848.50  DOWNSTREAM(FEET) =    841.80
 CHANNEL LENGTH THRU SUBAREA(FEET) =   293.00   CHANNEL SLOPE =  0.0229
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.921
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 A        2.55      0.40     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"                 B        3.69      0.30     1.000    84
 NATURAL FAIR COVER
 "OPEN BRUSH"                 C        0.48      0.25     1.000    92
 COMMERCIAL                   A        0.22      0.40     0.100    52
 COMMERCIAL                   B        0.23      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.17
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.31
 AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   1.13
 Tc(MIN.) =   18.52
 SUBAREA AREA(ACRES) =     7.17       SUBAREA RUNOFF(CFS) =   16.82
 EFFECTIVE AREA(ACRES) =     14.80     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.96
 TOTAL AREA(ACRES) =       14.8         PEAK FLOW RATE(CFS) =      34.83
```



```
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.60   FLOW VELOCITY(FEET/SEC.) =   4.70
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    841.80  DOWNSTREAM(FEET) =    835.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   500.00   CHANNEL SLOPE =  0.0136
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.759
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 A        1.23      0.40     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"                 B        7.82      0.30     1.000    84
 NATURAL FAIR COVER
 "OPEN BRUSH"                 D        0.03      0.20     1.000    96
 COMMERCIAL                   A        0.31      0.40     0.100    52
 COMMERCIAL                   B        0.76      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.905
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.15
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.29
 AVERAGE FLOW DEPTH(FEET) =   0.81   TRAVEL TIME(MIN.) =   1.94
 Tc(MIN.) =   20.47
 SUBAREA AREA(ACRES) =    10.15       SUBAREA RUNOFF(CFS) =   22.61
 EFFECTIVE AREA(ACRES) =     24.95     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       25.0         PEAK FLOW RATE(CFS) =      55.29

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.90   FLOW VELOCITY(FEET/SEC.) =   4.55
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1790.00 FEET.

+----------------------------------------------------------------------------+
| START AREA B                                                               |
| NEW SUBAREA RUN                                                            |
| AUGUST 2017                                                                |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.774
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                 B        0.80      0.30     1.000    84   11.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.50
  TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      2.50

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.580
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                 B        1.05      0.30     1.000    84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.80
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   1.14
  Tc(MIN.) =   12.99
  SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    3.10
  EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       5.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   3.09
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     33.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    846.00  DOWNSTREAM(FEET) =    838.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0356
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.436
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
```



```
  "8-10 DWELLINGS/ACRE"        B        1.39      0.30     0.400    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.90
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   0.96
  Tc(MIN.) =   13.95
  SUBAREA AREA(ACRES) =     1.39       SUBAREA RUNOFF(CFS) =    4.15
  EFFECTIVE AREA(ACRES) =      3.24     AREA-AVERAGED Fm(INCH/HR) =   0.22
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.74
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       9.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   4.23
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     33.00 =     745.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     34.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    838.00  DOWNSTREAM(FEET) =    830.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   279.00   CHANNEL SLOPE =  0.0287
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.292
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"        B        1.92      0.30     0.400    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.27
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   1.09
  Tc(MIN.) =   15.04
  SUBAREA AREA(ACRES) =     1.92       SUBAREA RUNOFF(CFS) =    5.48
  EFFECTIVE AREA(ACRES) =      5.16     AREA-AVERAGED Fm(INCH/HR) =   0.18
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.62
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      14.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   4.52
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     34.00 =    1024.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.2  TC(MIN.) =     15.04
  EFFECTIVE AREA(ACRES) =      5.16  AREA-AVERAGED Fm(INCH/HR)=  0.18
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.615
  PEAK FLOW RATE(CFS)   =      14.43
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

UNMITIGATED FLOW RATES

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE HYDROLOGY                                                    *
* 10-YEAR STORM EVENT - PROPOSED CONDITIONS                              *
* JULY 2017                                                              *
 ************************************************************************

  FILE NAME: OAK10.DAT
  TIME/DATE OF STUDY: 20:27 07/26/2017
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  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 =  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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.306
  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"               B        0.78      0.30     1.000    66   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.44      0.25     1.000    77   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.22
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.22

******************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   369.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.996
  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"               A        0.03      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        2.06      0.30     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.41      0.25     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.60
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   3.84
  Tc(MIN.) =   17.26
  SUBAREA AREA(ACRES) =     3.50       SUBAREA RUNOFF(CFS) =    5.40
  EFFECTIVE AREA(ACRES) =      4.72     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =       7.29

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   1.85
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     699.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.00  DOWNSTREAM(FEET) =    844.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   520.00   CHANNEL SLOPE =  0.0288
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
```

```
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.847
 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"               A        3.16      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        1.28      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.12      0.25     1.000    77
 COMMERCIAL                 A        0.23      0.40     0.100    32
 COMMERCIAL                 B        0.14      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.35
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.47
 AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   2.50
 Tc(MIN.) =   19.76
 SUBAREA AREA(ACRES) =     5.93       SUBAREA RUNOFF(CFS) =    8.11
 EFFECTIVE AREA(ACRES) =     10.65     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =      14.77

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.34   FLOW VELOCITY(FEET/SEC.) =   3.82
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1219.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    844.00  DOWNSTREAM(FEET) =    838.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0267
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.799
 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"               A        0.51      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        3.42      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        0.13      0.25     1.000    77
 COMMERCIAL                 A        0.37      0.40     0.100    32
 COMMERCIAL                 B        0.36      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.863
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.06
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.96
 AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   0.95
 Tc(MIN.) =   20.70
 SUBAREA AREA(ACRES) =     4.79       SUBAREA RUNOFF(CFS) =    6.59
 EFFECTIVE AREA(ACRES) =     15.44     AREA-AVERAGED Fm(INCH/HR) =   0.30
```



```
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       15.4         PEAK FLOW RATE(CFS) =      20.89

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.43   FLOW VELOCITY(FEET/SEC.) =   4.14
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1444.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   838.00  DOWNSTREAM(FEET) =   836.00
 FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.25
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      20.89
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   20.96
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =   20.96
 RAINFALL INTENSITY(INCH/HR) =   1.79
 AREA-AVERAGED Fm(INCH/HR) =  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.32
 AREA-AVERAGED Ap =  0.94
 EFFECTIVE STREAM AREA(ACRES) =      15.44
 TOTAL STREAM AREA(ACRES) =      15.44
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.89

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
 ELEVATION DATA: UPSTREAM(FEET) =    861.20  DOWNSTREAM(FEET) =    854.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.363
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.536
 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"               A        0.07      0.40     1.000    46   14.78
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.82      0.30     1.000    66   14.78
 NATURAL FAIR COVER
```

```
  "OPEN BRUSH"                D        0.03      0.20     1.000    83   14.78
  COMMERCIAL                  B        0.09      0.30     0.100    56    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.920
  SUBAREA RUNOFF(CFS) =      2.96
  TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      2.96

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    854.00  DOWNSTREAM(FEET) =    848.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0226
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 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"                A        0.60      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.51      0.30     1.000    66
  COMMERCIAL                  B        0.14      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.899
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   1.91
  Tc(MIN.) =    8.27
  SUBAREA AREA(ACRES) =     1.25       SUBAREA RUNOFF(CFS) =    3.07
  EFFECTIVE AREA(ACRES) =      2.26     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.91
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       5.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.46
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     573.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    841.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   323.00   CHANNEL SLOPE =  0.0217
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.719
  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"                A        1.01      0.40     1.000    46
  NATURAL FAIR COVER
```



```
  "OPEN BRUSH"                B        2.14      0.30     1.000    66
  COMMERCIAL                  A        0.11      0.40     0.100    32
  COMMERCIAL                  B        0.64      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.827
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.88
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.00
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.80
  Tc(MIN.) =   10.06
  SUBAREA AREA(ACRES) =     3.90       SUBAREA RUNOFF(CFS) =    8.58
  EFFECTIVE AREA(ACRES) =      6.16     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.86
  TOTAL AREA(ACRES) =        6.2         PEAK FLOW RATE(CFS) =      13.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   3.34
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.06
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.719
  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"                A        0.10      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.94      0.30     1.000    66
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       B        0.45      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.819
  SUBAREA AREA(ACRES) =     1.49      SUBAREA RUNOFF(CFS) =    3.31
  EFFECTIVE AREA(ACRES) =      7.65   AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =        7.6       PEAK FLOW RATE(CFS) =      16.81

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =   10.06
  RAINFALL INTENSITY(INCH/HR) =   2.72
  AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =       7.65
  TOTAL STREAM AREA(ACRES) =       7.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.81
```

```
  ** CONFLUENCE DATA **
   STREAM        Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1        20.89   20.96    1.786  0.32( 0.30) 0.94       15.4        1.00
      2        16.81   10.06    2.719  0.33( 0.28) 0.85        7.6       10.00

  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        33.12   10.06    2.719  0.32( 0.29) 0.89       15.1       10.00
      2        31.27   20.96    1.786  0.32( 0.29) 0.91       23.1        1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      33.12    Tc(MIN.) =    10.06
  EFFECTIVE AREA(ACRES) =      15.06   AREA-AVERAGED Fm(INCH/HR) =  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.89
  TOTAL AREA(ACRES) =       23.1
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

+----------------------------------------------------------------------------+
| START AREA B                                                               |
| NEW SUBAREA RUN                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   146.00
  ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    842.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.012
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.653
  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
  "8-10 DWELLINGS/ACRE"      B        1.01      0.30     0.400    56    6.01
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA RUNOFF(CFS) =      3.21
  TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      3.21

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  842.10  DOWNSTREAM ELEVATION(FEET) =  838.46
  STREET LENGTH(FEET) =   259.00   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) =       6.56
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.35
    HALFSTREET FLOOD WIDTH(FEET) =   10.74
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.95
  STREET FLOW TRAVEL TIME(MIN.) =   1.61   Tc(MIN.) =    7.62
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.188
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"      B        2.42      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
  SUBAREA AREA(ACRES) =    2.42      SUBAREA RUNOFF(CFS) =    6.68
  EFFECTIVE AREA(ACRES) =      3.43    AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        3.4        PEAK FLOW RATE(CFS) =       9.47

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  12.62
  FLOW VELOCITY(FEET/SEC.) =  2.93   DEPTH*VELOCITY(FT*FT/SEC.) =   1.14
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     405.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  838.46  DOWNSTREAM ELEVATION(FEET) =  832.28
  STREET LENGTH(FEET) =   342.00   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) =      11.70
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
```

```
  HALFSTREET FLOOD WIDTH(FEET) =   13.16
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.36
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.34
 STREET FLOW TRAVEL TIME(MIN.) =   1.70   Tc(MIN.) =    9.32
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.842
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        1.82      0.30     0.400    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    1.82      SUBAREA RUNOFF(CFS) =    4.46
 EFFECTIVE AREA(ACRES) =      5.25    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      12.86

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  13.63
 FLOW VELOCITY(FEET/SEC.) =  3.47   DEPTH*VELOCITY(FT*FT/SEC.) =   1.41
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     747.00 FEET.

+----------------------------------------------------------------------------+
| START AREA C                                                               |
| NEW SUBAREA RUN                                                            |
| JULY 2017                                                                  |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.476
 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"               B        0.80      0.30     1.000    66   11.85
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.57
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      1.57

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
```



```
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.330
 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"               B        1.05      0.30     1.000    66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.53
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.41
 AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.33
 Tc(MIN.) =   13.18
 SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    1.92
 EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        1.8          PEAK FLOW RATE(CFS) =       3.38

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   2.64
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     13.18
 EFFECTIVE AREA(ACRES) =      1.85  AREA-AVERAGED Fm(INCH/HR)=  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =       3.38
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE HYDROLOGY                                                    *
* 25-YEAR STORM EVENT - PROPOSED CONDITIONS                              *
* JULY 2017                                                              *
 ************************************************************************

  FILE NAME: OAK25.DAT
  TIME/DATE OF STUDY: 20:26 07/26/2017
==========================================================================
  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 =  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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.759
  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"               B        0.78      0.30     1.000    66   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.44      0.25     1.000    77   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.72
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.72

******************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   369.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.419
  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"               A        0.03      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        2.06      0.30     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.41      0.25     1.000    77
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.75
  AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   3.51
  Tc(MIN.) =   16.93
  SUBAREA AREA(ACRES) =     3.50       SUBAREA RUNOFF(CFS) =    6.73
  EFFECTIVE AREA(ACRES) =      4.72     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =       9.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   2.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     699.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.00  DOWNSTREAM(FEET) =    844.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   520.00   CHANNEL SLOPE =  0.0288
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
```

```
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.251
 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"               A        3.16      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        1.28      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.12      0.25     1.000    77
 COMMERCIAL                 A        0.23      0.40     0.100    32
 COMMERCIAL                 B        0.14      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.22
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.77
 AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   2.30
 Tc(MIN.) =   19.23
 SUBAREA AREA(ACRES) =     5.93       SUBAREA RUNOFF(CFS) =   10.26
 EFFECTIVE AREA(ACRES) =     10.65     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =      18.63

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   4.11
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1219.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    844.00  DOWNSTREAM(FEET) =    838.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0267
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.195
 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"               A        0.51      0.40     1.000    46
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        3.42      0.30     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        0.13      0.25     1.000    77
 COMMERCIAL                 A        0.37      0.40     0.100    32
 COMMERCIAL                 B        0.36      0.30     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.863
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      22.78
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.32
 AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   0.87
 Tc(MIN.) =   20.10
 SUBAREA AREA(ACRES) =     4.79       SUBAREA RUNOFF(CFS) =    8.30
 EFFECTIVE AREA(ACRES) =     15.44     AREA-AVERAGED Fm(INCH/HR) =   0.30
```



```
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       15.4         PEAK FLOW RATE(CFS) =      26.40

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.49   FLOW VELOCITY(FEET/SEC.) =   4.49
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1444.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   838.00  DOWNSTREAM(FEET) =   836.00
 FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.85
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      26.40
 PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   20.34
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =   20.34
 RAINFALL INTENSITY(INCH/HR) =   2.18
 AREA-AVERAGED Fm(INCH/HR) =  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.32
 AREA-AVERAGED Ap =  0.94
 EFFECTIVE STREAM AREA(ACRES) =      15.44
 TOTAL STREAM AREA(ACRES) =      15.44
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      26.40

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
 ELEVATION DATA: UPSTREAM(FEET) =    861.20  DOWNSTREAM(FEET) =    854.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.363
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.208
 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"               A        0.07      0.40     1.000    46   14.78
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.82      0.30     1.000    66   14.78
 NATURAL FAIR COVER
```

```
  "OPEN BRUSH"                D        0.03      0.20     1.000    83   14.78
  COMMERCIAL                  B        0.09      0.30     0.100    56    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.920
  SUBAREA RUNOFF(CFS) =      3.57
  TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      3.57

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    854.00  DOWNSTREAM(FEET) =    848.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0226
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.659
  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"                A        0.60      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.51      0.30     1.000    66
  COMMERCIAL                  B        0.14      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.899
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.48
  AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   1.79
  Tc(MIN.) =    8.15
  SUBAREA AREA(ACRES) =     1.25       SUBAREA RUNOFF(CFS) =    3.76
  EFFECTIVE AREA(ACRES) =      2.26     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.91
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       6.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   2.67
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     573.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    841.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   323.00   CHANNEL SLOPE =  0.0217
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.294
  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"                A        1.01      0.40     1.000    46
  NATURAL FAIR COVER
```



```
  "OPEN BRUSH"                B        2.14      0.30     1.000    66
  COMMERCIAL                  A        0.11      0.40     0.100    32
  COMMERCIAL                  B        0.64      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.827
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.24
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.66
  Tc(MIN.) =    9.81
  SUBAREA AREA(ACRES) =     3.90       SUBAREA RUNOFF(CFS) =   10.60
  EFFECTIVE AREA(ACRES) =      6.16     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.86
  TOTAL AREA(ACRES) =        6.2         PEAK FLOW RATE(CFS) =      16.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOW VELOCITY(FEET/SEC.) =   3.60
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.81
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.294
  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"                A        0.10      0.40     1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.94      0.30     1.000    66
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       B        0.45      0.30     0.400    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.819
  SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    4.08
  EFFECTIVE AREA(ACRES) =      7.65   AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =        7.6       PEAK FLOW RATE(CFS) =      20.77

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =    9.81
  RAINFALL INTENSITY(INCH/HR) =   3.29
  AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =       7.65
  TOTAL STREAM AREA(ACRES) =       7.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      20.77
```

```
 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       26.40   20.34    2.180  0.32( 0.30) 0.94      15.4       1.00
     2       20.77    9.81    3.294  0.33( 0.28) 0.85       7.6      10.00

 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       41.03    9.81    3.294  0.32( 0.29) 0.89      15.1      10.00
     2       39.50   20.34    2.180  0.32( 0.29) 0.91      23.1       1.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      41.03    Tc(MIN.) =     9.81
 EFFECTIVE AREA(ACRES) =      15.10   AREA-AVERAGED Fm(INCH/HR) =  0.29
 AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.89
 TOTAL AREA(ACRES) =       23.1
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

+----------------------------------------------------------------------------+
| START AREA B                                                               |
| NEW SUBAREA RUN                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   146.00
 ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    842.10

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.012
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.346
 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
 "8-10 DWELLINGS/ACRE"      B        1.01      0.30     0.400    56    6.01
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA RUNOFF(CFS) =      3.84
 TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      3.84

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  842.10  DOWNSTREAM ELEVATION(FEET) =  838.46
 STREET LENGTH(FEET) =   259.00   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) =       7.88
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.37
   HALFSTREET FLOOD WIDTH(FEET) =   11.68
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.79
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.04
 STREET FLOW TRAVEL TIME(MIN.) =   1.55   Tc(MIN.) =    7.56
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.818
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        2.42      0.30     0.400    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    2.42      SUBAREA RUNOFF(CFS) =    8.05
 EFFECTIVE AREA(ACRES) =      3.43    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =        3.4        PEAK FLOW RATE(CFS) =      11.41

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  13.71
 FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   1.24
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     405.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  838.46  DOWNSTREAM ELEVATION(FEET) =  832.28
 STREET LENGTH(FEET) =   342.00   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) =      14.12
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.42
```

```
  HALFSTREET FLOOD WIDTH(FEET) =   14.26
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.51
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.47
 STREET FLOW TRAVEL TIME(MIN.) =   1.62   Tc(MIN.) =    9.18
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.420
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        1.82      0.30     0.400    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    1.82      SUBAREA RUNOFF(CFS) =    5.41
 EFFECTIVE AREA(ACRES) =      5.25    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      15.59

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  14.80
 FLOW VELOCITY(FEET/SEC.) =  3.62   DEPTH*VELOCITY(FT*FT/SEC.) =   1.55
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     747.00 FEET.

+----------------------------------------------------------------------------+
| START AREA C                                                               |
| NEW SUBAREA RUN                                                            |
| JULY 2017                                                                  |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.960
 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"               B        0.80      0.30     1.000    66   11.85
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.92
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      1.92

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
```



```
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.796
 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"               B        1.05      0.30     1.000    66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.10
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.55
 AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.25
 Tc(MIN.) =   13.10
 SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    2.36
 EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        1.8          PEAK FLOW RATE(CFS) =       4.16

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   2.85
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     13.10
 EFFECTIVE AREA(ACRES) =      1.85  AREA-AVERAGED Fm(INCH/HR)=  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =       4.16
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE HYDROLOGY                                                   *
* 100-YEAR STORM EVENT - PROPOSED CONDITIONS                            *
* JULY 2017                                                             *
 ************************************************************************

  FILE NAME: OAK100.DAT
  TIME/DATE OF STUDY: 20:21 07/26/2017
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  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) III 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 =  1.00 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      1.00 TO NODE      2.00 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) =    876.00  DOWNSTREAM(FEET) =    861.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```



```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.417
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.515
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        0.78      0.30     1.000    84   13.42
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        0.44      0.25     1.000    92   13.42
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.55
  TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      3.55

******************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    861.50  DOWNSTREAM(FEET) =    859.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   369.00   CHANNEL SLOPE =  0.0068
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.110
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               A        0.03      0.40     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        2.06      0.30     1.000    84
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        1.41      0.25     1.000    92
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.93
  AVERAGE FLOW DEPTH(FEET) =   0.36   TRAVEL TIME(MIN.) =   3.19
  Tc(MIN.) =   16.61
  SUBAREA AREA(ACRES) =     3.50       SUBAREA RUNOFF(CFS) =    8.91
  EFFECTIVE AREA(ACRES) =      4.72     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =      12.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.46   FLOW VELOCITY(FEET/SEC.) =   2.20
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     699.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    859.00  DOWNSTREAM(FEET) =    844.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   520.00   CHANNEL SLOPE =  0.0288
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
```

```
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.906
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               A        3.16      0.40     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        1.28      0.30     1.000    84
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.12      0.25     1.000    92
 COMMERCIAL                 A        0.23      0.40     0.100    52
 COMMERCIAL                 B        0.14      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.944
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.90
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.15
 AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   2.09
 Tc(MIN.) =   18.70
 SUBAREA AREA(ACRES) =     5.93       SUBAREA RUNOFF(CFS) =   13.76
 EFFECTIVE AREA(ACRES) =     10.65     AREA-AVERAGED Fm(INCH/HR) =   0.31
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.97
 TOTAL AREA(ACRES) =       10.6         PEAK FLOW RATE(CFS) =      24.91

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.46   FLOW VELOCITY(FEET/SEC.) =   4.54
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1219.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    844.00  DOWNSTREAM(FEET) =    838.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00   CHANNEL SLOPE =  0.0267
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.837
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               A        0.51      0.40     1.000    66
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        3.42      0.30     1.000    84
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        0.13      0.25     1.000    92
 COMMERCIAL                 A        0.37      0.40     0.100    52
 COMMERCIAL                 B        0.36      0.30     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.863
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.44
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.73
 AVERAGE FLOW DEPTH(FEET) =   0.53   TRAVEL TIME(MIN.) =   0.79
 Tc(MIN.) =   19.49
 SUBAREA AREA(ACRES) =     4.79       SUBAREA RUNOFF(CFS) =   11.07
 EFFECTIVE AREA(ACRES) =     15.44     AREA-AVERAGED Fm(INCH/HR) =   0.30
```



```
 AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.94
 TOTAL AREA(ACRES) =       15.4         PEAK FLOW RATE(CFS) =      35.32

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =   4.97
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =    1444.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   838.00  DOWNSTREAM(FEET) =   836.00
 FLOW LENGTH(FEET) =   142.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.27
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      35.32
 PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   19.73
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =   19.73
 RAINFALL INTENSITY(INCH/HR) =   2.82
 AREA-AVERAGED Fm(INCH/HR) =  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.32
 AREA-AVERAGED Ap =  0.94
 EFFECTIVE STREAM AREA(ACRES) =      15.44
 TOTAL STREAM AREA(ACRES) =      15.44
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      35.32

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   307.00
 ELEVATION DATA: UPSTREAM(FEET) =    861.20  DOWNSTREAM(FEET) =    854.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.363
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.389
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"               A        0.07      0.40     1.000    66   14.78
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.82      0.30     1.000    84   14.78
 NATURAL FAIR COVER
```

```
  "OPEN BRUSH"                D        0.03      0.20     1.000    96   14.78
  COMMERCIAL                  B        0.09      0.30     0.100    76    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.920
  SUBAREA RUNOFF(CFS) =      4.64
  TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      4.64

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    854.00  DOWNSTREAM(FEET) =    848.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   266.00   CHANNEL SLOPE =  0.0226
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.728
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        0.60      0.40     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.51      0.30     1.000    84
  COMMERCIAL                  B        0.14      0.30     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.899
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.72
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.63
  Tc(MIN.) =    7.99
  SUBAREA AREA(ACRES) =     1.25       SUBAREA RUNOFF(CFS) =    4.96
  EFFECTIVE AREA(ACRES) =      2.26     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.91
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       9.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   2.92
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     573.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    848.00  DOWNSTREAM(FEET) =    841.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   323.00   CHANNEL SLOPE =  0.0217
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.279
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        1.01      0.40     1.000    66
  NATURAL FAIR COVER
```



```
  "OPEN BRUSH"                B        2.14      0.30     1.000    84
  COMMERCIAL                  A        0.11      0.40     0.100    52
  COMMERCIAL                  B        0.64      0.30     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.827
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.54
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   1.52
  Tc(MIN.) =    9.51
  SUBAREA AREA(ACRES) =     3.90       SUBAREA RUNOFF(CFS) =   14.06
  EFFECTIVE AREA(ACRES) =      6.16     AREA-AVERAGED Fm(INCH/HR) =   0.28
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   0.86
  TOTAL AREA(ACRES) =        6.2         PEAK FLOW RATE(CFS) =      22.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.47   FLOW VELOCITY(FEET/SEC.) =   3.97
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     896.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.51
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.279
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        0.10      0.40     1.000    66
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.94      0.30     1.000    84
  RESIDENTIAL
  "8-10 DWELLINGS/ACRE"       B        0.45      0.30     0.400    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.819
  SUBAREA AREA(ACRES) =    1.49      SUBAREA RUNOFF(CFS) =    5.40
  EFFECTIVE AREA(ACRES) =      7.65   AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =        7.6       PEAK FLOW RATE(CFS) =      27.55

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 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.) =    9.51
  RAINFALL INTENSITY(INCH/HR) =   4.28
  AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.33
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =       7.65
  TOTAL STREAM AREA(ACRES) =       7.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      27.55
```

```
** CONFLUENCE DATA **
 STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1       35.32   19.73    2.818  0.32( 0.30) 0.94      15.4       1.00
    2       27.55    9.51    4.279  0.33( 0.28) 0.85       7.6      10.00

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       54.46    9.51    4.279  0.32( 0.29) 0.89      15.1      10.00
    2       52.81   19.73    2.818  0.32( 0.29) 0.91      23.1       1.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      54.46    Tc(MIN.) =     9.51
EFFECTIVE AREA(ACRES) =      15.10   AREA-AVERAGED Fm(INCH/HR) =  0.29
AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.89
TOTAL AREA(ACRES) =       23.1
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    1586.00 FEET.

+----------------------------------------------------------------------------+
| START AREA B                                                               |
| NEW SUBAREA RUN                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   146.00
 ELEVATION DATA: UPSTREAM(FEET) =    845.00  DOWNSTREAM(FEET) =    842.10

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.012
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.567
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        1.01      0.30     0.400    76    6.01
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA RUNOFF(CFS) =      4.95
 TOTAL AREA(ACRES) =      1.01   PEAK FLOW RATE(CFS) =      4.95

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  842.10  DOWNSTREAM ELEVATION(FEET) =  838.46
 STREET LENGTH(FEET) =   259.00   CURB HEIGHT(INCHES) =  8.0
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```
 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) =      10.19
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.40
   HALFSTREET FLOOD WIDTH(FEET) =   13.09
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.96
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.17
 STREET FLOW TRAVEL TIME(MIN.) =   1.46   Tc(MIN.) =    7.47
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.915
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        2.42      0.30     0.400    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    2.42      SUBAREA RUNOFF(CFS) =   10.44
 EFFECTIVE AREA(ACRES) =      3.43    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =        3.4        PEAK FLOW RATE(CFS) =      14.80

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.44   HALFSTREET FLOOD WIDTH(FEET) =  15.27
 FLOW VELOCITY(FEET/SEC.) =  3.25   DEPTH*VELOCITY(FT*FT/SEC.) =   1.41
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =     405.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  838.46  DOWNSTREAM ELEVATION(FEET) =  832.28
 STREET LENGTH(FEET) =   342.00   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) =      18.32
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.45
```

```
  HALFSTREET FLOOD WIDTH(FEET) =   15.90
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.74
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.67
 STREET FLOW TRAVEL TIME(MIN.) =   1.52   Tc(MIN.) =    9.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.419
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      B        1.82      0.30     0.400    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.400
 SUBAREA AREA(ACRES) =    1.82      SUBAREA RUNOFF(CFS) =    7.04
 EFFECTIVE AREA(ACRES) =      5.25    AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =        5.2        PEAK FLOW RATE(CFS) =      20.31

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.46   HALFSTREET FLOOD WIDTH(FEET) =  16.60
 FLOW VELOCITY(FEET/SEC.) =  3.83   DEPTH*VELOCITY(FT*FT/SEC.) =   1.76
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =     747.00 FEET.

+----------------------------------------------------------------------------+
| START AREA C                                                               |
| NEW SUBAREA RUN                                                            |
| JULY 2017                                                                  |
+----------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
 ELEVATION DATA: UPSTREAM(FEET) =    876.50  DOWNSTREAM(FEET) =    850.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.849
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.774
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.80      0.30     1.000    84   11.85
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      2.50
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      2.50

****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    850.00  DOWNSTREAM(FEET) =    847.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.0156
```



```
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.580
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        1.05      0.30     1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.05
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.80
 AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   1.14
 Tc(MIN.) =   12.99
 SUBAREA AREA(ACRES) =     1.05       SUBAREA RUNOFF(CFS) =    3.10
 EFFECTIVE AREA(ACRES) =      1.85     AREA-AVERAGED Fm(INCH/HR) =   0.30
 AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        1.8          PEAK FLOW RATE(CFS) =       5.46

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   3.09
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     520.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =     12.99
 EFFECTIVE AREA(ACRES) =      1.85  AREA-AVERAGED Fm(INCH/HR)=  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =       5.46
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

MITIGATED FLOW RATES

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

              F L O O D    R O U T I N G    A N A L Y S I S
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                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREAS A 10-YEAR HC PROPOSED CONDITION                                 *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKA10.DAT
  TIME/DATE OF STUDY: 20:50 08/15/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      5.00 IS CODE = 1.2
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==============================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =   15.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.295
    LOW LOSS FRACTION = 0.726
    TIME OF CONCENTRATION(MIN.) = 20.70
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.34
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.72
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.95
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.59
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.20
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.68

------------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.62
```



```
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     3.12

------------------------------------------------------------------------------
```

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 5.2 10.4 15.5 20.7
15.800	0.6066	2.70	. Q . V . . .
15.817	0.6104	2.80	. Q . V . . .
15.833	0.6145	2.91	. Q . V . . .
15.850	0.6186	3.02	. Q . V . . .
15.867	0.6229	3.13	. Q . V . . .
15.883	0.6274	3.24	. Q . V . . .
15.900	0.6320	3.35	. Q . V . . .
15.917	0.6368	3.46	. Q . V . . .
15.933	0.6417	3.57	. Q . V . . .
15.950	0.6468	3.68	. Q . V . . .
15.967	0.6520	3.79	. Q . V . . .
15.983	0.6574	3.90	. Q . V . . .
16.000	0.6629	4.01	. Q . V . . .
16.017	0.6690	4.46	. Q . V . . .
16.033	0.6763	5.27	. Q V . . .
16.050	0.6846	6.07	. .Q V . . .
16.067	0.6941	6.88	. . Q V . . .
16.083	0.7047	7.68	. . Q V . . .
16.100	0.7164	8.49	. . QV . . .
16.117	0.7292	9.29	. . QV . . .
16.133	0.7431	10.10	. . VQ. . .
16.150	0.7581	10.90	. . V .Q . .
16.167	0.7743	11.71	. . V. Q . .
16.183	0.7915	12.52	. . V. Q . .
16.200	0.8098	13.32	. . V Q . .
16.217	0.8293	14.13	. . V Q . .
16.233	0.8499	14.93	. . .V Q . .
16.250	0.8715	15.74	. . .V Q . .
16.267	0.8943	16.54	. . . V .Q . .
16.283	0.9182	17.35	. . . V . Q .
16.300	0.9432	18.15	. . . V . Q .
16.317	0.9693	18.96	. . . V . Q .
16.333	0.9965	19.76	. . . V . Q .
16.350	1.0251	20.73	. . . V . Q
16.367	1.0526	19.99	. . . V . Q .
16.383	1.0789	19.06	. . . V . Q .
16.400	1.1039	18.13	. . . V . Q .
16.417	1.1276	17.20	. . . V . Q .
16.433	1.1500	16.28	. . . V .Q .
16.450	1.1711	15.35	. . . Q. .
16.467	1.1910	14.42	. . . Q V. .
16.483	1.2096	13.50	. . . Q V. .
16.500	1.2269	12.57	. . . Q V .
16.517	1.2429	11.64	. . . Q V .
16.533	1.2577	10.72	. . Q .V .

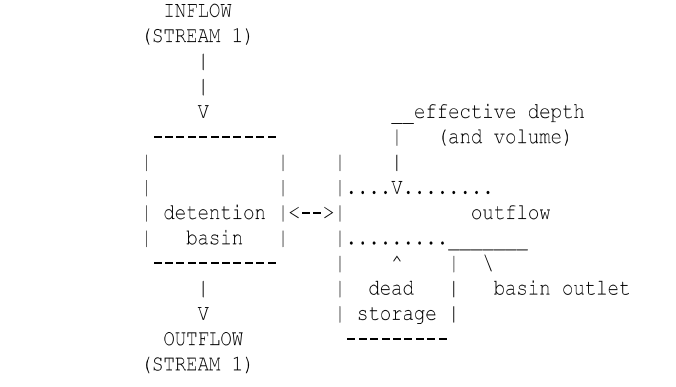
16.550	1.2712	9.79	. . Q . .V .
16.567	1.2834	8.86	. . Q . .V .
16.583	1.2943	7.93	. . Q . . V .
16.600	1.3040	7.01	. . Q . . V .
16.617	1.3123	6.08	. .Q . . V .
16.633	1.3194	5.15	. Q. . . V .
16.650	1.3253	4.23	. Q . . . V .
16.667	1.3298	3.30	. Q . . . V .
16.683	1.3331	2.37	. Q . . . V .
16.700	1.3353	1.61	. Q . . . V .
16.717	1.3374	1.52	. Q . . . V .
16.733	1.3394	1.49	. Q . . . V .
16.750	1.3415	1.47	. Q . . . V .
16.767	1.3435	1.45	. Q . . . V .
16.783	1.3454	1.43	. Q . . . V .
16.800	1.3474	1.41	. Q . . . V .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	295.0
20%	195.0
30%	165.0
40%	145.0
50%	120.0
60%	100.0
70%	70.0
80%	45.0
90%	25.0

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	11.03	0.180
3	2.00	15.60	0.410
4	3.00	19.10	0.690

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	2.80	0.00	0.18	2.0	0.033
15.833	0.000	2.91	0.00	0.19	2.1	0.034
15.850	0.000	3.02	0.00	0.20	2.1	0.036
15.867	0.000	3.13	0.00	0.20	2.2	0.037
15.883	0.000	3.24	0.00	0.21	2.3	0.038
15.900	0.000	3.35	0.00	0.22	2.4	0.039
15.917	0.000	3.46	0.00	0.23	2.5	0.041
15.933	0.000	3.57	0.00	0.23	2.5	0.042
15.950	0.000	3.68	0.00	0.24	2.6	0.044
15.967	0.000	3.79	0.00	0.25	2.7	0.045
15.983	0.000	3.90	0.00	0.26	2.8	0.047
16.000	0.000	4.01	0.00	0.27	2.9	0.048
16.017	0.000	4.46	0.00	0.28	3.0	0.050
16.033	0.000	5.27	0.00	0.29	3.2	0.053
16.050	0.000	6.07	0.00	0.32	3.4	0.057
16.067	0.000	6.88	0.00	0.34	3.6	0.061
16.083	0.000	7.68	0.00	0.37	3.9	0.066
16.100	0.000	8.49	0.00	0.40	4.3	0.072
16.117	0.000	9.29	0.00	0.44	4.6	0.079
16.133	0.000	10.10	0.00	0.48	5.0	0.086
16.150	0.000	10.90	0.00	0.52	5.5	0.093
16.167	0.000	11.71	0.00	0.56	6.0	0.101
16.183	0.000	12.52	0.00	0.61	6.5	0.109
16.200	0.000	13.32	0.00	0.66	7.0	0.118
16.217	0.000	14.13	0.00	0.71	7.5	0.127
16.233	0.000	14.93	0.00	0.76	8.1	0.137
16.250	0.000	15.74	0.00	0.81	8.7	0.146
16.267	0.000	16.54	0.00	0.87	9.3	0.156

16.283	0.000	17.35	0.00	0.93	9.9	0.167
16.300	0.000	18.15	0.00	0.98	10.5	0.177
16.317	0.000	18.96	0.00	1.04	11.0	0.188
16.333	0.000	19.76	0.00	1.09	11.3	0.200
16.350	0.000	20.73	0.00	1.14	11.5	0.212
16.367	0.000	19.99	0.00	1.19	11.8	0.224
16.383	0.000	19.06	0.00	1.23	12.0	0.233
16.400	0.000	18.13	0.00	1.27	12.2	0.242
16.417	0.000	17.20	0.00	1.30	12.3	0.248
16.433	0.000	16.28	0.00	1.32	12.4	0.254
16.450	0.000	15.35	0.00	1.34	12.5	0.258
16.467	0.000	14.42	0.00	1.35	12.6	0.260
16.483	0.000	13.50	0.00	1.35	12.6	0.261
16.500	0.000	12.57	0.00	1.35	12.6	0.261
16.517	0.000	11.64	0.00	1.35	12.6	0.260
16.533	0.000	10.72	0.00	1.34	12.6	0.257
16.550	0.000	9.79	0.00	1.32	12.5	0.253
16.567	0.000	8.86	0.00	1.30	12.4	0.249
16.583	0.000	7.93	0.00	1.27	12.3	0.242
16.600	0.000	7.01	0.00	1.24	12.2	0.235
16.617	0.000	6.08	0.00	1.20	12.0	0.227
16.633	0.000	5.15	0.00	1.16	11.9	0.218
16.650	0.000	4.23	0.00	1.12	11.7	0.208
16.667	0.000	3.30	0.00	1.07	11.5	0.196
16.683	0.000	2.37	0.00	1.02	11.2	0.184
16.700	0.000	1.61	0.00	0.95	10.8	0.171
16.717	0.000	1.52	0.00	0.89	10.1	0.160
16.733	0.000	1.49	0.00	0.83	9.4	0.149
16.750	0.000	1.47	0.00	0.77	8.8	0.139
16.767	0.000	1.45	0.00	0.72	8.2	0.129
16.783	0.000	1.43	0.00	0.67	7.7	0.121
16.800	0.000	1.41	0.00	0.63	7.2	0.113

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 1.615 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 1.615 AF
LOSS VOLUME = 0.000 AF

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 4

>>>>>MODEL PIPEFLOW ROUTING OF STREAM #1<<<<<

MODEL PIPEFLOW ROUTING OF STREAM 1 WHERE
STORAGE EFFECTS ARE NEGLECTED WITHIN THE PIPE, FLOW
VELOCITIES ARE ESTIMATED BY ASSUMING STEADY FLOW FOR
EACH UNIT INTERVAL(NORMAL DEPTH, Dn), AND FLOWS IN EXCESS
OF (.82)(DIAMETER) ARE PONDED AT THE UPSTREAM INLET:
UNIT INTERVAL FLOW VELOCITY COMPUTED USING Dn UP TO
(0.938)(DIAMETER):

PIPELENGTH(FT) = 142.00 MANNINGS FACTOR = 0.013
UPSTREAM ELEVATION(FT) = 838.00

DOWNSTREAM ELEVATION(FT) = 836.00
PIPE DIAMETER(FT) = 2.00

NORMAL DEPTH VELOCITY PIPE ROUTING RESULTS:

TIME (HRS)	INFLOW (CFS)	VELOCITY (FPS)	OUTFLOW (CFS)	UPSTREAM PONDING(AF)
15.800	1.93	4.86	1.91	0.000
15.817	2.00	4.91	1.98	0.000
15.833	2.07	4.95	2.05	0.000
15.850	2.14	5.00	2.12	0.000
15.867	2.22	5.06	2.19	0.000
15.883	2.30	5.11	2.27	0.000
15.900	2.38	5.17	2.35	0.000
15.917	2.46	5.23	2.44	0.000
15.933	2.55	5.29	2.52	0.000
15.950	2.63	5.35	2.61	0.000
15.967	2.72	5.40	2.70	0.000
15.983	2.81	5.45	2.79	0.000
16.000	2.91	5.50	2.88	0.000
16.017	3.01	5.56	2.98	0.000
16.033	3.16	5.64	3.12	0.000
16.050	3.37	5.75	3.31	0.000
16.067	3.62	5.89	3.55	0.000
16.083	3.92	6.05	3.84	0.000
16.100	4.25	6.20	4.16	0.000
16.117	4.63	6.36	4.53	0.000
16.133	5.04	6.53	4.94	0.000
16.150	5.48	6.70	5.37	0.000
16.167	5.95	6.86	5.83	0.000
16.183	6.45	7.02	6.33	0.000
16.200	6.98	7.19	6.85	0.000
16.217	7.52	7.36	7.40	0.000
16.233	8.09	7.53	7.97	0.000
16.250	8.68	7.65	8.53	0.000
16.267	9.28	7.77	9.14	0.000
16.283	9.90	7.90	9.76	0.000
16.300	10.54	8.03	10.40	0.000
16.317	11.02	8.12	10.92	0.000
16.333	11.31	8.17	11.24	0.000
16.350	11.55	8.20	11.49	0.000
16.367	11.79	8.24	11.73	0.000
16.383	11.99	8.28	11.95	0.000
16.400	12.17	8.31	12.14	0.000
16.417	12.32	8.34	12.29	0.000
16.433	12.44	8.36	12.42	0.000
16.450	12.53	8.38	12.51	0.000
16.467	12.60	8.39	12.58	0.000
16.483	12.63	8.39	12.62	0.000
16.500	12.64	8.40	12.64	0.000
16.517	12.63	8.39	12.63	0.000
16.533	12.59	8.39	12.60	0.000
16.550	12.53	8.37	12.54	0.000
16.567	12.44	8.36	12.46	0.000
16.583	12.33	8.34	12.35	0.000
16.600	12.20	8.31	12.23	0.000

16.617	12.05	8.28	12.08	0.000
16.633	11.87	8.26	11.91	0.000
16.650	11.68	8.23	11.72	0.000
16.667	11.47	8.19	11.51	0.000
16.683	11.23	8.15	11.29	0.000
16.700	10.81	8.09	10.91	0.000
16.717	10.14	7.95	10.29	0.000
16.733	9.44	7.80	9.60	0.000
16.750	8.80	7.67	8.95	0.000
16.767	8.20	7.55	8.35	0.000
16.783	7.66	7.40	7.78	0.000
16.800	7.15	7.24	7.26	0.000

****
FLOW PROCESS FROM NODE 11.00 TO NODE 13.00 IS CODE = 1.2

>>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==========

(SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #2)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 7.65
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.278
LOW LOSS FRACTION = 0.703
TIME OF CONCENTRATION(MIN.) = 10.06
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
RETURN FREQUENCY(YEARS) = 10
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.34
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.72
1-HOUR POINT RAINFALL VALUE(INCHES) = 0.95
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.59
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.20
24-HOUR POINT RAINFALL VALUE(INCHES) = 3.68

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.85
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.50

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 4.2 8.4 12.6 16.8
15.800	0.3437	2.34	. Q . V . . .
15.817	0.3471	2.49	. Q . V . . .
15.833	0.3508	2.64	. Q . V . . .
15.850	0.3547	2.80	. Q . V . . .
15.867	0.3587	2.97	. Q . V . . .
15.883	0.3631	3.14	. Q . V . . .
15.900	0.3676	3.30	. Q . V . . .
15.917	0.3724	3.47	. Q . V . . .
15.933	0.3774	3.64	. Q . V . . .
15.950	0.3827	3.80	. Q. V . . .
15.967	0.3881	3.97	. Q. V . . .
15.983	0.3938	4.14	. Q. V . . .
16.000	0.3997	4.30	. Q V . . .
16.017	0.4066	5.00	. .Q V. . .
16.033	0.4152	6.24	. . Q V. . .
16.050	0.4255	7.47	. . Q V . .
16.067	0.4375	8.70	. . Q . .
16.083	0.4512	9.94	. . .V Q . .
16.100	0.4666	11.17	. . . V Q . .
16.117	0.4837	12.40	. . . V Q. .
16.133	0.5025	13.64	. . . V . Q .
16.150	0.5229	14.87	. . . V . Q .
16.167	0.5451	16.11	. . . V . Q .
16.183	0.5683	16.80	. . . V . Q
16.200	0.5884	14.64	. . . V . Q .
16.217	0.6065	13.13	. . . V .Q .
16.233	0.6225	11.63	. . . Q V. .
16.250	0.6365	10.13	. . . Q V .
16.267	0.6484	8.63	. . Q V .
16.283	0.6582	7.13	. . Q . .V .
16.300	0.6660	5.63	. . Q . .V .
16.317	0.6717	4.13	. Q. . .V .
16.333	0.6753	2.63	. Q . . .V .
16.350	0.6776	1.68	. Q . . . V .
16.367	0.6798	1.61	. Q . . . V .
16.383	0.6819	1.54	. Q . . . V .
16.400	0.6840	1.47	. Q . . . V .
16.417	0.6859	1.40	. Q . . . V .
16.433	0.6877	1.33	. Q . . . V .
16.450	0.6895	1.27	. Q . . . V .
16.467	0.6911	1.20	. Q . . . V .
16.483	0.6927	1.13	. Q . . . V .
16.500	0.6941	1.06	. Q . . . V .
16.517	0.6955	1.01	. Q . . . V .
16.533	0.6969	0.98	. Q . . . V .

16.550	0.6982	0.95	. Q . . . V .
16.567	0.6995	0.92	. Q . . . V .
16.583	0.7007	0.89	. Q . . . V .
16.600	0.7018	0.86	. Q . . . V .
16.617	0.7030	0.83	.Q . . . V .
16.633	0.7041	0.79	.Q . . . V .
16.650	0.7051	0.76	.Q . . . V .
16.667	0.7061	0.73	.Q . . . V .
16.683	0.7071	0.71	.Q . . . V .
16.700	0.7081	0.70	.Q . . . V .
16.717	0.7090	0.69	.Q . . . V .
16.733	0.7100	0.68	.Q . . . V .
16.750	0.7109	0.67	.Q . . . V .
16.767	0.7118	0.66	.Q . . . V .
16.783	0.7127	0.65	.Q . . . V .
16.800	0.7136	0.64	.Q . . . V .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	190.0
20%	125.0
30%	85.0
40%	75.0
50%	65.0
60%	50.0
70%	35.0
80%	25.0
90%	10.0

****
FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 7
>>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 1<<<<<

****
FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11
>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 7.5 15.0 22.5 30.0
15.800	0.9169	4.25	. Q . V . . .
15.817	0.9231	4.47	. Q . V . . .

```
 15.833      0.9295      4.69  .     Q   .    V    .         .         .
 15.850      0.9363      4.92  .     Q   .    V    .         .         .
 15.867      0.9434      5.17  .     Q   .    V    .         .         .
 15.883      0.9509      5.41  .      Q  .    V    .         .         .
 15.900      0.9587      5.66  .      Q  .    V    .         .         .
 15.917      0.9668      5.91  .      Q  .    V    .         .         .
 15.933      0.9753      6.16  .       Q .    V    .         .         .
 15.950      0.9841      6.41  .       Q .    V    .         .         .
 15.967      0.9933      6.67  .       Q .     V   .         .         .
 15.983      1.0028      6.92  .        Q.     V   .         .         .
 16.000      1.0127      7.18  .        Q.     V   .         .         .
 16.017      1.0237      7.98  .         Q     V   .         .         .
 16.033      1.0366      9.36  .         . Q   V   .         .         .
 16.050      1.0515     10.78  .         .   Q  V  .         .         .
 16.067      1.0683     12.25  .         .     QV  .         .         .
 16.083      1.0873     13.78  .         .      VQ .         .         .
 16.100      1.1084     15.33  .         .       V Q         .         .
 16.117      1.1317     16.93  .         .       V . Q       .         .
 16.133      1.1573     18.57  .         .       V .   Q     .         .
 16.150      1.1852     20.24  .         .        V.     Q   .         .
 16.167      1.2154     21.94  .         .        V.        Q.         .
 16.183      1.2473     23.13  .         .         V         Q         .
 16.200      1.2769     21.49  .         .         V       Q .         .
 16.217      1.3052     20.53  .         .          .V     Q  .         .
 16.233      1.3322     19.60  .         .          .V    Q   .         .
 16.250      1.3579     18.67  .         .          . V Q     .         .
 16.267      1.3824     17.77  .         .          . VQ      .         .
 16.283      1.4056     16.89  .         .          . Q       .         .
 16.300      1.4277     16.03  .         .          .Q V      .         .
 16.317      1.4484     15.05  .         .          Q  V      .         .
 16.333      1.4676     13.87  .         .       Q .  V       .         .
 16.350      1.4857     13.18  .         .      Q   .   V     .         .
 16.367      1.5041     13.34  .         .      Q   .   V     .         .
 16.383      1.5227     13.49  .         .      Q   .   V     .         .
 16.400      1.5414     13.61  .         .       Q .    V     .         .
 16.417      1.5603     13.69  .         .       Q .    V     .         .
 16.433      1.5792     13.75  .         .       Q .    V     .         .
 16.450      1.5982     13.78  .         .       Q .    V     .         .
 16.467      1.6172     13.78  .         .       Q .     V    .         .
 16.483      1.6361     13.76  .         .       Q .     V    .         .
 16.500      1.6550     13.70  .         .       Q .     V    .         .
 16.517      1.6738     13.64  .         .       Q .      V   .         .
 16.533      1.6925     13.57  .         .       Q .      V   .         .
 16.550      1.7111     13.49  .         .      Q  .      V   .         .
 16.567      1.7295     13.37  .         .      Q  .       V .         .
 16.583      1.7477     13.24  .         .      Q  .       V .         .
 16.600      1.7657     13.08  .         .      Q  .       V .         .
 16.617      1.7835     12.90  .         .      Q  .       V .         .
 16.633      1.8010     12.71  .         .     Q   .        V.         .
 16.650      1.8182     12.49  .         .     Q   .        V.         .
 16.667      1.8351     12.25  .         .     Q   .        V.         .
 16.683      1.8516     11.99  .         .    Q    .         V         .
 16.700      1.8676     11.60  .         .    Q    .         V         .
 16.717      1.8827     10.97  .         .   Q     .         V         .
 16.733      1.8969     10.28  .         .  Q      .         V         .
 16.750      1.9101      9.62  .         . Q       .         .V        .
 16.767      1.9225      9.01  .         . Q       .         .V        .
 16.783      1.9341      8.43  .         .Q        .         .V        .
```



```
 16.800      1.9450      7.91  .         Q         .         .V        .
-------------------------------------------------------------------------------
  TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
  (Note: 100% of Peak Flow Rate estimate assumed to have
  an instantaneous time duration)

  Percentile of Estimated                Duration
      Peak Flow Rate                     (minutes)
  ======================                 =========
             0%                           1009.0
            10%                            510.0
            20%                            340.0
            30%                            255.0
            40%                            220.0
            50%                            195.0
            60%                             70.0
            70%                             55.0
            80%                             40.0
            90%                             15.0


*******************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE = 3.2
-------------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
===============================================================================

                    INFLOW
                   (STREAM 1)
                       |
                       |
                       V                 __effective depth
                    -----------          |   (and volume)
                   |           |    |    |
                   |           |    |....V.........
                   | detention |<-->|           outflow
                   |   basin   |    |.........._______
                    -----------     |    ^    |  \
                       |            |  dead   |   basin outlet
                       V            | storage |
                     OUTFLOW         ---------
                   (STREAM 1)


        ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
        THROUGH A FLOW-THROUGH DETENTION BASIN
        SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
          DEAD STORAGE(AF) =      0.000
          SPECIFIED DEAD STORAGE(AF) FILLED =      0.000
          SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET =      0.000
          DETENTION BASIN CONSTANT LOSS RATE(CFS) =    0.00


        BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

         INTERVAL    DEPTH      OUTFLOW     STORAGE
          NUMBER      (FT)       (CFS)       (AF)
```

1	0.00	0.00	0.000
2	1.00	15.88	0.260
3	2.00	22.46	0.590
4	3.00	27.51	0.970

==========

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	4.47	0.00	0.19	3.0	0.051
15.833	0.000	4.69	0.00	0.20	3.2	0.053
15.850	0.000	4.92	0.00	0.21	3.3	0.055
15.867	0.000	5.17	0.00	0.22	3.4	0.057
15.883	0.000	5.41	0.00	0.23	3.6	0.060
15.900	0.000	5.66	0.00	0.24	3.7	0.063
15.917	0.000	5.91	0.00	0.25	3.9	0.065
15.933	0.000	6.16	0.00	0.26	4.1	0.068
15.950	0.000	6.41	0.00	0.27	4.3	0.071
15.967	0.000	6.67	0.00	0.29	4.4	0.074
15.983	0.000	6.92	0.00	0.30	4.6	0.077
16.000	0.000	7.18	0.00	0.31	4.8	0.081
16.017	0.000	7.98	0.00	0.33	5.0	0.085
16.033	0.000	9.36	0.00	0.35	5.3	0.090
16.050	0.000	10.78	0.00	0.37	5.7	0.097
16.067	0.000	12.25	0.00	0.41	6.2	0.106
16.083	0.000	13.78	0.00	0.44	6.7	0.115
16.100	0.000	15.33	0.00	0.49	7.4	0.126
16.117	0.000	16.93	0.00	0.53	8.1	0.138
16.133	0.000	18.57	0.00	0.58	8.9	0.152
16.150	0.000	20.24	0.00	0.64	9.7	0.166
16.167	0.000	21.94	0.00	0.70	10.6	0.182
16.183	0.000	23.13	0.00	0.76	11.6	0.198
16.200	0.000	21.49	0.00	0.81	12.5	0.210
16.217	0.000	20.53	0.00	0.85	13.1	0.220
16.233	0.000	19.60	0.00	0.88	13.7	0.228
16.250	0.000	18.67	0.00	0.90	14.1	0.235
16.267	0.000	17.77	0.00	0.92	14.5	0.239
16.283	0.000	16.89	0.00	0.93	14.7	0.242
16.300	0.000	16.03	0.00	0.94	14.8	0.244
16.317	0.000	15.05	0.00	0.94	14.9	0.244
16.333	0.000	13.87	0.00	0.93	14.9	0.243
16.350	0.000	13.18	0.00	0.93	14.8	0.241
16.367	0.000	13.34	0.00	0.92	14.6	0.239
16.383	0.000	13.49	0.00	0.91	14.5	0.237
16.400	0.000	13.61	0.00	0.91	14.5	0.236
16.417	0.000	13.69	0.00	0.90	14.4	0.235
16.433	0.000	13.75	0.00	0.90	14.3	0.234
16.450	0.000	13.78	0.00	0.90	14.3	0.234
16.467	0.000	13.78	0.00	0.90	14.3	0.233
16.483	0.000	13.76	0.00	0.89	14.2	0.232
16.500	0.000	13.70	0.00	0.89	14.2	0.232
16.517	0.000	13.64	0.00	0.89	14.1	0.231

16.533	0.000	13.57	0.00	0.89	14.1	0.230
16.550	0.000	13.49	0.00	0.88	14.0	0.230
16.567	0.000	13.37	0.00	0.88	14.0	0.229
16.583	0.000	13.24	0.00	0.88	13.9	0.228
16.600	0.000	13.08	0.00	0.87	13.9	0.227
16.617	0.000	12.90	0.00	0.87	13.8	0.225
16.633	0.000	12.71	0.00	0.86	13.7	0.224
16.650	0.000	12.49	0.00	0.86	13.6	0.222
16.667	0.000	12.25	0.00	0.85	13.5	0.221
16.683	0.000	11.99	0.00	0.84	13.4	0.219
16.700	0.000	11.60	0.00	0.83	13.3	0.216
16.717	0.000	10.97	0.00	0.82	13.1	0.213
16.733	0.000	10.28	0.00	0.81	12.9	0.210
16.750	0.000	9.62	0.00	0.79	12.7	0.206
16.767	0.000	9.01	0.00	0.77	12.4	0.201
16.783	0.000	8.43	0.00	0.75	12.1	0.196
16.800	0.000	7.91	0.00	0.73	11.8	0.190

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 2.462 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 2.462 AF
LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

==========

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	5.0	10.0	15.0	20.0
15.800	0.8682	2.92	. Q	. V	.	.	.
15.817	0.8724	3.03	. Q	. V	.	.	.
15.833	0.8767	3.16	. Q	. V	.	.	.
15.850	0.8813	3.29	. Q	. V	.	.	.
15.867	0.8860	3.43	. Q	. V	.	.	.
15.883	0.8909	3.58	. Q	. V	.	.	.
15.900	0.8961	3.74	. Q	. V	.	.	.
15.917	0.9015	3.91	. Q	. V	.	.	.
15.933	0.9071	4.08	. Q	. V	.	.	.
15.950	0.9130	4.26	. Q	. V	.	.	.
15.967	0.9191	4.44	. Q	. V	.	.	.
15.983	0.9254	4.63	. Q.	V	.	.	.
16.000	0.9321	4.83	. Q.	V	.	.	.
16.017	0.9390	5.05	. Q	V	.	.	.
16.033	0.9464	5.34	. Q	V	.	.	.
16.050	0.9543	5.72	. .Q	V	.	.	.
16.067	0.9628	6.19	. . Q	V	.	.	.
16.083	0.9721	6.74	. . Q	V	.	.	.
16.100	0.9822	7.37	. .	QV	.	.	.
16.117	0.9934	8.08	. .	Q	.	.	.

```
16.133      1.0056      8.86  .         .     VQ  .         .         .
16.150      1.0190      9.71  .         .     V  Q.         .         .
16.167      1.0336     10.63  .         .     V   .Q        .         .
16.183      1.0496     11.59  .         .      V  .  Q      .         .
16.200      1.0667     12.46  .         .      V  .   Q     .         .
16.217      1.0848     13.15  .         .      V  .     Q   .         .
16.233      1.1037     13.71  .         .      V  .      Q  .         .
16.250      1.1232     14.14  .         .       V .       Q .         .
16.267      1.1431     14.47  .         .       V .       Q .         .
16.283      1.1634     14.70  .         .       V .        Q.         .
16.300      1.1838     14.85  .         .        V.        Q.         .
16.317      1.2044     14.90  .         .        V.        Q.         .
16.333      1.2248     14.87  .         .        V.        Q.         .
16.350      1.2452     14.76  .         .         V        Q.         .
16.367      1.2653     14.64  .         .         V        Q.         .
16.383      1.2853     14.54  .         .         V        Q.         .
16.400      1.3053     14.46  .         .         .V      Q .         .
16.417      1.3251     14.39  .         .         .V      Q .         .
16.433      1.3448     14.34  .         .         .V      Q .         .
16.450      1.3645     14.29  .         .         . V     Q .         .
16.467      1.3842     14.25  .         .         . V     Q .         .
16.483      1.4037     14.21  .         .         . V     Q .         .
16.500      1.4233     14.17  .         .         .  V    Q .         .
16.517      1.4427     14.13  .         .         .  V    Q .         .
16.533      1.4621     14.09  .         .         .  V    Q .         .
16.550      1.4815     14.05  .         .         .   V   Q .         .
16.567      1.5008     14.00  .         .         .   V  Q  .         .
16.583      1.5200     13.94  .         .         .   V  Q  .         .
16.600      1.5391     13.88  .         .         .    V Q  .         .
16.617      1.5581     13.81  .         .         .    V Q  .         .
16.633      1.5770     13.73  .         .         .    V Q  .         .
16.650      1.5958     13.63  .         .         .    V Q  .         .
16.667      1.6144     13.53  .         .         .     VQ  .         .
16.683      1.6329     13.42  .         .         .     Q   .         .
16.700      1.6512     13.29  .         .         .     Q   .         .
16.717      1.6693     13.13  .         .         .     QV  .         .
16.733      1.6871     12.92  .         .         .    Q V  .         .
16.750      1.7045     12.68  .         .         .    Q V  .         .
16.767      1.7216     12.41  .         .         .   Q  V  .         .
16.783      1.7383     12.11  .         .         .   Q   V .         .
16.800      1.7546     11.79  .         .         .  Q    V .         .
16.817      1.7704     11.46  .         .         . Q     V .         .
16.833      1.7857     11.12  .         .         . Q      V.         .
16.850      1.8005     10.77  .         .        .Q       V.         .
16.867      1.8148     10.41  .         .        Q        V.         .
16.883      1.8287     10.06  .         .        Q        V.         .
16.900      1.8421      9.70  .         .       Q.        V.         .
16.917      1.8549      9.35  .         .      Q .         V         .
16.933      1.8674      9.01  .         .      Q .         V         .
16.950      1.8793      8.67  .         .     Q  .         V         .
16.967      1.8908      8.34  .         .    Q   .         V         .
16.983      1.9018      8.01  .         .    Q   .         V         .
17.000      1.9124      7.70  .         .   Q    .         .V        .
17.017      1.9226      7.39  .         .  Q     .         .V        .
17.033      1.9324      7.10  .         .  Q     .         .V        .
17.050      1.9418      6.81  .         . Q      .         .V        .
17.067      1.9508      6.54  .         . Q      .         .V        .
17.083      1.9594      6.27  .         .Q       .         .V        .
```



```
17.100      1.9677      6.02  .         . Q       .         .V        .
17.117      1.9756      5.77  .         .Q        .         . V       .
17.133      1.9833      5.54  .         .Q        .         . V       .
17.150      1.9906      5.31  .         Q         .         . V       .
17.167      1.9976      5.10  .         Q         .         . V       .
17.183      2.0044      4.89  .        Q.         .         . V       .
17.200      2.0108      4.70  .        Q.         .         . V       .
17.217      2.0170      4.51  .        Q.         .         . V       .
17.233      2.0230      4.34  .       Q .         .         . V       .
17.250      2.0288      4.17  .       Q .         .         . V       .
17.267      2.0343      4.01  .       Q .         .         .  V      .
17.283      2.0396      3.85  .      Q  .         .         .  V      .
17.300      2.0447      3.71  .      Q  .         .         .  V      .
17.317      2.0496      3.57  .      Q  .         .         .  V      .
17.333      2.0544      3.44  .     Q   .         .         .  V      .
17.350      2.0589      3.32  .     Q   .         .         .  V      .
17.367      2.0633      3.20  .     Q   .         .         .  V      .
17.383      2.0676      3.09  .     Q   .         .         .  V      .
17.400      2.0717      2.98  .    Q    .         .         .  V      .
17.417      2.0757      2.88  .    Q    .         .         .  V      .
17.433      2.0795      2.79  .    Q    .         .         .  V      .
17.450      2.0832      2.70  .    Q    .         .         .  V      .
17.467      2.0868      2.61  .    Q    .         .         .  V      .
17.483      2.0903      2.53  .    Q    .         .         .  V      .
17.500      2.0937      2.45  .   Q     .         .         .   V     .
17.517      2.0969      2.38  .   Q     .         .         .   V     .
17.533      2.1001      2.31  .   Q     .         .         .   V     .
17.550      2.1032      2.24  .   Q     .         .         .   V     .
17.567      2.1062      2.18  .   Q     .         .         .   V     .
17.583      2.1092      2.12  .   Q     .         .         .   V     .
17.600      2.1120      2.07  .   Q     .         .         .   V     .
17.617      2.1148      2.02  .   Q     .         .         .   V     .
17.633      2.1175      1.97  .  Q      .         .         .   V     .
17.650      2.1201      1.92  .  Q      .         .         .   V     .
17.667      2.1227      1.88  .  Q      .         .         .   V     .
17.683      2.1253      1.84  .  Q      .         .         .   V     .
17.700      2.1277      1.80  .  Q      .         .         .   V     .
17.717      2.1302      1.76  .  Q      .         .         .   V     .
17.733      2.1325      1.72  .  Q      .         .         .   V     .
17.750      2.1348      1.69  .  Q      .         .         .   V     .
17.767      2.1371      1.66  .  Q      .         .         .   V     .
17.783      2.1394      1.63  .  Q      .         .         .   V     .
17.800      2.1416      1.60  .  Q      .         .         .   V     .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1069.0
10%	975.0
20%	480.0
30%	375.0
40%	315.0
50%	270.0
60%	240.0

70%	210.0
80%	180.0
90%	140.0

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END OF FLOODSCx ROUTING ANALYSIS

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******************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
              USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
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                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREAS A 25-YEAR HC PROPOSED CONDITION                                 *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKA25.DAT
  TIME/DATE OF STUDY: 20:49 08/15/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


******************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      5.00 IS CODE = 1.2
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==============================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =   15.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.295
    LOW LOSS FRACTION = 0.671
    TIME OF CONCENTRATION(MIN.) = 20.34
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

------------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.26
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    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     3.51

------------------------------------------------------------------------------
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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

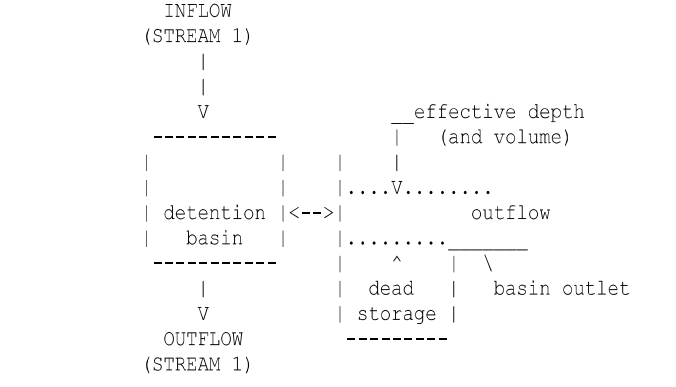
TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 6.5 13.0 19.5 26.0
15.800	0.9052	4.25	. Q . V . . .
15.817	0.9113	4.40	. Q . V . . .
15.833	0.9175	4.55	. Q . V . . .
15.850	0.9240	4.69	. Q . V . . .
15.867	0.9306	4.84	. Q . V . . .
15.883	0.9375	4.99	. Q . V . . .
15.900	0.9446	5.13	. Q . V . . .
15.917	0.9519	5.28	. Q . V . . .
15.933	0.9593	5.42	. Q . V . . .
15.950	0.9670	5.57	. Q . V . . .
15.967	0.9749	5.72	. Q . V . . .
15.983	0.9829	5.86	. Q. V . . .
16.000	0.9912	6.01	. Q. V . . .
16.017	1.0003	6.57	. Q V . . .
16.033	1.0107	7.55	. .Q V . . .
16.050	1.0224	8.53	. . Q V . . .
16.067	1.0355	9.52	. . Q V . . .
16.083	1.0500	10.50	. . Q V . . .
16.100	1.0658	11.48	. . QV . . .
16.117	1.0830	12.46	. . Q. . . .
16.133	1.1015	13.44	. . VQ . . .
16.150	1.1213	14.42	. . V. Q . . .
16.167	1.1426	15.40	. . V Q . . .
16.183	1.1651	16.38	. . V Q . . .
16.200	1.1890	17.36	. . .V Q . . .
16.217	1.2143	18.34	. . .V Q . . .
16.233	1.2409	19.32	. . .V Q. . .
16.250	1.2689	20.30	. . . V .Q . .
16.267	1.2982	21.28	. . . V . Q . .
16.283	1.3289	22.27	. . . V . Q . .
16.300	1.3609	23.25	. . . V . Q . .
16.317	1.3943	24.23	. . . V . Q . .
16.333	1.4290	25.21	. . . V . Q . .
16.350	1.4648	26.03	. . . V . Q . .
16.367	1.4989	24.71	. . . V . Q . .
16.383	1.5313	23.57	. . . V . Q . .
16.400	1.5623	22.43	. . . V . Q . .
16.417	1.5916	21.30	. . . V . Q . .
16.433	1.6193	20.16	. . . V Q . .
16.450	1.6455	19.02	. . . Q. . .
16.467	1.6702	17.88	. . . Q V. . .
16.483	1.6932	16.74	. . . Q V. . .
16.500	1.7147	15.60	. . . Q V . .
16.517	1.7346	14.46	. . . Q V . .
16.533	1.7530	13.33	. . Q V . .
16.550	1.7698	12.19	. . Q . V . .
16.567	1.7850	11.05	. . Q . V . .
16.583	1.7987	9.91	. . Q . V . .
16.600	1.8107	8.77	. . Q . V . .
16.617	1.8213	7.63	. .Q . V . .
16.633	1.8302	6.49	. Q. . V . .
16.650	1.8376	5.36	. Q . V . .
16.667	1.8434	4.22	. Q . V . .
16.683	1.8477	3.13	. Q . V . .
16.700	1.8516	2.83	. Q . V . .
16.717	1.8554	2.77	. Q . V . .
16.733	1.8591	2.71	. Q . V . .
16.750	1.8628	2.65	. Q . V . .
16.767	1.8663	2.59	. Q . V . .
16.783	1.8698	2.53	. Q . V . .
16.800	1.8732	2.47	. Q . V . .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	375.0
20%	225.0
30%	170.0
40%	150.0
50%	125.0
60%	95.0
70%	75.0
80%	50.0
90%	25.0

FLOW PROCESS FROM NODE 5.00 TO NODE 5.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	11.03	0.180
3	2.00	15.60	0.410
4	3.00	19.10	0.690

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	4.40	0.00	0.30	3.2	0.054
15.833	0.000	4.55	0.00	0.31	3.3	0.055
15.850	0.000	4.69	0.00	0.32	3.4	0.057
15.867	0.000	4.84	0.00	0.33	3.5	0.059
15.883	0.000	4.99	0.00	0.34	3.7	0.061
15.900	0.000	5.13	0.00	0.35	3.8	0.062
15.917	0.000	5.28	0.00	0.36	3.9	0.064
15.933	0.000	5.42	0.00	0.37	4.0	0.066
15.950	0.000	5.57	0.00	0.38	4.1	0.068
15.967	0.000	5.72	0.00	0.39	4.2	0.070
15.983	0.000	5.86	0.00	0.40	4.4	0.072
16.000	0.000	6.01	0.00	0.41	4.5	0.074
16.017	0.000	6.57	0.00	0.43	4.6	0.077
16.033	0.000	7.55	0.00	0.45	4.8	0.081
16.050	0.000	8.53	0.00	0.48	5.1	0.086
16.067	0.000	9.52	0.00	0.51	5.4	0.091
16.083	0.000	10.50	0.00	0.54	5.8	0.098
16.100	0.000	11.48	0.00	0.58	6.2	0.105
16.117	0.000	12.46	0.00	0.63	6.7	0.113
16.133	0.000	13.44	0.00	0.68	7.2	0.122
16.150	0.000	14.42	0.00	0.73	7.7	0.131
16.167	0.000	15.40	0.00	0.78	8.3	0.141
16.183	0.000	16.38	0.00	0.84	8.9	0.151
16.200	0.000	17.36	0.00	0.90	9.6	0.162
16.217	0.000	18.34	0.00	0.96	10.2	0.173
16.233	0.000	19.32	0.00	1.02	10.8	0.184
16.250	0.000	20.30	0.00	1.07	11.2	0.197
16.267	0.000	21.28	0.00	1.13	11.5	0.210

16.283	0.000	22.27	0.00	1.19	11.8	0.225
16.300	0.000	23.25	0.00	1.26	12.1	0.240
16.317	0.000	24.23	0.00	1.33	12.4	0.256
16.333	0.000	25.21	0.00	1.41	12.7	0.274
16.350	0.000	26.03	0.00	1.48	13.1	0.292
16.367	0.000	24.71	0.00	1.55	13.4	0.307
16.383	0.000	23.57	0.00	1.61	13.7	0.321
16.400	0.000	22.43	0.00	1.66	13.9	0.332
16.417	0.000	21.30	0.00	1.71	14.2	0.342
16.433	0.000	20.16	0.00	1.74	14.3	0.350
16.450	0.000	19.02	0.00	1.77	14.5	0.357
16.467	0.000	17.88	0.00	1.79	14.6	0.361
16.483	0.000	16.74	0.00	1.80	14.7	0.364
16.500	0.000	15.60	0.00	1.81	14.7	0.365
16.517	0.000	14.46	0.00	1.80	14.7	0.365
16.533	0.000	13.33	0.00	1.80	14.7	0.363
16.550	0.000	12.19	0.00	1.78	14.6	0.360
16.567	0.000	11.05	0.00	1.76	14.6	0.355
16.583	0.000	9.91	0.00	1.73	14.4	0.349
16.600	0.000	8.77	0.00	1.70	14.3	0.341
16.617	0.000	7.63	0.00	1.66	14.1	0.332
16.633	0.000	6.49	0.00	1.62	13.9	0.322
16.650	0.000	5.36	0.00	1.57	13.7	0.310
16.667	0.000	4.22	0.00	1.51	13.5	0.297
16.683	0.000	3.13	0.00	1.45	13.2	0.284
16.700	0.000	2.83	0.00	1.39	12.9	0.270
16.717	0.000	2.77	0.00	1.33	12.7	0.256
16.733	0.000	2.71	0.00	1.27	12.4	0.243
16.750	0.000	2.65	0.00	1.22	12.1	0.229
16.767	0.000	2.59	0.00	1.16	11.9	0.217
16.783	0.000	2.53	0.00	1.10	11.6	0.204
16.800	0.000	2.47	0.00	1.05	11.4	0.192

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 2.265 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 2.265 AF
LOSS VOLUME = 0.000 AF

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 4

>>>>>MODEL PIPEFLOW ROUTING OF STREAM #1<<<<<

MODEL PIPEFLOW ROUTING OF STREAM 1 WHERE
STORAGE EFFECTS ARE NEGLECTED WITHIN THE PIPE, FLOW
VELOCITIES ARE ESTIMATED BY ASSUMING STEADY FLOW FOR
EACH UNIT INTERVAL(NORMAL DEPTH, Dn), AND FLOWS IN EXCESS
OF (.82)(DIAMETER) ARE PONDED AT THE UPSTREAM INLET:
UNIT INTERVAL FLOW VELOCITY COMPUTED USING Dn UP TO
(0.938)(DIAMETER):

PIPELENGTH(FT) = 142.00 MANNINGS FACTOR = 0.013
UPSTREAM ELEVATION(FT) = 838.00

DOWNSTREAM ELEVATION(FT) = 836.00
PIPE DIAMETER(FT) = 2.00

NORMAL DEPTH VELOCITY PIPE ROUTING RESULTS:

TIME (HRS)	INFLOW (CFS)	VELOCITY (FPS)	OUTFLOW (CFS)	UPSTREAM PONDING(AF)
15.800	3.13	5.63	3.11	0.000
15.817	3.23	5.68	3.20	0.000
15.833	3.33	5.73	3.30	0.000
15.850	3.43	5.79	3.41	0.000
15.867	3.54	5.85	3.51	0.000
15.883	3.65	5.91	3.62	0.000
15.900	3.77	5.97	3.74	0.000
15.917	3.88	6.03	3.85	0.000
15.933	4.00	6.10	3.97	0.000
15.950	4.12	6.15	4.09	0.000
15.967	4.25	6.20	4.21	0.000
15.983	4.37	6.25	4.34	0.000
16.000	4.50	6.31	4.46	0.000
16.017	4.64	6.37	4.61	0.000
16.033	4.84	6.45	4.79	0.000
16.050	5.10	6.55	5.03	0.000
16.067	5.42	6.68	5.34	0.000
16.083	5.79	6.80	5.69	0.000
16.100	6.21	6.94	6.11	0.000
16.117	6.68	7.10	6.57	0.000
16.133	7.18	7.25	7.07	0.000
16.150	7.73	7.42	7.61	0.000
16.167	8.31	7.57	8.18	0.000
16.183	8.93	7.70	8.78	0.000
16.200	9.57	7.83	9.42	0.000
16.217	10.24	7.97	10.09	0.000
16.233	10.85	8.09	10.72	0.000
16.250	11.24	8.16	11.15	0.000
16.267	11.50	8.20	11.44	0.000
16.283	11.78	8.24	11.71	0.000
16.300	12.07	8.29	12.01	0.000
16.317	12.39	8.35	12.32	0.000
16.333	12.72	8.41	12.65	0.000
16.350	13.07	8.48	13.00	0.000
16.367	13.40	8.54	13.34	0.000
16.383	13.69	8.59	13.63	0.000
16.400	13.94	8.63	13.89	0.000
16.417	14.16	8.66	14.11	0.000
16.433	14.33	8.69	14.30	0.000
16.450	14.48	8.71	14.45	0.000
16.467	14.58	8.73	14.56	0.000
16.483	14.66	8.74	14.64	0.000
16.500	14.70	8.75	14.69	0.000
16.517	14.71	8.75	14.70	0.000
16.533	14.68	8.75	14.69	0.000
16.550	14.63	8.74	14.64	0.000
16.567	14.55	8.73	14.57	0.000
16.583	14.44	8.71	14.46	0.000
16.600	14.30	8.69	14.33	0.000

16.617	14.14	8.66	14.17	0.000
16.633	13.95	8.63	13.99	0.000
16.650	13.73	8.59	13.78	0.000
16.667	13.49	8.56	13.54	0.000
16.683	13.22	8.51	13.28	0.000
16.700	12.95	8.46	13.00	0.000
16.717	12.67	8.40	12.73	0.000
16.733	12.41	8.35	12.46	0.000
16.750	12.14	8.30	12.20	0.000
16.767	11.89	8.26	11.94	0.000
16.783	11.63	8.22	11.69	0.000
16.800	11.39	8.18	11.44	0.000

****
FLOW PROCESS FROM NODE 11.00 TO NODE 13.00 IS CODE = 1.2

>>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==========

(SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #2)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 7.65
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.278
LOW LOSS FRACTION = 0.653
TIME OF CONCENTRATION(MIN.) = 9.81
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
RETURN FREQUENCY(YEARS) = 25
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.40
30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.87
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.15
3-HOUR POINT RAINFALL VALUE(INCHES) = 1.94
6-HOUR POINT RAINFALL VALUE(INCHES) = 2.71
24-HOUR POINT RAINFALL VALUE(INCHES) = 4.49

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.17
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.69

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 5.2 10.3 15.5 20.6
15.800	0.5033	3.39	. Q . V . . .
15.817	0.5083	3.60	. Q . V . . .
15.833	0.5135	3.80	. Q . V . . .
15.850	0.5190	4.01	. Q . V . . .
15.867	0.5248	4.22	. Q . V . . .
15.883	0.5309	4.43	. Q . V . . .
15.900	0.5373	4.64	. Q . V . . .
15.917	0.5440	4.85	. Q. V . . .
15.933	0.5510	5.06	. Q. V . . .
15.950	0.5582	5.27	. Q V. . .
15.967	0.5658	5.47	. Q V. . .
15.983	0.5736	5.68	. .Q V. . .
16.000	0.5817	5.89	. .Q V. . .
16.017	0.5910	6.74	. . Q V . .
16.033	0.6023	8.24	. . Q V . .
16.050	0.6158	9.73	. . Q .V . .
16.067	0.6312	11.22	. . .Q . .
16.083	0.6487	12.72	. . . V Q . .
16.100	0.6683	14.21	. . . V Q . .
16.117	0.6899	15.70	. . . V Q . .
16.133	0.7136	17.20	. . . V . Q .
16.150	0.7394	18.69	. . . V . Q .
16.167	0.7678	20.65	. . . V . Q
16.183	0.7945	19.38	. . . V . Q .
16.200	0.8187	17.53	. . . V . Q .
16.217	0.8403	15.69	. . . V Q .
16.233	0.8593	13.85	. . . Q V. .
16.250	0.8759	12.01	. . . Q V. .
16.267	0.8899	10.16	. . Q. V .
16.283	0.9013	8.32	. . Q . V .
16.300	0.9103	6.48	. Q . .V .
16.317	0.9166	4.63	. Q . .V .
16.333	0.9207	2.92	. Q . .V .
16.350	0.9241	2.49	. Q . .V .
16.367	0.9274	2.40	. Q . .V .
16.383	0.9306	2.31	. Q . .V .
16.400	0.9336	2.22	. Q . .V .
16.417	0.9366	2.12	. Q . . V .
16.433	0.9394	2.03	. Q . . V .
16.450	0.9420	1.94	. Q . . V .
16.467	0.9446	1.85	. Q . . V .
16.483	0.9470	1.76	. Q . . V .
16.500	0.9493	1.67	. Q . . V .
16.517	0.9515	1.61	. Q . . V .
16.533	0.9536	1.55	. Q . . V .

16.550	0.9557	1.49	. Q . . V .
16.567	0.9576	1.43	. Q . . V .
16.583	0.9595	1.37	. Q . . V .
16.600	0.9613	1.31	. Q . . V .
16.617	0.9630	1.24	. Q . . V .
16.633	0.9647	1.18	. Q . . . V .
16.650	0.9662	1.12	. Q . . . V .
16.667	0.9677	1.08	. Q . . . V .
16.683	0.9692	1.06	. Q . . . V .
16.700	0.9706	1.04	. Q . . . V .
16.717	0.9720	1.02	.Q . . . V .
16.733	0.9734	1.00	.Q . . . V .
16.750	0.9747	0.98	.Q . . . V .
16.767	0.9761	0.96	.Q . . . V .
16.783	0.9774	0.95	.Q . . . V .
16.800	0.9786	0.93	.Q . . . V .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	220.0
20%	140.0
30%	90.0
40%	75.0
50%	60.0
60%	50.0
70%	35.0
80%	25.0
90%	15.0

****
FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 7
>>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 1<<<<<

****
FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11
>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 7.5 15.0 22.5 30.0
15.800	1.3548	6.50	. Q . V . . .
15.817	1.3642	6.80	. Q. V . . .

```
 15.833      1.3739      7.10  .        Q.     V   .         .         .
 15.850      1.3842      7.42  .        Q.     V   .         .         .
 15.867      1.3948      7.73  .         Q     V   .         .         .
 15.883      1.4059      8.05  .         Q     V   .         .         .
 15.900      1.4174      8.37  .        .Q     V   .         .         .
 15.917      1.4294      8.70  .        .Q     V   .         .         .
 15.933      1.4419      9.03  .        . Q    V   .         .         .
 15.950      1.4547      9.36  .        . Q    V   .         .         .
 15.967      1.4681      9.69  .        . Q     V  .         .         .
 15.983      1.4819     10.02  .        .  Q    V  .         .         .
 16.000      1.4962     10.36  .        .  Q    V  .         .         .
 16.017      1.5118     11.35  .        .    Q V   .         .         .
 16.033      1.5297     13.03  .        .      Q   .         .         .
 16.050      1.5501     14.77  .        .       VQ.         .         .
 16.067      1.5729     16.56  .        .       V . Q       .         .
 16.083      1.5983     18.41  .        .       V .   Q     .         .
 16.100      1.6262     20.32  .        .       V .      Q  .         .
 16.117      1.6569     22.27  .        .        V.        Q.        .
 16.133      1.6903     24.26  .        .        V.         . Q      .
 16.150      1.7266     26.30  .        .         V         .   Q    .
 16.167      1.7663     28.83  .        .         V         .     Q  .
 16.183      1.8051     28.16  .        .         .V        .    Q   .
 16.200      1.8422     26.95  .        .         .V        .   Q    .
 16.217      1.8777     25.78  .        .         .V        .  Q     .
 16.233      1.9115     24.57  .        .         . V       . Q      .
 16.250      1.9434     23.16  .        .         . V       Q        .
 16.267      1.9732     21.60  .        .         . V     Q .        .
 16.283      2.0008     20.03  .        .         .  V  Q   .        .
 16.300      2.0262     18.48  .        .         .  VQ     .        .
 16.317      2.0496     16.96  .        .         . QV      .        .
 16.333      2.0710     15.57  .        .         Q   V     .        .
 16.350      2.0924     15.49  .        .         Q   V     .        .
 16.367      2.1141     15.73  .        .         Q   V     .        .
 16.383      2.1360     15.94  .        .         .Q  V     .        .
 16.400      2.1582     16.11  .        .         .Q   V    .        .
 16.417      2.1806     16.24  .        .         .Q   V    .        .
 16.433      2.2031     16.33  .        .         .Q   V    .        .
 16.450      2.2256     16.39  .        .         .Q   V    .        .
 16.467      2.2482     16.41  .        .         .Q    V   .        .
 16.483      2.2708     16.40  .        .         .Q    V   .        .
 16.500      2.2933     16.36  .        .         .Q    V   .        .
 16.517      2.3158     16.31  .        .         .Q    V   .        .
 16.533      2.3382     16.24  .        .         .Q     V  .        .
 16.550      2.3604     16.13  .        .         .Q     V  .        .
 16.567      2.3824     15.99  .        .         .Q     V  .        .
 16.583      2.4042     15.83  .        .         .Q      V .        .
 16.600      2.4258     15.64  .        .         Q       V .        .
 16.617      2.4470     15.42  .        .         Q       V .        .
 16.633      2.4679     15.17  .        .         Q       V .        .
 16.650      2.4884     14.90  .        .        Q.       V .        .
 16.667      2.5086     14.62  .        .        Q.        V.        .
 16.683      2.5283     14.33  .        .        Q.        V.        .
 16.700      2.5476     14.04  .        .       Q .        V.        .
 16.717      2.5666     13.75  .        .       Q .        V.        .
 16.733      2.5851     13.46  .        .      Q  .         V        .
 16.750      2.6033     13.18  .        .      Q  .         V        .
 16.767      2.6210     12.91  .        .      Q  .         V        .
 16.783      2.6384     12.64  .        .     Q   .         V        .
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 16.800      2.6555     12.37  .         .     Q   .         V        .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	675.0
20%	385.0
30%	305.0
40%	245.0
50%	190.0
60%	70.0
70%	55.0
80%	40.0
90%	20.0

****
FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<

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ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)

1	0.00	0.00	0.000
2	1.00	15.88	0.260
3	2.00	22.46	0.590
4	3.00	27.51	0.970

==========

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	6.80	0.00	0.30	4.7	0.079
15.833	0.000	7.10	0.00	0.32	4.9	0.082
15.850	0.000	7.42	0.00	0.33	5.1	0.085
15.867	0.000	7.73	0.00	0.34	5.3	0.089
15.883	0.000	8.05	0.00	0.35	5.5	0.092
15.900	0.000	8.37	0.00	0.37	5.7	0.096
15.917	0.000	8.70	0.00	0.38	6.0	0.100
15.933	0.000	9.03	0.00	0.40	6.2	0.103
15.950	0.000	9.36	0.00	0.41	6.4	0.107
15.967	0.000	9.69	0.00	0.43	6.7	0.112
15.983	0.000	10.02	0.00	0.45	6.9	0.116
16.000	0.000	10.36	0.00	0.46	7.2	0.120
16.017	0.000	11.35	0.00	0.48	7.5	0.125
16.033	0.000	13.03	0.00	0.51	7.9	0.133
16.050	0.000	14.77	0.00	0.54	8.4	0.141
16.067	0.000	16.56	0.00	0.58	9.0	0.152
16.083	0.000	18.41	0.00	0.63	9.6	0.164
16.100	0.000	20.32	0.00	0.68	10.4	0.178
16.117	0.000	22.27	0.00	0.74	11.3	0.193
16.133	0.000	24.26	0.00	0.80	12.3	0.209
16.150	0.000	26.30	0.00	0.87	13.3	0.227
16.167	0.000	28.83	0.00	0.95	14.5	0.247
16.183	0.000	28.16	0.00	1.01	15.5	0.264
16.200	0.000	26.95	0.00	1.06	16.1	0.279
16.217	0.000	25.78	0.00	1.10	16.4	0.292
16.233	0.000	24.57	0.00	1.13	16.6	0.303
16.250	0.000	23.16	0.00	1.16	16.8	0.312
16.267	0.000	21.60	0.00	1.18	17.0	0.318
16.283	0.000	20.03	0.00	1.19	17.1	0.322
16.300	0.000	18.48	0.00	1.19	17.1	0.324
16.317	0.000	16.96	0.00	1.19	17.2	0.324
16.333	0.000	15.57	0.00	1.19	17.1	0.322
16.350	0.000	15.49	0.00	1.18	17.1	0.319
16.367	0.000	15.73	0.00	1.17	17.0	0.318
16.383	0.000	15.94	0.00	1.17	17.0	0.316
16.400	0.000	16.11	0.00	1.17	17.0	0.315
16.417	0.000	16.24	0.00	1.16	17.0	0.314
16.433	0.000	16.33	0.00	1.16	16.9	0.313
16.450	0.000	16.39	0.00	1.16	16.9	0.312
16.467	0.000	16.41	0.00	1.16	16.9	0.312
16.483	0.000	16.40	0.00	1.15	16.9	0.311
16.500	0.000	16.36	0.00	1.15	16.9	0.310
16.517	0.000	16.31	0.00	1.15	16.9	0.309

16.533	0.000	16.24	0.00	1.15	16.9	0.309
16.550	0.000	16.13	0.00	1.14	16.8	0.308
16.567	0.000	15.99	0.00	1.14	16.8	0.306
16.583	0.000	15.83	0.00	1.14	16.8	0.305
16.600	0.000	15.64	0.00	1.13	16.8	0.304
16.617	0.000	15.42	0.00	1.13	16.7	0.302
16.633	0.000	15.17	0.00	1.12	16.7	0.300
16.650	0.000	14.90	0.00	1.11	16.6	0.297
16.667	0.000	14.62	0.00	1.10	16.6	0.295
16.683	0.000	14.33	0.00	1.10	16.5	0.292
16.700	0.000	14.04	0.00	1.09	16.5	0.288
16.717	0.000	13.75	0.00	1.07	16.4	0.284
16.733	0.000	13.46	0.00	1.06	16.3	0.281
16.750	0.000	13.18	0.00	1.05	16.2	0.276
16.767	0.000	12.91	0.00	1.04	16.2	0.272
16.783	0.000	12.64	0.00	1.02	16.1	0.267
16.800	0.000	12.37	0.00	1.01	16.0	0.262

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 3.433 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 3.433 AF
LOSS VOLUME = 0.000 AF

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FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

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STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	5.0	10.0	15.0	20.0
15.800	1.2785	4.58	.	Q. V	.	.	.
15.817	1.2850	4.75	.	Q. V	.	.	.
15.833	1.2918	4.92	.	Q. V	.	.	.
15.850	1.2989	5.11	.	Q V	.	.	.
15.867	1.3062	5.31	.	Q V	.	.	.
15.883	1.3138	5.52	.	.Q V	.	.	.
15.900	1.3217	5.74	.	.Q V	.	.	.
15.917	1.3299	5.96	.	.Q V	.	.	.
15.933	1.3384	6.20	.	. Q V	.	.	.
15.950	1.3473	6.44	.	. Q V	.	.	.
15.967	1.3565	6.69	.	. Q V	.	.	.
15.983	1.3661	6.94	.	. Q V	.	.	.
16.000	1.3760	7.21	.	. Q V	.	.	.
16.017	1.3863	7.50	.	. QV	.	.	.
16.033	1.3972	7.88	.	. QV	.	.	.
16.050	1.4087	8.36	.	. Q	.	.	.
16.067	1.4210	8.95	.	. VQ	.	.	.
16.083	1.4343	9.64	.	. V Q.	.	.	.
16.100	1.4487	10.43	.	. V Q	.	.	.
16.117	1.4643	11.31	.	. V . Q	.	.	.

```
16.133      1.4812     12.27  .         .      V  .   Q     .         .
16.150      1.4995     13.32  .         .      V  .     Q   .         .
16.167      1.5194     14.47  .         .      V  .       Q .         .
16.183      1.5408     15.52  .         .      V  .         .Q        .
16.200      1.5630     16.11  .         .       V .          . Q      .
16.217      1.5856     16.39  .         .       V .          . Q      .
16.233      1.6085     16.63  .         .       V .          .  Q     .
16.250      1.6317     16.82  .         .        V.          .  Q     .
16.267      1.6551     16.98  .         .        V.          .  Q     .
16.283      1.6786     17.08  .         .        V.          .   Q    .
16.300      1.7022     17.14  .         .        V.          .   Q    .
16.317      1.7258     17.15  .         .         V          .   Q    .
16.333      1.7494     17.13  .         .         V          .   Q    .
16.350      1.7730     17.09  .         .         V          .   Q    .
16.367      1.7964     17.05  .         .         V          .   Q    .
16.383      1.8199     17.01  .         .         .V         .   Q    .
16.400      1.8433     16.99  .         .         .V         .  Q     .
16.417      1.8666     16.97  .         .         .V         .  Q     .
16.433      1.8900     16.95  .         .         . V        .  Q     .
16.450      1.9133     16.93  .         .         . V        .  Q     .
16.467      1.9366     16.92  .         .         . V        .  Q     .
16.483      1.9599     16.90  .         .         . V        .  Q     .
16.500      1.9831     16.89  .         .         .  V       .  Q     .
16.517      2.0064     16.87  .         .         .  V       .  Q     .
16.533      2.0296     16.86  .         .         .  V       .  Q     .
16.550      2.0528     16.84  .         .         .  V       .  Q     .
16.567      2.0760     16.82  .         .         .   V      .  Q     .
16.583      2.0991     16.79  .         .         .   V      .  Q     .
16.600      2.1222     16.76  .         .         .   V      .  Q     .
16.617      2.1452     16.73  .         .         .   V      .  Q     .
16.633      2.1682     16.69  .         .         .    V     .  Q     .
16.650      2.1912     16.65  .         .         .    V     .  Q     .
16.667      2.2140     16.60  .         .         .    V     .  Q     .
16.683      2.2368     16.54  .         .         .     V    .  Q     .
16.700      2.2595     16.47  .         .         .     V    . Q      .
16.717      2.2821     16.40  .         .         .     V    . Q      .
16.733      2.3046     16.33  .         .         .     V    . Q      .
16.750      2.3270     16.25  .         .         .      V   . Q      .
16.767      2.3492     16.16  .         .         .      V   . Q      .
16.783      2.3713     16.07  .         .         .      V   . Q      .
16.800      2.3933     15.97  .         .         .      V   .Q       .
16.817      2.4151     15.81  .         .         .       V .Q       .
16.833      2.4365     15.54  .         .         .       V .Q       .
16.850      2.4575     15.20  .         .         .       V Q        .
16.867      2.4779     14.83  .         .         .       VQ.        .
16.883      2.4978     14.45  .         .         .       QV.        .
16.900      2.5171     14.05  .         .         .       QV.        .
16.917      2.5359     13.64  .         .         .      Q V.        .
16.933      2.5542     13.22  .         .         .     Q  V.        .
16.950      2.5718     12.80  .         .         .    Q   V.        .
16.967      2.5888     12.38  .         .         .   Q     V        .
16.983      2.6053     11.96  .         .         .  Q      V        .
17.000      2.6212     11.54  .         .         .  Q      V        .
17.017      2.6365     11.13  .         .         . Q       V        .
17.033      2.6513     10.72  .         .         .Q        V        .
17.050      2.6655     10.33  .         .         Q         .V       .
17.067      2.6792      9.94  .         .        Q.         .V       .
17.083      2.6924      9.56  .         .        Q.         .V       .
```



```
17.100      2.7051      9.20  .         .       Q .         .V       .
17.117      2.7173      8.85  .         .      Q  .         .V       .
17.133      2.7290      8.50  .         .      Q  .         .V       .
17.150      2.7402      8.17  .         .     Q   .         .V       .
17.167      2.7510      7.86  .         .    Q    .         . V      .
17.183      2.7614      7.55  .         .    Q    .         . V      .
17.200      2.7714      7.26  .         .   Q     .         . V      .
17.217      2.7811      6.98  .         .  Q      .         . V      .
17.233      2.7903      6.71  .         .  Q      .         . V      .
17.250      2.7992      6.45  .         . Q       .         . V      .
17.267      2.8077      6.21  .         . Q       .         . V      .
17.283      2.8160      5.97  .         .Q        .         . V      .
17.300      2.8239      5.75  .         .Q        .         . V      .
17.317      2.8315      5.54  .         .Q        .         . V      .
17.333      2.8388      5.33  .         Q         .         .  V     .
17.350      2.8459      5.14  .         Q         .         .  V     .
17.367      2.8528      4.96  .        Q.         .         .  V     .
17.383      2.8594      4.79  .        Q.         .         .  V     .
17.400      2.8657      4.62  .        Q.         .         .  V     .
17.417      2.8719      4.46  .       Q .         .         .  V     .
17.433      2.8778      4.31  .       Q .         .         .  V     .
17.450      2.8836      4.17  .       Q .         .         .  V     .
17.467      2.8891      4.04  .       Q .         .         .  V     .
17.483      2.8945      3.91  .      Q  .         .         .  V     .
17.500      2.8997      3.79  .      Q  .         .         .  V     .
17.517      2.9048      3.68  .      Q  .         .         .  V     .
17.533      2.9097      3.57  .      Q  .         .         .  V     .
17.550      2.9145      3.47  .     Q   .         .         .  V     .
17.567      2.9191      3.37  .     Q   .         .         .   V    .
17.583      2.9236      3.28  .     Q   .         .         .   V    .
17.600      2.9280      3.19  .     Q   .         .         .   V    .
17.617      2.9323      3.11  .     Q   .         .         .   V    .
17.633      2.9365      3.03  .     Q   .         .         .   V    .
17.650      2.9405      2.95  .    Q    .         .         .   V    .
17.667      2.9445      2.88  .    Q    .         .         .   V    .
17.683      2.9484      2.82  .    Q    .         .         .   V    .
17.700      2.9522      2.76  .    Q    .         .         .   V    .
17.717      2.9559      2.70  .    Q    .         .         .   V    .
17.733      2.9595      2.64  .    Q    .         .         .   V    .
17.750      2.9631      2.58  .    Q    .         .         .   V    .
17.767      2.9666      2.53  .    Q    .         .         .   V    .
17.783      2.9700      2.48  .   Q     .         .         .   V    .
17.800      2.9734      2.44  .   Q     .         .         .   V    .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1069.0
10%	1069.0
20%	595.0
30%	445.0
40%	375.0
50%	320.0
60%	290.0

70%	255.0
80%	225.0
90%	200.0

END OF FLOODSCx ROUTING ANALYSIS

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

             F L O O D   R O U T I N G   A N A L Y S I S
             USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
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             Ver. 21.0  Release Date: 06/01/2014  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREAS A 100-YEAR HC PROPOSED CONDITION                                *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKA100.DAT
  TIME/DATE OF STUDY: 20:47 08/15/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      5.00 IS CODE = 1.2
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==========================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =   15.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.295
    LOW LOSS FRACTION = 0.340
    TIME OF CONCENTRATION(MIN.) = 19.49
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.52
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.09
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.45
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.43
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.36
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.63

--------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     4.53
```



```
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     2.72

--------------------------------------------------------------------------
```

```
============================================================================

                         2 4 - H O U R   S T O R M
                     R U N O F F   H Y D R O G R A P H

============================================================================
               HYDROGRAPH IN  ONE-MINUTE UNIT INTERVALS(CFS)
        (Notes: Time indicated is at END of Each Unit Intervals.
                Peak 5-minute rainfall intensity is modeled as
                a constant value for entire 5-minute period.)
----------------------------------------------------------------------------
 TIME(HRS) VOLUME(AF)    Q(CFS) 0.        8.7       17.5      26.2      34.9
----------------------------------------------------------------------------
  15.800      2.2213       7.16 .       Q .        V.         .         .
  15.817      2.2313       7.29 .       Q .        V.         .         .
  15.833      2.2415       7.42 .       Q .        V.         .         .
  15.850      2.2520       7.56 .       Q .        V.         .         .
  15.867      2.2625       7.69 .       Q .        V.         .         .
  15.883      2.2733       7.82 .       Q .         V         .         .
  15.900      2.2843       7.95 .        Q.         V         .         .
  15.917      2.2954       8.09 .        Q.         V         .         .
  15.933      2.3067       8.22 .        Q.         V         .         .
  15.950      2.3182       8.35 .        Q.         V         .         .
  15.967      2.3299       8.49 .        Q.         V         .         .
  15.983      2.3418       8.62 .        Q.         V         .         .
  16.000      2.3538       8.75 .         Q         V         .         .
  16.017      2.3669       9.49 .         Q         V         .         .
  16.033      2.3818      10.83 .         . Q       .V        .         .
  16.050      2.3986      12.17 .         .  Q      .V        .         .
  16.067      2.4172      13.51 .         .    Q    .V        .         .
  16.083      2.4376      14.84 .         .      Q  .V        .         .
  16.100      2.4599      16.18 .         .       Q .V        .         .
  16.117      2.4841      17.52 .         .         QV        .         .
  16.133      2.5100      18.86 .         .         .QV       .         .
  16.150      2.5379      20.20 .         .         . VQ      .         .
  16.167      2.5675      21.54 .         .         . V Q     .         .
  16.183      2.5991      22.88 .         .         . V   Q   .         .
  16.200      2.6324      24.22 .         .         .  V   Q  .         .
  16.217      2.6676      25.56 .         .         .  V     Q.         .
  16.233      2.7047      26.90 .         .         .  V      Q         .
  16.250      2.7436      28.24 .         .         .   V     . Q       .
  16.267      2.7843      29.58 .         .         .   V     .  Q      .
  16.283      2.8269      30.92 .         .         .   V     .    Q    .
  16.300      2.8713      32.26 .         .         .    V    .     Q   .
  16.317      2.9176      33.59 .         .         .    V    .       Q .
  16.333      2.9657      34.92 .         .         .     V   .         Q
  16.350      3.0117      33.41 .         .         .     V   .       Q .
  16.367      3.0557      31.92 .         .         .     V   .     Q   .
  16.383      3.0976      30.42 .         .         .      V  .   Q     .
  16.400      3.1374      28.93 .         .         .      V  .  Q      .
  16.417      3.1752      27.43 .         .         .       V .Q        .
  16.433      3.2109      25.94 .         .         .       VQ.         .
  16.450      3.2446      24.44 .         .         .       Q .         .
  16.467      3.2762      22.95 .         .         .     Q V .         .
  16.483      3.3058      21.46 .         .         .   Q    V.         .
  16.500      3.3333      19.96 .         .         . Q      V.         .
  16.517      3.3587      18.47 .         .         .Q       V.         .
  16.533      3.3821      16.97 .         .        Q.       V.         .
```



```
  16.550      3.4034      15.48 .         .      Q  .         V         .
  16.567      3.4227      13.98 .         .     Q   .         V         .
  16.583      3.4399      12.49 .         .   Q     .         V         .
  16.600      3.4550      10.99 .         . Q       .         V         .
  16.617      3.4681       9.50 .         Q         .         V         .
  16.633      3.4791       8.01 .        Q.         .         V         .
  16.650      3.4881       6.51 .      Q  .         .         V         .
  16.667      3.4960       5.75 .     Q   .         .         V         .
  16.683      3.5038       5.67 .     Q   .         .         V         .
  16.700      3.5115       5.59 .     Q   .         .         .V        .
  16.717      3.5191       5.51 .     Q   .         .         .V        .
  16.733      3.5266       5.43 .     Q   .         .         .V        .
  16.750      3.5340       5.35 .     Q   .         .         .V        .
  16.767      3.5412       5.26 .     Q   .         .         .V        .
  16.783      3.5484       5.18 .    Q    .         .         .V        .
  16.800      3.5554       5.10 .    Q    .         .         .V        .
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                =========
              0%                             1009.0
             10%                              905.0
             20%                              260.0
             30%                              175.0
             40%                              150.0
             50%                              125.0
             60%                              100.0
             70%                               75.0
             80%                               50.0
             90%                               25.0


 ****************************************************************************
   FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE = 3.2
 ----------------------------------------------------------------------------
   >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
 ============================================================================

                   INFLOW
                 (STREAM 1)
                      |
                      |
                      V                __effective depth
                -----------            |   (and volume)
               |           |    |      |
               |           |    |....V........
               | detention |<-->|            outflow
               |   basin   |    |.........________
                -----------     |    ^    |  \
                      |         |  dead   |   basin outlet
                      V         | storage |
                   OUTFLOW       ---------
                 (STREAM 1)
```

ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	11.03	0.180
3	2.00	15.60	0.410
4	3.00	19.10	0.690

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	7.29	0.00	0.57	6.2	0.102
15.833	0.000	7.42	0.00	0.58	6.3	0.104
15.850	0.000	7.56	0.00	0.58	6.4	0.105
15.867	0.000	7.69	0.00	0.59	6.5	0.107
15.883	0.000	7.82	0.00	0.60	6.6	0.109
15.900	0.000	7.95	0.00	0.61	6.7	0.110
15.917	0.000	8.09	0.00	0.62	6.8	0.112
15.933	0.000	8.22	0.00	0.63	6.9	0.114
15.950	0.000	8.35	0.00	0.64	7.0	0.116
15.967	0.000	8.49	0.00	0.65	7.1	0.117
15.983	0.000	8.62	0.00	0.66	7.3	0.119
16.000	0.000	8.75	0.00	0.67	7.4	0.121
16.017	0.000	9.49	0.00	0.69	7.5	0.124
16.033	0.000	10.83	0.00	0.71	7.7	0.128
16.050	0.000	12.17	0.00	0.74	8.0	0.134
16.067	0.000	13.51	0.00	0.78	8.4	0.141
16.083	0.000	14.84	0.00	0.83	8.9	0.149
16.100	0.000	16.18	0.00	0.88	9.4	0.158
16.117	0.000	17.52	0.00	0.94	10.0	0.169
16.133	0.000	18.86	0.00	1.00	10.7	0.180
16.150	0.000	20.20	0.00	1.05	11.2	0.193
16.167	0.000	21.54	0.00	1.11	11.4	0.206
16.183	0.000	22.88	0.00	1.18	11.7	0.222
16.200	0.000	24.22	0.00	1.25	12.0	0.239
16.217	0.000	25.56	0.00	1.33	12.4	0.257
16.233	0.000	26.90	0.00	1.42	12.7	0.276
16.250	0.000	28.24	0.00	1.51	13.1	0.297
16.267	0.000	29.58	0.00	1.60	13.6	0.319

16.283	0.000	30.92	0.00	1.71	14.0	0.342
16.300	0.000	32.26	0.00	1.81	14.5	0.367
16.317	0.000	33.59	0.00	1.92	15.0	0.392
16.333	0.000	34.92	0.00	2.03	15.5	0.419
16.350	0.000	33.41	0.00	2.12	15.9	0.443
16.367	0.000	31.92	0.00	2.20	16.2	0.465
16.383	0.000	30.42	0.00	2.27	16.4	0.484
16.400	0.000	28.93	0.00	2.33	16.6	0.501
16.417	0.000	27.43	0.00	2.38	16.8	0.516
16.433	0.000	25.94	0.00	2.42	17.0	0.528
16.450	0.000	24.44	0.00	2.46	17.1	0.538
16.467	0.000	22.95	0.00	2.49	17.3	0.546
16.483	0.000	21.46	0.00	2.51	17.3	0.552
16.500	0.000	19.96	0.00	2.52	17.4	0.555
16.517	0.000	18.47	0.00	2.52	17.4	0.557
16.533	0.000	16.97	0.00	2.52	17.4	0.556
16.550	0.000	15.48	0.00	2.51	17.4	0.553
16.567	0.000	13.98	0.00	2.50	17.4	0.549
16.583	0.000	12.49	0.00	2.47	17.3	0.542
16.600	0.000	10.99	0.00	2.44	17.2	0.534
16.617	0.000	9.50	0.00	2.40	17.1	0.523
16.633	0.000	8.01	0.00	2.36	16.9	0.511
16.650	0.000	6.51	0.00	2.31	16.8	0.497
16.667	0.000	5.75	0.00	2.26	16.6	0.482
16.683	0.000	5.67	0.00	2.20	16.4	0.467
16.700	0.000	5.59	0.00	2.15	16.2	0.452
16.717	0.000	5.51	0.00	2.10	16.0	0.438
16.733	0.000	5.43	0.00	2.05	15.9	0.424
16.750	0.000	5.35	0.00	2.00	15.7	0.409
16.767	0.000	5.26	0.00	1.94	15.4	0.395
16.783	0.000	5.18	0.00	1.88	15.2	0.382
16.800	0.000	5.10	0.00	1.82	14.9	0.368

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 4.527 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 4.527 AF
LOSS VOLUME = 0.000 AF

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 4

>>>>>MODEL PIPEFLOW ROUTING OF STREAM #1<<<<<

MODEL PIPEFLOW ROUTING OF STREAM 1 WHERE
STORAGE EFFECTS ARE NEGLECTED WITHIN THE PIPE, FLOW
VELOCITIES ARE ESTIMATED BY ASSUMING STEADY FLOW FOR
EACH UNIT INTERVAL(NORMAL DEPTH, Dn), AND FLOWS IN EXCESS
OF (.82)(DIAMETER) ARE PONDED AT THE UPSTREAM INLET:
UNIT INTERVAL FLOW VELOCITY COMPUTED USING Dn UP TO
(0.938)(DIAMETER):

PIPELENGTH(FT) = 142.00 MANNINGS FACTOR = 0.013
UPSTREAM ELEVATION(FT) = 838.00

DOWNSTREAM ELEVATION(FT) = 836.00
PIPE DIAMETER(FT) = 2.00

NORMAL DEPTH VELOCITY PIPE ROUTING RESULTS:

TIME (HRS)	INFLOW (CFS)	VELOCITY (FPS)	OUTFLOW (CFS)	UPSTREAM PONDING(AF)
15.800	6.12	6.91	6.10	0.000
15.817	6.21	6.94	6.19	0.000
15.833	6.30	6.97	6.28	0.000
15.850	6.40	7.01	6.37	0.000
15.867	6.50	7.04	6.47	0.000
15.883	6.60	7.07	6.57	0.000
15.900	6.70	7.11	6.68	0.000
15.917	6.81	7.14	6.78	0.000
15.933	6.92	7.17	6.89	0.000
15.950	7.03	7.21	7.00	0.000
15.967	7.14	7.24	7.12	0.000
15.983	7.26	7.28	7.23	0.000
16.000	7.37	7.31	7.35	0.000
16.017	7.51	7.36	7.48	0.000
16.033	7.73	7.42	7.68	0.000
16.050	8.03	7.51	7.97	0.000
16.067	8.42	7.60	8.33	0.000
16.083	8.89	7.69	8.78	0.000
16.100	9.42	7.80	9.30	0.000
16.117	10.03	7.93	9.89	0.000
16.133	10.69	8.06	10.54	0.000
16.150	11.15	8.14	11.05	0.000
16.167	11.42	8.18	11.36	0.000
16.183	11.71	8.23	11.64	0.000
16.200	12.03	8.28	11.96	0.000
16.217	12.38	8.35	12.30	0.000
16.233	12.75	8.42	12.67	0.000
16.250	13.15	8.49	13.07	0.000
16.267	13.57	8.57	13.49	0.000
16.283	14.02	8.64	13.93	0.000
16.300	14.50	8.72	14.40	0.000
16.317	15.00	8.79	14.89	0.000
16.333	15.48	8.85	15.38	0.000
16.350	15.87	8.90	15.79	0.000
16.367	16.15	8.93	16.09	0.000
16.383	16.41	8.96	16.35	0.000
16.400	16.64	8.98	16.59	0.000
16.417	16.83	9.00	16.79	0.000
16.433	17.00	9.02	16.96	0.000
16.450	17.14	9.03	17.11	0.000
16.467	17.25	9.04	17.23	0.000
16.483	17.34	9.05	17.32	0.000
16.500	17.39	9.05	17.38	0.000
16.517	17.43	9.06	17.42	0.000
16.533	17.43	9.06	17.43	0.000
16.550	17.41	9.05	17.41	0.000
16.567	17.36	9.05	17.37	0.000
16.583	17.29	9.04	17.31	0.000
16.600	17.20	9.03	17.22	0.000

16.617	17.08	9.02	17.11	0.000
16.633	16.94	9.01	16.97	0.000
16.650	16.77	8.99	16.81	0.000
16.667	16.59	8.98	16.63	0.000
16.683	16.41	8.96	16.45	0.000
16.700	16.22	8.94	16.26	0.000
16.717	16.04	8.92	16.08	0.000
16.733	15.86	8.90	15.90	0.000
16.750	15.68	8.88	15.72	0.000
16.767	15.45	8.85	15.50	0.000
16.783	15.17	8.81	15.23	0.000
16.800	14.90	8.78	14.96	0.000

****
FLOW PROCESS FROM NODE 11.00 TO NODE 13.00 IS CODE = 1.2

>>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==========

(SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #2)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 7.65
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.278
LOW LOSS FRACTION = 0.345
TIME OF CONCENTRATION(MIN.) = 9.51
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.52
30-MINUTE POINT RAINFALL VALUE(INCHES) = 1.09
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.45
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.43
6-HOUR POINT RAINFALL VALUE(INCHES) = 3.36
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.63

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 2.24
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 1.35

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 6.9 13.8 20.7 27.5
15.800	1.1333	4.63	. Q . V . .
15.817	1.1400	4.83	. Q . V . .
15.833	1.1469	5.03	. Q . V . .
15.850	1.1542	5.25	. Q . V . .
15.867	1.1618	5.52	. Q . V . .
15.883	1.1697	5.79	. Q . V . .
15.900	1.1781	6.06	. Q . .V . .
15.917	1.1868	6.34	. Q. .V . .
15.933	1.1959	6.61	. Q. .V . .
15.950	1.2054	6.89	. Q .V . .
15.967	1.2153	7.16	. Q .V . .
15.983	1.2255	7.44	. Q .V . .
16.000	1.2362	7.71	. .Q . V . .
16.017	1.2484	8.89	. . Q . V . .
16.033	1.2635	10.96	. . Q . V . .
16.050	1.2814	13.03	. . Q . V . .
16.067	1.3022	15.10	. . .Q V . .
16.083	1.3259	17.17	. . . VQ . .
16.100	1.3524	19.24	. . . V Q . .
16.117	1.3817	21.31	. . . V Q .
16.133	1.4140	23.38	. . . V . Q .
16.150	1.4490	25.45	. . . V . Q .
16.167	1.4869	27.54	. . . V . Q
16.183	1.5215	25.09	. . . V . Q .
16.200	1.5526	22.60	. . . V . Q .
16.217	1.5803	20.12	. . . VQ. .
16.233	1.6046	17.63	. . . Q V . .
16.250	1.6255	15.15	. . .Q V. .
16.267	1.6429	12.66	. . Q . V. .
16.283	1.6570	10.18	. . Q . V. .
16.300	1.6676	7.70	. .Q . V. .
16.317	1.6747	5.21	. Q . . V. .
16.333	1.6801	3.87	. Q . . V .
16.350	1.6853	3.76	. Q . . V .
16.367	1.6903	3.66	. Q . . V .
16.383	1.6952	3.55	. Q . . V .
16.400	1.6999	3.44	. Q . . V .
16.417	1.7045	3.34	. Q . . V .
16.433	1.7090	3.23	. Q . . V .
16.450	1.7133	3.13	. Q . . V .
16.467	1.7174	3.02	. Q . . V .
16.483	1.7215	2.92	. Q . . V .
16.500	1.7254	2.87	. Q . . V .
16.517	1.7293	2.82	. Q . . V .
16.533	1.7331	2.77	. Q . . V .

16.550	1.7369	2.73	.	Q	.	.	.V	.
16.567	1.7406	2.68	.	Q	.	.	.V	.
16.583	1.7442	2.64	.	Q	.	.	.V	.
16.600	1.7478	2.59	.	Q	.	.	.V	.
16.617	1.7513	2.55	.	Q	.	.	.V	.
16.633	1.7547	2.50	.	Q	.	.	.V	.
16.650	1.7581	2.46	.	Q	.	.	.V	.
16.667	1.7614	2.42	.	Q	.	.	.V	.
16.683	1.7647	2.39	.	Q	.	.	.V	.
16.700	1.7680	2.35	.	Q	.	.	.V	.
16.717	1.7712	2.32	.	Q	.	.	.V	.
16.733	1.7743	2.28	.	Q	.	.	.V	.
16.750	1.7774	2.25	.	Q	.	.	.V	.
16.767	1.7805	2.21	.	Q	.	.	.V	.
16.783	1.7834	2.18	.	Q	.	.	.V	.
16.800	1.7864	2.14	.	Q	.	.	.V	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	365.0
20%	135.0
30%	85.0
40%	70.0
50%	60.0
60%	50.0
70%	35.0
80%	25.0
90%	15.0

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 7

>>>>>STREAM NUMBER 2 ADDED TO STREAM NUMBER 1<<<<<

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 10.0 20.0 30.0 40.0
15.800	3.2512	10.72	. Q V. . .
15.817	3.2663	11.02	. .Q V. . .

```
 15.833      3.2819     11.31  .         .Q       V.         .         .
 15.850      3.2979     11.62  .         .Q       V.         .         .
 15.867      3.3144     11.99  .         .Q       V.         .         .
 15.883      3.3315     12.36  .         . Q      V.         .         .
 15.900      3.3490     12.74  .         . Q      V.         .         .
 15.917      3.3671     13.12  .         .  Q     V.         .         .
 15.933      3.3857     13.51  .         .  Q      V         .         .
 15.950      3.4049     13.89  .         .  Q      V         .         .
 15.967      3.4245     14.28  .         .   Q     V         .         .
 15.983      3.4447     14.67  .         .   Q     V         .         .
 16.000      3.4655     15.06  .         .    Q    V         .         .
 16.017      3.4880     16.37  .         .     Q   V         .         .
 16.033      3.5137     18.64  .         .      Q V         .         .
 16.050      3.5426     21.00  .         .       Q          .         .
 16.067      3.5749     23.43  .         .        .V Q      .         .
 16.083      3.6106     25.95  .         .        .V   Q    .         .
 16.100      3.6499     28.54  .         .        .V      Q .         .
 16.117      3.6929     31.20  .         .        .V        .Q        .
 16.133      3.7396     33.93  .         .        . V       .  Q      .
 16.150      3.7899     36.50  .         .        . V       .    Q    .
 16.167      3.8435     38.90  .         .        . V       .      Q  .
 16.183      3.8941     36.73  .         .        .  V      .    Q    .
 16.200      3.9417     34.56  .         .        .  V      .   Q     .
 16.217      3.9864     32.42  .         .        .  V      . Q       .
 16.233      4.0281     30.31  .         .        .  V      Q         .
 16.250      4.0670     28.22  .         .        .   V   Q .         .
 16.267      4.1030     26.15  .         .        .   V Q   .         .
 16.283      4.1362     24.11  .         .        .   Q     .         .
 16.300      4.1666     22.10  .         .        . Q V     .         .
 16.317      4.1943     20.11  .         .        Q   V     .         .
 16.333      4.2209     19.25  .         .       Q.   V     .         .
 16.350      4.2478     19.55  .         .       Q.    V    .         .
 16.367      4.2750     19.75  .         .       Q.    V    .         .
 16.383      4.3024     19.90  .         .       Q.    V    .         .
 16.400      4.3300     20.03  .         .        Q    V    .         .
 16.417      4.3577     20.13  .         .        Q    V    .         .
 16.433      4.3855     20.20  .         .        Q    V    .         .
 16.450      4.4134     20.24  .         .        Q     V   .         .
 16.467      4.4413     20.25  .         .        Q     V   .         .
 16.483      4.4692     20.24  .         .        Q     V   .         .
 16.500      4.4971     20.25  .         .        Q     V   .         .
 16.517      4.5250     20.24  .         .        Q     V   .         .
 16.533      4.5528     20.20  .         .        Q     V   .         .
 16.550      4.5805     20.14  .         .        Q      V  .         .
 16.567      4.6082     20.06  .         .        Q      V  .         .
 16.583      4.6356     19.95  .         .       Q.      V  .         .
 16.600      4.6629     19.81  .         .       Q.      V  .         .
 16.617      4.6900     19.65  .         .       Q.      V  .         .
 16.633      4.7168     19.47  .         .       Q.      V  .         .
 16.650      4.7433     19.27  .         .       Q.       V .         .
 16.667      4.7696     19.05  .         .       Q.       V .         .
 16.683      4.7955     18.83  .         .      Q .       V .         .
 16.700      4.8212     18.61  .         .      Q .       V .         .
 16.717      4.8465     18.40  .         .      Q .       V .         .
 16.733      4.8715     18.18  .         .      Q .       V .         .
 16.750      4.8963     17.96  .         .     Q  .       V .         .
 16.767      4.9207     17.71  .         .     Q  .        V.         .
 16.783      4.9446     17.41  .         .     Q  .        V.         .
```



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 16.800      4.9682     17.10  .         .      Q  .        V.         .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	1009.0
20%	555.0
30%	380.0
40%	265.0
50%	175.0
60%	70.0
70%	50.0
80%	35.0
90%	15.0

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FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<

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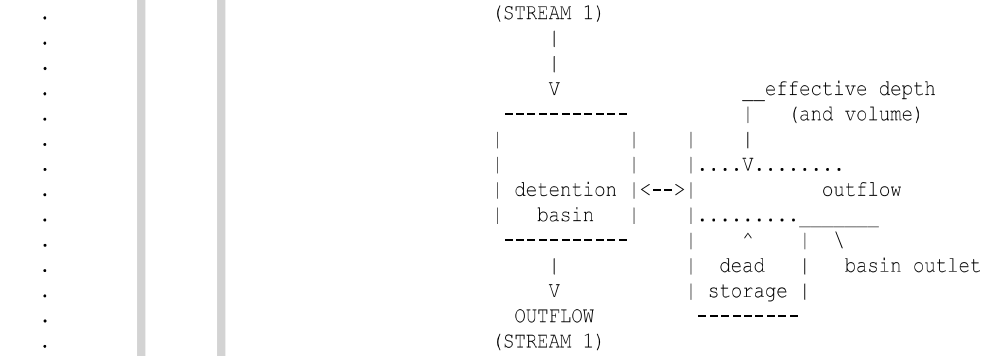

ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)

1	0.00	0.00	0.000
2	1.00	15.88	0.260
3	2.00	22.46	0.590
4	3.00	27.51	0.970

==========

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	11.02	0.00	0.57	9.0	0.149
15.833	0.000	11.31	0.00	0.58	9.2	0.152
15.850	0.000	11.62	0.00	0.60	9.4	0.155
15.867	0.000	11.99	0.00	0.61	9.6	0.158
15.883	0.000	12.36	0.00	0.62	9.8	0.162
15.900	0.000	12.74	0.00	0.64	10.0	0.166
15.917	0.000	13.12	0.00	0.65	10.2	0.170
15.933	0.000	13.51	0.00	0.67	10.5	0.174
15.950	0.000	13.89	0.00	0.68	10.7	0.178
15.967	0.000	14.28	0.00	0.70	11.0	0.183
15.983	0.000	14.67	0.00	0.72	11.3	0.187
16.000	0.000	15.06	0.00	0.74	11.6	0.192
16.017	0.000	16.37	0.00	0.76	11.9	0.198
16.033	0.000	18.64	0.00	0.80	12.4	0.207
16.050	0.000	21.00	0.00	0.84	13.0	0.218
16.067	0.000	23.43	0.00	0.89	13.7	0.231
16.083	0.000	25.95	0.00	0.95	14.6	0.247
16.100	0.000	28.54	0.00	1.01	15.5	0.265
16.117	0.000	31.20	0.00	1.08	16.2	0.285
16.133	0.000	33.93	0.00	1.15	16.6	0.309
16.150	0.000	36.50	0.00	1.23	17.1	0.336
16.167	0.000	38.90	0.00	1.32	17.7	0.365
16.183	0.000	36.73	0.00	1.40	18.2	0.391
16.200	0.000	34.56	0.00	1.46	18.7	0.413
16.217	0.000	32.42	0.00	1.52	19.1	0.431
16.233	0.000	30.31	0.00	1.56	19.4	0.446
16.250	0.000	28.22	0.00	1.60	19.7	0.458
16.267	0.000	26.15	0.00	1.62	19.9	0.466
16.283	0.000	24.11	0.00	1.64	20.0	0.472
16.300	0.000	22.10	0.00	1.65	20.1	0.475
16.317	0.000	20.11	0.00	1.65	20.2	0.474
16.333	0.000	19.25	0.00	1.65	20.1	0.473
16.350	0.000	19.55	0.00	1.64	20.1	0.472
16.367	0.000	19.75	0.00	1.64	20.1	0.472
16.383	0.000	19.90	0.00	1.64	20.1	0.472
16.400	0.000	20.03	0.00	1.64	20.1	0.472
16.417	0.000	20.13	0.00	1.64	20.1	0.472
16.433	0.000	20.20	0.00	1.64	20.1	0.472
16.450	0.000	20.24	0.00	1.64	20.1	0.472
16.467	0.000	20.25	0.00	1.64	20.1	0.472
16.483	0.000	20.24	0.00	1.64	20.1	0.472
16.500	0.000	20.25	0.00	1.64	20.1	0.472
16.517	0.000	20.24	0.00	1.64	20.1	0.473

16.533	0.000	20.20	0.00	1.64	20.1	0.473
16.550	0.000	20.14	0.00	1.64	20.1	0.473
16.567	0.000	20.06	0.00	1.64	20.1	0.473
16.583	0.000	19.95	0.00	1.64	20.1	0.472
16.600	0.000	19.81	0.00	1.64	20.1	0.472
16.617	0.000	19.65	0.00	1.64	20.1	0.471
16.633	0.000	19.47	0.00	1.64	20.1	0.471
16.650	0.000	19.27	0.00	1.63	20.1	0.469
16.667	0.000	19.05	0.00	1.63	20.0	0.468
16.683	0.000	18.83	0.00	1.63	20.0	0.466
16.700	0.000	18.61	0.00	1.62	20.0	0.465
16.717	0.000	18.40	0.00	1.61	19.9	0.462
16.733	0.000	18.18	0.00	1.61	19.9	0.460
16.750	0.000	17.96	0.00	1.60	19.8	0.458
16.767	0.000	17.71	0.00	1.59	19.8	0.455
16.783	0.000	17.41	0.00	1.58	19.7	0.451
16.800	0.000	17.10	0.00	1.57	19.7	0.448

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 6.765 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 6.765 AF
LOSS VOLUME = 0.000 AF

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FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

==========

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	7.5	15.0	22.5	30.0
15.800	3.1050	8.85	.	.Q	V .	.	.
15.817	3.1174	9.01	.	. Q	V .	.	.
15.833	3.1301	9.18	.	. Q	V .	.	.
15.850	3.1430	9.37	.	. Q	V .	.	.
15.867	3.1562	9.56	.	. Q	V .	.	.
15.883	3.1696	9.78	.	. Q	V .	.	.
15.900	3.1834	10.00	.	. Q	V .	.	.
15.917	3.1975	10.24	.	. Q	V .	.	.
15.933	3.2120	10.49	.	. Q	V .	.	.
15.950	3.2268	10.75	.	. Q	V.	.	.
15.967	3.2419	11.01	.	. Q	V.	.	.
15.983	3.2575	11.29	.	. Q	V.	.	.
16.000	3.2734	11.58	.	. Q	V.	.	.
16.017	3.2899	11.92	.	. Q	V.	.	.
16.033	3.3069	12.37	.	. Q	V.	.	.
16.050	3.3248	12.97	.	. Q	V.	.	.
16.067	3.3436	13.71	.	. QV.	.	.	.
16.083	3.3638	14.60	.	. Q.	.	.	.
16.100	3.3851	15.53	.	. Q	.	.	.
16.117	3.4074	16.18	.	. VQ	.	.	.

```
16.133      3.4303     16.63  .         .         V Q       .         .
16.150      3.4539     17.13  .         .         V Q       .         .
16.167      3.4783     17.69  .         .         V  Q      .         .
16.183      3.5034     18.23  .         .         V   Q     .         .
16.200      3.5292     18.70  .         .         V   Q     .         .
16.217      3.5555     19.10  .         .         .V   Q    .         .
16.233      3.5822     19.44  .         .         .V   Q    .         .
16.250      3.6094     19.70  .         .         .V    Q   .         .
16.267      3.6368     19.91  .         .         .V    Q   .         .
16.283      3.6644     20.05  .         .         .V    Q   .         .
16.300      3.6921     20.13  .         .         .V    Q   .         .
16.317      3.7199     20.16  .         .         .V    Q   .         .
16.333      3.7477     20.14  .         .         . V   Q   .         .
16.350      3.7754     20.12  .         .         . V   Q   .         .
16.367      3.8031     20.11  .         .         . V   Q   .         .
16.383      3.8308     20.10  .         .         . V   Q   .         .
16.400      3.8584     20.10  .         .         . V   Q   .         .
16.417      3.8861     20.10  .         .         . V   Q   .         .
16.433      3.9138     20.10  .         .         .  V  Q   .         .
16.450      3.9415     20.10  .         .         .  V  Q   .         .
16.467      3.9692     20.11  .         .         .  V  Q   .         .
16.483      3.9969     20.11  .         .         .  V  Q   .         .
16.500      4.0246     20.11  .         .         .  V  Q   .         .
16.517      4.0523     20.12  .         .         .  V  Q   .         .
16.533      4.0800     20.12  .         .         .   V Q   .         .
16.550      4.1078     20.12  .         .         .   V Q   .         .
16.567      4.1355     20.12  .         .         .   V Q   .         .
16.583      4.1632     20.12  .         .         .   V Q   .         .
16.600      4.1909     20.11  .         .         .   V Q   .         .
16.617      4.2186     20.10  .         .         .   V Q   .         .
16.633      4.2462     20.09  .         .         .    VQ   .         .
16.650      4.2739     20.07  .         .         .    VQ   .         .
16.667      4.3015     20.04  .         .         .    VQ   .         .
16.683      4.3291     20.01  .         .         .    VQ   .         .
16.700      4.3566     19.98  .         .         .    VQ   .         .
16.717      4.3840     19.94  .         .         .    VQ   .         .
16.733      4.4114     19.89  .         .         .     Q   .         .
16.750      4.4388     19.84  .         .         .     Q   .         .
16.767      4.4660     19.79  .         .         .     Q   .         .
16.783      4.4932     19.73  .         .         .     Q   .         .
16.800      4.5203     19.66  .         .         .     Q   .         .
16.817      4.5473     19.59  .         .         .     Q   .         .
16.833      4.5741     19.51  .         .         .     QV  .         .
16.850      4.6009     19.42  .         .         .    Q V  .         .
16.867      4.6275     19.33  .         .         .    Q V  .         .
16.883      4.6540     19.24  .         .         .    Q V  .         .
16.900      4.6804     19.14  .         .         .    Q V  .         .
16.917      4.7066     19.04  .         .         .    Q V  .         .
16.933      4.7327     18.93  .         .         .    Q V  .         .
16.950      4.7586     18.81  .         .         .    Q  V .         .
16.967      4.7844     18.70  .         .         .   Q   V .         .
16.983      4.8099     18.58  .         .         .   Q   V .         .
17.000      4.8354     18.46  .         .         .   Q   V .         .
17.017      4.8606     18.33  .         .         .   Q   V .         .
17.033      4.8857     18.20  .         .         .   Q   V .         .
17.050      4.9106     18.07  .         .         .   Q    V.         .
17.067      4.9353     17.94  .         .         .  Q     V.         .
17.083      4.9598     17.80  .         .         .  Q     V.         .
```



```
17.100      4.9841     17.65  .         .         .  Q     V.         .
17.117      5.0082     17.50  .         .         .  Q     V.         .
17.133      5.0321     17.34  .         .         .  Q     V.         .
17.150      5.0557     17.16  .         .         . Q      V.         .
17.167      5.0791     16.98  .         .         . Q       V         .
17.183      5.1023     16.80  .         .         . Q       V         .
17.200      5.1251     16.60  .         .         . Q       V         .
17.217      5.1477     16.41  .         .         .Q        V         .
17.233      5.1701     16.21  .         .         .Q        V         .
17.250      5.1921     16.00  .         .         .Q        V         .
17.267      5.2136     15.61  .         .         Q         V         .
17.283      5.2343     15.02  .         .         Q         V         .
17.300      5.2542     14.44  .         .        Q.         .V        .
17.317      5.2733     13.89  .         .       Q .         .V        .
17.333      5.2917     13.37  .         .      Q  .         .V        .
17.350      5.3094     12.87  .         .      Q  .         .V        .
17.367      5.3265     12.39  .         .     Q   .         .V        .
17.383      5.3430     11.94  .         .    Q    .         .V        .
17.400      5.3588     11.51  .         .    Q    .         .V        .
17.417      5.3741     11.10  .         .   Q     .         .V        .
17.433      5.3889     10.72  .         .   Q     .         .V        .
17.450      5.4031     10.35  .         .  Q      .         .V        .
17.467      5.4169     10.01  .         .  Q      .         .  V      .
17.483      5.4303      9.68  .         . Q       .         .  V      .
17.500      5.4432      9.37  .         . Q       .         .  V      .
17.517      5.4557      9.07  .         . Q       .         .  V      .
17.533      5.4678      8.79  .         .Q        .         .  V      .
17.550      5.4795      8.53  .         .Q        .         .  V      .
17.567      5.4909      8.28  .         .Q        .         .  V      .
17.583      5.5020      8.04  .         Q         .         .  V      .
17.600      5.5128      7.82  .         Q         .         .  V      .
17.617      5.5232      7.61  .         Q         .         .  V      .
17.633      5.5334      7.40  .        Q.         .         .  V      .
17.650      5.5434      7.21  .        Q.         .         .  V      .
17.667      5.5531      7.03  .        Q.         .         .  V      .
17.683      5.5625      6.86  .        Q.         .         .  V      .
17.700      5.5717      6.70  .       Q .         .         .  V      .
17.717      5.5808      6.55  .       Q .         .         .  V      .
17.733      5.5896      6.40  .       Q .         .         .   V     .
17.750      5.5982      6.26  .       Q .         .         .   V     .
17.767      5.6066      6.13  .       Q .         .         .   V     .
17.783      5.6149      6.01  .       Q .         .         .   V     .
17.800      5.6230      5.89  .      Q  .         .         .   V     .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1069.0
10%	1069.0
20%	1069.0
30%	830.0
40%	565.0
50%	465.0
60%	405.0

70%	370.0
80%	340.0
90%	260.0

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END OF FLOODSCx ROUTING ANALYSIS

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******************************************************************************

              F L O O D    R O U T I N G    A N A L Y S I S
              USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
          (c) Copyright 1989-2017 Advanced Engineering Software (aes)
              Ver. 21.1  Release Date: 01/17/2017  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREA C  10-YEAR HC PROPOSED CONDITION                                 *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKC10.DAT
  TIME/DATE OF STUDY: 20:53 12/03/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


******************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     23.00 IS CODE = 1.2
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==============================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    5.25
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.120
    LOW LOSS FRACTION = 0.390
    TIME OF CONCENTRATION(MIN.) =  9.33
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.34
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.72
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.95
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.59
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.20
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.68

------------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.98
```



```
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.63

------------------------------------------------------------------------------
```

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 3.2 6.4 9.6 12.8
15.800	0.4868	2.38	. Q . V. . .
15.817	0.4902	2.50	. Q . V. . .
15.833	0.4938	2.61	. Q . V . .
15.850	0.4976	2.73	. Q . V . .
15.867	0.5015	2.86	. Q . V . .
15.883	0.5056	2.99	. Q. V . .
15.900	0.5099	3.12	. Q. V . .
15.917	0.5144	3.24	. Q V . .
15.933	0.5190	3.37	. Q .V . .
15.950	0.5239	3.50	. Q .V . .
15.967	0.5289	3.63	. .Q .V . .
15.983	0.5340	3.76	. .Q .V . .
16.000	0.5394	3.89	. . Q .V . .
16.017	0.5455	4.43	. . Q . V . .
16.033	0.5529	5.38	. . Q . V . .
16.050	0.5616	6.33	. . Q. V . .
16.067	0.5717	7.29	. . . QV . .
16.083	0.5830	8.24	. . . V Q . .
16.100	0.5957	9.20	. . . V Q . .
16.117	0.6097	10.15	. . . V .Q .
16.133	0.6250	11.10	. . . V . Q .
16.150	0.6416	12.06	. . . V . Q .
16.167	0.6593	12.85	. . . V . Q
16.183	0.6751	11.49	. . . V . Q .
16.200	0.6893	10.34	. . . V . Q .
16.217	0.7020	9.18	. . . Q . .
16.233	0.7130	8.02	. . . Q V . .
16.250	0.7225	6.87	. . .Q V. .
16.267	0.7304	5.71	. . Q . V. .
16.283	0.7366	4.55	. . Q . V. .
16.300	0.7413	3.40	. Q . V . .
16.317	0.7445	2.30	. Q . V . .
16.333	0.7472	2.00	. Q . V . .
16.350	0.7499	1.92	. Q . V . .
16.367	0.7524	1.85	. Q . V . .
16.383	0.7549	1.78	. Q . V . .
16.400	0.7573	1.71	. Q . V . .
16.417	0.7595	1.64	. Q . V . .
16.433	0.7617	1.57	. Q . V . .
16.450	0.7638	1.50	. Q . .V . .
16.467	0.7657	1.43	. Q . .V . .
16.483	0.7676	1.38	. Q . .V . .
16.500	0.7695	1.35	. Q . .V . .
16.517	0.7713	1.33	. Q . .V . .
16.533	0.7731	1.30	. Q . .V . .

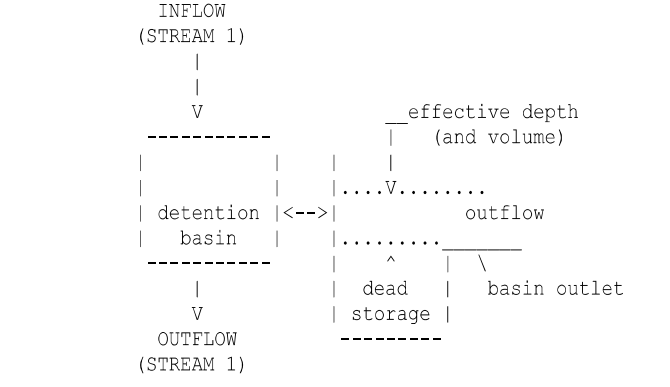
16.550	0.7749	1.27	. Q	.	.	.V .
16.567	0.7766	1.25	. Q	.	.	.V .
16.583	0.7782	1.22	. Q	.	.	.V .
16.600	0.7799	1.19	. Q	.	.	.V .
16.617	0.7815	1.17	. Q	.	.	.V .
16.633	0.7831	1.14	. Q	.	.	.V .
16.650	0.7846	1.11	. Q	.	.	.V .
16.667	0.7861	1.09	. Q	.	.	.V .
16.683	0.7876	1.06	. Q	.	.	.V .
16.700	0.7890	1.04	. Q	.	.	. V .
16.717	0.7904	1.02	. Q	.	.	. V .
16.733	0.7918	0.99	. Q	.	.	. V .
16.750	0.7931	0.97	. Q	.	.	. V .
16.767	0.7944	0.94	. Q	.	.	. V .
16.783	0.7957	0.92	. Q	.	.	. V .
16.800	0.7969	0.90	. Q	.	.	. V .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	380.0
20%	145.0
30%	90.0
40%	75.0
50%	60.0
60%	50.0
70%	40.0
80%	25.0
90%	10.0

FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	0.14	0.090
3	2.10	0.35	0.200
4	4.00	1.96	0.380
5	6.00	4.74	0.560
6	8.10	10.56	0.750
7	10.00	17.22	0.930
8	12.10	25.78	1.130
9	14.00	38.50	1.310

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	2.50	0.00	2.81	0.9	0.267
15.833	0.000	2.61	0.00	2.84	1.0	0.270
15.850	0.000	2.73	0.00	2.86	1.0	0.272
15.867	0.000	2.86	0.00	2.89	1.0	0.275
15.883	0.000	2.99	0.00	2.92	1.0	0.277
15.900	0.000	3.12	0.00	2.95	1.1	0.280
15.917	0.000	3.24	0.00	2.98	1.1	0.283
15.933	0.000	3.37	0.00	3.01	1.1	0.286
15.950	0.000	3.50	0.00	3.04	1.1	0.289
15.967	0.000	3.63	0.00	3.08	1.2	0.293
15.983	0.000	3.76	0.00	3.12	1.2	0.296
16.000	0.000	3.89	0.00	3.16	1.2	0.300
16.017	0.000	4.43	0.00	3.20	1.3	0.304
16.033	0.000	5.38	0.00	3.26	1.3	0.310
16.050	0.000	6.33	0.00	3.33	1.4	0.317
16.067	0.000	7.29	0.00	3.42	1.4	0.325
16.083	0.000	8.24	0.00	3.52	1.5	0.334
16.100	0.000	9.20	0.00	3.63	1.6	0.345
16.117	0.000	10.15	0.00	3.75	1.7	0.356
16.133	0.000	11.10	0.00	3.89	1.8	0.369
16.150	0.000	12.06	0.00	4.03	1.9	0.383
16.167	0.000	12.85	0.00	4.20	2.1	0.398
16.183	0.000	11.49	0.00	4.34	2.3	0.410

16.200	0.000	10.34	0.00	4.46	2.5	0.421
16.217	0.000	9.18	0.00	4.56	2.7	0.430
16.233	0.000	8.02	0.00	4.64	2.8	0.437
16.250	0.000	6.87	0.00	4.70	2.9	0.443
16.267	0.000	5.71	0.00	4.74	3.0	0.447
16.283	0.000	4.55	0.00	4.76	3.0	0.449
16.300	0.000	3.40	0.00	4.77	3.0	0.449
16.317	0.000	2.30	0.00	4.76	3.0	0.448
16.333	0.000	2.00	0.00	4.74	3.0	0.447
16.350	0.000	1.92	0.00	4.73	3.0	0.446
16.367	0.000	1.85	0.00	4.71	3.0	0.444
16.383	0.000	1.78	0.00	4.69	2.9	0.442
16.400	0.000	1.71	0.00	4.67	2.9	0.441
16.417	0.000	1.64	0.00	4.66	2.9	0.439
16.433	0.000	1.57	0.00	4.64	2.9	0.437
16.450	0.000	1.50	0.00	4.62	2.8	0.435
16.467	0.000	1.43	0.00	4.59	2.8	0.434
16.483	0.000	1.38	0.00	4.57	2.8	0.432
16.500	0.000	1.35	0.00	4.55	2.7	0.430
16.517	0.000	1.33	0.00	4.53	2.7	0.428
16.533	0.000	1.30	0.00	4.51	2.7	0.426
16.550	0.000	1.27	0.00	4.49	2.7	0.424
16.567	0.000	1.25	0.00	4.47	2.6	0.422
16.583	0.000	1.22	0.00	4.45	2.6	0.420
16.600	0.000	1.19	0.00	4.43	2.6	0.418
16.617	0.000	1.17	0.00	4.40	2.5	0.416
16.633	0.000	1.14	0.00	4.38	2.5	0.415
16.650	0.000	1.11	0.00	4.36	2.5	0.413
16.667	0.000	1.09	0.00	4.34	2.4	0.411
16.683	0.000	1.06	0.00	4.32	2.4	0.409
16.700	0.000	1.04	0.00	4.30	2.4	0.407
16.717	0.000	1.02	0.00	4.28	2.4	0.405
16.733	0.000	0.99	0.00	4.26	2.3	0.403
16.750	0.000	0.97	0.00	4.24	2.3	0.401
16.767	0.000	0.94	0.00	4.22	2.3	0.400
16.783	0.000	0.92	0.00	4.20	2.2	0.398
16.800	0.000	0.90	0.00	4.18	2.2	0.396

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 0.985 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 0.985 AF
LOSS VOLUME = 0.000 AF

****
FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 11
>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS) VOLUME(AF) Q(CFS) 0. 2.5 5.0 7.5 10.0

```
15.800      0.2216      0.92  .  Q    V .         .         .         .
15.817      0.2229      0.94  .  Q     V.         .         .         .
15.833      0.2242      0.96  .  Q     V.         .         .         .
15.850      0.2255      0.98  .  Q     V.         .         .         .
15.867      0.2269      1.01  .   Q    V.         .         .         .
15.883      0.2284      1.03  .   Q    V.         .         .         .
15.900      0.2298      1.05  .   Q    V.         .         .         .
15.917      0.2313      1.08  .   Q    V.         .         .         .
15.933      0.2328      1.11  .   Q    V.         .         .         .
15.950      0.2344      1.14  .   Q    V.         .         .         .
15.967      0.2360      1.17  .   Q    V.         .         .         .
15.983      0.2376      1.20  .   Q    V.         .         .         .
16.000      0.2393      1.23  .   Q    V.         .         .         .
16.017      0.2411      1.26  .    Q   V.         .         .         .
16.033      0.2429      1.31  .    Q   V.         .         .         .
16.050      0.2448      1.36  .    Q   V.         .         .         .
16.067      0.2467      1.43  .    Q    V         .         .         .
16.083      0.2488      1.51  .     Q   V         .         .         .
16.100      0.2510      1.60  .     Q   V         .         .         .
16.117      0.2533      1.70  .     Q   V         .         .         .
16.133      0.2558      1.81  .      Q  V         .         .         .
16.150      0.2585      1.94  .      Q  V         .         .         .
16.167      0.2614      2.12  .       Q V         .         .         .
16.183      0.2646      2.33  .        QV         .         .         .
16.200      0.2681      2.51  .         Q         .         .         .
16.217      0.2718      2.67  .         QV        .         .         .
16.233      0.2756      2.79  .         .Q        .         .         .
16.250      0.2796      2.89  .         .Q        .         .         .
16.267      0.2837      2.96  .         .Q        .         .         .
16.283      0.2878      3.01  .         .VQ       .         .         .
16.300      0.2920      3.03  .         .VQ       .         .         .
16.317      0.2961      3.02  .         . Q       .         .         .
16.333      0.3003      3.00  .         . Q       .         .         .
16.350      0.3044      2.98  .         .QV       .         .         .
16.367      0.3085      2.96  .         .QV       .         .         .
16.383      0.3125      2.94  .         .QV       .         .         .
16.400      0.3165      2.91  .         .QV       .         .         .
16.417      0.3205      2.88  .         .Q V      .         .         .
16.433      0.3244      2.86  .         .Q V      .         .         .
16.450      0.3283      2.83  .         .Q V      .         .         .
16.467      0.3322      2.80  .         .Q V      .         .         .
16.483      0.3360      2.77  .         .Q V      .         .         .
16.500      0.3398      2.74  .         Q  V      .         .         .
16.517      0.3435      2.71  .         Q  V      .         .         .
16.533      0.3472      2.68  .         Q   V     .         .         .
16.550      0.3509      2.65  .         Q   V     .         .         .
16.567      0.3545      2.62  .         Q   V     .         .         .
16.583      0.3581      2.60  .         Q   V     .         .         .
16.600      0.3616      2.57  .         Q   V     .         .         .
16.617      0.3651      2.54  .         Q   V     .         .         .
16.633      0.3685      2.51  .         Q   V     .         .         .
16.650      0.3720      2.48  .        Q.    V    .         .         .
16.667      0.3753      2.45  .        Q.    V    .         .         .
16.683      0.3787      2.42  .        Q.    V    .         .         .
16.700      0.3820      2.39  .        Q.    V    .         .         .
16.717      0.3852      2.36  .        Q.    V    .         .         .
16.733      0.3884      2.33  .        Q.    V    .         .         .
16.750      0.3916      2.31  .        Q.    V    .         .         .
```



```
16.767      0.3947      2.28  .        Q.    V    .         .         .
16.783      0.3978      2.25  .       Q .    V    .         .         .
16.800      0.4009      2.22  .       Q .    V    .         .         .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	1009.0
20%	1009.0
30%	860.0
40%	620.0
50%	435.0
60%	300.0
70%	210.0
80%	145.0
90%	85.0

==========

END OF FLOODSCx ROUTING ANALYSIS

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******************************************************************************

              F L O O D   R O U T I N G   A N A L Y S I S
              USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
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                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREA C  25-YEAR HC PROPOSED CONDITION                                 *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKC25.DAT
  TIME/DATE OF STUDY: 21:50 12/03/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


******************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     23.00 IS CODE = 1.2
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==============================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    5.25
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.120
    LOW LOSS FRACTION = 0.361
    TIME OF CONCENTRATION(MIN.) =  9.18
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

------------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.26
```



```
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.71

------------------------------------------------------------------------------
```

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 3.9 7.8 11.6 15.5
15.800	0.6285	3.09	. Q . V . .
15.817	0.6330	3.24	. Q . V . .
15.833	0.6377	3.40	. Q . V . .
15.850	0.6426	3.56	. Q. V . .
15.867	0.6477	3.72	. Q. V . .
15.883	0.6530	3.88	. Q. V . .
15.900	0.6586	4.03	. Q V . .
15.917	0.6644	4.19	. Q .V . .
15.933	0.6704	4.35	. .Q .V . .
15.950	0.6766	4.51	. .Q .V . .
15.967	0.6830	4.67	. . Q .V . .
15.983	0.6897	4.83	. . Q .V . .
16.000	0.6965	4.99	. . Q . V . .
16.017	0.7043	5.64	. . Q . V . .
16.033	0.7136	6.78	. . Q . V . .
16.050	0.7245	7.91	. . Q V . .
16.067	0.7370	9.05	. . . Q . .
16.083	0.7510	10.19	. . . V Q . .
16.100	0.7666	11.33	. . . V Q. .
16.117	0.7838	12.46	. . . V . Q .
16.133	0.8025	13.60	. . . V . Q .
16.150	0.8228	14.74	. . . V . Q .
16.167	0.8442	15.51	. . . V . Q
16.183	0.8630	13.67	. . . V . Q .
16.200	0.8799	12.27	. . . V .Q .
16.217	0.8949	10.87	. . . Q . .
16.233	0.9080	9.48	. . . Q V . .
16.250	0.9191	8.08	. . Q V. .
16.267	0.9283	6.68	. . Q . V. .
16.283	0.9356	5.29	. . Q . V. .
16.300	0.9409	3.89	. Q . V. .
16.317	0.9447	2.76	. Q . . V .
16.333	0.9483	2.58	. Q . . V .
16.350	0.9517	2.49	. Q . . V .
16.367	0.9550	2.39	. Q . . V .
16.383	0.9582	2.29	. Q . . V .
16.400	0.9612	2.20	. Q . . V .
16.417	0.9641	2.10	. Q . . V .
16.433	0.9669	2.01	. Q . . V .
16.450	0.9695	1.91	. Q . . V .
16.467	0.9720	1.82	. Q . . V .
16.483	0.9745	1.79	. Q . . .V .
16.500	0.9769	1.76	. Q . . .V .
16.517	0.9793	1.73	. Q . . .V .
16.533	0.9816	1.70	. Q . . .V .

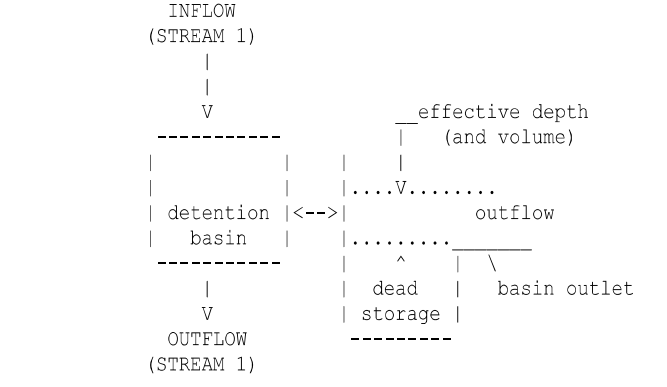
16.550	0.9839	1.68	. Q . . .V .
16.567	0.9862	1.65	. Q . . .V .
16.583	0.9884	1.62	. Q . . .V .
16.600	0.9906	1.59	. Q . . .V .
16.617	0.9928	1.57	. Q . . .V .
16.633	0.9949	1.54	. Q . . .V .
16.650	0.9970	1.50	. Q . . .V .
16.667	0.9990	1.47	. Q . . .V .
16.683	1.0010	1.44	. Q . . .V .
16.700	1.0029	1.41	. Q . . .V .
16.717	1.0048	1.38	. Q . . . V .
16.733	1.0067	1.35	. Q . . . V .
16.750	1.0085	1.32	. Q . . . V .
16.767	1.0103	1.29	. Q . . . V .
16.783	1.0120	1.26	. Q . . . V .
16.800	1.0137	1.24	. Q . . . V .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	440.0
20%	150.0
30%	100.0
40%	75.0
50%	65.0
60%	50.0
70%	40.0
80%	25.0
90%	10.0

FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	0.14	0.090
3	2.10	0.35	0.200
4	4.00	1.96	0.380
5	6.00	4.74	0.560
6	8.10	10.56	0.750
7	10.00	17.22	0.930
8	12.10	25.78	1.130
9	14.00	38.50	1.310

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	3.24	0.00	3.29	1.3	0.313
15.833	0.000	3.40	0.00	3.32	1.4	0.316
15.850	0.000	3.56	0.00	3.35	1.4	0.319
15.867	0.000	3.72	0.00	3.39	1.4	0.322
15.883	0.000	3.88	0.00	3.42	1.5	0.325
15.900	0.000	4.03	0.00	3.46	1.5	0.329
15.917	0.000	4.19	0.00	3.50	1.5	0.332
15.933	0.000	4.35	0.00	3.54	1.6	0.336
15.950	0.000	4.51	0.00	3.58	1.6	0.340
15.967	0.000	4.67	0.00	3.63	1.6	0.345
15.983	0.000	4.83	0.00	3.67	1.7	0.349
16.000	0.000	4.99	0.00	3.72	1.7	0.353
16.017	0.000	5.64	0.00	3.78	1.7	0.359
16.033	0.000	6.78	0.00	3.85	1.8	0.366
16.050	0.000	7.91	0.00	3.94	1.9	0.374
16.067	0.000	9.05	0.00	4.04	2.0	0.384
16.083	0.000	10.19	0.00	4.17	2.1	0.395
16.100	0.000	11.33	0.00	4.30	2.3	0.407
16.117	0.000	12.46	0.00	4.46	2.5	0.421
16.133	0.000	13.60	0.00	4.62	2.7	0.436
16.150	0.000	14.74	0.00	4.80	3.0	0.452
16.167	0.000	15.51	0.00	4.99	3.2	0.469
16.183	0.000	13.67	0.00	5.15	3.4	0.483

16.200	0.000	12.27	0.00	5.28	3.6	0.495
16.217	0.000	10.87	0.00	5.39	3.8	0.505
16.233	0.000	9.48	0.00	5.47	3.9	0.513
16.250	0.000	8.08	0.00	5.53	4.1	0.518
16.267	0.000	6.68	0.00	5.57	4.1	0.522
16.283	0.000	5.29	0.00	5.59	4.2	0.523
16.300	0.000	3.89	0.00	5.59	4.2	0.523
16.317	0.000	2.76	0.00	5.57	4.2	0.521
16.333	0.000	2.58	0.00	5.54	4.1	0.519
16.350	0.000	2.49	0.00	5.52	4.1	0.517
16.367	0.000	2.39	0.00	5.49	4.1	0.514
16.383	0.000	2.29	0.00	5.47	4.0	0.512
16.400	0.000	2.20	0.00	5.44	4.0	0.509
16.417	0.000	2.10	0.00	5.41	3.9	0.507
16.433	0.000	2.01	0.00	5.38	3.9	0.504
16.450	0.000	1.91	0.00	5.35	3.9	0.502
16.467	0.000	1.82	0.00	5.32	3.8	0.499
16.483	0.000	1.79	0.00	5.29	3.8	0.496
16.500	0.000	1.76	0.00	5.26	3.7	0.493
16.517	0.000	1.73	0.00	5.23	3.7	0.491
16.533	0.000	1.70	0.00	5.20	3.6	0.488
16.550	0.000	1.68	0.00	5.17	3.6	0.485
16.567	0.000	1.65	0.00	5.14	3.6	0.483
16.583	0.000	1.62	0.00	5.11	3.5	0.480
16.600	0.000	1.59	0.00	5.08	3.5	0.478
16.617	0.000	1.57	0.00	5.05	3.4	0.475
16.633	0.000	1.54	0.00	5.03	3.4	0.472
16.650	0.000	1.50	0.00	5.00	3.4	0.470
16.667	0.000	1.47	0.00	4.97	3.3	0.467
16.683	0.000	1.44	0.00	4.94	3.3	0.465
16.700	0.000	1.41	0.00	4.91	3.2	0.462
16.717	0.000	1.38	0.00	4.88	3.2	0.460
16.733	0.000	1.35	0.00	4.86	3.2	0.457
16.750	0.000	1.32	0.00	4.83	3.1	0.455
16.767	0.000	1.29	0.00	4.80	3.1	0.452
16.783	0.000	1.26	0.00	4.77	3.1	0.450
16.800	0.000	1.24	0.00	4.75	3.0	0.447

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 1.255 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 1.255 AF
LOSS VOLUME = 0.000 AF

****
FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 11
>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS) VOLUME(AF) Q(CFS) 0. 2.5 5.0 7.5 10.0

```
 15.800      0.3181      1.33  .    Q    V         .         .         .
 15.817      0.3200      1.35  .    Q    V         .         .         .
 15.833      0.3219      1.37  .    Q    V         .         .         .
 15.850      0.3238      1.40  .    Q    V         .         .         .
 15.867      0.3257      1.43  .    Q    V         .         .         .
 15.883      0.3277      1.46  .    Q    V         .         .         .
 15.900      0.3298      1.49  .    Q    V         .         .         .
 15.917      0.3319      1.52  .     Q   V         .         .         .
 15.933      0.3340      1.55  .     Q   V         .         .         .
 15.950      0.3362      1.59  .     Q   V         .         .         .
 15.967      0.3385      1.62  .     Q   V         .         .         .
 15.983      0.3407      1.66  .     Q   V         .         .         .
 16.000      0.3431      1.70  .     Q   V         .         .         .
 16.017      0.3455      1.75  .     Q   .V        .         .         .
 16.033      0.3480      1.80  .      Q  .V        .         .         .
 16.050      0.3505      1.87  .      Q  .V        .         .         .
 16.067      0.3532      1.96  .      Q  .V        .         .         .
 16.083      0.3561      2.10  .       Q .V        .         .         .
 16.100      0.3593      2.29  .        Q.V        .         .         .
 16.117      0.3627      2.49  .        Q.V        .         .         .
 16.133      0.3665      2.71  .         QV        .         .         .
 16.150      0.3705      2.95  .         .Q        .         .         .
 16.167      0.3749      3.21  .         .VQ       .         .         .
 16.183      0.3797      3.45  .         . VQ      .         .         .
 16.200      0.3847      3.65  .         . V Q     .         .         .
 16.217      0.3900      3.81  .         . V  Q    .         .         .
 16.233      0.3954      3.95  .         . V  Q    .         .         .
 16.250      0.4010      4.05  .         . V   Q   .         .         .
 16.267      0.4067      4.12  .         . V   Q   .         .         .
 16.283      0.4124      4.16  .         .  V  Q   .         .         .
 16.300      0.4181      4.17  .         .  V  Q   .         .         .
 16.317      0.4239      4.15  .         .  V  Q   .         .         .
 16.333      0.4295      4.12  .         .  V  Q   .         .         .
 16.350      0.4352      4.09  .         .  V  Q   .         .         .
 16.367      0.4407      4.05  .         .   V Q   .         .         .
 16.383      0.4463      4.02  .         .   V Q   .         .         .
 16.400      0.4517      3.98  .         .   VQ    .         .         .
 16.417      0.4572      3.94  .         .   VQ    .         .         .
 16.433      0.4625      3.90  .         .   VQ    .         .         .
 16.450      0.4679      3.86  .         .   VQ    .         .         .
 16.467      0.4731      3.82  .         .    Q    .         .         .
 16.483      0.4783      3.78  .         .    Q    .         .         .
 16.500      0.4835      3.73  .         .   QV    .         .         .
 16.517      0.4885      3.69  .         .   QV    .         .         .
 16.533      0.4936      3.65  .         .   QV    .         .         .
 16.550      0.4985      3.61  .         .   QV    .         .         .
 16.567      0.5035      3.57  .         .   Q V   .         .         .
 16.583      0.5083      3.53  .         .   Q V   .         .         .
 16.600      0.5131      3.49  .         .  Q  V   .         .         .
 16.617      0.5179      3.45  .         .  Q  V   .         .         .
 16.633      0.5226      3.41  .         .  Q  V   .         .         .
 16.650      0.5272      3.37  .         .  Q  V   .         .         .
 16.667      0.5318      3.33  .         .  Q  V   .         .         .
 16.683      0.5363      3.29  .         .  Q   V  .         .         .
 16.700      0.5408      3.25  .         . Q    V  .         .         .
 16.717      0.5452      3.21  .         . Q    V  .         .         .
 16.733      0.5496      3.17  .         . Q    V  .         .         .
 16.750      0.5539      3.13  .         . Q    V  .         .         .
```



```
 16.767      0.5581      3.09  .         . Q    V  .         .         .
 16.783      0.5623      3.06  .         . Q    V  .         .         .
 16.800      0.5665      3.02  .         . Q     V .         .         .
```

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	1009.0
20%	1009.0
30%	805.0
40%	530.0
50%	365.0
60%	275.0
70%	210.0
80%	145.0
90%	85.0

==========

END OF FLOODSCx ROUTING ANALYSIS

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

              F L O O D    R O U T I N G    A N A L Y S I S
              USING COUNTY HYDROLOGY MANUAL OF ORANGE(1986)
          (c) Copyright 1989-2017 Advanced Engineering Software (aes)
              Ver. 21.1  Release Date: 01/17/2017  License ID 1419

                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* OAK GROVE DEVELOPMENT                                                 *
* AREA C  100-YEAR HC PROPOSED CONDITION                                *
* SMALL AREA HYDROGRAPH MODEL - JULY 2017                               *
 ************************************************************************

  FILE NAME: OAKC100.DAT
  TIME/DATE OF STUDY: 21:09 12/03/2017

   The Small Area Unit Hydrograph Procedures in Section J
   of the Hydrology Manual provides estimates of runoff
   hydrograph and runoff volume for watersheds whose time of
   concentration is less than 25 minutes. The PROGRAM User
   should check the applicability of using the small area unit
   hydrograph procedures, and follow the guidelines in
   Sections J and K.5 in complex watershed modeling.


******************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     23.00 IS CODE = 1.2
------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (SMALL AREA UNIT-HYDROGRAPH ANALYSIS) <<<<<
==============================================================================

  (SMALL AREA UNIT-HYDROGRAPH ADDED TO STREAM #1)

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    5.25
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.120
    LOW LOSS FRACTION = 0.184
    TIME OF CONCENTRATION(MIN.) =  9.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED:
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.52
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.09
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.45
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.43
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.36
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.63

------------------------------------------------------------------------------
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.85
```



```
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.61

------------------------------------------------------------------------------
```

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

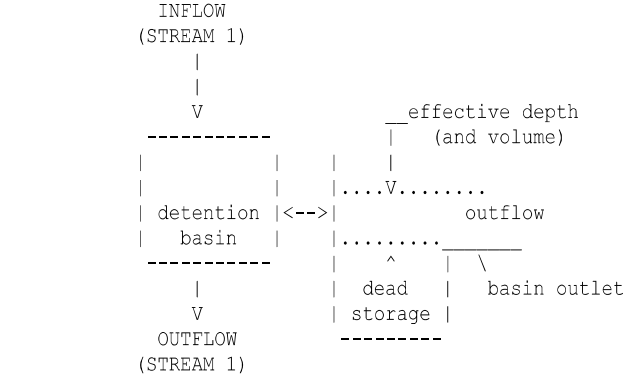
TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 5.1 10.2 15.2 20.3
15.800	0.9686	3.92	. Q . V . .
15.817	0.9743	4.08	. Q . .V . .
15.833	0.9801	4.25	. Q . .V . .
15.850	0.9862	4.42	. Q . .V . .
15.867	0.9925	4.61	. Q. .V . .
15.883	0.9992	4.81	. Q. .V . .
15.900	1.0061	5.02	. Q. .V . .
15.917	1.0133	5.22	. Q .V . .
15.933	1.0208	5.43	. Q . V . .
15.950	1.0285	5.63	. .Q . V . .
15.967	1.0366	5.84	. .Q . V . .
15.983	1.0449	6.05	. .Q . V . .
16.000	1.0535	6.25	. . Q . V . .
16.017	1.0633	7.13	. . Q . V . .
16.033	1.0753	8.68	. . Q . V . .
16.050	1.0894	10.23	. . Q V . .
16.067	1.1056	11.78	. . . Q . .
16.083	1.1240	13.33	. . . V Q . .
16.100	1.1445	14.89	. . . V Q. .
16.117	1.1671	16.44	. . . V . Q .
16.133	1.1919	17.99	. . . V . Q .
16.150	1.2199	20.31	. . . V . Q
16.167	1.2466	19.38	. . . V . Q .
16.183	1.2707	17.52	. . . V . Q .
16.200	1.2923	15.66	. . . V Q .
16.217	1.3113	13.80	. . . QV .
16.233	1.3278	11.94	. . . Q V .
16.250	1.3416	10.08	. . Q. V .
16.267	1.3530	8.22	. . Q . V.
16.283	1.3617	6.36	. . Q . V.
16.300	1.3679	4.50	. Q . . V.
16.317	1.3728	3.51	. Q . . V.
16.333	1.3774	3.38	. Q . . V.
16.350	1.3819	3.26	. Q . . V.
16.367	1.3862	3.13	. Q . . V.
16.383	1.3904	3.01	. Q . . V
16.400	1.3943	2.88	. Q . . V
16.417	1.3982	2.76	. Q . . V
16.433	1.4018	2.63	. Q . . V
16.450	1.4052	2.51	. Q . . V
16.467	1.4086	2.43	. Q . . V
16.483	1.4119	2.40	. Q . . V
16.500	1.4152	2.37	. Q . . V
16.517	1.4184	2.34	. Q . . V
16.533	1.4216	2.31	. Q . . V
16.550	1.4247	2.28	. Q . . V
16.567	1.4278	2.25	. Q . . V
16.583	1.4309	2.22	. Q . . V
16.600	1.4339	2.19	. Q . . V
16.617	1.4369	2.16	. Q . . .V
16.633	1.4398	2.13	. Q . . .V
16.650	1.4427	2.10	. Q . . .V
16.667	1.4455	2.06	. Q . . .V
16.683	1.4483	2.03	. Q . . .V
16.700	1.4511	2.00	. Q . . .V
16.717	1.4538	1.97	. Q . . .V
16.733	1.4565	1.93	. Q . . .V
16.750	1.4591	1.90	. Q . . .V
16.767	1.4617	1.87	. Q . . .V
16.783	1.4642	1.85	. Q . . .V
16.800	1.4667	1.83	. Q . . .V

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1009.0
10%	485.0
20%	150.0
30%	90.0
40%	75.0
50%	60.0
60%	45.0
70%	35.0
80%	25.0
90%	10.0

FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 3.2

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	0.14	0.090
3	2.10	0.35	0.200
4	4.00	1.96	0.380
5	6.00	4.74	0.560
6	8.10	10.56	0.750
7	10.00	17.22	0.930
8	12.10	25.78	1.130
9	14.00	38.50	1.310

==========

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(1-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
15.817	0.000	4.08	0.00	4.02	2.0	0.381
15.833	0.000	4.25	0.00	4.05	2.0	0.384
15.850	0.000	4.42	0.00	4.09	2.1	0.388
15.867	0.000	4.61	0.00	4.12	2.1	0.391
15.883	0.000	4.81	0.00	4.16	2.2	0.395
15.900	0.000	5.02	0.00	4.21	2.2	0.399
15.917	0.000	5.22	0.00	4.25	2.3	0.403
15.933	0.000	5.43	0.00	4.30	2.3	0.407
15.950	0.000	5.63	0.00	4.35	2.4	0.411
15.967	0.000	5.84	0.00	4.40	2.5	0.416
15.983	0.000	6.05	0.00	4.45	2.6	0.421
16.000	0.000	6.25	0.00	4.51	2.6	0.426
16.017	0.000	7.13	0.00	4.58	2.7	0.432
16.033	0.000	8.68	0.00	4.67	2.8	0.440
16.050	0.000	10.23	0.00	4.78	3.0	0.450
16.067	0.000	11.78	0.00	4.91	3.1	0.462
16.083	0.000	13.33	0.00	5.06	3.3	0.476
16.100	0.000	14.89	0.00	5.24	3.6	0.491
16.117	0.000	16.44	0.00	5.43	3.8	0.509
16.133	0.000	17.99	0.00	5.64	4.1	0.528
16.150	0.000	20.31	0.00	5.89	4.4	0.550
16.167	0.000	19.38	0.00	6.11	4.8	0.570
16.183	0.000	17.52	0.00	6.29	5.3	0.587

16.200	0.000	15.66	0.00	6.45	5.8	0.600
16.217	0.000	13.80	0.00	6.56	6.1	0.611
16.233	0.000	11.94	0.00	6.65	6.4	0.618
16.250	0.000	10.08	0.00	6.70	6.6	0.623
16.267	0.000	8.22	0.00	6.72	6.7	0.625
16.283	0.000	6.36	0.00	6.72	6.7	0.625
16.300	0.000	4.50	0.00	6.68	6.7	0.622
16.317	0.000	3.51	0.00	6.64	6.6	0.618
16.333	0.000	3.38	0.00	6.59	6.4	0.613
16.350	0.000	3.26	0.00	6.54	6.3	0.609
16.367	0.000	3.13	0.00	6.50	6.2	0.605
16.383	0.000	3.01	0.00	6.45	6.1	0.601
16.400	0.000	2.88	0.00	6.40	5.9	0.597
16.417	0.000	2.76	0.00	6.36	5.8	0.592
16.433	0.000	2.63	0.00	6.31	5.7	0.588
16.450	0.000	2.51	0.00	6.27	5.5	0.584
16.467	0.000	2.43	0.00	6.22	5.4	0.580
16.483	0.000	2.40	0.00	6.18	5.3	0.576
16.500	0.000	2.37	0.00	6.13	5.2	0.572
16.517	0.000	2.34	0.00	6.09	5.1	0.568
16.533	0.000	2.31	0.00	6.05	4.9	0.565
16.550	0.000	2.28	0.00	6.01	4.8	0.561
16.567	0.000	2.25	0.00	5.98	4.7	0.558
16.583	0.000	2.22	0.00	5.94	4.7	0.554
16.600	0.000	2.19	0.00	5.90	4.6	0.551
16.617	0.000	2.16	0.00	5.86	4.6	0.548
16.633	0.000	2.13	0.00	5.83	4.5	0.544
16.650	0.000	2.10	0.00	5.79	4.5	0.541
16.667	0.000	2.06	0.00	5.75	4.4	0.538
16.683	0.000	2.03	0.00	5.72	4.4	0.535
16.700	0.000	2.00	0.00	5.68	4.3	0.532
16.717	0.000	1.97	0.00	5.65	4.3	0.528
16.733	0.000	1.93	0.00	5.61	4.2	0.525
16.750	0.000	1.90	0.00	5.58	4.2	0.522
16.767	0.000	1.87	0.00	5.54	4.1	0.519
16.783	0.000	1.85	0.00	5.51	4.1	0.516
16.800	0.000	1.83	0.00	5.48	4.0	0.513

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 1.853 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 1.853 AF
LOSS VOLUME = 0.000 AF

****

FLOW PROCESS FROM NODE 23.00 TO NODE 23.00 IS CODE = 11

>>>>>VIEW STREAM NUMBER 1 HYDROGRAPH<<<<<

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STREAM HYDROGRAPH IN ONE-MINUTE UNIT INTERVALS(CFS)
(Notes: Time indicated is at END of Each Unit Intervals.
Peak 5-minute rainfall intensity is modeled as
a constant value for entire 5-minute period.)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0

```
 15.800      0.5902      1.93  .      Q  . V       .         .         .
 15.817      0.5929      1.96  .      Q  . V       .         .         .
 15.833      0.5956      2.01  .       Q . V       .         .         .
 15.850      0.5985      2.05  .       Q . V       .         .         .
 15.867      0.6014      2.11  .       Q . V       .         .         .
 15.883      0.6043      2.16  .       Q .  V      .         .         .
 15.900      0.6074      2.22  .       Q .  V      .         .         .
 15.917      0.6105      2.28  .        Q.  V      .         .         .
 15.933      0.6138      2.34  .        Q.  V      .         .         .
 15.950      0.6171      2.41  .        Q.  V      .         .         .
 15.967      0.6205      2.48  .        Q.  V      .         .         .
 15.983      0.6240      2.55  .         Q  V      .         .         .
 16.000      0.6276      2.63  .         Q  V      .         .         .
 16.017      0.6314      2.72  .         Q  V      .         .         .
 16.033      0.6353      2.82  .         .Q V      .         .         .
 16.050      0.6394      2.96  .         .Q V      .         .         .
 16.067      0.6437      3.13  .         . QV      .         .         .
 16.083      0.6483      3.33  .         .  Q      .         .         .
 16.100      0.6532      3.56  .         .   Q     .         .         .
 16.117      0.6584      3.81  .         .   VQ    .         .         .
 16.133      0.6641      4.10  .         .   V Q   .         .         .
 16.150      0.6701      4.41  .         .   V  Q  .         .         .
 16.167      0.6768      4.81  .         .   V    Q.         .         .
 16.183      0.6841      5.30  .         .   V     .Q        .         .
 16.200      0.6920      5.77  .         .   V     .  Q      .         .
 16.217      0.7005      6.14  .         .    V    .   Q     .         .
 16.233      0.7093      6.41  .         .    V    .    Q    .         .
 16.250      0.7184      6.60  .         .    V    .     Q   .         .
 16.267      0.7276      6.71  .         .    V    .     Q   .         .
 16.283      0.7369      6.73  .         .    V    .     Q   .         .
 16.300      0.7461      6.68  .         .     V   .     Q   .         .
 16.317      0.7552      6.57  .         .     V   .     Q   .         .
 16.333      0.7640      6.44  .         .     V   .    Q    .         .
 16.350      0.7727      6.31  .         .     V   .    Q    .         .
 16.367      0.7812      6.18  .         .     V   .   Q     .         .
 16.383      0.7896      6.05  .         .      V  .   Q     .         .
 16.400      0.7977      5.93  .         .      V  .  Q      .         .
 16.417      0.8057      5.80  .         .      V  .  Q      .         .
 16.433      0.8135      5.67  .         .      V  . Q       .         .
 16.450      0.8212      5.54  .         .      V  . Q       .         .
 16.467      0.8286      5.41  .         .      V  .Q        .         .
 16.483      0.8359      5.29  .         .       V .Q        .         .
 16.500      0.8430      5.17  .         .       V Q         .         .
 16.517      0.8500      5.05  .         .       V Q         .         .
 16.533      0.8568      4.94  .         .       VQ.         .         .
 16.550      0.8635      4.83  .         .       VQ.         .         .
 16.567      0.8700      4.74  .         .       Q .         .         .
 16.583      0.8764      4.68  .         .       Q .         .         .
 16.600      0.8828      4.63  .         .       QV.         .         .
 16.617      0.8891      4.58  .         .       QV.         .         .
 16.633      0.8953      4.53  .         .       QV.         .         .
 16.650      0.9015      4.47  .         .      Q V.         .         .
 16.667      0.9076      4.42  .         .      Q V.         .         .
 16.683      0.9136      4.37  .         .      Q V.         .         .
 16.700      0.9196      4.32  .         .      Q V.         .         .
 16.717      0.9255      4.28  .         .      Q V.         .         .
 16.733      0.9313      4.23  .         .     Q   V        .         .
 16.750      0.9371      4.18  .         .     Q   V        .         .
```



```
 16.767      0.9427      4.13  .         .     Q   V        .         .
 16.783      0.9484      4.08  .         .     Q   V        .         .
 16.800      0.9539      4.03  .         .     Q   V        .         .
--------------------------------------------------------------------------------
  TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
  (Note: 100% of Peak Flow Rate estimate assumed to have
  an instantaneous time duration)

  Percentile of Estimated                Duration
      Peak Flow Rate                     (minutes)
  ========================               =========
             0%                           1009.0
            10%                           1009.0
            20%                           1009.0
            30%                            600.0
            40%                            415.0
            50%                            290.0
            60%                            200.0
            70%                            125.0
            80%                             85.0
            90%                             50.0
================================================================================

  END OF FLOODSCx ROUTING ANALYSIS
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C. APPENDIX – HYDRAULIC RESULTS

BASIN A1 RATING TABLE						
Elevation	**Area (SF)**	**Depth**	**Volume (cf)**	**Cumulative Volume (cf)**	**Storage Volume (Acre-Ft)**	**Proposed Outlet 20" RCP**
538	7,018	0.0	0.0	0.0	0.00	0.00
539	8,989	1.0	8003.7	8003.7	0.18	11.03
540	11,015	2.0	10001.8	18005.4	0.41	15.60
541	13,097	3.0	12055.5	30061.0	0.69	19.10
Dead Storage		**=**	**0.00**	**Acre-Ft**		

BASIN A2 RATING TABLE						
Elevation	**Area (SF)**	**Depth**	**Volume (cf)**	**Cumulative Volume (cf)**	**Storage Volume (Acre-Ft)**	**Proposed Outlet 24" RCP**
538	10,296	0.0	0.0	0.0	0.00	0.00
539	12,789	1.0	11542.2	11542.2	0.26	15.88
540	15,338	2.0	14063.6	25605.8	0.59	22.46
541	17,945	3.0	16641.5	42247.2	0.97	27.51
Dead Storage		**=**	**0.00**	**Acre-Ft**		

Underground Infiltration Reservoir Stage Storage Discharge Table Produced from SOCHM					
Stage (ft)	Area (acres)	Storage (acre-ft)	Q outlet (cfs)	Q inf (cfs)	Q Total (cfs)
0.00	0.09	0.00	0.00	0.00	0.00
0.16	0.09	0.02	0.00	0.14	0.14
0.32	0.09	0.03	0.00	0.14	0.14
0.48	0.09	0.05	0.00	0.14	0.14
0.64	0.09	0.06	0.00	0.14	0.14
0.81	0.09	0.08	0.00	0.14	0.14
0.97	0.09	0.09	0.00	0.14	0.14
1.13	0.09	0.11	0.00	0.14	0.14
1.29	0.09	0.12	0.00	0.14	0.14
1.45	0.09	0.14	0.00	0.14	0.14
1.61	0.09	0.15	0.00	0.14	0.14
1.77	0.09	0.17	0.00	0.14	0.14
1.93	0.09	0.18	0.00	0.14	0.14
2.09	0.09	0.20	0.21	0.14	0.35
2.26	0.09	0.21	0.34	0.14	0.48
2.42	0.09	0.23	0.44	0.14	0.58
2.58	0.09	0.24	0.52	0.14	0.66
2.74	0.09	0.26	0.58	0.14	0.72
2.90	0.09	0.27	0.64	0.14	0.78
3.06	0.09	0.29	0.87	0.14	1.01
3.22	0.09	0.30	1.07	0.14	1.21
3.38	0.09	0.32	1.22	0.14	1.36
3.54	0.09	0.33	1.34	0.14	1.48
3.71	0.09	0.35	1.46	0.14	1.60
3.87	0.09	0.36	1.56	0.14	1.70
4.03	0.09	0.38	1.82	0.14	1.96
4.19	0.09	0.39	2.17	0.14	2.31
4.35	0.09	0.41	2.41	0.14	2.55
4.51	0.09	0.42	2.61	0.14	2.75
4.67	0.09	0.44	2.79	0.14	2.93
4.83	0.09	0.45	2.95	0.14	3.09
4.99	0.09	0.47	3.11	0.14	3.25
5.16	0.09	0.48	3.31	0.14	3.45
5.32	0.09	0.50	3.54	0.14	3.69
5.48	0.09	0.51	3.80	0.14	3.94
5.64	0.09	0.53	4.06	0.14	4.20
5.80	0.09	0.54	4.33	0.14	4.47
5.96	0.09	0.56	4.60	0.14	4.74
6.12	0.09	0.57	4.89	0.14	5.03
6.28	0.09	0.59	5.19	0.14	5.33
6.44	0.09	0.60	5.93	0.14	6.07
6.61	0.09	0.62	6.32	0.14	6.47
6.77	0.09	0.63	6.74	0.14	6.88
6.93	0.09	0.65	7.16	0.14	7.30
7.09	0.09	0.66	7.59	0.14	7.73
7.25	0.09	0.68	8.04	0.14	8.18
7.41	0.09	0.69	8.49	0.14	8.64
7.57	0.09	0.71	8.96	0.14	9.10
7.73	0.09	0.72	9.44	0.14	9.58
7.89	0.09	0.74	9.93	0.14	10.07
8.06	0.09	0.75	10.42	0.14	10.56
8.22	0.09	0.77	10.93	0.14	11.07
8.38	0.09	0.78	11.44	0.14	11.59
8.54	0.09	0.80	11.97	0.14	12.11
8.70	0.09	0.81	12.50	0.14	12.64
8.86	0.09	0.83	13.04	0.14	13.19
9.02	0.09	0.84	13.60	0.14	13.74
9.18	0.09	0.86	14.16	0.14	14.30
9.34	0.09	0.87	14.72	0.14	14.86
9.51	0.09	0.89	15.30	0.14	15.44
9.67	0.09	0.90	15.88	0.14	16.02
9.83	0.09	0.92	16.48	0.14	16.62
9.99	0.09	0.93	17.08	0.14	17.22
10.15	0.09	0.95	17.68	0.14	17.82
10.31	0.09	0.96	18.30	0.14	18.44
10.47	0.09	0.98	18.92	0.14	19.06
10.63	0.09	0.99	19.55	0.14	19.69
10.79	0.09	1.01	20.19	0.14	20.33
10.96	0.09	1.02	20.83	0.14	20.97
11.12	0.09	1.04	21.48	0.14	21.63
11.28	0.09	1.05	22.14	0.14	22.28
11.44	0.09	1.07	22.81	0.14	22.95
11.60	0.09	1.08	23.48	0.14	23.62
11.76	0.09	1.10	24.16	0.14	24.30
11.92	0.09	1.11	24.85	0.14	24.99
12.08	0.09	1.13	25.64	0.14	25.78
12.24	0.09	1.14	27.38	0.14	27.52
12.41	0.09	1.16	29.56	0.14	29.70
12.57	0.09	1.17	31.55	0.14	31.69
12.73	0.09	1.19	32.88	0.14	33.02
12.89	0.09	1.20	33.77	0.14	33.91
13.05	0.09	1.22	34.55	0.14	34.69
13.21	0.09	1.23	35.27	0.14	35.41
13.37	0.09	1.25	35.95	0.14	36.09
13.53	0.09	1.26	36.59	0.14	36.74
13.69	0.09	1.28	37.21	0.14	37.35
13.86	0.09	1.29	37.79	0.14	37.94
14.02	0.09	1.31	38.36	0.14	38.50
14.18	0.09	1.32	38.90	0.14	39.04
14.34	0.09	1.34	39.43	0.14	39.57
14.50	0.09	1.35	39.94	0.14	40.08
14.50	0.10	1.36	40.43	0.19	40.63

Worksheet for Off-Site Rectangular Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Bottom Width	4.50	ft
Discharge	52.03	ft^3/s

Results

Normal Depth	0.94	ft
Flow Area	4.23	ft^2
Wetted Perimeter	6.38	ft
Hydraulic Radius	0.66	ft
Top Width	4.50	ft
Critical Depth	1.61	ft
Critical Slope	0.00431	ft/ft
Velocity	12.29	ft/s
Velocity Head	2.35	ft
Specific Energy	3.29	ft
Froude Number	2.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	1.61	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00431	ft/ft

Worksheet for On Site Rectangular Channel

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Bottom Width	3.00	ft
Discharge	20.31	ft^3/s

Results

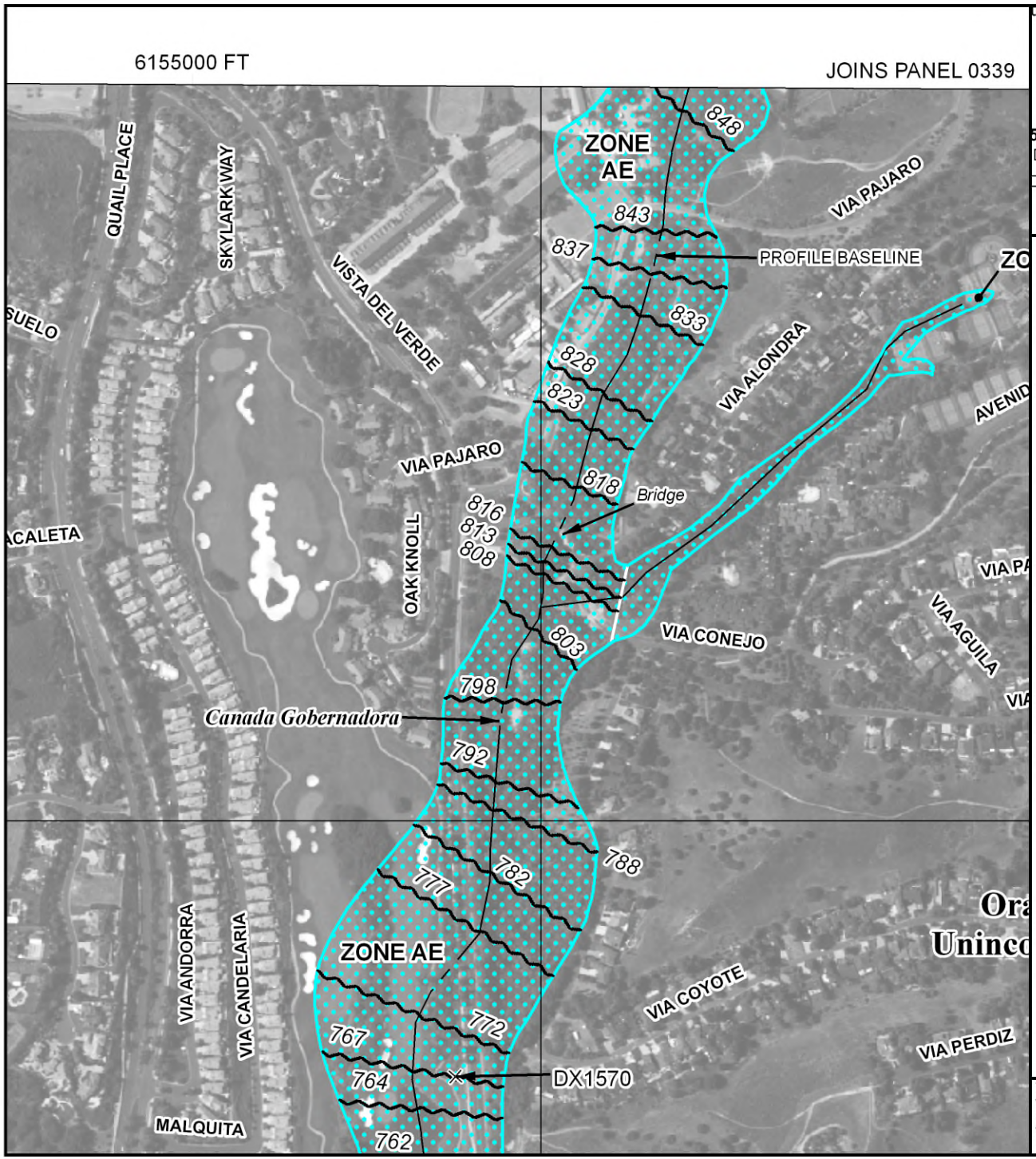
Normal Depth	0.88	ft
Flow Area	2.63	ft^2
Wetted Perimeter	4.76	ft
Hydraulic Radius	0.55	ft
Top Width	3.00	ft
Critical Depth	1.13	ft
Critical Slope	0.00499	ft/ft
Velocity	7.71	ft/s
Velocity Head	0.92	ft
Specific Energy	1.80	ft
Froude Number	1.45	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.88	ft
Critical Depth	1.13	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00499	ft/ft



tional Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0452J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 452 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY	060212	0452	J
RANCHO SANTA MARGARITA, CITY OF	060769	0452	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0452J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency