

Hydraulic / Hydrology Study

For

ROCKPORT RANCH DEVELOPMENT

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1.0 Project Description

1.1 Project Purpose

This study is being conducted to address the hydrologic and hydraulics issues associated with the proposed Rockport Ranch Development project. The floodwater conditions in the Menifee Valley area adjacent to the Rockport Ranch project area will be determined based on available references and project drainage analyses. The determination of the flooded area due to a 100 year storm event is included in this project, which is of substantial interest to planners, land developers, engineers and flood insurance providers.

The floodway hydraulics analysis procedures assume a steady flow with no significant turbulences for the chosen storm event. Steady flow refers to a condition where the fluid properties at a point in the system do not change over time. This analysis is being conducted through use of the USACE HEC-RAS, version 5.0.1 April 2016 computer software. The software input includes existing detailed cross sections of the existing floodway. Off-site flows were largely taken from the Rick Engineering Hydrology and Hydraulic Report for Menifee Valley Area Drainage Plan, dated August 16, 2007, and with elevations near the Rockport Ranch project site adjusted based on post development conditions. For any given flow rate, the software determines the water surface elevations at each cross section. The elevations are then plotted and shown as exhibits.

The amount of surface perviousness and imperviousness was determined by comparison of new site topography to the proposed site plan using CAD technique. This was utilized in evaluating the changes to onsite and offsite runoff coefficients, one of the important factors used to determine changes in storm runoff caused by the project. The Rockport Ranch project proposes a residential development on approximately 80 acres of the Menifee Valley area. This study also includes design recommendations for drainage system improvements, including design of bioretention basin systems and Modular Wetland Systems.

1.2 Project Proposed Facilities

The project is proposing a housing tract that will include several configurations of lot sizes, private streets to all housing, as well as all amenities that would encompass a housing tract.

A large wet pond will be designed in the southern end of the site to be used as water quality treatment onsite, with forebays sized according to DCV calculations in the WQMP. Biofiltration systems will be placed along Tres Lagos Drive, Old Newport Road, and Briggs Road.

A large closed conduit (box culvert) running parallel with Tres Lagos will be constructed to handle offsite flows from the 100 year storm according to the existing ultimate condition drainage analysis.

Abacherli UDT is the recorded owner of the project site.

2.0 Vicinity Map



Figure 1 Rockport Ranch Development Vicinity Map

3.0 Site Map

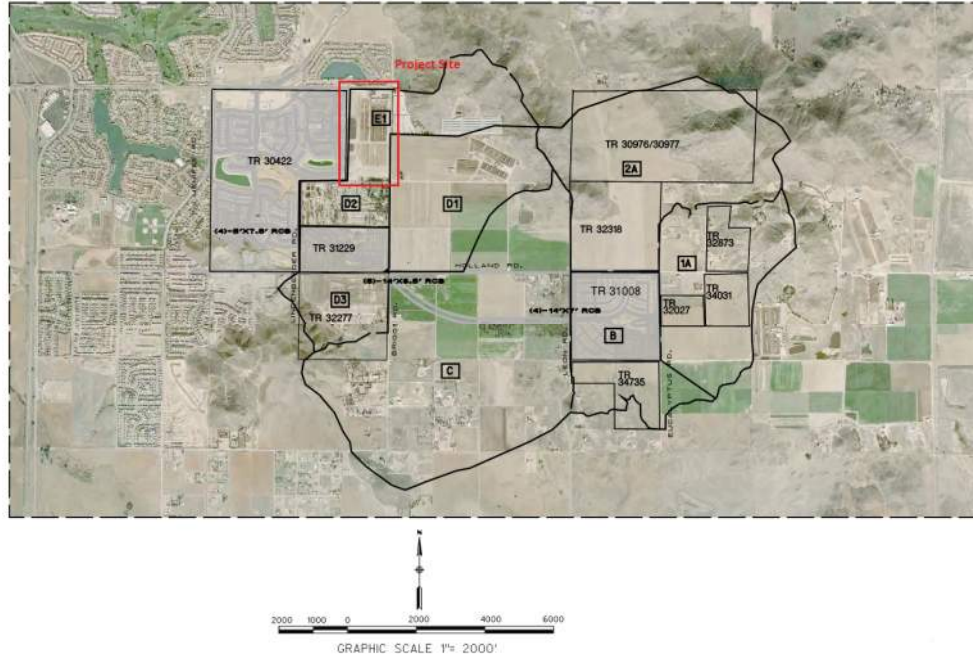


Figure 2 Project Site Aerial Map (Source: Exhibit 1 – Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan, Job Number 14795-B Dated December 13, 2006)

4.0 Description of Watershed

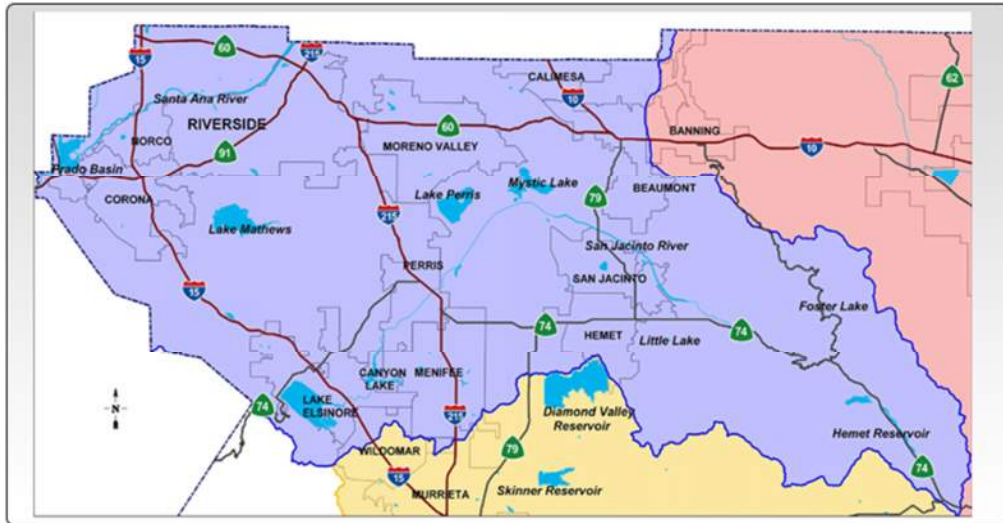


Fig.3 Santa Ana Watershed of Riverside County

4.1 Existing Conditions Topography

The proposed development is located at Menifee Valley area in the City of Menifee, County of Riverside, California. This area is located in the Santa Ana watershed within the intersection of Briggs Road and Tres Lagos Dr. A major portion of the site is a farm, graded pad with some street access, remaining concrete foundations (from Dairy operations), and storage buildings. There are four residential houses located on the north end of the site adjacent to Old Newport Road. Figure 1 and Figure 2 show the project site vicinity map and aerial photograph identifying the location of proposed site (Rick Engineering Exhibit with Rockport project site marked).

The site and surrounding area is subject to floodplain conditions per the Rick Engineering Study: *The Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan: Job No. 14795-B Dated August 16, 2007*, and the FEMA Map (See Attachment D). Flooding of the surrounding area has the potential to bring significant damage to any structure within the floodplain allowable flows stated in the drainage study for the Lakes Job No. 16684 dated October 21, 2013.

4.2 Defined Terminology for Different Conditions in this report.

This report is evaluating the conditions between an already existing drainage report; the following six terms are being used within this report:

1. **Pre Development Onsite** – This is defined as the pre-development conditions for the proposed project (within the property boundary only). (*Onsite Pre Development*)

2. **Post Development Onsite** – This is defined as the post-development conditions for the proposed project (within the property boundary only). (*Onsite without Detention*)
3. **Post Development Onsite Mitigated** – This is defined as the post-development condition after mitigation in the proposed lake. (*Onsite with Detention*)
4. **Existing Ultimate Condition** – This is defined by the hydrology study performed by Rick Engineering: (Rick Engineering Study: *The Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan: Job No. 14795-B Dated August 16, 2007*). This analysis includes offsite flows running onto the property. (*Area E1 Pre-Development*)
5. **Post Development Ultimate Condition** – This is defined by the Existing Ultimate Condition from Rick Engineering with post developed flows from the Proposed Project (Sub Area 1, Fig. 4.2) incorporated. (*Area E1 + Onsite without Detention*)
6. **Post Development Ultimate Condition Mitigated** – This is defined by the Existing Ultimate Condition from Rick Engineering with the Proposed Project Area that is mitigated through the proposed lake. (*Area E1 + Onsite with Detention*)

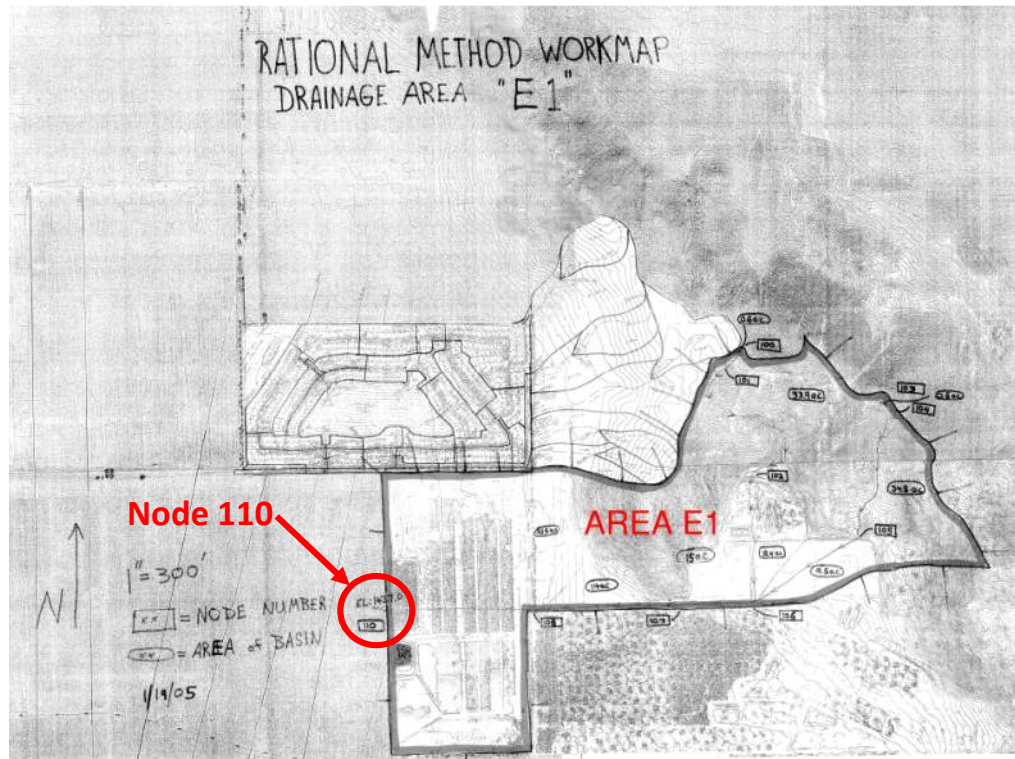


Figure 4.1

Existing Ultimate Condition

Rick Engineering report TR 30422-3 Dated October 21, 2013

Figure 4.1 shows Area E1 and defined as E1 per the Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan: Job No. 14795-B Dated August 16, 2007. That Area under the ultimate conditions produces a Q100 runoff of 418.14 CFS with a flow line that terminates at node 110 as seen in Figure 4.1. These conditions were produced assuming the

entire area of E1 was built out to maximum capacity of 1/4acre Single family homes built across the site. These flows were calculated with a soil type of “C” and an average runoff coefficient of 0.79. These Exhibits are provided in Attachment D of this report. As will be seen in the following sections this area was examined in closer detail to show how this offsite area relates to the project site.

4.2 Existing Conditions + Project Conditions (Sub Area 1) Topography

The Rockport Ranch project layout proposes to place multiple residential housing units on site covering a majority of the existing site. The overland flow from on site will travel to curb inlets in the streets which may over top but, will not exceed the right of way boundary of the private streets. The park area on the west side of the project will have storm drain catch basins to catch the runoff water and send it to pre-determined fore bays before entering the wet basin to the south. Once in the wet pond the water will travel to the lowest point on the west side of the property to exit through a box culvert and meet with the previously calculated flow from the Rick Engineering study.

The offsite flows that are a part of area E1 are separated into smaller areas as follows.

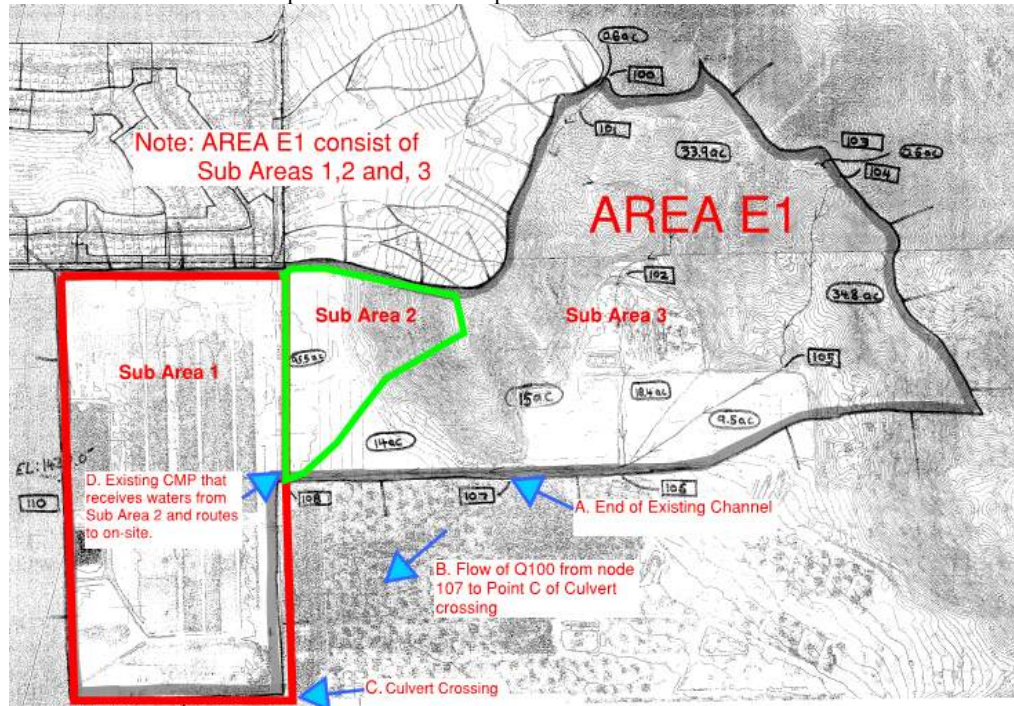


Figure 4.2

Defined Area E1 (Existing Ultimate Condition) is the entire area pre-determined by Rick Engineering TR 30422-3 Revised on October 21, 2013. This area was designed to carry the ultimate design flow of the defined area to Node 110. At Node 110 the total area was determined to be 222.3 Acres and an Ultimate flow of 418.14 CFS. Area E1 does not definitively define the proposed project since the study was designed to cover ultimate conditions over a large area. For this reason Area E1 was broken by nodes along the flowpath

into Sub Areas to better define the proposed project; and then one area was broken again by a weighted factor to determine the flow for the proposed project (Sub Area 1 and Sub Area 2)

Sub Area 1 consists of the proposed site of study (see figure 4.2) while the other Sub Area 2 and Sub Area 3 are offsite flows. Sub Area 1 and Sub Area 2, together are defined by Rick Engineering Hydrology Report TR 30422-3 Revised on October 21, 2013 as node 108 to node 110. This Area is 95.5 Acres which includes the proposed site (Sub Area 1) and the north Easterly portion of the Sub Area Addition that composes of the property east of existing Briggs Road (Sub Area 2). The flows for this entire 95.5 acre sub area is 166.02 CFS. Using a weighted average for the proposed project site area of 79.7 acres; the flow used for Sub Area 1 is on a weighted average as follows:

Proposed Area (Sub Area 1) divided by Total acres of Sub Area 1 & 2 is $79.7 \text{ Acres} / 95.5 \text{ Acres} = 0.83$

Then, $0.83 \times 166.02 \text{ CFS} = 138.54 \text{ CFS}$ (Ultimate Condition calculated flow from Sub Area 1)

This Hydrology study shows that Sub Area 1 Post Development Ultimate Condition will have flows that will travel and end at node 116 (the existing Rick Engineering node 110) to match existing ultimate conditions of 418.14 CFS. This area is sized to reduce the amount of flow to send a smaller flow than the pre-existing condition, and less than the predicted ultimate condition. Soils for this site are of a hydrological type of "C" and "D".

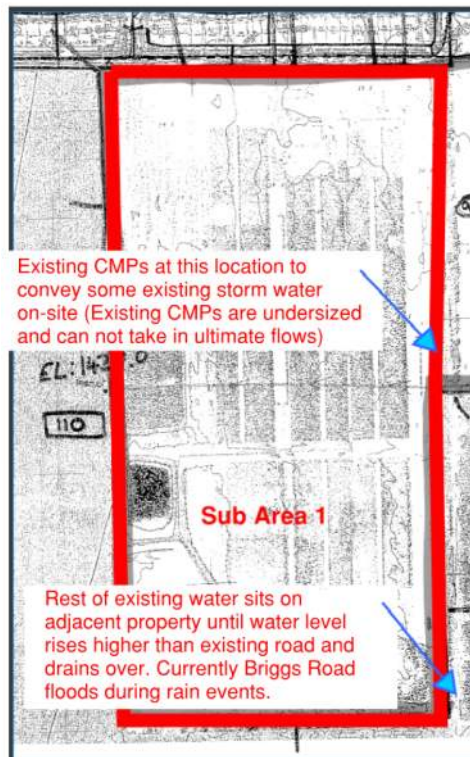


Figure 4.3

Sub Area 2 is defined by the following: from the Rick Engineering report of Node 108-110 the area is 95.5 and the proposed site 79.7 which leaves the following:

$$95.5 \text{ Acres} - 79.7 \text{ Acres} = 15.8 \text{ Acres}$$

Therefore the remaining Area is 15.8 Acres and designated as Sub Area 2. This area is to the north east of the proposed project of Rockport ranch and on the east side of the existing Briggs road. Flows from this area will travel south along Briggs to enter Existing corrugated metal pipes (CMP) to flow onsite where it travels westerly towards Node 110 across the existing dairy. The flows are calculated by taking the entire flow for Sub Area 108-110 and subtracting the flow from Sub Area 1:

$$166.02 \text{ CFS} - 138.54 \text{ CFS} = 27.48 \text{ CFS}$$

These flows will travel to the existing CMP pipes and then will be picked up in Reinforced Concrete Pipe (RCP) under the Briggs Improvements to the westerly side of the right of way. Once collected west of the road flows will travel south within the public Easement just west of the Right of way to the proposed box culvert North of Tres Lagos Drive and travel westerly to the POC.

Sub Area 3 is routed in the previous studies to node 108; Actual existing conditions have the channels ending approximately where node 107 is located. Figures 4.2, 4.4 and, 4.5 show the approximate location of the terminating channels where sized to ultimate conditions 252.12 CFS flows through to end at point C. in figure 4.2. The flow that exits this existing channel travel southwesterly as an over land flow across the neighboring site, flooding the site until (currently the water is high enough to overtop Briggs road and travel westerly) reaching a proposed box culvert under Briggs Road to allow the existing flows to travel westerly along Tres Lagos Drive to terminate at the node 316 (existing node 110); before traveling west to the adjacent sites floodway.

The Combined areas of Area 1, 2 and, 3 will be sized to hold the Ultimate conditions that were sized in *The Lakes Job No. 16684 dated October 21, 2013*.



Figure 4.4



Figure 4.5

4.3 Hydrologic Unit Contribution

The Santa Ana watershed is located in northwestern portion of Riverside County and bordered to the east by the Whitewater Watershed and to the south by the Santa Margarita Watershed. It drains into the Santa Ana River and ultimately discharges to the Pacific Ocean.

5.0 METHODOLOGY

This study complies with the April 1978 Riverside County Flood Control & Water Conservation District Hydrology Manual.

5.1 Hydrology Software

The “Riverside County Rational Hydrology Program” modules of the CIVILCADD/CIVIL DESIGN engineering software version 7.0 were used in this study. Initial time concentrations (T) were obtained from Plate D-3.

5.2 Routing Software

The “Flood Hydrograph Routing Program” module of the CIVILCADD/CIVIL DESIGN engineering software version 7.0 is used in this study. This software is complimented with the Hydraflow Hydrographs AutoCAD Civil 3D extension Version: 10.4 Autodesk, Inc.2004 in routing the hydrographs to a detention/storage chamber.

5.3 Hydraulics Software

The hydraulics calculations were performed on the Hydraflow Storm Sewers Extension v.10.4, and Hydraflow Hydrographs Extension v.10.4 by Autodesk, Inc. <http://www.autodesk.com/civil3d-stormwater>.

For public maintained storm drain, **WSPGW** version 14.05 released by CIVILDESIGN Corp. is used to analyze the hydraulic and size the conduits.

HEC-RAS version 5.0.3 by U.S. Army Corps of Engineers; 609 Second Street, Davis, CA 95616. Used to evaluate flows for the existing Briggs Road to analyze points where water overtops the road.

6.0 Methodology and Results

The hydrologic calculations that have been done at this point have been pipe sizing to insure the flows due to the 100-year peak flow rate are able to flow across site to the determined destinations without causing flooding. To account for existing conditions as part of DWG No. 421-3, CT 02-15 in regards to the 100-year flowrates expected to be bypassed through the site during 100-year storm events. These numbers will be used to size the proposed storm drain pipes, closed conduit (box culvert) and to doublecheck if the existing storm drain outlet facilities are adequate. Since these pipes are private, the hydrology software’s selected pipe sizes have been used to size the pipe sizes themselves. Since the project is in the preliminary stages, only the main storm line pipes will be sized hydraulically as well as the existing pipes running across Briggs Road.

6.1 Determine the Watershed that affects the project

Please see the “Watershed Map” in Attachment C

6.2 Calculate Runoff Coefficient

The site consists of several soil types. On site is a combination of soil type “C” and “D” while offsite to the East the soil type has areas of soil type “B”. The run off coefficient was determined using this soil type and basing the calculations on Civil-D Program setting for ¼ Acre Single family sizing as Rick Engineering did for the ultimate conditions.

6.3 Basin Areas Used in the Pre and Post Calculations (See Following Sheet)

PRE DEVELOPMENT BASIN AREAS

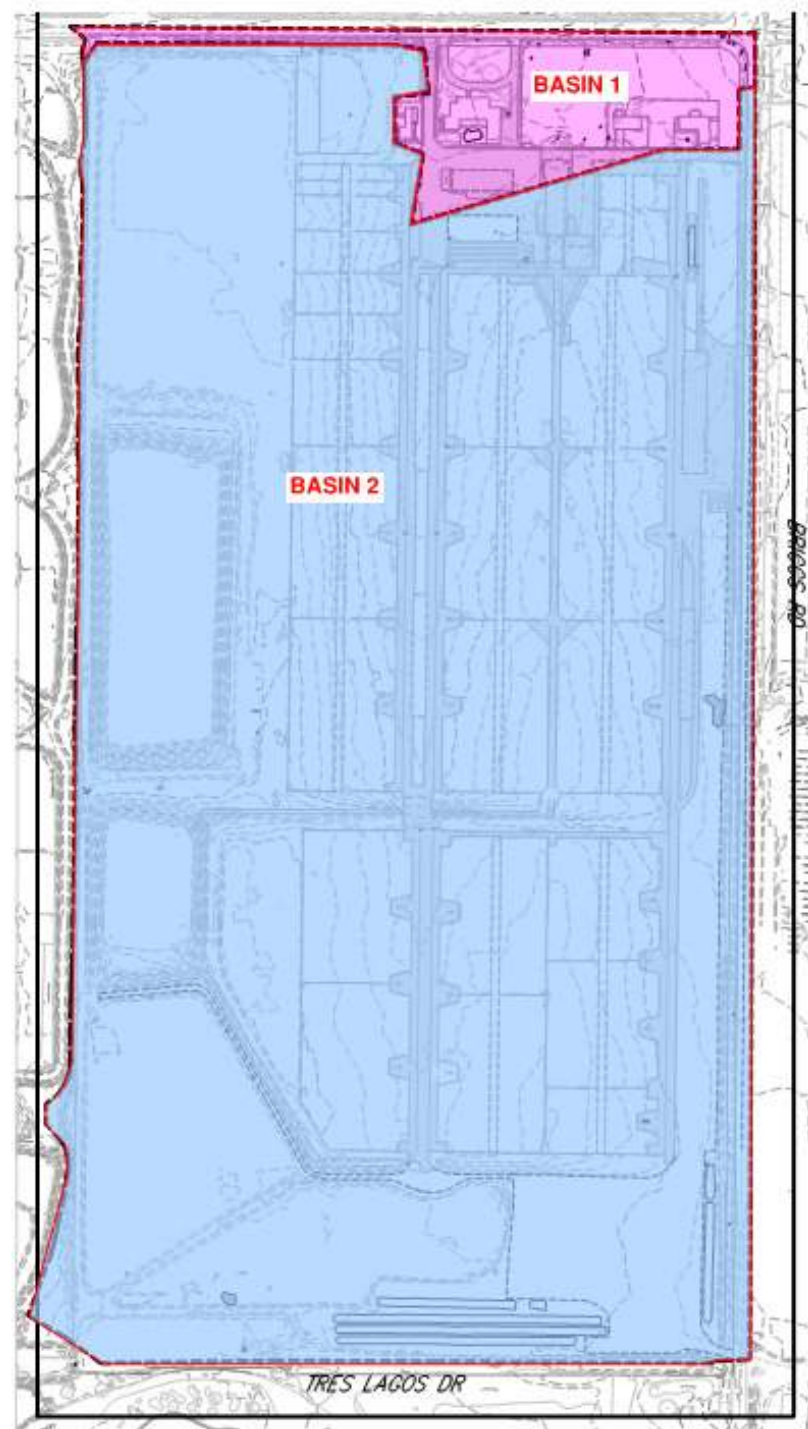


Figure 6.3. 1

POST DEVELOPMENT ONSITE AND OFFSITE

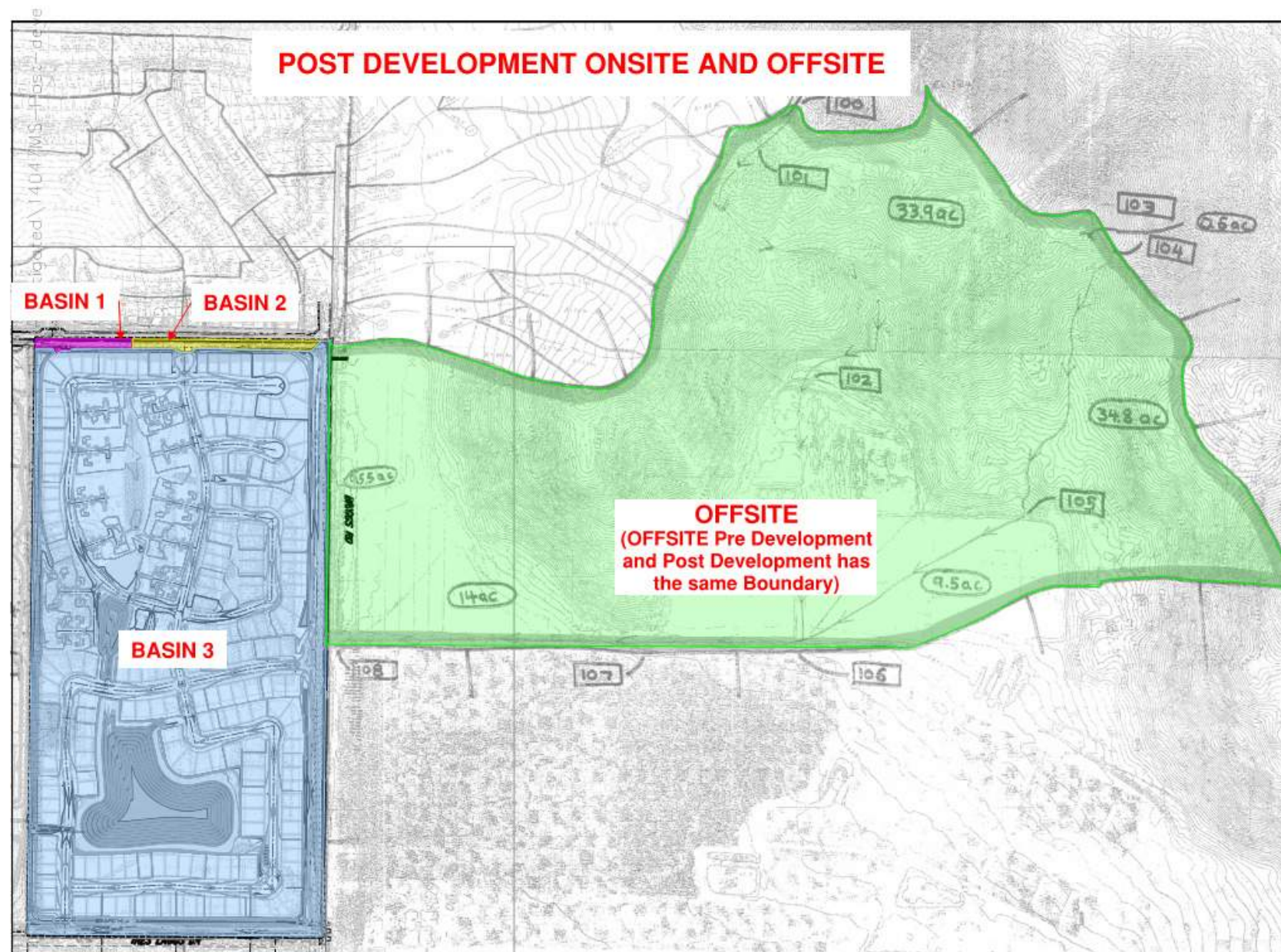


Figure 6.3. 2

6.4 Calculate Storm Flows using the Rational Method

ROCKPORT RANCH SITE FLOW (CFS)				
		Totals		
Item	AREA	2 YEAR	10 YEAR	100 YEAR
1	PRE- DEVELOPMENT ONSITE Basin 1	2.89	5.59	9.07
2	POST-DEVELOPMENT ONSITE Basin 1+ Basin 2	1.75	3.07	4.68
3	Result	Post<PRE	Post<PRE	Post<PRE
4	PRE- DEVELOPMENT ONSITE Basin 2	26.93	56.27	93.59
5	POST-DEVELOPMENT ONSITE Basin 3	50.07	95.73	151.62
6	POST-DEVELOPMENT ONSITE MITIGATED Basin 3	8.61	29.78	31.31
7	Result	PostMit<PRE	PostMit<PRE	PostMit<PRE
8	EXISTING ULTIMATE PER RICK ENGINEERING REPORT	N/A	N/A	418.14
9	POST-DEVELOPMENT Ultimate Basin 1+Basin 2 + Basin 3 + Offsite	N/A	N/A	423.47
10	POST-DEVELOPMENT Ultimate MITIGATED Basin 1+Basin 2 + Basin 3 + Offsite	N/A	N/A	271.56
11	Result	PostMit<PRE	PostMit<PRE	PostMit<PRE

Table 6.4.1 (A more detailed table is included at end of Attachment I2)

In order for this project to comply with the Riverside County Water Quality requirements as outlined in “Section V –Hydrologic Conditions of Concern” of this project specific Water Quality Management Plan (WQMP), the 2, 10 & 100 year for the one hour storm event; and is analyzed for flow volume.

The proposed project is divided into basins to allow water flows to convey to the appropriate areas as seen in figure 6.3.1 and 6.3.2. These basins are compared to one another to determine compliance. The post development condition must be at or less than the pre development condition otherwise other means need to be considered such as mitigation.

The pre development for onsite has two basins; Basin 1 and Basin 2. Basin 1 lies to the north and drains through a swale running westerly along Old Newport Road. These flows follow the table as set in Table 6.4.1. The Post Development for Basin 1 and Basin 2 utilize the same output as Basin 1 of the pre development onsite condition. All flows from the post development condition are at a lower flow rate than the pre development conditions as shown in table 6.4.1. a result which states for the 2, 10, and 100 years storms that the post development flow is lower than the pre development flow for those particular analysis areas.

The pre-development conditions onsite regarding Basin 2 is compared to post development conditions of Basin 3. These flows are un-mitigated as they travel offsite to Node 316 (which

is also Node 110 of the Rick Engineering study). This flow although is traveling to a lake, for the simplicity of this calculation the flows are routed as if no detention is occurring. After analysis of node 316 at the confluence at the south west end of the property the 2, 10, and 100 year storm events do not meet the pre development onsite condition and therefore additional means need to be accounted for compliance.

The measures taken for Basin 3 which did not meet conditions of pre-development flows was detaining water in the proposed lake to allow a smaller flow to be released in order to meet the pre-developed conditions. These values calculated by a unit hydrograph explained in section 7.2 shows the post development mitigated onsite conditions meet the pre development conditions and well within compliance (See table 6.4.1 line item 8).

This project not only has to comply with the pre-development conditions onsite, there is also an Existing Ultimate Condition performed by Rick Engineering (Rick Engineering Study: *The Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan: Job No. 14795-B Dated August 16, 2007*). This flow has an Ultimate flow located at Node 316 on the Post development map and Node 110 on the Existing Ultimate Condition Map. From Figure 6.3.2 is seen that the offsite boundary has the same area for the pre and post development studies. From table 6.4.1 line item 12 shows that the proposed site does not meet the Existing Ultimate Conditions and detention will be needed to ensure compliance.

The Proposed Ultimate Condition Mitigated was then used to detain water onsite in the proposed lake as detention. Once detained the output flow to Node 316 on the post development map is lower than the flows of 110 on the Existing Ultimate Condition (See table 6.4.1 line item 13).

After analyzing the following conditions above it was determined This projects meets the ultimate conditions for allowed flows of 418.14 CFS with a combined flows from TRES LAGOS to meet the Drainage study for "THE LAKES" TR 30422-3, Job Number 16684 dated October 21, 2013. Overall the proposed site plus the offsite conditions for the Ultimate Q100 condition is 271.56 CFS with the detention of onsite in the wet basin the discharge to the POC is much lower than the anticipated 418.14 CFS.

Please see "Post Development Onsite Q Calculations and Post Development Onsite Mitigated" in Attachments E, and F. for the developed conditions.

6.5 Design / Analyze Proposed Storm Drain Facilities

In this stage of the project, we will not get into detailed calculations for the proposed storm drain systems since they are private.

7.0 MITIGATION MEASURES

This Hydrology study analyzes the 2, 10, 100-year flows for the onsite conditions, along with the 100-year flows for the ultimate conditions. Onsite flows are mitigated through the proposed wet pond before discharging offsite to meet the criteria of post-development flows being less than the pre-development flows.

7.1 Mitigate Increase Runoff

As discussed above, the post developed runoff rates overall are 156.3 CFS for onsite and 95.82 CFS for offsite at the outfall, respectively. The flowrates shown on the predevelopment Q100 is 56.27 for Basin 2 +1 and 418.14 for the Ultimate outflow from the site. CFS for the existing west outfall, respectively (see Attachment E and Attachment F). The proposed site development

decreases the expected peak flows at each connection point and therefore no further mitigation is required.

7.2. RATIONAL METHOD

Based on its flow direction, the post development of Basin 1, Basin 2 and, Basin 3 is as follows:

Project Site Hydrology Analysis

The 2, 10 and, 100-year, 1-hour Rational Method Hydrologic Analysis were conducted for Rockport Ranch Residential project. The CIVILDESIGN output for each sub-basin system is presented in Attachments E2 – E4 for the Post Development Onsite; Attachments F2-F4 for the Post development Onsite mitigated; and Attachment I2 for the Post development Ultimate Conditions for 100 year storm event. Attachment F provides Hydrology Map corresponding nodes and drainage layout for the grading plan of the Rockport Ranch. Discharge values for each flood event were determined using the results of the rational method analysis.

a.1 Calculate Runoff Coefficient

Runoff coefficient is determined by soil type and land use type. Based on Riverside County Hydrology Manual, soils at project site are type “C” and type “D”. Therefore, runoff coefficients were determined based on type “C” and “D”. Land use type at project site is 7,200-10,000 S.F. lots, thus recommended value for impervious percentage is chosen as 50%.

a.2 Calculate Manning Roughness Coefficient

Average Manning Roughness Coefficient 0.015 for smooth finish asphalt pavement channel is used in this study.

a.3 Calculate Storm Flows using the Rational Method

The 100-year 1-hour duration storm is analyzed for sub basins at project site in this section to obtain runoff values. “Riverside County Rational Hydrology Program” module of the CIVILCADD/CIVIL DESIGN Engineering software version 9.0. for Rational Method and Synthetic unit hydrograph. These onsite flows were confluenced with offsite flows at the end of the Southern Box Culvert and onsite Lake.

Table 6.4.1 shows the discharge from the lake to offsite. The post development is higher than the pre development and additional measures of detention will be taken into account in order to bring the flow of the post to meet the conditions of the predevelopment. Before detention is incorporated the flow of the post conditions to run offsite is 423.47 CFS for the Post Development Ultimate condition and the Existing Pre development Ultimate Condition is 418.14 CFS. For onsite these flows values are for the pre development at the approximate location of the lake is 83.16 CFS and for the onsite post development flows is 151.62. The higher flow of the post development will be used to determine pipe sizes for routing water to the waterway.

a. Synthetic Unit Hydrograph

The on-site flows are pre-treated and directed to settling basin before drains to public storm drain offsite for water quality purposes.

Calculations for unit hydrograph use Section E of Riverside County Flood District and Water Conservation District (RCFC and WCD). CIVILD program was used to calculate the volume for expedient result. Pond routing calculation is done by using CIVIL3D Hydraflow hydrograph program. A wet pond is proposed for both water quality and peak flow mitigation. The wet pond contains two stages such as: dead storage and active storage. A dead storage water surface elevation is set at an invert elevation outlet at the downstream. Active storage (above the dead storage) is provided for 100 year storm event detention system. Stage/storage/discharge table was created to compute outflow hydrograph.

By routing the inflow hydrograph to the wet pond, Hydraflow Hydrograph computed the outflow hydrograph in an example as follows:

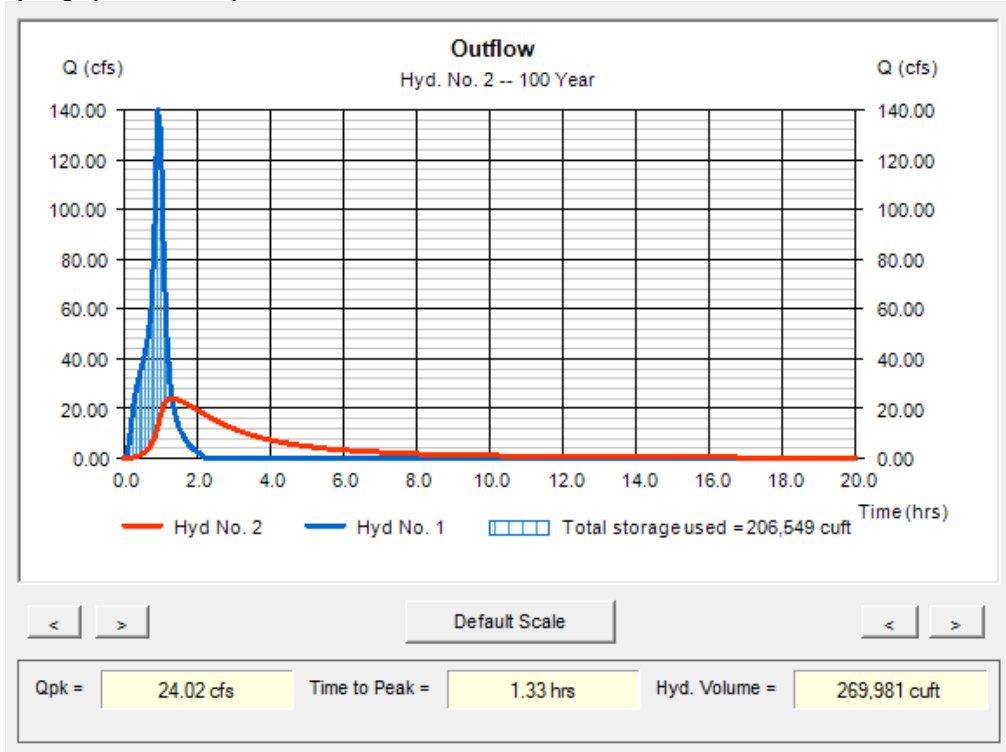


Figure 7.2.1 Outflow Hydrograph computed from Hydraflow Hydrograph

Therefore, this time of concentration is used as a user specified entry of data at a point where this point conflues with the other flow(s) in the system.

Hydrograph Report is provided in Appendix M. Flowrate differences between pre and post conditions of different conditions analyzed are shown in Table 6.4.1. The complete Unit Hydrograph analyses for pre and post conditions of confluence basin are provided in Appendix M.

a. WSPG

The Los Angeles County Flood Control District's Hydraulic Analysis System Program WSPGW Version 14.06 was used to model the box culvert that crosses Briggs Road and the South East corner of the site and continues as a box culvert that runs parallel on the North side of Tres Lagos Drive.

WSPGW computes and plots uniform and non-uniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with regular or irregular sections. Channel geometric information, Manning's roughness coefficient, discharge, as well as any known boundary conditions are required to complete the hydraulic model. The flow in a system may alternate between supercritical, subcritical, or pressure flow.

In this project, the Tres Lagos Box Culvert is at the Southern end of the site, which consists of 24 ft width channel and connects with project site POC combining with the onsite flows to discharge off site at the designated location. The headwall inlet that crosses Briggs Road at the southern end of the site is designed to carry 252.12 cfs across Briggs Road into the Tres Lagos Box Culvert.

Resulting analysis shows that the runoff is contained within the box culvert across the entire length from Briggs road to the POC. Proposed channels can convey runoff values without conflicts. However, super elevations exists at the west side of the property where the flow is turned to head north to POC designation. This will be solved with adding freeboards at curved area. Copies of the WSPGW analyses are provided in Appendices L.

For Flooding conditions based on the Q100 flood event and flows provided by Rick Engineering, the total height of the water at the entrance of the Box Culvert is 1429.02 Feet while the existing Flooding elevation of Rick Engineering study is given as 1429.58 Feet. This value was taken from the Hydrology and Hydraulics study performed by Rick Engineering and is located in (Rick Engineering Study: the *Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan: Job No. 14795-B Dated August 16, 2007*). The value used was on the downstream end to be conservative since the box culvert inlet will lie between two cross sections. This shows the designed height is below the Ultimate condition that was proposed for flooding conditions.

8.0 Summary and Conclusions

The Hydrology and Hydraulics of Rockport Development at City of Menifee was analyzed by Excel Engineering using multiple software.

The HEC-RAS software was executed based on subcritical flow regime to determine the water surface. The channel station's cross sections were generated from existing Rick Engineering model and aerial topography map at project location, and were manually input in the HEC-RAS program. This program generates water surface profiles for steady gradually varied flow. The basic computational procedure is based on the solution of the one dimensional energy equation. Energy losses are evaluated by friction (Manning's equation) and contraction/expansion along the reach.

CivilD program based on Rational Method (both CIVILCADD and Unit Hydrograph) has been used in this project to prove the overall total Runoff is decreased. From the post-development calculation, the water flow in post-development mitigated condition for the 100 year storm event is less than that of the pre-development condition.

Therefore, it is concluded that the Rockport Ranch Development project is neither increasing discharge nor generating water flow outside of proposed channels on existing upstream floodplain units. Therefore this project is NOT causing adverse hydrologic impacts to its surrounding area.

9.0 References

Hydraulic Engineering Center, February 2016. HEC-RAS River Analysis System Hydraulic Reference Manual, U.S. Army Corps of Engineer, Davis CA.

Rick Engineering Company, August 2007. Hydrologic and Hydraulic Report for Meniffee Valley Area Drainage Plan, Rick Engineering Company, San Diego, CA.

Rick Engineering Company, October 2013. Drainage Study for The Lakes TR 30422-3, Rick Engineering Company, San Diego, CA.

John W. Bryant, April 1978. Hydrology Manual, Riverside County Flood Control and Water Conservation District, CA.

NRCS, Hydrology National Engineering Handbook, Part 630 chapter 15 Time of concentration, May, 2010

CivilDesign Corporation, Water Surface Pressure Gradient Package Program “WSPGW” Version 14.05 User’s Manual, San Bernardino, CA 92410.

Hydraulic Engineering Center, February 2016. HEC-RAS River Analysis System Applications Guide, U.S. Army Corps of Engineer, Davis CA.

10.0 Declaration of Responsible Charge

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the City of Menifee is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK

Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
Fax – (760)745-1890

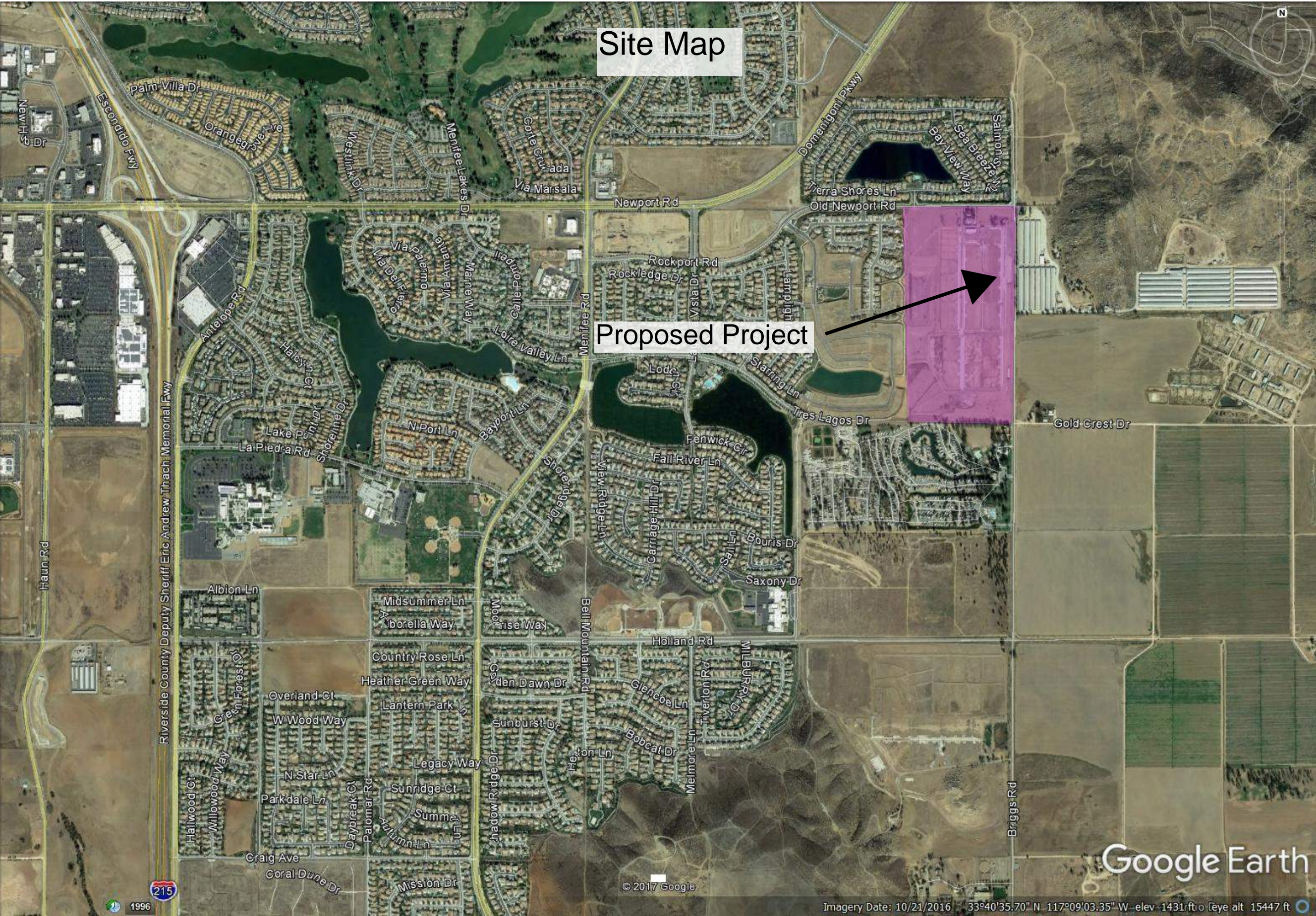
Project Number: 14-047

Robert D. Dentino, RCE 45629
Registration Expire: December 31, 2020

Date

11.0 Attachments

Attachment A
Site Map



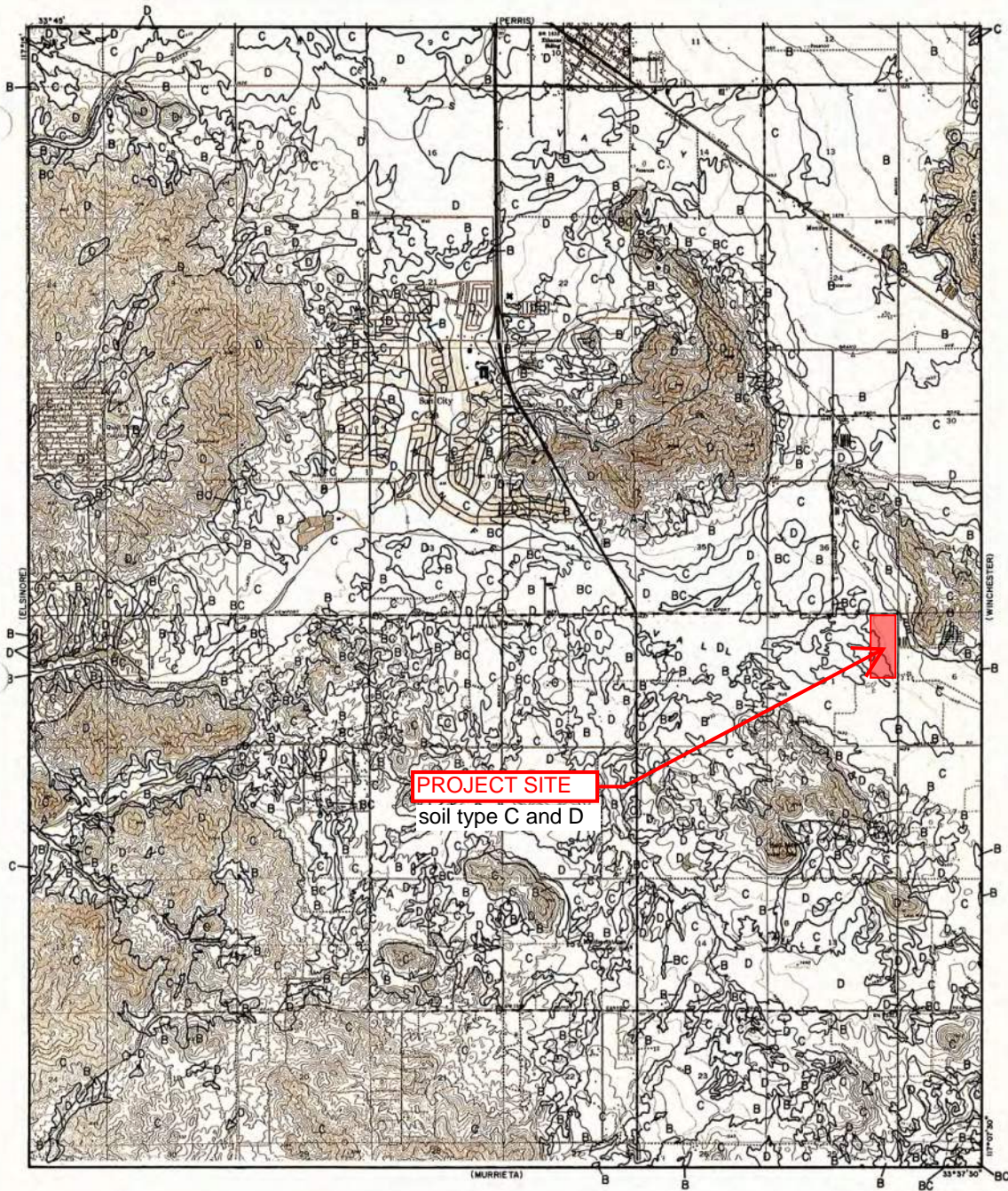
Site Map

Proposed Project

Google Earth

Attachment B

Figures and Tables from Riverside Hydrology Manual 1978



<p>LEGEND</p> <p>— SOILS GROUP BOUNDARY</p> <p>A SOILS GROUP DESIGNATION</p> <p>RCFC&WCD</p> <p>HYDROLOGY MANUAL</p>	<p>HYDROLOGIC SOILS GROUP MAP</p> <p>FOR</p> <p>ROMOLAND</p>
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PLATE C-1.42

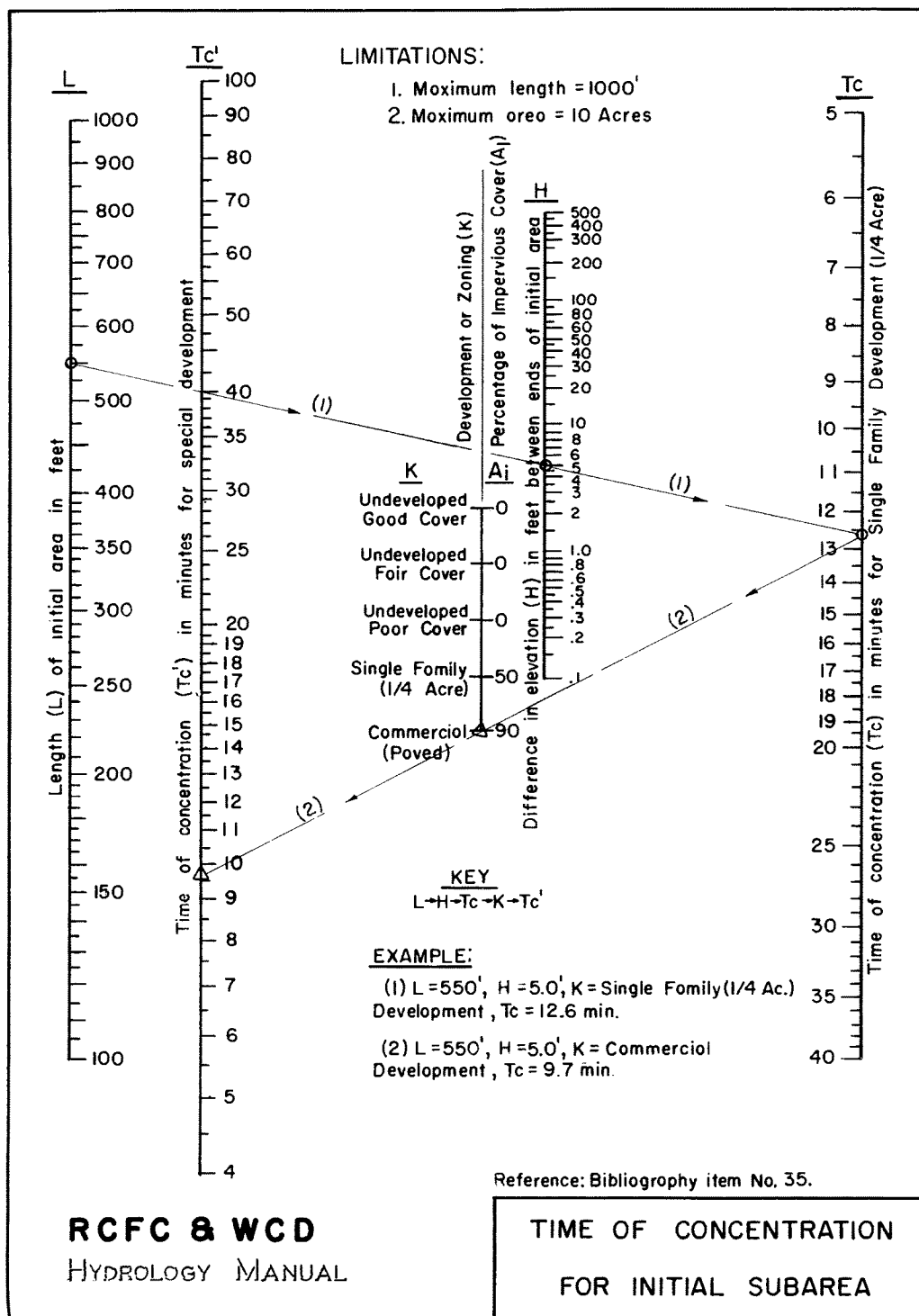
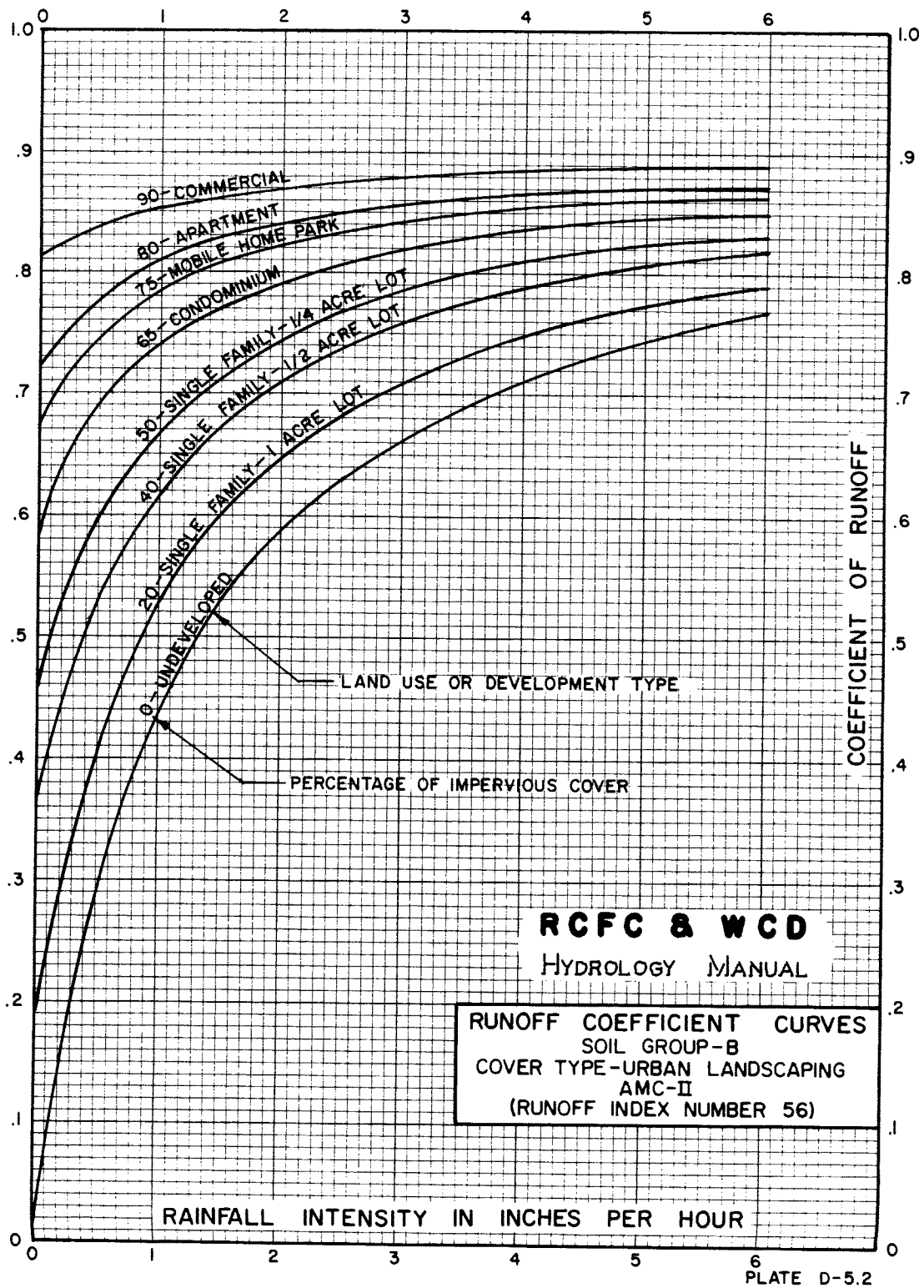
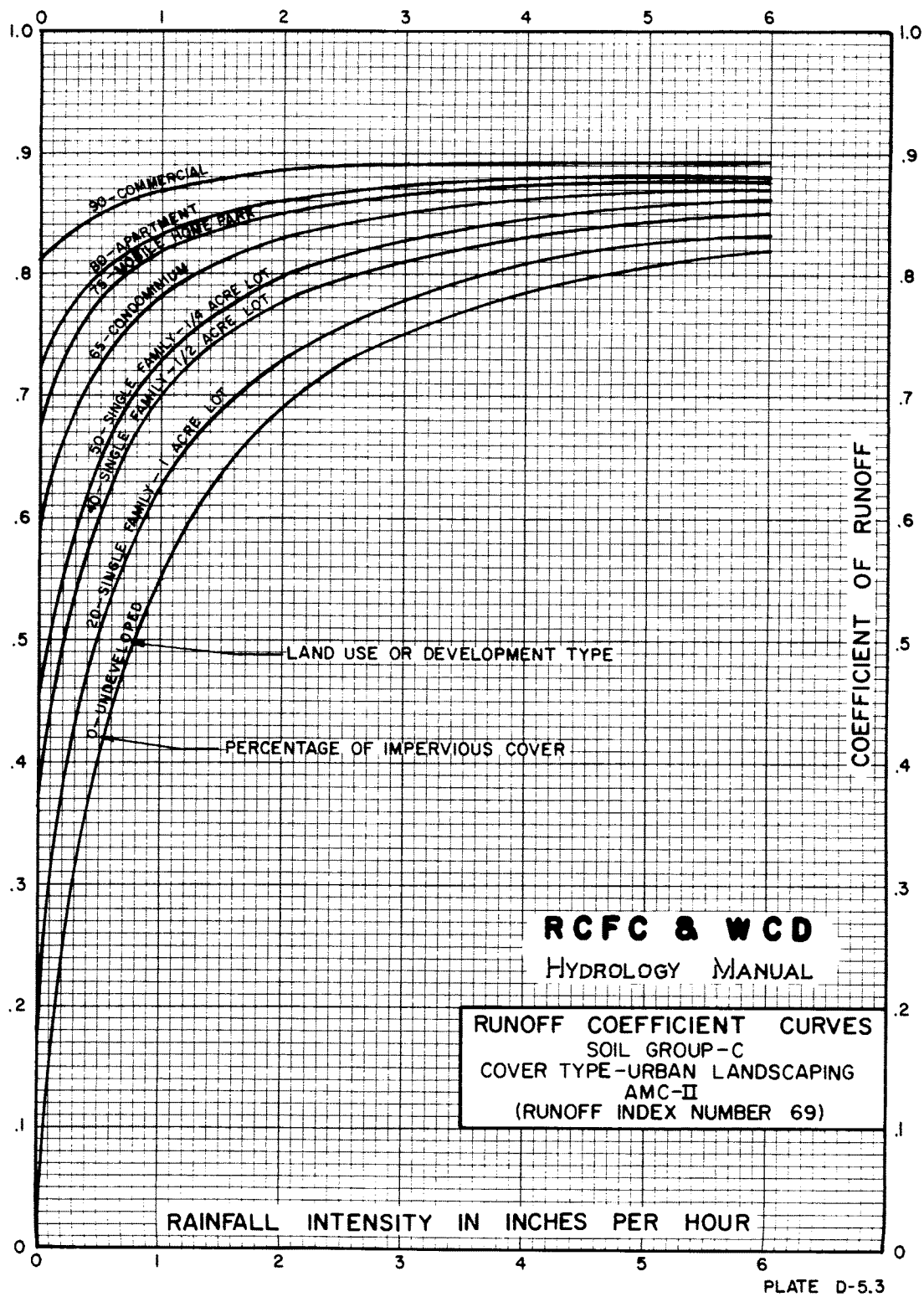


PLATE D-3





RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II					
Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS</u> -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS</u> -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS</u> -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92
RCFC & WCD HYDROLOGY MANUAL		RUNOFF INDEX NUMBERS FOR PERVIOUS AREA			

PLATE D-5.5 (1 of 2)

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II					
Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			
Notes:					
1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.					
2. Quality of cover definitions:					
Poor-Heavily grazed or regularly burned areas. Less than 50 per-					
cent of the ground surface is protected by plant cover or brush					
and tree canopy.					
Fair-Moderate cover with 50 percent to 75 percent of the ground sur-					
face protected.					
Good-Heavy or dense cover with more than 75 percent of the ground					
surface protected.					
3. See Plate C-2 for a detailed description of cover types.					
4. Use runoff index numbers based on ground cover type. See discussion					
under "Cover Type Descriptions" on Plate C-2.					
5. Reference Bibliography item 17.					
RCFC & WCD		RUNOFF INDEX NUMBERS			
HYDROLOGY MANUAL		FOR			
		PERVIOUS AREA			

PLATE D-5.5 (2 of 2)

ACTUAL IMPERVIOUS COVER		
Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. ($\frac{1}{2}$ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90
<p>Notes:</p> <ol style="list-style-type: none"> 1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions. 2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas. 3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above. 		
RCFC & WCD HYDROLOGY MANUAL		IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

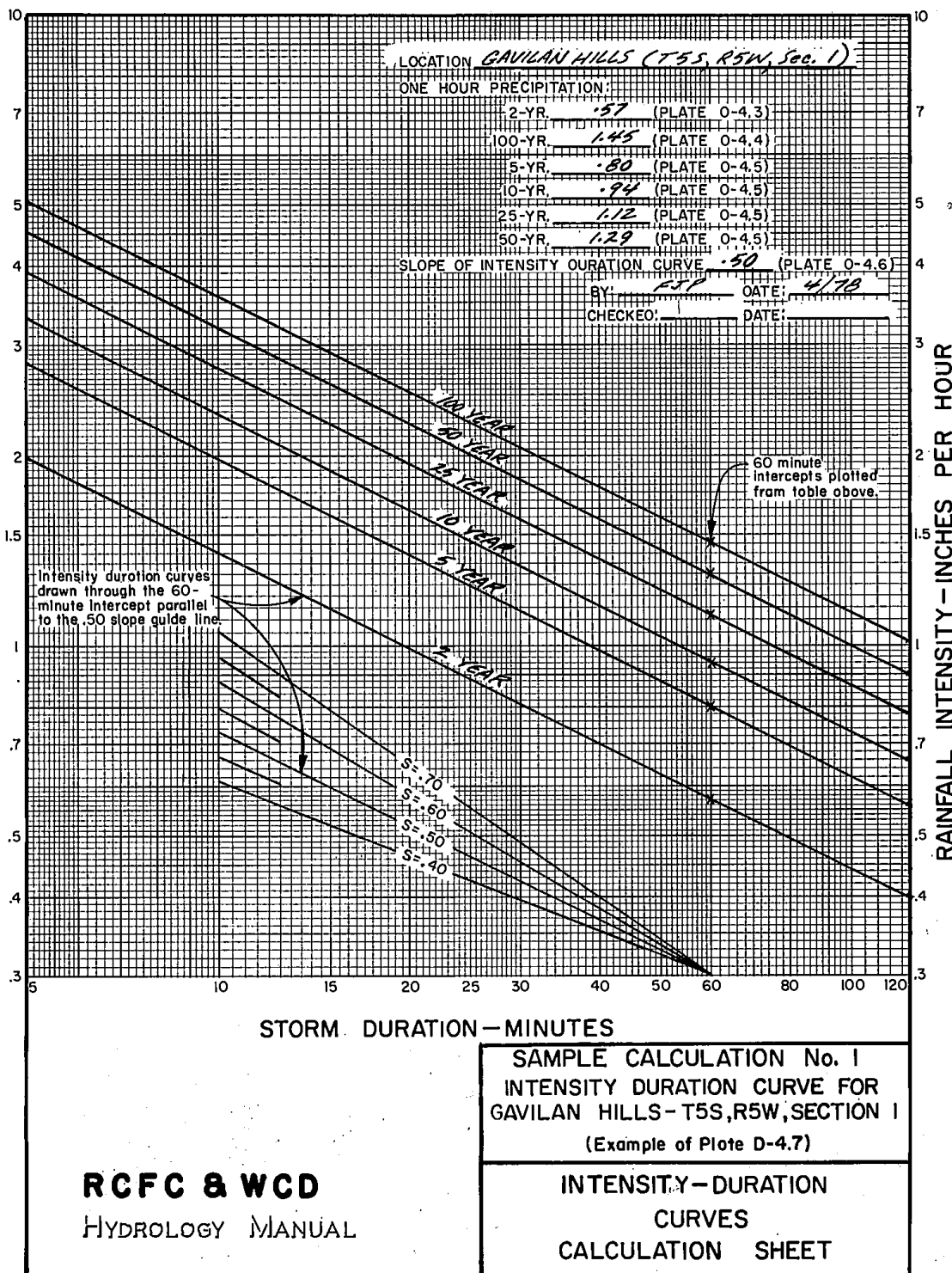
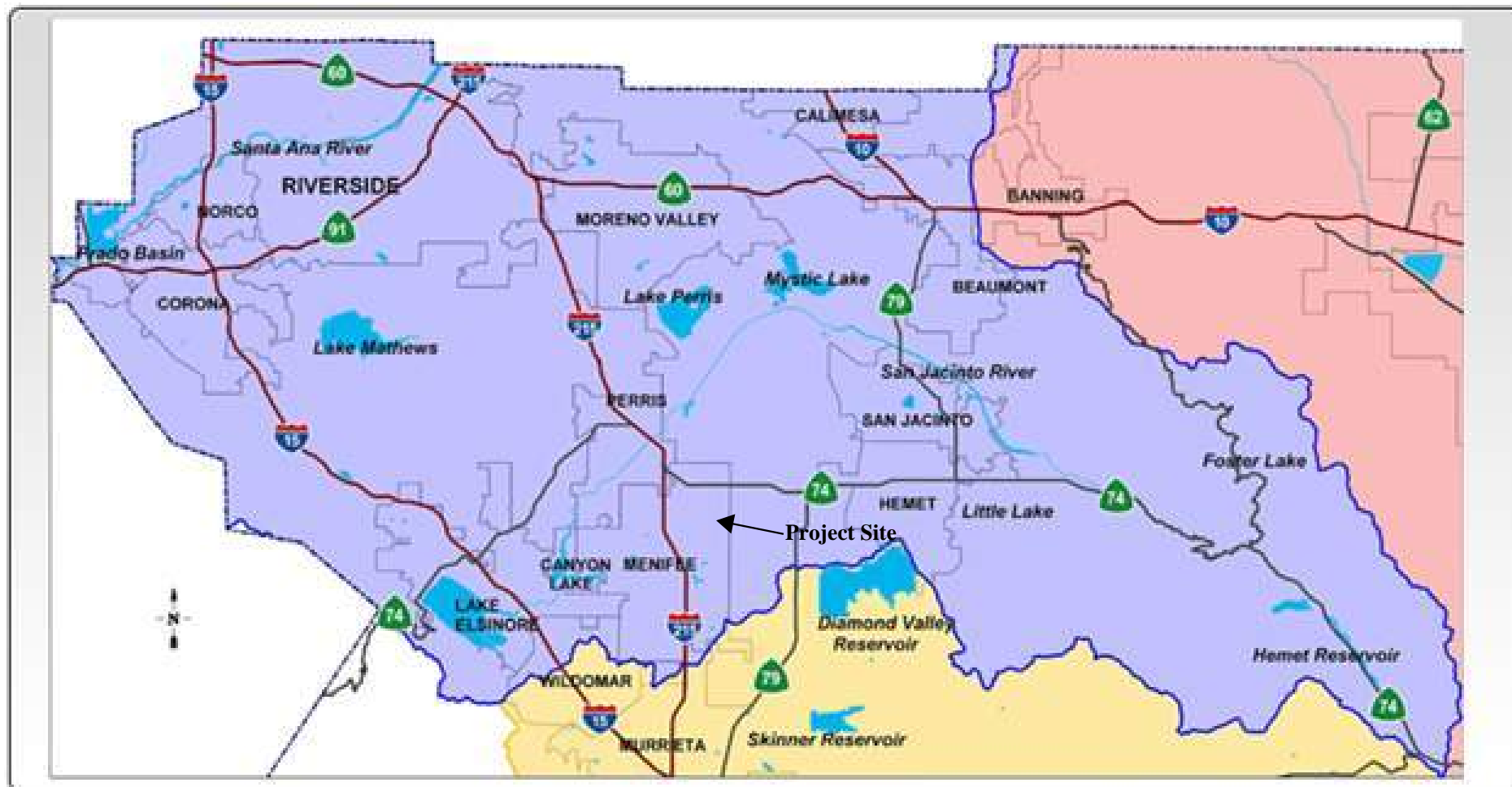


PLATE D-10.1

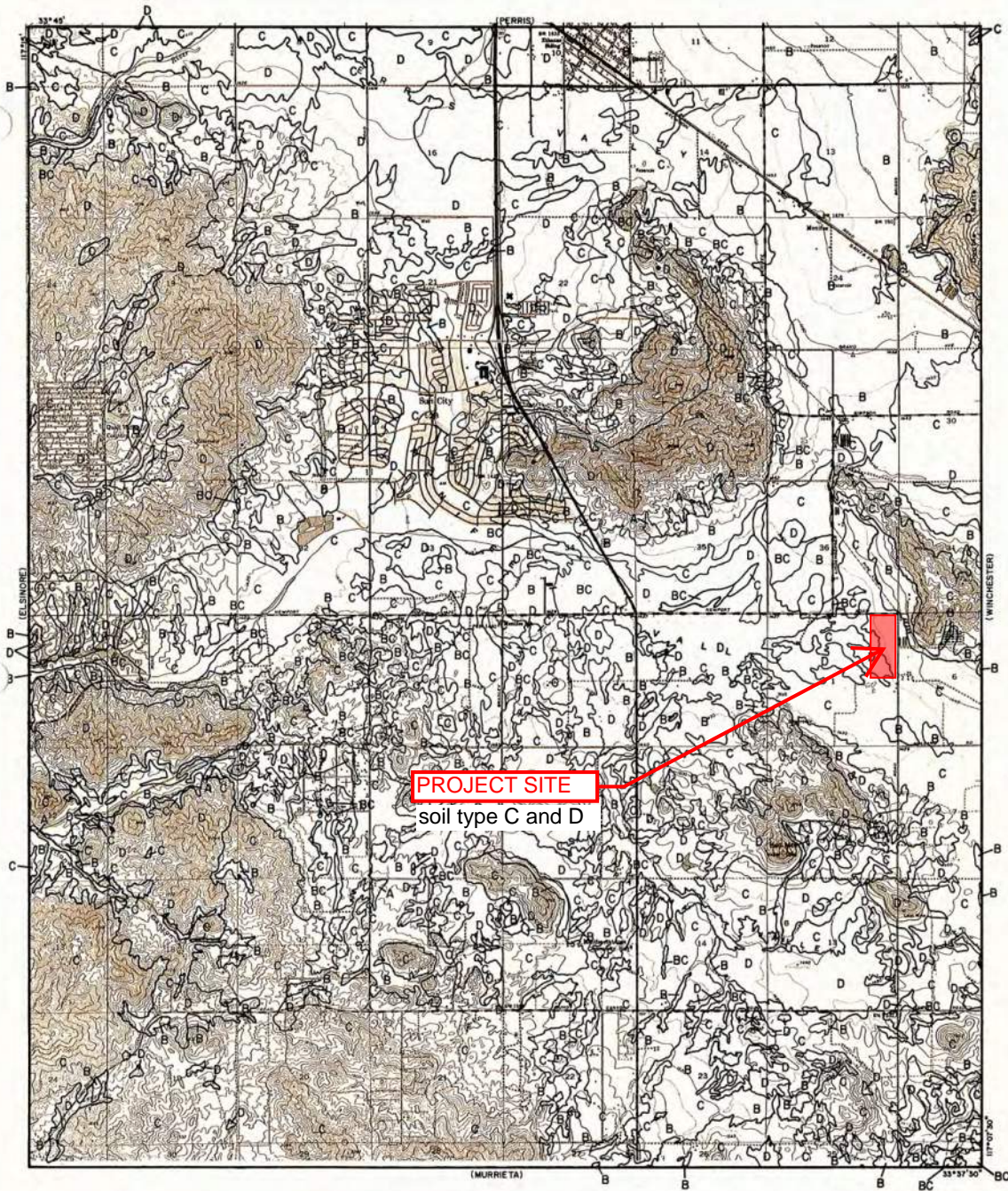
Attachment C
Water Shed Information

Attachment C1
Watershed Map

Santa Ana Watershed



Attachment C2
Soils Index Map



<p>LEGEND</p> <p>— SOILS GROUP BOUNDARY</p> <p>A SOILS GROUP DESIGNATION</p> <p>RCFC&WCD</p> <p>HYDROLOGY MANUAL</p>	<p>HYDROLOGIC SOILS GROUP MAP</p> <p>FOR</p> <p>ROMOLAND</p>
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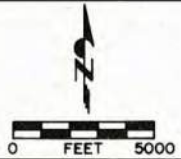
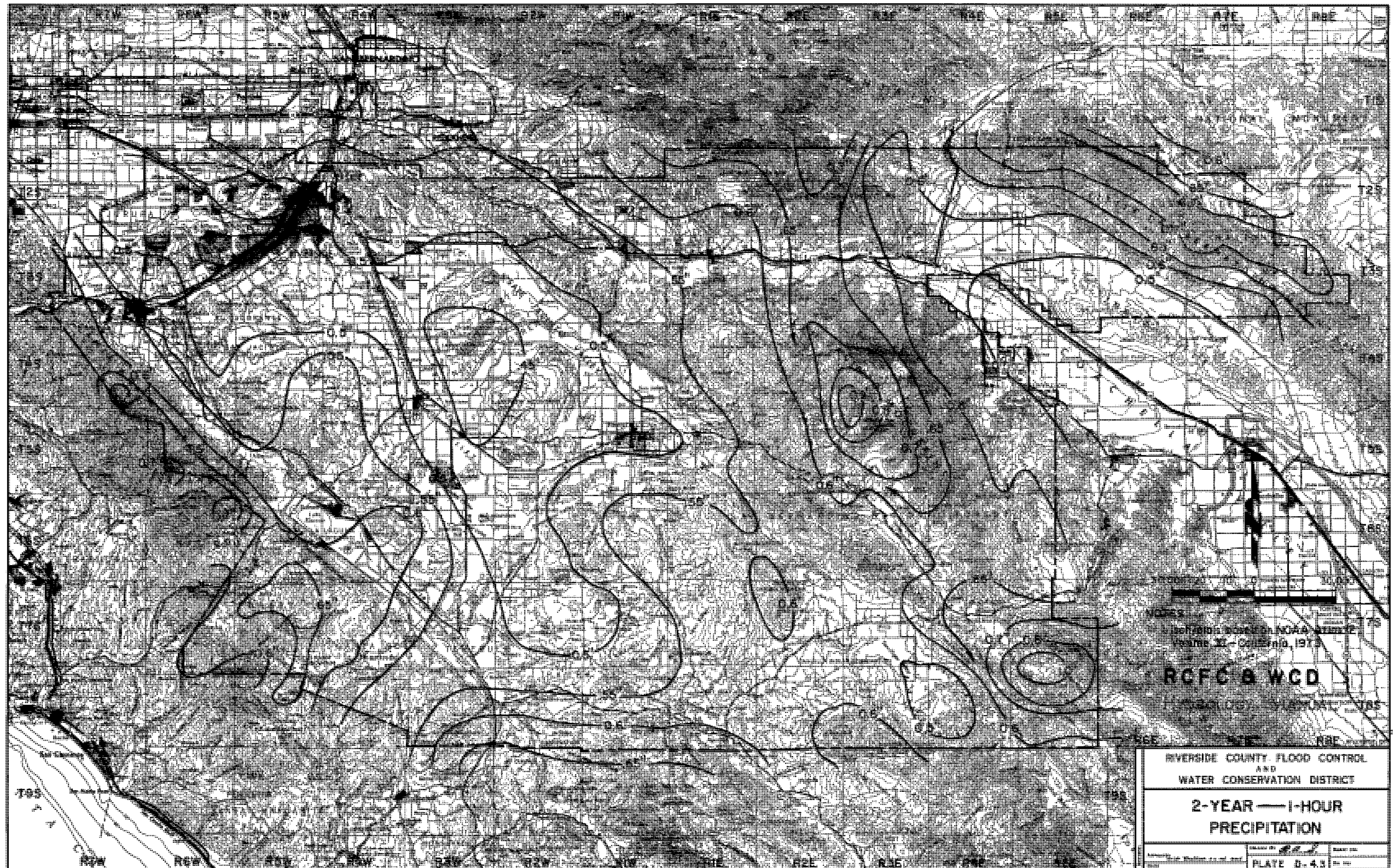


PLATE C-1.42

Attachment C3
Rainfall Isopluvial Map



Attachment C4
FEMA Flood Plain Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on this FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The horizontal datum was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRM for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NOS Information Services
NOAA NNGS12
National Geodetic Survey
SSMC-3, #0202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

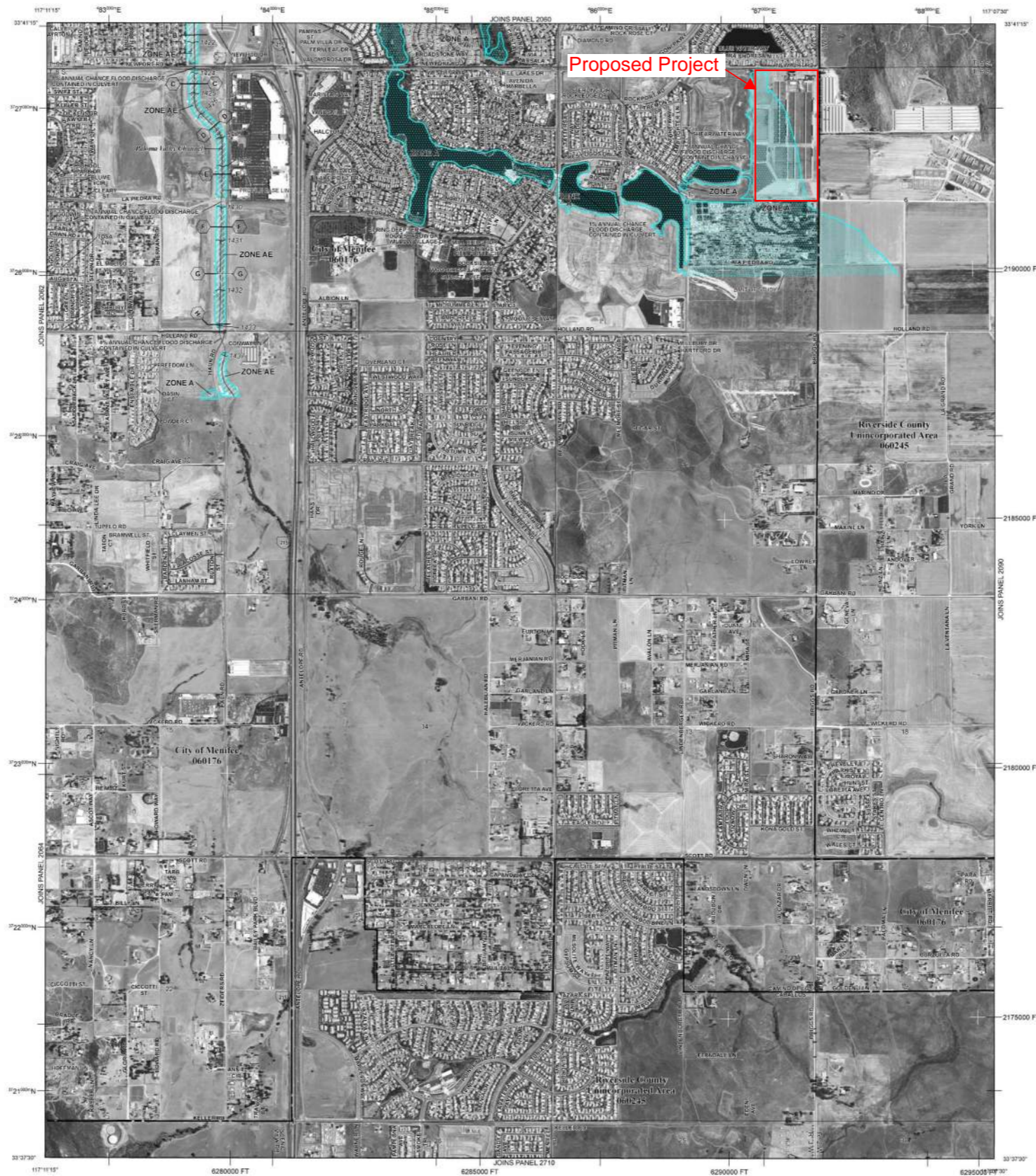
Base map information shown on this FIRM was derived from multiple sources including the Riverside County, CA effective database, and the National Geodetic Survey. Base map imagery for Riverside County, CA is a mosaic of the NAD 2009 images, 1 meter resolution.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at <http://msc.fema.gov/>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, ASR, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE ASR** Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

Base Flood Elevation line and value; elevation in feet*

Base Flood Elevation value where uniform within zone; elevation in feet

* Referenced to the North American Vertical Datum of 1988

Cross section line

Transect line

Geographic coordinates; referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

4750000 FT

6000000 FT

DX5510

M 1.5

River Mile

Refer to Map Repository List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

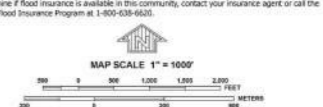
August 18, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

August 18, 2014, for a description of revisions, see Notice to Users page in the Flood Insurance Study report.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2070H

FIRM

**FLOOD INSURANCE RATE MAP
RIVERSIDE COUNTY,
CALIFORNIA
AND INCORPORATED AREAS**

PANEL 2070 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MENIFE, CITY OF	060176	2070	H
RIVERSIDE COUNTY UNINCORPORATED AREAS	060245	2070	H

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
06065C2070H
MAP REVISED
AUGUST 18, 2014**

Federal Emergency Management Agency

Attachment D
Pre Development Onsite

Attachment D1
Pre Development Onsite
Map

$TC_2 = 32.34 \text{ min. } Q_2 = 2.829 \text{ CFS}$
 $TC_{10} = 28.92 \text{ min. } Q_{10} = 5.592 \text{ CFS}$
 $TC_{100} = 26.81 \text{ min. } Q_{100} = 9.065 \text{ CFS}$

SUB AREA ADDITION 104
0.025 ACRES 1431.96 EG
40% IMP.

SUB AREA ADDITION 203
0.177 ACRES
5% IMP.

SUB AREA ADDITION 204
0.176 ACRES
0% IMP.

OLD NEWPORT RD

BRIGGS RD

SEE PREDEVELOPMENT SOUTH SHEET

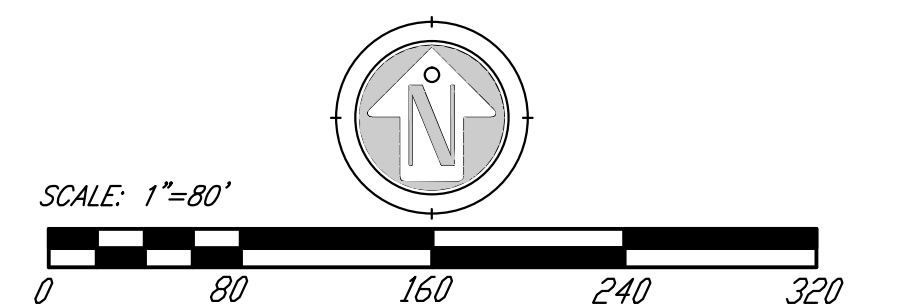
LEGEND

000

NOTE:

DUE TO AGRICULTURAL AREA
IMPERVIOUS PERCENTAGES
ARE INDIVIDUALLY
CALCULATED

ROCKPORT RANCH
PREDEVELOPMENT
RATIONAL METHOD
NORTH SHEET



RECOMMENDED FOR APPROVAL

DATE:

CHECKED BY:

DATE:

DEVELOPER:

EXCEL
ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92029
PH (760)745-8118 FX (760)745-1880

TENTATIVE

ROCKPORT RANCH

FOR:

W.O.

DATE:

1 OF 2

Attachment D2
Pre Development Onsite
2 Year

Pre Development – Onsite – 2 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 06/28/19   File:14047RockportPrel2.out
-----
14047Rockport Predevelopment Poc-2
Basin-1 poc-2
14047RockportPrel2.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

*****
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  199.000(Ft.)
Top (of initial area) elevation =  1436.840(Ft.)
Bottom (of initial area) elevation =  1435.790(Ft.)
Difference in elevation =  1.050(Ft.)
Slope =      0.00528  s(percent)=      0.53
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =      9.961 min.
Rainfall intensity =      1.318(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff =      0.704(CFS)
Total initial stream area =      0.730(Ac.)
Pervious area fraction = 0.600

*****
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =      1.685(CFS)
Depth of flow =  0.126(Ft.), Average velocity =  0.564(Ft/s)
***** Irregular Channel Data *****
-----

Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
```

Pre Development – 2 year Basin 1

Page 1 of 3

1	0.00	0.47
2	100.00	0.00
3	225.00	0.75

Manning's 'N' friction factor = 0.022

Sub-Channel flow = 1.685(CFS)
 ' ' flow top width = 47.638(Ft.)
 ' ' velocity= 0.564(Ft/s)
 ' ' area = 2.991(Sq.Ft)
 ' ' Froude number = 0.396

Upstream point elevation = 1435.790(Ft.)
 Downstream point elevation = 1434.300(Ft.)
 Flow length = 534.000(Ft.)
 Travel time = 15.79 min.
 Time of concentration = 25.75 min.
 Depth of flow = 0.126(Ft.)
 Average velocity = 0.564(Ft/s)
 Total irregular channel flow = 1.685(CFS)
 Irregular channel normal depth above invert elev. = 0.126(Ft.)
 Average velocity of channel(s) = 0.564(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.667
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 0.789(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.902(CFS) for 3.613(Ac.)
 Total runoff = 2.606(CFS) Total area = 4.343(Ac.)
 Depth of flow = 0.148(Ft.), Average velocity = 0.628(Ft/s)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.746(CFS)
 Depth of flow = 0.624(Ft.), Average velocity = 1.764(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 2.00
 2 8.00 0.00
 3 16.00 2.00

Manning's 'N' friction factor = 0.022

Sub-Channel flow = 2.746(CFS)
 ' ' flow top width = 4.991(Ft.)
 ' ' velocity= 1.764(Ft/s)
 ' ' area = 1.557(Sq.Ft)
 ' ' Froude number = 0.557

Upstream point elevation = 1434.300(Ft.)
 Downstream point elevation = 1431.960(Ft.)
 Flow length = 697.000(Ft.)
 Travel time = 6.59 min.
 Time of concentration = 32.34 min.
 Depth of flow = 0.624(Ft.)
 Average velocity = 1.764(Ft/s)
 Total irregular channel flow = 2.746(CFS)
 Irregular channel normal depth above invert elev. = 0.624(Ft.)
 Average velocity of channel(s) = 1.764(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.651
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000

Pre Development – 2 year Basin 1

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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 0.698(In/Hr) for a 2.0 year storm
Subarea runoff = 0.212(CFS) for 0.466(Ac.)
Total runoff = 2.818(CFS) Total area = 4.809(Ac.)
Depth of flow = 0.630(Ft.), Average velocity = 1.775(Ft/s)

+++++
Process from Point/Station 104.000 to Point/Station 104.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.651
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 32.34 min.
Rainfall intensity = 0.698(In/Hr) for a 2.0 year storm
Subarea runoff = 0.011(CFS) for 0.025(Ac.)
Total runoff = 2.829(CFS) Total area = 4.834(Ac.)
End of computations, total study area = 4.83 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.600
Area averaged RI index number = 69.0

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Pre Development – Onsite – 2 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 06/28/19   File:14047RockportPre22.out
-----
14047Rockport Predevelopment Poc-2
Basin - 2 - poc-1
14047RockportPre22.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 Hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  210.000(Ft.)
Top (of initial area) elevation =  1432.260(Ft.)
Bottom (of initial area) elevation =  1429.340(Ft.)
Difference in elevation =  2.920(Ft.)
Slope =  0.01390 s(percent)=  1.39
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  10.581 min.
Rainfall intensity =  1.276(In/Hr) for a  2.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff =  0.601(CFS)
Total initial stream area =  0.612(Ac.)
Pervious area fraction = 1.000

+++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =  3.500(CFS)
Depth of flow =  0.119(Ft.), Average velocity =  0.752(Ft/s)
***** Irregular Channel Data *****
-----

Information entered for subchannel number 1 :
```

Pre Development – 2year Basin 2

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Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.47
      2             225.00              0.00
      3             456.00              1.26
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 3.500(CFS)
      '      ' flow top width = 78.512(Ft.)
      '      ' velocity= 0.752(Ft/s)
      '      ' area = 4.655(Sq.Ft)
      '      ' Froude number = 0.544

Upstream point elevation = 1429.340(Ft.)
Downstream point elevation = 1425.070(Ft.)
Flow length = 797.000(Ft.)
Travel time = 17.67 min.
Time of concentration = 28.25 min.
Depth of flow = 0.119(Ft.)
Average velocity = 0.752(Ft/s)
Total irregular channel flow = 3.500(CFS)
Irregular channel normal depth above invert elev. = 0.119(Ft.)
Average velocity of channel(s) = 0.752(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.698
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.751(In/Hr) for a 2.0 year storm
Subarea runoff = 5.737(CFS) for 10.942(Ac.)
Total runoff = 6.338(CFS) Total area = 11.554(Ac.)
Depth of flow = 0.148(Ft.), Average velocity = 0.872(Ft/s)

+++++
Process from Point/Station 203.000 to Point/Station 203.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.698
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 28.25 min.
Rainfall intensity = 0.751(In/Hr) for a 2.0 year storm
Subarea runoff = 0.093(CFS) for 0.177(Ac.)
Total runoff = 6.431(CFS) Total area = 11.731(Ac.)

+++++
Process from Point/Station 203.000 to Point/Station 204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.429(CFS)
Depth of flow = 0.377(Ft.), Average velocity = 0.677(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.00
      2             125.00              0.00
      3             350.00              2.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 8.429(CFS)

```

Pre Development – 2year Basin 2

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'      '      flow top width =      65.995(Ft.)
'      '      velocity=      0.677(Ft/s)
'      '      area =      12.444(Sq.Ft)
'      '      Froude number =      0.275

Upstream point elevation = 1425.070(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 731.000(Ft.)
Travel time = 17.99 min.
Time of concentration = 46.24 min.
Depth of flow = 0.377(Ft.)
Average velocity = 0.677(Ft/s)
Total irregular channel flow = 8.429(CFS)
Irregular channel normal depth above invert elev. = 0.377(Ft.)
Average velocity of channel(s) = 0.677(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.654
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.576(In/Hr) for a 2.0 year storm
Subarea runoff = 3.937(CFS) for 10.468(Ac.)
Total runoff = 10.368(CFS) Total area = 22.199(Ac.)
Depth of flow = 0.408(Ft.), Average velocity = 0.713(Ft/s)

+++++
Process from Point/Station 204.000 to Point/Station 204.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.654
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 46.24 min.
Rainfall intensity = 0.576(In/Hr) for a 2.0 year storm
Subarea runoff = 0.066(CFS) for 0.176(Ac.)
Total runoff = 10.434(CFS) Total area = 22.375(Ac.)

+++++
Process from Point/Station 204.000 to Point/Station 204.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.375(Ac.)
Runoff from this stream = 10.434(CFS)
Time of concentration = 46.24 min.
Rainfall intensity = 0.576(In/Hr)

+++++
Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 292.000(Ft.)
Top (of initial area) elevation = 1436.840(Ft.)
Bottom (of initial area) elevation = 1433.070(Ft.)
Difference in elevation = 3.770(Ft.)
Slope = 0.01291 s(percent)= 1.29
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.710 min.
Rainfall intensity = 1.337(In/Hr) for a 2.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.733

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Pre Development – 2year Basin 2

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 1.237(CFS)
Total initial stream area = 1.263(Ac.)
Pervious area fraction = 0.600

+++++
Process from Point/Station 302.000 to Point/Station 303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 3.362(CFS)
Depth of flow = 0.192(Ft.), Average velocity = 1.278(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 3.00
2 215.00 0.00
3 428.00 3.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 3.362(CFS)
' ' flow top width = 27.395(Ft.)
' ' velocity = 1.278(Ft/s)
' ' area = 2.630(Sq.Ft)
' ' Froude number = 0.727

Upstream point elevation = 1433.070(Ft.)
Downstream point elevation = 1429.070(Ft.)
Flow length = 491.000(Ft.)
Travel time = 6.40 min.
Time of concentration = 16.11 min.
Depth of flow = 0.192(Ft.)
Average velocity = 1.278(Ft/s)
Total irregular channel flow = 3.362(CFS)
Irregular channel normal depth above invert elev. = 0.192(Ft.)
Average velocity of channel(s) = 1.278(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.700
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 1.017(In/Hr) for a 2.0 year storm
Subarea runoff = 4.192(CFS) for 5.890(Ac.)
Total runoff = 5.429(CFS) Total area = 7.153(Ac.)
Depth of flow = 0.230(Ft.), Average velocity = 1.441(Ft/s)

+++++
Process from Point/Station 303.000 to Point/Station 304.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 7.498(CFS)
Depth of flow = 0.337(Ft.), Average velocity = 1.288(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 3.24
2 200.00 0.00
3 400.00 4.88
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 7.498(CFS)

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Pre Development – 2year Basin 2

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'      '      flow top width =      34.577(Ft.)
'      '      velocity=      1.288(Ft/s)
'      '      area =      5.820(Sq.Ft)
'      '      Froude number =      0.553

Upstream point elevation = 1429.070(Ft.)
Downstream point elevation = 1426.380(Ft.)
Flow length = 687.000(Ft.)
Travel time = 8.89 min.
Time of concentration = 25.00 min.
Depth of flow = 0.337(Ft.)
Average velocity = 1.288(Ft/s)
Total irregular channel flow = 7.498(CFS)
Irregular channel normal depth above invert elev. = 0.337(Ft.)
Average velocity of channel(s) = 1.288(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.592
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 0.802(In/Hr) for a 2.0 year storm
Subarea runoff = 4.056(CFS) for 8.538(Ac.)
Total runoff = 9.486(CFS) Total area = 15.691(Ac.)
Depth of flow = 0.368(Ft.), Average velocity = 1.366(Ft/s)

+++++
Process from Point/Station 304.000 to Point/Station 204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 9.926(CFS)
Depth of flow = 0.861(Ft.), Average velocity = 1.983(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 30.00 0.00
3 60.00 4.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 9.926(CFS)
'      '      flow top width =      11.626(Ft.)
'      '      velocity=      1.983(Ft/s)
'      '      area =      5.006(Sq.Ft)
'      '      Froude number =      0.532

Upstream point elevation = 1426.380(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 740.000(Ft.)
Travel time = 6.22 min.
Time of concentration = 31.22 min.
Depth of flow = 0.861(Ft.)
Average velocity = 1.983(Ft/s)
Total irregular channel flow = 9.926(CFS)
Irregular channel normal depth above invert elev. = 0.861(Ft.)
Average velocity of channel(s) = 1.983(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.571
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 0.712(In/Hr) for a 2.0 year storm
Subarea runoff = 0.785(CFS) for 1.932(Ac.)

```

Pre Development – 2year Basin 2

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Total runoff = 10.270(CFS) Total area = 17.623(Ac.)
Depth of flow = 0.872(Ft.), Average velocity = 2.000(Ft/s)

Process from Point/Station 204.000 to Point/Station 204.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 17.623(Ac.)
Runoff from this stream = 10.270(CFS)
Time of concentration = 31.22 min.
Rainfall intensity = 0.712(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	10.434	46.24	0.576
2	10.270	31.22	0.712

Largest stream flow has longer time of concentration
Qp = 10.434 + sum of
Qb Ia/Ib
10.270 * 0.809 = 8.308
Qp = 18.742

Total of 2 streams to confluence:
Flow rates before confluence point:
10.434 10.270
Area of streams before confluence:
22.375 17.623
Results of confluence:
Total flow rate = 18.742(CFS)
Time of concentration = 46.237 min.
Effective stream area after confluence = 39.998(Ac.)

Process from Point/Station 204.000 to Point/Station 205.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Estimated mean flow rate at midpoint of channel = 19.126(CFS)
Depth of flow = 0.482(Ft.), Average velocity = 0.565(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.00
2 178.00 0.00
3 291.00 1.00
Manning's 'N' friction factor = 0.022

Sub-Channel flow = 19.126(CFS)
' ' flow top width = 140.321(Ft.)
' ' velocity = 0.565(Ft/s)
' ' area = 33.832(Sq.Ft)
' ' Froude number = 0.203

Upstream point elevation = 1424.390(Ft.)
Downstream point elevation = 1424.200(Ft.)
Flow length = 407.000(Ft.)
Travel time = 12.00 min.
Time of concentration = 58.24 min.
Depth of flow = 0.482(Ft.)
Average velocity = 0.565(Ft/s)
Total irregular channel flow = 19.126(CFS)
Irregular channel normal depth above invert elev. = 0.482(Ft.)
Average velocity of channel(s) = 0.565(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.631

Pre Development - 2year Basin 2

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.508(In/Hr) for a 2.0 year storm
Subarea runoff = 0.688(CFS) for 2.148(Ac.)
Total runoff = 19.430(CFS) Total area = 42.146(Ac.)
Depth of flow = 0.485(Ft.), Average velocity = 0.568(Ft/s)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.631
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 58.24 min.
Rainfall intensity = 0.508(In/Hr) for a 2.0 year storm
Subarea runoff = 0.033(CFS) for 0.104(Ac.)
Total runoff = 19.464(CFS) Total area = 42.250(Ac.)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 42.250(Ac.)
Runoff from this stream = 19.464(CFS)
Time of concentration = 58.24 min.
Rainfall intensity = 0.508(In/Hr)

*****
Process from Point/Station 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 330.000(Ft.)
Top (of initial area) elevation = 1439.510(Ft.)
Bottom (of initial area) elevation = 1434.650(Ft.)
Difference in elevation = 4.860(Ft.)
Slope = 0.01473 s(percent)= 1.47
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.932 min.
Rainfall intensity = 1.321(In/Hr) for a 2.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 0.315(CFS)
Total initial stream area = 0.326(Ac.)
Pervious area fraction = 0.600

*****
Process from Point/Station 402.000 to Point/Station 402.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.731
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 9.93 min.
Rainfall intensity = 1.321(In/Hr) for a 2.0 year storm
Subarea runoff = 0.017(CFS) for 0.018(Ac.)
Total runoff = 0.332(CFS) Total area = 0.344(Ac.)

*****
Process from Point/Station 402.000 to Point/Station 403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.774(CFS)
Depth of flow = 0.168(Ft.), Average velocity = 0.771(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.64
2 40.00 0.00
3 50.00 1.10
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 0.774(CFS)
' ' flow top width = 11.992(Ft.)
' ' velocity = 0.771(Ft/s)
' ' area = 1.004(Sq.Ft)
' ' Froude number = 0.469

Upstream point elevation = 1434.650(Ft.)
Downstream point elevation = 1431.180(Ft.)
Flow length = 976.000(Ft.)
Travel time = 21.11 min.
Time of concentration = 31.04 min.
Depth of flow = 0.168(Ft.)
Average velocity = 0.771(Ft/s)
Total irregular channel flow = 0.774(CFS)
Irregular channel normal depth above invert elev. = 0.168(Ft.)
Average velocity of channel(s) = 0.771(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.654
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 0.714(In/Hr) for a 2.0 year storm
Subarea runoff = 0.819(CFS) for 1.756(Ac.)
Total runoff = 1.151(CFS) Total area = 2.100(Ac.)
Depth of flow = 0.194(Ft.), Average velocity = 0.851(Ft/s)

*****
Process from Point/Station 403.000 to Point/Station 403.000
**** SUBAREA FLOW ADDITION ****

-----
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.654
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 31.04 min.
Rainfall intensity = 0.714(In/Hr) for a 2.0 year storm
Subarea runoff = 0.080(CFS) for 0.172(Ac.)
Total runoff = 1.232(CFS) Total area = 2.272(Ac.)

```

Pre Development – 2year Basin 2

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+++++
Process from Point/Station      403.000 to Point/Station      404.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      1.516(CFS)
Depth of flow =  0.269(Ft.), Average velocity =  0.699(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.30
      2              18.00              0.00
      3              25.00              0.00
Manning's 'N' friction factor =  0.022
-----
Sub-Channel flow =  1.516(CFS)
      '      '      flow top width =  9.106(Ft.)
      '      '      velocity=  0.699(Ft/s)
      '      '      area =  2.167(Sq.Ft)
      '      '      Froude number =  0.253

Upstream point elevation = 1431.180(Ft.)
Downstream point elevation = 1430.530(Ft.)
Flow length = 892.000(Ft.)
Travel time = 21.26 min.
Time of concentration = 52.30 min.
Depth of flow = 0.269(Ft.)
Average velocity = 0.699(Ft/s)
Total irregular channel flow = 1.516(CFS)
Irregular channel normal depth above invert elev. = 0.269(Ft.)
Average velocity of channel(s) = 0.699(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.616
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 0.538(In/Hr) for a 2.0 year storm
Subarea runoff = 0.489(CFS) for 1.475(Ac.)
Total runoff = 1.721(CFS) Total area = 3.747(Ac.)
Depth of flow = 0.290(Ft.), Average velocity = 0.731(Ft/s)

+++++
Process from Point/Station      404.000 to Point/Station      404.000
**** SUBAREA FLOW ADDITION ****

-----
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.616
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 52.30 min.
Rainfall intensity = 0.538(In/Hr) for a 2.0 year storm
Subarea runoff = 0.103(CFS) for 0.312(Ac.)
Total runoff = 1.824(CFS) Total area = 4.059(Ac.)

+++++
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      1.897(CFS)
Depth of flow = 0.422(Ft.), Average velocity = 0.523(Ft/s)

```

Pre Development – 2year Basin 2

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```

***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.37
      2             18.00              0.00
      3             25.00              0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 1.897(CFS)
      '      '      flow top width = 10.203(Ft.)
      '      '      velocity= 0.523(Ft/s)
      '      '      area = 3.627(Sq.Ft)
      '      '      Froude number = 0.155

Upstream point elevation = 1430.530(Ft.)
Downstream point elevation = 1430.460(Ft.)
Flow length = 293.000(Ft.)
Travel time = 9.34 min.
Time of concentration = 61.64 min.
Depth of flow = 0.422(Ft.)
Average velocity = 0.523(Ft/s)
Total irregular channel flow = 1.897(CFS)
Irregular channel normal depth above invert elev. = 0.422(Ft.)
Average velocity of channel(s) = 0.523(Ft/s)
Adding area flow to channel
CONDOMINIUM subarea type
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Rainfall intensity = 0.493(In/Hr) for a 2.0 year storm
Subarea runoff = 0.116(CFS) for 0.324(Ac.)
Total runoff = 1.940(CFS) Total area = 4.383(Ac.)
Depth of flow = 0.427(Ft.), Average velocity = 0.527(Ft/s)

*****
Process from Point/Station 405.000 to Point/Station 405.000
**** SUBAREA FLOW ADDITION ****

CONDOMINIUM subarea type
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Time of concentration = 61.64 min.
Rainfall intensity = 0.493(In/Hr) for a 2.0 year storm
Subarea runoff = 0.051(CFS) for 0.142(Ac.)
Total runoff = 1.991(CFS) Total area = 4.525(Ac.)

*****
Process from Point/Station 405.000 to Point/Station 406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.225(CFS)
Depth of flow = 0.164(Ft.), Average velocity = 0.363(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.17
      2             50.00              0.00
      3            220.00              1.06
Manning's 'N' friction factor = 0.022

```

Pre Development – 2year Basin 2

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```

-----
Sub-Channel flow = 2.225(CFS)
'   '   flow top width = 74.600(Ft.)
'   '   velocity= 0.363(Ft/s)
'   '   area = 6.122(Sq.Ft)
'   '   Froude number = 0.224

Upstream point elevation = 1430.460(Ft.)
Downstream point elevation = 1430.210(Ft.)
Flow length = 308.000(Ft.)
Travel time = 14.13 min.
Time of concentration = 75.76 min.
Depth of flow = 0.164(Ft.)
Average velocity = 0.363(Ft/s)
Total irregular channel flow = 2.225(CFS)
Irregular channel normal depth above invert elev. = 0.164(Ft.)
Average velocity of channel(s) = 0.363(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.655
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.441(In/Hr) for a 2.0 year storm
Subarea runoff = 0.414(CFS) for 1.432(Ac.)
Total runoff = 2.405(CFS) Total area = 5.957(Ac.)
Depth of flow = 0.169(Ft.), Average velocity = 0.371(Ft/s)

*****
Process from Point/Station 406.000 to Point/Station 407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 2.588(CFS)
Depth of flow = 0.040(Ft.), Average velocity = 1.004(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number   'X' coordinate   'Y' coordinate
1              0.00           0.20
2              26.00           0.00
3              88.00           0.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 2.588(CFS)
'   '   flow top width = 67.189(Ft.)
'   '   velocity= 1.004(Ft/s)
'   '   area = 2.578(Sq.Ft)
'   '   Froude number = 0.903

Upstream point elevation = 1430.210(Ft.)
Downstream point elevation = 1425.570(Ft.)
Flow length = 272.000(Ft.)
Travel time = 4.52 min.
Time of concentration = 80.28 min.
Depth of flow = 0.040(Ft.)
Average velocity = 1.004(Ft/s)
Total irregular channel flow = 2.588(CFS)
Irregular channel normal depth above invert elev. = 0.040(Ft.)
Average velocity of channel(s) = 1.004(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.649
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000

```

```

Rainfall intensity = 0.427(In/Hr) for a 2.0 year storm
Subarea runoff = 0.299(CFS) for 1.077(Ac.)
Total runoff = 2.703(CFS) Total area = 7.034(Ac.)
Depth of flow = 0.041(Ft.), Average velocity = 1.021(Ft/s)

+++++
Process from Point/Station 407.000 to Point/Station 407.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.480
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Time of concentration = 80.28 min.
Rainfall intensity = 0.427(In/Hr) for a 2.0 year storm
Subarea runoff = 1.688(CFS) for 8.236(Ac.)
Total runoff = 4.392(CFS) Total area = 15.270(Ac.)

+++++
Process from Point/Station 407.000 to Point/Station 408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.528(CFS)
Depth of flow = 0.198(Ft.), Average velocity = 0.886(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.00
2 25.00 0.00
3 50.00 3.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 4.528(CFS)
' ' flow top width = 26.649(Ft.)
' ' velocity = 0.886(Ft/s)
' ' area = 5.110(Sq.Ft)
' ' Froude number = 0.357

Upstream point elevation = 1425.570(Ft.)
Downstream point elevation = 1424.220(Ft.)
Flow length = 867.000(Ft.)
Travel time = 16.31 min.
Time of concentration = 96.59 min.
Depth of flow = 0.198(Ft.)
Average velocity = 0.886(Ft/s)
Total irregular channel flow = 4.528(CFS)
Irregular channel normal depth above invert elev. = 0.198(Ft.)
Average velocity of channel(s) = 0.886(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.576
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.387(In/Hr) for a 2.0 year storm
Subarea runoff = 0.212(CFS) for 0.949(Ac.)
Total runoff = 4.603(CFS) Total area = 16.219(Ac.)
Depth of flow = 0.200(Ft.), Average velocity = 0.892(Ft/s)
!!Warning: Water is above left or right bank elevations

+++++

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Pre Development – 2year Basin 2

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```

Process from Point/Station      408.000 to Point/Station      408.000
**** SUBAREA FLOW ADDITION ****

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```

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.631
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 96.59 min.
Rainfall intensity = 0.387(In/Hr) for a 2.0 year storm
Subarea runoff = 1.316(CFS) for 5.394(Ac.)
Total runoff = 5.919(CFS) Total area = 21.613(Ac.)

```

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+++++
Process from Point/Station      408.000 to Point/Station      205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

```

Depth of flow = 0.151(Ft.), Average velocity = 0.214(Ft/s)
***** Irregular Channel Data *****

```

```

Information entered for subchannel number 1 :
Point number   'X' coordinate   'Y' coordinate
      1           0.00           7.00
      2          17.00           0.00
      3         200.00           0.00
Manning's 'N' friction factor = 0.022

```

```

Sub-Channel flow = 5.919(CFS)
'   '   flow top width = 183.367(Ft.)
'   '   velocity= 0.214(Ft/s)
'   '   area = 27.714(Sq.Ft)
'   '   Froude number = 0.097

```

```

Upstream point elevation = 1424.220(Ft.)
Downstream point elevation = 1424.200(Ft.)
Flow length = 161.000(Ft.)
Travel time = 12.56 min.
Time of concentration = 109.15 min.
Depth of flow = 0.151(Ft.)
Average velocity = 0.214(Ft/s)
Total irregular channel flow = 5.919(CFS)
Irregular channel normal depth above invert elev. = 0.151(Ft.)
Average velocity of channel(s) = 0.214(Ft/s)

```

```

+++++
Process from Point/Station      205.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****

```

```

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.613(Ac.)
Runoff from this stream = 5.919(CFS)
Time of concentration = 109.15 min.
Rainfall intensity = 0.362(In/Hr)
Summary of stream data:

```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	19.464	58.24	0.508
2	5.919	109.15	0.362

```

Largest stream flow has longer or shorter time of concentration
Qp = 19.464 + sum of
      Qa      Tb/Ta
      5.919 * 0.534 = 3.158
Qp = 22.622
Total of 2 streams to confluence:

```

Pre Development – 2year Basin 2

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```

Flow rates before confluence point:
    19.464      5.919
Area of streams before confluence:
    42.250      21.613
Results of confluence:
Total flow rate =      22.622(CFS)
Time of concentration =      58.236 min.
Effective stream area after confluence =      63.863(Ac.)

+++++
Process from Point/Station      205.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow =      0.448(Ft.), Average velocity =      0.687(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.70
      2             15.00              0.00
      3             279.00              0.86
Manning's 'N' friction factor =      0.022
-----
Sub-Channel flow =      22.622(CFS)
'      '      flow top width =      147.065(Ft.)
'      '      velocity=      0.687(Ft/s)
'      '      area =      32.929(Sq.Ft)
'      '      Froude number =      0.256

Upstream point elevation =      1424.200(Ft.)
Downstream point elevation =      1423.990(Ft.)
Flow length =      276.000(Ft.)
Travel time =      6.70 min.
Time of concentration =      64.93 min.
Depth of flow =      0.448(Ft.)
Average velocity =      0.687(Ft/s)
Total irregular channel flow =      22.622(CFS)
Irregular channel normal depth above invert elev. =      0.448(Ft.)
Average velocity of channel(s) =      0.687(Ft/s)

+++++
Process from Point/Station      206.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****

-----
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      63.863(Ac.)
Runoff from this stream =      22.622(CFS)
Time of concentration =      64.93 min.
Rainfall intensity =      0.479(In/Hr)
Summary of stream data:

Stream      Flow rate      TC      Rainfall Intensity
No.      (CFS)      (min)      (In/Hr)

1      22.622      64.93      0.479
Largest stream flow has longer time of concentration
Qp =      22.622 + sum of
Qp =      22.622

Total of 1 streams to confluence:
Flow rates before confluence point:
    22.622
Area of streams before confluence:
    63.863
Results of confluence:
Total flow rate =      22.622(CFS)
Time of concentration =      64.932 min.
Effective stream area after confluence =      63.863(Ac.)

+++++

```

Process from Point/Station 501.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 355.000(Ft.)
 Top (of initial area) elevation = 1426.770(Ft.)
 Bottom (of initial area) elevation = 1426.310(Ft.)
 Difference in elevation = 0.460(Ft.)
 Slope = 0.00130 s(percent)= 0.13
 $TC = k(0.530)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 20.983 min.
 Rainfall intensity = 0.882(In/Hr) for a 2.0 year storm
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.722
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Initial subarea runoff = 1.165(CFS)
 Total initial stream area = 1.829(Ac.)
 Pervious area fraction = 1.000

 Process from Point/Station 502.000 to Point/Station 206.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 2.582(CFS)
 Depth of flow = 0.072(Ft.), Average velocity = 0.360(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 0.11
 2 294.00 0.00
 3 450.00 2.00

Manning's 'N' friction factor = 0.022

 Sub-Channel flow = 2.582(CFS)
 ' ' flow top width = 198.694(Ft.)
 ' ' velocity = 0.360(Ft/s)
 ' ' area = 7.176(Sq.Ft)
 ' ' Froude number = 0.334

Upstream point elevation = 1426.310(Ft.)
 Downstream point elevation = 1423.990(Ft.)
 Flow length = 976.000(Ft.)
 Travel time = 45.21 min.
 Time of concentration = 66.19 min.
 Depth of flow = 0.072(Ft.)
 Average velocity = 0.360(Ft/s)
 Total irregular channel flow = 2.582(CFS)
 Irregular channel normal depth above invert elev. = 0.072(Ft.)
 Average velocity of channel(s) = 0.360(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.617
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 0.474(In/Hr) for a 2.0 year storm
 Subarea runoff = 2.767(CFS) for 9.451(Ac.)
 Total runoff = 3.932(CFS) Total area = 11.280(Ac.)
 Depth of flow = 0.085(Ft.), Average velocity = 0.400(Ft/s)

 Process from Point/Station 206.000 to Point/Station 206.000

Pre Development – 2year Basin 2

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**** SUBAREA FLOW ADDITION ****

MOBILE HOME PARK subarea type
 Runoff Coefficient = 0.774
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.250; Impervious fraction = 0.750
 Time of concentration = 66.19 min.
 Rainfall intensity = 0.474(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.302(CFS) for 0.823(Ac.)
 Total runoff = 4.234(CFS) Total area = 12.103(Ac.)

 Process from Point/Station 206.000 to Point/Station 206.000
 **** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.617
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Time of concentration = 66.19 min.
 Rainfall intensity = 0.474(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.162(CFS) for 0.555(Ac.)
 Total runoff = 4.396(CFS) Total area = 12.658(Ac.)

 Process from Point/Station 206.000 to Point/Station 206.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 12.658(Ac.)
 Runoff from this stream = 4.396(CFS)
 Time of concentration = 66.19 min.
 Rainfall intensity = 0.474(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	22.622	64.93	0.479
2	4.396	66.19	0.474

Largest stream flow has longer or shorter time of concentration
 $Q_p = 22.622 + \text{sum of } \frac{Q_a \cdot T_b}{T_a}$
 $Q_p = 22.622 + 4.396 \cdot \frac{66.19 - 64.93}{66.19} = 26.934$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 22.622 4.396
 Area of streams before confluence:
 63.863 12.658
 Results of confluence:
 Total flow rate = 26.934(CFS)
 Time of concentration = 64.932 min.
 Effective stream area after confluence = 76.521(Ac.)
 End of computations, total study area = 76.52 (Ac.)
 The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.880
 Area averaged RI index number = 79.4

Attachment D3
Pre Development Onsite
10 Year

Pre Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 06/28/19   File:14047RockportPrel10.out
-----
14047Rockport Predevelopment Poc-2
Basin-1 poc-2
14047RockportPrel10.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+-----+
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
+-----+
Initial area flow distance = 199.000(Ft.)
Top (of initial area) elevation = 1436.840(Ft.)
Bottom (of initial area) elevation = 1435.790(Ft.)
Difference in elevation = 1.050(Ft.)
Slope = 0.00528 s(percent)= 0.53
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.961 min.
Rainfall intensity = 2.253(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 1.294(CFS)
Total initial stream area = 0.730(Ac.)
Pervious area fraction = 0.600

+-----+
Process from Point/Station 102.000 to Point/Station 103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+
```

Pre Development – 10 year Basin 1

Page 1 of 3

Estimated mean flow rate at midpoint of channel = 3.262(CFS)
 Depth of flow = 0.161(Ft.), Average velocity = 0.665(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 0.47
 2 100.00 0.00
 3 225.00 0.75
 Manning's 'N' friction factor = 0.022

Sub-Channel flow = 3.262(CFS)
 ' ' flow top width = 61.028(Ft.)
 ' ' velocity= 0.665(Ft/s)
 ' ' area = 4.908(Sq.Ft)
 ' ' Froude number = 0.413

Upstream point elevation = 1435.790(Ft.)
 Downstream point elevation = 1434.300(Ft.)
 Flow length = 534.000(Ft.)
 Travel time = 13.39 min.
 Time of concentration = 23.35 min.
 Depth of flow = 0.161(Ft.)
 Average velocity = 0.665(Ft/s)
 Total irregular channel flow = 3.262(CFS)
 Irregular channel normal depth above invert elev. = 0.161(Ft.)
 Average velocity of channel(s) = 0.665(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.741
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 1.435(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.841(CFS) for 3.613(Ac.)
 Total runoff = 5.134(CFS) Total area = 4.343(Ac.)
 Depth of flow = 0.191(Ft.), Average velocity = 0.745(Ft/s)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 5.381(CFS)
 Depth of flow = 0.803(Ft.), Average velocity = 2.087(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 2.00
 2 8.00 0.00
 3 16.00 2.00
 Manning's 'N' friction factor = 0.022

Sub-Channel flow = 5.381(CFS)
 ' ' flow top width = 6.423(Ft.)
 ' ' velocity= 2.087(Ft/s)
 ' ' area = 2.578(Sq.Ft)
 ' ' Froude number = 0.581

Upstream point elevation = 1434.300(Ft.)
 Downstream point elevation = 1431.960(Ft.)
 Flow length = 697.000(Ft.)
 Travel time = 5.57 min.
 Time of concentration = 28.92 min.
 Depth of flow = 0.803(Ft.)
 Average velocity = 2.087(Ft/s)
 Total irregular channel flow = 5.381(CFS)

Pre Development - 10 year Basin 1

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Irregular channel normal depth above invert elev. = 0.803(Ft.)
 Average velocity of channel(s) = 2.087(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.728
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 1.281(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.435(CFS) for 0.466(Ac.)
 Total runoff = 5.569(CFS) Total area = 4.809(Ac.)
 Depth of flow = 0.813(Ft.), Average velocity = 2.105(Ft/s)

++++++
 Process from Point/Station 104.000 to Point/Station 104.000
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.728
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Time of concentration = 28.92 min.
 Rainfall intensity = 1.281(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.023(CFS) for 0.025(Ac.)
 Total runoff = 5.592(CFS) Total area = 4.834(Ac.)
 End of computations, total study area = 4.83 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

 Area averaged pervious area fraction(Ap) = 0.600
 Area averaged RI index number = 69.0

Pre Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 06/28/19   File:14047RockportPre210.out
-----
14047Rockport Predevelopment Poc-2
Basin - 2 - poc-1
14047RockportPre210.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+-----+
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
+-----+
Initial area flow distance = 210.000(Ft.)
Top (of initial area) elevation = 1432.260(Ft.)
Bottom (of initial area) elevation = 1429.340(Ft.)
Difference in elevation = 2.920(Ft.)
Slope = 0.01390 s(percent)= 1.39
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.581 min.
Rainfall intensity = 2.182(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.093(CFS)
Total initial stream area = 0.612(Ac.)
Pervious area fraction = 1.000

+-----+
Process from Point/Station      202.000 to Point/Station      203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+
Estimated mean flow rate at midpoint of channel = 6.964(CFS)
Depth of flow = 0.153(Ft.), Average velocity = 0.893(Ft/s)
```

Pre Development – 10 year Basin 2

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***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.47
      2             225.00              0.00
      3             456.00              1.26
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 6.964(CFS)
      '      '      flow top width = 101.624(Ft.)
      '      '      velocity= 0.893(Ft/s)
      '      '      area = 7.800(Sq.Ft)
      '      '      Froude number = 0.568

Upstream point elevation = 1429.340(Ft.)
Downstream point elevation = 1425.070(Ft.)
Flow length = 797.000(Ft.)
Travel time = 14.88 min.
Time of concentration = 25.46 min.
Depth of flow = 0.153(Ft.)
Average velocity = 0.893(Ft/s)
Total irregular channel flow = 6.964(CFS)
Irregular channel normal depth above invert elev. = 0.153(Ft.)
Average velocity of channel(s) = 0.893(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.370(In/Hr) for a 10.0 year storm
Subarea runoff = 11.650(CFS) for 10.942(Ac.)
Total runoff = 12.744(CFS) Total area = 11.554(Ac.)
Depth of flow = 0.193(Ft.), Average velocity = 1.038(Ft/s)

+++++
Process from Point/Station 203.000 to Point/Station 203.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 25.46 min.
Rainfall intensity = 1.370(In/Hr) for a 10.0 year storm
Subarea runoff = 0.188(CFS) for 0.177(Ac.)
Total runoff = 12.932(CFS) Total area = 11.731(Ac.)

+++++
Process from Point/Station 203.000 to Point/Station 204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 17.155(CFS)
Depth of flow = 0.492(Ft.), Average velocity = 0.809(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.00
      2             125.00              0.00
      3             350.00              2.00
Manning's 'N' friction factor = 0.022
-----

```

Pre Development – 10 year Basin 2

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Sub-Channel flow = 17.155(CFS)
' ' flow top width = 86.146(Ft.)
' ' velocity= 0.809(Ft/s)
' ' area = 21.203(Sq.Ft)
' ' Froude number = 0.287

Upstream point elevation = 1425.070(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 731.000(Ft.)
Travel time = 15.06 min.
Time of concentration = 40.52 min.
Depth of flow = 0.492(Ft.)
Average velocity = 0.809(Ft/s)
Total irregular channel flow = 17.155(CFS)
Irregular channel normal depth above invert elev. = 0.492(Ft.)
Average velocity of channel(s) = 0.809(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.748
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.071(In/Hr) for a 10.0 year storm
Subarea runoff = 8.392(CFS) for 10.468(Ac.)
Total runoff = 21.324(CFS) Total area = 22.199(Ac.)
Depth of flow = 0.534(Ft.), Average velocity = 0.854(Ft/s)

+++++
Process from Point/Station 204.000 to Point/Station 204.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.748
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 40.52 min.
Rainfall intensity = 1.071(In/Hr) for a 10.0 year storm
Subarea runoff = 0.141(CFS) for 0.176(Ac.)
Total runoff = 21.465(CFS) Total area = 22.375(Ac.)

+++++
Process from Point/Station 204.000 to Point/Station 204.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.375(Ac.)
Runoff from this stream = 21.465(CFS)
Time of concentration = 40.52 min.
Rainfall intensity = 1.071(In/Hr)

+++++
Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 292.000(Ft.)
Top (of initial area) elevation = 1436.840(Ft.)
Bottom (of initial area) elevation = 1433.070(Ft.)
Difference in elevation = 3.770(Ft.)
Slope = 0.01291 s(percent)= 1.29
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.710 min.
Rainfall intensity = 2.284(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/2 Acre Lot)

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Pre Development – 10 year Basin 2

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Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 2.273(CFS)
Total initial stream area = 1.263(Ac.)
Pervious area fraction = 0.600

*****
Process from Point/Station 302.000 to Point/Station 303.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.382(CFS)
Depth of flow = 0.244(Ft.), Average velocity = 1.500(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 3.00
2 215.00 0.00
3 428.00 3.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 6.382(CFS)
' ' flow top width = 34.838(Ft.)
' ' velocity = 1.500(Ft/s)
' ' area = 4.253(Sq.Ft)
' ' Froude number = 0.757

Upstream point elevation = 1433.070(Ft.)
Downstream point elevation = 1429.070(Ft.)
Flow length = 491.000(Ft.)
Travel time = 5.45 min.
Time of concentration = 15.16 min.
Depth of flow = 0.244(Ft.)
Average velocity = 1.500(Ft/s)
Total irregular channel flow = 6.382(CFS)
Irregular channel normal depth above invert elev. = 0.244(Ft.)
Average velocity of channel(s) = 1.500(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.765
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 1.803(In/Hr) for a 10.0 year storm
Subarea runoff = 8.130(CFS) for 5.890(Ac.)
Total runoff = 10.403(CFS) Total area = 7.153(Ac.)
Depth of flow = 0.293(Ft.), Average velocity = 1.695(Ft/s)

*****
Process from Point/Station 303.000 to Point/Station 304.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 14.729(CFS)
Depth of flow = 0.434(Ft.), Average velocity = 1.525(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 3.24
2 200.00 0.00
3 400.00 4.88
Manning's 'N' friction factor = 0.022
-----

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Pre Development – 10 year Basin 2

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Sub-Channel flow = 14.729(CFS)
' ' flow top width = 44.540(Ft.)
' ' velocity= 1.525(Ft/s)
' ' area = 9.657(Sq.Ft)
' ' Froude number = 0.577

Upstream point elevation = 1429.070(Ft.)
Downstream point elevation = 1426.380(Ft.)
Flow length = 687.000(Ft.)
Travel time = 7.51 min.
Time of concentration = 22.67 min.
Depth of flow = 0.434(Ft.)
Average velocity = 1.525(Ft/s)
Total irregular channel flow = 14.729(CFS)
Irregular channel normal depth above invert elev. = 0.434(Ft.)
Average velocity of channel(s) = 1.525(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.690
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 1.457(In/Hr) for a 10.0 year storm
Subarea runoff = 8.588(CFS) for 8.538(Ac.)
Total runoff = 18.991(CFS) Total area = 15.691(Ac.)
Depth of flow = 0.477(Ft.), Average velocity = 1.625(Ft/s)

+-----+
Process from Point/Station 304.000 to Point/Station 204.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Estimated mean flow rate at midpoint of channel = 19.880(CFS)
Depth of flow = 1.117(Ft.), Average velocity = 2.359(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 30.00 0.00
3 60.00 4.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 19.880(CFS)
' ' flow top width = 15.085(Ft.)
' ' velocity= 2.359(Ft/s)
' ' area = 8.428(Sq.Ft)
' ' Froude number = 0.556

Upstream point elevation = 1426.380(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 740.000(Ft.)
Travel time = 5.23 min.
Time of concentration = 27.90 min.
Depth of flow = 1.117(Ft.)
Average velocity = 2.359(Ft/s)
Total irregular channel flow = 19.880(CFS)
Irregular channel normal depth above invert elev. = 1.117(Ft.)
Average velocity of channel(s) = 2.359(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.674
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 1.305(In/Hr) for a 10.0 year storm

```

Subarea runoff = 1.699(CFS) for 1.932(Ac.)
Total runoff = 20.689(CFS) Total area = 17.623(Ac.)
Depth of flow = 1.134(Ft.), Average velocity = 2.382(Ft/s)

Process from Point/Station 204.000 to Point/Station 204.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 17.623(Ac.)
Runoff from this stream = 20.689(CFS)
Time of concentration = 27.90 min.
Rainfall intensity = 1.305(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.465	40.52	1.071
2	20.689	27.90	1.305

Largest stream flow has longer time of concentration
Qp = 21.465 + sum of
Qb Ia/Ib
20.689 * 0.821 = 16.978
Qp = 38.443

Total of 2 streams to confluence:
Flow rates before confluence point:
21.465 20.689
Area of streams before confluence:
22.375 17.623
Results of confluence:
Total flow rate = 38.443(CFS)
Time of concentration = 40.517 min.
Effective stream area after confluence = 39.998(Ac.)

Process from Point/Station 204.000 to Point/Station 205.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Estimated mean flow rate at midpoint of channel = 39.228(CFS)
Depth of flow = 0.631(Ft.), Average velocity = 0.677(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.00
2 178.00 0.00
3 291.00 1.00
Manning's 'N' friction factor = 0.022

Sub-Channel flow = 39.229(CFS)
' ' flow top width = 183.702(Ft.)
' ' velocity = 0.677(Ft/s)
' ' area = 57.984(Sq.Ft)
' ' Froude number = 0.212

Upstream point elevation = 1424.390(Ft.)
Downstream point elevation = 1424.200(Ft.)
Flow length = 407.000(Ft.)
Travel time = 10.03 min.
Time of concentration = 50.54 min.
Depth of flow = 0.631(Ft.)
Average velocity = 0.677(Ft/s)
Total irregular channel flow = 39.228(CFS)
Irregular channel normal depth above invert elev. = 0.631(Ft.)
Average velocity of channel(s) = 0.677(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.733

Pre Development – 10 year Basin 2

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.953(In/Hr) for a 10.0 year storm
Subarea runoff = 1.500(CFS) for 2.148(Ac.)
Total runoff = 39.943(CFS) Total area = 42.146(Ac.)
Depth of flow = 0.636(Ft.), Average velocity = 0.680(Ft/s)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.733
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 50.54 min.
Rainfall intensity = 0.953(In/Hr) for a 10.0 year storm
Subarea runoff = 0.073(CFS) for 0.104(Ac.)
Total runoff = 40.016(CFS) Total area = 42.250(Ac.)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 42.250(Ac.)
Runoff from this stream = 40.016(CFS)
Time of concentration = 50.54 min.
Rainfall intensity = 0.953(In/Hr)

*****
Process from Point/Station 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 330.000(Ft.)
Top (of initial area) elevation = 1439.510(Ft.)
Bottom (of initial area) elevation = 1434.650(Ft.)
Difference in elevation = 4.860(Ft.)
Slope = 0.01473 s(percent)= 1.47
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.932 min.
Rainfall intensity = 2.257(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 0.579(CFS)
Total initial stream area = 0.326(Ac.)
Pervious area fraction = 0.600

*****
Process from Point/Station 402.000 to Point/Station 402.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000

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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 9.93 min.
Rainfall intensity = 2.257(In/Hr) for a 10.0 year storm
Subarea runoff = 0.032(CFS) for 0.018(Ac.)
Total runoff = 0.611(CFS) Total area = 0.344(Ac.)

+++++
Process from Point/Station 402.000 to Point/Station 403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 1.475(CFS)
Depth of flow = 0.213(Ft.), Average velocity = 0.905(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.64
2 40.00 0.00
3 50.00 1.10
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 1.475(CFS)
' ' flow top width = 15.274(Ft.)
' ' velocity = 0.905(Ft/s)
' ' area = 1.629(Sq.Ft)
' ' Froude number = 0.489

Upstream point elevation = 1434.650(Ft.)
Downstream point elevation = 1431.180(Ft.)
Flow length = 976.000(Ft.)
Travel time = 17.97 min.
Time of concentration = 27.90 min.
Depth of flow = 0.213(Ft.)
Average velocity = 0.905(Ft/s)
Total irregular channel flow = 1.475(CFS)
Irregular channel normal depth above invert elev. = 0.213(Ft.)
Average velocity of channel(s) = 0.905(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.730
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 27.90 min.
Rainfall intensity = 1.306(In/Hr) for a 10.0 year storm
Subarea runoff = 1.674(CFS) for 1.756(Ac.)
Total runoff = 2.285(CFS) Total area = 2.100(Ac.)
Depth of flow = 0.251(Ft.), Average velocity = 1.010(Ft/s)

+++++
Process from Point/Station 403.000 to Point/Station 403.000
**** SUBAREA FLOW ADDITION ****

-----
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.730
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 27.90 min.
Rainfall intensity = 1.306(In/Hr) for a 10.0 year storm
Subarea runoff = 0.164(CFS) for 0.172(Ac.)
Total runoff = 2.449(CFS) Total area = 2.272(Ac.)

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Pre Development – 10 year Basin 2

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*****
Process from Point/Station      403.000 to Point/Station      404.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      3.008(CFS)
Depth of flow =  0.399(Ft.), Average velocity =  0.882(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.30
      2              18.00              0.00
      3              25.00              0.00
Manning's 'N' friction factor =  0.022
-----
Sub-Channel flow =      3.008(CFS)
      '      '      flow top width =      10.119(Ft.)
      '      '      velocity=      0.882(Ft/s)
      '      '      area =      3.411(Sq.Ft)
      '      '      Froude number =      0.268

Upstream point elevation = 1431.180(Ft.)
Downstream point elevation = 1430.530(Ft.)
Flow length = 892.000(Ft.)
Travel time = 16.86 min.
Time of concentration = 44.76 min.
Depth of flow = 0.399(Ft.)
Average velocity = 0.882(Ft/s)
Total irregular channel flow = 3.008(CFS)
Irregular channel normal depth above invert elev. = 0.399(Ft.)
Average velocity of channel(s) = 0.882(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.700
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 1.016(In/Hr) for a 10.0 year storm
Subarea runoff = 1.049(CFS) for 1.475(Ac.)
Total runoff = 3.497(CFS) Total area = 3.747(Ac.)
Depth of flow = 0.434(Ft.), Average velocity = 0.926(Ft/s)

*****
Process from Point/Station      404.000 to Point/Station      404.000
**** SUBAREA FLOW ADDITION ****

-----
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.700
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 44.76 min.
Rainfall intensity = 1.016(In/Hr) for a 10.0 year storm
Subarea runoff = 0.222(CFS) for 0.312(Ac.)
Total runoff = 3.719(CFS) Total area = 4.059(Ac.)

*****
Process from Point/Station      404.000 to Point/Station      405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      3.868(CFS)
Depth of flow = 0.628(Ft.), Average velocity = 0.657(Ft/s)

```

Pre Development – 10 year Basin 2

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```

***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.37
      2             18.00              0.00
      3             25.00              0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 3.868(CFS)
      '      ' flow top width = 11.767(Ft.)
      '      ' velocity = 0.657(Ft/s)
      '      ' area = 5.890(Sq.Ft)
      '      ' Froude number = 0.164

Upstream point elevation = 1430.530(Ft.)
Downstream point elevation = 1430.460(Ft.)
Flow length = 293.000(Ft.)
Travel time = 7.44 min.
Time of concentration = 52.20 min.
Depth of flow = 0.628(Ft.)
Average velocity = 0.657(Ft/s)
Total irregular channel flow = 3.868(CFS)
Irregular channel normal depth above invert elev. = 0.628(Ft.)
Average velocity of channel(s) = 0.657(Ft/s)
Adding area flow to channel
CONDOMINIUM subarea type
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Rainfall intensity = 0.937(In/Hr) for a 10.0 year storm
Subarea runoff = 0.236(CFS) for 0.324(Ac.)
Total runoff = 3.955(CFS) Total area = 4.383(Ac.)
Depth of flow = 0.635(Ft.), Average velocity = 0.661(Ft/s)

+++++
Process from Point/Station 405.000 to Point/Station 405.000
**** SUBAREA FLOW ADDITION ****

CONDOMINIUM subarea type
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Time of concentration = 52.20 min.
Rainfall intensity = 0.937(In/Hr) for a 10.0 year storm
Subarea runoff = 0.103(CFS) for 0.142(Ac.)
Total runoff = 4.058(CFS) Total area = 4.525(Ac.)

+++++
Process from Point/Station 405.000 to Point/Station 406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 4.561(CFS)
Depth of flow = 0.211(Ft.), Average velocity = 0.462(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.17
      2             50.00              0.00
      3            220.00              1.06
Manning's 'N' friction factor = 0.022

```

Pre Development – 10 year Basin 2

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-----
Sub-Channel flow = 4.561(CFS)
' ' flow top width = 83.837(Ft.)
' ' velocity= 0.462(Ft/s)
' ' area = 9.869(Sq.Ft)
' ' Froude number = 0.237

Upstream point elevation = 1430.460(Ft.)
Downstream point elevation = 1430.210(Ft.)
Flow length = 308.000(Ft.)
Travel time = 11.11 min.
Time of concentration = 63.30 min.
Depth of flow = 0.211(Ft.)
Average velocity = 0.462(Ft/s)
Total irregular channel flow = 4.561(CFS)
Irregular channel normal depth above invert elev. = 0.211(Ft.)
Average velocity of channel(s) = 0.462(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.753
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.846(In/Hr) for a 10.0 year storm
Subarea runoff = 0.912(CFS) for 1.432(Ac.)
Total runoff = 4.971(CFS) Total area = 5.957(Ac.)
Depth of flow = 0.218(Ft.), Average velocity = 0.476(Ft/s)
!!Warning: Water is above left or right bank elevations

+++++
Process from Point/Station 406.000 to Point/Station 407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 5.332(CFS)
Depth of flow = 0.061(Ft.), Average velocity = 1.319(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.20
2 26.00 0.00
3 88.00 0.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 5.332(CFS)
' ' flow top width = 69.966(Ft.)
' ' velocity= 1.319(Ft/s)
' ' area = 4.043(Sq.Ft)
' ' Froude number = 0.967

Upstream point elevation = 1430.210(Ft.)
Downstream point elevation = 1425.570(Ft.)
Flow length = 272.000(Ft.)
Travel time = 3.44 min.
Time of concentration = 66.74 min.
Depth of flow = 0.061(Ft.)
Average velocity = 1.319(Ft/s)
Total irregular channel flow = 5.332(CFS)
Irregular channel normal depth above invert elev. = 0.061(Ft.)
Average velocity of channel(s) = 1.319(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.750
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000

```

Pre Development – 10 year Basin 2

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RI index for soil(AMC 2) = 89.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 0.822(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.664(CFS) for 1.077(Ac.)
 Total runoff = 5.635(CFS) Total area = 7.034(Ac.)
 Depth of flow = 0.063(Ft.), Average velocity = 1.346(Ft/s)

 Process from Point/Station 407.000 to Point/Station 407.000
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1 Acre Lot)
 Runoff Coefficient = 0.597
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.800; Impervious fraction = 0.200
 Time of concentration = 66.74 min.
 Rainfall intensity = 0.822(In/Hr) for a 10.0 year storm
 Subarea runoff = 4.040(CFS) for 8.236(Ac.)
 Total runoff = 9.674(CFS) Total area = 15.270(Ac.)

 Process from Point/Station 407.000 to Point/Station 408.000
 *** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Estimated mean flow rate at midpoint of channel = 9.950(CFS)
 Depth of flow = 0.316(Ft.), Average velocity = 1.196(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 0.00
 2 25.00 0.00
 3 50.00 3.00
 Manning's 'N' friction factor = 0.022

Sub-Channel flow = 9.950(CFS)
 ' ' flow top width = 27.633(Ft.)
 ' ' velocity = 1.196(Ft/s)
 ' ' area = 8.316(Sq.Ft)
 ' ' Froude number = 0.384

Upstream point elevation = 1425.570(Ft.)
 Downstream point elevation = 1424.220(Ft.)
 Flow length = 867.000(Ft.)
 Travel time = 12.08 min.
 Time of concentration = 78.82 min.
 Depth of flow = 0.316(Ft.)
 Average velocity = 1.196(Ft/s)
 Total irregular channel flow = 9.950(CFS)
 Irregular channel normal depth above invert elev. = 0.316(Ft.)
 Average velocity of channel(s) = 1.196(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.699
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Rainfall intensity = 0.753(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.499(CFS) for 0.949(Ac.)
 Total runoff = 10.174(CFS) Total area = 16.219(Ac.)
 Depth of flow = 0.320(Ft.), Average velocity = 1.207(Ft/s)
 !!Warning: Water is above left or right bank elevations

Pre Development – 10 year Basin 2

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```

*****
Process from Point/Station      408.000 to Point/Station      408.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.738
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 78.82 min.
Rainfall intensity = 0.753(In/Hr) for a 10.0 year storm
Subarea runoff = 2.999(CFS) for 5.394(Ac.)
Total runoff = 13.172(CFS) Total area = 21.613(Ac.)

*****
Process from Point/Station      408.000 to Point/Station      205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.244(Ft.), Average velocity = 0.294(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              7.00
      2             17.00              0.00
      3            200.00              0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 13.172(CFS)
      '      ' flow top width = 183.594(Ft.)
      '      ' velocity= 0.294(Ft/s)
      '      ' area = 44.809(Sq.Ft)
      '      ' Froude number = 0.105

Upstream point elevation = 1424.220(Ft.)
Downstream point elevation = 1424.200(Ft.)
Flow length = 161.000(Ft.)
Travel time = 9.13 min.
Time of concentration = 87.95 min.
Depth of flow = 0.244(Ft.)
Average velocity = 0.294(Ft/s)
Total irregular channel flow = 13.172(CFS)
Irregular channel normal depth above invert elev. = 0.244(Ft.)
Average velocity of channel(s) = 0.294(Ft/s)

*****
Process from Point/Station      205.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.613(Ac.)
Runoff from this stream = 13.172(CFS)
Time of concentration = 87.95 min.
Rainfall intensity = 0.710(In/Hr)
Summary of stream data:

Stream   Flow rate      TC      Rainfall Intensity
No.      (CFS)      (min)      (In/Hr)

1         40.016      50.54         0.953
2         13.172      87.95         0.710
Largest stream flow has longer or shorter time of concentration
Qp = 40.016 + sum of
      Qa      Tb/Ta
      13.172 * 0.575 = 7.570
Qp = 47.586

```

Pre Development – 10 year Basin 2

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Total of 2 streams to confluence:
Flow rates before confluence point:
40.016 13.172
Area of streams before confluence:
42.250 21.613
Results of confluence:
Total flow rate = 47.586(CFS)
Time of concentration = 50.543 min.
Effective stream area after confluence = 63.863(Ac.)

Process from Point/Station 205.000 to Point/Station 206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.592(Ft.), Average velocity = 0.827(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.70
2 15.00 0.00
3 279.00 0.86
Manning's 'N' friction factor = 0.022

Sub-Channel flow = 47.586(CFS)
' ' flow top width = 194.366(Ft.)
' ' velocity = 0.827(Ft/s)
' ' area = 57.517(Sq.Ft)
' ' Froude number = 0.268

Upstream point elevation = 1424.200(Ft.)
Downstream point elevation = 1423.990(Ft.)
Flow length = 276.000(Ft.)
Travel time = 5.56 min.
Time of concentration = 56.10 min.
Depth of flow = 0.592(Ft.)
Average velocity = 0.827(Ft/s)
Total irregular channel flow = 47.586(CFS)
Irregular channel normal depth above invert elev. = 0.592(Ft.)
Average velocity of channel(s) = 0.827(Ft/s)

Process from Point/Station 206.000 to Point/Station 206.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 63.863(Ac.)
Runoff from this stream = 47.586(CFS)
Time of concentration = 56.10 min.
Rainfall intensity = 0.902(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.586	56.10	0.902

Largest stream flow has longer time of concentration
Qp = 47.586 + sum of
Qp = 47.586

Total of 1 streams to confluence:
Flow rates before confluence point:
47.586
Area of streams before confluence:
63.863
Results of confluence:
Total flow rate = 47.586(CFS)
Time of concentration = 56.103 min.
Effective stream area after confluence = 63.863(Ac.)

```

*****
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 355.000(Ft.)
Top (of initial area) elevation = 1426.770(Ft.)
Bottom (of initial area) elevation = 1426.310(Ft.)
Difference in elevation = 0.460(Ft.)
Slope = 0.00130 s(percent)= 0.13
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 20.983 min.
Rainfall intensity = 1.518(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.787
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.187(CFS)
Total initial stream area = 1.829(Ac.)
Pervious area fraction = 1.000

*****
Process from Point/Station      502.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 5.211(CFS)
Depth of flow = 0.094(Ft.), Average velocity = 0.429(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                0.11
2                 294.00                0.00
3                 450.00                2.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 5.211(CFS)
'      '      flow top width = 258.547(Ft.)
'      '      velocity= 0.429(Ft/s)
'      '      area = 12.151(Sq.Ft)
'      '      Froude number = 0.349

Upstream point elevation = 1426.310(Ft.)
Downstream point elevation = 1423.990(Ft.)
Flow length = 976.000(Ft.)
Travel time = 37.93 min.
Time of concentration = 58.91 min.
Depth of flow = 0.094(Ft.)
Average velocity = 0.429(Ft/s)
Total irregular channel flow = 5.211(CFS)
Irregular channel normal depth above invert elev. = 0.094(Ft.)
Average velocity of channel(s) = 0.429(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.722
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 0.878(In/Hr) for a 10.0 year storm
Subarea runoff = 5.992(CFS) for 9.451(Ac.)
Total runoff = 8.178(CFS) Total area = 11.280(Ac.)
Depth of flow = 0.111(Ft.), Average velocity = 0.482(Ft/s)
!!Warning: Water is above left or right bank elevations
*****
Process from Point/Station      206.000 to Point/Station      206.000

```

Pre Development – 10 year Basin 2

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**** SUBAREA FLOW ADDITION ****

MOBILE HOME PARK subarea type
 Runoff Coefficient = 0.809
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.250; Impervious fraction = 0.750
 Time of concentration = 58.91 min.
 Rainfall intensity = 0.878(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.585(CFS) for 0.823(Ac.)
 Total runoff = 8.763(CFS) Total area = 12.103(Ac.)

 Process from Point/Station 206.000 to Point/Station 206.000
 **** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
 Runoff Coefficient = 0.722
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 86.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Time of concentration = 58.91 min.
 Rainfall intensity = 0.878(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.352(CFS) for 0.555(Ac.)
 Total runoff = 9.115(CFS) Total area = 12.658(Ac.)

 Process from Point/Station 206.000 to Point/Station 206.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 12.658(Ac.)
 Runoff from this stream = 9.115(CFS)
 Time of concentration = 58.91 min.
 Rainfall intensity = 0.878(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.586	56.10	0.902
2	9.115	58.91	0.878

Largest stream flow has longer or shorter time of concentration
 Qp = 47.586 + sum of
 Qa Tb/Ta
 9.115 * 0.952 = 8.680
 Qp = 56.266

Total of 2 streams to confluence:
 Flow rates before confluence point:
 47.586 9.115
 Area of streams before confluence:
 63.863 12.658

Results of confluence:
 Total flow rate = 56.266(CFS)
 Time of concentration = 56.103 min.
 Effective stream area after confluence = 76.521(Ac.)
 End of computations, total study area = 76.52 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.880
 Area averaged RI index number = 79.4

Pre Development – 10 year Basin 2

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Attachment D4
Pre Development Onsite
100 Year

Pre Development – Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2014 Version 9.0
Rational Hydrology Study      Date: 07/03/19   File:14047rockportprel100.out
-----
14047Rockport Predevelopment Poc-2
Basin-1 poc-2
14047RockportPrel100.rvv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 6332
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 199.000(Ft.)
Top (of initial area) elevation = 1436.840(Ft.)
Bottom (of initial area) elevation = 1435.790(Ft.)
Difference in elevation = 1.050(Ft.)
Slope = 0.00528 s(percent)= 0.53
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.961 min.
Rainfall intensity = 3.367(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.818
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 2.012(CFS)
Total initial stream area = 0.730(Ac.)
Pervious area fraction = 0.600
```

14047Rockport Predevelopment Poc-2
Basin-1 poc-2
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```

*****
Process from Point/Station      102.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      5.195(CFS)
Depth of flow = 0.191(Ft.), Average velocity = 0.747(Ft/s)
***** Irregular Channel Data *****
-----

Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.47
      2             100.00              0.00
      3             225.00              0.75
Manning's 'N' friction factor = 0.022
-----

Sub-Channel flow = 5.195(CFS)
'   '   flow top width = 72.659(Ft.)
'   '   velocity= 0.747(Ft/s)
'   '   area = 6.957(Sq.Ft)
'   '   Froude number = 0.425

Upstream point elevation = 1435.790(Ft.)
Downstream point elevation = 1434.300(Ft.)
Flow length = 534.000(Ft.)
Travel time = 11.92 min.
Time of concentration = 21.88 min.
Depth of flow = 0.191(Ft.)
Average velocity = 0.747(Ft/s)
Total irregular channel flow = 5.195(CFS)
Irregular channel normal depth above invert elev. = 0.191(Ft.)
Average velocity of channel(s) = 0.747(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.785
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 2.219(In/Hr) for a 100.0 year storm
Subarea runoff = 6.295(CFS) for 3.613(Ac.)
Total runoff = 8.307(CFS) Total area = 4.343(Ac.)
Depth of flow = 0.228(Ft.), Average velocity = 0.840(Ft/s)

*****
Process from Point/Station      103.000 to Point/Station      104.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel =      8.709(CFS)
Depth of flow = 0.962(Ft.), Average velocity = 2.354(Ft/s)
***** Irregular Channel Data *****
-----

Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.00
      2              8.00              0.00
      3             16.00              2.00
Manning's 'N' friction factor = 0.022
-----

Sub-Channel flow = 8.709(CFS)
'   '   flow top width = 7.694(Ft.)
'   '   velocity= 2.354(Ft/s)
'   '   area = 3.700(Sq.Ft)
'   '   Froude number = 0.598

Upstream point elevation = 1434.300(Ft.)
Downstream point elevation = 1431.960(Ft.)
Flow length = 697.000(Ft.)

```

Travel time = 4.93 min.
 Time of concentration = 26.81 min.
 Depth of flow = 0.962(Ft.)
 Average velocity = 2.354(Ft/s)
 Total irregular channel flow = 8.709(CFS)
 Irregular channel normal depth above invert elev. = 0.962(Ft.)
 Average velocity of channel(s) = 2.354(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 1.992(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.720(CFS) for 0.466(Ac.)
 Total runoff = 9.026(CFS) Total area = 4.809(Ac.)
 Depth of flow = 0.975(Ft.), Average velocity = 2.375(Ft/s)

++++++
 Process from Point/Station 104.000 to Point/Station 104.000
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Time of concentration = 26.81 min.
 Rainfall intensity = 1.992(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.039(CFS) for 0.025(Ac.)
 Total runoff = 9.065(CFS) Total area = 4.834(Ac.)
 End of computations, total study area = 4.83 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.600
 Area averaged RI index number = 69.0

Pre Development – Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 06/28/19   File:14047RockportPre2100.out
-----
14047Rockport Predevelopment Poc-2
Basin - 2 - poc-1
14047RockportPre2100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 210.000(Ft.)
Top (of initial area) elevation = 1432.260(Ft.)
Bottom (of initial area) elevation = 1429.340(Ft.)
Difference in elevation = 2.920(Ft.)
Slope = 0.01390 s(percent)= 1.39
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.581 min.
Rainfall intensity = 3.261(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.844
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 1.684(CFS)
Total initial stream area = 0.612(Ac.)
Pervious area fraction = 1.000

*****
Process from Point/Station 202.000 to Point/Station 203.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 11.199(CFS)
```

Pre Development – 100 year Basin 2

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```

Depth of flow = 0.183(Ft.), Average velocity = 1.005(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.47
      2             225.00              0.00
      3             456.00              1.26
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 11.199(CFS)
      '      '      flow top width = 121.442(Ft.)
      '      '      velocity= 1.005(Ft/s)
      '      '      area = 11.138(Sq.Ft)
      '      '      Froude number = 0.585

Upstream point elevation = 1429.340(Ft.)
Downstream point elevation = 1425.070(Ft.)
Flow length = 797.000(Ft.)
Travel time = 13.21 min.
Time of concentration = 23.79 min.
Depth of flow = 0.183(Ft.)
Average velocity = 1.005(Ft/s)
Total irregular channel flow = 11.199(CFS)
Irregular channel normal depth above invert elev. = 0.183(Ft.)
Average velocity of channel(s) = 1.005(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 2.123(In/Hr) for a 100.0 year storm
Subarea runoff = 18.963(CFS) for 10.942(Ac.)
Total runoff = 20.647(CFS) Total area = 11.554(Ac.)
Depth of flow = 0.231(Ft.), Average velocity = 1.172(Ft/s)

*****
Process from Point/Station 203.000 to Point/Station 203.000
**** SUBAREA FLOW ADDITION ****
-----
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 23.79 min.
Rainfall intensity = 2.123(In/Hr) for a 100.0 year storm
Subarea runoff = 0.307(CFS) for 0.177(Ac.)
Total runoff = 20.954(CFS) Total area = 11.731(Ac.)

*****
Process from Point/Station 203.000 to Point/Station 204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
-----
Estimated mean flow rate at midpoint of channel = 27.987(CFS)
Depth of flow = 0.591(Ft.), Average velocity = 0.914(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.00
      2             125.00              0.00
      3             350.00              2.00

```

Pre Development – 100 year Basin 2

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Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 27.987(CFS)
' ' flow top width = 103.502(Ft.)
' ' velocity = 0.914(Ft/s)
' ' area = 30.608(Sq.Ft)
' ' Froude number = 0.296

Upstream point elevation = 1425.070(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 731.000(Ft.)
Travel time = 13.32 min.
Time of concentration = 37.12 min.
Depth of flow = 0.591(Ft.)
Average velocity = 0.914(Ft/s)
Total irregular channel flow = 27.987(CFS)
Irregular channel normal depth above invert elev. = 0.591(Ft.)
Average velocity of channel(s) = 0.914(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.797
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.677(In/Hr) for a 100.0 year storm
Subarea runoff = 13.987(CFS) for 10.468(Ac.)
Total runoff = 34.941(CFS) Total area = 22.199(Ac.)
Depth of flow = 0.643(Ft.), Average velocity = 0.967(Ft/s)

+-----+
Process from Point/Station 204.000 to Point/Station 204.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.797
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 37.12 min.
Rainfall intensity = 1.677(In/Hr) for a 100.0 year storm
Subarea runoff = 0.235(CFS) for 0.176(Ac.)
Total runoff = 35.176(CFS) Total area = 22.375(Ac.)

+-----+
Process from Point/Station 204.000 to Point/Station 204.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.375(Ac.)
Runoff from this stream = 35.176(CFS)
Time of concentration = 37.12 min.
Rainfall intensity = 1.677(In/Hr)

+-----+
Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 292.000(Ft.)
Top (of initial area) elevation = 1436.840(Ft.)
Bottom (of initial area) elevation = 1433.070(Ft.)
Difference in elevation = 3.770(Ft.)
Slope = 0.01291 s(percent)= 1.29
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.710 min.
Rainfall intensity = 3.413(In/Hr) for a 100.0 year storm

```

Pre Development – 100 year Basin 2

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SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.819
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Initial subarea runoff = 3.532(CFS)
 Total initial stream area = 1.263(Ac.)
 Pervious area fraction = 0.600

 Process from Point/Station 302.000 to Point/Station 303.000

 *** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

 Estimated mean flow rate at midpoint of channel = 10.075(CFS)
 Depth of flow = 0.290(Ft.), Average velocity = 1.682(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 3.00
 2 215.00 0.00
 3 428.00 3.00
 Manning's 'N' friction factor = 0.022

 Sub-Channel flow = 10.075(CFS)
 flow top width = 41.344(Ft.)
 velocity = 1.682(Ft/s)
 area = 5.991(Sq.Ft)
 Froude number = 0.779

 Upstream point elevation = 1433.070(Ft.)
 Downstream point elevation = 1429.070(Ft.)
 Flow length = 491.000(Ft.)
 Travel time = 4.87 min.
 Time of concentration = 14.58 min.
 Depth of flow = 0.290(Ft.)
 Average velocity = 1.682(Ft/s)
 Total irregular channel flow = 10.075(CFS)
 Irregular channel normal depth above invert elev. = 0.290(Ft.)
 Average velocity of channel(s) = 1.682(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.803
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 2.752(In/Hr) for a 100.0 year storm
 Subarea runoff = 13.023(CFS) for 5.890(Ac.)
 Total runoff = 16.555(CFS) Total area = 7.153(Ac.)
 Depth of flow = 0.349(Ft.), Average velocity = 1.904(Ft/s)

 Process from Point/Station 303.000 to Point/Station 304.000

 *** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

 Estimated mean flow rate at midpoint of channel = 23.807(CFS)
 Depth of flow = 0.519(Ft.), Average velocity = 1.720(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 3.24
 2 200.00 0.00
 3 400.00 4.88
 Manning's 'N' friction factor = 0.022

Pre Development – 100 year Basin 2

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-----
Sub-Channel flow = 23.807(CFS)
' ' flow top width = 53.327(Ft.)
' ' velocity= 1.720(Ft/s)
' ' area = 13.843(Sq.Ft)
' ' Froude number = 0.595

Upstream point elevation = 1429.070(Ft.)
Downstream point elevation = 1426.380(Ft.)
Flow length = 687.000(Ft.)
Travel time = 6.66 min.
Time of concentration = 21.23 min.
Depth of flow = 0.519(Ft.)
Average velocity = 1.720(Ft/s)
Total irregular channel flow = 23.807(CFS)
Irregular channel normal depth above invert elev. = 0.519(Ft.)
Average velocity of channel(s) = 1.720(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Rainfall intensity = 2.254(In/Hr) for a 100.0 year storm
Subarea runoff = 14.414(CFS) for 8.538(Ac.)
Total runoff = 30.970(CFS) Total area = 15.691(Ac.)
Depth of flow = 0.573(Ft.), Average velocity = 1.837(Ft/s)

*****
Process from Point/Station 304.000 to Point/Station 204.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 32.443(CFS)
Depth of flow = 1.343(Ft.), Average velocity = 2.666(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 30.00 0.00
3 60.00 4.00
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 32.443(CFS)
' ' flow top width = 18.126(Ft.)
' ' velocity= 2.666(Ft/s)
' ' area = 12.169(Sq.Ft)
' ' Froude number = 0.573

Upstream point elevation = 1426.380(Ft.)
Downstream point elevation = 1424.390(Ft.)
Flow length = 740.000(Ft.)
Travel time = 4.63 min.
Time of concentration = 25.86 min.
Depth of flow = 1.343(Ft.)
Average velocity = 2.666(Ft/s)
Total irregular channel flow = 32.443(CFS)
Irregular channel normal depth above invert elev. = 1.343(Ft.)
Average velocity of channel(s) = 2.666(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.736
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200

```

Rainfall intensity = 2.031(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.888(CFS) for 1.932(Ac.)
 Total runoff = 33.857(CFS) Total area = 17.623(Ac.)
 Depth of flow = 1.364(Ft.), Average velocity = 2.695(Ft/s)

 Process from Point/Station 204.000 to Point/Station 204.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 17.623(Ac.)
 Runoff from this stream = 33.857(CFS)
 Time of concentration = 25.86 min.
 Rainfall intensity = 2.031(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	35.176	37.12	1.677
2	33.857	25.86	2.031

Largest stream flow has longer time of concentration
 Qp = 35.176 + sum of
 Qb Ia/Ib
 33.857 * 0.826 = 27.956
 Qp = 63.132

Total of 2 streams to confluence:
 Flow rates before confluence point:
 35.176 33.857
 Area of streams before confluence:
 22.375 17.623
 Results of confluence:
 Total flow rate = 63.132(CFS)
 Time of concentration = 37.116 min.
 Effective stream area after confluence = 39.998(Ac.)

 Process from Point/Station 204.000 to Point/Station 205.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 64.423(CFS)
 Depth of flow = 0.760(Ft.), Average velocity = 0.766(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 1.00
 2 178.00 0.00
 3 291.00 1.00
 Manning's 'N' friction factor = 0.022

Sub-Channel flow = 64.423(CFS)
 ' flow top width = 221.261(Ft.)
 ' velocity= 0.766(Ft/s)
 ' area = 84.118(Sq.Ft)
 ' Froude number = 0.219

Upstream point elevation = 1424.390(Ft.)
 Downstream point elevation = 1424.200(Ft.)
 Flow length = 407.000(Ft.)
 Travel time = 8.86 min.
 Time of concentration = 45.97 min.
 Depth of flow = 0.760(Ft.)
 Average velocity = 0.766(Ft/s)
 Total irregular channel flow = 64.423(CFS)
 Irregular channel normal depth above invert elev. = 0.760(Ft.)
 Average velocity of channel(s) = 0.766(Ft/s)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea

```

Runoff Coefficient = 0.786
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.497(In/Hr) for a 100.0 year storm
Subarea runoff = 2.528(CFS) for 2.148(Ac.)
Total runoff = 65.660(CFS) Total area = 42.146(Ac.)
Depth of flow = 0.766(Ft.), Average velocity = 0.770(Ft/s)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.786
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 45.97 min.
Rainfall intensity = 1.497(In/Hr) for a 100.0 year storm
Subarea runoff = 0.122(CFS) for 0.104(Ac.)
Total runoff = 65.782(CFS) Total area = 42.250(Ac.)

*****
Process from Point/Station 205.000 to Point/Station 205.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 42.250(Ac.)
Runoff from this stream = 65.782(CFS)
Time of concentration = 45.97 min.
Rainfall intensity = 1.497(In/Hr)

*****
Process from Point/Station 401.000 to Point/Station 402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 330.000(Ft.)
Top (of initial area) elevation = 1439.510(Ft.)
Bottom (of initial area) elevation = 1434.650(Ft.)
Difference in elevation = 4.860(Ft.)
Slope = 0.01473 s(percent)= 1.47
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.932 min.
Rainfall intensity = 3.372(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Initial subarea runoff = 0.900(CFS)
Total initial stream area = 0.326(Ac.)
Pervious area fraction = 0.600

*****
Process from Point/Station 402.000 to Point/Station 402.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

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Pre Development – 100 year Basin 2

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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 9.93 min.
Rainfall intensity = 3.372(In/Hr) for a 100.0 year storm
Subarea runoff = 0.050(CFS) for 0.018(Ac.)
Total runoff = 0.950(CFS) Total area = 0.344(Ac.)

*****
Process from Point/Station 402.000 to Point/Station 403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Estimated mean flow rate at midpoint of channel = 2.374(CFS)
Depth of flow = 0.255(Ft.), Average velocity = 1.020(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.64
2 40.00 0.00
3 50.00 1.10
Manning's 'N' friction factor = 0.022

-----
Sub-Channel flow = 2.374(CFS)
' ' flow top width = 18.256(Ft.)
' ' velocity = 1.020(Ft/s)
' ' area = 2.328(Sq.Ft)
' ' Froude number = 0.503

Upstream point elevation = 1434.650(Ft.)
Downstream point elevation = 1431.180(Ft.)
Flow length = 976.000(Ft.)
Travel time = 15.95 min.
Time of concentration = 25.88 min.
Depth of flow = 0.255(Ft.)
Average velocity = 1.020(Ft/s)
Total irregular channel flow = 2.374(CFS)
Irregular channel normal depth above invert elev. = 0.255(Ft.)
Average velocity of channel(s) = 1.020(Ft/s)
Adding area flow to channel
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Rainfall intensity = 2.030(In/Hr) for a 100.0 year storm
Subarea runoff = 2.769(CFS) for 1.756(Ac.)
Total runoff = 3.719(CFS) Total area = 2.100(Ac.)
Depth of flow = 0.302(Ft.), Average velocity = 1.141(Ft/s)

*****
Process from Point/Station 403.000 to Point/Station 403.000
**** SUBAREA FLOW ADDITION ****

-----
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.600; Impervious fraction = 0.400
Time of concentration = 25.88 min.
Rainfall intensity = 2.030(In/Hr) for a 100.0 year storm
Subarea runoff = 0.271(CFS) for 0.172(Ac.)
Total runoff = 3.990(CFS) Total area = 2.272(Ac.)

```

Pre Development – 100 year Basin 2

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 Process from Point/Station 403.000 to Point/Station 404.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 4.908(CFS)
 Depth of flow = 0.525(Ft.), Average velocity = 1.033(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 2.30
 2 18.00 0.00
 3 25.00 0.00

Manning's 'N' friction factor = 0.022

 Sub-Channel flow = 4.908(CFS)
 ' ' flow top width = 11.107(Ft.)
 ' ' velocity = 1.033(Ft/s)
 ' ' area = 4.751(Sq.Ft)
 ' ' Froude number = 0.278

Upstream point elevation = 1431.180(Ft.)
 Downstream point elevation = 1430.530(Ft.)
 Flow length = 892.000(Ft.)
 Travel time = 14.39 min.
 Time of concentration = 40.28 min.
 Depth of flow = 0.525(Ft.)
 Average velocity = 1.033(Ft/s)
 Total irregular channel flow = 4.908(CFS)
 Irregular channel normal depth above invert elev. = 0.525(Ft.)
 Average velocity of channel(s) = 1.033(Ft/s)
 Adding area flow to channel
 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.753
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Rainfall intensity = 1.606(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.784(CFS) for 1.475(Ac.)
 Total runoff = 5.774(CFS) Total area = 3.747(Ac.)
 Depth of flow = 0.574(Ft.), Average velocity = 1.087(Ft/s)

 Process from Point/Station 404.000 to Point/Station 404.000
 **** SUBAREA FLOW ADDITION ****

 SINGLE FAMILY (1/2 Acre Lot)
 Runoff Coefficient = 0.753
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.600; Impervious fraction = 0.400
 Time of concentration = 40.28 min.
 Rainfall intensity = 1.606(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.377(CFS) for 0.312(Ac.)
 Total runoff = 6.152(CFS) Total area = 4.059(Ac.)

 Process from Point/Station 404.000 to Point/Station 405.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

 Estimated mean flow rate at midpoint of channel = 6.372(CFS)
 Depth of flow = 0.823(Ft.), Average velocity = 0.764(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Pre Development – 100 year Basin 2

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```

Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.37
      2             18.00              0.00
      3             25.00              0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 6.372(CFS)
      '      ' flow top width = 13.252(Ft.)
      '      ' velocity= 0.764(Ft/s)
      '      ' area = 8.336(Sq.Ft)
      '      ' Froude number = 0.170

Upstream point elevation = 1430.530(Ft.)
Downstream point elevation = 1430.460(Ft.)
Flow length = 293.000(Ft.)
Travel time = 6.39 min.
Time of concentration = 46.66 min.
Depth of flow = 0.823(Ft.)
Average velocity = 0.764(Ft/s)
Total irregular channel flow = 6.372(CFS)
Irregular channel normal depth above invert elev. = 0.823(Ft.)
Average velocity of channel(s) = 0.764(Ft/s)
Adding area flow to channel
CONDOMINIUM subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Rainfall intensity = 1.485(In/Hr) for a 100.0 year storm
Subarea runoff = 0.390(CFS) for 0.324(Ac.)
Total runoff = 6.541(CFS) Total area = 4.383(Ac.)
Depth of flow = 0.835(Ft.), Average velocity = 0.770(Ft/s)

+++++
Process from Point/Station 405.000 to Point/Station 405.000
**** SUBAREA FLOW ADDITION ****

CONDOMINIUM subarea type
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.350; Impervious fraction = 0.650
Time of concentration = 46.66 min.
Rainfall intensity = 1.485(In/Hr) for a 100.0 year storm
Subarea runoff = 0.171(CFS) for 0.142(Ac.)
Total runoff = 6.712(CFS) Total area = 4.525(Ac.)

+++++
Process from Point/Station 405.000 to Point/Station 406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 7.522(CFS)
Depth of flow = 0.256(Ft.), Average velocity = 0.546(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.17
      2             50.00              0.00
      3             220.00             1.06
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 7.522(CFS)
      '      ' flow top width = 90.988(Ft.)

```

Pre Development – 100 year Basin 2

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'      '      velocity=    0.546(Ft/s)
'      '      area =     13.767(Sq.Ft)
'      '      Froude number =    0.248

Upstream point elevation = 1430.460(Ft.)
Downstream point elevation = 1430.210(Ft.)
Flow length = 308.000(Ft.)
Travel time = 9.39 min.
Time of concentration = 56.06 min.
Depth of flow = 0.256(Ft.)
Average velocity = 0.546(Ft/s)
Total irregular channel flow = 7.522(CFS)
Irregular channel normal depth above invert elev. = 0.256(Ft.)
Average velocity of channel(s) = 0.546(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.348(In/Hr) for a 100.0 year storm
Subarea runoff = 1.548(CFS) for 1.432(Ac.)
Total runoff = 8.260(CFS) Total area = 5.957(Ac.)
Depth of flow = 0.265(Ft.), Average velocity = 0.563(Ft/s)
!!Warning: Water is above left or right bank elevations

+-----+
Process from Point/Station 406.000 to Point/Station 407.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***
+-----+

Estimated mean flow rate at midpoint of channel = 8.870(CFS)
Depth of flow = 0.083(Ft.), Average velocity = 1.591(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.20
2 26.00 0.00
3 88.00 0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 8.870(CFS)
'      '      flow top width = 72.755(Ft.)
'      '      velocity= 1.591(Ft/s)
'      '      area = 5.574(Sq.Ft)
'      '      Froude number = 1.013

Upstream point elevation = 1430.210(Ft.)
Downstream point elevation = 1425.570(Ft.)
Flow length = 272.000(Ft.)
Travel time = 2.85 min.
Time of concentration = 58.91 min.
Depth of flow = 0.083(Ft.)
Average velocity = 1.591(Ft/s)
Total irregular channel flow = 8.870(CFS)
Irregular channel normal depth above invert elev. = 0.083(Ft.)
Average velocity of channel(s) = 1.591(Ft/s)
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.800
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.313(In/Hr) for a 100.0 year storm

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Subarea runoff =      1.131(CFS) for      1.077(Ac.)
Total runoff =      9.390(CFS)      Total area =      7.034(Ac.)
Depth of flow =      0.086(Ft.), Average velocity =      1.625(Ft/s)

+++++
Process from Point/Station      407.000 to Point/Station      407.000
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.674
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.800; Impervious fraction = 0.200
Time of concentration = 58.91 min.
Rainfall intensity = 1.313(In/Hr) for a 100.0 year storm
Subarea runoff =      7.291(CFS) for      8.236(Ac.)
Total runoff =      16.681(CFS)      Total area =      15.270(Ac.)

+++++
Process from Point/Station      407.000 to Point/Station      408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =      17.160(CFS)
Depth of flow =      0.436(Ft.), Average velocity =      1.467(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.00
      2             25.00              0.00
      3             50.00              3.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow =      17.160(CFS)
      '      '      flow top width =      28.636(Ft.)
      '      '      velocity=      1.467(Ft/s)
      '      '      area =      11.700(Sq.Ft)
      '      '      Froude number =      0.404

Upstream point elevation = 1425.570(Ft.)
Downstream point elevation = 1424.220(Ft.)
Flow length = 867.000(Ft.)
Travel time = 9.85 min.
Time of concentration = 68.76 min.
Depth of flow = 0.436(Ft.)
Average velocity = 1.467(Ft/s)
Total irregular channel flow = 17.160(CFS)
Irregular channel normal depth above invert elev. = 0.436(Ft.)
Average velocity of channel(s) = 1.467(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.763
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.209(In/Hr) for a 100.0 year storm
Subarea runoff =      0.876(CFS) for      0.949(Ac.)
Total runoff =      17.557(CFS)      Total area =      16.219(Ac.)
Depth of flow =      0.442(Ft.), Average velocity =      1.479(Ft/s)
!!Warning: Water is above left or right bank elevations

+++++
Process from Point/Station      408.000 to Point/Station      408.000

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Pre Development – 100 year Basin 2

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**** SUBAREA FLOW ADDITION ****

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UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 89.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 68.76 min.
Rainfall intensity = 1.209(In/Hr) for a 100.0 year storm
Subarea runoff = 5.167(CFS) for 5.394(Ac.)
Total runoff = 22.724(CFS) Total area = 21.613(Ac.)

+++++
Process from Point/Station 408.000 to Point/Station 205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

```

Depth of flow = 0.339(Ft.), Average velocity = 0.365(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 7.00
2 17.00 0.00
3 200.00 0.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 22.724(CFS)
' ' flow top width = 183.823(Ft.)
' ' velocity = 0.365(Ft/s)
' ' area = 62.187(Sq.Ft)
' ' Froude number = 0.111

Upstream point elevation = 1424.220(Ft.)
Downstream point elevation = 1424.200(Ft.)
Flow length = 161.000(Ft.)
Travel time = 7.34 min.
Time of concentration = 76.10 min.
Depth of flow = 0.339(Ft.)
Average velocity = 0.365(Ft/s)
Total irregular channel flow = 22.724(CFS)
Irregular channel normal depth above invert elev. = 0.339(Ft.)
Average velocity of channel(s) = 0.365(Ft/s)
+++++
Process from Point/Station 205.000 to Point/Station 205.000
**** CONFLUENCE OF MINOR STREAMS ****

```

```

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.613(Ac.)
Runoff from this stream = 22.724(CFS)
Time of concentration = 76.10 min.
Rainfall intensity = 1.146(In/Hr)
Summary of stream data:

```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	65.782	45.97	1.497
2	22.724	76.10	1.146

```

Largest stream flow has longer or shorter time of concentration
Qp = 65.782 + sum of
      Qa Tb/Ta
      22.724 * 0.604 = 13.728
Qp = 79.510

Total of 2 streams to confluence:
Flow rates before confluence point:
65.782 22.724

```

Pre Development – 100 year Basin 2

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```

Area of streams before confluence:
  42.250      21.613
Results of confluence:
Total flow rate =      79.510(CFS)
Time of concentration =      45.973 min.
Effective stream area after confluence =      63.863(Ac.)
+++++
Process from Point/Station      205.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow =      0.717(Ft.), Average velocity =      0.941(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              0.70
      2             15.00              0.00
      3             279.00              0.86
Manning's 'N' friction factor =      0.022
-----
Sub-Channel flow =      79.510(CFS)
      '      '      flow top width =      235.170(Ft.)
      '      '      velocity=      0.941(Ft/s)
      '      '      area =      84.463(Sq.Ft)
      '      '      Froude number =      0.277

Upstream point elevation =      1424.200(Ft.)
Downstream point elevation =      1423.990(Ft.)
Flow length =      276.000(Ft.)
Travel time =      4.89 min.
Time of concentration =      50.86 min.
Depth of flow =      0.717(Ft.)
Average velocity =      0.941(Ft/s)
Total irregular channel flow =      79.510(CFS)
Irregular channel normal depth above invert elev. =      0.717(Ft.)
Average velocity of channel(s) =      0.941(Ft/s)
!!Warning: Water is above left or right bank elevations
+++++
Process from Point/Station      206.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      63.863(Ac.)
Runoff from this stream =      79.510(CFS)
Time of concentration =      50.86 min.
Rainfall intensity =      1.419(In/Hr)
Summary of stream data:

Stream   Flow rate   TC           Rainfall Intensity
No.      (CFS)         (min)        (In/Hr)

1         79.510     50.86         1.419
Largest stream flow has longer time of concentration
Qp =      79.510 + sum of
Qp =      79.510

Total of 1 streams to confluence:
Flow rates before confluence point:
      79.510
Area of streams before confluence:
      63.863
Results of confluence:
Total flow rate =      79.510(CFS)
Time of concentration =      50.860 min.
Effective stream area after confluence =      63.863(Ac.)
+++++
Process from Point/Station      501.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****

```

Pre Development – 100 year Basin 2

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```

Initial area flow distance = 355.000(Ft.)
Top (of initial area) elevation = 1426.770(Ft.)
Bottom (of initial area) elevation = 1426.310(Ft.)
Difference in elevation = 0.460(Ft.)
Slope = 0.00130 s(percent)= 0.13
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 20.983 min.
Rainfall intensity = 2.269(In/Hr) for a 100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.408(CFS)
Total initial stream area = 1.829(Ac.)
Pervious area fraction = 1.000
*****
Process from Point/Station 502.000 to Point/Station 206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 8.492(CFS)
Depth of flow = 0.112(Ft.), Average velocity = 0.489(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.11
2 294.00 0.00
3 450.00 2.00
Manning's 'N' friction factor = 0.022
-----
Sub-Channel flow = 8.493(CFS)
' ' flow top width = 302.762(Ft.)
' ' velocity= 0.489(Ft/s)
' ' area = 17.350(Sq.Ft)
' ' Froude number = 0.360

Upstream point elevation = 1426.310(Ft.)
Downstream point elevation = 1423.990(Ft.)
Flow length = 976.000(Ft.)
Travel time = 33.23 min.
Time of concentration = 54.22 min.
Depth of flow = 0.112(Ft.)
Average velocity = 0.489(Ft/s)
Total irregular channel flow = 8.492(CFS)
Irregular channel normal depth above invert elev. = 0.112(Ft.)
Average velocity of channel(s) = 0.489(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Rainfall intensity = 1.372(In/Hr) for a 100.0 year storm
Subarea runoff = 10.074(CFS) for 9.451(Ac.)
Total runoff = 13.482(CFS) Total area = 11.280(Ac.)
Depth of flow = 0.131(Ft.), Average velocity = 0.588(Ft/s)
!!Warning: Water is above left or right bank elevations
*****
Process from Point/Station 206.000 to Point/Station 206.000
**** SUBAREA FLOW ADDITION ****

```

Pre Development – 100 year Basin 2

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MOBILE HOME PARK subarea type
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.250; Impervious fraction = 0.750
Time of concentration = 54.22 min.
Rainfall intensity = 1.372(In/Hr) for a 100.0 year storm
Subarea runoff = 0.939(CFS) for 0.823(Ac.)
Total runoff = 14.421(CFS) Total area = 12.103(Ac.)

Process from Point/Station 206.000 to Point/Station 206.000
**** SUBAREA FLOW ADDITION ****

UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 86.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 54.22 min.
Rainfall intensity = 1.372(In/Hr) for a 100.0 year storm
Subarea runoff = 0.592(CFS) for 0.555(Ac.)
Total runoff = 15.013(CFS) Total area = 12.658(Ac.)

Process from Point/Station 206.000 to Point/Station 206.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 12.658(Ac.)
Runoff from this stream = 15.013(CFS)
Time of concentration = 54.22 min.
Rainfall intensity = 1.372(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	79.510	50.86	1.419
2	15.013	54.22	1.372

Largest stream flow has longer or shorter time of concentration
Qp = 79.510 + sum of
Qa Tb/Ta
15.013 * 0.938 = 14.083
Qp = 93.594

Total of 2 streams to confluence:
Flow rates before confluence point:
79.510 15.013
Area of streams before confluence:
63.863 12.658

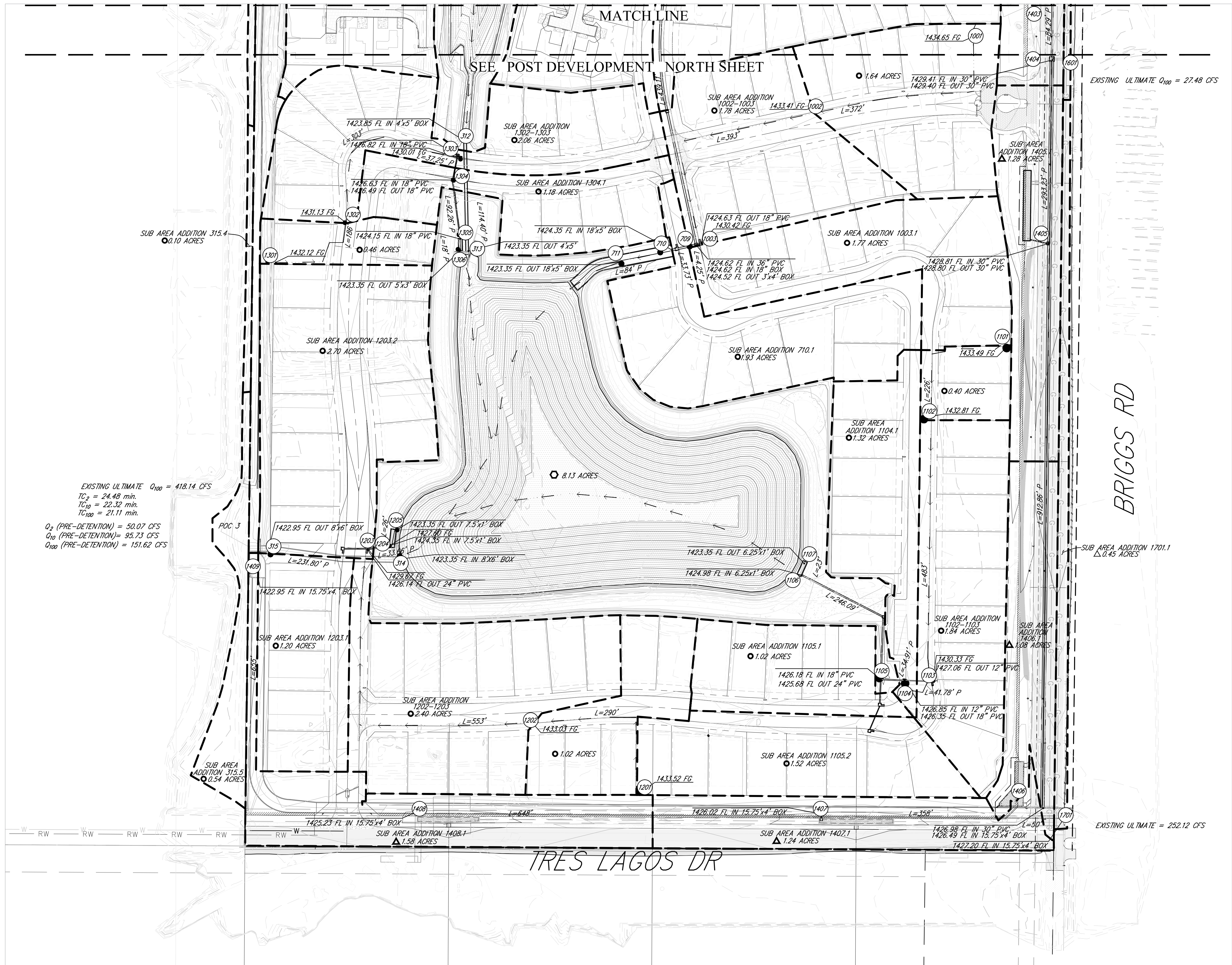
Results of confluence:
Total flow rate = 93.594(CFS)
Time of concentration = 50.860 min.
Effective stream area after confluence = 76.521(Ac.)
End of computations, total study area = 76.52 (Ac.)
The following figures may be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.880
Area averaged RI index number = 79.4

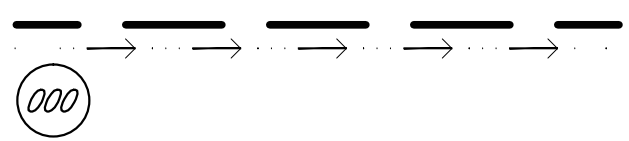
Attachment E
Post Development Onsite

Attachment E1
Post Development Onsite
Map

DATE:	
-------	--



LEGEND

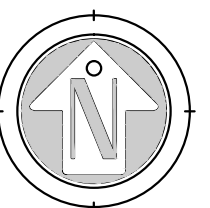


IMPERVIOUS COVER

IN REFERENCE TO "ROFC & MCD HYDROLOGY MANUAL"
PLATE D-5.6

- SINGLE FAMILY (1/4 ACRE)
- △ COMMERCIAL
- ◇ USER-DEFINED

ROCKPORT RANCH POST DEVELOPMENT RATIONAL METHOD SOUTH SHEET



SCALE: 1"=80'
0 80 160 240 320

RECOMMENDED FOR APPROVAL

DATE:

CHECKED BY:

DATE:

DEVELOPER:

EXCEL
ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
440 STATE PLACE, ESCONDIDO, CA 92025
PH (760)745-8118 FX (760)745-1180

TENTATIVE

ROCKPORT RANCH

FOR:

W.O.

DATE:

2 OF 2

Attachment E2
Post Development Onsite
2 Year

Post Development – Onsite – 2 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST2b1.out
-----
14047 POST 2
basin1-pocl
14047POST2b1.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  163.000(Ft.)
Top (of initial area) elevation =  1440.000(Ft.)
Bottom (of initial area) elevation =  1436.800(Ft.)
Difference in elevation =  3.200(Ft.)
Slope =  0.01963 s(percent)=  1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  5.051 min.
Rainfall intensity =  1.903(In/Hr) for a  2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =  0.318(CFS)
Total initial stream area =  0.190(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station      102.000 to Point/Station      103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1436.800(Ft.)
End of street segment elevation =  1433.900(Ft.)
Length of street segment =  441.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
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Post Development-Onsite-2 year-Basin 1

Page 1 of 2

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Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.750
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 2.000
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 0.822(CFS)
Depth of flow = 0.223(Ft.), Average velocity = 1.473(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 6.876(Ft.)
Flow velocity = 1.47(Ft/s)
Travel time = 4.99 min. TC = 10.04 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.313(In/Hr) for a 2.0 year storm
Subarea runoff = 0.950(CFS) for 0.830(Ac.)
Total runoff = 1.268(CFS) Total area = 1.020(Ac.)
Street flow at end of street = 1.268(CFS)
Half street flow at end of street = 1.268(CFS)
Depth of flow = 0.252(Ft.), Average velocity = 1.623(Ft/s)
Flow width (from curb towards crown)= 8.342(Ft.)

+++++
Process from Point/Station 103.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
Downstream point/station elevation = 1429.140(Ft.)
Pipe length = 35.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.268(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.268(CFS)
Normal flow depth in pipe = 4.14(In.)
Flow top width inside pipe = 15.15(In.)
Critical Depth = 5.05(In.)
Pipe flow velocity = 4.13(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 10.19 min.
End of computations, total study area = 1.02 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

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Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST2b2.out
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14047 POST 2
BASIN 2 -poc 2
14047POST2b2.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 Hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400
+++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  224.000(Ft.)
Top (of initial area) elevation =  1434.700(Ft.)
Bottom (of initial area) elevation =  1433.990(Ft.)
Difference in elevation =  0.710(Ft.)
Slope =  0.00317  s(percent)=  0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  8.261 min.
Rainfall intensity =  1.459(In/Hr) for a  2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff =  0.217(CFS)
Total initial stream area =  0.170(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station      202.000 to Point/Station      203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1433.990(Ft.)
End of street segment elevation =  1432.770(Ft.)
Length of street segment =  241.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  16.000(Ft.)
```

Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.363(CFS)
 Depth of flow = 0.183(Ft.), Average velocity = 1.125(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 4.878(Ft.)
 Flow velocity = 1.12(Ft/s)
 Travel time = 3.57 min. TC = 11.83 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.202(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.240(CFS) for 0.230(Ac.)
 Total runoff = 0.457(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 0.457(CFS)
 Half street flow at end of street = 0.457(CFS)
 Depth of flow = 0.195(Ft.), Average velocity = 1.175(Ft/s)
 Flow width (from curb towards crown) = 5.513(Ft.)

 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.83 min.
 Rainfall intensity = 1.202(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.021(CFS) for 0.020(Ac.)
 Total runoff = 0.478(CFS) Total area = 0.420(Ac.)

 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.478(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.478(CFS)
 Normal flow depth in pipe = 1.64(In.)
 Flow top width inside pipe = 10.36(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 5.96(Ft/s)
 Travel time through pipe = 0.16 min.
 Time of concentration (TC) = 11.99 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST2b3r1.out
-----
14047 POST 3
basin3-poc3
14047POST2b3r1
14047POST2b3r1.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5300
+++++
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  340.000(Ft.)
Top (of initial area) elevation =  1436.730(Ft.)
Bottom (of initial area) elevation =  1434.100(Ft.)
Difference in elevation =  2.630(Ft.)
Slope =  0.00774 s(percent)=  0.77
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  10.616 min.
Rainfall intensity =  1.252(In/Hr) for a  2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.754
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =  0.737(CFS)
Total initial stream area =  0.780(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station      302.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1434.100(Ft.)
End of street segment elevation =  1432.100(Ft.)
Length of street segment =  583.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  16.000(Ft.)
Slope from gutter to grade break (v/hz) =  0.078
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Post Development-Onsite-2 year-Basin 3 Reach 1

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Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.776(CFS)
 Depth of flow = 0.205(Ft.), Average velocity = 1.346(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.605(Ft.)
 Flow velocity = 1.35(Ft/s)
 Travel time = 7.22 min. TC = 17.83 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.726
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 0.951(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.982(CFS) for 2.870(Ac.)
 Total runoff = 2.719(CFS) Total area = 3.650(Ac.)
 Street flow at end of street = 2.719(CFS)
 Half street flow at end of street = 2.719(CFS)
 Depth of flow = 0.244(Ft.), Average velocity = 1.499(Ft/s)
 Flow width (from curb towards crown)= 13.568(Ft.)

 Process from Point/Station 303.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.440(Ft.)
 Downstream point/station elevation = 1427.370(Ft.)
 Pipe length = 36.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.719(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.719(CFS)
 Normal flow depth in pipe = 8.59(In.)
 Flow top width inside pipe = 23.01(In.)
 Critical Depth = 6.88(In.)
 Pipe flow velocity = 2.69(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 18.06 min.

 Process from Point/Station 304.100 to Point/Station 304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.725
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.06 min.
 Rainfall intensity = 0.945(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.206(CFS) for 0.300(Ac.)
 Total runoff = 2.924(CFS) Total area = 3.950(Ac.)

 Process from Point/Station 304.000 to Point/Station 305.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 1427.270(Ft.)
 Downstream point/station elevation = 1426.990(Ft.)
 Pipe length = 139.32(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.924(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.924(CFS)
 Normal flow depth in pipe = 8.82(In.)
 Flow top width inside pipe = 23.14(In.)
 Critical Depth = 7.14(In.)
 Pipe flow velocity = 2.79(Ft/s)
 Travel time through pipe = 0.83 min.
 Time of concentration (TC) = 18.89 min.

 Process from Point/Station 305.100 to Point/Station 305.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.723
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.89 min.
 Rainfall intensity = 0.922(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.327(CFS) for 1.990(Ac.)
 Total runoff = 4.251(CFS) Total area = 5.940(Ac.)

 Process from Point/Station 305.200 to Point/Station 305.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.723
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.89 min.
 Rainfall intensity = 0.922(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.260(CFS) for 1.890(Ac.)
 Total runoff = 5.511(CFS) Total area = 7.830(Ac.)

 Process from Point/Station 305.000 to Point/Station 306.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.890(Ft.)
 Downstream point/station elevation = 1425.940(Ft.)
 Pipe length = 475.31(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.511(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 5.511(CFS)
 Normal flow depth in pipe = 11.27(In.)
 Flow top width inside pipe = 29.06(In.)
 Critical Depth = 9.30(In.)
 Pipe flow velocity = 3.27(Ft/s)
 Travel time through pipe = 2.43 min.
 Time of concentration (TC) = 21.32 min.

 Process from Point/Station 306.100 to Point/Station 306.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.716

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.32 min.
 Rainfall intensity = 0.865(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.028(CFS) for 1.660(Ac.)
 Total runoff = 6.540(CFS) Total area = 9.490(Ac.)
 ++++++
 Process from Point/Station 306.200 to Point/Station 306.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.716
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.32 min.
 Rainfall intensity = 0.865(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.849(CFS) for 1.370(Ac.)
 Total runoff = 7.388(CFS) Total area = 10.860(Ac.)
 ++++++
 Process from Point/Station 306.000 to Point/Station 307.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.840(Ft.)
 Downstream point/station elevation = 1425.650(Ft.)
 Pipe length = 92.15(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.388(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 7.388(CFS)
 Normal flow depth in pipe = 13.14(In.)
 Flow top width inside pipe = 29.77(In.)
 Critical Depth = 10.83(In.)
 Pipe flow velocity = 3.58(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 21.75 min.
 ++++++
 Process from Point/Station 307.100 to Point/Station 307.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.715
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.75 min.
 Rainfall intensity = 0.856(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.116(CFS) for 0.190(Ac.)
 Total runoff = 7.505(CFS) Total area = 11.050(Ac.)
 ++++++
 Process from Point/Station 307.000 to Point/Station 308.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.550(Ft.)
 Downstream point/station elevation = 1425.140(Ft.)
 Pipe length = 205.46(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.505(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 7.505(CFS)

Post Development-Onsite-2 year-Basin 3 Reach 1

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Normal flow depth in pipe = 12.32(In.)
 Flow top width inside pipe = 34.16(In.)
 Critical Depth = 10.35(In.)
 Pipe flow velocity = 3.51(Ft/s)
 Travel time through pipe = 0.98 min.
 Time of concentration (TC) = 22.72 min.

 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 11.050(Ac.)
 Runoff from this stream = 7.505(CFS)
 Time of concentration = 22.72 min.
 Rainfall intensity = 0.837(In/Hr)

 Process from Point/Station 401.000 to Point/Station 402.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 306.000(Ft.)
 Top (of initial area) elevation = 1433.390(Ft.)
 Bottom (of initial area) elevation = 1431.700(Ft.)
 Difference in elevation = 1.690(Ft.)
 Slope = 0.00552 s(percent) = 0.55
 $TC = k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.887 min.
 Rainfall intensity = 1.235(In/Hr) for a 2.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.753
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.149(CFS)
 Total initial stream area = 0.160(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 402.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.700(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 740.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.352(CFS)
 Depth of flow = 0.102(Ft.), Average velocity = 0.907(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.445(Ft.)
 Flow velocity = 0.91(Ft/s)
 Travel time = 13.60 min. TC = 24.49 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.708
 Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.307(CFS) for 0.540(Ac.)
 Total runoff = 0.456(CFS) Total area = 0.700(Ac.)
 Street flow at end of street = 0.456(CFS)
 Half street flow at end of street = 0.456(CFS)
 Depth of flow = 0.114(Ft.), Average velocity = 0.970(Ft/s)
 Flow width (from curb towards crown) = 7.052(Ft.)
 ++++++
 Process from Point/Station 308.100 to Point/Station 308.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.708
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 24.49 min.
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.694(CFS) for 1.220(Ac.)
 Total runoff = 1.150(CFS) Total area = 1.920(Ac.)
 ++++++
 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.920(Ac.)
 Runoff from this stream = 1.150(CFS)
 Time of concentration = 24.49 min.
 Rainfall intensity = 0.804(In/Hr)

Process from Point/Station 501.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 312.000(Ft.)
 Top (of initial area) elevation = 1432.920(Ft.)
 Bottom (of initial area) elevation = 1431.000(Ft.)
 Difference in elevation = 1.920(Ft.)
 Slope = 0.00615 s(percent) = 0.62
 $TC = k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.737 min.
 Rainfall intensity = 1.245(In/Hr) for a 2.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.754
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.216(CFS)
 Total initial stream area = 0.230(Ac.)
 Pervious area fraction = 0.500

Process from Point/Station 502.100 to Point/Station 502.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.754
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 10.74 min.
 Rainfall intensity = 1.245(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.394(CFS) for 0.420(Ac.)
 Total runoff = 0.610(CFS) Total area = 0.650(Ac.)

 Process from Point/Station 502.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.000(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 474.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 14.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.807(CFS)
 Depth of flow = 0.141(Ft.), Average velocity = 1.185(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.414(Ft.)
 Flow velocity = 1.18(Ft/s)
 Travel time = 6.67 min. TC = 17.41 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.727
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 0.963(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.294(CFS) for 0.420(Ac.)
 Total runoff = 0.904(CFS) Total area = 1.070(Ac.)
 Street flow at end of street = 0.904(CFS)
 Half street flow at end of street = 0.904(CFS)
 Depth of flow = 0.148(Ft.), Average velocity = 1.220(Ft/s)
 Flow width (from curb towards crown)= 8.765(Ft.)

 Process from Point/Station 308.200 to Point/Station 308.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.727
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.41 min.
 Rainfall intensity = 0.963(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.757(CFS) for 1.080(Ac.)
 Total runoff = 1.661(CFS) Total area = 2.150(Ac.)

 Process from Point/Station 308.000 to Point/Station 308.000

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**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 2.150(Ac.)
 Runoff from this stream = 1.661(CFS)
 Time of concentration = 17.41 min.
 Rainfall intensity = 0.963(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.505	22.72	0.837
2	1.150	24.49	0.804
3	1.661	17.41	0.963

Largest stream flow has longer or shorter time of concentration
 Qp = 7.505 + sum of
 Qa Tb/Ta
 1.150 * 0.928 = 1.067
 Qb Ia/Ib
 1.661 * 0.868 = 1.442
 Qp = 10.014

Total of 3 streams to confluence:
 Flow rates before confluence point:
 7.505 1.150 1.661
 Area of streams before confluence:
 11.050 1.920 2.150
 Results of confluence:
 Total flow rate = 10.014(CFS)
 Time of concentration = 22.723 min.
 Effective stream area after confluence = 15.120(Ac.)

 Process from Point/Station 308.000 to Point/Station 309.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.826(Ft.), Average velocity = 3.032(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	2.20
2	0.00	0.00
3	4.00	0.00
4	4.00	2.20

 Manning's 'N' friction factor = 0.015

Sub-Channel flow = 10.014(CFS)
 ' flow top width = 4.000(Ft.)
 ' velocity = 3.032(Ft/s)
 ' area = 3.302(Sq.Ft)
 ' Froude number = 0.588

Upstream point elevation = 1425.040(Ft.)
 Downstream point elevation = 1424.970(Ft.)
 Flow length = 36.500(Ft.)
 Travel time = 0.20 min.
 Time of concentration = 22.92 min.
 Depth of flow = 0.826(Ft.)
 Average velocity = 3.032(Ft/s)
 Total irregular channel flow = 10.014(CFS)
 Irregular channel normal depth above invert elev. = 0.826(Ft.)
 Average velocity of channel(s) = 3.032(Ft/s)

 Process from Point/Station 309.100 to Point/Station 309.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.712
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 22.92 min.
 Rainfall intensity = 0.833(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.776(CFS) for 1.310(Ac.)
 Total runoff = 10.791(CFS) Total area = 16.430(Ac.)

+-----+
 Process from Point/Station 309.000 to Point/Station 309.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 16.430(Ac.)
 Runoff from this stream = 10.791(CFS)
 Time of concentration = 22.92 min.
 Rainfall intensity = 0.833(In/Hr)

+-----+
 Process from Point/Station 601.000 to Point/Station 602.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 311.000(Ft.)
 Top (of initial area) elevation = 1434.050(Ft.)
 Bottom (of initial area) elevation = 1432.280(Ft.)
 Difference in elevation = 1.770(Ft.)
 Slope = 0.00569 s(percent)= 0.57
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.892 min.
 Rainfall intensity = 1.235(In/Hr) for a 2.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.753
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.698(CFS)
 Total initial stream area = 0.750(Ac.)
 Pervious area fraction = 0.500

+-----+
 Process from Point/Station 602.000 to Point/Station 603.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
 End of street segment elevation = 1429.500(Ft.)
 Length of street segment = 798.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.388(CFS)
 Depth of flow = 0.185(Ft.), Average velocity = 1.272(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.576(Ft.)

```

Flow velocity = 1.27(Ft/s)
Travel time = 10.46 min. TC = 21.35 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.716
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 0.865(In/Hr) for a 2.0 year storm
Subarea runoff = 1.293(CFS) for 2.090(Ac.)
Total runoff = 1.991(CFS) Total area = 2.840(Ac.)
Street flow at end of street = 1.991(CFS)
Half street flow at end of street = 1.991(CFS)
Depth of flow = 0.214(Ft.), Average velocity = 1.393(Ft/s)
Flow width (from curb towards crown) = 12.066(Ft.)

*****
Process from Point/Station 603.100 to Point/Station 603.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.716
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.35 min.
Rainfall intensity = 0.865(In/Hr) for a 2.0 year storm
Subarea runoff = 1.256(CFS) for 2.030(Ac.)
Total runoff = 3.247(CFS) Total area = 4.870(Ac.)

*****
Process from Point/Station 603.000 to Point/Station 309.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1429.500(Ft.)
End of street segment elevation = 1429.000(Ft.)
Length of street segment = 101.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 3.267(CFS)
Depth of flow = 0.244(Ft.), Average velocity = 1.801(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 13.570(Ft.)
Flow velocity = 1.80(Ft/s)
Travel time = 0.93 min. TC = 22.29 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.713
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500

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Rainfall intensity = 0.845(In/Hr) for a 2.0 year storm
Subarea runoff = 0.036(CFS) for 0.060(Ac.)
Total runoff = 3.283(CFS) Total area = 4.930(Ac.)
Street flow at end of street = 3.283(CFS)
Half street flow at end of street = 3.283(CFS)
Depth of flow = 0.245(Ft.), Average velocity = 1.803(Ft/s)
Flow width (from curb towards crown)= 13.594(Ft.)

+++++
Process from Point/Station 309.000 to Point/Station 309.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 4.930(Ac.)
Runoff from this stream = 3.283(CFS)
Time of concentration = 22.29 min.
Rainfall intensity = 0.845(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 10.791 22.92 0.833
2 3.283 22.29 0.845
Largest stream flow has longer time of concentration
Qp = 10.791 + sum of
Qb Ia/Ib
3.283 * 0.985 = 3.235
Qp = 14.025

Total of 2 streams to confluence:
Flow rates before confluence point:
10.791 3.283
Area of streams before confluence:
16.430 4.930
Results of confluence:
Total flow rate = 14.025(CFS)
Time of concentration = 22.923 min.
Effective stream area after confluence = 21.360(Ac.)

+++++
Process from Point/Station 309.000 to Point/Station 310.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.918(Ft.), Average velocity = 3.821(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 14.025(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity= 3.821(Ft/s)
' ' area = 3.671(Sq.Ft)
' ' Froude number = 0.703

Upstream point elevation = 1424.870(Ft.)
Downstream point elevation = 1424.850(Ft.)
Flow length = 9.650(Ft.)
Travel time = 0.04 min.
Time of concentration = 22.97 min.
Depth of flow = 0.918(Ft.)
Average velocity = 3.821(Ft/s)
Total irregular channel flow = 14.025(CFS)
Irregular channel normal depth above invert elev. = 0.918(Ft.)

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Average velocity of channel(s) = 3.821(Ft/s)

+++++
Process from Point/Station 310.000 to Point/Station 311.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.282(Ft.), Average velocity = 4.730(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.00
2 0.00 0.00
3 10.50 0.00
4 10.50 2.00
Manning's 'N' friction factor = 0.017

Sub-Channel flow = 14.026(CFS)
' ' flow top width = 10.500(Ft.)
' ' velocity= 4.730(Ft/s)
' ' area = 2.965(Sq.Ft)
' ' Froude number = 1.569

Upstream point elevation = 1424.850(Ft.)
Downstream point elevation = 1423.850(Ft.)
Flow length = 59.000(Ft.)
Travel time = 0.21 min.
Time of concentration = 23.17 min.
Depth of flow = 0.282(Ft.)
Average velocity = 4.730(Ft/s)
Total irregular channel flow = 14.025(CFS)
Irregular channel normal depth above invert elev. = 0.282(Ft.)
Average velocity of channel(s) = 4.730(Ft/s)

+++++
Process from Point/Station 311.000 to Point/Station 312.000
**** SUBAREA FLOW ADDITION ****

USER INPUT of soil data for subarea
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 23.17 min.
Rainfall intensity = 0.828(In/Hr) for a 2.0 year storm
Subarea runoff = 0.736(CFS) for 1.020(Ac.)
Total runoff = 14.761(CFS) Total area = 22.380(Ac.)

+++++
Process from Point/Station 312.000 to Point/Station 313.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.737(Ft.), Average velocity = 5.004(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 0.00 0.00
3 4.00 0.00
4 4.00 5.00
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 14.761(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity= 5.004(Ft/s)
' ' area = 2.950(Sq.Ft)
' ' Froude number = 1.027

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Upstream point elevation = 1423.850(Ft.)
 Downstream point elevation = 1423.350(Ft.)
 Flow length = 114.400(Ft.)
 Travel time = 0.38 min.
 Time of concentration = 23.55 min.
 Depth of flow = 0.737(Ft.)
 Average velocity = 5.004(Ft/s)
 Total irregular channel flow = 14.761(CFS)
 Irregular channel normal depth above invert elev. = 0.737(Ft.)
 Average velocity of channel(s) = 5.004(Ft/s)

++++++
 Process from Point/Station 313.000 to Point/Station 314.000
 **** SUBAREA FLOW ADDITION ****

USER INPUT of soil data for subarea
 Runoff Coefficient = 0.871
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 98.00
 Pervious area fraction = 1.000; Impervious fraction = 0.000
 Time of concentration = 23.55 min.
 Rainfall intensity = 0.821(In/Hr) for a 2.0 year storm
 Subarea runoff = 5.812(CFS) for 8.130(Ac.)
 Total runoff = 20.574(CFS) Total area = 30.510(Ac.)

++++++
 Process from Point/Station 314.000 to Point/Station 314.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 30.510(Ac.)
 Runoff from this stream = 20.574(CFS)
 Time of concentration = 23.55 min.
 Rainfall intensity = 0.821(In/Hr)

++++++
 Process from Point/Station 711.000 to Point/Station 314.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 0.882(In/Hr) for a 2.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.718
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 User specified values are as follows:
 TC = 20.56 min. Rain intensity = 0.88(In/Hr)
 Total area = 21.08(Ac.) Total runoff = 15.04(CFS)

++++++
 Process from Point/Station 314.000 to Point/Station 314.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 21.080(Ac.)
 Runoff from this stream = 15.038(CFS)
 Time of concentration = 20.56 min.
 Rainfall intensity = 0.882(In/Hr)

```

*****
Process from Point/Station      1107.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      0.909(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.721
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 19.44 min. Rain intensity =      0.91(In/Hr)
Total area =      6.10(Ac.) Total runoff =      4.45(CFS)

*****
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =      6.100(Ac.)
Runoff from this stream =      4.451(CFS)
Time of concentration = 19.44 min.
Rainfall intensity =      0.909(In/Hr)

*****
Process from Point/Station      1205.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      0.915(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.722
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 19.20 min. Rain intensity =      0.91(In/Hr)
Total area =      7.32(Ac.) Total runoff =      5.29(CFS)

*****
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area =      7.320(Ac.)
Runoff from this stream =      5.295(CFS)
Time of concentration = 19.20 min.
Rainfall intensity =      0.915(In/Hr)

*****
Process from Point/Station      1306.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      1.113(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.743
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:

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TC = 13.26 min. Rain intensity = 1.11(In/Hr)
Total area = 3.70(Ac.) Total runoff = 3.39(CFS)

Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 5
Stream flow area = 3.700(Ac.)
Runoff from this stream = 3.386(CFS)
Time of concentration = 13.26 min.
Rainfall intensity = 1.113(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	20.574	23.55	0.821
2	15.038	20.56	0.882
3	4.451	19.44	0.909
4	5.295	19.20	0.915
5	3.386	13.26	1.113

Largest stream flow has longer time of concentration
Qp = 20.574 + sum of
Qb Ia/Ib
15.038 * 0.930 = 13.992
Qb Ia/Ib
4.451 * 0.903 = 4.020
Qb Ia/Ib
5.295 * 0.897 = 4.751
Qb Ia/Ib
3.386 * 0.737 = 2.497
Qp = 45.835

Total of 5 streams to confluence:
Flow rates before confluence point:
20.574 15.038 4.451 5.295 3.386
Area of streams before confluence:
30.510 21.080 6.100 7.320 3.700

Results of confluence:
Total flow rate = 45.835(CFS)
Time of concentration = 23.554 min.
Effective stream area after confluence = 68.710(Ac.)

Process from Point/Station 314.000 to Point/Station 315.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.372(Ft.), Average velocity = 4.175(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 6.00
2 0.00 0.00
3 8.00 0.00
4 8.00 6.00
Manning's 'N' friction factor = 0.015

Sub-Channel flow = 45.835(CFS)
' ' flow top width = 8.000(Ft.)
' ' velocity= 4.175(Ft/s)
' ' area = 10.979(Sq.Ft)
' ' Froude number = 0.628

Upstream point elevation = 1423.350(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 231.800(Ft.)
Travel time = 0.93 min.
Time of concentration = 24.48 min.

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Depth of flow = 1.372(Ft.)
 Average velocity = 4.175(Ft/s)
 Total irregular channel flow = 45.835(CFS)
 Irregular channel normal depth above invert elev. = 1.372(Ft.)
 Average velocity of channel(s) = 4.175(Ft/s)

 Process from Point/Station 315.100 to Point/Station 315.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.740
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 24.48 min.
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.107(CFS) for 0.180(Ac.)
 Total runoff = 45.942(CFS) Total area = 68.890(Ac.)

 Process from Point/Station 315.200 to Point/Station 315.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.740
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 24.48 min.
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.053(CFS) for 1.770(Ac.)
 Total runoff = 46.995(CFS) Total area = 70.660(Ac.)

 Process from Point/Station 315.300 to Point/Station 315.300
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.740
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 24.48 min.
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.107(CFS) for 0.180(Ac.)
 Total runoff = 47.102(CFS) Total area = 70.840(Ac.)

 Process from Point/Station 315.400 to Point/Station 315.400
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.740
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 24.48 min.
 Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm

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Subarea runoff = 0.059(CFS) for 0.100(Ac.)
Total runoff = 47.162(CFS) Total area = 70.940(Ac.)

Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.740
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 24.48 min.
Rainfall intensity = 0.804(In/Hr) for a 2.0 year storm
Subarea runoff = 0.321(CFS) for 0.540(Ac.)
Total runoff = 47.483(CFS) Total area = 71.480(Ac.)

Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 47.483(CFS)
Time of concentration = 24.48 min.
Rainfall intensity = 0.804(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.483	24.48	0.804

Largest stream flow has longer time of concentration
Qp = 47.483 + sum of
Qp = 47.483

Total of 1 main streams to confluence:
Flow rates before confluence point:
47.483
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 47.483(CFS)
Time of concentration = 24.480 min.
Effective stream area after confluence = 71.480(Ac.)

Process from Point/Station 1409.000 to Point/Station 315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 0.520(In/Hr) for a 2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 55.70 min. Rain intensity = 0.52(In/Hr)
Total area = 8.43(Ac.) Total runoff = 5.89(CFS)

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Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 8.430(Ac.)
 Runoff from this stream = 5.889(CFS)
 Time of concentration = 55.70 min.
 Rainfall intensity = 0.520(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	47.483	24.48	0.804
2	5.889	55.70	0.520

Largest stream flow has longer or shorter time of concentration
 Qp = 47.483 + sum of
 Qa Tb/Ta
 5.889 * 0.439 = 2.588
 Qp = 50.071

Total of 2 main streams to confluence:

Flow rates before confluence point:

47.483 5.889
 Area of streams before confluence:
 71.480 8.430

Results of confluence:

Total flow rate = 50.071(CFS)
 Time of concentration = 24.480 min.
 Effective stream area after confluence = 79.910(Ac.)
 End of computations, total study area = 79.91 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.515
 Area averaged RI index number = 72.5

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CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/26/19 File:14047POSTB3R22.out

14047 POST 2
Basin 3 Reach 2
14047POSTB3R22.rrv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 2.0
Calculated rainfall intensity data:
1 hour intensity = 0.500(In/Hr)
Slope of intensity duration curve = 0.5400

Process from Point/Station 701.000 to Point/Station 702.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 329.000(Ft.)
Top (of initial area) elevation = 1435.900(Ft.)
Bottom (of initial area) elevation = 1433.950(Ft.)
Difference in elevation = 1.950(Ft.)
Slope = 0.00593 s(percent)= 0.59
TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.050 min.
Rainfall intensity = 1.247(In/Hr) for a 2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.754
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 0.865(CFS)
Total initial stream area = 0.920(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 702.000 to Point/Station 703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.950(Ft.)
End of street segment elevation = 1431.540(Ft.)
Length of street segment = 477.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078

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Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.262(CFS)
 Depth of flow = 0.164(Ft.), Average velocity = 1.426(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.551(Ft.)
 Flow velocity = 1.43(Ft/s)
 Travel time = 5.58 min. TC = 16.63 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.731
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.000(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.695(CFS) for 0.950(Ac.)
 Total runoff = 1.559(CFS) Total area = 1.870(Ac.)
 Street flow at end of street = 1.559(CFS)
 Half street flow at end of street = 1.559(CFS)
 Depth of flow = 0.179(Ft.), Average velocity = 1.505(Ft/s)
 Flow width (from curb towards crown)= 10.312(Ft.)

 Process from Point/Station 703.100 to Point/Station 703.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.731
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.63 min.
 Rainfall intensity = 1.000(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.197(CFS) for 0.270(Ac.)
 Total runoff = 1.757(CFS) Total area = 2.140(Ac.)

 Process from Point/Station 703.000 to Point/Station 704.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.610(Ft.)
 Downstream point/station elevation = 1427.450(Ft.)
 Pipe length = 80.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.757(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.757(CFS)
 Normal flow depth in pipe = 7.63(In.)
 Flow top width inside pipe = 17.79(In.)
 Critical Depth = 5.98(In.)
 Pipe flow velocity = 2.47(Ft/s)
 Travel time through pipe = 0.54 min.
 Time of concentration (TC) = 17.17 min.

 Process from Point/Station 704.000 to Point/Station 704.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 2.140(Ac.)

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Runoff from this stream =      1.757(CFS)
Time of concentration =    17.17 min.
Rainfall intensity =      0.983(In/Hr)

*****
Process from Point/Station      901.000 to Point/Station      902.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =    211.000(Ft.)
Top (of initial area) elevation = 1438.790(Ft.)
Bottom (of initial area) elevation = 1433.300(Ft.)
Difference in elevation =      5.490(Ft.)
Slope =      0.02602 s(percent)=      2.60
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =      6.882 min.
Rainfall intensity =      1.610(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.778
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =      0.526(CFS)
Total initial stream area =      0.420(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      902.000 to Point/Station      705.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.330(Ft.)
End of street segment elevation = 1432.180(Ft.)
Length of street segment =    295.000(Ft.)
Height of curb above gutter flowline =      6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width =      2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street =      1.119(CFS)
Depth of flow = 0.165(Ft.), Average velocity = 1.255(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 9.582(Ft.)
Flow velocity = 1.26(Ft/s)
Travel time = 3.92 min.      TC = 10.80 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity =      1.262(In/Hr) for a      2.0 year storm
Subarea runoff =      1.096(CFS) for      1.150(Ac.)
Total runoff =      1.622(CFS)      Total area =      1.570(Ac.)
Street flow at end of street = 1.622(CFS)
Half street flow at end of street = 1.622(CFS)
Depth of flow = 0.192(Ft.), Average velocity = 1.380(Ft/s)
Flow width (from curb towards crown)= 10.967(Ft.)

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Post Development – 2 year Basin 3 Reach 2

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*****
Process from Point/Station      705.000 to Point/Station      706.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.690(Ft.)
Downstream point/station elevation = 1427.620(Ft.)
Pipe length = 36.77(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.622(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 1.622(CFS)
Normal flow depth in pipe = 12.00(In.)
Flow top width inside pipe = 0.00(In.)
Critical Depth = 6.50(In.)
Pipe flow velocity = 1.98(Ft/s)
Travel time through pipe = 0.31 min.
Time of concentration (TC) = 11.11 min.

*****
Process from Point/Station      706.100 to Point/Station      706.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.754
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 11.11 min.
Rainfall intensity = 1.243(In/Hr) for a 2.0 year storm
Subarea runoff = 1.387(CFS) for 1.480(Ac.)
Total runoff = 3.009(CFS) Total area = 3.050(Ac.)

*****
Process from Point/Station      706.000 to Point/Station      704.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.520(Ft.)
Downstream point/station elevation = 1427.450(Ft.)
Pipe length = 31.87(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.009(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 3.009(CFS)
Normal flow depth in pipe = 10.17(In.)
Flow top width inside pipe = 17.85(In.)
Critical Depth = 7.92(In.)
Pipe flow velocity = 2.93(Ft/s)
Travel time through pipe = 0.18 min.
Time of concentration (TC) = 11.29 min

*****
Process from Point/Station      704.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.050(Ac.)
Runoff from this stream = 3.009(CFS)
Time of concentration = 11.29 min.
Rainfall intensity = 1.232(In/Hr)
Summary of stream data:

Stream   Flow rate      TC      Rainfall Intensity
No.      (CFS)          (min)      (In/Hr)

1         1.757        17.17         0.983
2         3.009        11.29         1.232
Largest stream flow has longer or shorter time of concentration
Qp =      3.009 + sum of
          Qa          Tb/Ta

```

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$Q_p = \frac{1.757 * 0.658}{4.164} = 1.155$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 1.757 3.009
 Area of streams before confluence:
 2.140 3.050
 Results of confluence:
 Total flow rate = 4.164(CFS)
 Time of concentration = 11.290 min.
 Effective stream area after confluence = 5.190(Ac.)

+-----+
 Process from Point/Station 704.000 to Point/Station 707.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.350(Ft.)
 Downstream point/station elevation = 1427.120(Ft.)
 Pipe length = 114.66(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.164(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.164(CFS)
 Normal flow depth in pipe = 10.72(In.)
 Flow top width inside pipe = 23.86(In.)
 Critical Depth = 8.59(In.)
 Pipe flow velocity = 3.07(Ft/s)
 Travel time through pipe = 0.62 min.
 Time of concentration (TC) = 11.91 min.

+-----+
 Process from Point/Station 707.100 to Point/Station 707.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.778
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 11.91 min.
 Rainfall intensity = 1.197(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.596(CFS) for 0.640(Ac.)
 Total runoff = 4.760(CFS) Total area = 5.830(Ac.)

+-----+
 Process from Point/Station 707.000 to Point/Station 708.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.020(Ft.)
 Downstream point/station elevation = 1425.700(Ft.)
 Pipe length = 613.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.760(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.760(CFS)
 Normal flow depth in pipe = 11.33(In.)
 Flow top width inside pipe = 23.96(In.)
 Critical Depth = 9.21(In.)
 Pipe flow velocity = 3.26(Ft/s)
 Travel time through pipe = 3.13 min.
 Time of concentration (TC) = 15.05 min.

+-----+
 Process from Point/Station 708.000 to Point/Station 708.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 5.830(Ac.)
 Runoff from this stream = 4.760(CFS)

Time of concentration = 15.05 min.
Rainfall intensity = 1.055(In/Hr)

Process from Point/Station 801.000 to Point/Station 802.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 337.000(Ft.)
Top (of initial area) elevation = 1433.880(Ft.)
Bottom (of initial area) elevation = 1432.280(Ft.)
Difference in elevation = 1.600(Ft.)
Slope = 0.00475 s(percent)= 0.47
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.663 min.
Rainfall intensity = 1.211(In/Hr) for a 2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 0.791(CFS)
Total initial stream area = 0.870(Ac.)
Pervious area fraction = 0.500

Process from Point/Station 802.000 to Point/Station 803.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
End of street segment elevation = 1429.390(Ft.)
Length of street segment = 559.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 1.480(CFS)
Depth of flow = 0.175(Ft.), Average velocity = 1.498(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 10.077(Ft.)
Flow velocity = 1.50(Ft/s)
Travel time = 6.22 min. TC = 17.88 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 0.961(In/Hr) for a 2.0 year storm
Subarea runoff = 1.279(CFS) for 1.830(Ac.)
Total runoff = 2.070(CFS) Total area = 2.700(Ac.)
Street flow at end of street = 2.070(CFS)
Half street flow at end of street = 2.070(CFS)
Depth of flow = 0.201(Ft.), Average velocity = 1.631(Ft/s)
Flow width (from curb towards crown)= 11.387(Ft.)

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Process from Point/Station 803.100 to Point/Station 803.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 17.88 min.
Rainfall intensity = 0.961(In/Hr) for a 2.0 year storm
Subarea runoff = 1.272(CFS) for 1.820(Ac.)
Total runoff = 3.343(CFS) Total area = 4.520(Ac.)

Process from Point/Station 803.000 to Point/Station 804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.930(Ft.)
Downstream point/station elevation = 1425.860(Ft.)
Pipe length = 36.52(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.343(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 3.343(CFS)
Normal flow depth in pipe = 9.61(In.)
Flow top width inside pipe = 23.52(In.)
Critical Depth = 7.67(In.)
Pipe flow velocity = 2.85(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 18.10 min.

Process from Point/Station 804.100 to Point/Station 804.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.10 min.
Rainfall intensity = 0.955(In/Hr) for a 2.0 year storm
Subarea runoff = 2.505(CFS) for 3.610(Ac.)
Total runoff = 5.848(CFS) Total area = 8.130(Ac.)

Process from Point/Station 804.000 to Point/Station 708.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.760(Ft.)
Downstream point/station elevation = 1425.700(Ft.)
Pipe length = 29.74(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.848(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 5.848(CFS)
Normal flow depth in pipe = 11.61(In.)
Flow top width inside pipe = 29.23(In.)
Critical Depth = 9.59(In.)
Pipe flow velocity = 3.33(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 18.25 min.

Process from Point/Station 708.000 to Point/Station 708.000
**** CONFLUENCE OF MINOR STREAMS ****

Post Development - 2 year Basin 3 Reach 2

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Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 8.130(Ac.)
 Runoff from this stream = 5.848(CFS)
 Time of concentration = 18.25 min.
 Rainfall intensity = 0.951(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.760	15.05	1.055
2	5.848	18.25	0.951

Largest stream flow has longer time of concentration
 $Q_p = 5.848 + \text{sum of } Q_b \text{ Ia/Ib}$
 $4.760 * 0.901 = 4.290$
 $Q_p = 10.138$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 4.760 5.848
 Area of streams before confluence:
 5.830 8.130
 Results of confluence:
 Total flow rate = 10.138(CFS)
 Time of concentration = 18.247 min.
 Effective stream area after confluence = 13.960(Ac.)

++++++
 Process from Point/Station 708.000 to Point/Station 709.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.600(Ft.)
 Downstream point/station elevation = 1424.620(Ft.)
 Pipe length = 439.11(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 10.138(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 10.138(CFS)
 Normal flow depth in pipe = 14.04(In.)
 Flow top width inside pipe = 35.12(In.)
 Critical Depth = 12.07(In.)
 Pipe flow velocity = 3.97(Ft/s)
 Travel time through pipe = 1.84 min.
 Time of concentration (TC) = 20.09 min.

++++++
 Process from Point/Station 709.000 to Point/Station 709.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 13.960(Ac.)
 Runoff from this stream = 10.138(CFS)
 Time of concentration = 20.09 min.
 Rainfall intensity = 0.903(In/Hr)

++++++
 Process from Point/Station 1001.000 to Point/Station 1002.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 372.000(Ft.)
 Top (of initial area) elevation = 1434.650(Ft.)
 Bottom (of initial area) elevation = 1433.410(Ft.)
 Difference in elevation = 1.240(Ft.)
 Slope = 0.00333 s(percent) = 0.33
 $TC = k(0.390)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
 Initial area time of concentration = 13.023 min.
 Rainfall intensity = 1.141(In/Hr) for a 2.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.745

Post Development – 2 year Basin 3 Reach 2

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.394(CFS)
Total initial stream area = 1.640(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station 1002.000 to Point/Station 1003.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.410(Ft.)
End of street segment elevation = 1430.420(Ft.)
Length of street segment = 393.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 2.074(CFS)
Depth of flow = 0.185(Ft.), Average velocity = 1.884(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 10.619(Ft.)
Flow velocity = 1.88(Ft/s)
Travel time = 3.48 min. TC = 16.50 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.732
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 1.004(In/Hr) for a 2.0 year storm
Subarea runoff = 1.308(CFS) for 1.780(Ac.)
Total runoff = 2.702(CFS) Total area = 3.420(Ac.)
Street flow at end of street = 2.702(CFS)
Half street flow at end of street = 2.702(CFS)
Depth of flow = 0.207(Ft.), Average velocity = 2.015(Ft/s)
Flow width (from curb towards crown)= 11.695(Ft.)

*****
Process from Point/Station 1003.100 to Point/Station 1003.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.50 min.
Rainfall intensity = 1.004(In/Hr) for a 2.0 year storm
Subarea runoff = 1.354(CFS) for 1.770(Ac.)
Total runoff = 4.056(CFS) Total area = 5.190(Ac.)
*****

```

Post Development – 2 year Basin 3 Reach 2

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```

Process from Point/Station      1003.000 to Point/Station      709.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1424.630(Ft.)
Downstream point/station elevation = 1424.620(Ft.)
Pipe length = 4.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.056(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 4.056(CFS)
Normal flow depth in pipe = 12.14(In.)
Flow top width inside pipe = 16.87(In.)
Critical Depth = 9.25(In.)
Pipe flow velocity = 3.20(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 16.52 min.

+++++
Process from Point/Station      709.000 to Point/Station      709.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 5.190(Ac.)
Runoff from this stream = 4.056(CFS)
Time of concentration = 16.52 min.
Rainfall intensity = 1.003(In/Hr)
Summary of stream data:

Stream   Flow rate      TC           Rainfall Intensity
No.      (CFS)          (min)        (In/Hr)

1        10.138       20.09         0.903
2         4.056       16.52         1.003
Largest stream flow has longer time of concentration
Qp = 10.138 + sum of
      Qb      Ia/Ib
      4.056 * 0.900 = 3.649
Qp = 13.787

Total of 2 streams to confluence:
Flow rates before confluence point:
10.138      4.056
Area of streams before confluence:
13.960      5.190
Results of confluence:
Total flow rate = 13.787(CFS)
Time of concentration = 20.090 min.
Effective stream area after confluence = 19.150(Ac.)

+++++
Process from Point/Station      709.000 to Point/Station      710.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.851(Ft.), Average velocity = 5.401(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number   'X' coordinate   'Y' coordinate
1              0.00          4.00
2              0.00          0.00
3              3.00          0.00
4              3.00          4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 13.787(CFS)
'   '   flow top width = 3.000(Ft.)
'   '   velocity = 5.401(Ft/s)
'   '   area = 2.553(Sq.Ft)
'   '   Froude number = 1.032

Upstream point elevation = 1424.520(Ft.)

```

Post Development – 2 year Basin 3 Reach 2

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Downstream point elevation = 1424.350(Ft.)
 Flow length = 33.730(Ft.)
 Travel time = 0.10 min.
 Time of concentration = 20.19 min.
 Depth of flow = 0.851(Ft.)
 Average velocity = 5.401(Ft/s)
 Total irregular channel flow = 13.787(CFS)
 Irregular channel normal depth above invert elev. = 0.851(Ft.)
 Average velocity of channel(s) = 5.401(Ft/s)

++++++
 Process from Point/Station 710.100 to Point/Station 710.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.720
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 20.19 min.
 Rainfall intensity = 0.900(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.251(CFS) for 1.930(Ac.)
 Total runoff = 15.038(CFS) Total area = 21.080(Ac.)

++++++
 Process from Point/Station 710.000 to Point/Station 711.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.217(Ft.), Average velocity = 3.845(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	5.00
2	0.00	0.00
3	18.00	0.00
4	18.00	5.00

 Manning's 'N' friction factor = 0.015

Sub-Channel flow = 15.038(CFS)

'	'	flow top width = 18.000(Ft.)
'	'	velocity = 3.845(Ft/s)
'	'	area = 3.911(Sq.Ft)
'	'	Froude number = 1.454

Upstream point elevation = 1424.350(Ft.)
 Downstream point elevation = 1423.350(Ft.)
 Flow length = 84.000(Ft.)
 Travel time = 0.36 min.
 Time of concentration = 20.56 min.
 Depth of flow = 0.217(Ft.)
 Average velocity = 3.845(Ft/s)
 Total irregular channel flow = 15.038(CFS)
 Irregular channel normal depth above invert elev. = 0.217(Ft.)
 Average velocity of channel(s) = 3.845(Ft/s)
 End of computations, total study area = 21.08 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
 Area averaged RI index number = 69.7

Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study          Date: 07/29/19   File:14047POSTB3R32.out
-----
14047 POST 2
BASIN 3
14047POSTB3R32.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station  1101.000 to Point/Station  1102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  226.000(Ft.)
Top (of initial area) elevation =  1433.490(Ft.)
Bottom (of initial area) elevation =  1432.810(Ft.)
Difference in elevation =  0.680(Ft.)
Slope =  0.00301 s(percent)=  0.30
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  10.890 min.
Rainfall intensity =  1.257(In/Hr) for a  2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =  0.379(CFS)
Total initial stream area =  0.400(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station  1102.000 to Point/Station  1103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1432.810(Ft.)
End of street segment elevation =  1430.330(Ft.)
Length of street segment =  483.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
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Post Development – 2 year Basin 3 Reach 3

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Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 1.083(CFS)
Depth of flow = 0.114(Ft.), Average velocity = 1.154(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 7.044(Ft.)
Flow velocity = 1.15(Ft/s)
Travel time = 6.98 min. TC = 17.87 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.727
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 0.962(In/Hr) for a 2.0 year storm
Subarea runoff = 1.287(CFS) for 1.840(Ac.)
Total runoff = 1.666(CFS) Total area = 2.240(Ac.)
Street flow at end of street = 1.666(CFS)
Half street flow at end of street = 0.833(CFS)
Depth of flow = 0.137(Ft.), Average velocity = 1.290(Ft/s)
Flow width (from curb towards crown)= 8.204(Ft.)

+++++
Process from Point/Station 1103.000 to Point/Station 1104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.060(Ft.)
Downstream point/station elevation = 1426.850(Ft.)
Pipe length = 41.78(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.666(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.666(CFS)
Normal flow depth in pipe = 7.11(In.)
Flow top width inside pipe = 11.79(In.)
Critical Depth = 6.58(In.)
Pipe flow velocity = 3.43(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 18.07 min.

+++++
Process from Point/Station 1104.100 to Point/Station 1104.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.07 min.
Rainfall intensity = 0.956(In/Hr) for a 2.0 year storm
Subarea runoff = 0.955(CFS) for 1.320(Ac.)
Total runoff = 2.622(CFS) Total area = 3.560(Ac.)

+++++
Process from Point/Station 1104.000 to Point/Station 1105.000

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Post Development – 2 year Basin 3 Reach 3

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**** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 1426.350(Ft.)
Downstream point/station elevation = 1426.180(Ft.)
Pipe length = 34.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.622(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 2.622(CFS)
Normal flow depth in pipe = 7.44(In.)
Flow top width inside pipe = 17.73(In.)
Critical Depth = 7.35(In.)
Pipe flow velocity = 3.80(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 18.22 min.

+++++
Process from Point/Station 1105.100 to Point/Station 1105.100
**** SUBAREA FLOW ADDITION ****

```

```

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.22 min.
Rainfall intensity = 0.952(In/Hr) for a 2.0 year storm
Subarea runoff = 0.734(CFS) for 1.020(Ac.)
Total runoff = 3.356(CFS) Total area = 4.580(Ac.)

+++++
Process from Point/Station 1105.200 to Point/Station 1105.200
**** SUBAREA FLOW ADDITION ****

```

```

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.22 min.
Rainfall intensity = 0.952(In/Hr) for a 2.0 year storm
Subarea runoff = 1.095(CFS) for 1.520(Ac.)
Total runoff = 4.451(CFS) Total area = 6.100(Ac.)

+++++
Process from Point/Station 1105.000 to Point/Station 1106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 1425.680(Ft.)
Downstream point/station elevation = 1424.980(Ft.)
Pipe length = 246.09(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.451(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 4.451(CFS)
Normal flow depth in pipe = 10.09(In.)
Flow top width inside pipe = 23.69(In.)
Critical Depth = 8.89(In.)
Pipe flow velocity = 3.55(Ft/s)
Travel time through pipe = 1.16 min.
Time of concentration (TC) = 19.38 min.

+++++
Process from Point/Station 1106.000 to Point/Station 1107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

```

Depth of flow = 0.116(Ft.), Average velocity = 6.129(Ft/s)

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Post Development – 2 year Basin 3 Reach 3

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***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              1.00
      2              0.00              0.00
      3              6.25              0.00
      4              6.25              1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 4.451(CFS)
'      '      flow top width = 6.250(Ft.)
'      '      velocity= 6.129(Ft/s)
'      '      area = 0.726(Sq.Ft)
'      '      Froude number = 3.169

Upstream point elevation = 1424.980(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 23.000(Ft.)
Travel time = 0.06 min.
Time of concentration = 19.44 min.
Depth of flow = 0.116(Ft.)
Average velocity = 6.129(Ft/s)
Total irregular channel flow = 4.451(CFS)
Irregular channel normal depth above invert elev. = 0.116(Ft.)
Average velocity of channel(s) = 6.129(Ft/s)
End of computations, total study area = 6.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 72.8

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Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POSTB3R42.out
-----
14047 POST 2
BASIN 3
14047POSTB3R42.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400
*****
Process from Point/Station      1201.000 to Point/Station      1202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  290.000(Ft.)
Top (of initial area) elevation =  1433.520(Ft.)
Bottom (of initial area) elevation =  1433.030(Ft.)
Difference in elevation =  0.490(Ft.)
Slope =  0.00169  s(percent)=  0.17
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  13.504 min.
Rainfall intensity =  1.119(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) =  75.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =  0.881(CFS)
Total initial stream area =  1.020(Ac.)
Pervious area fraction = 0.50

*****
Process from Point/Station      1202.000 to Point/Station      1203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1433.030(Ft.)
End of street segment elevation =  1429.670(Ft.)
Length of street segment =  553.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  16.000(Ft.)
Slope from gutter to grade break (v/hz) =  0.078
```

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.747(CFS)
 Depth of flow = 0.181(Ft.), Average velocity = 1.659(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.393(Ft.)
 Flow velocity = 1.66(Ft/s)
 Travel time = 5.56 min. TC = 19.06 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.754
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 0.929(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.682(CFS) for 2.400(Ac.)
 Total runoff = 2.563(CFS) Total area = 3.420(Ac.)
 Street flow at end of street = 2.563(CFS)
 Half street flow at end of street = 2.563(CFS)
 Depth of flow = 0.212(Ft.), Average velocity = 1.828(Ft/s)
 Flow width (from curb towards crown)= 11.952(Ft.)

++++++
 Process from Point/Station 1203.100 to Point/Station 1203.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.754
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.06 min.
 Rainfall intensity = 0.929(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.841(CFS) for 1.200(Ac.)
 Total runoff = 3.403(CFS) Total area = 4.620(Ac.)

++++++
 Process from Point/Station 1203.200 to Point/Station 1203.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.754
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.06 min.
 Rainfall intensity = 0.929(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.892(CFS) for 2.700(Ac.)
 Total runoff = 5.295(CFS) Total area = 7.320(Ac.)

++++++
 Process from Point/Station 1203.000 to Point/Station 1204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.140(Ft.)

```

Downstream point/station elevation = 1424.350(Ft.)
Pipe length = 33.66(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.295(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.295(CFS)
Normal flow depth in pipe = 5.16(In.)
Flow top width inside pipe = 19.72(In.)
Critical Depth = 9.73(In.)
Pipe flow velocity = 10.66(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 19.11 min.

*****
Process from Point/Station 1204.000 to Point/Station 1205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.139(Ft.), Average velocity = 5.085(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                1.00
2                  0.00                0.00
3                  7.50                0.00
4                  7.50                1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 5.295(CFS)
'      ' flow top width = 7.500(Ft.)
'      ' velocity = 5.085(Ft/s)
'      ' area = 1.041(Sq.Ft)
'      ' Froude number = 2.405

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 26.000(Ft.)
Travel time = 0.09 min.
Time of concentration = 19.20 min.
Depth of flow = 0.139(Ft.)
Average velocity = 5.085(Ft/s)
Total irregular channel flow = 5.295(CFS)
Irregular channel normal depth above invert elev. = 0.139(Ft.)
Average velocity of channel(s) = 5.085(Ft/s)
End of computations, total study area = 7.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POSTB3R52.out
-----
14047 POST 2
BASIN 3
14047POSTB3R52.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 Hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station  1301.000 to Point/Station  1302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  186.000(Ft.)
Top (of initial area) elevation = 1432.120(Ft.)
Bottom (of initial area) elevation = 1431.130(Ft.)
Difference in elevation =  0.990(Ft.)
Slope =  0.00532 s(percent)=  0.53
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  8.988 min.
Rainfall intensity =  1.394(In/Hr) for a  2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =  0.507(CFS)
Total initial stream area =  0.460(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station  1302.000 to Point/Station  1303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.130(Ft.)
End of street segment elevation = 1430.010(Ft.)
Length of street segment =  303.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  16.000(Ft.)
```

Post Development – 2 year Basin 3 Reach 5

Page 1 of 3

Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.454(CFS)
 Depth of flow = 0.186(Ft.), Average velocity = 1.315(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.641(Ft.)
 Flow velocity = 1.32(Ft/s)
 Travel time = 3.84 min. TC = 12.83 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.150(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.835(CFS) for 2.060(Ac.)
 Total runoff = 2.343(CFS) Total area = 2.520(Ac.)
 Street flow at end of street = 2.343(CFS)
 Half street flow at end of street = 2.343(CFS)
 Depth of flow = 0.226(Ft.), Average velocity = 1.484(Ft/s)
 Flow width (from curb towards crown) = 12.669(Ft.)

 Process from Point/Station 1303.000 to Point/Station 1304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.820(Ft.)
 Downstream point/station elevation = 1426.630(Ft.)
 Pipe length = 37.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.343(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.343(CFS)
 Normal flow depth in pipe = 6.91(In.)
 Flow top width inside pipe = 17.51(In.)
 Critical Depth = 6.95(In.)
 Pipe flow velocity = 3.75(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 12.99 min.

 Process from Point/Station 1304.100 to Point/Station 1304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.774
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 12.99 min.
 Rainfall intensity = 1.142(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.043(CFS) for 1.180(Ac.)
 Total runoff = 3.386(CFS) Total area = 3.700(Ac.)

 Process from Point/Station 1304.000 to Point/Station 1305.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Post Development – 2 year Basin 3 Reach 5

Page 2 of 3

```

Upstream point/station elevation = 1426.490(Ft.)
Downstream point/station elevation = 1424.150(Ft.)
Pipe length = 92.26(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.386(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 3.386(CFS)
Normal flow depth in pipe = 5.49(In.)
Flow top width inside pipe = 16.57(In.)
Critical Depth = 8.42(In.)
Pipe flow velocity = 7.41(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 13.20 min.

+++++
Process from Point/Station 1305.000 to Point/Station 1306.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.130(Ft.), Average velocity = 5.192(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              3.00
      2              0.00              0.00
      3              5.00              0.00
      4              5.00              3.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 3.386(CFS)
      '      '      flow top width = 5.000(Ft.)
      '      '      velocity= 5.192(Ft/s)
      '      '      area = 0.652(Sq.Ft)
      '      '      Froude number = 2.534

Upstream point elevation = 1424.150(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 18.000(Ft.)
Travel time = 0.06 min.
Time of concentration = 13.26 min.
Depth of flow = 0.130(Ft.)
Average velocity = 5.192(Ft/s)
Total irregular channel flow = 3.386(CFS)
Irregular channel normal depth above invert elev. = 0.130(Ft.)
Average velocity of channel(s) = 5.192(Ft/s)
End of computations, total study area = 3.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/26/19 File:14047POSTB3R62.out
-----
14047 POST 2
Basin 3 Reach 6
14047POSTB3R62.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.200(In.)

Storm event year = 2.0
Calculated rainfall intensity data:
1 hour intensity = 0.500(In/Hr)
Slope of intensity duration curve = 0.5400

*****
Process from Point/Station 1401.000 to Point/Station 1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 1.406(In/Hr) for a 2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.601(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 1402.000 to Point/Station 1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.000(Ft.)
```

Post Development – 2 year Basin 3 - Reach 6

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Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.499(CFS)
 Depth of flow = 0.173(Ft.), Average velocity = 1.543(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.991(Ft.)
 Flow velocity = 1.54(Ft/s)
 Travel time = 9.60 min. TC = 18.45 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.865
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 0.945(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.734(CFS) for 2.120(Ac.)
 Total runoff = 2.335(CFS) Total area = 2.610(Ac.)
 Street flow at end of street = 2.335(CFS)
 Half street flow at end of street = 2.335(CFS)
 Depth of flow = 0.208(Ft.), Average velocity = 1.727(Ft/s)
 Flow width (from curb towards crown)= 11.743(Ft.)

 Process from Point/Station 1501.100 to Point/Station 1501.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.865
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 18.45 min.
 Rainfall intensity = 0.945(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.082(CFS) for 0.100(Ac.)
 Total runoff = 2.417(CFS) Total area = 2.710(Ac.)

 Process from Point/Station 1501.000 to Point/Station 1502.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
 Downstream point/station elevation = 1431.710(Ft.)
 Pipe length = 32.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.417(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.417(CFS)
 Normal flow depth in pipe = 3.14(In.)
 Flow top width inside pipe = 16.19(In.)
 Critical Depth = 6.49(In.)
 Pipe flow velocity = 9.97(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 18.50 min.

 Process from Point/Station 1502.000 to Point/Station 1403.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

```

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.417(CFS)
Normal flow depth in pipe = 6.86(In.)
Flow top width inside pipe = 25.20(In.)
Critical Depth = 6.09(In.)
Pipe flow velocity = 2.86(Ft/s)
Travel time through pipe = 1.90 min.
Time of concentration (TC) = 20.40 min.

*****
Process from Point/Station 1403.000 to Point/Station 1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.417(CFS)
Normal flow depth in pipe = 6.88(In.)
Flow top width inside pipe = 25.22(In.)
Critical Depth = 6.09(In.)
Pipe flow velocity = 2.85(Ft/s)
Travel time through pipe = 0.49 min.
Time of concentration (TC) = 20.89 min.

*****
Process from Point/Station 1601.000 to Point/Station 1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 20.89 min.
Rainfall intensity = 0.884(In/Hr) for a 2.0 year storm
Subarea runoff = 0.069(CFS) for 0.090(Ac.)
Total runoff = 2.486(CFS) Total area = 2.800(Ac.)

*****
Process from Point/Station 1404.000 to Point/Station 1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.486(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.486(CFS)
Normal flow depth in pipe = 7.45(In.)
Flow top width inside pipe = 25.92(In.)
Critical Depth = 6.16(In.)
Pipe flow velocity = 2.62(Ft/s)
Travel time through pipe = 1.87 min.
Time of concentration (TC) = 22.76 min.

*****
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000

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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 22.76 min.
Rainfall intensity = 0.844(In/Hr) for a 2.0 year storm
Subarea runoff = 0.932(CFS) for 1.280(Ac.)
Total runoff = 3.417(CFS) Total area = 4.080(Ac.)

*****
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 3.417(CFS)
Normal flow depth in pipe = 8.78(In.)
Flow top width inside pipe = 27.30(In.)
Critical Depth = 7.27(In.)
Pipe flow velocity = 2.86(Ft/s)
Travel time through pipe = 5.33 min.
Time of concentration (TC) = 28.09 min.

*****
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.09 min.
Rainfall intensity = 0.753(In/Hr) for a 2.0 year storm
Subarea runoff = 0.700(CFS) for 1.080(Ac.)
Total runoff = 4.117(CFS) Total area = 5.160(Ac.)

*****
Process from Point/Station 1701.100 to Point/Station 1701.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.09 min.
Rainfall intensity = 0.753(In/Hr) for a 2.0 year storm
Subarea runoff = 0.292(CFS) for 0.450(Ac.)
Total runoff = 4.409(CFS) Total area = 5.610(Ac.)

*****
Process from Point/Station 1701.000 to Point/Station 1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.098(Ft.), Average velocity = 2.866(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00

```

2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.409(CFS)
 ' ' flow top width = 15.750(Ft.)
 ' ' velocity = 2.866(Ft/s)
 ' ' area = 1.539(Sq.Ft)
 ' ' Froude number = 1.616

Upstream point elevation = 1427.200(Ft.)
 Downstream point elevation = 1426.490(Ft.)
 Flow length = 50.000(Ft.)
 Travel time = 0.29 min.
 Time of concentration = 28.38 min.
 Depth of flow = 0.098(Ft.)
 Average velocity = 2.866(Ft/s)
 Total irregular channel flow = 4.409(CFS)
 Irregular channel normal depth above invert elev. = 0.098(Ft.)
 Average velocity of channel(s) = 2.866(Ft/s)

 Process from Point/Station 1406.000 to Point/Station 1407.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.209(Ft.), Average velocity = 1.431(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 4.00
 2 0.00 0.00
 3 14.75 0.00
 4 15.75 4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.409(CFS)
 ' ' flow top width = 14.802(Ft.)
 ' ' velocity = 1.431(Ft/s)
 ' ' area = 3.081(Sq.Ft)
 ' ' Froude number = 0.553

Upstream point elevation = 1426.490(Ft.)
 Downstream point elevation = 1426.020(Ft.)
 Flow length = 358.000(Ft.)
 Travel time = 4.17 min.
 Time of concentration = 32.55 min.
 Depth of flow = 0.209(Ft.)
 Average velocity = 1.431(Ft/s)
 Total irregular channel flow = 4.409(CFS)
 Irregular channel normal depth above invert elev. = 0.209(Ft.)
 Average velocity of channel(s) = 1.431(Ft/s)

 Process from Point/Station 1407.100 to Point/Station 1407.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.858
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 32.55 min.
 Rainfall intensity = 0.696(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.740(CFS) for 1.240(Ac.)
 Total runoff = 5.149(CFS) Total area = 6.850(Ac.)

Post Development – 2 year Basin 3 - Reach 6

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+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 5.149(CFS)
'      '      flow top width = 15.750(Ft.)
'      '      velocity= 1.526(Ft/s)
'      '      area = 3.374(Sq.Ft)
'      '      Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 38.53 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 5.149(CFS)
'      '      flow top width = 15.750(Ft.)
'      '      velocity= 1.526(Ft/s)
'      '      area = 3.374(Sq.Ft)
'      '      Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 44.52 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

Post Development – 2 year Basin 3 - Reach 6

Page 6 of 8

```

Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 5.149(CFS)
      '      flow top width = 15.750(Ft.)
      '      velocity= 1.526(Ft/s)
      '      area = 3.374(Sq.Ft)
      '      Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 50.50 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 50.50 min.
Rainfall intensity = 0.549(In/Hr) for a 2.0 year storm
Subarea runoff = 0.740(CFS) for 1.580(Ac.)
Total runoff = 5.889(CFS) Total area = 8.430(Ac.)

+++++
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.178(Ft.), Average velocity = 2.102(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 5.889(CFS)
      '      flow top width = 15.750(Ft.)
      '      velocity= 2.102(Ft/s)
      '      area = 2.802(Sq.Ft)
      '      Froude number = 0.878

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 5.19 min.

```

Time of concentration = 55.70 min.
Depth of flow = 0.178(Ft.)
Average velocity = 2.102(Ft/s)
Total irregular channel flow = 5.889(CFS)
Irregular channel normal depth above invert elev. = 0.178(Ft.)
Average velocity of channel(s) = 2.102(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 69.0

Attachment E3
Post Development Onsite
10 Year

Post Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST10b1.out
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14047 POC 1
basin1-pocl
14047POST10b1.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012

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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 3.230(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.544(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100
+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1436.800(Ft.)
End of street segment elevation = 1433.900(Ft.)
```

Post Development – Onsite – 10 year – Basin 1

Page 1 of 2

Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.437(CFS)
 Depth of flow = 0.261(Ft.), Average velocity = 1.670(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.804(Ft.)
 Flow velocity = 1.67(Ft/s)
 Travel time = 4.40 min. TC = 9.45 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.882
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.317(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.695(CFS) for 0.830(Ac.)
 Total runoff = 2.239(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 2.239(CFS)
 Half street flow at end of street = 2.239(CFS)
 Depth of flow = 0.297(Ft.), Average velocity = 1.854(Ft/s)
 Flow width (from curb towards crown) = 10.597(Ft.)

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.239(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.239(CFS)
 Normal flow depth in pipe = 5.53(In.)
 Flow top width inside pipe = 16.60(In.)
 Critical Depth = 6.78(In.)
 Pipe flow velocity = 4.87(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 9.57 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/26/19 File:14047POST10b2.out
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14047 POST 2
BASIN 2 -poc 2
14047POST10b2.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

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Program License Serial Number 4012

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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)
Top (of initial area) elevation = 1434.700(Ft.)
Bottom (of initial area) elevation = 1433.990(Ft.)
Difference in elevation = 0.710(Ft.)
Slope = 0.00317 s(percent)= 0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.261 min.
Rainfall intensity = 2.488(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.373(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)
End of street segment elevation = 1432.770(Ft.)
Length of street segment = 241.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
```

Post Development – Onsite – 10 year – Basin 2

Page 1 of 2

Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.626(CFS)
 Depth of flow = 0.214(Ft.), Average velocity = 1.254(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.436(Ft.)
 Flow velocity = 1.25(Ft/s)
 Travel time = 3.20 min. TC = 11.46 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.880
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.092(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.423(CFS) for 0.230(Ac.)
 Total runoff = 0.797(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 0.797(CFS)
 Half street flow at end of street = 0.797(CFS)
 Depth of flow = 0.229(Ft.), Average velocity = 1.321(Ft/s)
 Flow width (from curb towards crown)= 7.197(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.880
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.46 min.
 Rainfall intensity = 2.092(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.037(CFS) for 0.020(Ac.)
 Total runoff = 0.833(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.833(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.833(CFS)
 Normal flow depth in pipe = 2.14(In.)
 Flow top width inside pipe = 11.65(In.)
 Critical Depth = 4.06(In.)
 Pipe flow velocity = 7.05(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 11.60 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST10b3r1.out
-----
14047 POST 3
basin3-poc3
14047POST10b3r1.rrv
14047POST2b3r1.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 301.000 to Point/Station 302.000
*** INITIAL AREA EVALUATION ***

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1436.730(Ft.)
Bottom (of initial area) elevation = 1434.100(Ft.)
Difference in elevation = 2.630(Ft.)
Slope = 0.00774 s(percent)= 0.77
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.616 min.
Rainfall intensity = 2.179(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.364(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station 302.000 to Point/Station 303.000
*** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***

Top of street segment elevation = 1434.100(Ft.)
End of street segment elevation = 1432.100(Ft.)
Length of street segment = 583.000(Ft.)
```

14047 POST 10
BASIN 3-Reach 1
Page 1 of 18

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.326(CFS)
 Depth of flow = 0.265(Ft.), Average velocity = 1.577(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.615(Ft.)
 Flow velocity = 1.58(Ft/s)
 Travel time = 6.16 min. TC = 16.78 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.709(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.842(CFS) for 2.870(Ac.)
 Total runoff = 5.207(CFS) Total area = 3.650(Ac.)
 Street flow at end of street = 5.207(CFS)
 Half street flow at end of street = 5.207(CFS)
 Depth of flow = 0.318(Ft.), Average velocity = 1.765(Ft/s)
 Flow width (from curb towards crown)= 17.252(Ft.)

 Process from Point/Station 303.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.440(Ft.)
 Downstream point/station elevation = 1427.370(Ft.)
 Pipe length = 36.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.207(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 5.207(CFS)
 Normal flow depth in pipe = 12.36(In.)
 Flow top width inside pipe = 23.99(In.)
 Critical Depth = 9.66(In.)
 Pipe flow velocity = 3.19(Ft/s)
 Travel time through pipe = 0.19 min.
 Time of concentration (TC) = 16.97 min.

 Process from Point/Station 304.100 to Point/Station 304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.97 min.
 Rainfall intensity = 1.699(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.399(CFS) for 0.300(Ac.)
 Total runoff = 5.606(CFS) Total area = 3.950(Ac.)

```

Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.270(Ft.)
Downstream point/station elevation = 1426.990(Ft.)
Pipe length = 139.32(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.606(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.606(CFS)
Normal flow depth in pipe = 12.74(In.)
Flow top width inside pipe = 23.95(In.)
Critical Depth = 10.03(In.)
Pipe flow velocity = 3.31(Ft/s)
Travel time through pipe = 0.70 min.
Time of concentration (TC) = 17.67 min.

+-----+
Process from Point/Station      305.100 to Point/Station      305.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.781
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 17.67 min.
Rainfall intensity = 1.663(In/Hr) for a 10.0 year storm
Subarea runoff = 2.584(CFS) for 1.990(Ac.)
Total runoff = 8.190(CFS) Total area = 5.940(Ac.)

+-----+
Process from Point/Station      305.200 to Point/Station      305.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.781
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 17.67 min.
Rainfall intensity = 1.663(In/Hr) for a 10.0 year storm
Subarea runoff = 2.454(CFS) for 1.890(Ac.)
Total runoff = 10.644(CFS) Total area = 7.830(Ac.)

+-----+
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.890(Ft.)
Downstream point/station elevation = 1425.940(Ft.)
Pipe length = 475.31(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 10.644(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 10.644(CFS)
Normal flow depth in pipe = 16.41(In.)
Flow top width inside pipe = 29.87(In.)
Critical Depth = 13.10(In.)
Pipe flow velocity = 3.87(Ft/s)
Travel time through pipe = 2.04 min.
Time of concentration (TC) = 19.71 min.

+-----+
Process from Point/Station      306.100 to Point/Station      306.100
**** SUBAREA FLOW ADDITION ****

```

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.776
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.71 min.
 Rainfall intensity = 1.569(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.021(CFS) for 1.660(Ac.)
 Total runoff = 12.665(CFS) Total area = 9.490(Ac.)

 Process from Point/Station 306.200 to Point/Station 306.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.776
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.71 min.
 Rainfall intensity = 1.569(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.668(CFS) for 1.370(Ac.)
 Total runoff = 14.333(CFS) Total area = 10.860(Ac.)

 Process from Point/Station 306.000 to Point/Station 307.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.840(Ft.)
 Downstream point/station elevation = 1425.650(Ft.)
 Pipe length = 92.15(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 14.333(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 14.333(CFS)
 Normal flow depth in pipe = 19.73(In.)
 Flow top width inside pipe = 28.47(In.)
 Critical Depth = 15.30(In.)
 Pipe flow velocity = 4.18(Ft/s)
 Travel time through pipe = 0.37 min.
 Time of concentration (TC) = 20.08 min.

 Process from Point/Station 307.100 to Point/Station 307.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 20.08 min.
 Rainfall intensity = 1.554(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.229(CFS) for 0.190(Ac.)
 Total runoff = 14.562(CFS) Total area = 11.050(Ac.)

 Process from Point/Station 307.000 to Point/Station 308.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.550(Ft.)
 Downstream point/station elevation = 1425.140(Ft.)
 Pipe length = 205.46(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 14.562(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 14.562(CFS)
 Normal flow depth in pipe = 17.77(In.)
 Flow top width inside pipe = 36.00(In.)
 Critical Depth = 14.60(In.)
 Pipe flow velocity = 4.19(Ft/s)
 Travel time through pipe = 0.82 min.
 Time of concentration (TC) = 20.90 min.

 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 11.050(Ac.)
 Runoff from this stream = 14.562(CFS)
 Time of concentration = 20.90 min.
 Rainfall intensity = 1.522(In/Hr)

 Process from Point/Station 401.000 to Point/Station 402.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 306.000(Ft.)
 Top (of initial area) elevation = 1433.390(Ft.)
 Bottom (of initial area) elevation = 1431.700(Ft.)
 Difference in elevation = 1.690(Ft.)
 Slope = 0.00552 s(percent) = 0.55
 $TC = k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.887 min.
 Rainfall intensity = 2.150(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.802
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.276(CFS)
 Total initial stream area = 0.160(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 402.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.700(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 740.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.621(CFS)
 Depth of flow = 0.130(Ft.), Average velocity = 1.050(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.863(Ft.)
 Flow velocity = 1.05(Ft/s)
 Travel time = 11.74 min. TC = 22.63 min.
 Adding area flow to street

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.769
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.459(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.606(CFS) for 0.540(Ac.)
 Total runoff = 0.882(CFS) Total area = 0.700(Ac.)
 Street flow at end of street = 0.882(CFS)
 Half street flow at end of street = 0.882(CFS)
 Depth of flow = 0.151(Ft.), Average velocity = 1.149(Ft/s)
 Flow width (from curb towards crown)= 8.911(Ft.)

++++++
 Process from Point/Station 308.100 to Point/Station 308.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.769
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 22.63 min.
 Rainfall intensity = 1.459(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.369(CFS) for 1.220(Ac.)
 Total runoff = 2.250(CFS) Total area = 1.920(Ac.)

++++++
 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.920(Ac.)
 Runoff from this stream = 2.250(CFS)
 Time of concentration = 22.63 min.
 Rainfall intensity = 1.459(In/Hr)

++++++
 Process from Point/Station 501.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 312.000(Ft.)
 Top (of initial area) elevation = 1432.920(Ft.)
 Bottom (of initial area) elevation = 1431.000(Ft.)
 Difference in elevation = 1.920(Ft.)
 Slope = 0.00615 s(percent)= 0.62
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.737 min.
 Rainfall intensity = 2.166(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.802
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.400(CFS)
 Total initial stream area = 0.230(Ac.)
 Pervious area fraction = 0.500

++++++
 Process from Point/Station 502.100 to Point/Station 502.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.802
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 10.74 min.
 Rainfall intensity = 2.166(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.730(CFS) for 0.420(Ac.)
 Total runoff = 1.130(CFS) Total area = 0.650(Ac.)

++++++
 Process from Point/Station 502.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.000(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 474.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 14.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.454(CFS)
 Depth of flow = 0.181(Ft.), Average velocity = 1.377(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.408(Ft.)
 Flow velocity = 1.38(Ft/s)
 Travel time = 5.74 min. TC = 16.47 min.
 Adding area flow to street

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.784
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.726(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.568(CFS) for 0.420(Ac.)
 Total runoff = 1.698(CFS) Total area = 1.070(Ac.)
 Street flow at end of street = 1.698(CFS)
 Half street flow at end of street = 1.698(CFS)
 Depth of flow = 0.193(Ft.), Average velocity = 1.432(Ft/s)
 Flow width (from curb towards crown)= 11.012(Ft.)

++++++
 Process from Point/Station 308.200 to Point/Station 308.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.784
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.47 min.
 Rainfall intensity = 1.726(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.461(CFS) for 1.080(Ac.)

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Total runoff =      3.159(CFS)      Total area =      2.150(Ac.)

+*****+
Process from Point/Station      308.000 to Point/Station      308.000
**** CONFLUENCE OF MINOR STREAMS ****
+*****+

Along Main Stream number: 1 in normal stream number 3
Stream flow area =      2.150(Ac.)
Runoff from this stream =      3.159(CFS)
Time of concentration =      16.47 min.
Rainfall intensity =      1.726(In/Hr)
Summary of stream data:

Stream   Flow rate      TC      Rainfall Intensity
No.      (CFS)      (min)      (In/Hr)

1         14.562      20.90      1.522
2          2.250      22.63      1.459
3          3.159      16.47      1.726
Largest stream flow has longer or shorter time of concentration
Qp =      14.562 + sum of
          Qa      Tb/Ta
          2.250 *      0.924 =      2.078
          Qb      Ia/Ib
          3.159 *      0.882 =      2.785
Qp =      19.425

Total of 3 streams to confluence:
Flow rates before confluence point:
      14.562      2.250      3.159
Area of streams before confluence:
      11.050      1.920      2.150
Results of confluence:
Total flow rate =      19.425(CFS)
Time of concentration =      20.898 min.
Effective stream area after confluence =      15.120(Ac.)

+*****+
Process from Point/Station      308.000 to Point/Station      309.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+*****+

Depth of flow =      1.309(Ft.), Average velocity =      3.711(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                 0.00                 2.20
2                 0.00                 0.00
3                 4.00                 0.00
4                 4.00                 2.20
Manning's 'N' friction factor =      0.015
-----
Sub-Channel flow =      19.425(CFS)
'      '      flow top width =      4.000(Ft.)
'      '      velocity=      3.711(Ft/s)
'      '      area =      5.235(Sq.Ft)
'      '      Froude number =      0.572

Upstream point elevation =      1425.040(Ft.)
Downstream point elevation =      1424.970(Ft.)
Flow length =      36.500(Ft.)
Travel time =      0.16 min.
Time of concentration =      21.06 min.
Depth of flow =      1.309(Ft.)
Average velocity =      3.711(Ft/s)
Total irregular channel flow =      19.425(CFS)
Irregular channel normal depth above invert elev. =      1.309(Ft.)
Average velocity of channel(s) =      3.711(Ft/s)

+*****+

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Process from Point/Station      309.100 to Point/Station      309.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.06 min.
Rainfall intensity = 1.515(In/Hr) for a 10.0 year storm
Subarea runoff = 1.533(CFS) for 1.310(Ac.)
Total runoff = 20.958(CFS) Total area = 16.430(Ac.)

+*****+
Process from Point/Station      309.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.430(Ac.)
Runoff from this stream = 20.958(CFS)
Time of concentration = 21.06 min.
Rainfall intensity = 1.515(In/Hr)

+*****+
Process from Point/Station      601.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 311.000(Ft.)
Top (of initial area) elevation = 1434.050(Ft.)
Bottom (of initial area) elevation = 1432.280(Ft.)
Difference in elevation = 1.770(Ft.)
Slope = 0.00569 s(percent)= 0.57
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.892 min.
Rainfall intensity = 2.149(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.293(CFS)
Total initial stream area = 0.750(Ac.)
Pervious area fraction = 0.500

+*****+
Process from Point/Station      602.000 to Point/Station      603.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
End of street segment elevation = 1429.500(Ft.)
Length of street segment = 798.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 2.597(CFS)

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Depth of flow = 0.239(Ft.), Average velocity = 1.490(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.303(Ft.)
 Flow velocity = 1.49(Ft/s)
 Travel time = 8.92 min. TC = 19.82 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.565(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.536(CFS) for 2.090(Ac.)
 Total runoff = 3.829(CFS) Total area = 2.840(Ac.)
 Street flow at end of street = 3.829(CFS)
 Half street flow at end of street = 3.829(CFS)
 Depth of flow = 0.280(Ft.), Average velocity = 1.643(Ft/s)
 Flow width (from curb towards crown)= 15.352(Ft.)

++++++
 Process from Point/Station 603.100 to Point/Station 603.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.775
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.82 min.
 Rainfall intensity = 1.565(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.463(CFS) for 2.030(Ac.)
 Total runoff = 6.292(CFS) Total area = 4.870(Ac.)

++++++
 Process from Point/Station 603.000 to Point/Station 309.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1429.500(Ft.)
 End of street segment elevation = 1429.000(Ft.)
 Length of street segment = 101.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 6.331(CFS)
 Depth of flow = 0.320(Ft.), Average velocity = 2.127(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.330(Ft.)
 Flow velocity = 2.13(Ft/s)
 Travel time = 0.79 min. TC = 20.61 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.774
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000

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Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 1.533(In/Hr) for a 10.0 year storm
Subarea runoff = 0.071(CFS) for 0.060(Ac.)
Total runoff = 6.363(CFS) Total area = 4.930(Ac.)
Street flow at end of street = 6.363(CFS)
Half street flow at end of street = 6.363(CFS)
Depth of flow = 0.320(Ft.), Average velocity = 2.130(Ft/s)
Flow width (from curb towards crown)= 17.362(Ft.)

*****
Process from Point/Station 309.000 to Point/Station 309.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 4.930(Ac.)
Runoff from this stream = 6.363(CFS)
Time of concentration = 20.61 min.
Rainfall intensity = 1.533(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 20.958 21.06 1.515
2 6.363 20.61 1.533
Largest stream flow has longer time of concentration
Qp = 20.958 + sum of
Qb Ia/Ib
6.363 * 0.989 = 6.290
Qp = 27.249

Total of 2 streams to confluence:
Flow rates before confluence point:
20.958 6.363
Area of streams before confluence:
16.430 4.930
Results of confluence:
Total flow rate = 27.249(CFS)
Time of concentration = 21.062 min.
Effective stream area after confluence = 21.360(Ac.)

*****
Process from Point/Station 309.000 to Point/Station 310.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Depth of flow = 1.464(Ft.), Average velocity = 4.652(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.013
-----

Sub-Channel flow = 27.249(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity= 4.652(Ft/s)
' ' area = 5.857(Sq.Ft)
' ' Froude number = 0.678

Upstream point elevation = 1424.870(Ft.)
Downstream point elevation = 1424.850(Ft.)
Flow length = 9.650(Ft.)
Travel time = 0.03 min.
Time of concentration = 21.10 min.
Depth of flow = 1.464(Ft.)

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Average velocity = 4.652(Ft/s)
Total irregular channel flow = 27.249(CFS)
Irregular channel normal depth above invert elev. = 1.464(Ft.)
Average velocity of channel(s) = 4.652(Ft/s)

+-----+
Process from Point/Station 310.000 to Point/Station 311.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+

Depth of flow = 0.425(Ft.), Average velocity = 6.107(Ft/s)
***** Irregular Channel Data *****
+-----+
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.00
2 0.00 0.00
3 10.50 0.00
4 10.50 2.00
Manning's 'N' friction factor = 0.017
+-----+
Sub-Channel flow = 27.249(CFS)
' ' flow top width = 10.500(Ft.)
' ' velocity = 6.107(Ft/s)
' ' area = 4.462(Sq.Ft)
' ' Froude number = 1.651

Upstream point elevation = 1424.850(Ft.)
Downstream point elevation = 1423.850(Ft.)
Flow length = 59.000(Ft.)
Travel time = 0.16 min.
Time of concentration = 21.26 min.
Depth of flow = 0.425(Ft.)
Average velocity = 6.107(Ft/s)
Total irregular channel flow = 27.249(CFS)
Irregular channel normal depth above invert elev. = 0.425(Ft.)
Average velocity of channel(s) = 6.107(Ft/s)

+-----+
Process from Point/Station 311.000 to Point/Station 312.000
**** SUBAREA FLOW ADDITION ****
+-----+
USER INPUT of soil data for subarea
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 21.26 min.
Rainfall intensity = 1.508(In/Hr) for a 10.0 year storm
Subarea runoff = 1.360(CFS) for 1.020(Ac.)
Total runoff = 28.608(CFS) Total area = 22.380(Ac.)

+-----+
Process from Point/Station 312.000 to Point/Station 313.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+

Depth of flow = 1.162(Ft.), Average velocity = 6.155(Ft/s)
***** Irregular Channel Data *****
+-----+
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 0.00 0.00
3 4.00 0.00
4 4.00 5.00
Manning's 'N' friction factor = 0.013
+-----+
Sub-Channel flow = 28.608(CFS)
' ' flow top width = 4.000(Ft.)

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'      '      velocity=      6.155(Ft/s)
'      '      area =      4.648(Sq.Ft)
'      '      Froude number =      1.006

Upstream point elevation = 1423.850(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 114.400(Ft.)
Travel time = 0.31 min.
Time of concentration = 21.57 min.
Depth of flow = 1.162(Ft.)
Average velocity = 6.155(Ft/s)
Total irregular channel flow = 28.608(CFS)
Irregular channel normal depth above invert elev. = 1.162(Ft.)
Average velocity of channel(s) = 6.155(Ft/s)

+++++
Process from Point/Station      313.000 to Point/Station      314.000
**** SUBAREA FLOW ADDITION ****

USER INPUT of soil data for subarea
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 21.57 min.
Rainfall intensity = 1.496(In/Hr) for a 10.0 year storm
Subarea runoff = 10.753(CFS) for 8.130(Ac.)
Total runoff = 39.361(CFS)      Total area = 30.510(Ac.)

+++++
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 30.510(Ac.)
Runoff from this stream = 39.361(CFS)
Time of concentration = 21.57 min.
Rainfall intensity = 1.496(In/Hr)

+++++
Process from Point/Station      711.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.589(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 19.26 min. Rain intensity = 1.59(In/Hr)
Total area = 21.08(Ac.) Total runoff = 28.20(CFS)

+++++
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.080(Ac.)
Runoff from this stream = 28.197(CFS)
Time of concentration = 19.26 min.
Rainfall intensity = 1.589(In/Hr)

+++++

```

```

Process from Point/Station      1107.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      1.638(In/Hr) for a      10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.780
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 18.18 min. Rain intensity =      1.64(In/Hr)
Total area =      6.10(Ac.) Total runoff =      8.42(CFS)

+*****+
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =      6.100(Ac.)
Runoff from this stream =      8.416(CFS)
Time of concentration = 18.18 min.
Rainfall intensity =      1.638(In/Hr)

+*****+
Process from Point/Station      1205.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      1.629(In/Hr) for a      10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.779
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 18.38 min. Rain intensity =      1.63(In/Hr)
Total area =      7.32(Ac.) Total runoff =      9.87(CFS)

+*****+
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area =      7.320(Ac.)
Runoff from this stream =      9.869(CFS)
Time of concentration = 18.38 min.
Rainfall intensity =      1.629(In/Hr)

+*****+
Process from Point/Station      1306.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      1.985(In/Hr) for a      10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.796
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 12.65 min. Rain intensity =      1.99(In/Hr)
Total area =      3.70(Ac.) Total runoff =      6.24(CFS)

+*****+

```

Process from Point/Station 314.000 to Point/Station 314.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 5
 Stream flow area = 3.700(Ac.)
 Runoff from this stream = 6.244(CFS)
 Time of concentration = 12.65 min.
 Rainfall intensity = 1.985(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	39.361	21.57	1.496
2	28.197	19.26	1.589
3	8.416	18.18	1.638
4	9.869	18.38	1.629
5	6.244	12.65	1.985

Largest stream flow has longer time of concentration

Qp = 39.361 + sum of
 Qb Ia/Ib
 28.197 * 0.942 = 26.556
 Qb Ia/Ib
 8.416 * 0.913 = 7.687
 Qb Ia/Ib
 9.869 * 0.919 = 9.067
 Qb Ia/Ib
 6.244 * 0.754 = 4.706
 Qp = 87.378

Total of 5 streams to confluence:

Flow rates before confluence point:
 39.361 28.197 8.416 9.869 6.244

Area of streams before confluence:
 30.510 21.080 6.100 7.320 3.700

Results of confluence:

Total flow rate = 87.378(CFS)
 Time of concentration = 21.567 min.
 Effective stream area after confluence = 68.710(Ac.)

 Process from Point/Station 314.000 to Point/Station 315.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.131(Ft.), Average velocity = 5.126(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	6.00
2	0.00	0.00
3	8.00	0.00
4	8.00	6.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 87.378(CFS)
 ' ' flow top width = 8.000(Ft.)
 ' ' velocity = 5.126(Ft/s)
 ' ' area = 17.046(Sq.Ft)
 ' ' Froude number = 0.619

Upstream point elevation = 1423.350(Ft.)
 Downstream point elevation = 1422.950(Ft.)
 Flow length = 231.800(Ft.)
 Travel time = 0.75 min.
 Time of concentration = 22.32 min.
 Depth of flow = 2.131(Ft.)
 Average velocity = 5.126(Ft/s)
 Total irregular channel flow = 87.378(CFS)
 Irregular channel normal depth above invert elev. = 2.131(Ft.)

Average velocity of channel(s) = 5.126(Ft/s)

Process from Point/Station 315.100 to Point/Station 315.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr) for a 10.0 year storm
Subarea runoff = 0.210(CFS) for 0.180(Ac.)
Total runoff = 87.588(CFS) Total area = 68.890(Ac.)

Process from Point/Station 315.200 to Point/Station 315.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr) for a 10.0 year storm
Subarea runoff = 2.069(CFS) for 1.770(Ac.)
Total runoff = 89.657(CFS) Total area = 70.660(Ac.)

Process from Point/Station 315.300 to Point/Station 315.300
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr) for a 10.0 year storm
Subarea runoff = 0.210(CFS) for 0.180(Ac.)
Total runoff = 89.867(CFS) Total area = 70.840(Ac.)

Process from Point/Station 315.400 to Point/Station 315.400
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr) for a 10.0 year storm
Subarea runoff = 0.117(CFS) for 0.100(Ac.)
Total runoff = 89.984(CFS) Total area = 70.940(Ac.)

```

Process from Point/Station      315.500 to Point/Station      315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.795
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr) for a 10.0 year storm
Subarea runoff = 0.631(CFS) for 0.540(Ac.)
Total runoff = 90.615(CFS) Total area = 71.480(Ac.)

++++
Process from Point/Station      315.000 to Point/Station      315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 90.615(CFS)
Time of concentration = 22.32 min.
Rainfall intensity = 1.469(In/Hr)
Summary of stream data:

Stream   Flow rate   TC           Rainfall Intensity
No.      (CFS)         (min)        (In/Hr)

1        90.615       22.32        1.469
Largest stream flow has longer time of concentration
Qp = 90.615 + sum of
Qp = 90.615

Total of 1 main streams to confluence:
Flow rates before confluence point:
90.615
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 90.615(CFS)
Time of concentration = 22.321 min.
Effective stream area after confluence = 71.480(Ac.)

++++
Process from Point/Station      1409.000 to Point/Station      315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 0.989(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 47.14 min. Rain intensity = 0.99(In/Hr)
Total area = 8.43(Ac.) Total runoff = 10.80(CFS)

++++
Process from Point/Station      315.000 to Point/Station      315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

```

In Main Stream number: 2
 Stream flow area = 8.430(Ac.)
 Runoff from this stream = 10.799(CFS)
 Time of concentration = 47.14 min.
 Rainfall intensity = 0.989(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	90.615	22.32	1.469
2	10.799	47.14	0.989

Largest stream flow has longer or shorter time of concentration
 Qp = 90.615 + sum of
 Qa Tb/Ta
 10.799 * 0.474 = 5.113
 Qp = 95.729

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 90.615 10.799
 Area of streams before confluence:
 71.480 8.430

Results of confluence:
 Total flow rate = 95.729(CFS)
 Time of concentration = 22.321 min.
 Effective stream area after confluence = 79.910(Ac.)
 End of computations, total study area = 79.91 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.515
 Area averaged RI index number = 72.5

Post Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R210.out
-----
14047 POST 3
Basin 3 Reach 2
14047POSTB3R210.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 701.000 to Point/Station 702.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 329.000(Ft.)
Top (of initial area) elevation = 1435.900(Ft.)
Bottom (of initial area) elevation = 1433.950(Ft.)
Difference in elevation = 1.950(Ft.)
Slope = 0.00593 s(percent)= 0.59
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.050 min.
Rainfall intensity = 2.133(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.801
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.572(CFS)
Total initial stream area = 0.920(Ac.)
Pervious area fraction = 0.500
*****
Process from Point/Station 702.000 to Point/Station 703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.950(Ft.)
End of street segment elevation = 1431.540(Ft.)
Length of street segment = 477.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
```

Post Development – 10 year - Basin 3 - Reach 2

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Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.269(CFS)
 Depth of flow = 0.209(Ft.), Average velocity = 1.655(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.824(Ft.)
 Flow velocity = 1.65(Ft/s)
 Travel time = 4.80 min. TC = 15.85 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.786
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.761(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.315(CFS) for 0.950(Ac.)
 Total runoff = 2.887(CFS) Total area = 1.870(Ac.)
 Street flow at end of street = 2.887(CFS)
 Half street flow at end of street = 2.887(CFS)
 Depth of flow = 0.231(Ft.), Average velocity = 1.759(Ft/s)
 Flow width (from curb towards crown)= 12.918(Ft.)
 ++++++
 Process from Point/Station 703.100 to Point/Station 703.100
 **** SUBAREA FLOW ADDITION ****

 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.786
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 15.85 min.
 Rainfall intensity = 1.761(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.374(CFS) for 0.270(Ac.)
 Total runoff = 3.261(CFS) Total area = 2.140(Ac.)
 ++++++
 Process from Point/Station 703.000 to Point/Station 704.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

 Upstream point/station elevation = 1427.610(Ft.)
 Downstream point/station elevation = 1427.450(Ft.)
 Pipe length = 80.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.261(CFS)
 Normal flow depth in pipe = 11.04(In.)
 Flow top width inside pipe = 17.53(In.)
 Critical Depth = 8.25(In.)
 Pipe flow velocity = 2.87(Ft/s)
 Travel time through pipe = 0.46 min.
 Time of concentration (TC) = 16.32 min.
 ++++++
 Process from Point/Station 704.000 to Point/Station 704.000
 **** CONFLUENCE OF MINOR STREAMS ****

Post Development – 10 year - Basin 3 - Reach 2

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Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 2.140(Ac.)
 Runoff from this stream = 3.261(CFS)
 Time of concentration = 16.32 min.
 Rainfall intensity = 1.735(In/Hr)

 Process from Point/Station 901.000 to Point/Station 902.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 211.000(Ft.)
 Top (of initial area) elevation = 1438.790(Ft.)
 Bottom (of initial area) elevation = 1433.300(Ft.)
 Difference in elevation = 5.490(Ft.)
 Slope = 0.02602 s(percent)= 2.60
 $TC = k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$
 Initial area time of concentration = 6.882 min.
 Rainfall intensity = 2.741(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.819
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.943(CFS)
 Total initial stream area = 0.420(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 902.000 to Point/Station 705.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.330(Ft.)
 End of street segment elevation = 1432.180(Ft.)
 Length of street segment = 295.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.004(CFS)
 Depth of flow = 0.210(Ft.), Average velocity = 1.456(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 11.848(Ft.)
 Flow velocity = 1.46(Ft/s)
 Travel time = 3.38 min. TC = 10.26 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.804
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.218(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.052(CFS) for 1.150(Ac.)
 Total runoff = 2.995(CFS) Total area = 1.570(Ac.)
 Street flow at end of street = 2.995(CFS)
 Half street flow at end of street = 2.995(CFS)

Post Development – 10 year - Basin 3 - Reach 2

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Depth of flow = 0.248(Ft.), Average velocity = 1.611(Ft/s)
Flow width (from curb towards crown)= 13.733(Ft.)

Process from Point/Station 705.000 to Point/Station 706.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.690(Ft.)
Downstream point/station elevation = 1427.620(Ft.)
Pipe length = 36.77(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.995(CFS)
Given pipe size = 12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.529(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.260(Ft.)
Minor friction loss = 0.339(Ft.) K-factor = 1.50
Pipe flow velocity = 3.81(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 10.42 min.

Process from Point/Station 706.100 to Point/Station 706.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 10.42 min.
Rainfall intensity = 2.200(In/Hr) for a 10.0 year storm
Subarea runoff = 2.617(CFS) for 1.480(Ac.)
Total runoff = 5.612(CFS) Total area = 3.050(Ac.)

Process from Point/Station 706.000 to Point/Station 704.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.520(Ft.)
Downstream point/station elevation = 1427.450(Ft.)
Pipe length = 31.87(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.612(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.256(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.091(Ft.)
Minor friction loss = 0.235(Ft.) K-factor = 1.50
Pipe flow velocity = 3.18(Ft/s)
Travel time through pipe = 0.17 min.
Time of concentration (TC) = 10.59 min.

Process from Point/Station 704.000 to Point/Station 704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.050(Ac.)
Runoff from this stream = 5.612(CFS)
Time of concentration = 10.59 min.
Rainfall intensity = 2.182(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.261	16.32	1.735

Post Development – 10 year - Basin 3 - Reach 2

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```

2          5.612      10.59          2.182
Largest stream flow has longer or shorter time of concentration
Qp = 5.612 + sum of
      Qa      Tb/Ta
      3.261 * 0.649 = 2.116
Qp = 7.728

Total of 2 streams to confluence:
Flow rates before confluence point:
      3.261      5.612
Area of streams before confluence:
      2.140      3.050
Results of confluence:
Total flow rate = 7.728(CFS)
Time of concentration = 10.588 min.
Effective stream area after confluence = 5.190(Ac.)

+++++
Process from Point/Station 704.000 to Point/Station 707.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.350(Ft.)
Downstream point/station elevation = 1427.120(Ft.)
Pipe length = 114.66(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.728(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 7.728(CFS)
Normal flow depth in pipe = 15.69(In.)
Flow top width inside pipe = 22.84(In.)
Critical Depth = 11.87(In.)
Pipe flow velocity = 3.55(Ft/s)
Travel time through pipe = 0.54 min.
Time of concentration (TC) = 11.13 min.

+++++
Process from Point/Station 707.100 to Point/Station 707.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 11.13 min.
Rainfall intensity = 2.125(In/Hr) for a 10.0 year storm
Subarea runoff = 1.118(CFS) for 0.640(Ac.)
Total runoff = 8.846(CFS) Total area = 5.830(Ac.)

+++++
Process from Point/Station 707.000 to Point/Station 708.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.020(Ft.)
Downstream point/station elevation = 1425.700(Ft.)
Pipe length = 613.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.846(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.846(CFS)
Normal flow depth in pipe = 16.88(In.)
Flow top width inside pipe = 21.93(In.)
Critical Depth = 12.73(In.)
Pipe flow velocity = 3.75(Ft/s)
Travel time through pipe = 2.73 min.
Time of concentration (TC) = 13.85 min.

+++++
Process from Point/Station 708.000 to Point/Station 708.000
**** CONFLUENCE OF MINOR STREAMS ****

```

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 5.830(Ac.)
 Runoff from this stream = 8.846(CFS)
 Time of concentration = 13.85 min.
 Rainfall intensity = 1.892(In/Hr)

 Process from Point/Station 801.000 to Point/Station 802.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 337.000(Ft.)
 Top (of initial area) elevation = 1433.880(Ft.)
 Bottom (of initial area) elevation = 1432.280(Ft.)
 Difference in elevation = 1.600(Ft.)
 Slope = 0.00475 s(percent) = 0.47
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 11.663 min.
 Rainfall intensity = 2.073(In/Hr) for a 10.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.799
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 1.441(CFS)
 Total initial stream area = 0.870(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 802.000 to Point/Station 803.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
 End of street segment elevation = 1429.390(Ft.)
 Length of street segment = 559.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 14.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.695(CFS)
 Depth of flow = 0.224(Ft.), Average velocity = 1.743(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.542(Ft.)
 Flow velocity = 1.74(Ft/s)
 Travel time = 5.34 min. TC = 17.01 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.697(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.430(CFS) for 1.830(Ac.)
 Total runoff = 3.871(CFS) Total area = 2.700(Ac.)

Post Development – 10 year - Basin 3 - Reach 2

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Street flow at end of street = 3.871(CFS)
 Half street flow at end of street = 3.871(CFS)
 Depth of flow = 0.260(Ft.), Average velocity = 1.910(Ft/s)
 Flow width (from curb towards crown)= 14.331(Ft.)

++++++
 Process from Point/Station 803.100 to Point/Station 803.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.01 min.
 Rainfall intensity = 1.697(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.417(CFS) for 1.820(Ac.)
 Total runoff = 6.289(CFS) Total area = 4.520(Ac.)

++++++
 Process from Point/Station 803.000 to Point/Station 804.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.930(Ft.)
 Downstream point/station elevation = 1425.860(Ft.)
 Pipe length = 36.52(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.289(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 6.289(CFS)
 Normal flow depth in pipe = 13.89(In.)
 Flow top width inside pipe = 23.70(In.)
 Critical Depth = 10.65(In.)
 Pipe flow velocity = 3.34(Ft/s)
 Travel time through pipe = 0.18 min.
 Time of concentration (TC) = 17.19 min.

++++++
 Process from Point/Station 804.100 to Point/Station 804.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.782
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.19 min.
 Rainfall intensity = 1.688(In/Hr) for a 10.0 year storm
 Subarea runoff = 4.765(CFS) for 3.610(Ac.)
 Total runoff = 11.053(CFS) Total area = 8.130(Ac.)

++++++
 Process from Point/Station 804.000 to Point/Station 708.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.760(Ft.)
 Downstream point/station elevation = 1425.700(Ft.)
 Pipe length = 29.74(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 11.053(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 11.053(CFS)
 Normal flow depth in pipe = 16.76(In.)
 Flow top width inside pipe = 29.79(In.)
 Critical Depth = 13.36(In.)
 Pipe flow velocity = 3.92(Ft/s)
 Travel time through pipe = 0.13 min.

Post Development – 10 year - Basin 3 - Reach 2

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Time of concentration (TC) = 17.32 min.

Process from Point/Station 708.000 to Point/Station 708.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 8.130(Ac.)
Runoff from this stream = 11.053(CFS)
Time of concentration = 17.32 min.
Rainfall intensity = 1.681(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.846	13.85	1.892
2	11.053	17.32	1.681

Largest stream flow has longer time of concentration
 $Q_p = 11.053 + \text{sum of } Q_b \text{ Ia/Ib}$
 $8.846 * 0.888 = 7.860$
 $Q_p = 18.913$

Total of 2 streams to confluence:
Flow rates before confluence point:
8.846 11.053
Area of streams before confluence:
5.830 8.130
Results of confluence:
Total flow rate = 18.913(CFS)
Time of concentration = 17.316 min.
Effective stream area after confluence = 13.960(Ac.)

Process from Point/Station 708.000 to Point/Station 709.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.600(Ft.)
Downstream point/station elevation = 1424.620(Ft.)
Pipe length = 439.11(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 18.913(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 18.913(CFS)
Normal flow depth in pipe = 20.11(In.)
Flow top width inside pipe = 35.75(In.)
Critical Depth = 16.73(In.)
Pipe flow velocity = 4.66(Ft/s)
Travel time through pipe = 1.57 min.
Time of concentration (TC) = 18.89 min.

Process from Point/Station 709.000 to Point/Station 709.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 13.960(Ac.)
Runoff from this stream = 18.913(CFS)
Time of concentration = 18.89 min.
Rainfall intensity = 1.605(In/Hr)

Process from Point/Station 1001.000 to Point/Station 1002.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 372.000(Ft.)
Top (of initial area) elevation = 1434.650(Ft.)
Bottom (of initial area) elevation = 1433.410(Ft.)

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Difference in elevation = 1.240(Ft.)
Slope = 0.00333 s(percent)= 0.33
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.023 min.
Rainfall intensity = 1.955(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.547(CFS)
Total initial stream area = 1.640(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station 1002.000 to Point/Station 1003.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.410(Ft.)
End of street segment elevation = 1430.420(Ft.)
Length of street segment = 393.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 3.812(CFS)
Depth of flow = 0.238(Ft.), Average velocity = 2.199(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 13.270(Ft.)
Flow velocity = 2.20(Ft/s)
Travel time = 2.98 min. TC = 16.00 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.785
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 1.753(In/Hr) for a 10.0 year storm
Subarea runoff = 2.450(CFS) for 1.780(Ac.)
Total runoff = 4.998(CFS) Total area = 3.420(Ac.)
Street flow at end of street = 4.998(CFS)
Half street flow at end of street = 4.998(CFS)
Depth of flow = 0.266(Ft.), Average velocity = 2.354(Ft/s)
Flow width (from curb towards crown)= 14.663(Ft.)

+++++
Process from Point/Station 1003.100 to Point/Station 1003.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00

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Post Development – 10 year - Basin 3 - Reach 2

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Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.00 min.
 Rainfall intensity = 1.753(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.510(CFS) for 1.770(Ac.)
 Total runoff = 7.507(CFS) Total area = 5.190(Ac.)

 Process from Point/Station 1003.000 to Point/Station 709.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1424.630(Ft.)
 Downstream point/station elevation = 1424.620(Ft.)
 Pipe length = 4.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.507(CFS)
 Nearest computed pipe diameter = 21.00(In.)
 Calculated individual pipe flow = 7.507(CFS)
 Normal flow depth in pipe = 16.78(In.)
 Flow top width inside pipe = 16.83(In.)
 Critical Depth = 12.17(In.)
 Pipe flow velocity = 3.64(Ft/s)
 Travel time through pipe = 0.02 min.
 Time of concentration (TC) = 16.02 min.

 Process from Point/Station 709.000 to Point/Station 709.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 5.190(Ac.)
 Runoff from this stream = 7.507(CFS)
 Time of concentration = 16.02 min.
 Rainfall intensity = 1.752(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.913	18.89	1.605
2	7.507	16.02	1.752

Largest stream flow has longer time of concentration
 $Q_p = 18.913 + \text{sum of } Q_b \frac{I_a}{I_b}$
 $Q_p = 18.913 + 7.507 * 0.917 = 25.794$
 $Q_p = 25.794$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 18.913 7.507
 Area of streams before confluence:
 13.960 5.190
 Results of confluence:
 Total flow rate = 25.794(CFS)
 Time of concentration = 18.886 min.
 Effective stream area after confluence = 19.150(Ac.)

 Process from Point/Station 709.000 to Point/Station 710.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.336(Ft.), Average velocity = 6.437(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	3.00	0.00
4	3.00	4.00

Manning's 'N' friction factor = 0.013

```

Sub-Channel flow = 25.794(CFS)
' ' flow top width = 3.000(Ft.)
' ' velocity= 6.437(Ft/s)
' ' area = 4.007(Sq.Ft)
' ' Froude number = 0.982

Upstream point elevation = 1424.520(Ft.)
Downstream point elevation = 1424.350(Ft.)
Flow length = 33.730(Ft.)
Travel time = 0.09 min.
Time of concentration = 18.97 min.
Depth of flow = 1.336(Ft.)
Average velocity = 6.437(Ft/s)
Total irregular channel flow = 25.794(CFS)
Irregular channel normal depth above invert elev. = 1.336(Ft.)
Average velocity of channel(s) = 6.437(Ft/s)

+++++
Process from Point/Station 710.100 to Point/Station 710.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.97 min.
Rainfall intensity = 1.601(In/Hr) for a 10.0 year storm
Subarea runoff = 2.403(CFS) for 1.930(Ac.)
Total runoff = 28.197(CFS) Total area = 21.080(Ac.)

+++++
Process from Point/Station 710.000 to Point/Station 711.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.318(Ft.), Average velocity = 4.923(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 0.00 0.00
3 18.00 0.00
4 18.00 5.00
Manning's 'N' friction factor = 0.015

-----
Sub-Channel flow = 28.197(CFS)
' ' flow top width = 18.000(Ft.)
' ' velocity= 4.923(Ft/s)
' ' area = 5.728(Sq.Ft)
' ' Froude number = 1.538

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 84.000(Ft.)
Travel time = 0.28 min.
Time of concentration = 19.26 min.
Depth of flow = 0.318(Ft.)
Average velocity = 4.923(Ft/s)
Total irregular channel flow = 28.197(CFS)
Irregular channel normal depth above invert elev. = 0.318(Ft.)
Average velocity of channel(s) = 4.923(Ft/s)
End of computations, total study area = 21.08 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 69.7

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Post Development – 10 year - Basin 3 - Reach 2

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Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POSTB3R310.out
-----
14047 POST 3
BASIN 3
14047POSTB3R310.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1101.000 to Point/Station 1102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 226.000(Ft.)
Top (of initial area) elevation = 1433.490(Ft.)
Bottom (of initial area) elevation = 1432.810(Ft.)
Difference in elevation = 0.680(Ft.)
Slope = 0.00301 s(percent)= 0.30
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.890 min.
Rainfall intensity = 2.149(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.802
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 0.689(CFS)
Total initial stream area = 0.400(Ac.)
Pervious area fraction = 0.500
*****
Process from Point/Station 1102.000 to Point/Station 1103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.810(Ft.)
End of street segment elevation = 1430.330(Ft.)
Length of street segment = 483.000(Ft.)
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Post Development – Onsite – 10 year – Basin 3 – Reach 3

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Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.011(CFS)
 Depth of flow = 0.148(Ft.), Average velocity = 1.353(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.775(Ft.)
 Flow velocity = 1.35(Ft/s)
 Travel time = 5.95 min. TC = 16.84 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.783
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.706(In/Hr) for a 10.0 year storm
 Subarea runoff = 2.458(CFS) for 1.840(Ac.)
 Total runoff = 3.148(CFS) Total area = 2.240(Ac.)
 Street flow at end of street = 3.148(CFS)
 Half street flow at end of street = 1.574(CFS)
 Depth of flow = 0.179(Ft.), Average velocity = 1.517(Ft/s)
 Flow width (from curb towards crown)= 10.317(Ft.)

 Process from Point/Station 1103.000 to Point/Station 1104.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.060(Ft.)
 Downstream point/station elevation = 1426.850(Ft.)
 Pipe length = 41.78(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.148(CFS)
 Nearest computed pipe diameter = 15.00(In.)
 Calculated individual pipe flow = 3.148(CFS)
 Normal flow depth in pipe = 9.14(In.)
 Flow top width inside pipe = 14.64(In.)
 Critical Depth = 8.57(In.)
 Pipe flow velocity = 4.02(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 17.01 min.

 Process from Point/Station 1104.100 to Point/Station 1104.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.807
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.01 min.
 Rainfall intensity = 1.697(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.807(CFS) for 1.320(Ac.)
 Total runoff = 4.954(CFS) Total area = 3.560(Ac.)

Post Development – Onsite – 10 year – Basin 3 – Reach 3

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Process from Point/Station    1104.000 to Point/Station    1105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.350(Ft.)
Downstream point/station elevation = 1426.180(Ft.)
Pipe length = 34.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.954(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 4.954(CFS)
Normal flow depth in pipe = 10.84(In.)
Flow top width inside pipe = 17.62(In.)
Critical Depth = 10.28(In.)
Pipe flow velocity = 4.45(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 17.14 min.
+++++
Process from Point/Station    1105.100 to Point/Station    1105.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 17.14 min.
Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
Subarea runoff = 1.390(CFS) for 1.020(Ac.)
Total runoff = 6.344(CFS) Total area = 4.580(Ac.)

+++++
Process from Point/Station    1105.200 to Point/Station    1105.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.806
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 17.14 min.
Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
Subarea runoff = 2.071(CFS) for 1.520(Ac.)
Total runoff = 8.416(CFS) Total area = 6.100(Ac.)

+++++
Process from Point/Station    1105.000 to Point/Station    1106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.680(Ft.)
Downstream point/station elevation = 1424.980(Ft.)
Pipe length = 246.09(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.416(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.416(CFS)
Normal flow depth in pipe = 14.77(In.)
Flow top width inside pipe = 23.35(In.)
Critical Depth = 12.39(In.)
Pipe flow velocity = 4.15(Ft/s)
Travel time through pipe = 0.99 min.
Time of concentration (TC) = 18.13 min.

+++++
Process from Point/Station    1106.000 to Point/Station    1107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.171(Ft.), Average velocity = 7.854(Ft/s)

```

Post Development – Onsite – 10 year – Basin 3 – Reach 3

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```

***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              1.00
      2              0.00              0.00
      3              6.25              0.00
      4              6.25              1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 8.416(CFS)
'      '      flow top width = 6.250(Ft.)
'      '      velocity= 7.854(Ft/s)
'      '      area = 1.071(Sq.Ft)
'      '      Froude number = 3.343

Upstream point elevation = 1424.980(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 23.000(Ft.)
Travel time = 0.05 min.
Time of concentration = 18.18 min.
Depth of flow = 0.171(Ft.)
Average velocity = 7.854(Ft/s)
Total irregular channel flow = 8.416(CFS)
Irregular channel normal depth above invert elev. = 0.171(Ft.)
Average velocity of channel(s) = 7.854(Ft/s)
End of computations, total study area = 6.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 72.8

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Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R410.out
-----
14047 POST 2
BASIN 3
14047POSTB3R410.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1201.000 to Point/Station 1202.000
*** INITIAL AREA EVALUATION ***
-----
Initial area flow distance = 290.000(Ft.)
Top (of initial area) elevation = 1433.520(Ft.)
Bottom (of initial area) elevation = 1433.030(Ft.)
Difference in elevation = 0.490(Ft.)
Slope = 0.00169 s(percent)= 0.17
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.504 min.
Rainfall intensity = 1.918(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.595(CFS)
Total initial stream area = 1.020(Ac.)
Pervious area fraction = 0.500
*****
Process from Point/Station 1202.000 to Point/Station 1203.000
*** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***
-----
Top of street segment elevation = 1433.030(Ft.)
End of street segment elevation = 1429.670(Ft.)
Length of street segment = 553.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
```

Post Development – Onsite – 10 year – Basin 3 – Reach 4

Page 1 of 3

Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.210(CFS)
 Depth of flow = 0.233(Ft.), Average velocity = 1.935(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.983(Ft.)
 Flow velocity = 1.94(Ft/s)
 Travel time = 4.76 min. TC = 18.27 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.804
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 1.634(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.152(CFS) for 2.400(Ac.)
 Total runoff = 4.747(CFS) Total area = 3.420(Ac.)
 Street flow at end of street = 4.747(CFS)
 Half street flow at end of street = 4.747(CFS)
 Depth of flow = 0.273(Ft.), Average velocity = 2.136(Ft/s)
 Flow width (from curb towards crown)= 14.997(Ft.)

++++++
 Process from Point/Station 1203.100 to Point/Station 1203.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.804
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.27 min.
 Rainfall intensity = 1.634(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.576(CFS) for 1.200(Ac.)
 Total runoff = 6.323(CFS) Total area = 4.620(Ac.)

++++++
 Process from Point/Station 1203.200 to Point/Station 1203.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.804
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.27 min.
 Rainfall intensity = 1.634(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.546(CFS) for 2.700(Ac.)
 Total runoff = 9.869(CFS) Total area = 7.320(Ac.)

++++++
 Process from Point/Station 1203.000 to Point/Station 1204.000

Post Development – Onsite – 10 year – Basin 3 – Reach 4

Page 2 of 3

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**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----
Upstream point/station elevation = 1426.140(Ft.)
Downstream point/station elevation = 1424.350(Ft.)
Pipe length = 33.66(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.869(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 9.869(CFS)
Normal flow depth in pipe = 7.07(In.)
Flow top width inside pipe = 21.88(In.)
Critical Depth = 13.48(In.)
Pipe flow velocity = 12.76(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 18.31 min.
*****
Process from Point/Station 1204.000 to Point/Station 1205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
-----
Depth of flow = 0.203(Ft.), Average velocity = 6.480(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                  1.00
2                  0.00                  0.00
3                  7.50                  0.00
4                  7.50                  1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 9.869(CFS)
'      '      flow top width = 7.500(Ft.)
'      '      velocity = 6.480(Ft/s)
'      '      area = 1.523(Sq.Ft)
'      '      Froude number = 2.534

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 26.000(Ft.)
Travel time = 0.07 min.
Time of concentration = 18.38 min.
Depth of flow = 0.203(Ft.)
Average velocity = 6.480(Ft/s)
Total irregular channel flow = 9.869(CFS)
Irregular channel normal depth above invert elev. = 0.203(Ft.)
Average velocity of channel(s) = 6.480(Ft/s)
End of computations, total study area = 7.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R510.out
-----
14047 POST 2
BASIN 3
14047POSTB3R510.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300
+++++
Process from Point/Station 1301.000 to Point/Station 1302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 186.000(Ft.)
Top (of initial area) elevation = 1432.120(Ft.)
Bottom (of initial area) elevation = 1431.130(Ft.)
Difference in elevation = 0.990(Ft.)
Slope = 0.00532 s(percent)= 0.53
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.988 min.
Rainfall intensity = 2.380(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 0.908(CFS)
Total initial stream area = 0.460(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station 1302.000 to Point/Station 1303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.130(Ft.)
End of street segment elevation = 1430.010(Ft.)
```

Post Development – 10 year Basin 3 Reach 5

Page 1 of 3

Length of street segment = 303.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.652(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 1.532(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.260(Ft.)
 Flow velocity = 1.53(Ft/s)
 Travel time = 3.30 min. TC = 12.28 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.819
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.016(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.401(CFS) for 2.060(Ac.)
 Total runoff = 4.308(CFS) Total area = 2.520(Ac.)
 Street flow at end of street = 4.308(CFS)
 Half street flow at end of street = 4.308(CFS)
 Depth of flow = 0.290(Ft.), Average velocity = 1.731(Ft/s)
 Flow width (from curb towards crown) = 15.862(Ft.)

 Process from Point/Station 1303.000 to Point/Station 1304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.820(Ft.)
 Downstream point/station elevation = 1426.630(Ft.)
 Pipe length = 37.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.308(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 4.308(CFS)
 Normal flow depth in pipe = 9.79(In.)
 Flow top width inside pipe = 17.93(In.)
 Critical Depth = 9.55(In.)
 Pipe flow velocity = 4.39(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 12.43 min.

 Process from Point/Station 1304.100 to Point/Station 1304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.818
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 12.43 min.
 Rainfall intensity = 2.004(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.935(CFS) for 1.180(Ac.)
 Total runoff = 6.244(CFS) Total area = 3.700(Ac.)

Post Development – 10 year Basin 3 Reach 5

Page 2 of 3

```

Process from Point/Station      1304.000 to Point/Station      1305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.490(Ft.)
Downstream point/station elevation = 1424.150(Ft.)
Pipe length = 92.26(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.244(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 6.244(CFS)
Normal flow depth in pipe = 7.62(In.)
Flow top width inside pipe = 17.79(In.)
Critical Depth = 11.59(In.)
Pipe flow velocity = 8.78(Ft/s)
Travel time through pipe = 0.18 min.
Time of concentration (TC) = 12.60 min.

+++++
Process from Point/Station      1305.000 to Point/Station      1306.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.190(Ft.), Average velocity = 6.573(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              3.00
      2              0.00              0.00
      3              5.00              0.00
      4              5.00              3.00
Manning's 'N' friction factor = 0.015

-----
Sub-Channel flow = 6.244(CFS)
'      '      flow top width = 5.000(Ft.)
'      '      velocity= 6.573(Ft/s)
'      '      area = 0.950(Sq.Ft)
'      '      Froude number = 2.658

Upstream point elevation = 1424.150(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 18.000(Ft.)
Travel time = 0.05 min.
Time of concentration = 12.65 min.
Depth of flow = 0.190(Ft.)
Average velocity = 6.573(Ft/s)
Total irregular channel flow = 6.244(CFS)
Irregular channel normal depth above invert elev. = 0.190(Ft.)
Average velocity of channel(s) = 6.573(Ft/s)
End of computations, total study area = 3.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R610.out
-----
14047 POC 3
basin3-poc3
14047POSTB3R610.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 1401.000 to Point/Station 1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 2.400(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.037(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100
+++++
Process from Point/Station 1402.000 to Point/Station 1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
```

Basin 3 Reach 6
14047POSTB3R610.rrv
Page 1 of 8

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 24.000(Ft.)
 Distance from crown to crossfall grade break = 22.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.654(CFS)
 Depth of flow = 0.219(Ft.), Average velocity = 1.784(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.307(Ft.)
 Flow velocity = 1.78(Ft/s)
 Travel time = 8.31 min. TC = 17.15 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.876
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
 Subarea runoff = 3.139(CFS) for 2.120(Ac.)
 Total runoff = 4.177(CFS) Total area = 2.610(Ac.)
 Street flow at end of street = 4.177(CFS)
 Half street flow at end of street = 4.177(CFS)
 Depth of flow = 0.264(Ft.), Average velocity = 2.000(Ft/s)
 Flow width (from curb towards crown)= 14.542(Ft.)

++++++
 Process from Point/Station 1501.100 to Point/Station 1501.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.876
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 17.15 min.
 Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.148(CFS) for 0.100(Ac.)
 Total runoff = 4.325(CFS) Total area = 2.710(Ac.)

++++++
 Process from Point/Station 1501.000 to Point/Station 1502.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
 Downstream point/station elevation = 1431.710(Ft.)
 Pipe length = 32.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.325(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.325(CFS)
 Normal flow depth in pipe = 4.17(In.)
 Flow top width inside pipe = 18.18(In.)
 Critical Depth = 8.76(In.)
 Pipe flow velocity = 11.86(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 17.19 min.

++++++

```

Process from Point/Station    1502.000 to Point/Station    1403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.325(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.325(CFS)
Normal flow depth in pipe = 9.22(In.)
Flow top width inside pipe = 27.69(In.)
Critical Depth = 8.20(In.)
Pipe flow velocity = 3.38(Ft/s)
Travel time through pipe = 1.61 min.
Time of concentration (TC) = 18.80 min.
+-----+
Process from Point/Station    1403.000 to Point/Station    1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.325(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.325(CFS)
Normal flow depth in pipe = 9.25(In.)
Flow top width inside pipe = 27.71(In.)
Critical Depth = 8.20(In.)
Pipe flow velocity = 3.36(Ft/s)
Travel time through pipe = 0.42 min.
Time of concentration (TC) = 19.22 min.

+-----+
Process from Point/Station    1601.000 to Point/Station    1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 19.22 min.
Rainfall intensity = 1.590(In/Hr) for a 10.0 year storm
Subarea runoff = 0.125(CFS) for 0.090(Ac.)
Total runoff = 4.450(CFS) Total area = 2.800(Ac.)

+-----+
Process from Point/Station    1404.000 to Point/Station    1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.450(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.450(CFS)
Normal flow depth in pipe = 10.04(In.)
Flow top width inside pipe = 28.31(In.)
Critical Depth = 8.32(In.)
Pipe flow velocity = 3.09(Ft/s)
Travel time through pipe = 1.58 min.
Time of concentration (TC) = 20.81 min.

+-----+
Process from Point/Station    1405.100 to Point/Station    1405.100
**** SUBAREA FLOW ADDITION ****

```

COMMERCIAL subarea type
 Runoff Coefficient = 0.875
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 20.81 min.
 Rainfall intensity = 1.525(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.707(CFS) for 1.280(Ac.)
 Total runoff = 6.157(CFS) Total area = 4.080(Ac.)

 Process from Point/Station 1405.000 to Point/Station 1406.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
 Downstream point/station elevation = 1426.980(Ft.)
 Pipe length = 912.86(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.157(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 6.157(CFS)
 Normal flow depth in pipe = 11.99(In.)
 Flow top width inside pipe = 29.39(In.)
 Critical Depth = 9.84(In.)
 Pipe flow velocity = 3.36(Ft/s)
 Travel time through pipe = 4.52 min.
 Time of concentration (TC) = 25.33 min.

 Process from Point/Station 1406.100 to Point/Station 1406.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.873
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 25.33 min.
 Rainfall intensity = 1.374(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.295(CFS) for 1.080(Ac.)
 Total runoff = 7.452(CFS) Total area = 5.160(Ac.)

 Process from Point/Station 1701.100 to Point/Station 1701.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.873
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 25.33 min.
 Rainfall intensity = 1.374(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.540(CFS) for 0.450(Ac.)
 Total runoff = 7.992(CFS) Total area = 5.610(Ac.)

```

+++++
Process from Point/Station      1701.000 to Point/Station      1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.140(Ft.), Average velocity = 3.628(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 7.992(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 3.628(Ft/s)
      '      '      area = 2.203(Sq.Ft)
      '      '      Froude number = 1.709

Upstream point elevation = 1427.200(Ft.)
Downstream point elevation = 1426.490(Ft.)
Flow length = 50.000(Ft.)
Travel time = 0.23 min.
Time of concentration = 25.56 min.
Depth of flow = 0.140(Ft.)
Average velocity = 3.628(Ft/s)
Total irregular channel flow = 7.992(CFS)
Irregular channel normal depth above invert elev. = 0.140(Ft.)
Average velocity of channel(s) = 3.628(Ft/s)

+++++
Process from Point/Station      1406.000 to Point/Station      1407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.299(Ft.), Average velocity = 1.807(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             14.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 7.992(CFS)
      '      '      flow top width = 14.825(Ft.)
      '      '      velocity= 1.807(Ft/s)
      '      '      area = 4.424(Sq.Ft)
      '      '      Froude number = 0.583

Upstream point elevation = 1426.490(Ft.)
Downstream point elevation = 1426.020(Ft.)
Flow length = 358.000(Ft.)
Travel time = 3.30 min.
Time of concentration = 28.86 min.
Depth of flow = 0.299(Ft.)
Average velocity = 1.807(Ft/s)
Total irregular channel flow = 7.992(CFS)
Irregular channel normal depth above invert elev. = 0.299(Ft.)
Average velocity of channel(s) = 1.807(Ft/s)

+++++
Process from Point/Station      1407.100 to Point/Station      1407.100
**** SUBAREA FLOW ADDITION ****

```

```

COMMERCIAL subarea type
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.86 min.
Rainfall intensity = 1.282(In/Hr) for a 10.0 year storm
Subarea runoff = 1.385(CFS) for 1.240(Ac.)
Total runoff = 9.378(CFS) Total area = 6.850(Ac.)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 33.59 min.
Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 38.32 min.

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```

Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 43.05 min.
Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

-----
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 43.05 min.
Rainfall intensity = 1.037(In/Hr) for a 10.0 year storm
Subarea runoff = 1.421(CFS) for 1.580(Ac.)
Total runoff = 10.799(CFS) Total area = 8.430(Ac.)

+++++
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.257(Ft.), Average velocity = 2.668(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 10.799(CFS)

```

```

'      '      flow top width =      15.750(Ft.)
'      '      velocity=      2.668(Ft/s)
'      '      area =      4.047(Sq.Ft)
'      '      Froude number =      0.928

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 4.09 min.
Time of concentration = 47.14 min.
Depth of flow = 0.257(Ft.)
Average velocity = 2.668(Ft/s)
Total irregular channel flow = 10.799(CFS)
Irregular channel normal depth above invert elev. = 0.257(Ft.)
Average velocity of channel(s) = 2.668(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

```

Attachment E4
Post Development Onsite
100 Year

Post Development – Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST100bl.out
-----
14047 POC 1
basin1-pocl
14047POST100bl.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 4.826(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.816(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1436.800(Ft.)
```

Post Development – Onsite – 100 year – Basin 1

Page 1 of 2

End of street segment elevation = 1433.900(Ft.)
 Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.153(CFS)
 Depth of flow = 0.294(Ft.), Average velocity = 1.836(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.427(Ft.)
 Flow velocity = 1.84(Ft/s)
 Travel time = 4.00 min. TC = 9.05 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.887
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.542(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.608(CFS) for 0.830(Ac.)
 Total runoff = 3.424(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 3.424(CFS)
 Half street flow at end of street = 3.424(CFS)
 Depth of flow = 0.337(Ft.), Average velocity = 2.052(Ft/s)
 Flow width (from curb towards crown)= 12.584(Ft.)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.424(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.424(CFS)
 Normal flow depth in pipe = 6.91(In.)
 Flow top width inside pipe = 17.51(In.)
 Critical Depth = 8.47(In.)
 Pipe flow velocity = 5.48(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 9.16 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 100 year

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST100b2.out

14047 POST 2
BASIN 2 -poc 2
14047POST100b2.rvv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sun City] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)
Top (of initial area) elevation = 1434.700(Ft.)
Bottom (of initial area) elevation = 1433.990(Ft.)
Difference in elevation = 0.710(Ft.)
Slope = 0.00317 s(percent)= 0.32
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.261 min.
Rainfall intensity = 3.718(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.561(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)
End of street segment elevation = 1432.770(Ft.)
Length of street segment = 241.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)

Post Development – Onsite- 100 year – Basin 2

Page 1 of 2

Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.912(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 1.361(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.648(Ft.)
 Flow velocity = 1.36(Ft/s)
 Travel time = 2.95 min. TC = 11.21 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.644(CFS) for 0.230(Ac.)
 Total runoff = 1.205(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 1.205(CFS)
 Half street flow at end of street = 1.205(CFS)
 Depth of flow = 0.258(Ft.), Average velocity = 1.451(Ft/s)
 Flow width (from curb towards crown)= 8.636(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.21 min.
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.056(CFS) for 0.020(Ac.)
 Total runoff = 1.261(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

 Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.261(CFS)
 Normal flow depth in pipe = 2.61(In.)
 Flow top width inside pipe = 12.67(In.)
 Critical Depth = 5.03(In.)
 Pipe flow velocity = 7.98(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 11.33 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite- 100 year – Basin 2

Page 2 of 2

Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST100b3r1.out
-----
14047 POST 3
basin3-poc3
14047POST100b3r1.rrv
14047POST2b3r1.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station      301.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1436.730(Ft.)
Bottom (of initial area) elevation = 1434.100(Ft.)
Difference in elevation = 2.630(Ft.)
Slope = 0.00774 s(percent)= 0.77
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.616 min.
Rainfall intensity = 3.255(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.108(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.500
*****
Process from Point/Station      302.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1434.100(Ft.)
End of street segment elevation = 1432.100(Ft.)
Length of street segment = 583.000(Ft.)
```

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BASIN 3 Reach 1
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Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 5.191(CFS)
 Depth of flow = 0.318(Ft.), Average velocity = 1.764(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.232(Ft.)
 Flow velocity = 1.76(Ft/s)
 Travel time = 5.51 min. TC = 16.12 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.609(In/Hr) for a 100.0 year storm
 Subarea runoff = 6.109(CFS) for 2.870(Ac.)
 Total runoff = 8.216(CFS) Total area = 3.650(Ac.)
 Street flow at end of street = 8.216(CFS)
 Half street flow at end of street = 8.216(CFS)
 Depth of flow = 0.374(Ft.), Average velocity = 2.081(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown) = 18.000(Ft.)

 Process from Point/Station 303.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.440(Ft.)
 Downstream point/station elevation = 1427.370(Ft.)
 Pipe length = 36.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.216(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 8.216(CFS)
 Normal flow depth in pipe = 16.69(In.)
 Flow top width inside pipe = 22.09(In.)
 Critical Depth = 12.24(In.)
 Pipe flow velocity = 3.53(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 16.30 min.

 Process from Point/Station 304.100 to Point/Station 304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.30 min.
 Rainfall intensity = 2.594(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.635(CFS) for 0.300(Ac.)
 Total runoff = 8.851(CFS) Total area = 3.950(Ac.)

```

*****
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.270(Ft.)
Downstream point/station elevation = 1426.990(Ft.)
Pipe length = 139.32(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.851(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.851(CFS)
Normal flow depth in pipe = 17.34(In.)
Flow top width inside pipe = 21.49(In.)
Critical Depth = 12.73(In.)
Pipe flow velocity = 3.64(Ft/s)
Travel time through pipe = 0.64 min.
Time of concentration (TC) = 16.93 min.

*****
Process from Point/Station      305.100 to Point/Station      305.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.93 min.
Rainfall intensity = 2.542(In/Hr) for a 100.0 year storm
Subarea runoff = 4.118(CFS) for 1.990(Ac.)
Total runoff = 12.969(CFS) Total area = 5.940(Ac.)

*****
Process from Point/Station      305.200 to Point/Station      305.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.93 min.
Rainfall intensity = 2.542(In/Hr) for a 100.0 year storm
Subarea runoff = 3.911(CFS) for 1.890(Ac.)
Total runoff = 16.880(CFS) Total area = 7.830(Ac.)

*****
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.890(Ft.)
Downstream point/station elevation = 1425.940(Ft.)
Pipe length = 475.31(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.880(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 16.880(CFS)
Normal flow depth in pipe = 22.69(In.)
Flow top width inside pipe = 25.76(In.)
Critical Depth = 16.66(In.)
Pipe flow velocity = 4.24(Ft/s)
Travel time through pipe = 1.87 min.
Time of concentration (TC) = 18.80 min.

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Process from Point/Station      306.100 to Point/Station      306.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.80 min.
Rainfall intensity = 2.404(In/Hr) for a 100.0 year storm
Subarea runoff = 3.234(CFS) for 1.660(Ac.)
Total runoff = 20.114(CFS) Total area = 9.490(Ac.)

+++++
Process from Point/Station      306.200 to Point/Station      306.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.80 min.
Rainfall intensity = 2.404(In/Hr) for a 100.0 year storm
Subarea runoff = 2.669(CFS) for 1.370(Ac.)
Total runoff = 22.783(CFS) Total area = 10.860(Ac.)

+++++
Process from Point/Station      306.000 to Point/Station      307.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.840(Ft.)
Downstream point/station elevation = 1425.650(Ft.)
Pipe length = 92.15(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 22.783(CFS)
Given pipe size = 30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.596(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.284(Ft.)
Minor friction loss = 0.502(Ft.) K-factor = 1.50
Pipe flow velocity = 4.64(Ft/s)
Travel time through pipe = 0.33 min.
Time of concentration (TC) = 19.13 min.

+++++
Process from Point/Station      307.100 to Point/Station      307.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.810
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 19.13 min.
Rainfall intensity = 2.382(In/Hr) for a 100.0 year storm
Subarea runoff = 0.366(CFS) for 0.190(Ac.)
Total runoff = 23.149(CFS) Total area = 11.050(Ac.)

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*****
Process from Point/Station      307.000 to Point/Station      308.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.550(Ft.)
Downstream point/station elevation = 1425.140(Ft.)
Pipe length = 205.46(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 23.149(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 23.149(CFS)
Normal flow depth in pipe = 23.86(In.)
Flow top width inside pipe = 34.04(In.)
Critical Depth = 18.59(In.)
Pipe flow velocity = 4.66(Ft/s)
Travel time through pipe = 0.74 min.
Time of concentration (TC) = 19.87 min.

*****
Process from Point/Station      308.000 to Point/Station      308.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 11.050(Ac.)
Runoff from this stream = 23.149(CFS)
Time of concentration = 19.87 min.
Rainfall intensity = 2.335(In/Hr)

*****
Process from Point/Station      401.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 306.000(Ft.)
Top (of initial area) elevation = 1433.390(Ft.)
Bottom (of initial area) elevation = 1431.700(Ft.)
Difference in elevation = 1.690(Ft.)
Slope = 0.00552 s(percent)= 0.55
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.887 min.
Rainfall intensity = 3.212(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 0.426(CFS)
Total initial stream area = 0.160(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      402.000 to Point/Station      308.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.700(Ft.)
End of street segment elevation = 1429.020(Ft.)
Length of street segment = 740.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150

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Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.945(CFS)
 Depth of flow = 0.156(Ft.), Average velocity = 1.170(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.137(Ft.)
 Flow velocity = 1.17(Ft/s)
 Travel time = 10.54 min. TC = 21.43 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.805
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.243(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.975(CFS) for 0.540(Ac.)
 Total runoff = 1.402(CFS) Total area = 0.700(Ac.)
 Street flow at end of street = 1.402(CFS)
 Half street flow at end of street = 1.402(CFS)
 Depth of flow = 0.184(Ft.), Average velocity = 1.293(Ft/s)
 Flow width (from curb towards crown) = 10.539(Ft.)

 Process from Point/Station 308.100 to Point/Station 308.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.805
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.43 min.
 Rainfall intensity = 2.243(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.204(CFS) for 1.220(Ac.)
 Total runoff = 3.605(CFS) Total area = 1.920(Ac.)

 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.920(Ac.)
 Runoff from this stream = 3.605(CFS)
 Time of concentration = 21.43 min.
 Rainfall intensity = 2.243(In/Hr)

 Process from Point/Station 501.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 312.000(Ft.)
 Top (of initial area) elevation = 1432.920(Ft.)
 Bottom (of initial area) elevation = 1431.000(Ft.)
 Difference in elevation = 1.920(Ft.)
 Slope = 0.00615 s(percent) = 0.62
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.737 min.
 Rainfall intensity = 3.236(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.830
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500

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Initial subarea runoff =      0.618(CFS)
Total initial stream area =      0.230(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station      502.100 to Point/Station      502.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 10.74 min.
Rainfall intensity = 3.236(In/Hr) for a 100.0 year storm
Subarea runoff = 1.128(CFS) for 0.420(Ac.)
Total runoff = 1.745(CFS)      Total area = 0.650(Ac.)

+++++
Process from Point/Station      502.000 to Point/Station      308.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.000(Ft.)
End of street segment elevation = 1429.020(Ft.)
Length of street segment = 474.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 2.224(CFS)
Depth of flow = 0.216(Ft.), Average velocity = 1.534(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 12.155(Ft.)
Flow velocity = 1.53(Ft/s)
Travel time = 5.15 min.      TC = 15.89 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.816
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.629(In/Hr) for a 100.0 year storm
Subarea runoff = 0.902(CFS) for 0.420(Ac.)
Total runoff = 2.647(CFS)      Total area = 1.070(Ac.)
Street flow at end of street = 2.647(CFS)
Half street flow at end of street = 2.647(CFS)
Depth of flow = 0.232(Ft.), Average velocity = 1.603(Ft/s)
Flow width (from curb towards crown)= 12.956(Ft.)

+++++
Process from Point/Station      308.200 to Point/Station      308.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.816
Decimal fraction soil group A = 0.000

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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 15.89 min.
Rainfall intensity = 2.629(In/Hr) for a 100.0 year storm
Subarea runoff = 2.318(CFS) for 1.080(Ac.)
Total runoff = 4.965(CFS) Total area = 2.150(Ac.)

*****
Process from Point/Station 308.000 to Point/Station 308.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 2.150(Ac.)
Runoff from this stream = 4.965(CFS)
Time of concentration = 15.89 min.
Rainfall intensity = 2.629(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 23.149 19.87 2.335
2 3.605 21.43 2.243
3 4.965 15.89 2.629
Largest stream flow has longer or shorter time of concentration
Qp = 23.149 + sum of
    Qa Tb/Ta
    3.605 * 0.927 = 3.343
    Qb Ia/Ib
    4.965 * 0.888 = 4.410
Qp = 30.902

Total of 3 streams to confluence:
Flow rates before confluence point:
    23.149 3.605 4.965
Area of streams before confluence:
    11.050 1.920 2.150
Results of confluence:
Total flow rate = 30.902(CFS)
Time of concentration = 19.870 min.
Effective stream area after confluence = 15.120(Ac.)

*****
Process from Point/Station 308.000 to Point/Station 309.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.834(Ft.), Average velocity = 4.212(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.015

-----
Sub-Channel flow = 30.902(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity = 4.212(Ft/s)
' ' area = 7.336(Sq.Ft)
' ' Froude number = 0.548

Upstream point elevation = 1425.040(Ft.)
Downstream point elevation = 1424.970(Ft.)
Flow length = 36.500(Ft.)
Travel time = 0.14 min.

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Time of concentration = 20.01 min.
 Depth of flow = 1.834(Ft.)
 Average velocity = 4.212(Ft/s)
 Total irregular channel flow = 30.902(CFS)
 Irregular channel normal depth above invert elev. = 1.834(Ft.)
 Average velocity of channel(s) = 4.212(Ft/s)

 Process from Point/Station 309.100 to Point/Station 309.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.808
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 20.01 min.
 Rainfall intensity = 2.326(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.462(CFS) for 1.310(Ac.)
 Total runoff = 33.364(CFS) Total area = 16.430(Ac.)

 Process from Point/Station 309.000 to Point/Station 309.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 16.430(Ac.)
 Runoff from this stream = 33.364(CFS)
 Time of concentration = 20.01 min.
 Rainfall intensity = 2.326(In/Hr)

 Process from Point/Station 601.000 to Point/Station 602.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 311.000(Ft.)
 Top (of initial area) elevation = 1434.050(Ft.)
 Bottom (of initial area) elevation = 1432.280(Ft.)
 Difference in elevation = 1.770(Ft.)
 Slope = 0.00569 s(percent)= 0.57
 $TC = k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.892 min.
 Rainfall intensity = 3.211(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.829
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 1.997(CFS)
 Total initial stream area = 0.750(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 602.000 to Point/Station 603.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
 End of street segment elevation = 1429.500(Ft.)
 Length of street segment = 798.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)

Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.055(CFS)
 Depth of flow = 0.287(Ft.), Average velocity = 1.667(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.682(Ft.)
 Flow velocity = 1.67(Ft/s)
 Travel time = 7.98 min. TC = 18.87 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.400(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.064(CFS) for 2.090(Ac.)
 Total runoff = 6.061(CFS) Total area = 2.840(Ac.)
 Street flow at end of street = 6.061(CFS)
 Half street flow at end of street = 6.061(CFS)
 Depth of flow = 0.336(Ft.), Average velocity = 1.853(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown)= 18.000(Ft.)

++++++
 Process from Point/Station 603.100 to Point/Station 603.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.87 min.
 Rainfall intensity = 2.400(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.947(CFS) for 2.030(Ac.)
 Total runoff = 10.008(CFS) Total area = 4.870(Ac.)

++++++
 Process from Point/Station 603.000 to Point/Station 309.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1429.500(Ft.)
 End of street segment elevation = 1429.000(Ft.)
 Length of street segment = 101.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 10.070(CFS)
 Depth of flow = 0.376(Ft.), Average velocity = 2.520(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Streetflow hydraulics at midpoint of street travel:

```

Halfstreet flow width = 18.000(Ft.)
Flow velocity = 2.52(Ft/s)
Travel time = 0.67 min. TC = 19.54 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.809
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.356(In/Hr) for a 100.0 year storm
Subarea runoff = 0.114(CFS) for 0.060(Ac.)
Total runoff = 10.122(CFS) Total area = 4.930(Ac.)
Street flow at end of street = 10.122(CFS)
Half street flow at end of street = 10.122(CFS)
Depth of flow = 0.377(Ft.), Average velocity = 2.525(Ft/s)
Note: depth of flow exceeds top of street crown.
Flow width (from curb towards crown)= 18.000(Ft.)

*****
Process from Point/Station 309.000 to Point/Station 309.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 4.930(Ac.)
Runoff from this stream = 10.122(CFS)
Time of concentration = 19.54 min.
Rainfall intensity = 2.356(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 33.364 20.01 2.326
2 10.122 19.54 2.356
Largest stream flow has longer time of concentration
Qp = 33.364 + sum of
      Qb Ia/Ib
      10.122 * 0.987 = 9.993
Qp = 43.358

Total of 2 streams to confluence:
Flow rates before confluence point:
33.364 10.122
Area of streams before confluence:
16.430 4.930
Results of confluence:
Total flow rate = 43.358(CFS)
Time of concentration = 20.014 min.
Effective stream area after confluence = 21.360(Ac.)

*****
Process from Point/Station 309.000 to Point/Station 310.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.062(Ft.), Average velocity = 5.257(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 43.358(CFS)
flow top width = 4.000(Ft.)

```

```

'      '      velocity=    5.257(Ft/s)
'      '      area =      8.248(Sq.Ft)
'      '      Froude number =    0.645

Upstream point elevation = 1424.870(Ft.)
Downstream point elevation = 1424.850(Ft.)
Flow length = 9.650(Ft.)
Travel time = 0.03 min.
Time of concentration = 20.04 min.
Depth of flow = 2.062(Ft.)
Average velocity = 5.257(Ft/s)
Total irregular channel flow = 43.358(CFS)
Irregular channel normal depth above invert elev. = 2.062(Ft.)
Average velocity of channel(s) = 5.257(Ft/s)

+++++
Process from Point/Station 310.000 to Point/Station 311.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.567(Ft.), Average velocity = 7.281(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                2.00
2                  0.00                0.00
3                 10.50                0.00
4                 10.50                2.00
Manning's 'N' friction factor = 0.017

-----
Sub-Channel flow = 43.358(CFS)
'      '      flow top width = 10.500(Ft.)
'      '      velocity=    7.281(Ft/s)
'      '      area =      5.955(Sq.Ft)
'      '      Froude number =    1.704

Upstream point elevation = 1424.850(Ft.)
Downstream point elevation = 1423.850(Ft.)
Flow length = 59.000(Ft.)
Travel time = 0.14 min.
Time of concentration = 20.18 min.
Depth of flow = 0.567(Ft.)
Average velocity = 7.281(Ft/s)
Total irregular channel flow = 43.358(CFS)
Irregular channel normal depth above invert elev. = 0.567(Ft.)
Average velocity of channel(s) = 7.281(Ft/s)

+++++
Process from Point/Station 311.000 to Point/Station 312.000
**** SUBAREA FLOW ADDITION ****

-----
USER INPUT of soil data for subarea
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 20.18 min.
Rainfall intensity = 2.316(In/Hr) for a 100.0 year storm
Subarea runoff = 2.101(CFS) for 1.020(Ac.)
Total runoff = 45.459(CFS) Total area = 22.380(Ac.)

+++++
Process from Point/Station 312.000 to Point/Station 313.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 1.619(Ft.), Average velocity = 7.018(Ft/s)
***** Irregular Channel Data *****

-----

```

```

Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              5.00
      2              0.00              0.00
      3              4.00              0.00
      4              4.00              5.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 45.459(CFS)
      '      '      flow top width = 4.000(Ft.)
      '      '      velocity= 7.018(Ft/s)
      '      '      area = 6.478(Sq.Ft)
      '      '      Froude number = 0.972

Upstream point elevation = 1423.850(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 114.400(Ft.)
Travel time = 0.27 min.
Time of concentration = 20.45 min.
Depth of flow = 1.619(Ft.)
Average velocity = 7.018(Ft/s)
Total irregular channel flow = 45.459(CFS)
Irregular channel normal depth above invert elev. = 1.619(Ft.)
Average velocity of channel(s) = 7.018(Ft/s)

+++++
Process from Point/Station 313.000 to Point/Station 314.000
**** SUBAREA FLOW ADDITION ****

USER INPUT of soil data for subarea
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 20.45 min.
Rainfall intensity = 2.300(In/Hr) for a 100.0 year storm
Subarea runoff = 16.630(CFS) for 8.130(Ac.)
Total runoff = 62.090(CFS) Total area = 30.510(Ac.)

+++++
Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 30.510(Ac.)
Runoff from this stream = 62.090(CFS)
Time of concentration = 20.45 min.
Rainfall intensity = 2.300(In/Hr)

+++++
Process from Point/Station 711.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.426(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 18.49 min. Rain intensity = 2.43(In/Hr)
Total area = 21.08(Ac.) Total runoff = 44.20(CFS)

+++++
Process from Point/Station 314.000 to Point/Station 314.000

```

**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.080(Ac.)
Runoff from this stream = 44.195(CFS)
Time of concentration = 18.49 min.
Rainfall intensity = 2.426(In/Hr)

Process from Point/Station 1107.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.497(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 17.51 min. Rain intensity = 2.50(In/Hr)
Total area = 6.10(Ac.) Total runoff = 13.27(CFS)

Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 6.100(Ac.)
Runoff from this stream = 13.273(CFS)
Time of concentration = 17.51 min.
Rainfall intensity = 2.497(In/Hr)

Process from Point/Station 1205.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.470(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 17.87 min. Rain intensity = 2.47(In/Hr)
Total area = 7.32(Ac.) Total runoff = 15.43(CFS)

Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area = 7.320(Ac.)
Runoff from this stream = 15.433(CFS)
Time of concentration = 17.87 min.
Rainfall intensity = 2.470(In/Hr)

Process from Point/Station 1306.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 3.015(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)

```

Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 12.27 min. Rain intensity = 3.01(In/Hr)
Total area = 3.70(Ac.) Total runoff = 9.72(CFS)

*****
Process from Point/Station 314.000 to Point/Station 314.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 5
Stream flow area = 3.700(Ac.)
Runoff from this stream = 9.723(CFS)
Time of concentration = 12.27 min.
Rainfall intensity = 3.015(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 62.090 20.45 2.300
2 44.195 18.49 2.426
3 13.273 17.51 2.497
4 15.433 17.87 2.470
5 9.723 12.27 3.015
Largest stream flow has longer time of concentration
Qp = 62.090 + sum of
Qb Ia/Ib
44.195 * 0.948 = 41.895
Qb Ia/Ib
13.273 * 0.921 = 12.224
Qb Ia/Ib
15.433 * 0.931 = 14.368
Qb Ia/Ib
9.723 * 0.763 = 7.417
Qp = 137.994

Total of 5 streams to confluence:
Flow rates before confluence point:
62.090 44.195 13.273 15.433 9.723
Area of streams before confluence:
30.510 21.080 6.100 7.320 3.700
Results of confluence:
Total flow rate = 137.994(CFS)
Time of concentration = 20.452 min.
Effective stream area after confluence = 68.710(Ac.)

*****
Process from Point/Station 314.000 to Point/Station 315.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Depth of flow = 2.946(Ft.), Average velocity = 5.854(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 6.00
2 0.00 0.00
3 8.00 0.00
4 8.00 6.00
Manning's 'N' friction factor = 0.015

-----
Sub-Channel flow = 137.994(CFS)
' ' flow top width = 8.000(Ft.)
' ' velocity= 5.854(Ft/s)

```

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'      '      area =      23.572(Sq.Ft)
'      '      Froude number =      0.601

Upstream point elevation = 1423.350(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 231.800(Ft.)
Travel time = 0.66 min.
Time of concentration = 21.11 min.
Depth of flow = 2.946(Ft.)
Average velocity = 5.854(Ft/s)
Total irregular channel flow = 137.994(CFS)
Irregular channel normal depth above invert elev. = 2.946(Ft.)
Average velocity of channel(s) = 5.854(Ft/s)

+++++
Process from Point/Station      315.100 to Point/Station      315.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
Subarea runoff = 0.336(CFS) for 0.180(Ac.)
Total runoff = 138.330(CFS)      Total area = 68.890(Ac.)

+++++
Process from Point/Station      315.200 to Point/Station      315.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
Subarea runoff = 3.306(CFS) for 1.770(Ac.)
Total runoff = 141.636(CFS)      Total area = 70.660(Ac.)

+++++
Process from Point/Station      315.300 to Point/Station      315.300
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
Subarea runoff = 0.336(CFS) for 0.180(Ac.)
Total runoff = 141.973(CFS)      Total area = 70.840(Ac.)

+++++
Process from Point/Station      315.400 to Point/Station      315.400
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)

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```

Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
Subarea runoff = 0.187(CFS) for 0.100(Ac.)
Total runoff = 142.159(CFS) Total area = 70.940(Ac.)

*****
Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.826
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
Subarea runoff = 1.009(CFS) for 0.540(Ac.)
Total runoff = 143.168(CFS) Total area = 71.480(Ac.)

*****
Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 143.168(CFS)
Time of concentration = 21.11 min.
Rainfall intensity = 2.261(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 143.168 21.11 2.261
Largest stream flow has longer time of concentration
Qp = 143.168 + sum of
Qp = 143.168

Total of 1 main streams to confluence:
Flow rates before confluence point:
143.168
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 143.168(CFS)
Time of concentration = 21.111 min.
Effective stream area after confluence = 71.480(Ac.)

*****
Process from Point/Station 1409.000 to Point/Station 315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.571(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

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Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 42.00 min. Rain intensity = 1.57(In/Hr)
Total area = 8.43(Ac.) Total runoff = 16.82(CFS)

+++++
Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 8.430(Ac.)
Runoff from this stream = 16.817(CFS)
Time of concentration = 42.00 min.
Rainfall intensity = 1.571(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 143.168 21.11 2.261
2 16.817 42.00 1.571
Largest stream flow has longer or shorter time of concentration
Qp = 143.168 + sum of
      Qa Tb/Ta
      16.817 * 0.503 = 8.453
Qp = 151.621

Total of 2 main streams to confluence:
Flow rates before confluence point:
143.168 16.817
Area of streams before confluence:
71.480 8.430

Results of confluence:
Total flow rate = 151.621(CFS)
Time of concentration = 21.111 min.
Effective stream area after confluence = 79.910(Ac.)
End of computations, total study area = 79.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.515
Area averaged RI index number = 72.5

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Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R2100.out
-----
14047 POST 3
Basin 3 Reach 2
14047POSTB3R2100.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 701.000 to Point/Station 702.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 329.000(Ft.)
Top (of initial area) elevation = 1435.900(Ft.)
Bottom (of initial area) elevation = 1433.950(Ft.)
Difference in elevation = 1.950(Ft.)
Slope = 0.00593 s(percent)= 0.59
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.050 min.
Rainfall intensity = 3.187(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.430(CFS)
Total initial stream area = 0.920(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station 702.000 to Point/Station 703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.950(Ft.)
End of street segment elevation = 1431.540(Ft.)
```

Post Development – 100 year - Basin 3 - Reach 2

Page 1 of 12

Length of street segment = 477.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.497(CFS)
 Depth of flow = 0.250(Ft.), Average velocity = 1.846(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.862(Ft.)
 Flow velocity = 1.85(Ft/s)
 Travel time = 4.31 min. TC = 15.36 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.818
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.677(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.079(CFS) for 0.950(Ac.)
 Total runoff = 4.509(CFS) Total area = 1.870(Ac.)
 Street flow at end of street = 4.509(CFS)
 Half street flow at end of street = 4.509(CFS)
 Depth of flow = 0.278(Ft.), Average velocity = 1.968(Ft/s)
 Flow width (from curb towards crown) = 15.226(Ft.)

 Process from Point/Station 703.100 to Point/Station 703.100
 *** SUBAREA FLOW ADDITION ***

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.818
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 15.36 min.
 Rainfall intensity = 2.677(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.591(CFS) for 0.270(Ac.)
 Total runoff = 5.100(CFS) Total area = 2.140(Ac.)

 Process from Point/Station 703.000 to Point/Station 704.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.610(Ft.)
 Downstream point/station elevation = 1427.450(Ft.)
 Pipe length = 80.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.100(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 0.223(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 0.189(Ft.)
 Minor friction loss = 0.194(Ft.) K-factor = 1.50
 Pipe flow velocity = 2.89(Ft/s)
 Travel time through pipe = 0.46 min.
 Time of concentration (TC) = 15.82 min.

```

*****
Process from Point/Station      704.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =          2.140(Ac.)
Runoff from this stream =          5.100(CFS)
Time of concentration =       15.82 min.
Rainfall intensity =         2.635(In/Hr)

*****
Process from Point/Station      901.000 to Point/Station      902.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =    211.000(Ft.)
Top (of initial area) elevation = 1438.790(Ft.)
Bottom (of initial area) elevation = 1433.300(Ft.)
Difference in elevation =         5.490(Ft.)
Slope =      0.02602 s(percent)=      2.60
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =      6.882 min.
Rainfall intensity =         4.096(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =          1.450(CFS)
Total initial stream area =          0.420(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      902.000 to Point/Station      705.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.330(Ft.)
End of street segment elevation = 1432.180(Ft.)
Length of street segment =    295.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 3.114(CFS)
Depth of flow = 0.252(Ft.), Average velocity = 1.627(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 13.931(Ft.)
Flow velocity = 1.63(Ft/s)
Travel time = 3.02 min.      TC = 9.90 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 3.377(In/Hr) for a 100.0 year storm
Subarea runoff = 3.232(CFS) for 1.150(Ac.)

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Total runoff = 4.682(CFS) Total area = 1.570(Ac.)
Street flow at end of street = 4.682(CFS)
Half street flow at end of street = 4.682(CFS)
Depth of flow = 0.297(Ft.), Average velocity = 1.803(Ft/s)
Flow width (from curb towards crown)= 16.197(Ft.)

Process from Point/Station 705.000 to Point/Station 706.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.690(Ft.)
Downstream point/station elevation = 1427.620(Ft.)
Pipe length = 36.77(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.682(CFS)
Given pipe size = 12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
1.392(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.635(Ft.)
Minor friction loss = 0.828(Ft.) K-factor = 1.50
Pipe flow velocity = 5.96(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 10.01 min.

Process from Point/Station 706.100 to Point/Station 706.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 10.01 min.
Rainfall intensity = 3.359(In/Hr) for a 100.0 year storm
Subarea runoff = 4.136(CFS) for 1.480(Ac.)
Total runoff = 8.818(CFS) Total area = 3.050(Ac.)

Process from Point/Station 706.000 to Point/Station 704.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.520(Ft.)
Downstream point/station elevation = 1427.450(Ft.)
Pipe length = 31.87(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.818(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.734(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.224(Ft.)
Minor friction loss = 0.580(Ft.) K-factor = 1.50
Pipe flow velocity = 4.99(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 10.11 min.

Process from Point/Station 704.000 to Point/Station 704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.050(Ac.)
Runoff from this stream = 8.818(CFS)
Time of concentration = 10.11 min.
Rainfall intensity = 3.340(In/Hr)
Summary of stream data:

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Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.100	15.82	2.635
2	8.818	10.11	3.340

Largest stream flow has longer or shorter time of concentration

Qp = 8.818 + sum of

Qa Tb/Ta

5.100 * 0.639 = 3.261

Qp = 12.078

Total of 2 streams to confluence:

Flow rates before confluence point:

5.100 8.818

Area of streams before confluence:

2.140 3.050

Results of confluence:

Total flow rate = 12.078(CFS)

Time of concentration = 10.113 min.

Effective stream area after confluence = 5.190(Ac.)

Process from Point/Station 704.000 to Point/Station 707.000

**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.350(Ft.)

Downstream point/station elevation = 1427.120(Ft.)

Pipe length = 114.66(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 12.078(CFS)

Given pipe size = 24.00(In.)

NOTE: Normal flow is pressure flow in user selected pipe size.

The approximate hydraulic grade line above the pipe invert is

0.441(Ft.) at the headworks or inlet of the pipe(s)

Pipe friction loss = 0.327(Ft.)

Minor friction loss = 0.344(Ft.) K-factor = 1.50

Pipe flow velocity = 3.84(Ft/s)

Travel time through pipe = 0.50 min.

Time of concentration (TC) = 10.61 min.

Process from Point/Station 707.100 to Point/Station 707.100

**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.846

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

RI index for soil(AMC 2) = 75.00

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration = 10.61 min.

Rainfall intensity = 3.256(In/Hr) for a 100.0 year storm

Subarea runoff = 1.763(CFS) for 0.640(Ac.)

Total runoff = 13.841(CFS) Total area = 5.830(Ac.)

Process from Point/Station 707.000 to Point/Station 708.000

**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.020(Ft.)

Downstream point/station elevation = 1425.700(Ft.)

Pipe length = 613.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 13.841(CFS)

Given pipe size = 24.00(In.)

NOTE: Normal flow is pressure flow in user selected pipe size.

The approximate hydraulic grade line above the pipe invert is

1.426(Ft.) at the headworks or inlet of the pipe(s)

Pipe friction loss = 2.294(Ft.)

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Minor friction loss =      0.452(Ft.)      K-factor =   1.50
Pipe flow velocity =      4.41(Ft/s)
Travel time through pipe =    2.32 min.
Time of concentration (TC) =   12.93 min.

*****
Process from Point/Station      708.000 to Point/Station      708.000
**** CONFLUENCE OF MINOR STREAMS ****

-----
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.830(Ac.)
Runoff from this stream =    13.841(CFS)
Time of concentration =    12.93 min.
Rainfall intensity =    2.932(In/Hr)

*****
Process from Point/Station      801.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****

-----
Initial area flow distance =   337.000(Ft.)
Top (of initial area) elevation = 1433.880(Ft.)
Bottom (of initial area) elevation = 1432.280(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =      0.00475 s(percent)=      0.47
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.663 min.
Rainfall intensity =      3.097(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =    2.228(CFS)
Total initial stream area =      0.870(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      802.000 to Point/Station      803.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

-----
Top of street segment elevation = 1432.280(Ft.)
End of street segment elevation = 1429.390(Ft.)
Length of street segment =   559.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street =    4.182(CFS)
Depth of flow = 0.268(Ft.), Average velocity = 1.948(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 14.744(Ft.)
Flow velocity = 1.95(Ft/s)
Travel time = 4.78 min.      TC = 16.45 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000

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Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.581(In/Hr) for a 100.0 year storm
Subarea runoff = 3.851(CFS) for 1.830(Ac.)
Total runoff = 6.080(CFS) Total area = 2.700(Ac.)
Street flow at end of street = 6.080(CFS)
Half street flow at end of street = 6.080(CFS)
Depth of flow = 0.312(Ft.), Average velocity = 2.140(Ft/s)
Flow width (from curb towards crown)= 16.934(Ft.)

*****
Process from Point/Station 803.100 to Point/Station 803.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.45 min.
Rainfall intensity = 2.581(In/Hr) for a 100.0 year storm
Subarea runoff = 3.830(CFS) for 1.820(Ac.)
Total runoff = 9.910(CFS) Total area = 4.520(Ac.)

*****
Process from Point/Station 803.000 to Point/Station 804.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.930(Ft.)
Downstream point/station elevation = 1425.860(Ft.)
Pipe length = 36.52(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.910(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 9.910(CFS)
Normal flow depth in pipe = 19.69(In.)
Flow top width inside pipe = 18.43(In.)
Critical Depth = 13.52(In.)
Pipe flow velocity = 3.59(Ft/s)
Travel time through pipe = 0.17 min.
Time of concentration (TC) = 16.62 min.

*****
Process from Point/Station 804.100 to Point/Station 804.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.62 min.
Rainfall intensity = 2.567(In/Hr) for a 100.0 year storm
Subarea runoff = 7.552(CFS) for 3.610(Ac.)
Total runoff = 17.462(CFS) Total area = 8.130(Ac.)

*****
Process from Point/Station 804.000 to Point/Station 708.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.760(Ft.)
Downstream point/station elevation = 1425.700(Ft.)
Pipe length = 29.74(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 17.462(CFS)
Given pipe size = 30.00(In.)

```

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Calculated individual pipe flow = 17.462(CFS)
 Normal flow depth in pipe = 23.30(In.)
 Flow top width inside pipe = 24.99(In.)
 Critical Depth = 16.97(In.)
 Pipe flow velocity = 4.27(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 16.73 min.

++++++
 Process from Point/Station 708.000 to Point/Station 708.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 8.130(Ac.)
 Runoff from this stream = 17.462(CFS)
 Time of concentration = 16.73 min.
 Rainfall intensity = 2.558(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.841	12.93	2.932
2	17.462	16.73	2.558

Largest stream flow has longer time of concentration
 Qp = 17.462 + sum of
 Qb Ia/Ib
 13.841 * 0.872 = 12.073
 Qp = 29.535

Total of 2 streams to confluence:
 Flow rates before confluence point:
 13.841 17.462
 Area of streams before confluence:
 5.830 8.130
 Results of confluence:
 Total flow rate = 29.535(CFS)
 Time of concentration = 16.732 min.
 Effective stream area after confluence = 13.960(Ac.)

++++++
 Process from Point/Station 708.000 to Point/Station 709.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.600(Ft.)
 Downstream point/station elevation = 1424.620(Ft.)
 Pipe length = 439.11(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 29.535(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 29.535(CFS)
 Normal flow depth in pipe = 27.66(In.)
 Flow top width inside pipe = 30.38(In.)
 Critical Depth = 21.12(In.)
 Pipe flow velocity = 5.07(Ft/s)
 Travel time through pipe = 1.44 min.
 Time of concentration (TC) = 18.18 min.

++++++
 Process from Point/Station 709.000 to Point/Station 709.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 13.960(Ac.)
 Runoff from this stream = 29.535(CFS)
 Time of concentration = 18.18 min.
 Rainfall intensity = 2.448(In/Hr)

++++++
 Process from Point/Station 1001.000 to Point/Station 1002.000

```

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 372.000(Ft.)
Top (of initial area) elevation = 1434.650(Ft.)
Bottom (of initial area) elevation = 1433.410(Ft.)
Difference in elevation = 1.240(Ft.)
Slope = 0.00333 s(percent)= 0.33
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.023 min.
Rainfall intensity = 2.921(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 3.945(CFS)
Total initial stream area = 1.640(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station 1002.000 to Point/Station 1003.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.410(Ft.)
End of street segment elevation = 1430.420(Ft.)
Length of street segment = 393.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 5.897(CFS)
Depth of flow = 0.285(Ft.), Average velocity = 2.454(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 15.588(Ft.)
Flow velocity = 2.45(Ft/s)
Travel time = 2.67 min. TC = 15.69 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.646(In/Hr) for a 100.0 year storm
Subarea runoff = 3.848(CFS) for 1.780(Ac.)
Total runoff = 7.793(CFS) Total area = 3.420(Ac.)
Street flow at end of street = 7.793(CFS)
Half street flow at end of street = 7.793(CFS)
Depth of flow = 0.319(Ft.), Average velocity = 2.632(Ft/s)
Flow width (from curb towards crown)= 17.284(Ft.)

+++++
Process from Point/Station 1003.100 to Point/Station 1003.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 15.69 min.
Rainfall intensity = 2.646(In/Hr) for a 100.0 year storm
Subarea runoff = 3.913(CFS) for 1.770(Ac.)
Total runoff = 11.706(CFS) Total area = 5.190(Ac.)

*****
Process from Point/Station 1003.000 to Point/Station 709.000
*** PIPEFLOW TRAVEL TIME (Program estimated size) ***

Upstream point/station elevation = 1424.630(Ft.)
Downstream point/station elevation = 1424.620(Ft.)
Pipe length = 4.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.706(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 11.706(CFS)
Normal flow depth in pipe = 21.60(In.)
Flow top width inside pipe = 14.40(In.)
Critical Depth = 14.74(In.)
Pipe flow velocity = 3.93(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 15.71 min.

*****
Process from Point/Station 709.000 to Point/Station 709.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 5.190(Ac.)
Runoff from this stream = 11.706(CFS)
Time of concentration = 15.71 min.
Rainfall intensity = 2.645(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 29.535 18.18 2.448
2 11.706 15.71 2.645
Largest stream flow has longer time of concentration
Qp = 29.535 + sum of
      Qb Ia/Ib
      11.706 * 0.926 = 10.835
Qp = 40.370

Total of 2 streams to confluence:
Flow rates before confluence point:
29.535 11.706
Area of streams before confluence:
13.960 5.190
Results of confluence:
Total flow rate = 40.370(CFS)
Time of concentration = 18.176 min.
Effective stream area after confluence = 19.150(Ac.)

*****
Process from Point/Station 709.000 to Point/Station 710.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Depth of flow = 1.873(Ft.), Average velocity = 7.184(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00

```

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      2          0.00          0.00
      3          3.00          0.00
      4          3.00          4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 40.370(CFS)
' ' flow top width = 3.000(Ft.)
' ' velocity= 7.184(Ft/s)
' ' area = 5.619(Sq.Ft)
' ' Froude number = 0.925

Upstream point elevation = 1424.520(Ft.)
Downstream point elevation = 1424.350(Ft.)
Flow length = 33.730(Ft.)
Travel time = 0.08 min.
Time of concentration = 18.25 min.
Depth of flow = 1.873(Ft.)
Average velocity = 7.184(Ft/s)
Total irregular channel flow = 40.370(CFS)
Irregular channel normal depth above invert elev. = 1.873(Ft.)
Average velocity of channel(s) = 7.184(Ft/s)

+++++
Process from Point/Station 710.100 to Point/Station 710.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.25 min.
Rainfall intensity = 2.443(In/Hr) for a 100.0 year storm
Subarea runoff = 3.825(CFS) for 1.930(Ac.)
Total runoff = 44.195(CFS) Total area = 21.080(Ac.)

+++++
Process from Point/Station 710.000 to Point/Station 711.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.418(Ft.), Average velocity = 5.867(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
      1          0.00          5.00
      2          0.00          0.00
      3          18.00         0.00
      4          18.00          5.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 44.195(CFS)
' ' flow top width = 18.000(Ft.)
' ' velocity= 5.867(Ft/s)
' ' area = 7.533(Sq.Ft)
' ' Froude number = 1.598

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 84.000(Ft.)
Travel time = 0.24 min.
Time of concentration = 18.49 min.
Depth of flow = 0.418(Ft.)
Average velocity = 5.867(Ft/s)
Total irregular channel flow = 44.195(CFS)
Irregular channel normal depth above invert elev. = 0.418(Ft.)
Average velocity of channel(s) = 5.867(Ft/s)
End of computations, total study area = 21.08 (Ac.)

```

Post Development – 100 year - Basin 3 - Reach 2

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The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.500
Area averaged RI index number = 69.7

Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POSTB3R3100.out
-----
14047 POST 3
BASIN 3
14047POSTB3R3100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+-----+
Process from Point/Station 1101.000 to Point/Station 1102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 226.000(Ft.)
Top (of initial area) elevation = 1433.490(Ft.)
Bottom (of initial area) elevation = 1432.810(Ft.)
Difference in elevation = 0.680(Ft.)
Slope = 0.00301 s(percent)= 0.30
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.890 min.
Rainfall intensity = 3.212(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.065(CFS)
Total initial stream area = 0.400(Ac.)
Pervious area fraction = 0.500
+-----+
Process from Point/Station 1102.000 to Point/Station 1103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
```

Post Development – Onsite – 100 year – Basin 3 – Reach 3

Page 1 of 4

Top of street segment elevation = 1432.810(Ft.)
 End of street segment elevation = 1430.330(Ft.)
 Length of street segment = 483.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.083(CFS)
 Depth of flow = 0.178(Ft.), Average velocity = 1.509(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.239(Ft.)
 Flow velocity = 1.51(Ft/s)
 Travel time = 5.33 min. TC = 16.22 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.600(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.903(CFS) for 1.840(Ac.)
 Total runoff = 4.968(CFS) Total area = 2.240(Ac.)
 Street flow at end of street = 4.968(CFS)
 Half street flow at end of street = 2.484(CFS)
 Depth of flow = 0.217(Ft.), Average velocity = 1.703(Ft/s)
 Flow width (from curb towards crown)= 12.187(Ft.)

 Process from Point/Station 1103.000 to Point/Station 1104.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.060(Ft.)
 Downstream point/station elevation = 1426.850(Ft.)
 Pipe length = 41.78(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.968(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 4.968(CFS)
 Normal flow depth in pipe = 10.75(In.)
 Flow top width inside pipe = 17.66(In.)
 Critical Depth = 10.28(In.)
 Pipe flow velocity = 4.51(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 16.38 min.

 Process from Point/Station 1104.100 to Point/Station 1104.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.834
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.38 min.
 Rainfall intensity = 2.587(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.848(CFS) for 1.320(Ac.)

Post Development – Onsite – 100 year – Basin 3 – Reach 3

Page 2 of 4

```

Total runoff =      7.816(CFS)          Total area =      3.560(Ac.)

+++++
Process from Point/Station      1104.000 to Point/Station      1105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.350(Ft.)
Downstream point/station elevation = 1426.180(Ft.)
Pipe length = 34.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.816(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 7.816(CFS)
Normal flow depth in pipe = 16.20(In.)
Flow top width inside pipe = 10.80(In.)
Critical Depth = 12.99(In.)
Pipe flow velocity = 4.66(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 16.50 min.

+++++
Process from Point/Station      1105.100 to Point/Station      1105.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.50 min.
Rainfall intensity = 2.577(In/Hr) for a 100.0 year storm
Subarea runoff = 2.191(CFS) for 1.020(Ac.)
Total runoff = 10.007(CFS)          Total area = 4.580(Ac.)

+++++
Process from Point/Station      1105.200 to Point/Station      1105.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.50 min.
Rainfall intensity = 2.577(In/Hr) for a 100.0 year storm
Subarea runoff = 3.266(CFS) for 1.520(Ac.)
Total runoff = 13.273(CFS)          Total area = 6.100(Ac.)

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+++++
Process from Point/Station 1105.000 to Point/Station 1106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.680(Ft.)
Downstream point/station elevation = 1424.980(Ft.)
Pipe length = 246.09(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.273(CFS)
Given pipe size = 24.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
      0.563(Ft.) at the headworks or inlet of the pipe(s)
      Pipe friction loss = 0.847(Ft.)
      Minor friction loss = 0.416(Ft.) K-factor = 1.50
      Pipe flow velocity = 4.22(Ft/s)
      Travel time through pipe = 0.97 min.
      Time of concentration (TC) = 17.47 min.

+++++
Process from Point/Station 1106.000 to Point/Station 1107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.227(Ft.), Average velocity = 9.362(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              1.00
      2              0.00              0.00
      3              6.25              0.00
      4              6.25              1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 13.273(CFS)
      '      '      flow top width = 6.250(Ft.)
      '      '      velocity= 9.362(Ft/s)
      '      '      area = 1.418(Sq.Ft)
      '      '      Froude number = 3.464

Upstream point elevation = 1424.980(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 23.000(Ft.)
Travel time = 0.04 min.
Time of concentration = 17.51 min.
Depth of flow = 0.227(Ft.)
Average velocity = 9.362(Ft/s)
Total irregular channel flow = 13.273(CFS)
Irregular channel normal depth above invert elev. = 0.227(Ft.)
Average velocity of channel(s) = 9.362(Ft/s)
End of computations, total study area = 6.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 72.8

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Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POSTB3R4100.out
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14047 POST 2
BASIN 3
14047POSTB3R4100.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 1201.000 to Point/Station 1202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 290.000(Ft.)
Top (of initial area) elevation = 1433.520(Ft.)
Bottom (of initial area) elevation = 1433.030(Ft.)
Difference in elevation = 0.490(Ft.)
Slope = 0.00169 s(percent)= 0.17
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.504 min.
Rainfall intensity = 2.866(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.840
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.454(CFS)
Total initial stream area = 1.020(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station 1202.000 to Point/Station 1203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

Post Development – Onsite – 100 year – Basin 3 – Reach 4

Page 1 of 3

Top of street segment elevation = 1433.030(Ft.)
 End of street segment elevation = 1429.670(Ft.)
 Length of street segment = 553.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.953(CFS)
 Depth of flow = 0.278(Ft.), Average velocity = 2.159(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.235(Ft.)
 Flow velocity = 2.16(Ft/s)
 Travel time = 4.27 min. TC = 17.77 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.944(CFS) for 2.400(Ac.)
 Total runoff = 7.398(CFS) Total area = 3.420(Ac.)
 Street flow at end of street = 7.398(CFS)
 Half street flow at end of street = 7.398(CFS)
 Depth of flow = 0.327(Ft.), Average velocity = 2.388(Ft/s)
 Flow width (from curb towards crown)= 17.676(Ft.)

++++++
 Process from Point/Station 1203.100 to Point/Station 1203.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.77 min.
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.472(CFS) for 1.200(Ac.)
 Total runoff = 9.870(CFS) Total area = 4.620(Ac.)

++++++
 Process from Point/Station 1203.200 to Point/Station 1203.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.77 min.
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 5.562(CFS) for 2.700(Ac.)

Post Development – Onsite – 100 year – Basin 3 – Reach 4

Page 2 of 3

Total runoff = 15.433(CFS) Total area = 7.320(Ac.)

Process from Point/Station 1203.000 to Point/Station 1204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.140(Ft.)
 Downstream point/station elevation = 1424.350(Ft.)
 Pipe length = 33.66(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 15.433(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 15.433(CFS)
 Normal flow depth in pipe = 8.94(In.)
 Flow top width inside pipe = 23.21(In.)
 Critical Depth = 17.01(In.)
 Pipe flow velocity = 14.46(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 17.81 min.

Process from Point/Station 1204.000 to Point/Station 1205.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.267(Ft.), Average velocity = 7.699(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	0.00	0.00
3	7.50	0.00
4	7.50	1.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 15.433(CFS)
 ' ' flow top width = 7.500(Ft.)
 ' ' velocity = 7.699(Ft/s)
 ' ' area = 2.004(Sq.Ft)
 ' ' Froude number = 2.625

Upstream point elevation = 1424.350(Ft.)
 Downstream point elevation = 1423.350(Ft.)
 Flow length = 26.000(Ft.)
 Travel time = 0.06 min.
 Time of concentration = 17.87 min.
 Depth of flow = 0.267(Ft.)
 Average velocity = 7.699(Ft/s)
 Total irregular channel flow = 15.433(CFS)
 Irregular channel normal depth above invert elev. = 0.267(Ft.)
 Average velocity of channel(s) = 7.699(Ft/s)
 End of computations, total study area = 7.32 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
 Area averaged RI index number = 75.0

Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R5100.out
-----
14047 POST 2
BASIN 3
14047POSTB3R5100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+-----+
Process from Point/Station 1301.000 to Point/Station 1302.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 186.000(Ft.)
Top (of initial area) elevation = 1432.120(Ft.)
Bottom (of initial area) elevation = 1431.130(Ft.)
Difference in elevation = 0.990(Ft.)
Slope = 0.00532 s(percent)= 0.53
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.988 min.
Rainfall intensity = 3.556(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.390(CFS)
Total initial stream area = 0.460(Ac.)
Pervious area fraction = 0.500
+-----+
Process from Point/Station 1302.000 to Point/Station 1303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1431.130(Ft.)
End of street segment elevation = 1430.010(Ft.)
```

Post Development – 100 year Basin 3 Reach 5

Page 1 of 3

Length of street segment = 303.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.076(CFS)
 Depth of flow = 0.284(Ft.), Average velocity = 1.707(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.539(Ft.)
 Flow velocity = 1.71(Ft/s)
 Travel time = 2.96 min. TC = 11.95 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.843
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 3.058(In/Hr) for a 100.0 year storm
 Subarea runoff = 5.310(CFS) for 2.060(Ac.)
 Total runoff = 6.700(CFS) Total area = 2.520(Ac.)
 Street flow at end of street = 6.700(CFS)
 Half street flow at end of street = 6.700(CFS)
 Depth of flow = 0.344(Ft.), Average velocity = 1.963(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown) = 18.000(Ft.)

 Process from Point/Station 1303.000 to Point/Station 1304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.820(Ft.)
 Downstream point/station elevation = 1426.630(Ft.)
 Pipe length = 37.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.700(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 6.700(CFS)
 Normal flow depth in pipe = 13.27(In.)
 Flow top width inside pipe = 15.85(In.)
 Critical Depth = 12.02(In.)
 Pipe flow velocity = 4.80(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 12.08 min.

 Process from Point/Station 1304.100 to Point/Station 1304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.843
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 12.08 min.
 Rainfall intensity = 3.041(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.023(CFS) for 1.180(Ac.)
 Total runoff = 9.723(CFS) Total area = 3.700(Ac.)

Post Development – 100 year Basin 3 Reach 5

Page 2 of 3

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*****
Process from Point/Station      1304.000 to Point/Station      1305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.490(Ft.)
Downstream point/station elevation = 1424.150(Ft.)
Pipe length = 92.26(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.723(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 9.723(CFS)
Normal flow depth in pipe = 9.86(In.)
Flow top width inside pipe = 17.92(In.)
Critical Depth = 14.44(In.)
Pipe flow velocity = 9.82(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 12.23 min.

*****
Process from Point/Station      1305.000 to Point/Station      1306.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.250(Ft.), Average velocity = 7.778(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                3.00
2                  0.00                0.00
3                  5.00                0.00
4                  5.00                3.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 9.723(CFS)
'      '      flow top width = 5.000(Ft.)
'      '      velocity = 7.778(Ft/s)
'      '      area = 1.250(Sq.Ft)
'      '      Froude number = 2.741

Upstream point elevation = 1424.150(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 18.000(Ft.)
Travel time = 0.04 min.
Time of concentration = 12.27 min.
Depth of flow = 0.250(Ft.)
Average velocity = 7.778(Ft/s)
Total irregular channel flow = 9.723(CFS)
Irregular channel normal depth above invert elev. = 0.250(Ft.)
Average velocity of channel(s) = 7.778(Ft/s)
End of computations, total study area = 3.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

```

Post Development – Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R6100.out
-----
14047 POC 3
basin3-poc3
14047POSTB3R6100.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1401.000 to Point/Station 1402.000
*** INITIAL AREA EVALUATION ***
-----
Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 3.586(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.559(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 1402.000 to Point/Station 1403.000
*** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***
-----
Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
```

Post Development – 100 year - Basin 3 - Reach 6

Page 1 of 8

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Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 12.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 4.019(CFS)
Depth of flow = 0.260(Ft.), Average velocity = 1.981(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 14.337(Ft.)
Flow velocity = 1.98(Ft/s)
Travel time = 7.48 min. TC = 16.32 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
Subarea runoff = 4.852(CFS) for 2.120(Ac.)
Total runoff = 6.411(CFS) Total area = 2.610(Ac.)
Street flow at end of street = 6.411(CFS)
Half street flow at end of street = 6.411(CFS)
Depth of flow = 0.314(Ft.), Average velocity = 2.228(Ft/s)
Flow width (from curb towards crown)= 17.041(Ft.)

+++++
Process from Point/Station 1501.100 to Point/Station 1501.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 16.32 min.
Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
Subarea runoff = 0.229(CFS) for 0.100(Ac.)
Total runoff = 6.640(CFS) Total area = 2.710(Ac.)
+++++
Process from Point/Station 1501.000 to Point/Station 1502.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
Downstream point/station elevation = 1431.710(Ft.)
Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 5.14(In.)
Flow top width inside pipe = 19.70(In.)
Critical Depth = 10.96(In.)
Pipe flow velocity = 13.45(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 16.36 min.

+++++
Process from Point/Station 1502.000 to Point/Station 1403.000

```

Post Development – 100 year - Basin 3 - Reach 6

Page 2 of 8

```

**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----
Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.57(In.)
Flow top width inside pipe = 29.20(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.80(Ft/s)
Travel time through pipe = 1.43 min.
Time of concentration (TC) = 17.79 min.

++++
Process from Point/Station 1403.000 to Point/Station 1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----
Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.60(In.)
Flow top width inside pipe = 29.22(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.79(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 18.16 min.

++++
Process from Point/Station 1601.000 to Point/Station 1404.000
**** SUBAREA FLOW ADDITION ****
-----
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 18.16 min.
Rainfall intensity = 2.449(In/Hr) for a 100.0 year storm
Subarea runoff = 0.194(CFS) for 0.090(Ac.)
Total runoff = 6.834(CFS) Total area = 2.800(Ac.)

++++
Process from Point/Station 1404.000 to Point/Station 1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----
Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.834(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.834(CFS)
Normal flow depth in pipe = 12.66(In.)
Flow top width inside pipe = 29.63(In.)
Critical Depth = 10.38(In.)
Pipe flow velocity = 3.47(Ft/s)
Travel time through pipe = 1.41 min.
Time of concentration (TC) = 19.57 min.

++++
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****
-----
COMMERCIAL subarea type

```

```

Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 19.57 min.
Rainfall intensity = 2.354(In/Hr) for a 100.0 year storm
Subarea runoff = 2.657(CFS) for 1.280(Ac.)
Total runoff = 9.491(CFS) Total area = 4.080(Ac.)

*****
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.491(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 9.491(CFS)
Normal flow depth in pipe = 15.33(In.)
Flow top width inside pipe = 29.99(In.)
Critical Depth = 12.33(In.)
Pipe flow velocity = 3.77(Ft/s)
Travel time through pipe = 4.04 min.
Time of concentration (TC) = 23.61 min.

*****
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.61 min.
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm
Subarea runoff = 2.026(CFS) for 1.080(Ac.)
Total runoff = 11.517(CFS) Total area = 5.160(Ac.)

*****
Process from Point/Station 1701.100 to Point/Station 1701.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.61 min.
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm
Subarea runoff = 0.844(CFS) for 0.450(Ac.)
Total runoff = 12.361(CFS) Total area = 5.610(Ac.)

*****
Process from Point/Station 1701.000 to Point/Station 1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.182(Ft.), Average velocity = 4.310(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :

```

Post Development – 100 year - Basin 3 - Reach 6

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```

Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 12.361(CFS)
'   '   flow top width = 15.750(Ft.)
'   '   velocity= 4.310(Ft/s)
'   '   area = 2.868(Sq.Ft)
'   '   Froude number = 1.780

Upstream point elevation = 1427.200(Ft.)
Downstream point elevation = 1426.490(Ft.)
Flow length = 50.000(Ft.)
Travel time = 0.19 min.
Time of concentration = 23.81 min.
Depth of flow = 0.182(Ft.)
Average velocity = 4.310(Ft/s)
Total irregular channel flow = 12.361(CFS)
Irregular channel normal depth above invert elev. = 0.182(Ft.)
Average velocity of channel(s) = 4.310(Ft/s)

+-----+
Process from Point/Station 1406.000 to Point/Station 1407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+
Depth of flow = 0.390(Ft.), Average velocity = 2.141(Ft/s)
***** Irregular Channel Data *****
+-----+
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             14.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 12.361(CFS)
'   '   flow top width = 14.848(Ft.)
'   '   velocity= 2.141(Ft/s)
'   '   area = 5.775(Sq.Ft)
'   '   Froude number = 0.605

Upstream point elevation = 1426.490(Ft.)
Downstream point elevation = 1426.020(Ft.)
Flow length = 358.000(Ft.)
Travel time = 2.79 min.
Time of concentration = 26.59 min.
Depth of flow = 0.390(Ft.)
Average velocity = 2.141(Ft/s)
Total irregular channel flow = 12.361(CFS)
Irregular channel normal depth above invert elev. = 0.390(Ft.)
Average velocity of channel(s) = 2.141(Ft/s)

+-----+
Process from Point/Station 1407.100 to Point/Station 1407.100
**** SUBAREA FLOW ADDITION ****
+-----+
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 26.59 min.
Rainfall intensity = 2.001(In/Hr) for a 100.0 year storm
Subarea runoff = 2.182(CFS) for 1.240(Ac.)

```

Post Development – 100 year - Basin 3 - Reach 6

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Total runoff = 14.542(CFS) Total area = 6.850(Ac.)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 14.542(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 2.291(Ft/s)
' ' area = 6.348(Sq.Ft)
' ' Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 30.58 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 14.542(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 2.291(Ft/s)
' ' area = 6.348(Sq.Ft)
' ' Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 34.57 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)

Post Development – 100 year - Basin 3 - Reach 6

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```

***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 14.542(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 2.291(Ft/s)
      '      '      area = 6.348(Sq.Ft)
      '      '      Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 38.55 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

*****
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 38.55 min.
Rainfall intensity = 1.643(In/Hr) for a 100.0 year storm
Subarea runoff = 2.274(CFS) for 1.580(Ac.)
Total runoff = 16.817(CFS) Total area = 8.430(Ac.)

*****
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.337(Ft.), Average velocity = 3.173(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 16.817(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 3.173(Ft/s)
      '      '      area = 5.300(Sq.Ft)
      '      '      Froude number = 0.964

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 3.44 min.
Time of concentration = 42.00 min.
Depth of flow = 0.337(Ft.)

```

Average velocity = 3.173(Ft/s)
Total irregular channel flow = 16.817(CFS)
Irregular channel normal depth above invert elev. = 0.337(Ft.)
Average velocity of channel(s) = 3.173(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

Attachment F
Post Development Onsite Mitigated

Attachment F1
Post Development Onsite Mitigated
Map

$TC_2 = 11.99 \text{ min. } Q_2 = 0.45 \text{ CFS}$
 $TC_{10} = 11.60 \text{ min. } Q_{10} = 0.83 \text{ CFS}$
 $TC_{100} = 11.33 \text{ min. } Q_{100} = 1.26 \text{ CFS}$

$TC_2 = 10.19 \text{ min. } Q_2 = 1.27 \text{ CFS}$
 $TC_{10} = 9.57 \text{ min. } Q_{10} = 2.24 \text{ CFS}$
 $TC_{100} = 9.16 \text{ min. } Q_{100} = 3.42 \text{ CFS}$
POC 1

SUB AREA ADDITION 203.1
0.02 ACRES

0.23 ACRES L=241'

0.17 ACRES L=224'

0.83 ACRES L=441'

L=163'
0.19 ACRES

L=317'
0.49 ACRES

POC 2

SUB AREA ADDITION 315.1
0.18 ACRES

SUB AREA ADDITION 315.2
1.77 ACRES

SUB AREA ADDITION 315.3
0.18 ACRES

68.71 ACRES

SUB AREA ADDITION 1501
0.10 ACRES

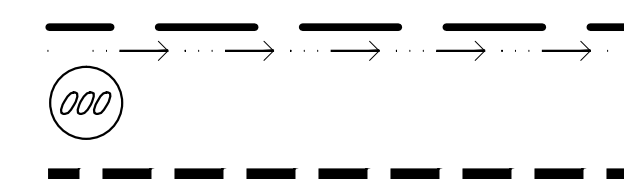
SUB AREA ADDITION 1402-1403
2.12 ACRES

SUB AREA ADDITION 1401-1404
0.09 ACRES

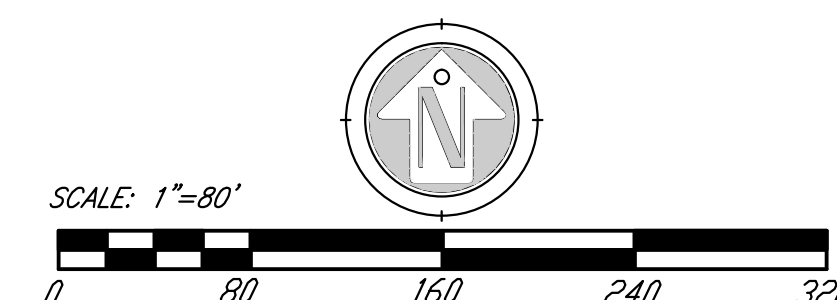
MATCH LINE

SEE POST DEVELOPMENT SOUTH SHEET

LEGEND



ROCKPORT RANCH
POST DEVELOPMENT-MITIGATED
RATIONAL METHOD
NORTH SHEET



RECOMMENDED FOR APPROVAL

DATE:

CHECKED BY:

DATE:

DEVELOPER:

EXCEL
ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
640 STATE PLACE, ESCONDIDO, CA 92025
PH (760) 745-8118 FX (760) 745-1880

TENTATIVE

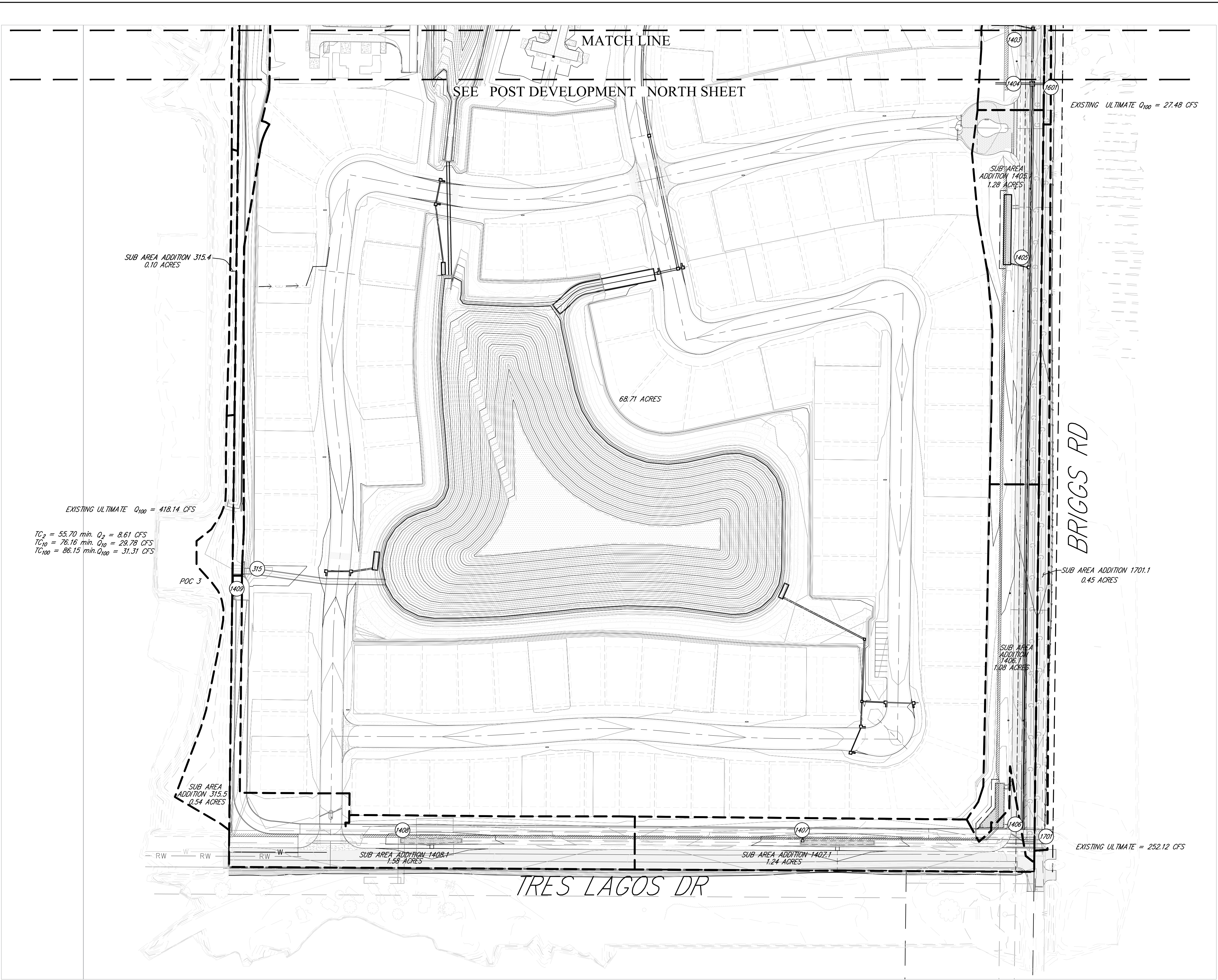
ROCKPORT RANCH

FOR:

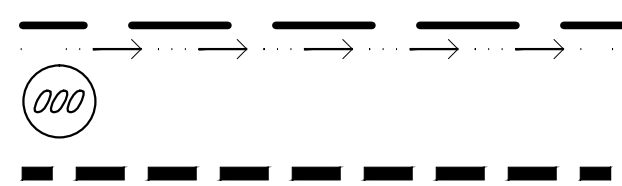
W.O.

DATE:

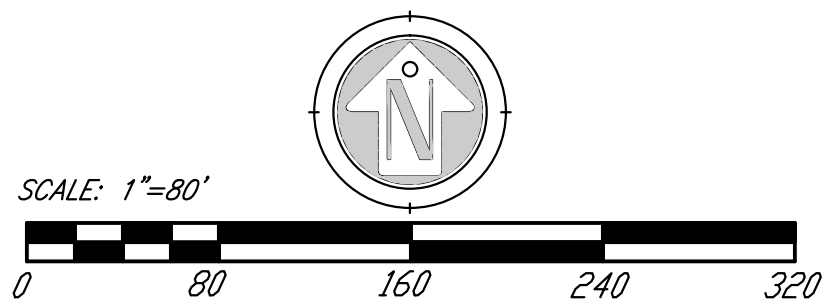
1 OF 2



LEGEND



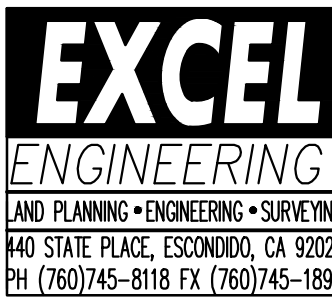
ROCKPORT RANCH
POST DEVELOPMENT-MITIGATED
RATIONAL METHOD
SOUTH SHEET



RECOMMENDED FOR APPROVAL

DATE: _____
CHECKED BY: _____
DATE: _____

DEVELOPER:



TENTATIVE

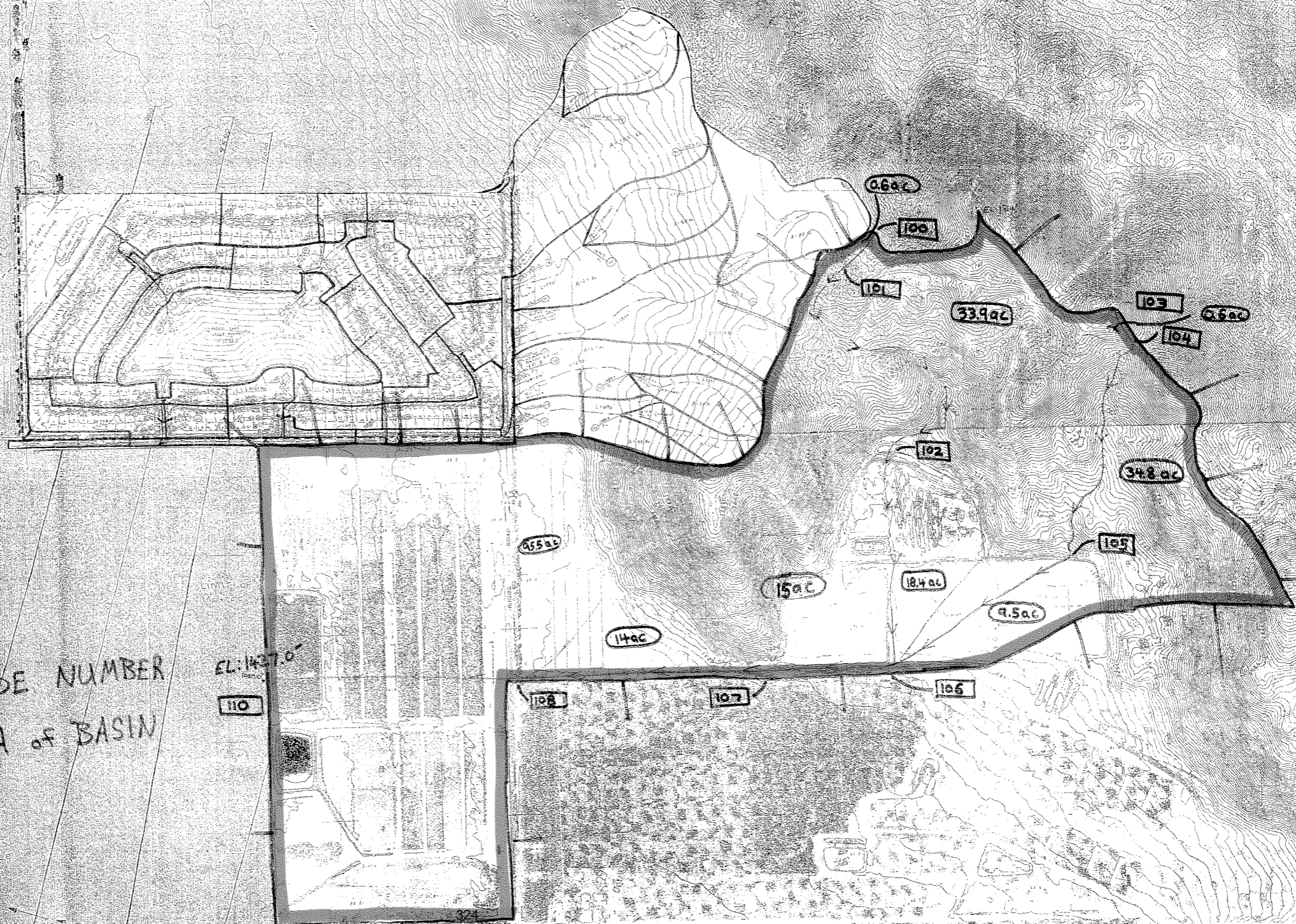
ROCKPORT RANCH

FOR: _____ W.O. _____ DATE: _____

2 OF 2

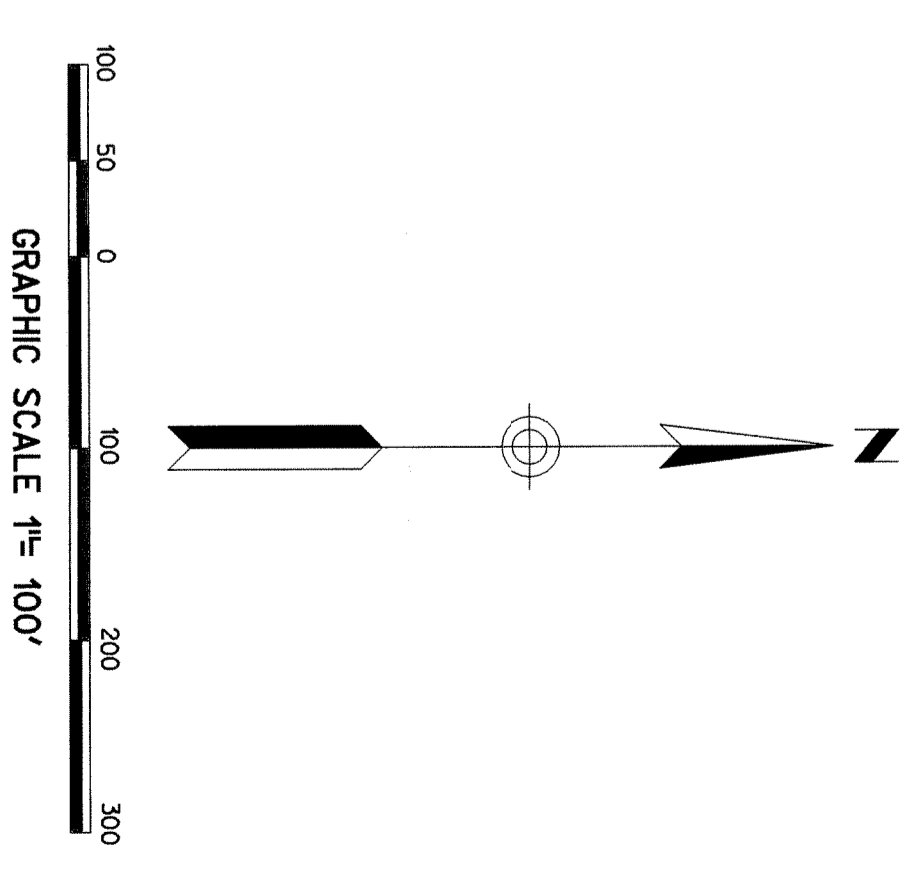
RATIONAL METHOD WORKMAP

DRAINAGE AREA "E1"



1/19/05

THE LAKES, TR 30422-3 HEC-RAS WORKMAP PASEO ANALYSIS



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THE LAKES, TR 30422-3
HEC-RAS WORKMAP
PASEO ANALYSIS

Attachment F2
Post Development Onsite Mitigated
2 Year

Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST2b1.out
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14047 POST 2
basin1-pocl
14047POST2b1.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  163.000(Ft.)
Top (of initial area) elevation =  1440.000(Ft.)
Bottom (of initial area) elevation =  1436.800(Ft.)
Difference in elevation =  3.200(Ft.)
Slope =  0.01963 s(percent)=  1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  5.051 min.
Rainfall intensity =  1.903(In/Hr) for a  2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =  0.318(CFS)
Total initial stream area =  0.190(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station      102.000 to Point/Station      103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1436.800(Ft.)
End of street segment elevation =  1433.900(Ft.)
Length of street segment =  441.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
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Post Development-Onsite-2 year-Basin 1

Page 1 of 2

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Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.750
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 2.000
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 0.822(CFS)
Depth of flow = 0.223(Ft.), Average velocity = 1.473(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 6.876(Ft.)
Flow velocity = 1.47(Ft/s)
Travel time = 4.99 min. TC = 10.04 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.313(In/Hr) for a 2.0 year storm
Subarea runoff = 0.950(CFS) for 0.830(Ac.)
Total runoff = 1.268(CFS) Total area = 1.020(Ac.)
Street flow at end of street = 1.268(CFS)
Half street flow at end of street = 1.268(CFS)
Depth of flow = 0.252(Ft.), Average velocity = 1.623(Ft/s)
Flow width (from curb towards crown)= 8.342(Ft.)

+++++
Process from Point/Station 103.000 to Point/Station 104.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
Downstream point/station elevation = 1429.140(Ft.)
Pipe length = 35.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.268(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.268(CFS)
Normal flow depth in pipe = 4.14(In.)
Flow top width inside pipe = 15.15(In.)
Critical Depth = 5.05(In.)
Pipe flow velocity = 4.13(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 10.19 min.
End of computations, total study area = 1.02 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

```

Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST2b2.out
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14047 POST 2
BASIN 2 -poc 2
14047POST2b2.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 Hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400
+++++
Process from Point/Station      201.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  224.000(Ft.)
Top (of initial area) elevation =  1434.700(Ft.)
Bottom (of initial area) elevation =  1433.990(Ft.)
Difference in elevation =  0.710(Ft.)
Slope =  0.00317  s(percent)=  0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  8.261 min.
Rainfall intensity =  1.459(In/Hr) for a  2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff =  0.217(CFS)
Total initial stream area =  0.170(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station      202.000 to Point/Station      203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1433.990(Ft.)
End of street segment elevation =  1432.770(Ft.)
Length of street segment =  241.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  18.000(Ft.)
Distance from crown to crossfall grade break =  16.000(Ft.)
```

Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.363(CFS)
 Depth of flow = 0.183(Ft.), Average velocity = 1.125(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 4.878(Ft.)
 Flow velocity = 1.12(Ft/s)
 Travel time = 3.57 min. TC = 11.83 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 1.202(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.240(CFS) for 0.230(Ac.)
 Total runoff = 0.457(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 0.457(CFS)
 Half street flow at end of street = 0.457(CFS)
 Depth of flow = 0.195(Ft.), Average velocity = 1.175(Ft/s)
 Flow width (from curb towards crown) = 5.513(Ft.)

 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.870
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.83 min.
 Rainfall intensity = 1.202(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.021(CFS) for 0.020(Ac.)
 Total runoff = 0.478(CFS) Total area = 0.420(Ac.)

 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.478(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.478(CFS)
 Normal flow depth in pipe = 1.64(In.)
 Flow top width inside pipe = 10.36(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 5.96(Ft/s)
 Travel time through pipe = 0.16 min.
 Time of concentration (TC) = 11.99 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Mitigated Onsite – 2 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST2B3R1.out
-----
14047 POST 2 MITIGATED
BASIN 3
14047POST2b3r1.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

+++++
Process from Point/Station      314.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      0.402(In/Hr) for a      2.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.631
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 90.00 min. Rain intensity =      0.40(In/Hr)
Total area =      68.71(Ac.) Total runoff =      3.78(CFS)

+++++
Process from Point/Station      314.000 to Point/Station      315.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.280(Ft.), Average velocity = 1.685(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                0.00                6.00
2                0.00                0.00
3                8.00                0.00
4                8.00                6.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow =      3.779(CFS)
flow top width =      8.000(Ft.)
```

Post Development-Mitigated Onsite-2 year-Basin 3 Reach 1

Page 1 of 4

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'      '      velocity=    1.685(Ft/s)
'      '      area  =    2.243(Sq.Ft)
'      '      Froude number =    0.561

Upstream point elevation = 1423.350(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 231.800(Ft.)
Travel time = 2.29 min.
Time of concentration = 92.29 min.
Depth of flow = 0.280(Ft.)
Average velocity = 1.685(Ft/s)
Total irregular channel flow = 3.779(CFS)
Irregular channel normal depth above invert elev. = 0.280(Ft.)
Average velocity of channel(s) = 1.685(Ft/s)

+++++
Process from Point/Station 315.100 to Point/Station 315.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.662
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr) for a 2.0 year storm
Subarea runoff = 0.047(CFS) for 0.180(Ac.)
Total runoff = 3.826(CFS) Total area = 68.890(Ac.)

+++++
Process from Point/Station 315.200 to Point/Station 315.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.662
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr) for a 2.0 year storm
Subarea runoff = 0.464(CFS) for 1.770(Ac.)
Total runoff = 4.291(CFS) Total area = 70.660(Ac.)

+++++
Process from Point/Station 315.300 to Point/Station 315.300
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.662
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr) for a 2.0 year storm
Subarea runoff = 0.047(CFS) for 0.180(Ac.)
Total runoff = 4.338(CFS) Total area = 70.840(Ac.)

+++++
Process from Point/Station 315.400 to Point/Station 315.400
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)

```

```

Runoff Coefficient = 0.662
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr) for a 2.0 year storm
Subarea runoff = 0.026(CFS) for 0.100(Ac.)
Total runoff = 4.364(CFS) Total area = 70.940(Ac.)

*****
Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.662
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr) for a 2.0 year storm
Subarea runoff = 0.142(CFS) for 0.540(Ac.)
Total runoff = 4.506(CFS) Total area = 71.480(Ac.)

*****
Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 4.506(CFS)
Time of concentration = 92.29 min.
Rainfall intensity = 0.396(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 4.506 92.29 0.396
Largest stream flow has longer time of concentration
Qp = 4.506 + sum of
Qp = 4.506

Total of 1 main streams to confluence:
Flow rates before confluence point:
4.506
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 4.506(CFS)
Time of concentration = 92.293 min.
Effective stream area after confluence = 71.480(Ac.)

*****
Process from Point/Station 1409.000 to Point/Station 315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 0.520(In/Hr) for a 2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.852
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

```

Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 55.70 min. Rain intensity = 0.52(In/Hr)
 Total area = 8.43(Ac.) Total runoff = 5.89(CFS)

++++++
 Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 8.430(Ac.)
 Runoff from this stream = 5.890(CFS)
 Time of concentration = 55.70 min.
 Rainfall intensity = 0.520(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.506	92.29	0.396
2	5.890	55.70	0.520

Largest stream flow has longer or shorter time of concentration
 Qp = 5.890 + sum of
 Qa Tb/Ta
 4.506 * 0.604 = 2.719
 Qp = 8.609

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 4.506 5.890
 Area of streams before confluence:
 71.480 8.430

Results of confluence:
 Total flow rate = 8.609(CFS)
 Time of concentration = 55.700 min.
 Effective stream area after confluence = 79.910(Ac.)
 End of computations, total study area = 79.91 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.458
 Area averaged RI index number = 69.2

Post Development – Onsite – 2 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POSTB3R62.out
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14047 POST 2
Basin 3 Reach 6
14047POSTB3R62.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =      2.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =      2.0
Calculated rainfall intensity data:
1 hour intensity =  0.500(In/Hr)
Slope of intensity duration curve = 0.5400

*****
Process from Point/Station      1401.000 to Point/Station      1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =  317.000(Ft.)
Top (of initial area) elevation =  1440.000(Ft.)
Bottom (of initial area) elevation =  1438.570(Ft.)
Difference in elevation =  1.430(Ft.)
Slope =  0.00451 s(percent)=  0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =  8.845 min.
Rainfall intensity =  1.406(In/Hr) for a  2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff =  0.601(CFS)
Total initial stream area =  0.490(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station      1402.000 to Point/Station      1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1438.570(Ft.)
End of street segment elevation =  1433.630(Ft.)
Length of street segment =  889.000(Ft.)
Height of curb above gutter flowline =  6.0(In.)
Width of half street (curb to crown) =  24.000(Ft.)
Distance from crown to crossfall grade break =  22.000(Ft.)
```

Post Development – 2 year Basin 3 - Reach 6

Page 1 of 8

Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.499(CFS)
 Depth of flow = 0.173(Ft.), Average velocity = 1.543(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.991(Ft.)
 Flow velocity = 1.54(Ft/s)
 Travel time = 9.60 min. TC = 18.45 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.865
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 0.945(In/Hr) for a 2.0 year storm
 Subarea runoff = 1.734(CFS) for 2.120(Ac.)
 Total runoff = 2.335(CFS) Total area = 2.610(Ac.)
 Street flow at end of street = 2.335(CFS)
 Half street flow at end of street = 2.335(CFS)
 Depth of flow = 0.208(Ft.), Average velocity = 1.727(Ft/s)
 Flow width (from curb towards crown)= 11.743(Ft.)

 Process from Point/Station 1501.100 to Point/Station 1501.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.865
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 18.45 min.
 Rainfall intensity = 0.945(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.082(CFS) for 0.100(Ac.)
 Total runoff = 2.417(CFS) Total area = 2.710(Ac.)

 Process from Point/Station 1501.000 to Point/Station 1502.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
 Downstream point/station elevation = 1431.710(Ft.)
 Pipe length = 32.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.417(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.417(CFS)
 Normal flow depth in pipe = 3.14(In.)
 Flow top width inside pipe = 16.19(In.)
 Critical Depth = 6.49(In.)
 Pipe flow velocity = 9.97(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 18.50 min.

 Process from Point/Station 1502.000 to Point/Station 1403.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

```

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.417(CFS)
Normal flow depth in pipe = 6.86(In.)
Flow top width inside pipe = 25.20(In.)
Critical Depth = 6.09(In.)
Pipe flow velocity = 2.86(Ft/s)
Travel time through pipe = 1.90 min.
Time of concentration (TC) = 20.40 min.

*****
Process from Point/Station 1403.000 to Point/Station 1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.417(CFS)
Normal flow depth in pipe = 6.88(In.)
Flow top width inside pipe = 25.22(In.)
Critical Depth = 6.09(In.)
Pipe flow velocity = 2.85(Ft/s)
Travel time through pipe = 0.49 min.
Time of concentration (TC) = 20.89 min.

*****
Process from Point/Station 1601.000 to Point/Station 1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 20.89 min.
Rainfall intensity = 0.884(In/Hr) for a 2.0 year storm
Subarea runoff = 0.069(CFS) for 0.090(Ac.)
Total runoff = 2.486(CFS) Total area = 2.800(Ac.)

*****
Process from Point/Station 1404.000 to Point/Station 1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.486(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 2.486(CFS)
Normal flow depth in pipe = 7.45(In.)
Flow top width inside pipe = 25.92(In.)
Critical Depth = 6.16(In.)
Pipe flow velocity = 2.62(Ft/s)
Travel time through pipe = 1.87 min.
Time of concentration (TC) = 22.76 min.

*****
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.863
Decimal fraction soil group A = 0.000

```

```

Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 22.76 min.
Rainfall intensity = 0.844(In/Hr) for a 2.0 year storm
Subarea runoff = 0.932(CFS) for 1.280(Ac.)
Total runoff = 3.417(CFS) Total area = 4.080(Ac.)

*****
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.417(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 3.417(CFS)
Normal flow depth in pipe = 8.78(In.)
Flow top width inside pipe = 27.30(In.)
Critical Depth = 7.27(In.)
Pipe flow velocity = 2.86(Ft/s)
Travel time through pipe = 5.33 min.
Time of concentration (TC) = 28.09 min.

*****
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.09 min.
Rainfall intensity = 0.753(In/Hr) for a 2.0 year storm
Subarea runoff = 0.700(CFS) for 1.080(Ac.)
Total runoff = 4.117(CFS) Total area = 5.160(Ac.)

*****
Process from Point/Station 1701.100 to Point/Station 1701.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.09 min.
Rainfall intensity = 0.753(In/Hr) for a 2.0 year storm
Subarea runoff = 0.292(CFS) for 0.450(Ac.)
Total runoff = 4.409(CFS) Total area = 5.610(Ac.)

*****
Process from Point/Station 1701.000 to Point/Station 1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.098(Ft.), Average velocity = 2.866(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00

```

2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.409(CFS)
 ' ' flow top width = 15.750(Ft.)
 ' ' velocity = 2.866(Ft/s)
 ' ' area = 1.539(Sq.Ft)
 ' ' Froude number = 1.616

Upstream point elevation = 1427.200(Ft.)
 Downstream point elevation = 1426.490(Ft.)
 Flow length = 50.000(Ft.)
 Travel time = 0.29 min.
 Time of concentration = 28.38 min.
 Depth of flow = 0.098(Ft.)
 Average velocity = 2.866(Ft/s)
 Total irregular channel flow = 4.409(CFS)
 Irregular channel normal depth above invert elev. = 0.098(Ft.)
 Average velocity of channel(s) = 2.866(Ft/s)

 Process from Point/Station 1406.000 to Point/Station 1407.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.209(Ft.), Average velocity = 1.431(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 4.00
 2 0.00 0.00
 3 14.75 0.00
 4 15.75 4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 4.409(CFS)
 ' ' flow top width = 14.802(Ft.)
 ' ' velocity = 1.431(Ft/s)
 ' ' area = 3.081(Sq.Ft)
 ' ' Froude number = 0.553

Upstream point elevation = 1426.490(Ft.)
 Downstream point elevation = 1426.020(Ft.)
 Flow length = 358.000(Ft.)
 Travel time = 4.17 min.
 Time of concentration = 32.55 min.
 Depth of flow = 0.209(Ft.)
 Average velocity = 1.431(Ft/s)
 Total irregular channel flow = 4.409(CFS)
 Irregular channel normal depth above invert elev. = 0.209(Ft.)
 Average velocity of channel(s) = 1.431(Ft/s)

 Process from Point/Station 1407.100 to Point/Station 1407.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.858
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 32.55 min.
 Rainfall intensity = 0.696(In/Hr) for a 2.0 year storm
 Subarea runoff = 0.740(CFS) for 1.240(Ac.)
 Total runoff = 5.149(CFS) Total area = 6.850(Ac.)

```

+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 5.149(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.526(Ft/s)
' ' area = 3.374(Sq.Ft)
' ' Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 38.53 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 5.149(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.526(Ft/s)
' ' area = 3.374(Sq.Ft)
' ' Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 44.52 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station      1407.000 to Point/Station      1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

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Post Development – 2 year Basin 3 - Reach 6

Page 6 of 8

```

Depth of flow = 0.214(Ft.), Average velocity = 1.526(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 5.149(CFS)
      '      flow top width = 15.750(Ft.)
      '      velocity= 1.526(Ft/s)
      '      area = 3.374(Sq.Ft)
      '      Froude number = 0.581

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 5.98 min.
Time of concentration = 50.50 min.
Depth of flow = 0.214(Ft.)
Average velocity = 1.526(Ft/s)
Total irregular channel flow = 5.149(CFS)
Irregular channel normal depth above invert elev. = 0.214(Ft.)
Average velocity of channel(s) = 1.526(Ft/s)

+++++
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 50.50 min.
Rainfall intensity = 0.549(In/Hr) for a 2.0 year storm
Subarea runoff = 0.740(CFS) for 1.580(Ac.)
Total runoff = 5.889(CFS) Total area = 8.430(Ac.)

+++++
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.178(Ft.), Average velocity = 2.102(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 5.889(CFS)
      '      flow top width = 15.750(Ft.)
      '      velocity= 2.102(Ft/s)
      '      area = 2.802(Sq.Ft)
      '      Froude number = 0.878

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 5.19 min.

```

Time of concentration = 55.70 min.
Depth of flow = 0.178(Ft.)
Average velocity = 2.102(Ft/s)
Total irregular channel flow = 5.889(CFS)
Irregular channel normal depth above invert elev. = 0.178(Ft.)
Average velocity of channel(s) = 2.102(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 69.0

Attachment F3
Post Development Onsite Mitigated
10 Year

Post Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/26/19   File:14047POST10b1.out
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14047 POC 1
basin1-pocl
14047POST10b1.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012

-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 3.230(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.544(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100
+++++
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1436.800(Ft.)
End of street segment elevation = 1433.900(Ft.)
```

Post Development – Onsite – 10 year – Basin 1

Page 1 of 2

Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 1.437(CFS)
 Depth of flow = 0.261(Ft.), Average velocity = 1.670(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 8.804(Ft.)
 Flow velocity = 1.67(Ft/s)
 Travel time = 4.40 min. TC = 9.45 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.882
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.317(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.695(CFS) for 0.830(Ac.)
 Total runoff = 2.239(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 2.239(CFS)
 Half street flow at end of street = 2.239(CFS)
 Depth of flow = 0.297(Ft.), Average velocity = 1.854(Ft/s)
 Flow width (from curb towards crown) = 10.597(Ft.)

++++++
 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.239(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.239(CFS)
 Normal flow depth in pipe = 5.53(In.)
 Flow top width inside pipe = 16.60(In.)
 Critical Depth = 6.78(In.)
 Pipe flow velocity = 4.87(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 9.57 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 10 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/26/19 File:14047POST10b2.out
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14047 POST 2
BASIN 2 -poc 2
14047POST10b2.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

-----
Program License Serial Number 4012

-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)
Top (of initial area) elevation = 1434.700(Ft.)
Bottom (of initial area) elevation = 1433.990(Ft.)
Difference in elevation = 0.710(Ft.)
Slope = 0.00317 s(percent)= 0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.261 min.
Rainfall intensity = 2.488(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.373(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

+++++
Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)
End of street segment elevation = 1432.770(Ft.)
Length of street segment = 241.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
```

Post Development – Onsite – 10 year – Basin 2

Page 1 of 2

Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on 11 side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.626(CFS)
 Depth of flow = 0.214(Ft.), Average velocity = 1.254(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 6.436(Ft.)
 Flow velocity = 1.25(Ft/s)
 Travel time = 3.20 min. TC = 11.46 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.880
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.092(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.423(CFS) for 0.230(Ac.)
 Total runoff = 0.797(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 0.797(CFS)
 Half street flow at end of street = 0.797(CFS)
 Depth of flow = 0.229(Ft.), Average velocity = 1.321(Ft/s)
 Flow width (from curb towards crown)= 7.197(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.880
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.46 min.
 Rainfall intensity = 2.092(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.037(CFS) for 0.020(Ac.)
 Total runoff = 0.833(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.833(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.833(CFS)
 Normal flow depth in pipe = 2.14(In.)
 Flow top width inside pipe = 11.65(In.)
 Critical Depth = 4.06(In.)
 Pipe flow velocity = 7.05(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 11.60 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Mitigated Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST10B3R1.out
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14047 POST 2 MITIGATED
BASIN 3
14047POST10b3r1.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 314.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 0.773(In/Hr) for a 10.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 75.00 min. Rain intensity = 0.77(In/Hr)
Total area = 68.71(Ac.) Total runoff = 23.23(CFS)
+++++
Process from Point/Station 314.000 to Point/Station 315.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.878(Ft.), Average velocity = 3.306(Ft/s)
***** Irregular Channel Data *****
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Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                0.00                6.00
2                0.00                0.00
3                8.00                0.00
4                8.00                6.00
Manning's 'N' friction factor = 0.015
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Post Development-Mitigated Onsite-10 year-Basin 3 Reach 1

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Sub-Channel flow = 23.230(CFS)
      flow top width = 8.000(Ft.)
      velocity= 3.306(Ft/s)
      area = 7.026(Sq.Ft)
      Froude number = 0.622

Upstream point elevation = 1423.350(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 231.800(Ft.)
Travel time = 1.17 min.
Time of concentration = 76.17 min.
Depth of flow = 0.878(Ft.)
Average velocity = 3.306(Ft/s)
Total irregular channel flow = 23.230(CFS)
Irregular channel normal depth above invert elev. = 0.878(Ft.)
Average velocity of channel(s) = 3.306(Ft/s)

+++++
Process from Point/Station 315.100 to Point/Station 315.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.735
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 76.17 min.
Rainfall intensity = 0.767(In/Hr) for a 10.0 year storm
Subarea runoff = 0.101(CFS) for 0.180(Ac.)
Total runoff = 23.331(CFS) Total area = 68.890(Ac.)

+++++
Process from Point/Station 315.200 to Point/Station 315.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.735
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 76.17 min.
Rainfall intensity = 0.767(In/Hr) for a 10.0 year storm
Subarea runoff = 0.997(CFS) for 1.770(Ac.)
Total runoff = 24.329(CFS) Total area = 70.660(Ac.)

+++++
Process from Point/Station 315.300 to Point/Station 315.300
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.735
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 76.17 min.
Rainfall intensity = 0.767(In/Hr) for a 10.0 year storm
Subarea runoff = 0.101(CFS) for 0.180(Ac.)
Total runoff = 24.430(CFS) Total area = 70.840(Ac.)

+++++
Process from Point/Station 315.400 to Point/Station 315.400

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Post Development-Mitigated Onsite-10 year-Basin 3 Reach 1

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**** SUBAREA FLOW ADDITION ****

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SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.735
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 76.17 min.
 Rainfall intensity = 0.767(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.056(CFS) for 0.100(Ac.)
 Total runoff = 24.486(CFS) Total area = 70.940(Ac.)

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+++++
Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

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SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.735
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 76.17 min.
 Rainfall intensity = 0.767(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.304(CFS) for 0.540(Ac.)
 Total runoff = 24.791(CFS) Total area = 71.480(Ac.)

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+++++
Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

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The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 71.480(Ac.)
 Runoff from this stream = 24.791(CFS)
 Time of concentration = 76.17 min.
 Rainfall intensity = 0.767(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	24.791	76.17	0.767

Largest stream flow has longer time of concentration
 Qp = 24.791 + sum of
 Qp = 24.791

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 24.791
 Area of streams before confluence:
 71.480

Results of confluence:
 Total flow rate = 24.791(CFS)
 Time of concentration = 76.168 min.
 Effective stream area after confluence = 71.480(Ac.)

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+++++
Process from Point/Station 1409.000 to Point/Station 315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

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Rainfall intensity = 0.905(In/Hr) for a 10.0 year storm
 COMMERCIAL subarea type

Runoff Coefficient = 0.864
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 55.70 min. Rain intensity = 0.90(In/Hr)
 Total area = 8.43(Ac.) Total runoff = 5.89(CFS)

++++++
 Process from Point/Station 315.000 to Point/Station 315.000
 *** CONFLUENCE OF MAIN STREAMS ***

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 8.430(Ac.)
 Runoff from this stream = 5.890(CFS)
 Time of concentration = 55.70 min.
 Rainfall intensity = 0.905(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	24.791	76.17	0.767
2	5.890	55.70	0.905

Largest stream flow has longer time of concentration
 Qp = 24.791 + sum of
 Qb Ia/Ib
 5.890 * 0.847 = 4.990
 Qp = 29.780

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 24.791 5.890
 Area of streams before confluence:
 71.480 8.430

Results of confluence:
 Total flow rate = 29.780(CFS)
 Time of concentration = 76.168 min.
 Effective stream area after confluence = 79.910(Ac.)
 End of computations, total study area = 79.91 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.458
 Area averaged RI index number = 69.2

Post Development – Onsite – 10 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R610.out
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14047 POC 3
basin3-poc3
14047POSTB3R610.rrv
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***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.870(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 1401.000 to Point/Station 1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 2.400(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.037(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100
+++++
Process from Point/Station 1402.000 to Point/Station 1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
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Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 12.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 2.654(CFS)
Depth of flow = 0.219(Ft.), Average velocity = 1.784(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 12.307(Ft.)
Flow velocity = 1.78(Ft/s)
Travel time = 8.31 min. TC = 17.15 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
Subarea runoff = 3.139(CFS) for 2.120(Ac.)
Total runoff = 4.177(CFS) Total area = 2.610(Ac.)
Street flow at end of street = 4.177(CFS)
Half street flow at end of street = 4.177(CFS)
Depth of flow = 0.264(Ft.), Average velocity = 2.000(Ft/s)
Flow width (from curb towards crown)= 14.542(Ft.)

+++++
Process from Point/Station 1501.100 to Point/Station 1501.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 17.15 min.
Rainfall intensity = 1.690(In/Hr) for a 10.0 year storm
Subarea runoff = 0.148(CFS) for 0.100(Ac.)
Total runoff = 4.325(CFS) Total area = 2.710(Ac.)

+++++
Process from Point/Station 1501.000 to Point/Station 1502.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
Downstream point/station elevation = 1431.710(Ft.)
Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.325(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 4.325(CFS)
Normal flow depth in pipe = 4.17(In.)
Flow top width inside pipe = 18.18(In.)
Critical Depth = 8.76(In.)
Pipe flow velocity = 11.86(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 17.19 min.

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Process from Point/Station    1502.000 to Point/Station    1403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.325(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.325(CFS)
Normal flow depth in pipe = 9.22(In.)
Flow top width inside pipe = 27.69(In.)
Critical Depth = 8.20(In.)
Pipe flow velocity = 3.38(Ft/s)
Travel time through pipe = 1.61 min.
Time of concentration (TC) = 18.80 min.
+-----+
Process from Point/Station    1403.000 to Point/Station    1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.325(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.325(CFS)
Normal flow depth in pipe = 9.25(In.)
Flow top width inside pipe = 27.71(In.)
Critical Depth = 8.20(In.)
Pipe flow velocity = 3.36(Ft/s)
Travel time through pipe = 0.42 min.
Time of concentration (TC) = 19.22 min.

+-----+
Process from Point/Station    1601.000 to Point/Station    1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 19.22 min.
Rainfall intensity = 1.590(In/Hr) for a 10.0 year storm
Subarea runoff = 0.125(CFS) for 0.090(Ac.)
Total runoff = 4.450(CFS) Total area = 2.800(Ac.)

+-----+
Process from Point/Station    1404.000 to Point/Station    1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.450(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.450(CFS)
Normal flow depth in pipe = 10.04(In.)
Flow top width inside pipe = 28.31(In.)
Critical Depth = 8.32(In.)
Pipe flow velocity = 3.09(Ft/s)
Travel time through pipe = 1.58 min.
Time of concentration (TC) = 20.81 min.

+-----+
Process from Point/Station    1405.100 to Point/Station    1405.100
**** SUBAREA FLOW ADDITION ****

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COMMERCIAL subarea type
 Runoff Coefficient = 0.875
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 20.81 min.
 Rainfall intensity = 1.525(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.707(CFS) for 1.280(Ac.)
 Total runoff = 6.157(CFS) Total area = 4.080(Ac.)

 Process from Point/Station 1405.000 to Point/Station 1406.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
 Downstream point/station elevation = 1426.980(Ft.)
 Pipe length = 912.86(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.157(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 6.157(CFS)
 Normal flow depth in pipe = 11.99(In.)
 Flow top width inside pipe = 29.39(In.)
 Critical Depth = 9.84(In.)
 Pipe flow velocity = 3.36(Ft/s)
 Travel time through pipe = 4.52 min.
 Time of concentration (TC) = 25.33 min.

 Process from Point/Station 1406.100 to Point/Station 1406.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.873
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 25.33 min.
 Rainfall intensity = 1.374(In/Hr) for a 10.0 year storm
 Subarea runoff = 1.295(CFS) for 1.080(Ac.)
 Total runoff = 7.452(CFS) Total area = 5.160(Ac.)

 Process from Point/Station 1701.100 to Point/Station 1701.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.873
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 25.33 min.
 Rainfall intensity = 1.374(In/Hr) for a 10.0 year storm
 Subarea runoff = 0.540(CFS) for 0.450(Ac.)
 Total runoff = 7.992(CFS) Total area = 5.610(Ac.)

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+++++
Process from Point/Station      1701.000 to Point/Station      1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

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Depth of flow = 0.140(Ft.), Average velocity = 3.628(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 7.992(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 3.628(Ft/s)
      '      '      area = 2.203(Sq.Ft)
      '      '      Froude number = 1.709

Upstream point elevation = 1427.200(Ft.)
Downstream point elevation = 1426.490(Ft.)
Flow length = 50.000(Ft.)
Travel time = 0.23 min.
Time of concentration = 25.56 min.
Depth of flow = 0.140(Ft.)
Average velocity = 3.628(Ft/s)
Total irregular channel flow = 7.992(CFS)
Irregular channel normal depth above invert elev. = 0.140(Ft.)
Average velocity of channel(s) = 3.628(Ft/s)

+++++
Process from Point/Station      1406.000 to Point/Station      1407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.299(Ft.), Average velocity = 1.807(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             14.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013

-----
Sub-Channel flow = 7.992(CFS)
      '      '      flow top width = 14.825(Ft.)
      '      '      velocity= 1.807(Ft/s)
      '      '      area = 4.424(Sq.Ft)
      '      '      Froude number = 0.583

Upstream point elevation = 1426.490(Ft.)
Downstream point elevation = 1426.020(Ft.)
Flow length = 358.000(Ft.)
Travel time = 3.30 min.
Time of concentration = 28.86 min.
Depth of flow = 0.299(Ft.)
Average velocity = 1.807(Ft/s)
Total irregular channel flow = 7.992(CFS)
Irregular channel normal depth above invert elev. = 0.299(Ft.)
Average velocity of channel(s) = 1.807(Ft/s)

+++++
Process from Point/Station      1407.100 to Point/Station      1407.100
**** SUBAREA FLOW ADDITION ****

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COMMERCIAL subarea type
Runoff Coefficient = 0.871
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 28.86 min.
Rainfall intensity = 1.282(In/Hr) for a 10.0 year storm
Subarea runoff = 1.385(CFS) for 1.240(Ac.)
Total runoff = 9.378(CFS) Total area = 6.850(Ac.)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 33.59 min.
Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 38.32 min.

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Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.308(Ft.), Average velocity = 1.931(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 9.378(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 1.931(Ft/s)
' ' area = 4.857(Sq.Ft)
' ' Froude number = 0.613

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 4.73 min.
Time of concentration = 43.05 min.
Depth of flow = 0.308(Ft.)
Average velocity = 1.931(Ft/s)
Total irregular channel flow = 9.378(CFS)
Irregular channel normal depth above invert elev. = 0.308(Ft.)
Average velocity of channel(s) = 1.931(Ft/s)

+++++
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

-----
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 43.05 min.
Rainfall intensity = 1.037(In/Hr) for a 10.0 year storm
Subarea runoff = 1.421(CFS) for 1.580(Ac.)
Total runoff = 10.799(CFS) Total area = 8.430(Ac.)

+++++
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 0.257(Ft.), Average velocity = 2.668(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 10.799(CFS)

```

```

'      '      flow top width =      15.750(Ft.)
'      '      velocity=      2.668(Ft/s)
'      '      area =      4.047(Sq.Ft)
'      '      Froude number =      0.928

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 4.09 min.
Time of concentration = 47.14 min.
Depth of flow = 0.257(Ft.)
Average velocity = 2.668(Ft/s)
Total irregular channel flow = 10.799(CFS)
Irregular channel normal depth above invert elev. = 0.257(Ft.)
Average velocity of channel(s) = 2.668(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

```

Attachment F4
Post Development Onsite Mitigated
100 Year

Post Development – Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19  File:14047POST100bl.out
-----
14047 POC 1
basin1-pocl
14047POST100bl.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 4.826(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.816(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1436.800(Ft.)
```

Post Development – Onsite – 100 year – Basin 1

Page 1 of 2

End of street segment elevation = 1433.900(Ft.)
 Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.153(CFS)
 Depth of flow = 0.294(Ft.), Average velocity = 1.836(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.427(Ft.)
 Flow velocity = 1.84(Ft/s)
 Travel time = 4.00 min. TC = 9.05 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.887
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.542(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.608(CFS) for 0.830(Ac.)
 Total runoff = 3.424(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 3.424(CFS)
 Half street flow at end of street = 3.424(CFS)
 Depth of flow = 0.337(Ft.), Average velocity = 2.052(Ft/s)
 Flow width (from curb towards crown)= 12.584(Ft.)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.424(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.424(CFS)
 Normal flow depth in pipe = 6.91(In.)
 Flow top width inside pipe = 17.51(In.)
 Critical Depth = 8.47(In.)
 Pipe flow velocity = 5.48(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 9.16 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite – 100 year

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST100b2.out

14047 POST 2
BASIN 2 -poc 2
14047POST100b2.rvv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sun City] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)
Top (of initial area) elevation = 1434.700(Ft.)
Bottom (of initial area) elevation = 1433.990(Ft.)
Difference in elevation = 0.710(Ft.)
Slope = 0.00317 s(percent)= 0.32
TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 8.261 min.
Rainfall intensity = 3.718(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.561(CFS)
Total initial stream area = 0.170(Ac.)
Pervious area fraction = 0.100

Process from Point/Station 202.000 to Point/Station 203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)
End of street segment elevation = 1432.770(Ft.)
Length of street segment = 241.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)

Post Development – Onsite- 100 year – Basin 2

Page 1 of 2

Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.912(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 1.361(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.648(Ft.)
 Flow velocity = 1.36(Ft/s)
 Travel time = 2.95 min. TC = 11.21 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.644(CFS) for 0.230(Ac.)
 Total runoff = 1.205(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 1.205(CFS)
 Half street flow at end of street = 1.205(CFS)
 Depth of flow = 0.258(Ft.), Average velocity = 1.451(Ft/s)
 Flow width (from curb towards crown)= 8.636(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.21 min.
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.056(CFS) for 0.020(Ac.)
 Total runoff = 1.261(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

 Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.261(CFS)
 Normal flow depth in pipe = 2.61(In.)
 Flow top width inside pipe = 12.67(In.)
 Critical Depth = 5.03(In.)
 Pipe flow velocity = 7.98(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 11.33 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Onsite- 100 year – Basin 2

Page 2 of 2

Post Development – Mitigated Onsite – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST100B3R1.out
-----
14047 POST 2 MITIGATED
BASIN 3
14047POST100b3r1.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 314.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.081(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.740
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 85.00 min. Rain intensity = 1.08(In/Hr)
Total area = 68.71(Ac.) Total runoff = 24.35(CFS)

+++++
Process from Point/Station 314.000 to Point/Station 315.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.905(Ft.), Average velocity = 3.362(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 6.00
```

Post Development-Mitigated Onsite-100 year-Basin 3 Reach 1

Page 1 of 4

2	0.00	0.00
3	8.00	0.00
4	8.00	6.00

Manning's 'N' friction factor = 0.015

Sub-Channel flow = 24.350(CFS)
 ' ' flow top width = 8.000(Ft.)
 ' ' velocity= 3.362(Ft/s)
 ' ' area = 7.243(Sq.Ft)
 ' ' Froude number = 0.623

Upstream point elevation = 1423.350(Ft.)
 Downstream point elevation = 1422.950(Ft.)
 Flow length = 231.800(Ft.)
 Travel time = 1.15 min.
 Time of concentration = 86.15 min.
 Depth of flow = 0.905(Ft.)
 Average velocity = 3.362(Ft/s)
 Total irregular channel flow = 24.350(CFS)
 Irregular channel normal depth above invert elev. = 0.905(Ft.)
 Average velocity of channel(s) = 3.362(Ft/s)

 Process from Point/Station 315.100 to Point/Station 315.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.768
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 86.15 min.
 Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.148(CFS) for 0.180(Ac.)
 Total runoff = 24.498(CFS) Total area = 68.890(Ac.)

 Process from Point/Station 315.200 to Point/Station 315.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.768
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 86.15 min.
 Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.459(CFS) for 1.770(Ac.)
 Total runoff = 25.958(CFS) Total area = 70.660(Ac.)

 Process from Point/Station 315.300 to Point/Station 315.300
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.768
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 86.15 min.
 Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm

Post Development-Mitigated Onsite-100 year-Basin 3 Reach 1

Page 2 of 4

Subarea runoff = 0.148(CFS) for 0.180(Ac.)
Total runoff = 26.106(CFS) Total area = 70.840(Ac.)

+++++
Process from Point/Station 315.400 to Point/Station 315.400
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.082(CFS) for 0.100(Ac.)
Total runoff = 26.189(CFS) Total area = 70.940(Ac.)

+++++
Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.445(CFS) for 0.540(Ac.)
Total runoff = 26.634(CFS) Total area = 71.480(Ac.)

+++++
Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 26.634(CFS)
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.634	86.15	1.073

Largest stream flow has longer time of concentration
Qp = 26.634 + sum of
Qp = 26.634

Total of 1 main streams to confluence:
Flow rates before confluence point:
26.634
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 26.634(CFS)
Time of concentration = 86.149 min.
Effective stream area after confluence = 71.480(Ac.)

 Process from Point/Station 1409.000 to Point/Station 315.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.352(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.872
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 55.70 min. Rain intensity = 1.35(In/Hr)
 Total area = 8.43(Ac.) Total runoff = 5.89(CFS)

 Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 8.430(Ac.)
 Runoff from this stream = 5.890(CFS)
 Time of concentration = 55.70 min.
 Rainfall intensity = 1.352(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	26.634	86.15	1.073
2	5.890	55.70	1.352

Largest stream flow has longer time of concentration

Qp = 26.634 + sum of

$$Q_b \quad I_a/I_b$$

$$5.890 * 0.794 = 4.675$$
 Qp = 31.308

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 26.634 5.890
 Area of streams before confluence:
 71.480 8.430

Results of confluence:
 Total flow rate = 31.308(CFS)
 Time of concentration = 86.149 min.
 Effective stream area after confluence = 79.910(Ac.)
 End of computations, total study area = 79.91 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.458
 Area averaged RI index number = 69.2

Post Development – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R6100.out
-----
14047 POC 3
basin3-poc3
14047POSTB3R6100.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1401.000 to Point/Station 1402.000
*** INITIAL AREA EVALUATION ***
-----
Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 3.586(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.559(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 1402.000 to Point/Station 1403.000
*** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***
-----
Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
```

Post Development – 100 year - Basin 3 - Reach 6

Page 1 of 8

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 24.000(Ft.)
 Distance from crown to crossfall grade break = 22.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.019(CFS)
 Depth of flow = 0.260(Ft.), Average velocity = 1.981(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.337(Ft.)
 Flow velocity = 1.98(Ft/s)
 Travel time = 7.48 min. TC = 16.32 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.852(CFS) for 2.120(Ac.)
 Total runoff = 6.411(CFS) Total area = 2.610(Ac.)
 Street flow at end of street = 6.411(CFS)
 Half street flow at end of street = 6.411(CFS)
 Depth of flow = 0.314(Ft.), Average velocity = 2.228(Ft/s)
 Flow width (from curb towards crown)= 17.041(Ft.)

++++++
 Process from Point/Station 1501.100 to Point/Station 1501.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 16.32 min.
 Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.229(CFS) for 0.100(Ac.)
 Total runoff = 6.640(CFS) Total area = 2.710(Ac.)
 ++++++
 Process from Point/Station 1501.000 to Point/Station 1502.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
 Downstream point/station elevation = 1431.710(Ft.)
 Pipe length = 32.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.640(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 6.640(CFS)
 Normal flow depth in pipe = 5.14(In.)
 Flow top width inside pipe = 19.70(In.)
 Critical Depth = 10.96(In.)
 Pipe flow velocity = 13.45(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 16.36 min.

++++++
 Process from Point/Station 1502.000 to Point/Station 1403.000

Post Development – 100 year - Basin 3 - Reach 6

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```

**** PIPEFLOW TRAVEL TIME (User specified size) ****
Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.57(In.)
Flow top width inside pipe = 29.20(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.80(Ft/s)
Travel time through pipe = 1.43 min.
Time of concentration (TC) = 17.79 min.

+-----+
Process from Point/Station 1403.000 to Point/Station 1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.60(In.)
Flow top width inside pipe = 29.22(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.79(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 18.16 min.

+-----+
Process from Point/Station 1601.000 to Point/Station 1404.000
**** SUBAREA FLOW ADDITION ****
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 18.16 min.
Rainfall intensity = 2.449(In/Hr) for a 100.0 year storm
Subarea runoff = 0.194(CFS) for 0.090(Ac.)
Total runoff = 6.834(CFS) Total area = 2.800(Ac.)

+-----+
Process from Point/Station 1404.000 to Point/Station 1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.834(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.834(CFS)
Normal flow depth in pipe = 12.66(In.)
Flow top width inside pipe = 29.63(In.)
Critical Depth = 10.38(In.)
Pipe flow velocity = 3.47(Ft/s)
Travel time through pipe = 1.41 min.
Time of concentration (TC) = 19.57 min.

+-----+
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****
COMMERCIAL subarea type

```

```

Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 19.57 min.
Rainfall intensity = 2.354(In/Hr) for a 100.0 year storm
Subarea runoff = 2.657(CFS) for 1.280(Ac.)
Total runoff = 9.491(CFS) Total area = 4.080(Ac.)

*****
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.491(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 9.491(CFS)
Normal flow depth in pipe = 15.33(In.)
Flow top width inside pipe = 29.99(In.)
Critical Depth = 12.33(In.)
Pipe flow velocity = 3.77(Ft/s)
Travel time through pipe = 4.04 min.
Time of concentration (TC) = 23.61 min.

*****
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.61 min.
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm
Subarea runoff = 2.026(CFS) for 1.080(Ac.)
Total runoff = 11.517(CFS) Total area = 5.160(Ac.)

*****
Process from Point/Station 1701.100 to Point/Station 1701.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 23.61 min.
Rainfall intensity = 2.131(In/Hr) for a 100.0 year storm
Subarea runoff = 0.844(CFS) for 0.450(Ac.)
Total runoff = 12.361(CFS) Total area = 5.610(Ac.)

*****
Process from Point/Station 1701.000 to Point/Station 1406.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.182(Ft.), Average velocity = 4.310(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :

```

Post Development – 100 year - Basin 3 - Reach 6

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```

Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 12.361(CFS)
'   '   flow top width = 15.750(Ft.)
'   '   velocity= 4.310(Ft/s)
'   '   area = 2.868(Sq.Ft)
'   '   Froude number = 1.780

Upstream point elevation = 1427.200(Ft.)
Downstream point elevation = 1426.490(Ft.)
Flow length = 50.000(Ft.)
Travel time = 0.19 min.
Time of concentration = 23.81 min.
Depth of flow = 0.182(Ft.)
Average velocity = 4.310(Ft/s)
Total irregular channel flow = 12.361(CFS)
Irregular channel normal depth above invert elev. = 0.182(Ft.)
Average velocity of channel(s) = 4.310(Ft/s)

+-----+
Process from Point/Station 1406.000 to Point/Station 1407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
+-----+
Depth of flow = 0.390(Ft.), Average velocity = 2.141(Ft/s)
***** Irregular Channel Data *****
+-----+
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             14.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 12.361(CFS)
'   '   flow top width = 14.848(Ft.)
'   '   velocity= 2.141(Ft/s)
'   '   area = 5.775(Sq.Ft)
'   '   Froude number = 0.605

Upstream point elevation = 1426.490(Ft.)
Downstream point elevation = 1426.020(Ft.)
Flow length = 358.000(Ft.)
Travel time = 2.79 min.
Time of concentration = 26.59 min.
Depth of flow = 0.390(Ft.)
Average velocity = 2.141(Ft/s)
Total irregular channel flow = 12.361(CFS)
Irregular channel normal depth above invert elev. = 0.390(Ft.)
Average velocity of channel(s) = 2.141(Ft/s)

+-----+
Process from Point/Station 1407.100 to Point/Station 1407.100
**** SUBAREA FLOW ADDITION ****
+-----+
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 26.59 min.
Rainfall intensity = 2.001(In/Hr) for a 100.0 year storm
Subarea runoff = 2.182(CFS) for 1.240(Ac.)

```

Post Development – 100 year - Basin 3 - Reach 6

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Total runoff = 14.542(CFS) Total area = 6.850(Ac.)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 14.542(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 2.291(Ft/s)
' ' area = 6.348(Sq.Ft)
' ' Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 30.58 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 15.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013

Sub-Channel flow = 14.542(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 2.291(Ft/s)
' ' area = 6.348(Sq.Ft)
' ' Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 34.57 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

+++++
Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.403(Ft.), Average velocity = 2.291(Ft/s)

Post Development – 100 year - Basin 3 - Reach 6

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```

***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 14.542(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 2.291(Ft/s)
      '      '      area = 6.348(Sq.Ft)
      '      '      Froude number = 0.636

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 3.99 min.
Time of concentration = 38.55 min.
Depth of flow = 0.403(Ft.)
Average velocity = 2.291(Ft/s)
Total irregular channel flow = 14.542(CFS)
Irregular channel normal depth above invert elev. = 0.403(Ft.)
Average velocity of channel(s) = 2.291(Ft/s)

*****
Process from Point/Station 1408.100 to Point/Station 1408.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 38.55 min.
Rainfall intensity = 1.643(In/Hr) for a 100.0 year storm
Subarea runoff = 2.274(CFS) for 1.580(Ac.)
Total runoff = 16.817(CFS) Total area = 8.430(Ac.)

*****
Process from Point/Station 1408.000 to Point/Station 1409.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.337(Ft.), Average velocity = 3.173(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 16.817(CFS)
      '      '      flow top width = 15.750(Ft.)
      '      '      velocity= 3.173(Ft/s)
      '      '      area = 5.300(Sq.Ft)
      '      '      Froude number = 0.964

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 3.44 min.
Time of concentration = 42.00 min.
Depth of flow = 0.337(Ft.)

```

Average velocity = 3.173(Ft/s)
Total irregular channel flow = 16.817(CFS)
Irregular channel normal depth above invert elev. = 0.337(Ft.)
Average velocity of channel(s) = 3.173(Ft/s)
End of computations, total study area = 8.43 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 69.0

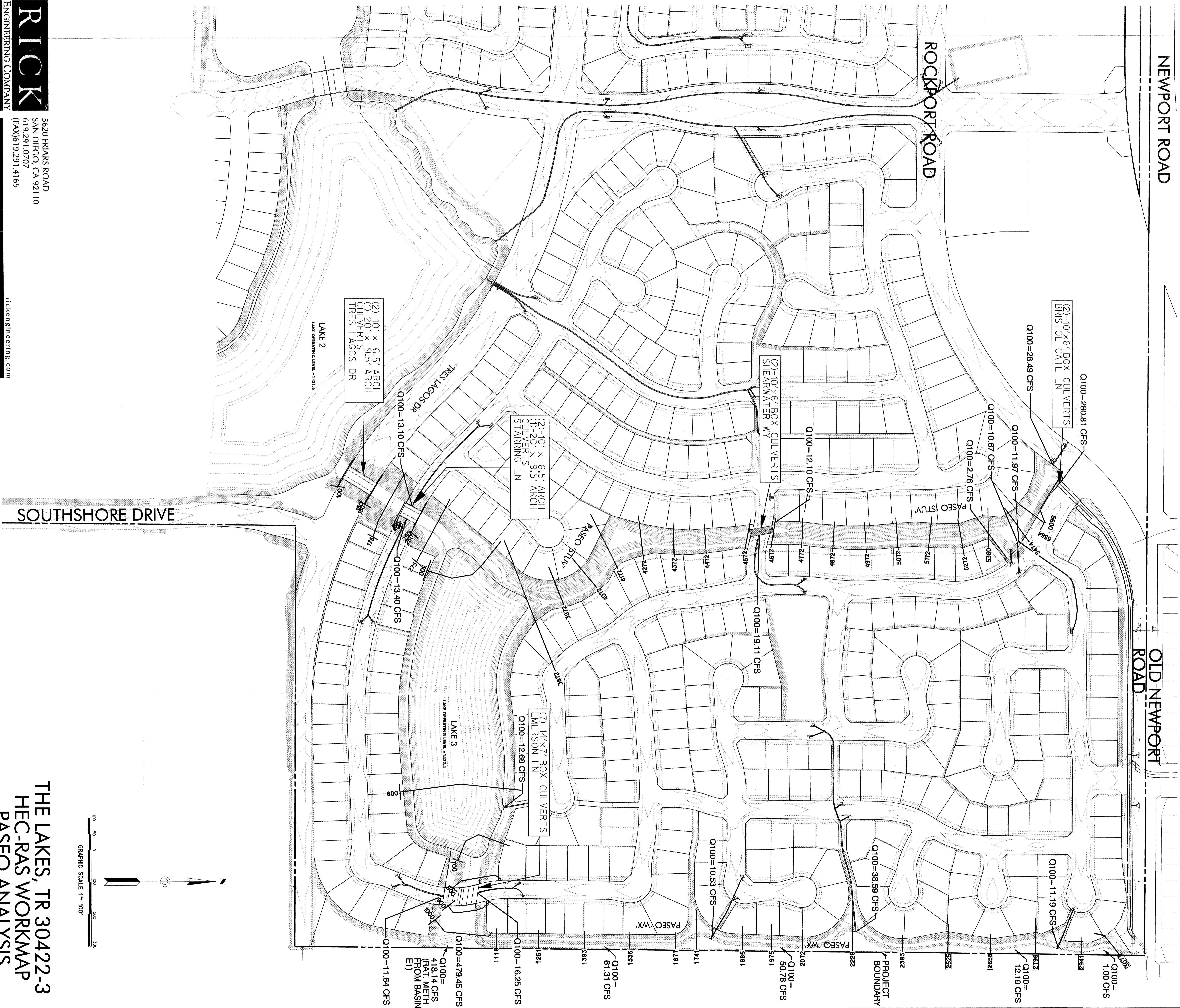
Attachment G
Existing Ultimate Conditions

Attachment G1
Existing Ultimate Conditions
Map

THE LAKES, TR 30422-3

HEC-RAS WORKMAP

PASEO ANALYSIS



RATIONAL METHOD WORKMAP

DRAINAGE AREA "E1"

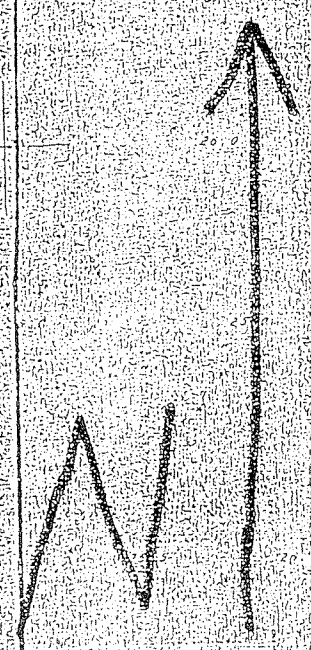
Note: AREA E1 consist of
Sub Areas 1,2 and, 3

AREA E1

Sub Area 1

Sub Area 2

Sub Area 3



1" = 300'

[XX] = NODE NUMBER

(XX) = AREA of BASIN

1/19/05

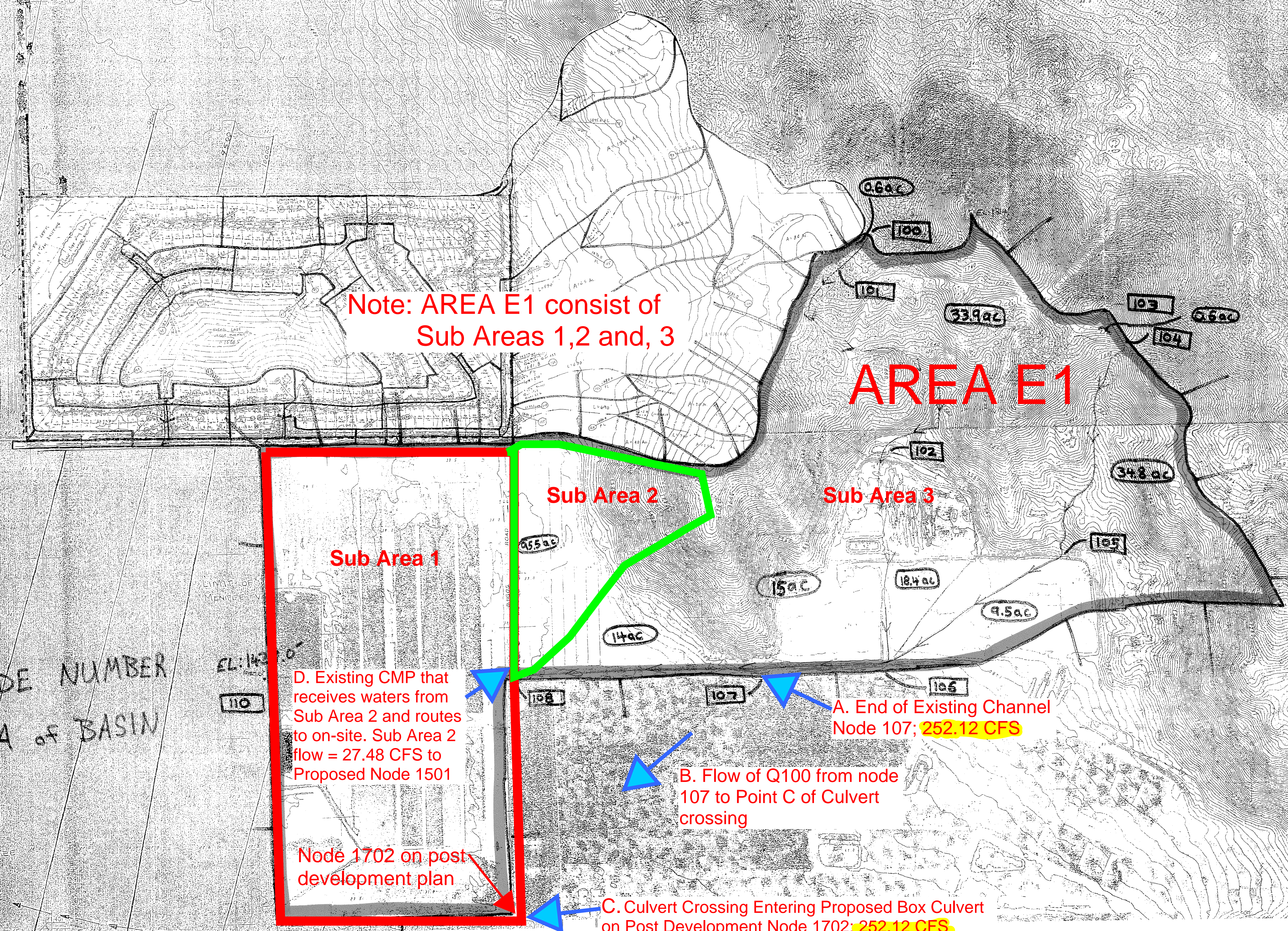
D. Existing CMP that receives waters from Sub Area 2 and routes to on-site. Sub Area 2 flow = 27.48 CFS to Proposed Node 1501

A. End of Existing Channel Node 107; 252.12 CFS

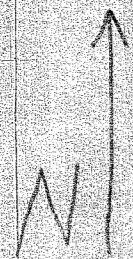
B. Flow of Q100 from node 107 to Point C of Culvert crossing

Node 1702 on post development plan

C. Culvert Crossing Entering Proposed Box Culvert on Post Development Node 1702; 252.12 CFS



RATIONAL METHOD WORKMAP DRAINAGE AREA "E1"

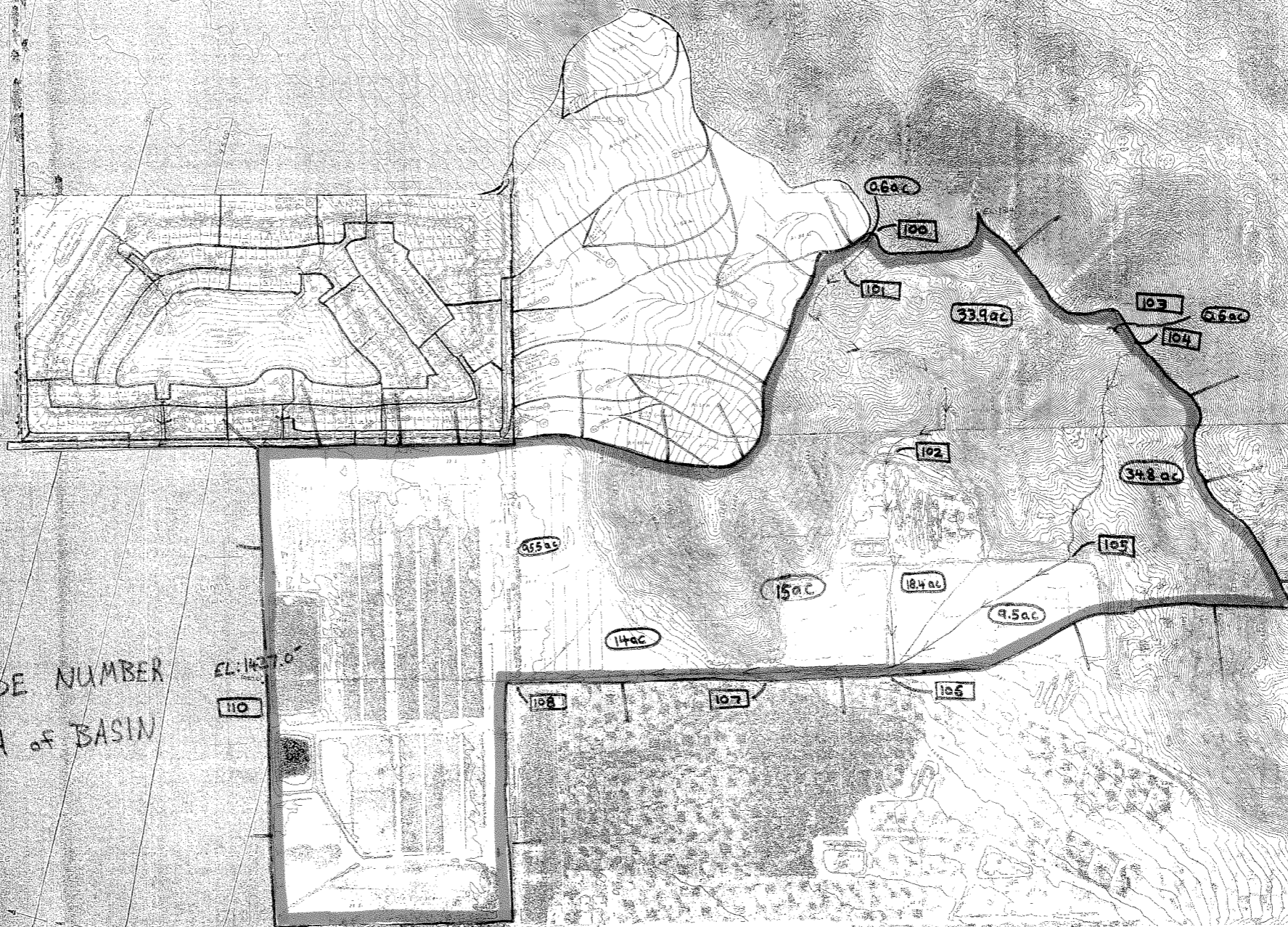


1" = 300'

[xx] = NODE NUMBER

(xx) = AREA OF BASIN

1/19/05



RATIONAL METHOD WORKMAP

DRAINAGE AREA "E1"

Note: AREA E1 consist of
Sub Areas 1,2 and, 3

AREA E1

Sub Area 2

Sub Area 3

Sub Area 1

1" = 300'

[XX] = NODE NUMBER

(XX) = AREA of BASIN

1/19/05

D. Existing CMP that
receives waters from
Sub Area 2 and routes
to on-site. Sub Area 2
flow = 27.48 CFS to
Proposed Node 1601

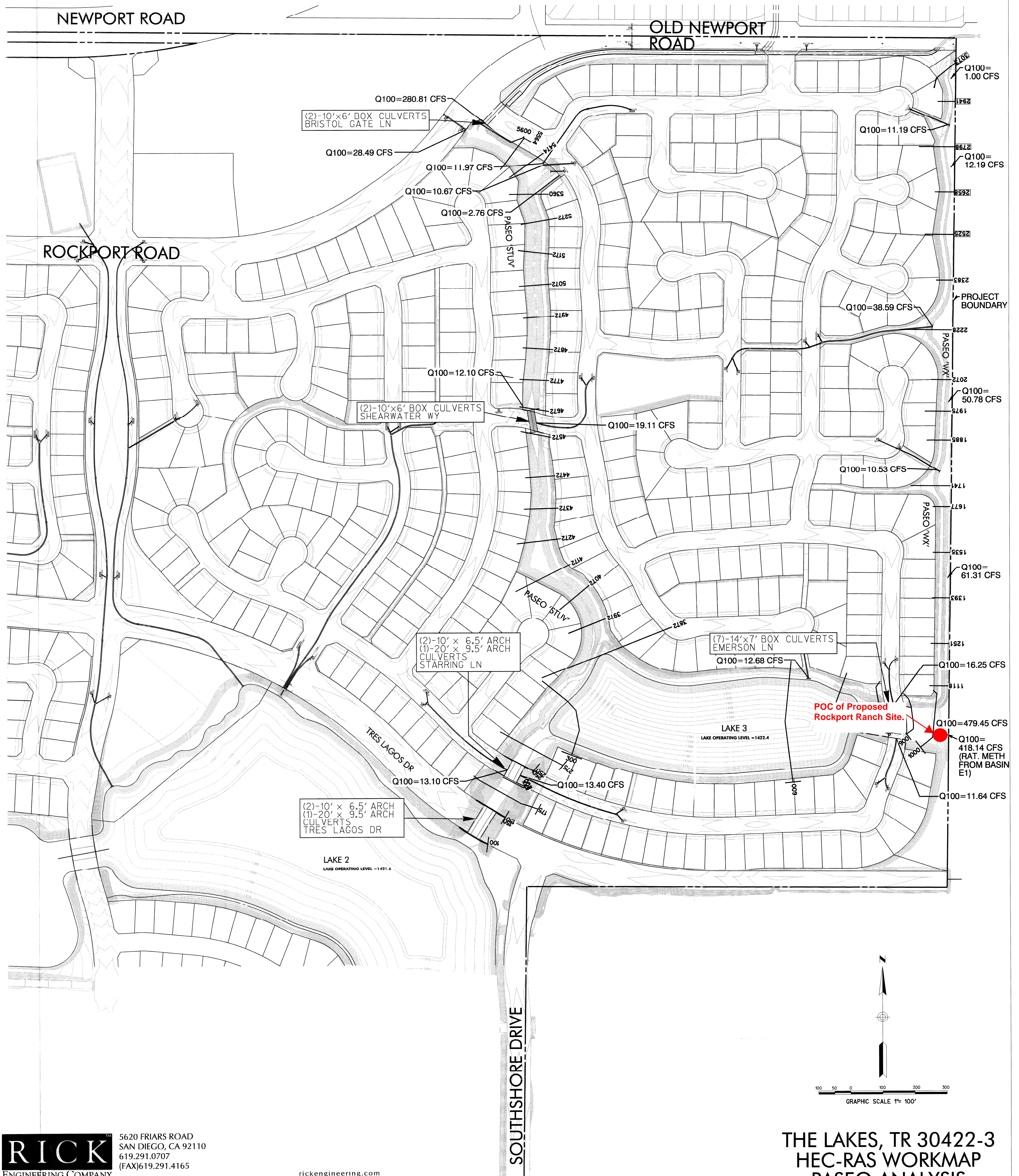
Node 1701 on post
development plan

A. End of Existing Channel
Node 107; 252.12 CFS

B. Flow of Q100 from node
107 to Point C of Culvert
crossing

C. Culvert Crossing Entering Proposed Box Culvert
on Post Development Node 1701; 252.12 CFS

THE LAKES, TR 30422-3 HEC-RAS WORKMAP PASEO ANALYSIS



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THE LAKES, TR 30422-3
HEC-RAS WORKMAP
PASEO ANALYSIS

Attachment G2
Existing Ultimate Conditions
Purpose of Offsite Conditions

Existing Ultimate Conditions and Purpose of Offsite Conditions. In Reference to:
 4.0 Description of Watershed
 4.2 Existing Conditions + Project Conditions Topography

4.2 Existing Conditions + Project Conditions (Sub Area 1) Topography

The Rockport Ranch project layout proposes to place multiple residential housing units on site covering a majority of the existing site. The overland flow from on site will travel to curb inlets in the streets which may over top but, will not exceed the right of way boundary of the private streets. The park area on the west side of the project will have storm drain catch basins to catch the runoff water and send it to pre-determined fore bays before entering the wet basin to the south. Once in the wet pond the water will travel to the lowest point on the west side of the property to exit through a box culvert and meet with the previously calculated flow from the Rick Engineering study.

The offsite flows that are a part of area E1 are separated into smaller areas as follows.

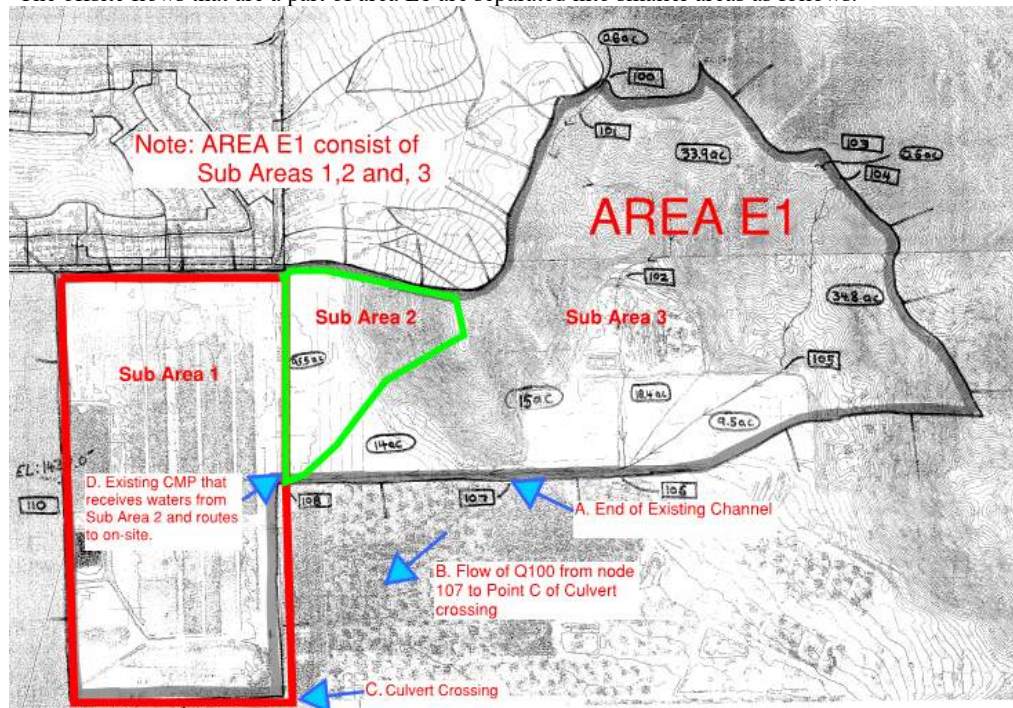


Figure 4.2

Defined Area E1 (Existing Ultimate Condition) is the entire area pre-determined by Rick Engineering TR 30422-3 Revised on October 21, 2013. This area was designed to carry the ultimate design flow of the defined area to Node 110. At Node 110 the total area was determined to be 222.3 Acres and an Ultimate flow of 418.14 CFS. Area E1 does not definitively define the proposed project since the study was designed to cover ultimate conditions over a large area. For this reason Area E1 was broken by nodes along the flowpath

into Sub Areas to better define the proposed project; and then one area was broken again by a weighted factor to determine the flow for the proposed project (Sub Area 1 and Sub Area 2)

Sub Area 1 consists of the proposed site of study (see figure 4.2) while the other Sub Area 2 and Sub Area 3 are offsite flows. Sub Area 1 and Sub Area 2, together are defined by Rick Engineering Hydrology Report TR 30422-3 Revised on October 21, 2013 as node 108 to node 110. This Area is 95.5 Acres which includes the proposed site (Sub Area 1) and the north Easterly portion of the Sub Area Addition that composes of the property east of existing Briggs Road (Sub Area 2). The flows for this entire 95.5 acre sub area is 166.02 CFS. Using a weighted average for the proposed project site area of 79.7 acres; the flow used for Sub Area 1 is on a weighted average as follows:

Proposed Area (Sub Area 1) divided by Total acres of Sub Area 1 & 2 is $79.7 \text{ Acres} / 95.5 \text{ Acres} = 0.83$

Then, $0.83 \times 166.02 \text{ CFS} = 138.54 \text{ CFS}$ (Ultimate Condition calculated flow from Sub Area 1)

This Hydrology study shows that Sub Area 1 Post Development Ultimate Condition will have flows that will travel and end at node 116 (the existing Rick Engineering node 110) to match existing ultimate conditions of 418.14 CFS. This area is sized to reduce the amount of flow to send a smaller flow than the pre-existing condition, and less than the predicted ultimate condition. Soils for this site are of a hydrological type of "C" and "D".

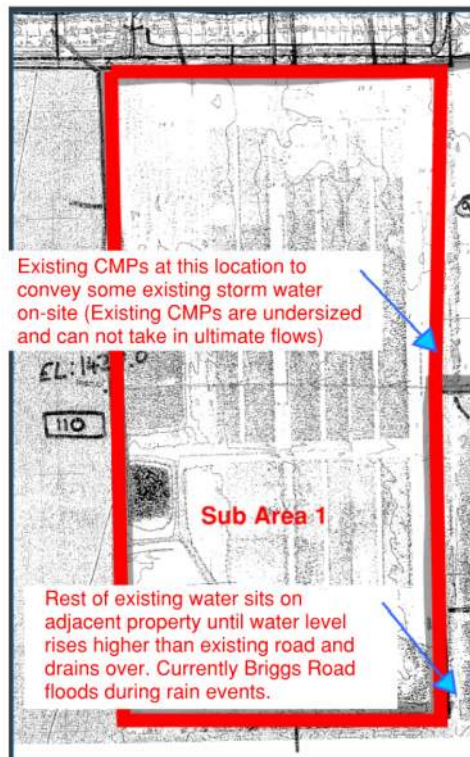


Figure 4.3

Sub Area 2 is defined by the following: from the Rick Engineering report of Node 108-110 the area is 95.5 and the proposed site 79.7 which leaves the following:

$$95.5 \text{ Acres} - 79.7 \text{ Acres} = 15.8 \text{ Acres}$$

Therefore the remaining Area is 15.8 Acres and designated as Sub Area 2. This area is to the north east of the proposed project of Rockport ranch and on the east side of the existing Briggs road. Flows from this area will travel south along Briggs to enter Existing corrugated metal pipes (CMP) to flow onsite where it travels westerly towards Node 110 across the existing dairy. The flows are calculated by taking the entire flow for Sub Area 108-110 and subtracting the flow from Sub Area 1:

$$166.02 \text{ CFS} - 138.54 \text{ CFS} = 27.48 \text{ CFS}$$

These flows will travel to the existing CMP pipes and then will be picked up in Reinforced Concrete Pipe (RCP) under the Briggs Improvements to the westerly side of the right of way. Once collected west of the road flows will travel south within the public Easement just west of the Right of way to the proposed box culvert North of Tres Lagos Drive and travel westerly to the POC.

Sub Area 3 is routed in the previous studies to node 108; Actual existing conditions have the channels ending approximately where node 107 is located. Figures 4.2, 4.4 and, 4.5 show the approximate location of the terminating channels where sized to ultimate conditions 252.12 CFS flows through to end at point C. in figure 4.2. The flow that exits this existing channel travel southwesterly as an over land flow across the neighboring site, flooding the site until (currently the water is high enough to overtop Briggs road and travel westerly) reaching a proposed box culvert under Briggs Road to allow the existing flows to travel westerly along Tres Lagos Drive to terminate at the node 316 (existing node 110); before traveling west to the adjacent sites floodway.

The Combined areas of Area 1, 2 and, 3 will be sized to hold the Ultimate conditions that were sized in *The Lakes Job No. 16684 dated October 21, 2013*.



Figure 4.4



Figure 4.5

Attachment G3
Existing Ultimate Conditions
Exhibits for Offsite Conditions

**DRAINAGE STUDY
FOR
THE LAKES
TR 30422-3**

JOB NUMBER 16684

JULY 1, 2013

REVISED: SEPTEMBER 6, 2013

REVISED: OCTOBER 21, 2013

**RICK ENGINEERING COMPANY
ENGINEERING COMPANY
RICK ENGINEERING CO.**



rickengineering.com

DRAINAGE STUDY

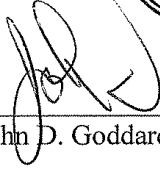
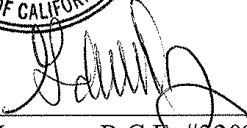
FOR

THE LAKES

Tract# 30422-3
Job Number 16684

Revised: October 21, 2013



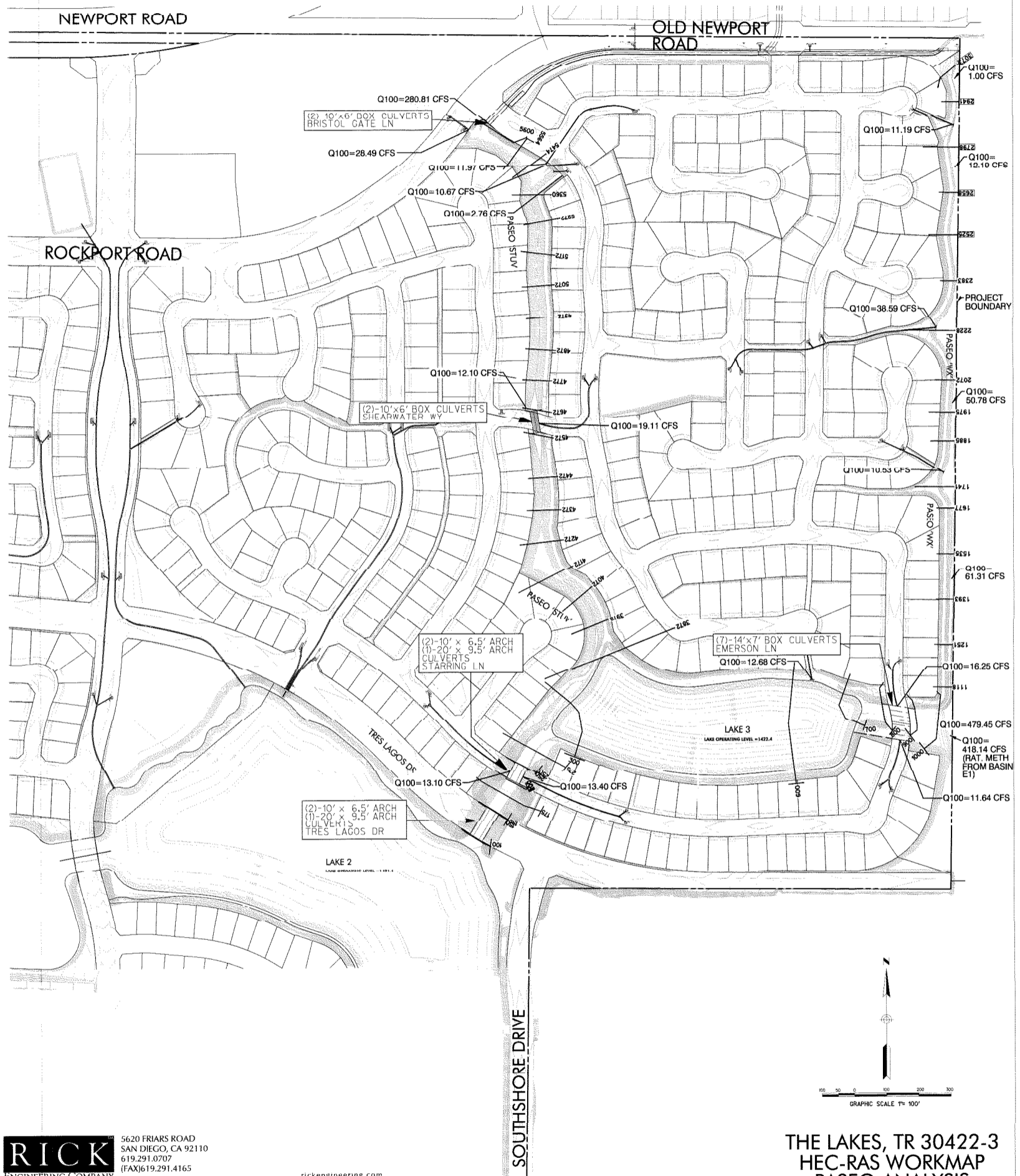
 

John D. Goddard, Jr. R.C.E. #33037

Prepared By:

Rick Engineering Company
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San Diego, California 92110-2596
(619) 291-0707
www.rickengineering.com

THE LAKES, TR 30422-3 HEC-RAS WORKMAP PASEO ANALYSIS



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San Diego

Riverside

Sacramento

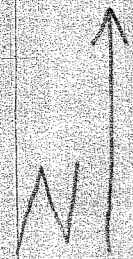
Orange

Phoenix

Tucson

THE LAKES, TR 30422-3
HEC-RAS WORKMAP
PASEO ANALYSIS

RATIONAL METHOD WORKMAP DRAINAGE AREA "E1"

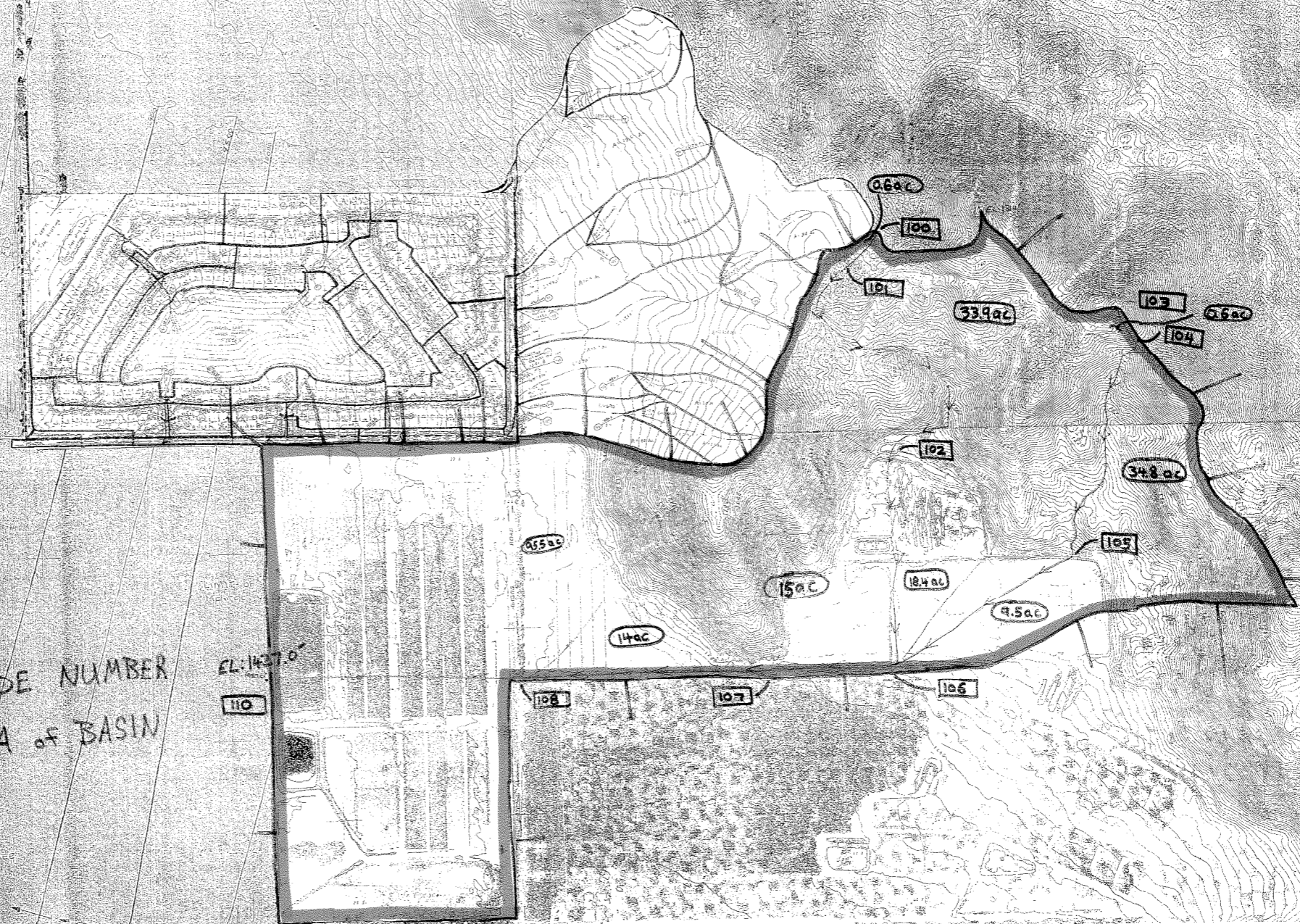


1" = 300'

[xx] = NODE NUMBER

(xx) = AREA OF BASIN

1/19/05



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
(RCFC&WCD) 1978 HYDROLOGY MANUAL

(c) Copyright 1982-2003 Advanced Engineering Software (aes)
(Rational Tabling Version 5.9D)

Release Date: 01/01/2003 License 1D 1261

Analysis prepared by:

RICK ENGINEERING COMPANY
5620 Friars Road
San Diego, California 92110
619-291-0707 Fax 619-291-4165

***** DESCRIPTION OF STUDY *****
* LAKES AT MENIFEE RATIONAL METHOD AREA EI *
* RICK ENGINEERING COMPANY JOB NO. 14590 *
* 1/21/05 *

FILE NAME: MENIFEE.RAT
TIME/DATE OF STUDY: 10:31 01/21/2005

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
2-YEAR, 1-HOUR PRECIPITATION(INCH) = 0.480
100-YEAR, 1-HOUR PRECIPITATION(INCH) = 1.200
COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.200
SLOPE OF INTENSITY DURATION CURVE = 0.5400
RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
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 H/LKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (FT) (n)
=== =====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

(LOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

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

=====

ASSUMED INITIAL SUBAREA UNIFORM

DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
 $TC = K * [(LENGTH ** 3) / (ELEVATION CHANGE)] ** .2$
 INITIAL SUBAREA FLOW-LENGTH (FEET) = 225.00
 UPSTREAM ELEVATION (FEET) = 1714.00
 DOWNSTREAM ELEVATION (FEET) = 1696.00
 ELEVATION DIFFERENCE (FEET) = 18.00
 $FC = 0.709 * [(225.00 ** 3) / (18.00)] ** .2 = 10.260$
 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.114
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7548
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF (CFS) = 1.41
 TOTAL AREA (ACRES) = 0.60 TOTAL RUNOFF (CFS) = 1.41

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 51

>>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW <<<<<
 >>>> TRAVELTIME THRU SUBAREA (EXISTING ELEMENT) <<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	1696.00	DOWNSTREAM (FEET) =	1520.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	1775.00	CHANNEL SLOPE =	0.0992
CHANNEL BASE (FEET) =	1.00	"Z" FACTOR =	4.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	2.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	2.695		
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT =	.7363		
SOIL CLASSIFICATION IS	"C"		
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =	35.24		
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =	9.39		
AVERAGE FLOW DEPTH (FEET) =	0.85	TRAVEL TIME (MIN.) =	3.15
Tc (MIN.) =	13.41		
SUBAREA AREA (ACRES) =	33.90	SUBAREA RUNOFF (CFS) =	67.27
TOTAL AREA (ACRES) =	34.50	PEAK FLOW RATE (CFS) =	68.68

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH (FEET) = 1.12 FLOW VELOCITY (FEET/SEC.) = 11.11
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 2000.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 106.00 IS CODE = 51

>>>> COMPUTE TRAPEZOIDAL CHANNEL FLOW <<<<<
 >>>> TRAVELTIME THRU SUBAREA (EXISTING ELEMENT) <<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) =	1520.00	DOWNSTREAM (FEET) =	1467.00
CHANNEL LENGTH THRU SUBAREA (FEET) =	1130.00	CHANNEL SLOPE =	0.0469
CHANNEL BASE (FEET) =	1.00	"Z" FACTOR =	4.000
MANNING'S FACTOR =	0.030	MAXIMUM DEPTH (FEET) =	2.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	2.491		
SINGLE-FAMILY (1/2 ACRE LOT) RUNOFF COEFFICIENT =	.7953		
SOIL CLASSIFICATION IS	"C"		
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =	86.90		
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =	8.94		
AVERAGE FLOW DEPTH (FEET) =	1.44	TRAVEL TIME (MIN.) =	2.11
Tc (MIN.) =	15.52		
SUBAREA AREA (ACRES) =	18.40	SUBAREA RUNOFF (CFS) =	36.45
TOTAL AREA (ACRES) =	52.90	PEAK FLOW RATE (CFS) =	105.13

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH (FEET) = 1.56 FLOW VELOCITY (FEET/SEC.) = 9.32
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 3130.00 FEET.

```

*****
FLOW PROCESS FROM NODE      106.00 TO NODE      106.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 15.52
RAINFALL INTENSITY(INCH/HR) = 2.49
TOTAL STREAM AREA(ACRES) = 52.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 105.13

*****
FLOW PROCESS FROM NODE      103.00 TO NODE      104.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 180.00
UPSTREAM ELEVATION(FEET) = 1765.00
DOWNSTREAM ELEVATION(FEET) = 1702.00
ELEVATION DIFFERENCE(FEET) = 63.00
TC = 0.709*[(180.00**3)/(63.00)]**.2 = 6.985
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.833
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7784
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 1.79
TOTAL AREA(ACRES) = 0.60 TOTAL RUNOFF(CFS) = 1.79

*****
FLOW PROCESS FROM NODE      104.00 TO NODE      105.00 IS CODE =  51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1702.00 DOWNSTREAM(FEET) = 1500.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1330.00 CHANNEL SLOPE = 0.1519
CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 4.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.374
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7643
SOIL CLASSIFICATION IS "C"
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 46.84
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 11.91
AVERAGE FLOW DEPTH(FEET) = 0.87 TRAVEL TIME(MIN.) = 1.86
Tc(MIN.) = 8.85
SUBAREA AREA(ACRES) = 34.80 SUBAREA RUNOFF(CFS) = 89.73
TOTAL AREA(ACRES) = 35.40 PEAK FLOW RATE(CFS) = 91.52

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 1.16 FLOW VELOCITY(FEET/SEC.) = 14.06
LONGEST FLOWPATH FROM NODE 103.00 TO NODE 105.00 = 1510.00 FEET.

*****
FLOW PROCESS FROM NODE      105.00 TO NODE      106.00 IS CODE =  51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

```

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1500.00 DOWNSTREAM(FEET) = 1467.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1120.00 CHANNEL SLOPE = 0.0295
CHANNEL BASE(FEET) = 1.00 "Z" FACTOR = 4.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.965
SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8244
SOIL CLASSIFICATION IS "C"
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 103.14
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.81
AVERAGE FLOW DEPTH(FEET) = 1.70 TRAVEL TIME(MIN.) = 2.39
Tc(MIN.) = 11.24
SUBAREA AREA(ACRES) = 9.50 SUBAREA RUNOFF(CFS) = 23.22
TOTAL AREA(ACRES) = 44.90 PEAK FLOW RATE(CFS) = 114.74

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 1.77 FLOW VELOCITY(FEET/SEC.) = 8.05
LONGEST FLOWPATH FROM NODE 103.00 TO NODE 106.00 = 2630.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 106.00 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.) = 11.24
RAINFALL INTENSITY(INCH/HR) = 2.96
TOTAL STREAM AREA(ACRES) = 44.90
PEAK FLOW RATE(CFS) AT CONFLUENCE = 114.74

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	105.13	15.52	2.491	52.90
2	114.74	11.24	2.965	44.90

*****WARNING*****
IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	190.88	11.24	2.965
2	201.52	15.52	2.491

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 190.88 Tc(MIN.) = 11.24
TOTAL AREA(ACRES) = 97.80
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 106.00 = 3130.00 FEET.

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1467.00 DOWNSTREAM(FEET) = 1456.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 675.00 CHANNEL SLOPE = 0.0163
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 4.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 3.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.745
SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8194
SOIL CLASSIFICATION IS "C"
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 207.74
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.51
AVERAGE FLOW DEPTH(FEET) = 1.27 TRAVEL TIME(MIN.) = 1.73
Tc(MIN.) = 12.96
SUBAREA AREA(ACRES) = 15.00 SUBAREA RUNOFF(CFS) = 33.73
TOTAL AREA(ACRES) = 112.80 PEAK FLOW RATE(CFS) = 224.61

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 1.33 FLOW VELOCITY(FEET/SEC.) = 6.67
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 107.00 = 3805.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 108.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1456.00 DOWNSTREAM(FEET) = 1439.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1280.00 CHANNEL SLOPE = 0.0133
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 4.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 3.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.423
SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8108
SOIL CLASSIFICATION IS "C"
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 238.37
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.35
AVERAGE FLOW DEPTH(FEET) = 1.45 TRAVEL TIME(MIN.) = 3.36
Tc(MIN.) = 16.33
SUBAREA AREA(ACRES) = 14.00 SUBAREA RUNOFF(CFS) = 27.51
TOTAL AREA(ACRES) = 126.80 PEAK FLOW RATE(CFS) = 252.12

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 1.50 FLOW VELOCITY(FEET/SEC.) = 6.46
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 108.00 = 5085.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 110.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1439.00 DOWNSTREAM(FEET) = 1427.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 1380.00 CHANNEL SLOPE = 0.0087
CHANNEL BASE(FEET) = 20.00 "Z" FACTOR = 4.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 3.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.166
SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8025
SOIL CLASSIFICATION IS "C"

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 335.22
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.10
AVERAGE FLOW DEPTH(FEET) = 1.97 TRAVEL TIME(MIN.) = 3.77
Tc(MIN.) = 20.10
SUBAREA AREA(ACRES) = 95.50 SUBAREA RUNOFF(CFS) = 166.02
TOTAL AREA(ACRES) = 222.30 PEAK FLOW RATE(CFS) = 418.14

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 2.22 FLOW VELOCITY(FEET/SEC.) = 6.51
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 110.00 = 6465.00 FEET.

=====

END OF STUDY SUMMARY:

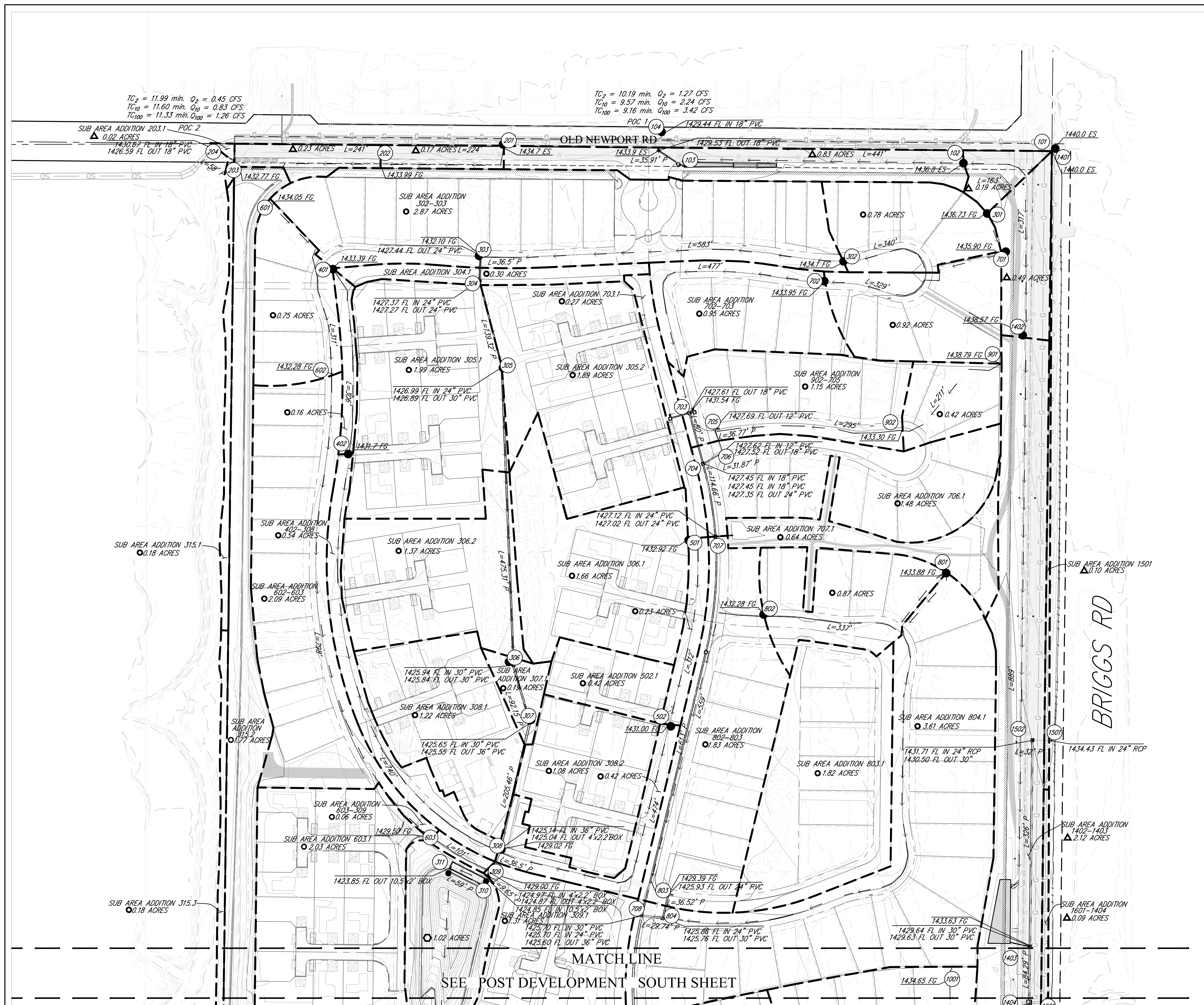
TOTAL AREA(ACRES) = 222.30 TC(MIN.) = 20.10
PEAK FLOW RATE(CFS) = 418.14

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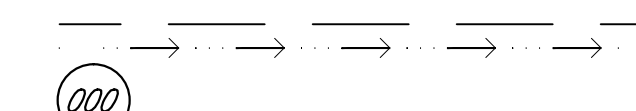
END OF RATIONAL METHOD ANALYSIS

Attachment H
Post Development Ultimate Conditions

Attachment H1
Post Development Ultimate Conditions
Map



LEGEND

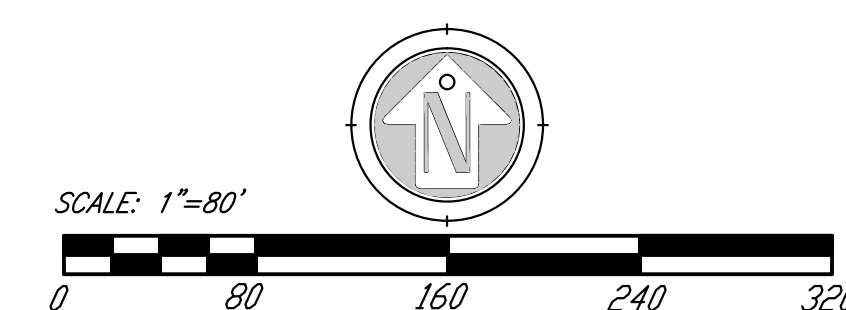


IMPERVIOUS COVER

IN REFERENCE TO "TRCFC & WCD HYDROLOGY MANUAL"
PLATE D-5.6

- SINGLE FAMILY (1/4 ACRE)
- △ COMMERCIAL
- ⊗ USER DEFINED

ROCKPORT RANCH POST DEVELOPMENT ULTIMATE RATIONAL METHOD NORTH SHEET



RECOMMENDED FOR APPROVAL

DATE:

CHECKED BY:

DATE:

DEVELOPER:

EXCEL
ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
640 STATE PLACE, ESCONDIDO, CA 92025
PH (760) 745-8118 FX (760) 745-1180

TENTATIVE

ROCKPORT RANCH

FOR:

W.O.

DATE:

1 OF 2

RATIONAL METHOD WORKMAP

DRAINAGE AREA "E1"

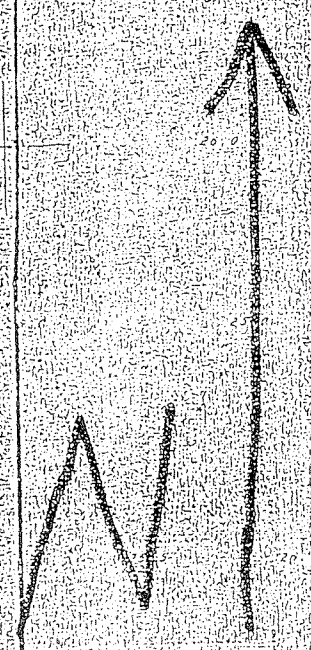
Note: AREA E1 consist of
Sub Areas 1,2 and, 3

AREA E1

Sub Area 1

Sub Area 2

Sub Area 3



1" = 300'

[XX] = NODE NUMBER

(XX) = AREA of BASIN

1/19/05

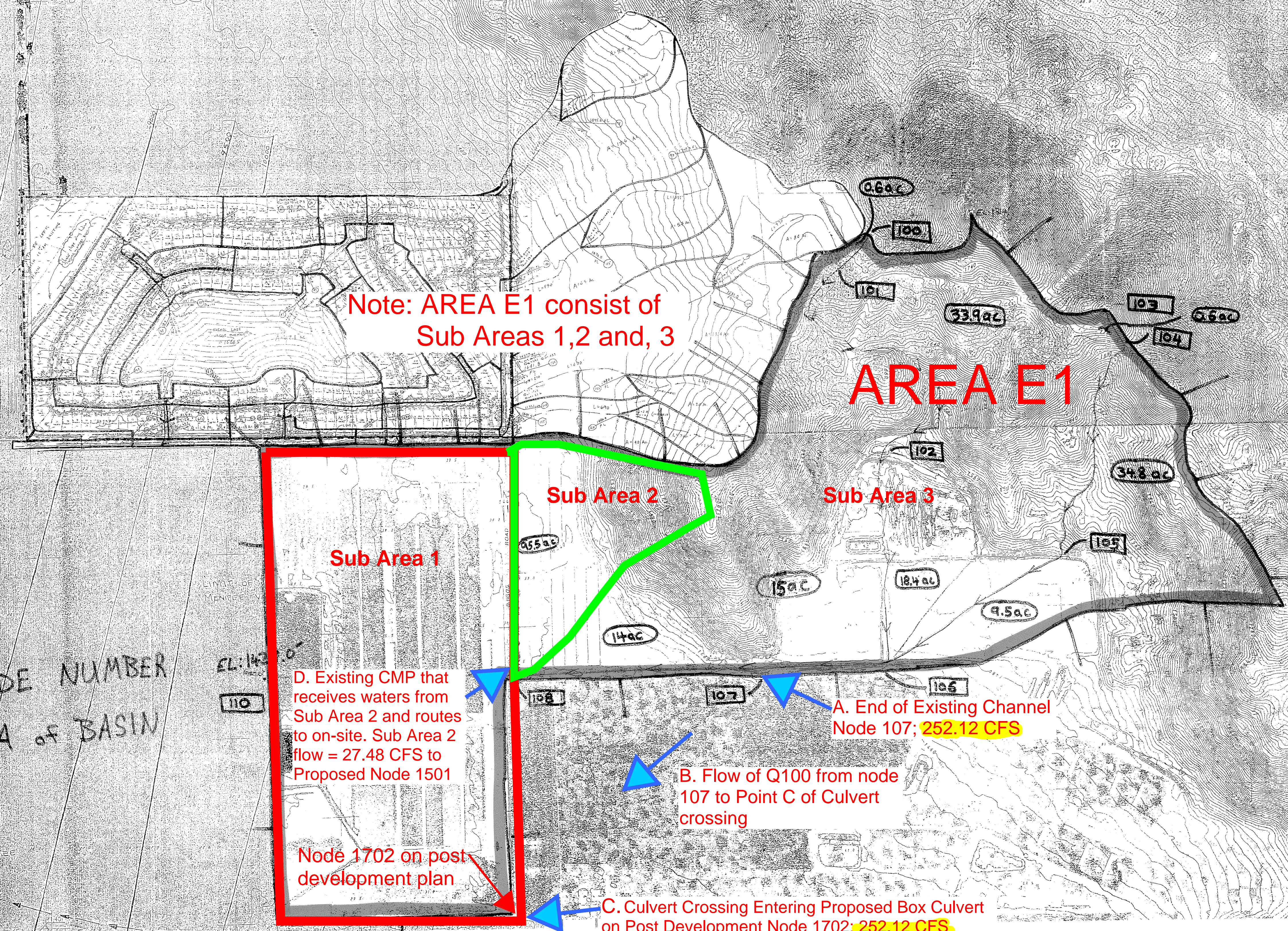
D. Existing CMP that
receives waters from
Sub Area 2 and routes
to on-site. Sub Area 2
flow = 27.48 CFS to
Proposed Node 1501

A. End of Existing Channel
Node 107; 252.12 CFS

B. Flow of Q100 from node
107 to Point C of Culvert
crossing

Node 1702 on post
development plan

C. Culvert Crossing Entering Proposed Box Culvert
on Post Development Node 1702; 252.12 CFS



Attachment H2
Post Development Ultimate Conditions
100 Year

Post Development Ultimate – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST100bl.out
-----
14047 POC 1
basin1-pocl
14047POST100bl.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 4.826(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.816(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1436.800(Ft.)
```

Post Development Ultimate – 100 year – Basin 1

Page 1 of 2

End of street segment elevation = 1433.900(Ft.)
 Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.153(CFS)
 Depth of flow = 0.294(Ft.), Average velocity = 1.836(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.427(Ft.)
 Flow velocity = 1.84(Ft/s)
 Travel time = 4.00 min. TC = 9.05 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.887
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.542(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.608(CFS) for 0.830(Ac.)
 Total runoff = 3.424(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 3.424(CFS)
 Half street flow at end of street = 3.424(CFS)
 Depth of flow = 0.337(Ft.), Average velocity = 2.052(Ft/s)
 Flow width (from curb towards crown)= 12.584(Ft.)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.424(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.424(CFS)
 Normal flow depth in pipe = 6.91(In.)
 Flow top width inside pipe = 17.51(In.)
 Critical Depth = 8.47(In.)
 Pipe flow velocity = 5.48(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 9.16 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development Ultimate– 100 year

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST100b2.out

14047 POST 2
BASIN 2 -poc 2
14047POST100b2.rrv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sun City] area used.

10 year storm 10 minute intensity = 2.250(In/Hr)

10 year storm 60 minute intensity = 0.870(In/Hr)

100 year storm 10 minute intensity = 3.360(In/Hr)

100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.300(In/Hr)

Slope of intensity duration curve = 0.5300

Process from Point/Station 201.000 to Point/Station 202.000

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)

Top (of initial area) elevation = 1434.700(Ft.)

Bottom (of initial area) elevation = 1433.990(Ft.)

Difference in elevation = 0.710(Ft.)

Slope = 0.00317 s(percent)= 0.32

TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 8.261 min.

Rainfall intensity = 3.718(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.888

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 69.00

Pervious area fraction = 0.100; Impervious fraction = 0.900

Initial subarea runoff = 0.561(CFS)

Total initial stream area = 0.170(Ac.)

Pervious area fraction = 0.100

Process from Point/Station 202.000 to Point/Station 203.000

**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)

End of street segment elevation = 1432.770(Ft.)

Length of street segment = 241.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)

Width of half street (curb to crown) = 18.000(Ft.)

Distance from crown to crossfall grade break = 16.000(Ft.)

Slope from gutter to grade break (v/hz) = 0.750

Post Development Ultimate - 100 year – Basin 2

Page 1 of 2

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.912(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 1.361(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.648(Ft.)
 Flow velocity = 1.36(Ft/s)
 Travel time = 2.95 min. TC = 11.21 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.644(CFS) for 0.230(Ac.)
 Total runoff = 1.205(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 1.205(CFS)
 Half street flow at end of street = 1.205(CFS)
 Depth of flow = 0.258(Ft.), Average velocity = 1.451(Ft/s)
 Flow width (from curb towards crown)= 8.636(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.21 min.
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.056(CFS) for 0.020(Ac.)
 Total runoff = 1.261(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.261(CFS)
 Normal flow depth in pipe = 2.61(In.)
 Flow top width inside pipe = 12.67(In.)
 Critical Depth = 5.03(In.)
 Pipe flow velocity = 7.98(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 11.33 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development Ultimate – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/31/19   File:14047POSTULT100B3R1.out
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14047 POST 3
basin3-poc3
14047POSTULT100b3r1.rrv
14047POST2b3r1.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 301.000 to Point/Station 302.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 340.000(Ft.)
Top (of initial area) elevation = 1436.730(Ft.)
Bottom (of initial area) elevation = 1434.100(Ft.)
Difference in elevation = 2.630(Ft.)
Slope = 0.00774 s(percent)= 0.77
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.616 min.
Rainfall intensity = 3.255(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.108(CFS)
Total initial stream area = 0.780(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station 302.000 to Point/Station 303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1434.100(Ft.)
End of street segment elevation = 1432.100(Ft.)
Length of street segment = 583.000(Ft.)
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14047 POST ULTIMATE 100
BASIN 3 Reach 1
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Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 5.191(CFS)
 Depth of flow = 0.318(Ft.), Average velocity = 1.764(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 17.232(Ft.)
 Flow velocity = 1.76(Ft/s)
 Travel time = 5.51 min. TC = 16.12 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.609(In/Hr) for a 100.0 year storm
 Subarea runoff = 6.109(CFS) for 2.870(Ac.)
 Total runoff = 8.216(CFS) Total area = 3.650(Ac.)
 Street flow at end of street = 8.216(CFS)
 Half street flow at end of street = 8.216(CFS)
 Depth of flow = 0.374(Ft.), Average velocity = 2.081(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown) = 18.000(Ft.)

++++++
 Process from Point/Station 303.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.440(Ft.)
 Downstream point/station elevation = 1427.370(Ft.)
 Pipe length = 36.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 8.216(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 8.216(CFS)
 Normal flow depth in pipe = 16.69(In.)
 Flow top width inside pipe = 22.09(In.)
 Critical Depth = 12.24(In.)
 Pipe flow velocity = 3.53(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 16.30 min.

++++++
 Process from Point/Station 304.100 to Point/Station 304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.30 min.
 Rainfall intensity = 2.594(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.635(CFS) for 0.300(Ac.)
 Total runoff = 8.851(CFS) Total area = 3.950(Ac.)

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*****
Process from Point/Station      304.000 to Point/Station      305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.270(Ft.)
Downstream point/station elevation = 1426.990(Ft.)
Pipe length = 139.32(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.851(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 8.851(CFS)
Normal flow depth in pipe = 17.34(In.)
Flow top width inside pipe = 21.49(In.)
Critical Depth = 12.73(In.)
Pipe flow velocity = 3.64(Ft/s)
Travel time through pipe = 0.64 min.
Time of concentration (TC) = 16.93 min.
*****
Process from Point/Station      305.100 to Point/Station      305.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.93 min.
Rainfall intensity = 2.542(In/Hr) for a 100.0 year storm
Subarea runoff = 4.118(CFS) for 1.990(Ac.)
Total runoff = 12.969(CFS) Total area = 5.940(Ac.)

*****
Process from Point/Station      305.200 to Point/Station      305.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.814
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.93 min.
Rainfall intensity = 2.542(In/Hr) for a 100.0 year storm
Subarea runoff = 3.911(CFS) for 1.890(Ac.)
Total runoff = 16.880(CFS) Total area = 7.830(Ac.)

*****
Process from Point/Station      305.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.890(Ft.)
Downstream point/station elevation = 1425.940(Ft.)
Pipe length = 475.31(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 16.880(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 16.880(CFS)
Normal flow depth in pipe = 22.69(In.)
Flow top width inside pipe = 25.76(In.)
Critical Depth = 16.66(In.)
Pipe flow velocity = 4.24(Ft/s)
Travel time through pipe = 1.87 min.
Time of concentration (TC) = 18.80 min.

*****
Process from Point/Station      306.100 to Point/Station      306.100
**** SUBAREA FLOW ADDITION ****

```

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.80 min.
 Rainfall intensity = 2.404(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.234(CFS) for 1.660(Ac.)
 Total runoff = 20.114(CFS) Total area = 9.490(Ac.)

 Process from Point/Station 306.200 to Point/Station 306.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.80 min.
 Rainfall intensity = 2.404(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.669(CFS) for 1.370(Ac.)
 Total runoff = 22.783(CFS) Total area = 10.860(Ac.)

 Process from Point/Station 306.000 to Point/Station 307.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.840(Ft.)
 Downstream point/station elevation = 1425.650(Ft.)
 Pipe length = 92.15(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 22.783(CFS)
 Given pipe size = 30.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 0.596(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 0.284(Ft.)
 Minor friction loss = 0.502(Ft.) K-factor = 1.50
 Pipe flow velocity = 4.64(Ft/s)
 Travel time through pipe = 0.33 min.
 Time of concentration (TC) = 19.13 min.

 Process from Point/Station 307.100 to Point/Station 307.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 19.13 min.
 Rainfall intensity = 2.382(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.366(CFS) for 0.190(Ac.)
 Total runoff = 23.149(CFS) Total area = 11.050(Ac.)

 Process from Point/Station 307.000 to Point/Station 308.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.550(Ft.)
 Downstream point/station elevation = 1425.140(Ft.)

Pipe length = 205.46(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 23.149(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 23.149(CFS)
 Normal flow depth in pipe = 23.86(In.)
 Flow top width inside pipe = 34.04(In.)
 Critical Depth = 18.59(In.)
 Pipe flow velocity = 4.66(Ft/s)
 Travel time through pipe = 0.74 min.
 Time of concentration (TC) = 19.87 min.

 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 11.050(Ac.)
 Runoff from this stream = 23.149(CFS)
 Time of concentration = 19.87 min.
 Rainfall intensity = 2.335(In/Hr)

 Process from Point/Station 401.000 to Point/Station 402.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 306.000(Ft.)
 Top (of initial area) elevation = 1433.390(Ft.)
 Bottom (of initial area) elevation = 1431.700(Ft.)
 Difference in elevation = 1.690(Ft.)
 Slope = 0.00552 s(percent)= 0.55
 $TC = k(0.390) * [(length^3) / (elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.887 min.
 Rainfall intensity = 3.212(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.829
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.426(CFS)
 Total initial stream area = 0.160(Ac.)
 Pervious area fraction = 0.500

 Process from Point/Station 402.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.700(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 740.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.945(CFS)
 Depth of flow = 0.156(Ft.), Average velocity = 1.170(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 9.137(Ft.)
 Flow velocity = 1.17(Ft/s)
 Travel time = 10.54 min. TC = 21.43 min.

Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.805
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.243(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.975(CFS) for 0.540(Ac.)
 Total runoff = 1.402(CFS) Total area = 0.700(Ac.)
 Street flow at end of street = 1.402(CFS)
 Half street flow at end of street = 1.402(CFS)
 Depth of flow = 0.184(Ft.), Average velocity = 1.293(Ft/s)
 Flow width (from curb towards crown)= 10.539(Ft.)

++++++
 Process from Point/Station 308.100 to Point/Station 308.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.805
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.43 min.
 Rainfall intensity = 2.243(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.204(CFS) for 1.220(Ac.)
 Total runoff = 3.605(CFS) Total area = 1.920(Ac.)

++++++
 Process from Point/Station 308.000 to Point/Station 308.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.920(Ac.)
 Runoff from this stream = 3.605(CFS)
 Time of concentration = 21.43 min.
 Rainfall intensity = 2.243(In/Hr)

++++++
 Process from Point/Station 501.000 to Point/Station 502.000
 **** INITIAL AREA EVALUATION ****

Initial area flow distance = 312.000(Ft.)
 Top (of initial area) elevation = 1432.920(Ft.)
 Bottom (of initial area) elevation = 1431.000(Ft.)
 Difference in elevation = 1.920(Ft.)
 Slope = 0.00615 s(percent)= 0.62
 TC = $k(0.390)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 10.737 min.
 Rainfall intensity = 3.236(In/Hr) for a 100.0 year storm
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.830
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Initial subarea runoff = 0.618(CFS)
 Total initial stream area = 0.230(Ac.)
 Pervious area fraction = 0.500

++++++
 Process from Point/Station 502.100 to Point/Station 502.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.830
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 10.74 min.
 Rainfall intensity = 3.236(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.128(CFS) for 0.420(Ac.)
 Total runoff = 1.745(CFS) Total area = 0.650(Ac.)

Process from Point/Station 502.000 to Point/Station 308.000
 **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1431.000(Ft.)
 End of street segment elevation = 1429.020(Ft.)
 Length of street segment = 474.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 14.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.224(CFS)
 Depth of flow = 0.216(Ft.), Average velocity = 1.534(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 12.155(Ft.)
 Flow velocity = 1.53(Ft/s)
 Travel time = 5.15 min. TC = 15.89 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.629(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.902(CFS) for 0.420(Ac.)
 Total runoff = 2.647(CFS) Total area = 1.070(Ac.)
 Street flow at end of street = 2.647(CFS)
 Half street flow at end of street = 2.647(CFS)
 Depth of flow = 0.232(Ft.), Average velocity = 1.603(Ft/s)
 Flow width (from curb towards crown)= 12.956(Ft.)

Process from Point/Station 308.200 to Point/Station 308.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 15.89 min.
 Rainfall intensity = 2.629(In/Hr) for a 100.0 year storm

Subarea runoff = 2.318(CFS) for 1.080(Ac.)
Total runoff = 4.965(CFS) Total area = 2.150(Ac.)

Process from Point/Station 308.000 to Point/Station 308.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 2.150(Ac.)
Runoff from this stream = 4.965(CFS)
Time of concentration = 15.89 min.
Rainfall intensity = 2.629(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.149	19.87	2.335
2	3.605	21.43	2.243
3	4.965	15.89	2.629

Largest stream flow has longer or shorter time of concentration
Qp = 23.149 + sum of
Qa Tb/Ta
3.605 * 0.927 = 3.343
Qb Ia/Ib
4.965 * 0.888 = 4.410
Qp = 30.902

Total of 3 streams to confluence:
Flow rates before confluence point:
23.149 3.605 4.965
Area of streams before confluence:
11.050 1.920 2.150
Results of confluence:
Total flow rate = 30.902(CFS)
Time of concentration = 19.870 min.
Effective stream area after confluence = 15.120(Ac.)

Process from Point/Station 308.000 to Point/Station 309.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.834(Ft.), Average velocity = 4.212(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.015

Sub-Channel flow = 30.902(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity = 4.212(Ft/s)
' ' area = 7.336(Sq.Ft)
' ' Froude number = 0.548

Upstream point elevation = 1425.040(Ft.)
Downstream point elevation = 1424.970(Ft.)
Flow length = 36.500(Ft.)
Travel time = 0.14 min.
Time of concentration = 20.01 min.
Depth of flow = 1.834(Ft.)
Average velocity = 4.212(Ft/s)
Total irregular channel flow = 30.902(CFS)
Irregular channel normal depth above invert elev. = 1.834(Ft.)
Average velocity of channel(s) = 4.212(Ft/s)

```

*****
Process from Point/Station      309.100 to Point/Station      309.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 20.01 min.
Rainfall intensity = 2.326(In/Hr) for a 100.0 year storm
Subarea runoff = 2.462(CFS) for 1.310(Ac.)
Total runoff = 33.364(CFS) Total area = 16.430(Ac.)

*****
Process from Point/Station      309.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 16.430(Ac.)
Runoff from this stream = 33.364(CFS)
Time of concentration = 20.01 min.
Rainfall intensity = 2.326(In/Hr)

*****
Process from Point/Station      601.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 311.000(Ft.)
Top (of initial area) elevation = 1434.050(Ft.)
Bottom (of initial area) elevation = 1432.280(Ft.)
Difference in elevation = 1.770(Ft.)
Slope = 0.00569 s(percent)= 0.57
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.892 min.
Rainfall intensity = 3.211(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.997(CFS)
Total initial stream area = 0.750(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      602.000 to Point/Station      603.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1432.280(Ft.)
End of street segment elevation = 1429.500(Ft.)
Length of street segment = 798.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150

```

Estimated mean flow rate at midpoint of street = 4.055(CFS)
 Depth of flow = 0.287(Ft.), Average velocity = 1.667(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.682(Ft.)
 Flow velocity = 1.67(Ft/s)
 Travel time = 7.98 min. TC = 18.87 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.400(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.064(CFS) for 2.090(Ac.)
 Total runoff = 6.061(CFS) Total area = 2.840(Ac.)
 Street flow at end of street = 6.061(CFS)
 Half street flow at end of street = 6.061(CFS)
 Depth of flow = 0.336(Ft.), Average velocity = 1.853(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown)= 18.000(Ft.)

 Process from Point/Station 603.100 to Point/Station 603.100
 *** SUBAREA FLOW ADDITION ***

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.810
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 18.87 min.
 Rainfall intensity = 2.400(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.947(CFS) for 2.030(Ac.)
 Total runoff = 10.008(CFS) Total area = 4.870(Ac.)

 Process from Point/Station 603.000 to Point/Station 309.000
 *** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ***

Top of street segment elevation = 1429.500(Ft.)
 End of street segment elevation = 1429.000(Ft.)
 Length of street segment = 101.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 10.070(CFS)
 Depth of flow = 0.376(Ft.), Average velocity = 2.520(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 18.000(Ft.)
 Flow velocity = 2.52(Ft/s)
 Travel time = 0.67 min. TC = 19.54 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.809

```

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.356(In/Hr) for a 100.0 year storm
Subarea runoff = 0.114(CFS) for 0.060(Ac.)
Total runoff = 10.122(CFS) Total area = 4.930(Ac.)
Street flow at end of street = 10.122(CFS)
Half street flow at end of street = 10.122(CFS)
Depth of flow = 0.377(Ft.), Average velocity = 2.525(Ft/s)
Note: depth of flow exceeds top of street crown.
Flow width (from curb towards crown)= 18.000(Ft.)

+++++
Process from Point/Station 309.000 to Point/Station 309.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 4.930(Ac.)
Runoff from this stream = 10.122(CFS)
Time of concentration = 19.54 min.
Rainfall intensity = 2.356(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 33.364 20.01 2.326
2 10.122 19.54 2.356
Largest stream flow has longer time of concentration
Qp = 33.364 + sum of
      Qb Ia/Ib
      10.122 * 0.987 = 9.993
Qp = 43.358

Total of 2 streams to confluence:
Flow rates before confluence point:
      33.364 10.122
Area of streams before confluence:
      16.430 4.930
Results of confluence:
Total flow rate = 43.358(CFS)
Time of concentration = 20.014 min.
Effective stream area after confluence = 21.360(Ac.)

+++++
Process from Point/Station 309.000 to Point/Station 310.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.062(Ft.), Average velocity = 5.257(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 2.20
2 0.00 0.00
3 4.00 0.00
4 4.00 2.20
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 43.358(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity= 5.257(Ft/s)
' ' area = 8.248(Sq.Ft)
' ' Froude number = 0.645

Upstream point elevation = 1424.870(Ft.)
Downstream point elevation = 1424.850(Ft.)

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```

Flow length =      9.650(Ft.)
Travel time  =      0.03 min.
Time of concentration = 20.04 min.
Depth of flow =  2.062(Ft.)
Average velocity =  5.257(Ft/s)
Total irregular channel flow =  43.358(CFS)
Irregular channel normal depth above invert elev. =  2.062(Ft.)
Average velocity of channel(s) =  5.257(Ft/s)

*****
Process from Point/Station      310.000 to Point/Station      311.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow =  0.567(Ft.), Average velocity =  7.281(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              2.00
      2              0.00              0.00
      3             10.50              0.00
      4             10.50              2.00
Manning's 'N' friction factor =  0.017
-----
Sub-Channel flow =  43.358(CFS)
      '      '      flow top width =  10.500(Ft.)
      '      '      velocity=  7.281(Ft/s)
      '      '      area =  5.955(Sq.Ft)
      '      '      Froude number =  1.704

Upstream point elevation = 1424.850(Ft.)
Downstream point elevation = 1423.850(Ft.)
Flow length =  59.000(Ft.)
Travel time  =  0.14 min.
Time of concentration = 20.18 min.
Depth of flow =  0.567(Ft.)
Average velocity =  7.281(Ft/s)
Total irregular channel flow =  43.358(CFS)
Irregular channel normal depth above invert elev. =  0.567(Ft.)
Average velocity of channel(s) =  7.281(Ft/s)

*****
Process from Point/Station      311.000 to Point/Station      312.000
**** SUBAREA FLOW ADDITION ****

-----
USER INPUT of soil data for subarea
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 20.18 min.
Rainfall intensity = 2.316(In/Hr) for a 100.0 year storm
Subarea runoff = 2.101(CFS) for 1.020(Ac.)
Total runoff = 45.459(CFS)      Total area = 22.380(Ac.)

*****
Process from Point/Station      312.000 to Point/Station      313.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow =  1.619(Ft.), Average velocity =  7.018(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              5.00
      2              0.00              0.00
      3              4.00              0.00
      4              4.00              5.00

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Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 45.459(CFS)
' ' flow top width = 4.000(Ft.)
' ' velocity = 7.018(Ft/s)
' ' area = 6.478(Sq.Ft)
' ' Froude number = 0.972

Upstream point elevation = 1423.850(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 114.400(Ft.)
Travel time = 0.27 min.
Time of concentration = 20.45 min.
Depth of flow = 1.619(Ft.)
Average velocity = 7.018(Ft/s)
Total irregular channel flow = 45.459(CFS)
Irregular channel normal depth above invert elev. = 1.619(Ft.)
Average velocity of channel(s) = 7.018(Ft/s)

*****
Process from Point/Station 313.000 to Point/Station 314.000
**** SUBAREA FLOW ADDITION ****

USER INPUT of soil data for subarea
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 98.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Time of concentration = 20.45 min.
Rainfall intensity = 2.300(In/Hr) for a 100.0 year storm
Subarea runoff = 16.630(CFS) for 8.130(Ac.)
Total runoff = 62.090(CFS) Total area = 30.510(Ac.)

*****
Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 30.510(Ac.)
Runoff from this stream = 62.090(CFS)
Time of concentration = 20.45 min.
Rainfall intensity = 2.300(In/Hr)

*****
Process from Point/Station 711.000 to Point/Station 314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.426(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 18.49 min. Rain intensity = 2.43(In/Hr)
Total area = 21.08(Ac.) Total runoff = 44.20(CFS)

*****
Process from Point/Station 314.000 to Point/Station 314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 21.080(Ac.)
Runoff from this stream = 44.195(CFS)
Time of concentration = 18.49 min.

```

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Rainfall intensity =      2.426(In/Hr)

+++++
Process from Point/Station      1107.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      2.497(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 17.51 min.  Rain intensity =      2.50(In/Hr)
Total area =      6.10(Ac.)  Total runoff =      13.27(CFS)

+++++
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =      6.100(Ac.)
Runoff from this stream =      13.273(CFS)
Time of concentration = 17.51 min.
Rainfall intensity =      2.497(In/Hr)

+++++
Process from Point/Station      1205.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      2.470(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 17.87 min.  Rain intensity =      2.47(In/Hr)
Total area =      7.32(Ac.)  Total runoff =      15.43(CFS)

+++++
Process from Point/Station      314.000 to Point/Station      314.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area =      7.320(Ac.)
Runoff from this stream =      15.433(CFS)
Time of concentration = 17.87 min.
Rainfall intensity =      2.470(In/Hr)

+++++
Process from Point/Station      1306.000 to Point/Station      314.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity =      3.015(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 12.27 min.  Rain intensity =      3.01(In/Hr)

```

Total area = 3.70(Ac.) Total runoff = 9.72(CFS)

 Process from Point/Station 314.000 to Point/Station 314.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 5
 Stream flow area = 3.700(Ac.)
 Runoff from this stream = 9.723(CFS)
 Time of concentration = 12.27 min.
 Rainfall intensity = 3.015(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	62.090	20.45	2.300
2	44.195	18.49	2.426
3	13.273	17.51	2.497
4	15.433	17.87	2.470
5	9.723	12.27	3.015

Largest stream flow has longer time of concentration
 Qp = 62.090 + sum of
 Qb Ia/Ib
 44.195 * 0.948 = 41.895
 Qb Ia/Ib
 13.273 * 0.921 = 12.224
 Qb Ia/Ib
 15.433 * 0.931 = 14.368
 Qb Ia/Ib
 9.723 * 0.763 = 7.417
 Qp = 137.994

Total of 5 streams to confluence:
 Flow rates before confluence point:
 62.090 44.195 13.273 15.433 9.723
 Area of streams before confluence:
 30.510 21.080 6.100 7.320 3.700
 Results of confluence:
 Total flow rate = 137.994(CFS)
 Time of concentration = 20.452 min.
 Effective stream area after confluence = 68.710(Ac.)

 Process from Point/Station 314.000 to Point/Station 315.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.946(Ft.), Average velocity = 5.854(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 6.00
 2 0.00 0.00
 3 8.00 0.00
 4 8.00 6.00
 Manning's 'N' friction factor = 0.015

Sub-Channel flow = 137.994(CFS)
 ' ' flow top width = 8.000(Ft.)
 ' ' velocity = 5.854(Ft/s)
 ' ' area = 23.572(Sq.Ft)
 ' ' Froude number = 0.601

Upstream point elevation = 1423.350(Ft.)
 Downstream point elevation = 1422.950(Ft.)
 Flow length = 231.800(Ft.)
 Travel time = 0.66 min.
 Time of concentration = 21.11 min.
 Depth of flow = 2.946(Ft.)

Average velocity = 5.854(Ft/s)
 Total irregular channel flow = 137.994(CFS)
 Irregular channel normal depth above invert elev. = 2.946(Ft.)
 Average velocity of channel(s) = 5.854(Ft/s)

++++++
 Process from Point/Station 315.100 to Point/Station 315.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.826
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.336(CFS) for 0.180(Ac.)
 Total runoff = 138.330(CFS) Total area = 68.890(Ac.)

++++++
 Process from Point/Station 315.200 to Point/Station 315.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.826
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.306(CFS) for 1.770(Ac.)
 Total runoff = 141.636(CFS) Total area = 70.660(Ac.)

++++++
 Process from Point/Station 315.300 to Point/Station 315.300
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.826
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.336(CFS) for 0.180(Ac.)
 Total runoff = 141.973(CFS) Total area = 70.840(Ac.)

++++++
 Process from Point/Station 315.400 to Point/Station 315.400
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.826
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.187(CFS) for 0.100(Ac.)

Total runoff = 142.159(CFS) Total area = 70.940(Ac.)

 Process from Point/Station 315.500 to Point/Station 315.500
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.826
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.009(CFS) for 0.540(Ac.)
 Total runoff = 143.168(CFS) Total area = 71.480(Ac.)

 Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 71.480(Ac.)
 Runoff from this stream = 143.168(CFS)
 Time of concentration = 21.11 min.
 Rainfall intensity = 2.261(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	143.168	21.11	2.261

Largest stream flow has longer time of concentration
 Qp = 143.168 + sum of
 Qp = 143.168

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 143.168
 Area of streams before confluence:
 71.480

Results of confluence:
 Total flow rate = 143.168(CFS)
 Time of concentration = 21.111 min.
 Effective stream area after confluence = 71.480(Ac.)

 Process from Point/Station 1409.000 to Point/Station 315.000
 **** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.174(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.881
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 22.75 min. Rain intensity = 2.17(In/Hr)
 Total area = 149.38(Ac.) Total runoff = 259.85(CFS)

 Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 149.380(Ac.)
 Runoff from this stream = 259.850(CFS)
 Time of concentration = 22.75 min.
 Rainfall intensity = 2.174(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
------------	-----------------	----------	----------------------------

1	143.168	21.11	2.261
2	259.850	22.75	2.174

Largest stream flow has longer time of concentration
 $Q_p = 259.850 + \text{sum of}$
 $Q_b \quad I_a/I_b$
 $143.168 * 0.961 = 137.607$
 $Q_p = 397.457$

Total of 2 main streams to confluence:

Flow rates before confluence point:
 143.168 259.850

Area of streams before confluence:
 71.480 149.380

Results of confluence:

Total flow rate = 397.457(CFS)
 Time of concentration = 22.750 min.
 Effective stream area after confluence = 220.860(Ac.)
 End of computations, total study area = 220.86 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.250
 Area averaged RI index number = 70.3

Post Development Ultimate – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R2100.out
-----
14047 POST 3
Basin 3 Reach 2
14047POSTB3R2100.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 701.000 to Point/Station 702.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 329.000(Ft.)
Top (of initial area) elevation = 1435.900(Ft.)
Bottom (of initial area) elevation = 1433.950(Ft.)
Difference in elevation = 1.950(Ft.)
Slope = 0.00593 s(percent)= 0.59
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.050 min.
Rainfall intensity = 3.187(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.430(CFS)
Total initial stream area = 0.920(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station 702.000 to Point/Station 703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.950(Ft.)
End of street segment elevation = 1431.540(Ft.)
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Post Development Ultimate – 100 year - Basin 3 - Reach 2

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Length of street segment = 477.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.497(CFS)
 Depth of flow = 0.250(Ft.), Average velocity = 1.846(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 13.862(Ft.)
 Flow velocity = 1.85(Ft/s)
 Travel time = 4.31 min. TC = 15.36 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.818
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.677(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.079(CFS) for 0.950(Ac.)
 Total runoff = 4.509(CFS) Total area = 1.870(Ac.)
 Street flow at end of street = 4.509(CFS)
 Half street flow at end of street = 4.509(CFS)
 Depth of flow = 0.278(Ft.), Average velocity = 1.968(Ft/s)
 Flow width (from curb towards crown) = 15.226(Ft.)

 Process from Point/Station 703.100 to Point/Station 703.100
 *** SUBAREA FLOW ADDITION ***

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.818
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 15.36 min.
 Rainfall intensity = 2.677(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.591(CFS) for 0.270(Ac.)
 Total runoff = 5.100(CFS) Total area = 2.140(Ac.)

 Process from Point/Station 703.000 to Point/Station 704.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.610(Ft.)
 Downstream point/station elevation = 1427.450(Ft.)
 Pipe length = 80.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.100(CFS)
 Given pipe size = 18.00(In.)
 NOTE: Normal flow is pressure flow in user selected pipe size.
 The approximate hydraulic grade line above the pipe invert is
 0.223(Ft.) at the headworks or inlet of the pipe(s)
 Pipe friction loss = 0.189(Ft.)
 Minor friction loss = 0.194(Ft.) K-factor = 1.50
 Pipe flow velocity = 2.89(Ft/s)
 Travel time through pipe = 0.46 min.
 Time of concentration (TC) = 15.82 min.

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*****
Process from Point/Station      704.000 to Point/Station      704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =          2.140(Ac.)
Runoff from this stream =          5.100(CFS)
Time of concentration =       15.82 min.
Rainfall intensity =         2.635(In/Hr)

*****
Process from Point/Station      901.000 to Point/Station      902.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance =    211.000(Ft.)
Top (of initial area) elevation = 1438.790(Ft.)
Bottom (of initial area) elevation = 1433.300(Ft.)
Difference in elevation =        5.490(Ft.)
Slope =      0.02602 s(percent)=      2.60
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.882 min.
Rainfall intensity =         4.096(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =          1.450(CFS)
Total initial stream area =          0.420(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      902.000 to Point/Station      705.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.330(Ft.)
End of street segment elevation = 1432.180(Ft.)
Length of street segment =    295.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 3.114(CFS)
Depth of flow = 0.252(Ft.), Average velocity = 1.627(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 13.931(Ft.)
Flow velocity = 1.63(Ft/s)
Travel time = 3.02 min.      TC = 9.90 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity =         3.377(In/Hr) for a 100.0 year storm
Subarea runoff =          3.232(CFS) for 1.150(Ac.)

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Total runoff = 4.682(CFS) Total area = 1.570(Ac.)
Street flow at end of street = 4.682(CFS)
Half street flow at end of street = 4.682(CFS)
Depth of flow = 0.297(Ft.), Average velocity = 1.803(Ft/s)
Flow width (from curb towards crown)= 16.197(Ft.)

Process from Point/Station 705.000 to Point/Station 706.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.690(Ft.)
Downstream point/station elevation = 1427.620(Ft.)
Pipe length = 36.77(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.682(CFS)
Given pipe size = 12.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
1.392(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.635(Ft.)
Minor friction loss = 0.828(Ft.) K-factor = 1.50
Pipe flow velocity = 5.96(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 10.01 min.

Process from Point/Station 706.100 to Point/Station 706.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.832
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 10.01 min.
Rainfall intensity = 3.359(In/Hr) for a 100.0 year storm
Subarea runoff = 4.136(CFS) for 1.480(Ac.)
Total runoff = 8.818(CFS) Total area = 3.050(Ac.)

Process from Point/Station 706.000 to Point/Station 704.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.520(Ft.)
Downstream point/station elevation = 1427.450(Ft.)
Pipe length = 31.87(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.818(CFS)
Given pipe size = 18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.734(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.224(Ft.)
Minor friction loss = 0.580(Ft.) K-factor = 1.50
Pipe flow velocity = 4.99(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 10.11 min.

Process from Point/Station 704.000 to Point/Station 704.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 3.050(Ac.)
Runoff from this stream = 8.818(CFS)
Time of concentration = 10.11 min.
Rainfall intensity = 3.340(In/Hr)
Summary of stream data:

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Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.100	15.82	2.635
2	8.818	10.11	3.340

Largest stream flow has longer or shorter time of concentration

Qp = 8.818 + sum of

Qa	Tb/Ta	
5.100	0.639	3.261

Qp = 12.078

Total of 2 streams to confluence:

Flow rates before confluence point:

5.100	8.818

Area of streams before confluence:

2.140	3.050

Results of confluence:

Total flow rate = 12.078(CFS)

Time of concentration = 10.113 min.

Effective stream area after confluence = 5.190(Ac.)

Process from Point/Station 704.000 to Point/Station 707.000

**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.350(Ft.)

Downstream point/station elevation = 1427.120(Ft.)

Pipe length = 114.66(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 12.078(CFS)

Given pipe size = 24.00(In.)

NOTE: Normal flow is pressure flow in user selected pipe size.

The approximate hydraulic grade line above the pipe invert is 0.441(Ft.) at the headworks or inlet of the pipe(s)

Pipe friction loss = 0.327(Ft.)

Minor friction loss = 0.344(Ft.) K-factor = 1.50

Pipe flow velocity = 3.84(Ft/s)

Travel time through pipe = 0.50 min.

Time of concentration (TC) = 10.61 min.

Process from Point/Station 707.100 to Point/Station 707.100

**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)

Runoff Coefficient = 0.846

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000

Decimal fraction soil group D = 1.000

RI index for soil(AMC 2) = 75.00

Pervious area fraction = 0.500; Impervious fraction = 0.500

Time of concentration = 10.61 min.

Rainfall intensity = 3.256(In/Hr) for a 100.0 year storm

Subarea runoff = 1.763(CFS) for 0.640(Ac.)

Total runoff = 13.841(CFS) Total area = 5.830(Ac.)

Process from Point/Station 707.000 to Point/Station 708.000

**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1427.020(Ft.)

Downstream point/station elevation = 1425.700(Ft.)

Pipe length = 613.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 13.841(CFS)

Given pipe size = 24.00(In.)

NOTE: Normal flow is pressure flow in user selected pipe size.

The approximate hydraulic grade line above the pipe invert is 1.426(Ft.) at the headworks or inlet of the pipe(s)

Pipe friction loss = 2.294(Ft.)

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Minor friction loss =      0.452(Ft.)      K-factor =   1.50
Pipe flow velocity =      4.41(Ft/s)
Travel time through pipe =    2.32 min.
Time of concentration (TC) =   12.93 min.

*****
Process from Point/Station      708.000 to Point/Station      708.000
**** CONFLUENCE OF MINOR STREAMS ****

-----
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.830(Ac.)
Runoff from this stream =    13.841(CFS)
Time of concentration =    12.93 min.
Rainfall intensity =    2.932(In/Hr)

*****
Process from Point/Station      801.000 to Point/Station      802.000
**** INITIAL AREA EVALUATION ****

-----
Initial area flow distance =   337.000(Ft.)
Top (of initial area) elevation = 1433.880(Ft.)
Bottom (of initial area) elevation = 1432.280(Ft.)
Difference in elevation =      1.600(Ft.)
Slope =      0.00475 s(percent)=      0.47
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.663 min.
Rainfall intensity =      3.097(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff =    2.228(CFS)
Total initial stream area =      0.870(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station      802.000 to Point/Station      803.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

-----
Top of street segment elevation = 1432.280(Ft.)
End of street segment elevation = 1429.390(Ft.)
Length of street segment =   559.000(Ft.)
Height of curb above gutter flowline =    6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width =    2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street =    4.182(CFS)
Depth of flow = 0.268(Ft.), Average velocity = 1.948(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 14.744(Ft.)
Flow velocity = 1.95(Ft/s)
Travel time = 4.78 min.      TC = 16.45 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000

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Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.581(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.851(CFS) for 1.830(Ac.)
 Total runoff = 6.080(CFS) Total area = 2.700(Ac.)
 Street flow at end of street = 6.080(CFS)
 Half street flow at end of street = 6.080(CFS)
 Depth of flow = 0.312(Ft.), Average velocity = 2.140(Ft/s)
 Flow width (from curb towards crown)= 16.934(Ft.)

 Process from Point/Station 803.100 to Point/Station 803.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.815
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.45 min.
 Rainfall intensity = 2.581(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.830(CFS) for 1.820(Ac.)
 Total runoff = 9.910(CFS) Total area = 4.520(Ac.)

 Process from Point/Station 803.000 to Point/Station 804.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.930(Ft.)
 Downstream point/station elevation = 1425.860(Ft.)
 Pipe length = 36.52(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 9.910(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 9.910(CFS)
 Normal flow depth in pipe = 19.69(In.)
 Flow top width inside pipe = 18.43(In.)
 Critical Depth = 13.52(In.)
 Pipe flow velocity = 3.59(Ft/s)
 Travel time through pipe = 0.17 min.
 Time of concentration (TC) = 16.62 min.

 Process from Point/Station 804.100 to Point/Station 804.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.815
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.62 min.
 Rainfall intensity = 2.567(In/Hr) for a 100.0 year storm
 Subarea runoff = 7.552(CFS) for 3.610(Ac.)
 Total runoff = 17.462(CFS) Total area = 8.130(Ac.)

 Process from Point/Station 804.000 to Point/Station 708.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.760(Ft.)
 Downstream point/station elevation = 1425.700(Ft.)
 Pipe length = 29.74(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.462(CFS)
 Given pipe size = 30.00(In.)

Calculated individual pipe flow = 17.462(CFS)
 Normal flow depth in pipe = 23.30(In.)
 Flow top width inside pipe = 24.99(In.)
 Critical Depth = 16.97(In.)
 Pipe flow velocity = 4.27(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 16.73 min.

 Process from Point/Station 708.000 to Point/Station 708.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 8.130(Ac.)
 Runoff from this stream = 17.462(CFS)
 Time of concentration = 16.73 min.
 Rainfall intensity = 2.558(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.841	12.93	2.932
2	17.462	16.73	2.558

Largest stream flow has longer time of concentration
 Qp = 17.462 + sum of
 Qb Ia/Ib
 13.841 * 0.872 = 12.073
 Qp = 29.535

Total of 2 streams to confluence:
 Flow rates before confluence point:
 13.841 17.462
 Area of streams before confluence:
 5.830 8.130
 Results of confluence:
 Total flow rate = 29.535(CFS)
 Time of concentration = 16.732 min.
 Effective stream area after confluence = 13.960(Ac.)

 Process from Point/Station 708.000 to Point/Station 709.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.600(Ft.)
 Downstream point/station elevation = 1424.620(Ft.)
 Pipe length = 439.11(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 29.535(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 29.535(CFS)
 Normal flow depth in pipe = 27.66(In.)
 Flow top width inside pipe = 30.38(In.)
 Critical Depth = 21.12(In.)
 Pipe flow velocity = 5.07(Ft/s)
 Travel time through pipe = 1.44 min.
 Time of concentration (TC) = 18.18 min.

 Process from Point/Station 709.000 to Point/Station 709.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 13.960(Ac.)
 Runoff from this stream = 29.535(CFS)
 Time of concentration = 18.18 min.
 Rainfall intensity = 2.448(In/Hr)

 Process from Point/Station 1001.000 to Point/Station 1002.000

```

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 372.000(Ft.)
Top (of initial area) elevation = 1434.650(Ft.)
Bottom (of initial area) elevation = 1433.410(Ft.)
Difference in elevation = 1.240(Ft.)
Slope = 0.00333 s(percent)= 0.33
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.023 min.
Rainfall intensity = 2.921(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.823
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 3.945(CFS)
Total initial stream area = 1.640(Ac.)
Pervious area fraction = 0.500

+++++
Process from Point/Station 1002.000 to Point/Station 1003.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.410(Ft.)
End of street segment elevation = 1430.420(Ft.)
Length of street segment = 393.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 18.000(Ft.)
Distance from crown to crossfall grade break = 16.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 14.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 5.897(CFS)
Depth of flow = 0.285(Ft.), Average velocity = 2.454(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 15.588(Ft.)
Flow velocity = 2.45(Ft/s)
Travel time = 2.67 min. TC = 15.69 min.
Adding area flow to street
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.817
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Rainfall intensity = 2.646(In/Hr) for a 100.0 year storm
Subarea runoff = 3.848(CFS) for 1.780(Ac.)
Total runoff = 7.793(CFS) Total area = 3.420(Ac.)
Street flow at end of street = 7.793(CFS)
Half street flow at end of street = 7.793(CFS)
Depth of flow = 0.319(Ft.), Average velocity = 2.632(Ft/s)
Flow width (from curb towards crown)= 17.284(Ft.)

+++++
Process from Point/Station 1003.100 to Point/Station 1003.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.835

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Post Development Ultimate – 100 year - Basin 3 - Reach 2

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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 15.69 min.
Rainfall intensity = 2.646(In/Hr) for a 100.0 year storm
Subarea runoff = 3.913(CFS) for 1.770(Ac.)
Total runoff = 11.706(CFS) Total area = 5.190(Ac.)

*****
Process from Point/Station 1003.000 to Point/Station 709.000
*** PIPEFLOW TRAVEL TIME (Program estimated size) ***

Upstream point/station elevation = 1424.630(Ft.)
Downstream point/station elevation = 1424.620(Ft.)
Pipe length = 4.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 11.706(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 11.706(CFS)
Normal flow depth in pipe = 21.60(In.)
Flow top width inside pipe = 14.40(In.)
Critical Depth = 14.74(In.)
Pipe flow velocity = 3.93(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 15.71 min.

*****
Process from Point/Station 709.000 to Point/Station 709.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 5.190(Ac.)
Runoff from this stream = 11.706(CFS)
Time of concentration = 15.71 min.
Rainfall intensity = 2.645(In/Hr)
Summary of stream data:

Stream Flow rate TC Rainfall Intensity
No. (CFS) (min) (In/Hr)

1 29.535 18.18 2.448
2 11.706 15.71 2.645
Largest stream flow has longer time of concentration
Qp = 29.535 + sum of
      Qb Ia/Ib
      11.706 * 0.926 = 10.835
Qp = 40.370

Total of 2 streams to confluence:
Flow rates before confluence point:
29.535 11.706
Area of streams before confluence:
13.960 5.190
Results of confluence:
Total flow rate = 40.370(CFS)
Time of concentration = 18.176 min.
Effective stream area after confluence = 19.150(Ac.)

*****
Process from Point/Station 709.000 to Point/Station 710.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Depth of flow = 1.873(Ft.), Average velocity = 7.184(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00

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Post Development Ultimate – 100 year - Basin 3 - Reach 2

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2	0.00	0.00
3	3.00	0.00
4	3.00	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 40.370(CFS)
' ' flow top width = 3.000(Ft.)
' ' velocity= 7.184(Ft/s)
' ' area = 5.619(Sq.Ft)
' ' Froude number = 0.925

Upstream point elevation = 1424.520(Ft.)
Downstream point elevation = 1424.350(Ft.)
Flow length = 33.730(Ft.)
Travel time = 0.08 min.
Time of concentration = 18.25 min.
Depth of flow = 1.873(Ft.)
Average velocity = 7.184(Ft/s)
Total irregular channel flow = 40.370(CFS)
Irregular channel normal depth above invert elev. = 1.873(Ft.)
Average velocity of channel(s) = 7.184(Ft/s)

+++++

Process from Point/Station 710.100 to Point/Station 710.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 18.25 min.
Rainfall intensity = 2.443(In/Hr) for a 100.0 year storm
Subarea runoff = 3.825(CFS) for 1.930(Ac.)
Total runoff = 44.195(CFS) Total area = 21.080(Ac.)

+++++

Process from Point/Station 710.000 to Point/Station 711.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.418(Ft.), Average velocity = 5.867(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 5.00
2 0.00 0.00
3 18.00 0.00
4 18.00 5.00
Manning's 'N' friction factor = 0.015

Sub-Channel flow = 44.195(CFS)
' ' flow top width = 18.000(Ft.)
' ' velocity= 5.867(Ft/s)
' ' area = 7.533(Sq.Ft)
' ' Froude number = 1.598

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 84.000(Ft.)
Travel time = 0.24 min.
Time of concentration = 18.49 min.
Depth of flow = 0.418(Ft.)
Average velocity = 5.867(Ft/s)
Total irregular channel flow = 44.195(CFS)
Irregular channel normal depth above invert elev. = 0.418(Ft.)
Average velocity of channel(s) = 5.867(Ft/s)
End of computations, total study area = 21.08 (Ac.)

Post Development Ultimate - 100 year - Basin 3 - Reach 2

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Post Development Ultimate – Onsite – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POSTB3R3100.out
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14047 POST 3
BASIN 3
14047POSTB3R3100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 1101.000 to Point/Station 1102.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 226.000(Ft.)
Top (of initial area) elevation = 1433.490(Ft.)
Bottom (of initial area) elevation = 1432.810(Ft.)
Difference in elevation = 0.680(Ft.)
Slope = 0.00301 s(percent)= 0.30
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.890 min.
Rainfall intensity = 3.212(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.065(CFS)
Total initial stream area = 0.400(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station 1102.000 to Point/Station 1103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

Post Development Ultimate - 100 year – Basin 3 – Reach 3

Page 1 of 4

Top of street segment elevation = 1432.810(Ft.)
 End of street segment elevation = 1430.330(Ft.)
 Length of street segment = 483.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [2] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 3.083(CFS)
 Depth of flow = 0.178(Ft.), Average velocity = 1.509(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.239(Ft.)
 Flow velocity = 1.51(Ft/s)
 Travel time = 5.33 min. TC = 16.22 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.816
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.600(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.903(CFS) for 1.840(Ac.)
 Total runoff = 4.968(CFS) Total area = 2.240(Ac.)
 Street flow at end of street = 4.968(CFS)
 Half street flow at end of street = 2.484(CFS)
 Depth of flow = 0.217(Ft.), Average velocity = 1.703(Ft/s)
 Flow width (from curb towards crown)= 12.187(Ft.)

 Process from Point/Station 1103.000 to Point/Station 1104.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1427.060(Ft.)
 Downstream point/station elevation = 1426.850(Ft.)
 Pipe length = 41.78(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.968(CFS)
 Nearest computed pipe diameter = 18.00(In.)
 Calculated individual pipe flow = 4.968(CFS)
 Normal flow depth in pipe = 10.75(In.)
 Flow top width inside pipe = 17.66(In.)
 Critical Depth = 10.28(In.)
 Pipe flow velocity = 4.51(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 16.38 min.

 Process from Point/Station 1104.100 to Point/Station 1104.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.834
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 16.38 min.
 Rainfall intensity = 2.587(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.848(CFS) for 1.320(Ac.)

Post Development Ultimate - 100 year - Basin 3 - Reach 3

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Total runoff =      7.816(CFS)          Total area =      3.560(Ac.)

+++++
Process from Point/Station      1104.000 to Point/Station      1105.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.350(Ft.)
Downstream point/station elevation = 1426.180(Ft.)
Pipe length = 34.91(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.816(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 7.816(CFS)
Normal flow depth in pipe = 16.20(In.)
Flow top width inside pipe = 10.80(In.)
Critical Depth = 12.99(In.)
Pipe flow velocity = 4.66(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 16.50 min.

+++++
Process from Point/Station      1105.100 to Point/Station      1105.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.50 min.
Rainfall intensity = 2.577(In/Hr) for a 100.0 year storm
Subarea runoff = 2.191(CFS) for 1.020(Ac.)
Total runoff = 10.007(CFS)          Total area = 4.580(Ac.)

+++++
Process from Point/Station      1105.200 to Point/Station      1105.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.834
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 16.50 min.
Rainfall intensity = 2.577(In/Hr) for a 100.0 year storm
Subarea runoff = 3.266(CFS) for 1.520(Ac.)
Total runoff = 13.273(CFS)          Total area = 6.100(Ac.)

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*****
Process from Point/Station 1105.000 to Point/Station 1106.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1425.680(Ft.)
Downstream point/station elevation = 1424.980(Ft.)
Pipe length = 246.09(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 13.273(CFS)
Given pipe size = 24.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
0.563(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 0.847(Ft.)
Minor friction loss = 0.416(Ft.) K-factor = 1.50
Pipe flow velocity = 4.22(Ft/s)
Travel time through pipe = 0.97 min.
Time of concentration (TC) = 17.47 min.

*****
Process from Point/Station 1106.000 to Point/Station 1107.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.227(Ft.), Average velocity = 9.362(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 1.00
2 0.00 0.00
3 6.25 0.00
4 6.25 1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 13.273(CFS)
' ' flow top width = 6.250(Ft.)
' ' velocity = 9.362(Ft/s)
' ' area = 1.418(Sq.Ft)
' ' Froude number = 3.464

Upstream point elevation = 1424.980(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 23.000(Ft.)
Travel time = 0.04 min.
Time of concentration = 17.51 min.
Depth of flow = 0.227(Ft.)
Average velocity = 9.362(Ft/s)
Total irregular channel flow = 13.273(CFS)
Irregular channel normal depth above invert elev. = 0.227(Ft.)
Average velocity of channel(s) = 9.362(Ft/s)
End of computations, total study area = 6.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 72.8

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The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.500
Area averaged RI index number = 69.7

Post Development Ultimate – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19  File:14047POSTB3R4100.out
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14047 POST 2
BASIN 3
14047POSTB3R4100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 1201.000 to Point/Station 1202.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 290.000(Ft.)
Top (of initial area) elevation = 1433.520(Ft.)
Bottom (of initial area) elevation = 1433.030(Ft.)
Difference in elevation = 0.490(Ft.)
Slope = 0.00169 s(percent)= 0.17
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.504 min.
Rainfall intensity = 2.866(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.840
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 2.454(CFS)
Total initial stream area = 1.020(Ac.)
Pervious area fraction = 0.500

*****
Process from Point/Station 1202.000 to Point/Station 1203.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

Post Development Ultimate – 100 year – Basin 3 – Reach 4

Page 1 of 3

Top of street segment elevation = 1433.030(Ft.)
 End of street segment elevation = 1429.670(Ft.)
 Length of street segment = 553.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.953(CFS)
 Depth of flow = 0.278(Ft.), Average velocity = 2.159(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.235(Ft.)
 Flow velocity = 2.16(Ft/s)
 Travel time = 4.27 min. TC = 17.77 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.944(CFS) for 2.400(Ac.)
 Total runoff = 7.398(CFS) Total area = 3.420(Ac.)
 Street flow at end of street = 7.398(CFS)
 Half street flow at end of street = 7.398(CFS)
 Depth of flow = 0.327(Ft.), Average velocity = 2.388(Ft/s)
 Flow width (from curb towards crown)= 17.676(Ft.)

++++++
 Process from Point/Station 1203.100 to Point/Station 1203.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.77 min.
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.472(CFS) for 1.200(Ac.)
 Total runoff = 9.870(CFS) Total area = 4.620(Ac.)

++++++
 Process from Point/Station 1203.200 to Point/Station 1203.200
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.832
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 17.77 min.
 Rainfall intensity = 2.477(In/Hr) for a 100.0 year storm
 Subarea runoff = 5.562(CFS) for 2.700(Ac.)

Post Development Ultimate – 100 year – Basin 3 – Reach 4

Page 2 of 3

```

Total runoff =      15.433(CFS)          Total area =      7.320(Ac.)

+++++
Process from Point/Station      1203.000 to Point/Station      1204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.140(Ft.)
Downstream point/station elevation = 1424.350(Ft.)
Pipe length = 33.66(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 15.433(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 15.433(CFS)
Normal flow depth in pipe = 8.94(In.)
Flow top width inside pipe = 23.21(In.)
Critical Depth = 17.01(In.)
Pipe flow velocity = 14.46(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 17.81 min.

+++++
Process from Point/Station      1204.000 to Point/Station      1205.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.267(Ft.), Average velocity = 7.699(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                1.00
2                  0.00                0.00
3                  7.50                0.00
4                  7.50                1.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 15.433(CFS)
'      '      flow top width = 7.500(Ft.)
'      '      velocity= 7.699(Ft/s)
'      '      area = 2.004(Sq.Ft)
'      '      Froude number = 2.625

Upstream point elevation = 1424.350(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 26.000(Ft.)
Travel time = 0.06 min.
Time of concentration = 17.87 min.
Depth of flow = 0.267(Ft.)
Average velocity = 7.699(Ft/s)
Total irregular channel flow = 15.433(CFS)
Irregular channel normal depth above invert elev. = 0.267(Ft.)
Average velocity of channel(s) = 7.699(Ft/s)
End of computations, total study area = 7.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development Ultimate – 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POSTB3R5100.out
-----
14047 POST 2
BASIN 3
14047POSTB3R5100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

+++++
Process from Point/Station 1301.000 to Point/Station 1302.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 186.000(Ft.)
Top (of initial area) elevation = 1432.120(Ft.)
Bottom (of initial area) elevation = 1431.130(Ft.)
Difference in elevation = 0.990(Ft.)
Slope = 0.00532 s(percent)= 0.53
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.988 min.
Rainfall intensity = 3.556(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Initial subarea runoff = 1.390(CFS)
Total initial stream area = 0.460(Ac.)
Pervious area fraction = 0.500
+++++
Process from Point/Station 1302.000 to Point/Station 1303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1431.130(Ft.)
End of street segment elevation = 1430.010(Ft.)
```

Post Development Ultimate – 100 year Basin 3 Reach 5

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Length of street segment = 303.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.076(CFS)
 Depth of flow = 0.284(Ft.), Average velocity = 1.707(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 15.539(Ft.)
 Flow velocity = 1.71(Ft/s)
 Travel time = 2.96 min. TC = 11.95 min.
 Adding area flow to street
 SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.843
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Rainfall intensity = 3.058(In/Hr) for a 100.0 year storm
 Subarea runoff = 5.310(CFS) for 2.060(Ac.)
 Total runoff = 6.700(CFS) Total area = 2.520(Ac.)
 Street flow at end of street = 6.700(CFS)
 Half street flow at end of street = 6.700(CFS)
 Depth of flow = 0.344(Ft.), Average velocity = 1.963(Ft/s)
 Note: depth of flow exceeds top of street crown.
 Flow width (from curb towards crown) = 18.000(Ft.)

 Process from Point/Station 1303.000 to Point/Station 1304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.820(Ft.)
 Downstream point/station elevation = 1426.630(Ft.)
 Pipe length = 37.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.700(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 6.700(CFS)
 Normal flow depth in pipe = 13.27(In.)
 Flow top width inside pipe = 15.85(In.)
 Critical Depth = 12.02(In.)
 Pipe flow velocity = 4.80(Ft/s)
 Travel time through pipe = 0.13 min.
 Time of concentration (TC) = 12.08 min.

 Process from Point/Station 1304.100 to Point/Station 1304.100
 **** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
 Runoff Coefficient = 0.843
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 RI index for soil(AMC 2) = 75.00
 Pervious area fraction = 0.500; Impervious fraction = 0.500
 Time of concentration = 12.08 min.
 Rainfall intensity = 3.041(In/Hr) for a 100.0 year storm
 Subarea runoff = 3.023(CFS) for 1.180(Ac.)
 Total runoff = 9.723(CFS) Total area = 3.700(Ac.)

Post Development Ultimate – 100 year Basin 3 Reach 5

Page 2 of 3

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*****
Process from Point/Station      1304.000 to Point/Station      1305.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1426.490(Ft.)
Downstream point/station elevation = 1424.150(Ft.)
Pipe length = 92.26(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.723(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 9.723(CFS)
Normal flow depth in pipe = 9.86(In.)
Flow top width inside pipe = 17.92(In.)
Critical Depth = 14.44(In.)
Pipe flow velocity = 9.82(Ft/s)
Travel time through pipe = 0.16 min.
Time of concentration (TC) = 12.23 min.

*****
Process from Point/Station      1305.000 to Point/Station      1306.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.250(Ft.), Average velocity = 7.778(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
1                  0.00                3.00
2                  0.00                0.00
3                  5.00                0.00
4                  5.00                3.00
Manning's 'N' friction factor = 0.015
-----
Sub-Channel flow = 9.723(CFS)
'      '      flow top width = 5.000(Ft.)
'      '      velocity = 7.778(Ft/s)
'      '      area = 1.250(Sq.Ft)
'      '      Froude number = 2.741

Upstream point elevation = 1424.150(Ft.)
Downstream point elevation = 1423.350(Ft.)
Flow length = 18.000(Ft.)
Travel time = 0.04 min.
Time of concentration = 12.27 min.
Depth of flow = 0.250(Ft.)
Average velocity = 7.778(Ft/s)
Total irregular channel flow = 9.723(CFS)
Irregular channel normal depth above invert elev. = 0.250(Ft.)
Average velocity of channel(s) = 7.778(Ft/s)
End of computations, total study area = 3.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 75.0

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Post Development Ultimate - 100 year

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/31/19   File:14047POSTULTB3R6100.out
-----
14047 POC 3
basin3-poc3
14047POSTULTB3R6100.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1401.000 to Point/Station 1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 3.586(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.559(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100
*****
Process from Point/Station 1402.000 to Point/Station 1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
```

Post Development Ultimate – 100 year - Basin 3 - Reach 6

Page 1 of 9

Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 24.000(Ft.)
 Distance from crown to crossfall grade break = 22.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.078
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 12.000(Ft.)
 Slope from curb to property line (v/hz) = 0.020
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 0.156(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 4.019(CFS)
 Depth of flow = 0.260(Ft.), Average velocity = 1.981(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 14.337(Ft.)
 Flow velocity = 1.98(Ft/s)
 Travel time = 7.48 min. TC = 16.32 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
 Subarea runoff = 4.852(CFS) for 2.120(Ac.)
 Total runoff = 6.411(CFS) Total area = 2.610(Ac.)
 Street flow at end of street = 6.411(CFS)
 Half street flow at end of street = 6.411(CFS)
 Depth of flow = 0.314(Ft.), Average velocity = 2.228(Ft/s)
 Flow width (from curb towards crown)= 17.041(Ft.)

 Process from Point/Station 1501.100 to Point/Station 1501.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 16.32 min.
 Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.229(CFS) for 0.100(Ac.)
 Total runoff = 6.640(CFS) Total area = 2.710(Ac.)

 Process from Point/Station 1501.000 to Point/Station 1502.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
 Downstream point/station elevation = 1431.710(Ft.)
 Pipe length = 32.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.640(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 6.640(CFS)
 Normal flow depth in pipe = 5.14(In.)
 Flow top width inside pipe = 19.70(In.)
 Critical Depth = 10.96(In.)
 Pipe flow velocity = 13.45(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 16.36 min.

Post Development Ultimate – 100 year - Basin 3 - Reach 6

Page 2 of 9

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Process from Point/Station      1502.000 to Point/Station      1403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.57(In.)
Flow top width inside pipe = 29.20(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.80(Ft/s)
Travel time through pipe = 1.43 min.
Time of concentration (TC) = 17.79 min.

+-----+
Process from Point/Station      1403.000 to Point/Station      1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.60(In.)
Flow top width inside pipe = 29.22(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.79(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 18.16 min.

+-----+
Process from Point/Station      1601.000 to Point/Station      1601.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.85(In/Hr)
Total area = 15.82(Ac.) Total runoff = 27.29(CFS)

+-----+
Process from Point/Station      1601.000 to Point/Station      1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 5.00 min.
Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
Subarea runoff = 0.389(CFS) for 0.090(Ac.)
Total runoff = 27.679(CFS) Total area = 15.910(Ac.)

+-----+
Process from Point/Station      1404.000 to Point/Station      1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```

```

Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.679(CFS)
Given pipe size = 30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
      1.485(Ft.) at the headworks or inlet of the pipe(s)
      Pipe friction loss = 1.335(Ft.)
      Minor friction loss = 0.741(Ft.) K-factor = 1.50
      Pipe flow velocity = 5.64(Ft/s)
      Travel time through pipe = 0.87 min.
      Time of concentration (TC) = 5.87 min.

+++++
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 5.87 min.
Rainfall intensity = 4.458(In/Hr) for a 100.0 year storm
Subarea runoff = 5.074(CFS) for 1.280(Ac.)
Total runoff = 32.753(CFS) Total area = 17.190(Ac.)

+++++
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.753(CFS)
Given pipe size = 30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
      5.036(Ft.) at the headworks or inlet of the pipe(s)
      Pipe friction loss = 5.819(Ft.)
      Minor friction loss = 1.037(Ft.) K-factor = 1.50
      Pipe flow velocity = 6.67(Ft/s)
      Travel time through pipe = 2.28 min.
      Time of concentration (TC) = 8.15 min.

+++++
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.15 min.
Rainfall intensity = 3.746(In/Hr) for a 100.0 year storm
Subarea runoff = 3.591(CFS) for 1.080(Ac.)
Total runoff = 36.344(CFS) Total area = 18.270(Ac.)

+++++
Process from Point/Station 1701.000 to Point/Station 1406.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

```

Rainfall intensity = 2.591(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 16.33 min. Rain intensity = 2.59(In/Hr)
 Total area = 125.13(Ac.) Total runoff = 252.96(CFS)
 ++++++
 Process from Point/Station 1701.100 to Point/Station 1701.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 16.33 min.
 Rainfall intensity = 2.591(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.030(CFS) for 0.450(Ac.)
 Total runoff = 253.990(CFS) Total area = 125.580(Ac.)

+++++
 Process from Point/Station 1701.000 to Point/Station 1406.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.170(Ft.), Average velocity = 13.788(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

 Manning's 'N' friction factor = 0.013

Sub-Channel flow = 253.990(CFS)

'	'	flow top width = 15.750(Ft.)
'	'	velocity= 13.788(Ft/s)
'	'	area = 18.422(Sq.Ft)
'	'	Froude number = 2.247

Upstream point elevation = 1427.200(Ft.)
 Downstream point elevation = 1426.490(Ft.)
 Flow length = 50.000(Ft.)
 Travel time = 0.06 min.
 Time of concentration = 16.39 min.
 Depth of flow = 1.170(Ft.)
 Average velocity = 13.788(Ft/s)
 Total irregular channel flow = 253.990(CFS)
 Irregular channel normal depth above invert elev. = 1.170(Ft.)
 Average velocity of channel(s) = 13.788(Ft/s)

+++++
 Process from Point/Station 1701.000 to Point/Station 1406.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.170(Ft.), Average velocity = 13.788(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00

```

2          0.00          0.00
3          15.75         0.00
4          15.75         4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 253.990(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 13.788(Ft/s)
' ' area = 18.422(Sq.Ft)
' ' Froude number = 2.247

Upstream point elevation = 1427.200(Ft.)
Downstream point elevation = 1426.490(Ft.)
Flow length = 50.000(Ft.)
Travel time = 0.06 min.
Time of concentration = 16.45 min.
Depth of flow = 1.170(Ft.)
Average velocity = 13.788(Ft/s)
Total irregular channel flow = 253.990(CFS)
Irregular channel normal depth above invert elev. = 1.170(Ft.)
Average velocity of channel(s) = 13.788(Ft/s)

+++++
Process from Point/Station 1406.000 to Point/Station 1407.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

-----
Depth of flow = 2.600(Ft.), Average velocity = 6.480(Ft/s)
***** Irregular Channel Data *****

-----
Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 4.00
2 0.00 0.00
3 14.75 0.00
4 15.75 4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 253.990(CFS)
' ' flow top width = 15.400(Ft.)
' ' velocity= 6.480(Ft/s)
' ' area = 39.197(Sq.Ft)
' ' Froude number = 0.716

Upstream point elevation = 1426.490(Ft.)
Downstream point elevation = 1426.020(Ft.)
Flow length = 358.000(Ft.)
Travel time = 0.92 min.
Time of concentration = 17.37 min.
Depth of flow = 2.600(Ft.)
Average velocity = 6.480(Ft/s)
Total irregular channel flow = 253.990(CFS)
Irregular channel normal depth above invert elev. = 2.600(Ft.)
Average velocity of channel(s) = 6.480(Ft/s)

+++++
Process from Point/Station 1407.100 to Point/Station 1407.100
**** SUBAREA FLOW ADDITION ****

-----
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 17.37 min.
Rainfall intensity = 2.508(In/Hr) for a 100.0 year storm
Subarea runoff = 2.744(CFS) for 1.240(Ac.)
Total runoff = 256.734(CFS) Total area = 126.820(Ac.)
+++++

```

Post Development Ultimate – 100 year - Basin 3 - Reach 6

Page 6 of 9

Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 256.734(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 6.608(Ft/s)
' ' area = 38.855(Sq.Ft)
' ' Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 18.75 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 256.734(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity = 6.608(Ft/s)
' ' area = 38.855(Sq.Ft)
' ' Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 20.14 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Post Development Ultimate - 100 year - Basin 3 - Reach 6

Page 7 of 9

```

Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 256.734(CFS)
      '      ' flow top width = 15.750(Ft.)
      '      ' velocity= 6.608(Ft/s)
      '      ' area = 38.855(Sq.Ft)
      '      ' Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 21.52 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

*****
Process from Point/Station 1408.100 to Point/Station 1408.100
*** SUBAREA FLOW ADDITION ***
-----
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 21.52 min.
Rainfall intensity = 2.239(In/Hr) for a 100.0 year storm
Subarea runoff = 3.116(CFS) for 1.580(Ac.)
Total runoff = 259.850(CFS) Total area = 128.400(Ac.)

*****
Process from Point/Station 1408.000 to Point/Station 1409.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***
-----
Depth of flow = 1.862(Ft.), Average velocity = 8.861(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 259.850(CFS)
      '      ' flow top width = 15.750(Ft.)
      '      ' velocity= 8.861(Ft/s)
      '      ' area = 29.327(Sq.Ft)
      '      ' Froude number = 1.144

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 1.23 min.
Time of concentration = 22.75 min.
Depth of flow = 1.862(Ft.)
Average velocity = 8.861(Ft/s)
Total irregular channel flow = 259.850(CFS)
Irregular channel normal depth above invert elev. = 1.862(Ft.)

```

Post Development Ultimate – 100 year - Basin 3 - Reach 6

Page 8 of 9

Average velocity of channel(s) = 8.861(Ft/s)
End of computations, total study area = 149.38 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 69.0

Attachment I
Post Development Ultimate Conditions Mitigated

Attachment I1
Post Development Ultimate Conditions Mitigated
Map

$TC_2 = 11.99 \text{ min. } Q_2 = 0.45 \text{ CFS}$
 $TC_{10} = 11.60 \text{ min. } Q_{10} = 0.83 \text{ CFS}$
 $TC_{100} = 11.33 \text{ min. } Q_{100} = 1.26 \text{ CFS}$

$TC_2 = 10.19 \text{ min. } Q_2 = 1.27 \text{ CFS}$
 $TC_{10} = 9.57 \text{ min. } Q_{10} = 2.24 \text{ CFS}$
 $TC_{100} = 9.16 \text{ min. } Q_{100} = 3.42 \text{ CFS}$
POC 1

SUB AREA ADDITION 203.1
0.02 ACRES

0.23 ACRES L=241'

0.17 ACRES L=224'

0.83 ACRES L=441'

L=163'
0.19 ACRES

L=317'
0.49 ACRES

POC 2

SUB AREA ADDITION 315.1
0.18 ACRES

SUB AREA
ADDITION
315.2
1.77 ACRES

SUB AREA ADDITION 315.3
0.18 ACRES

68.71 ACRES

SUB AREA ADDITION 1501
0.10 ACRES

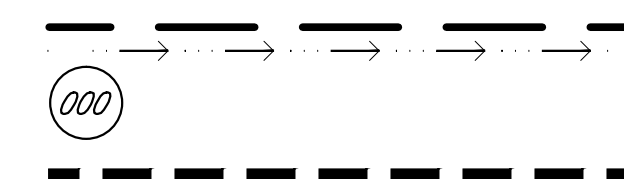
SUB AREA ADDITION
1402-1403
2.12 ACRES

SUB AREA ADDITION
1401-1404
0.09 ACRES

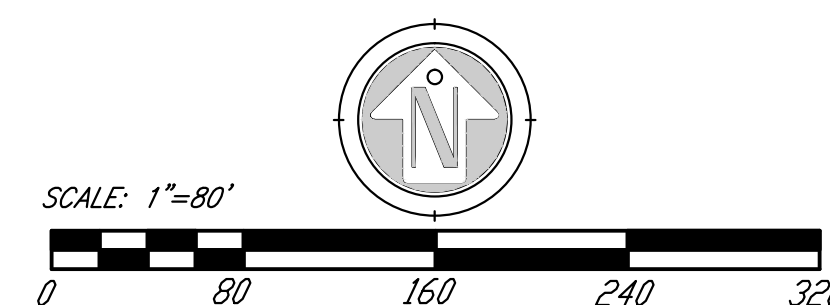
MATCH LINE

SEE POST DEVELOPMENT SOUTH SHEET

LEGEND



ROCKPORT RANCH
POST DEVELOPMENT-ULTIMATE MITIGATED
RATIONAL METHOD
NORTH SHEET



RECOMMENDED FOR APPROVAL

DATE:

CHECKED BY:

DATE:

DEVELOPER:

EXCEL
ENGINEERING
LAND PLANNING • ENGINEERING • SURVEYING
640 STATE PLACE, ESCONDIDO, CA 92025
PH (760) 745-8118 FX (760) 745-1880

TENTATIVE

ROCKPORT RANCH

FOR:

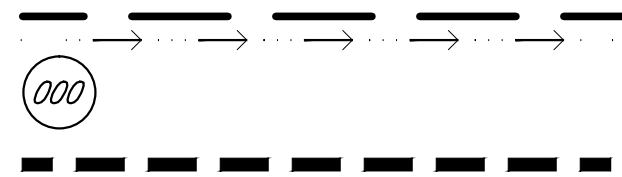
W.O.

DATE:

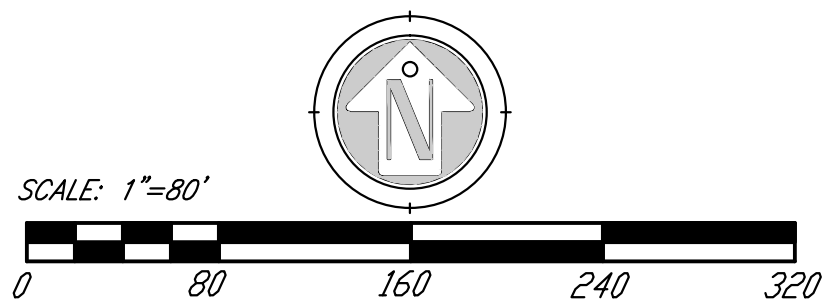
1 OF 2



LEGEND



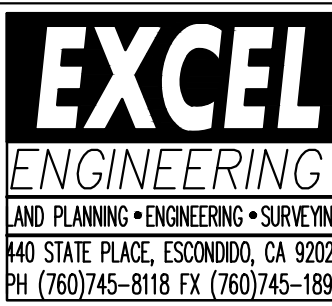
ROCKPORT RANCH
POST DEVELOPMENT-ULTIMATE MITIGATED
RATIONAL METHOD
SOUTH SHEET



RECOMMENDED FOR APPROVAL

DATE: _____
CHECKED BY: _____
DATE: _____

DEVELOPER:



TENTATIVE

ROCKPORT RANCH

FOR: _____ W.O. _____ DATE: _____

2 OF 2

RATIONAL METHOD WORKMAP

DRAINAGE AREA "E1"

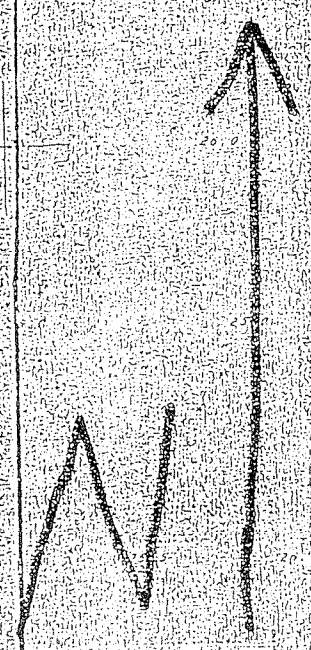
Note: AREA E1 consist of
Sub Areas 1,2 and, 3

AREA E1

Sub Area 1

Sub Area 2

Sub Area 3



1" = 300'

[XX] = NODE NUMBER

(XX) = AREA of BASIN

1/19/05

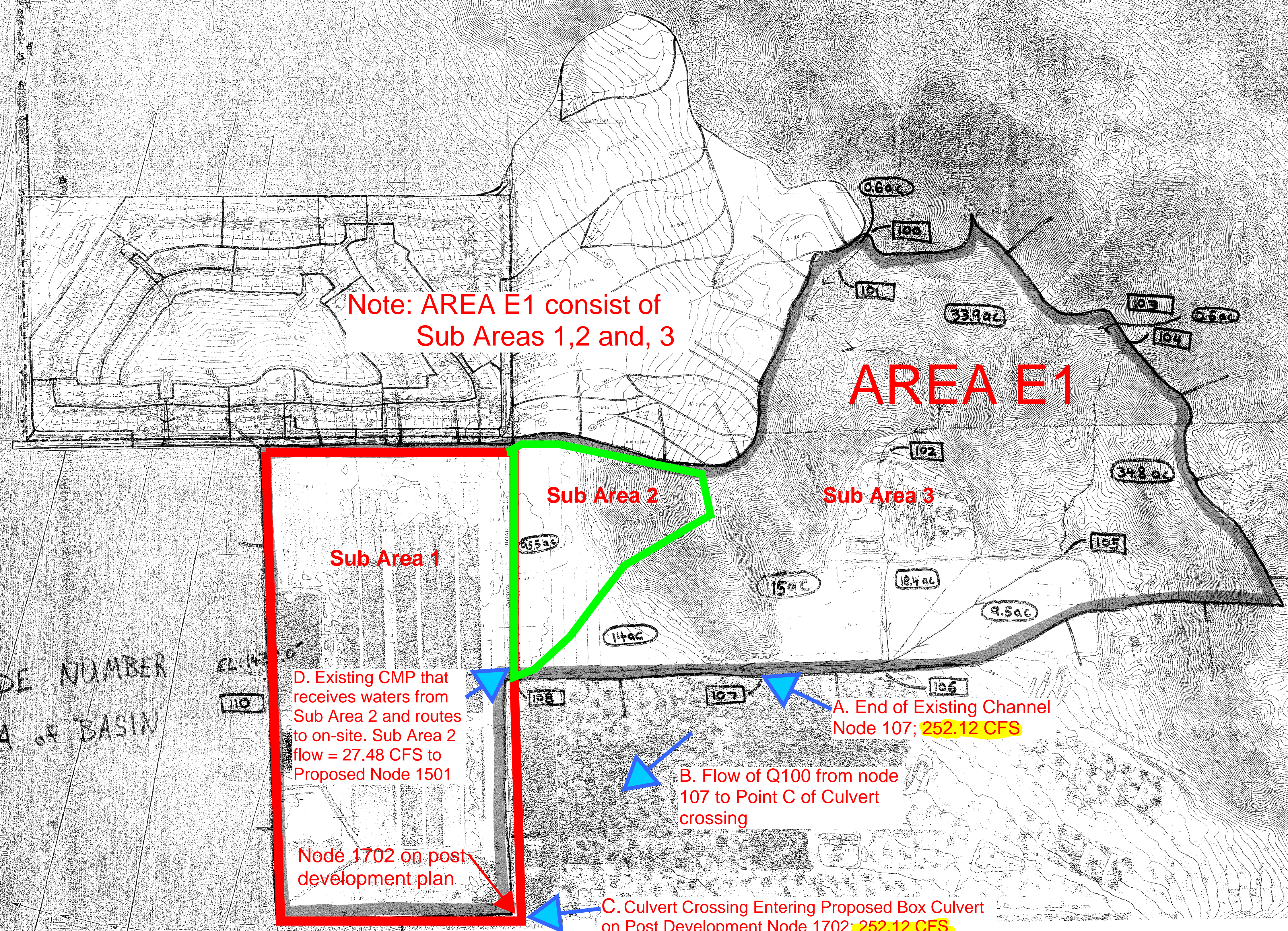
D. Existing CMP that
receives waters from
Sub Area 2 and routes
to on-site. Sub Area 2
flow = 27.48 CFS to
Proposed Node 1501

A. End of Existing Channel
Node 107; 252.12 CFS

B. Flow of Q100 from node
107 to Point C of Culvert
crossing

Node 1702 on post
development plan

C. Culvert Crossing Entering Proposed Box Culvert
on Post Development Node 1702; 252.12 CFS



Attachment I2

Post Development Ultimate Conditions Mitigated
100 Year

Post Development Ultimate Mitigated – 100 year

```
Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/29/19   File:14047POST100bl.out
-----
14047 POC 1
basin1-pocl
14047POST100bl.rrv
-----
***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
-----

Program License Serial Number 4012
-----
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

*****
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****
-----
Initial area flow distance = 163.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1436.800(Ft.)
Difference in elevation = 3.200(Ft.)
Slope = 0.01963 s(percent)= 1.96
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.051 min.
Rainfall intensity = 4.826(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 0.816(CFS)
Total initial stream area = 0.190(Ac.)
Pervious area fraction = 0.100

*****
Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-----
Top of street segment elevation = 1436.800(Ft.)
```

Post Development Ultimate Mitigated – 100 year – Basin 1

Page 1 of 2

End of street segment elevation = 1433.900(Ft.)
 Length of street segment = 441.000(Ft.)
 Height of curb above gutter flowline = 6.0(In.)
 Width of half street (curb to crown) = 18.000(Ft.)
 Distance from crown to crossfall grade break = 16.000(Ft.)
 Slope from gutter to grade break (v/hz) = 0.750
 Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 2.153(CFS)
 Depth of flow = 0.294(Ft.), Average velocity = 1.836(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 10.427(Ft.)
 Flow velocity = 1.84(Ft/s)
 Travel time = 4.00 min. TC = 9.05 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.887
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.542(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.608(CFS) for 0.830(Ac.)
 Total runoff = 3.424(CFS) Total area = 1.020(Ac.)
 Street flow at end of street = 3.424(CFS)
 Half street flow at end of street = 3.424(CFS)
 Depth of flow = 0.337(Ft.), Average velocity = 2.052(Ft/s)
 Flow width (from curb towards crown)= 12.584(Ft.)

 Process from Point/Station 103.000 to Point/Station 104.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.530(Ft.)
 Downstream point/station elevation = 1429.140(Ft.)
 Pipe length = 35.91(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.424(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.424(CFS)
 Normal flow depth in pipe = 6.91(In.)
 Flow top width inside pipe = 17.51(In.)
 Critical Depth = 8.47(In.)
 Pipe flow velocity = 5.48(Ft/s)
 Travel time through pipe = 0.11 min.
 Time of concentration (TC) = 9.16 min.
 End of computations, total study area = 1.02 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development Ultimate Mitigated – 100 year

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/29/19 File:14047POST100b2.out

14047 POST 2
BASIN 2 -poc 2
14047POST100b2.rrv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)

For the [Sun City] area used.

10 year storm 10 minute intensity = 2.250(In/Hr)

10 year storm 60 minute intensity = 0.870(In/Hr)

100 year storm 10 minute intensity = 3.360(In/Hr)

100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0

Calculated rainfall intensity data:

1 hour intensity = 1.300(In/Hr)

Slope of intensity duration curve = 0.5300

Process from Point/Station 201.000 to Point/Station 202.000

**** INITIAL AREA EVALUATION ****

Initial area flow distance = 224.000(Ft.)

Top (of initial area) elevation = 1434.700(Ft.)

Bottom (of initial area) elevation = 1433.990(Ft.)

Difference in elevation = 0.710(Ft.)

Slope = 0.00317 s(percent)= 0.32

TC = $k(0.300)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 8.261 min.

Rainfall intensity = 3.718(In/Hr) for a 100.0 year storm

COMMERCIAL subarea type

Runoff Coefficient = 0.888

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 1.000

Decimal fraction soil group D = 0.000

RI index for soil(AMC 2) = 69.00

Pervious area fraction = 0.100; Impervious fraction = 0.900

Initial subarea runoff = 0.561(CFS)

Total initial stream area = 0.170(Ac.)

Pervious area fraction = 0.100

Process from Point/Station 202.000 to Point/Station 203.000

**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1433.990(Ft.)

End of street segment elevation = 1432.770(Ft.)

Length of street segment = 241.000(Ft.)

Height of curb above gutter flowline = 6.0(In.)

Width of half street (curb to crown) = 18.000(Ft.)

Distance from crown to crossfall grade break = 16.000(Ft.)

Slope from gutter to grade break (v/hz) = 0.750

Post Development Ultimate Mitigated - 100 year – Basin 2

Page 1 of 2

Slope from grade break to crown (v/hz) = 0.020
 Street flow is on [1] side(s) of the street
 Distance from curb to property line = 10.000(Ft.)
 Slope from curb to property line (v/hz) = 2.000
 Gutter width = 2.000(Ft.)
 Gutter hike from flowline = 1.500(In.)
 Manning's N in gutter = 0.0150
 Manning's N from gutter to grade break = 0.0150
 Manning's N from grade break to crown = 0.0150
 Estimated mean flow rate at midpoint of street = 0.912(CFS)
 Depth of flow = 0.238(Ft.), Average velocity = 1.361(Ft/s)
 Streetflow hydraulics at midpoint of street travel:
 Halfstreet flow width = 7.648(Ft.)
 Flow velocity = 1.36(Ft/s)
 Travel time = 2.95 min. TC = 11.21 min.
 Adding area flow to street
 COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.644(CFS) for 0.230(Ac.)
 Total runoff = 1.205(CFS) Total area = 0.400(Ac.)
 Street flow at end of street = 1.205(CFS)
 Half street flow at end of street = 1.205(CFS)
 Depth of flow = 0.258(Ft.), Average velocity = 1.451(Ft/s)
 Flow width (from curb towards crown)= 8.636(Ft.)
 ++++++
 Process from Point/Station 203.100 to Point/Station 203.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.886
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 11.21 min.
 Rainfall intensity = 3.163(In/Hr) for a 100.0 year storm
 Subarea runoff = 0.056(CFS) for 0.020(Ac.)
 Total runoff = 1.261(CFS) Total area = 0.420(Ac.)
 ++++++
 Process from Point/Station 203.000 to Point/Station 204.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.670(Ft.)
 Downstream point/station elevation = 1426.590(Ft.)
 Pipe length = 58.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.261(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.261(CFS)
 Normal flow depth in pipe = 2.61(In.)
 Flow top width inside pipe = 12.67(In.)
 Critical Depth = 5.03(In.)
 Pipe flow velocity = 7.98(Ft/s)
 Travel time through pipe = 0.12 min.
 Time of concentration (TC) = 11.33 min.
 End of computations, total study area = 0.42 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Area averaged pervious area fraction(Ap) = 0.100
 Area averaged RI index number = 69.0

Post Development – Ultimate Mitigated Onsite – 100 year

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study Date: 07/31/19 File:14047post100b3r1.out

14047 POST 2 MITIGATED
BASIN 3
14047POSTULTMIT100b3r1.rrv

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file

Program License Serial Number 4012

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Sun City] area used.

10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300

Process from Point/Station 314.000 to Point/Station 314.000
*** USER DEFINED FLOW INFORMATION AT A POINT ***

Rainfall intensity = 1.081(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.740
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
User specified values are as follows:
TC = 85.00 min. Rain intensity = 1.08(In/Hr)
Total area = 68.71(Ac.) Total runoff = 24.35(CFS)

Process from Point/Station 314.000 to Point/Station 315.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***

Depth of flow = 0.905(Ft.), Average velocity = 3.362(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	6.00
2	0.00	0.00
3	8.00	0.00
4	8.00	6.00

Manning's 'N' friction factor = 0.015

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Sub-Channel flow =      24.350(CFS)
'      '      flow top width =      8.000(Ft.)
'      '      velocity=      3.362(Ft/s)
'      '      area =      7.243(Sq.Ft)
'      '      Froude number =      0.623

Upstream point elevation = 1423.350(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 231.800(Ft.)
Travel time = 1.15 min.
Time of concentration = 86.15 min.
Depth of flow = 0.905(Ft.)
Average velocity = 3.362(Ft/s)
Total irregular channel flow = 24.350(CFS)
Irregular channel normal depth above invert elev. = 0.905(Ft.)
Average velocity of channel(s) = 3.362(Ft/s)

+++++
Process from Point/Station      315.100 to Point/Station      315.100
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.148(CFS) for 0.180(Ac.)
Total runoff = 24.498(CFS)      Total area = 68.890(Ac.)

+++++
Process from Point/Station      315.200 to Point/Station      315.200
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 1.459(CFS) for 1.770(Ac.)
Total runoff = 25.958(CFS)      Total area = 70.660(Ac.)

+++++
Process from Point/Station      315.300 to Point/Station      315.300
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.148(CFS) for 0.180(Ac.)
Total runoff = 26.106(CFS)      Total area = 70.840(Ac.)

+++++
Process from Point/Station      315.400 to Point/Station      315.400
**** SUBAREA FLOW ADDITION ****

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Post Development- Ultimate Mitigated -100 year-Basin 3 Reach 1

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SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.082(CFS) for 0.100(Ac.)
Total runoff = 26.189(CFS) Total area = 70.940(Ac.)

Process from Point/Station 315.500 to Point/Station 315.500
**** SUBAREA FLOW ADDITION ****

SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.768
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.500; Impervious fraction = 0.500
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr) for a 100.0 year storm
Subarea runoff = 0.445(CFS) for 0.540(Ac.)
Total runoff = 26.634(CFS) Total area = 71.480(Ac.)

Process from Point/Station 315.000 to Point/Station 315.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 71.480(Ac.)
Runoff from this stream = 26.634(CFS)
Time of concentration = 86.15 min.
Rainfall intensity = 1.073(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.634	86.15	1.073

Largest stream flow has longer time of concentration
Qp = 26.634 + sum of
Qp = 26.634

Total of 1 main streams to confluence:
Flow rates before confluence point:
26.634
Area of streams before confluence:
71.480

Results of confluence:
Total flow rate = 26.634(CFS)
Time of concentration = 86.149 min.
Effective stream area after confluence = 71.480(Ac.)

Process from Point/Station 1409.000 to Point/Station 315.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.174(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 22.75 min. Rain intensity = 2.17(In/Hr)
 Total area = 149.38(Ac.) Total runoff = 259.85(CFS)

++++++
 Process from Point/Station 315.000 to Point/Station 315.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 149.380(Ac.)
 Runoff from this stream = 259.850(CFS)
 Time of concentration = 22.75 min.
 Rainfall intensity = 2.174(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.634	86.15	1.073
2	259.850	22.75	2.174

Largest stream flow has longer or shorter time of concentration
 $Q_p = 259.850 + \text{sum of}$
 $\quad Q_a \quad T_b/T_a$
 $\quad 26.634 * 0.264 = 7.033$
 $Q_p = 266.883$

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 26.634 259.850
 Area of streams before confluence:
 71.480 149.380

Results of confluence:
 Total flow rate = 266.883(CFS)
 Time of concentration = 22.750 min.
 Effective stream area after confluence = 220.860(Ac.)
 End of computations, total study area = 220.86 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.229
 Area averaged RI index number = 69.1

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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2004 Version 7.0
Rational Hydrology Study      Date: 07/31/19   File:14047POSTULTB3R6100.out
-----
14047 POC 3
basin3-poc3
14047POSTULTB3R6100.rrv
-----

***** Hydrology Study Control Information *****

English (in-lb) Units used in input data file
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Program License Serial Number 4012

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Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Sun City ] area used.
10 year storm 10 minute intensity = 2.250(In/Hr)
10 year storm 60 minute intensity = 0.870(In/Hr)
100 year storm 10 minute intensity = 3.360(In/Hr)
100 year storm 60 minute intensity = 1.300(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5300
*****
Process from Point/Station 1401.000 to Point/Station 1402.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 317.000(Ft.)
Top (of initial area) elevation = 1440.000(Ft.)
Bottom (of initial area) elevation = 1438.570(Ft.)
Difference in elevation = 1.430(Ft.)
Slope = 0.00451 s(percent)= 0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.845 min.
Rainfall intensity = 3.586(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 1.559(CFS)
Total initial stream area = 0.490(Ac.)
Pervious area fraction = 0.100
*****
Process from Point/Station 1402.000 to Point/Station 1403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1438.570(Ft.)
End of street segment elevation = 1433.630(Ft.)
Length of street segment = 889.000(Ft.)
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Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.078
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 12.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 0.156(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 4.019(CFS)
Depth of flow = 0.260(Ft.), Average velocity = 1.981(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 14.337(Ft.)
Flow velocity = 1.98(Ft/s)
Travel time = 7.48 min. TC = 16.32 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
Subarea runoff = 4.852(CFS) for 2.120(Ac.)
Total runoff = 6.411(CFS) Total area = 2.610(Ac.)
Street flow at end of street = 6.411(CFS)
Half street flow at end of street = 6.411(CFS)
Depth of flow = 0.314(Ft.), Average velocity = 2.228(Ft/s)
Flow width (from curb towards crown)= 17.041(Ft.)

+++++
Process from Point/Station 1501.100 to Point/Station 1501.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 16.32 min.
Rainfall intensity = 2.592(In/Hr) for a 100.0 year storm
Subarea runoff = 0.229(CFS) for 0.100(Ac.)
Total runoff = 6.640(CFS) Total area = 2.710(Ac.)

+++++
Process from Point/Station 1501.000 to Point/Station 1502.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1434.430(Ft.)
Downstream point/station elevation = 1431.710(Ft.)
Pipe length = 32.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 5.14(In.)
Flow top width inside pipe = 19.70(In.)
Critical Depth = 10.96(In.)
Pipe flow velocity = 13.45(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 16.36 min.

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Process from Point/Station      1502.000 to Point/Station      1403.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1430.500(Ft.)
Downstream point/station elevation = 1429.640(Ft.)
Pipe length = 326.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.57(In.)
Flow top width inside pipe = 29.20(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.80(Ft/s)
Travel time through pipe = 1.43 min.
Time of concentration (TC) = 17.79 min.

+*****+
Process from Point/Station      1403.000 to Point/Station      1404.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1429.630(Ft.)
Downstream point/station elevation = 1429.410(Ft.)
Pipe length = 84.29(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.640(CFS)
Normal flow depth in pipe = 11.60(In.)
Flow top width inside pipe = 29.22(In.)
Critical Depth = 10.24(In.)
Pipe flow velocity = 3.79(Ft/s)
Travel time through pipe = 0.37 min.
Time of concentration (TC) = 18.16 min.

+*****+
Process from Point/Station      1601.000 to Point/Station      1601.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.85(In/Hr)
Total area = 15.82(Ac.) Total runoff = 27.29(CFS)

+*****+
Process from Point/Station      1601.000 to Point/Station      1404.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 5.00 min.
Rainfall intensity = 4.852(In/Hr) for a 100.0 year storm
Subarea runoff = 0.389(CFS) for 0.090(Ac.)
Total runoff = 27.679(CFS) Total area = 15.910(Ac.)

+*****+
Process from Point/Station      1404.000 to Point/Station      1405.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

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Upstream point/station elevation = 1429.400(Ft.)
Downstream point/station elevation = 1428.810(Ft.)
Pipe length = 293.23(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.679(CFS)
Given pipe size = 30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
      1.485(Ft.) at the headworks or inlet of the pipe(s)
      Pipe friction loss = 1.335(Ft.)
      Minor friction loss = 0.741(Ft.) K-factor = 1.50
      Pipe flow velocity = 5.64(Ft/s)
      Travel time through pipe = 0.87 min.
      Time of concentration (TC) = 5.87 min.

+++++
Process from Point/Station 1405.100 to Point/Station 1405.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 5.87 min.
Rainfall intensity = 4.458(In/Hr) for a 100.0 year storm
Subarea runoff = 5.074(CFS) for 1.280(Ac.)
Total runoff = 32.753(CFS) Total area = 17.190(Ac.)

+++++
Process from Point/Station 1405.000 to Point/Station 1406.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1428.800(Ft.)
Downstream point/station elevation = 1426.980(Ft.)
Pipe length = 912.86(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 32.753(CFS)
Given pipe size = 30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
      5.036(Ft.) at the headworks or inlet of the pipe(s)
      Pipe friction loss = 5.819(Ft.)
      Minor friction loss = 1.037(Ft.) K-factor = 1.50
      Pipe flow velocity = 6.67(Ft/s)
      Travel time through pipe = 2.28 min.
      Time of concentration (TC) = 8.15 min.

+++++
Process from Point/Station 1406.100 to Point/Station 1406.100
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 8.15 min.
Rainfall intensity = 3.746(In/Hr) for a 100.0 year storm
Subarea runoff = 3.591(CFS) for 1.080(Ac.)
Total runoff = 36.344(CFS) Total area = 18.270(Ac.)

+++++
Process from Point/Station 1701.000 to Point/Station 1406.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

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Rainfall intensity = 2.591(In/Hr) for a 100.0 year storm
 COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 User specified values are as follows:
 TC = 16.33 min. Rain intensity = 2.59(In/Hr)
 Total area = 125.13(Ac.) Total runoff = 252.96(CFS)
 ++++++
 Process from Point/Station 1701.100 to Point/Station 1701.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 16.33 min.
 Rainfall intensity = 2.591(In/Hr) for a 100.0 year storm
 Subarea runoff = 1.030(CFS) for 0.450(Ac.)
 Total runoff = 253.990(CFS) Total area = 125.580(Ac.)

+++++
 Process from Point/Station 1701.000 to Point/Station 1406.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.170(Ft.), Average velocity = 13.788(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

 Manning's 'N' friction factor = 0.013

Sub-Channel flow = 253.990(CFS)

'	'	flow top width = 15.750(Ft.)
'	'	velocity= 13.788(Ft/s)
'	'	area = 18.422(Sq.Ft)
'	'	Froude number = 2.247

Upstream point elevation = 1427.200(Ft.)
 Downstream point elevation = 1426.490(Ft.)
 Flow length = 50.000(Ft.)
 Travel time = 0.06 min.
 Time of concentration = 16.39 min.
 Depth of flow = 1.170(Ft.)
 Average velocity = 13.788(Ft/s)
 Total irregular channel flow = 253.990(CFS)
 Irregular channel normal depth above invert elev. = 1.170(Ft.)
 Average velocity of channel(s) = 13.788(Ft/s)

+++++
 Process from Point/Station 1701.000 to Point/Station 1406.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 1.170(Ft.), Average velocity = 13.788(Ft/s)
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00

2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 253.990(CFS)
 ' ' flow top width = 15.750(Ft.)
 ' ' velocity = 13.788(Ft/s)
 ' ' area = 18.422(Sq.Ft)
 ' ' Froude number = 2.247

Upstream point elevation = 1427.200(Ft.)
 Downstream point elevation = 1426.490(Ft.)
 Flow length = 50.000(Ft.)
 Travel time = 0.06 min.
 Time of concentration = 16.45 min.
 Depth of flow = 1.170(Ft.)
 Average velocity = 13.788(Ft/s)
 Total irregular channel flow = 253.990(CFS)
 Irregular channel normal depth above invert elev. = 1.170(Ft.)
 Average velocity of channel(s) = 13.788(Ft/s)

 Process from Point/Station 1406.000 to Point/Station 1407.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.600(Ft.), Average velocity = 6.480(Ft/s)
 ***** Irregular Channel Data *****

Information entered for subchannel number 1 :
 Point number 'X' coordinate 'Y' coordinate
 1 0.00 4.00
 2 0.00 0.00
 3 14.75 0.00
 4 15.75 4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 253.990(CFS)
 ' ' flow top width = 15.400(Ft.)
 ' ' velocity = 6.480(Ft/s)
 ' ' area = 39.197(Sq.Ft)
 ' ' Froude number = 0.716

Upstream point elevation = 1426.490(Ft.)
 Downstream point elevation = 1426.020(Ft.)
 Flow length = 358.000(Ft.)
 Travel time = 0.92 min.
 Time of concentration = 17.37 min.
 Depth of flow = 2.600(Ft.)
 Average velocity = 6.480(Ft/s)
 Total irregular channel flow = 253.990(CFS)
 Irregular channel normal depth above invert elev. = 2.600(Ft.)
 Average velocity of channel(s) = 6.480(Ft/s)

 Process from Point/Station 1407.100 to Point/Station 1407.100
 **** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
 Runoff Coefficient = 0.883
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 RI index for soil(AMC 2) = 69.00
 Pervious area fraction = 0.100; Impervious fraction = 0.900
 Time of concentration = 17.37 min.
 Rainfall intensity = 2.508(In/Hr) for a 100.0 year storm
 Subarea runoff = 2.744(CFS) for 1.240(Ac.)
 Total runoff = 256.734(CFS) Total area = 126.820(Ac.)

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Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 256.734(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 6.608(Ft/s)
' ' area = 38.855(Sq.Ft)
' ' Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 18.75 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	4.00
2	0.00	0.00
3	15.75	0.00
4	15.75	4.00

Manning's 'N' friction factor = 0.013

Sub-Channel flow = 256.734(CFS)
' ' flow top width = 15.750(Ft.)
' ' velocity= 6.608(Ft/s)
' ' area = 38.855(Sq.Ft)
' ' Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 20.14 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

Process from Point/Station 1407.000 to Point/Station 1408.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 2.467(Ft.), Average velocity = 6.608(Ft/s)
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Post Development Ultimate Mitigated – 100 year - Basin 3 - Reach 6

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```

Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 256.734(CFS)
'   '   flow top width = 15.750(Ft.)
'   '   velocity= 6.608(Ft/s)
'   '   area = 38.855(Sq.Ft)
'   '   Froude number = 0.741

Upstream point elevation = 1426.020(Ft.)
Downstream point elevation = 1425.230(Ft.)
Flow length = 548.000(Ft.)
Travel time = 1.38 min.
Time of concentration = 21.52 min.
Depth of flow = 2.467(Ft.)
Average velocity = 6.608(Ft/s)
Total irregular channel flow = 256.734(CFS)
Irregular channel normal depth above invert elev. = 2.467(Ft.)
Average velocity of channel(s) = 6.608(Ft/s)

*****
Process from Point/Station 1408.100 to Point/Station 1408.100
*** SUBAREA FLOW ADDITION ***
-----
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Time of concentration = 21.52 min.
Rainfall intensity = 2.239(In/Hr) for a 100.0 year storm
Subarea runoff = 3.116(CFS) for 1.580(Ac.)
Total runoff = 259.850(CFS) Total area = 128.400(Ac.)

*****
Process from Point/Station 1408.000 to Point/Station 1409.000
*** IRREGULAR CHANNEL FLOW TRAVEL TIME ***
-----
Depth of flow = 1.862(Ft.), Average velocity = 8.861(Ft/s)
***** Irregular Channel Data *****
-----
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
      1              0.00              4.00
      2              0.00              0.00
      3             15.75              0.00
      4             15.75              4.00
Manning's 'N' friction factor = 0.013
-----
Sub-Channel flow = 259.850(CFS)
'   '   flow top width = 15.750(Ft.)
'   '   velocity= 8.861(Ft/s)
'   '   area = 29.327(Sq.Ft)
'   '   Froude number = 1.144

Upstream point elevation = 1425.230(Ft.)
Downstream point elevation = 1422.950(Ft.)
Flow length = 655.000(Ft.)
Travel time = 1.23 min.
Time of concentration = 22.75 min.
Depth of flow = 1.862(Ft.)
Average velocity = 8.861(Ft/s)
Total irregular channel flow = 259.850(CFS)
Irregular channel normal depth above invert elev. = 1.862(Ft.)

```

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Average velocity of channel(s) = 8.861(Ft/s)
End of computations, total study area = 149.38 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(A_p) = 0.100
Area averaged RI index number = 69.0

ROCKPORT RANCH SITE FLOW				
		Name and Map Exhibit/Report		
Item	AREA	2 YEAR	10 YEAR	100 YEAR
1	PRE- DEVELOPMENT ONSITE Basin 1	2.89	5.59	9.065
2	PRE- DEVELOPMENT ONSITE Basin 2	26.93	56.27	93.59
3	POST-DEVELOPMENT ONSITE Basin 1	1.27	2.24	3.42
4	POST-DEVELOPMENT ONSITE Basin 2	0.48	0.83	1.26
5	POST-DEVELOPMENT ONSITE Basin 3	50.07	95.73	151.62
6	POST-DEVELOPMENT ONSITE MITIGATED Basin 1	N/A	N/A	N/A
7	POST-DEVELOPMENT ONSITE MITIGATED Basin 2	N/A	N/A	N/A
8	POST-DEVELOPMENT ONSITE MITIGATED Basin 3	8.61	29.78	31.31
9	EXISTING ULTIMATE PER RICK ENGINEERING REPORT	N/A	N/A	418.14
10	POST ULTIMATE Basin 1	N/A	N/A	3.42
11	POST ULTIMATE Basin 2	N/A	N/A	1.26
12	POST ULTIMATE Basin 3	N/A	N/A	398.46
13	POST-DEVELOPMENT Ultimate MITIGATED Basin 1	N/A	N/A	N/A
14	POST-DEVELOPMENT Ultimate MITIGATED Basin 2	N/A	N/A	N/A
15	POST-DEVELOPMENT Ultimate MITIGATED Basin 3	N/A	N/A	266.88

ROCKPORT RANCH SITE AREA			
		Name and Map Exhibit/Report	
Item 1	AREA	Basin Areas (AC.)	Total Areas (AC.)
16	PRE- DEVELOPMENT ONSITE Basin 1	4.8	Item 16+17
17	PRE- DEVELOPMENT ONSITE Basin 2	76.5	81.35
18	POST-DEVELOPMENT ONSITE Basin 1	1.0	Item 18+19+20
19	POST-DEVELOPMENT ONSITE Basin 2	0.4	
20	POST-DEVELOPMENT ONSITE Basin 3	79.9	81.35
21	POST-DEVELOPMENT ONSITE Basin 1	1.0	Item 21+22+23
22	POST-DEVELOPMENT ONSITE Basin 2	0.6	
23	POST-DEVELOPMENT ONSITE MITIGATED Basin 3	79.9	81.35

Ultimate Conditions Area			
Item		Basins(Acres)	Total Area (Acres)
24	EXISTING ULTIMATE PER RICK ENGINEERING REPORT	222.3	222.3
25	POST ULTIMATE Basin 1	1.0	Item 25+26+27
26	POST ULTIMATE Basin 2	0.4	
27	POST ULTIMATE Basin 3	220.9	222.3
28	POST-DEVELOPMENT Ultimate MITIGATED Basin 1	1.0	Item 28+29+30
29	POST-DEVELOPMENT Ultimate MITIGATED Basin 2	0.4	
30	POST-DEVELOPMENT Ultimate MITIGATED Basin 3 (Includes off	220.9	222.3

Total Values from Civil-D files compiled and compared to show compliance.

Attachment J
Hydraulic Calculations

J1. Purpose of Hydraulic Calculations

The purpose of the Hydraulic calculations in this section is to show the HGL and flowlines of the proposed storm drain pipes and structures fall within tolerance of the available Q100 flows and are adequately sized.

J2. Methodology of Hydraulic Calculation

▪ Pipe Flow

- Hydraflow Storm Sewers Extension computes the hydraulic grade line using a method that is similar to the method used for computing open channels. The application begins computing at the most downstream line and works in a standard step procedure in an upstream direction. This method assumes the starting hydraulic grade line elevation, HGL, is known. For more information, see Computing the System. Hydraflow Storm Sewers Extension assumes an upstream HGL for a given line and then checks the energy equation. If the energy equation does not balance, another HGL is assumed and the iterative process continues until the assumed HGL equals the computed HGL. The starting downstream HGL for the next upstream line is based on the computed HGL plus any junction (minor) loss.
- If the starting HGL at the downstream end of any line (except outfalls) is below the Minimum Starting Depth that was set in the Design Codes, Hydraflow Storm Sewers Extension automatically change the HGL to the Minimum Starting Depth.
- Hydraflow Storm Sewers Extension computes the HGL for any given line at three places:

HGL Down	Represents the downstream end of the line. At the beginning of an outfall there is a user-defined elevation which can be a known elevation, Crown, Normal Depth $(d_c + D)/2$, or Critical Depth. At all other lines it is equal to the HGL Junction of its downstream line. However, if the energy grade line (EGL Dn) is less than the energy grade line (EGL) in the downstream junction (EGL Junction), the HGL Down is reset to the EGL Junction minus the velocity head. This prevents an increase of energy in the downstream direction if you have selected Correct EGL Discrepancies in the Design Codes dialog box . If the starting HGL is below the Minimum Starting Depth that you specified in the Design Codes, Hydraflow Storm Sewers Extension automatically changes the HGL to the Minimum Starting Depth.
HGL Up	Represents the upstream end of the pipe and is computed using the Standard Step Method. If you select the option Check For Inlet Control on the Calculations tab in the Design Codes dialog box, and the line is flowing under inlet control, the HGL Up is equal to the HGL Junction minus the upstream velocity head.
HGL Junct	Represents the junction at the upstream end of each Line, and is equal to the HGL Up plus any minor or junction loss. If you select the option Check For Inlet Control on the Calculations tab in the Design Codes dialog box, and the line is flowing

under inlet control, the HGL Junct is equal to the depth determined by the Inlet Control procedure.

The energy grade line (EGL) is computed as the HGL plus velocity head. If the line is flowing under inlet control, velocity at this point is zero and the EGL equals HGL.

▪ Critical Depth

Critical depth is computed using the following equation:

$$Dc = \left(\frac{1.01}{D^{2.6}}\right) \times \left(\frac{Q^2}{g}\right)^{.25}$$

Where:

Dc = Critical depth

D = Pipe diameter

Q = Flow rate

Note

If Dc is greater than 85% of D, then a trial-and-error method is used to find the minimum specific energy, for example the critical depth. For more information please refer to Open Channel Hydraulics, McGraw - Hill, 1985, by Richard H. French.

▪ Junction Losses

Junction losses are computed using the following equation:

$$Junctionloss = k\left(\frac{V^2}{2g}\right)$$

Where:

k = Coefficient

V = Velocity of flow exiting the junction

Junction losses are not computed for lines at critical depth or lines that flow under inlet control.

▪ Junction Loss Coefficients

Hydraflow Storm Sewers Extension automatically computes and assigns junction loss coefficients based on the junction configuration when you specify Automatic in the Design

Codes - Calculations tab. Coefficients are selected based on data adapted from FHWA HEC No. 22. These selected coefficients are based on the angle of the lines entering the junction at its upstream end.

For angles less than 90 degrees, Hydraflow Storm Sewers Extension uses the following equation to compute junction loss coefficients K:

$$K = \left[1 - \left(\frac{90 - \text{DeflectionAngle}}{90} \right)^2 \right]$$

If the junction is an inlet, K is multiplied by 1.5. K is never less than 0.15 for Manholes, or 0.50 for Inlets. For angles greater than or equal to 90, Inlets K = 1.5, and Manholes K = 1.00. For Lines at ends of a branch, K = 1.00

A conservative value for this coefficient is 1.0, which assumes all of the velocity head is lost at the manhole, and the junction is simply a reservoir being fed by any incoming lines. The incoming velocity is lost and converted to static head.

▪ **Supercritical Flow**

Hydraflow Storm Sewers Extension can automatically compute supercritical flow profiles with hydraulic jumps. If the energy equation does not balance, Hydraflow Storm Sewers Extension initially assumes critical depth and proceeds to the next upstream line. When the subcritical profile is finished, the calculation procedure is reversed for any lines with critical depth assumed at their upstream ends, (from upstream to downstream), and computes the supercritical profile.

▪ **Hydraulic Jump**

The Momentum Principle is used to determine the depths and locations of hydraulic jumps. At each step (one tenth of the line length) during supercritical flow calculations, the momentum is computed and compared to the momentum developed during the subcritical profile calculations. If the two momentums are equal, then a hydraulic jump must occur.

Note:

There are some situations when a hydraulic jump does not exist or when it is submerged.

The following condition must be satisfied to determine a hydraulic jump:

Momentum (M) of the subcritical profile equals the momentum of the supercritical profile.

$$M1 = M2$$

Where:

Q = Flow rate

A = Cross-sectional area of flow

Y = Distance from the water surface to the centroid of A

The location of the jump is the point along the line when $M1 = M2$, and is reported as the distance from the downstream end of the line. The length of the jump is difficult to determine, especially in circular sections. A generally acceptable jump length is between 4 and 6 times the sequent depth. Hydraflow Storm Sewers Extension assumes 5 for the jump length.

The following illustration shows the computation of supercritical flow profiles with hydraulic jumps. The dotted line represents the energy grade line (EGL).

▪ Inlet Control

Inlet and outlet control is often a misunderstood concept in storm sewer hydraulics. Inlet control occurs when it is more difficult for the flow to enter the pipe than to move through the pipe. The critical factors during inlet control are the cross-sectional area of the pipe and the inlet geometry. The roughness coefficient, pipe length, and slope are not necessary.

Outlet control occurs when it is more difficult for the flow to move through the pipe than to enter the pipe. The solution is to compute the HGL assuming both exist, and then selecting the larger of the two.

You can check HGL calculations for inlet control on all junctions except for No Junction types. One calculation method is derived from HDS-5 Hydraulic design of Highway Culverts, and the other is the standard orifice equation. If the computed HGL for inlet control is greater than the computed HGL (outlet control), then the HGL Junction is set equal to the inlet control value. When inlet control is used, the minor loss (junction loss) is not computed.

The standard orifice equation used is:

$$Q = CoA\sqrt{2gh}$$

Where:

Co = Orifice coefficient = 0.62

A = Cross-sectional area of flow in sqft (sqm)

h = Headwater depth to the center of A in ft (m)

Note

This is the default equation used when working in SI units.

▪ Flow Under Inlet Control

The HDS-5 method uses the following inlet control equation:

$$Hdi = D \times \left[c \times \left(\frac{Q}{A\sqrt{D}} \right)^2 + Y - .5S \right]$$

Where:

Hdi = Headwater depth above invert

D = Line Rise, ft

c = 0.0398 (Coeff. for square edged circular section)

Q = Flow rate, cfs

A = Full cross-sectional area of pipe, sqft

Y = Coeff. 0.67

S = Line slope, ft/ft

This equation only applies when Q/AD^{0.5} is greater than or equal to 4.0.

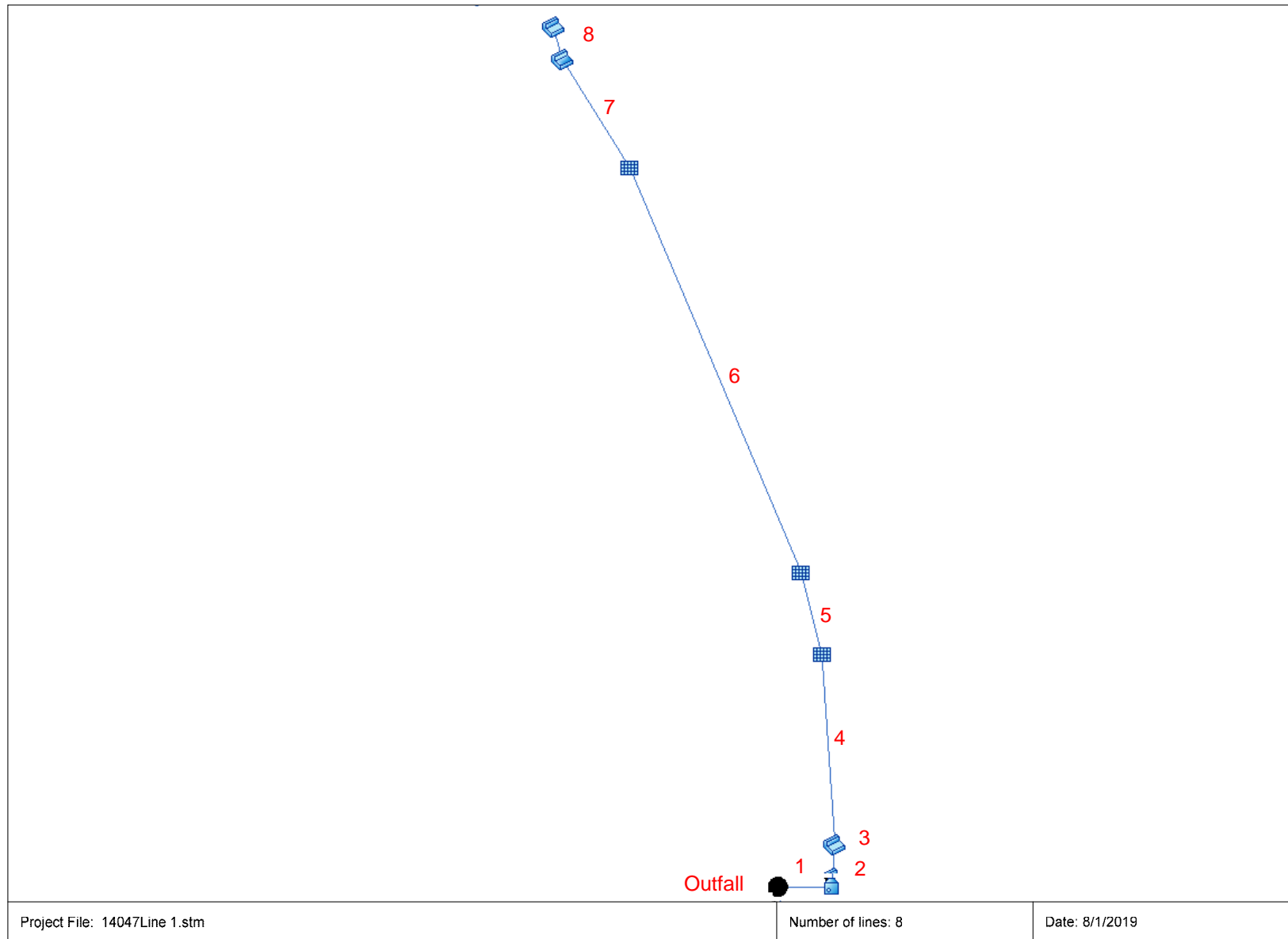
Note

Inlet control is only considered when you select the Check for Inlet Control option on the Calculations tab in the Design Codes dialog box. If this option is not selected then inlet control is not evaluated.

J3. Calculations from Hydraulics Software

Attachment J3.1
Hydraulic Calculations
Line 1 Run; West Side
of property Run

14047 Line 1



Storm Sewers v10.40

Structure Report

Page 1

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1		Manhole	1428.55	Cir	4.00	4.00	24x126	Box	1424.85	26x48	Box	1424.85
2		Grate	1429.00	Rect	4.00	4.00	26x48	Box	1424.87	26x48	Box	1424.97
3		Grate	1429.02	Cir	4.00	4.00	26x48	Box	1425.04	36	Cir	1425.14
4		DropGrate	1429.67	Cir	4.00	4.00	36	Cir	1425.55	30	Cir	1425.65
5		DropGrate	1430.65	Cir	4.00	4.00	30	Cir	1425.84	30	Cir	1425.94
6		DropGrate	1431.31	Cir	4.00	4.00	30	Cir	1426.89	30	Cir	1426.99
7		Curb-Horiz	1432.11	Cir	4.00	4.00	30	Cir	1427.27	24	Cir	1427.37
8		Grate	1432.10	Cir	4.00	4.00	24	Cir	1427.44			
14047 Line 1							Number of Structures: 8			Run Date: 8/1/2019		

Storm Sewers v10.40

Storm Sewer Summary Report

Page 1

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		43.36	24x126	Box	59.000	1423.85	1424.85	1.695	1424.39	1425.66	0.40	1426.06	End	Manhole
2		43.36	26x48	Box	9.650	1424.85	1424.87	0.207	1426.93	1426.95	0.21	1427.16	1	Grate
3		30.90	26x48	Box	36.500	1424.97	1425.04	0.192	1427.16	1427.18	n/a	1427.28	2	Grate
4		23.15	36	Cir	205.460	1425.14	1425.55	0.200	1427.28	1427.61	n/a	1427.77	3	DropGrate
5		22.78	30	Cir	92.150	1425.65	1425.84	0.206	1428.15*	1428.44*	n/a	1428.60	4	DropGrate
6		16.88	30	Cir	475.310	1425.94	1426.89	0.200	1428.60	1429.38	n/a	1429.47	5	DropGrate
7		8.85	30	Cir	139.320	1426.99	1427.27	0.201	1429.47	1429.52	n/a	1429.55	6	Curb-Horiz
8		8.22	24	Cir	36.500	1427.37	1427.44	0.192	1429.55*	1429.60*	n/a	1429.71	7	Grate
14047 Line 1									Number of lines: 8			Run Date: 8/1/2019		
NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown).														

Storm Sewers v10.40

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
			(ac)	(ac)				(min)	(min)					(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	59.000	0.00	0.00	0.00	0.00	0.00	0.0	5.4	0.0	43.36	241.1	6.37	x 26 b	1.69	1423.85	1424.85	1424.39	1425.66	1426.90	1428.55	
2	1	9.650	0.00	0.00	0.00	0.00	0.00	0.0	5.4	0.0	43.36	36.45	5.21	x 26 b	0.21	1424.85	1424.87	1426.93	1426.95	1428.55	1429.00	
3	2	36.500	0.00	0.00	0.00	0.00	0.00	0.0	5.2	0.0	30.90	0.00	3.56	x 26 b	0.19	1424.97	1425.04	1427.16	1427.18	1429.00	1429.02	
4	3	205.460	0.00	0.00	0.00	0.00	0.00	0.0	4.2	0.0	23.15	0.00	4.38	36	0.20	1425.14	1425.55	1427.28	1427.61	1429.02	1429.67	
5	4	92.150	0.00	0.00	0.00	0.00	0.00	0.0	3.8	0.0	22.78	0.00	4.64	30	0.21	1425.65	1425.84	1428.15	1428.44	1429.67	1430.65	
6	5	475.310	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	16.88	0.00	3.44	30	0.20	1425.94	1426.89	1428.60	1429.38	1430.65	1431.31	
7	6	139.320	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	8.85	0.00	1.85	30	0.20	1426.99	1427.27	1429.47	1429.52	1431.31	1432.11	
8	7	36.500	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	8.22	0.00	2.62	24	0.19	1427.37	1427.44	1429.55	1429.60	1432.11	1432.10	
14047 Line 1																Number of lines: 8				Run Date: 8/1/2019		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Inlet Report

Page 1

Line No	Inlet ID	Q = CIA	Q carry	Q capt	Q Byp	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
		(cfs)	(cfs)	(cfs)	(cfs)		Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		43.36*	0.00	0.00	43.36	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		43.36*	0.00	43.36	0.00	Grate	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.667	0.020	0.013	16.78	774.18	17.11	774.18	4.0	1
3		30.90*	0.00	30.90	0.00	Grate	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	8.32	412.86	8.32	412.86	0.0	2
4		23.15*	0.00	23.15	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	4.64	465.99	4.64	465.99	0.0	3
5		22.78*	0.00	22.78	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	4.49	451.43	4.49	451.43	0.0	4
6		16.88*	0.00	16.88	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	2.47	248.71	2.47	248.71	0.0	5
7		8.85*	0.00	8.85	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	1.69	81.64	1.69	81.64	0.0	6
8		8.22*	0.00	8.22	0.00	Grate	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.64	29.13	0.64	29.13	0.0	7
14047 Line 1														Number of lines: 8				Run Date: 8/1/2019				
NOTES: Inlet N-Values = 0.016; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

Storm Sewers v10.40

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 8/1/2019	
					Total Flow	Elev of Crown						Span		Pipe	Full Flow	Frequency: 100 yrs						
						Elev of Invert										Proj: 14047Line 1.stm						
						Q	Up									Down	Fall	Size	Slope	Vel	Cap	Line description
(ft)	Increment (ac)	Sub-Total (ac)	Sum CA	(min)	(min)	(in/hr)	(cfs)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)								
1	End	MH	0.015	59.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.41	0.48	0.00	0.00	43.36 43.36	1428.55	1425.66 1426.85 1424.85	1424.39 1425.85 1423.85	1.27 1.26 1.00	24 126 Box	2.15 1.69	6.37 11.48	43.36 241.1		
2	1	Grate	0.013	9.650	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.37	0.03	0.00	0.00	43.36 43.36	1429.00	1426.95 1427.07 1424.87	1426.93 1427.05 1424.85	0.02 0.02 0.02	26 48 Box	0.22 0.21	5.21 4.14	43.36 36.45		
3	2	Grate	0.013	36.500	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.20	0.17	0.00	0.00	30.90 30.90	1429.02	1427.18 1427.24 1425.04	1427.16 1427.17 1424.97	0.02 0.07 0.07	26 48 Box	0.06 0.19	3.56 0.00	30.90 0.00		
4	3	DrGrt	0.013	205.460	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	4.15	1.05	0.00	0.00	23.15 23.15	1429.67	1427.61 1428.55 1425.55	1427.28 1428.14 1425.14	0.32 0.41 0.41	36 36 Cir	0.16 0.20	4.38 0.00	23.15 0.00		
5	4	DrGrt	0.013	92.150	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	3.82	0.33	0.00	0.00	22.78 22.78	1430.65	1428.44 1428.34 1425.84	1428.15 1428.15 1425.65	0.29 0.19 0.19	30 30 Cir	0.31 0.21	4.64 0.00	22.78 0.00		
6	5	DrGrt	0.013	475.310	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	1.52	2.30	0.00	0.00	16.88 16.88	1431.31	1429.38 1429.39 1426.89	1428.60 1428.44 1425.94	0.78 0.95 0.95	30 30 Cir	0.16 0.20	3.44 0.00	16.88 0.00		
7	6	Curb	0.013	139.320	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.23	1.29	0.00	0.00	8.85 8.85	1432.11	1429.52 1429.77 1427.27	1429.47 1429.49 1426.99	0.05 0.28 0.28	30 30 Cir	0.04 0.20	1.85 0.00	8.85 0.00		
8	7	Grate	0.013	36.500	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.23	0.00	0.00	8.22 8.22	1432.10	1429.60 1429.44 1427.44	1429.55 1429.37 1427.37	0.05 0.07 0.07	24 24 Cir	0.13 0.19	2.62 0.00	8.22 0.00		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 (in/hr) ; Time of flow in section is based on full flow.																						
14047 Line 1																						

MyReport

Line No.	Area Dn	Area Up	Byp Ln No	Coeff C1	Coeff C2	Coeff C3	Capac Full	Crit Depth	Cross SI, Sw	Cross SI, Sx	Curb Len	Defl Ang	Depth Dn	Depth Up	DnStm Ln No	Drng Area	Easting X	EGL Dn	EGL Up	Energy Loss	
	(sqft)	(sqft)		(C)	(C)	(C)	(cfs)	(ft)	(ft/ft)	(ft/ft)	(ft)	(Deg)	(ft)	(ft)		(ac)	(ft)	(ft)	(ft)	(ft)	
1	5.67	8.50	n/a	0.20	0.50	0.90	241.11	0.81	....	....	....	0.000	0.54	0.81**	Outfall	0.00	273.61	1424.80	1426.06	0.000	
2	8.32	8.32	1	0.20	0.50	0.90	36.45	1.54	0.667	0.020	....	-90.000	2.08	2.08	1	0.00	273.61	1427.35	1427.37	0.020	
3	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	0.050	0.020	....	5.000	0.00	0.00**	2	0.00	276.79	1427.36	1427.39	0.000	
4	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	-9.000	0.00	0.00**	3	0.00	262.46	1427.57	1427.92	0.000	
5	0.00	0.00	4	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	-10.000	0.00	0.00**	4	0.00	240.16	1428.49	1428.77	0.000	
6	0.00	0.00	5	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	-9.000	0.00	0.00**	5	0.00	54.44	1428.79	1429.56	0.000	
7	0.00	0.00	6	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	-9.000	0.00	0.00**	6	0.00	-19.38	1429.52	1429.58	0.000	
8	0.00	0.00	7	0.20	0.50	0.90	0.00	0.00	0.050	0.020	....	17.000	0.00	0.00**	7	0.00	-28.83	1429.66	1429.71	0.000	
14047 Line 1													Number of lines: 8				Date: 8/1/2019				
NOTES: ** Critical depth																					

Storm Sewers

MyReport

Flow Rate	Sf Ave	Sf Dn	Grate Area	Grate Len	Grate Width	Gnd/Rim El Dn	Gnd/Rim El Up	Gutter Depth	Gutter Slope	Gutter Spread	Gutter Width	HGL Dn	HGL Up	HGL Jnct	HGL Jmp Dn	HGL Jmp Up	Incr CxA	Incr Q	Inlet Depth	Inlet Eff
(cfs)	(ft/ft)	(ft/ft)	(sqft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(cfs)	(ft)	(%)
43.36	0.000	0.000	....	....	....	1426.90	1428.55	....	....	....	....	1424.39	1425.66	1426.06	....	....	0.00	43.36	....	....
43.36	0.202	0.203	2.00	2.00	2.00	1428.55	1429.00	16.78	Sag	774.18	2.00	1426.93	1426.95	1427.16	....	....	0.00	43.36	17.11	100
30.90	0.000	0.000	2.00	2.00	2.00	1429.00	1429.02	8.32	Sag	412.86	2.00	1427.16	1427.18	1427.28	....	....	0.00	30.90	8.32	100
23.15	0.000	0.000	2.00	2.00	2.00	1429.02	1429.67	4.64	Sag	465.99	2.00	1427.28	1427.61	1427.77	....	....	0.00	23.15	4.64	100
22.78	0.000	0.000	2.00	2.00	2.00	1429.67	1430.65	4.49	Sag	451.43	2.00	1428.15	1428.44	1428.60	....	....	0.00	22.78	4.49	100
16.88	0.000	0.000	2.00	2.00	2.00	1430.65	1431.31	2.47	Sag	248.71	2.00	1428.60	1429.38	1429.47	....	....	0.00	16.88	2.47	100
8.85	0.000	0.000	....	....	....	1431.31	1432.11	1.69	Sag	81.64	2.00	1429.47	1429.52	1429.55	....	....	0.00	8.85	1.69	100
8.22	0.000	0.000	2.00	2.00	2.00	1432.11	1432.10	0.64	Sag	29.13	2.00	1429.55	1429.60	1429.71	....	....	0.00	8.22	0.64	100
14047 Line 1													Number of lines: 8				Date: 8/1/2019			
NOTES: ** Critical depth																				

Storm Sewers

MyReport

Inlet ID	Inlet Loc	Inlet Spread (ft)	Inlet Time (min)	i Sys (in/hr)	i Inlet (in/hr)	Invert Dn (ft)	Invert Up (ft)	Jump Loc (ft)	Jump Len (ft)	Vel Hd Jmp Dn (ft)	Vel Hd Jmp Up (ft)	J-Loss Coeff	Junct Type	Known Q (cfs)	Cost RCP	Cost CMP	Cost PVC	Line ID	
	Sag	....	0.0	0.00	0.00	1423.85	1424.85	....	....	0.00	0.00	1.00	MH	43.36	2,224	2,002	1,890		
	Sag	774.18	0.0	0.00	0.00	1424.85	1424.87	....	....	0.00	0.00	0.50	Grate	43.36	120	108	102		
	Sag	412.86	0.0	0.00	0.00	1424.97	1425.04	....	....	0.00	0.00	0.50	Grate	30.90	100	90	85		
	Sag	465.99	0.0	0.00	0.00	1425.14	1425.55	....	....	0.00	0.00	0.50	Dp-Grate	23.15	9,960	8,964	8,466		
	Sag	451.43	0.0	0.00	0.00	1425.65	1425.84	....	....	0.00	0.00	0.50	Dp-Grate	22.78	4,536	4,082	3,856		
	Sag	248.71	0.0	0.00	0.00	1425.94	1426.89	....	....	0.00	0.00	0.50	Dp-Grate	16.88	22,920	20,628	19,482		
	Sag	81.64	0.0	0.00	0.00	1426.99	1427.27	....	....	0.00	0.00	0.51	Curb	8.85	6,792	6,113	5,773		
	Sag	29.13	0.0	0.00	0.00	1427.37	1427.44	....	....	0.00	0.00	1.00	Grate	8.22	1,726	1,553	1,467		
14047 Line 1												Number of lines: 8				Date: 8/1/2019			
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 -- Return period = 100 Yrs. ; ** Critical depth																			

Storm Sewers

MyReport

Line Length	Line Size	Line Slope	Line Type	Local Depr	n-val Gutter	n-val Pipe	Minor Loss	Northing Y	Pipe Travel	Q Byp	Q Capt	Q Carry	Line Rise	Runoff Coeff	Line Span	Area A1	Area A2	Area A3	Tc	Throat Ht	Total Area	Total CxA
(ft)	(in)	(%)		(in)			(ft)	(ft)	(min)	(cfs)	(cfs)	(cfs)	(in)	(C)	(in)	(ac)	(ac)	(ac)	(min)	(in)	(ac)	
59.000	24 x 126	1.69	Box	....	....	0.015	0.40	140.07	0.48	....	....	....	24	0.00	126	0.00	0.00	0.00	5.4	....	0.00	0.00
9.650	26 x 48	0.21	Box	4.0	....	0.013	0.21	149.72	0.03	0.00	43.36	0.00	26	0.00	48	0.00	0.00	0.00	5.4	....	0.00	0.00
36.500	26 x 48	0.19	Box	0.0	....	0.013	n/a	186.09	0.17	0.00	30.90	0.00	26	0.00	48	0.00	0.00	0.00	5.2	....	0.00	0.00
205.460	36	0.20	Cir	....	....	0.013	n/a	391.04	1.05	0.00	23.15	0.00	36	0.00	36	0.00	0.00	0.00	4.2	....	0.00	0.00
92.150	30	0.21	Cir	....	....	0.013	n/a	480.46	0.33	0.00	22.78	0.00	30	0.00	30	0.00	0.00	0.00	3.8	....	0.00	0.00
475.310	30	0.20	Cir	....	....	0.013	n/a	917.98	2.30	0.00	16.88	0.00	30	0.00	30	0.00	0.00	0.00	1.5	....	0.00	0.00
139.320	30	0.20	Cir	0.0	....	0.013	n/a	1036.13	1.29	0.00	8.85	0.00	30	0.00	30	0.00	0.00	0.00	0.2	4.0	0.00	0.00
36.500	24	0.19	Cir	0.0	....	0.013	n/a	1071.39	0.23	0.00	8.22	0.00	24	0.00	24	0.00	0.00	0.00	0.0	....	0.00	0.00
14047 Line 1													Number of lines: 8					Date: 8/1/2019				
NOTES: ** Critical depth																						

Storm Sewers

MyReport

Total Runoff	Vel Ave	Vel Dn	Vel Hd Dn	Vel Hd Up	Vel Up	Cover Dn	Cover Up	Storage	
(cfs)	(ft/s)	(ft/s)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(cft)	
0.00	6.37	7.65	0.40	0.40	5.10	1.05	1.70	418.04	
0.00	5.21	5.21	0.42	0.42	5.21	1.50	1.93	80.31	
0.00	3.56	3.52	0.00	0.00	3.61	1.83	1.78	0.00	
0.00	4.38	4.28	0.00	0.00	4.48	0.88	1.12	0.00	
0.00	4.64	4.64	0.00	0.00	4.64	1.52	2.31	0.00	
0.00	3.44	3.44	0.00	0.00	3.44	2.21	1.92	0.00	
0.00	1.85	1.81	0.00	0.00	1.90	1.82	2.34	0.00	
0.00	2.62	2.62	0.00	0.00	2.62	2.74	2.66	0.00	
14047 Line 1									Number of lines: 8
NOTES: ** Critical depth									Date: 8/1/2019

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
1		User																		0.00
2		User																		0.00
3		User																		0.00
4		User																		0.00
5		User																		0.00
6		User																		0.00
7		User																		0.00
8		User																		0.00
14047 Line 1					Min. Tc used for intensity calculations = 5 min							Number of lines: 8				Date: 8/1/2019				

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in)	(cfs)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K)	(ft)
1	24 126 B	43.36	1423.85	1424.39	0.54	5.67	7.65	0.40	1424.80	0.000	59.000	1424.85	1425.66	0.81**	8.50	5.10	0.40	1426.06	0.000	0.000	n/a	1.00	0.40
2	26 48 B	43.36	1424.85	1426.93	2.08*	8.32	5.21	0.42	1427.35	0.203	9.650	1424.87	1426.95	2.08	8.32	5.21	0.42	1427.37	0.202	0.202	0.020	0.50	0.21
3	26 48 B	30.90	1424.97	1427.16	0.00	0.00	3.52	0.00	1427.16	0.000	36.500	1425.04	1427.18	0.00**	0.00	3.61	0.00	1427.18	0.000	0.000	0.000	0.50	n/a
4	36	23.15	1425.14	1427.28	0.00	0.00	4.28	0.00	1427.28	0.000	205.460	1425.55	1427.61	0.00**	0.00	4.48	0.00	1427.61	0.000	0.000	0.000	0.50	n/a
5	30	22.78	1425.65	1428.15	0.00*	0.00	4.64	0.00	1428.15	0.000	92.150	1425.84	1428.44	0.00**	0.00	4.64	0.00	1428.44	0.000	0.000	0.000	0.50	n/a
6	30	16.88	1425.94	1428.60	0.00	0.00	3.44	0.00	1428.60	0.000	475.310	1426.89	1429.38	0.00**	0.00	3.44	0.00	1429.38	0.000	0.000	0.000	0.50	n/a
7	30	8.85	1426.99	1429.47	0.00	0.00	1.81	0.00	1429.47	0.000	139.320	1427.27	1429.52	0.00**	0.00	1.90	0.00	1429.52	0.000	0.000	0.000	0.51	n/a
8	24	8.22	1427.37	1429.55	0.00	0.00	2.62	0.00	1429.55	0.000	36.500	1427.44	1429.60	0.00**	0.00	2.62	0.00	1429.60	0.000	0.000	0.000	1.00	n/a
14047 Line 1															Number of lines: 8					Run Date: 8/1/2019			
Notes: * Normal depth assumed.; ** Critical depth. ; c = cir e = ellip b = box																							

Hydraflow HGL Computation Procedure

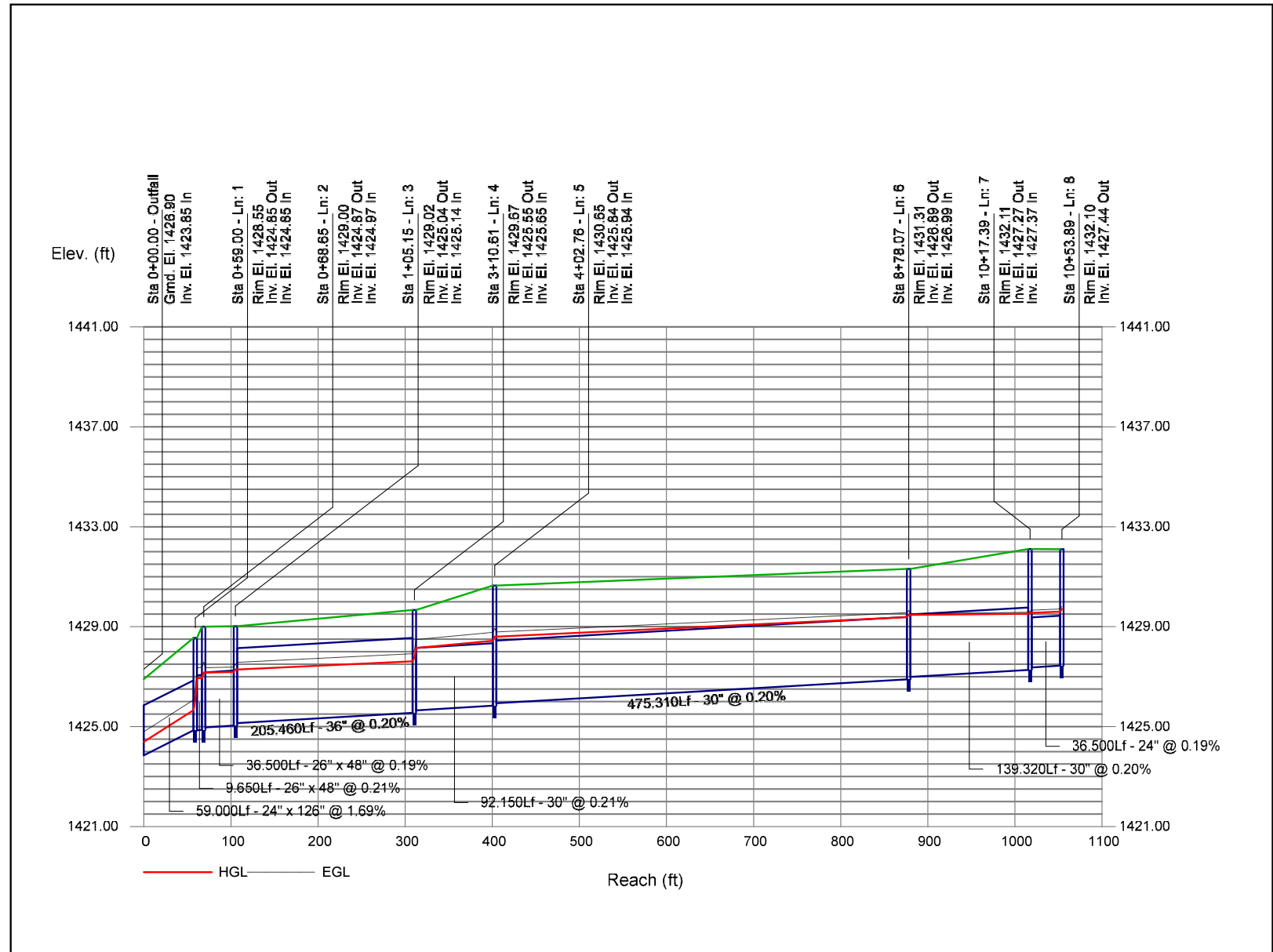
General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line size is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average $Sf/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Profile

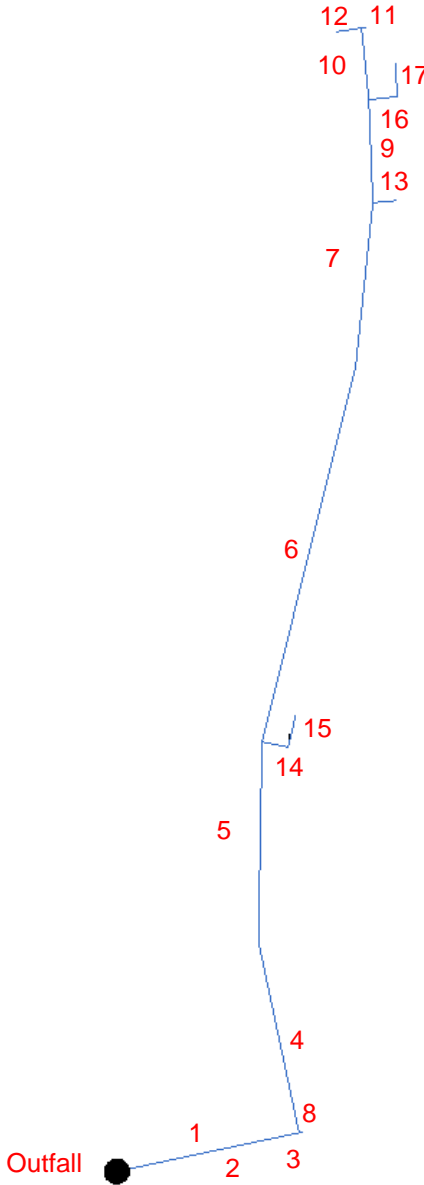
Proj. file: 14047Line 1.stm



Storm Sewers

Attachment J3.2
Hydraulic Calculations
Line 2 Run; Center of
Property

14047 Line 2



Project File: 14047Line 2.stm

Number of lines: 17

Date: 8/1/2019

Storm Sewers v10.40

Structure Report

Page 1

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1		Manhole	1430.53	Cir	4.00	4.00	36x126	Box	1424.35	48	Cir	1424.35
2		Grate	1430.41	Rect	4.00	4.00	48	Cir	1424.46	36x48	Box	1424.46
3		Manhole	1430.11	Cir	4.00	4.00	36x48	Box	1424.52	36 18	Cir Cir	1424.62 1424.62
4		Manhole	1432.26	Cir	4.00	4.00	36	Cir	1425.05	36	Cir	1425.15
5		Manhole	1430.09	Cir	4.00	4.00	36	Cir	1425.59	30 30	Cir Cir	1425.70 1425.70
6		Manhole	1431.63	Cir	4.00	4.00	30	Cir	1426.56	24	Cir	1426.66
7		Manhole	1432.92	Cir	4.00	4.00	24	Cir	1427.02	24 8	Cir Cir	1427.12 1427.12
8		Curb-Horiz	1430.42	Cir	4.00	4.00	18	Cir	1424.63			
9		Manhole	1431.87	Cir	4.00	4.00	24	Cir	1427.35	18 18	Cir Cir	1427.45 1427.45
10		Manhole	1431.54	Cir	4.00	4.00	18	Cir	1427.61	18 18	Cir Cir	1427.71 1427.71
11		Curb-Horiz	1431.87	Cir	4.00	4.00	18	Cir	1427.72			
12		Curb-Horiz	1431.87	Cir	4.00	4.00	18	Cir	1427.77			
13		DropGrate	1429.54	Cir	4.00	4.00	8	Cir	1427.38			
14		Curb-Horiz	1429.39	Cir	4.00	4.00	30	Cir	1425.76	24	Cir	1425.86
15		Curb-Horiz	1429.39	Cir	4.00	4.00	24	Cir	1425.93			
16		Curb-Horiz	1432.25	Cir	4.00	4.00	18	Cir	1427.52	12	Cir	1427.62
17		Curb-Horiz	1432.18	Cir	4.00	4.00	12	Cir	1427.69			
14047 Line 2							Number of Structures: 17			Run Date: 8/1/2019		

Storm Sewers v10.40

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		44.20	36x126	Box	173.000	1423.35	1424.35	0.578	1424.11	1425.17	0.06	1425.17	End	Manhole
2		40.37	48	Cir	5.730	1424.35	1424.46	1.919	1425.57	1426.36	n/a	1426.36	1	Grate
3		40.37	36x48	Box	28.000	1424.46	1424.52	0.214	1427.09	1427.11	n/a	1427.35	2	Manhole
4		29.54	36	Cir	217.330	1424.62	1425.05	0.198	1427.35	1427.71	n/a	1427.80	3	Manhole
5		29.54	36	Cir	221.780	1425.15	1425.59	0.198	1427.80	1428.18	n/a	1428.50	4	Manhole
6		13.84	30	Cir	430.450	1425.70	1426.56	0.200	1428.50	1428.96	n/a	1428.98	5	Manhole
7		13.84	24	Cir	182.770	1426.66	1427.02	0.197	1428.98*	1429.66*	n/a	1429.96	6	Manhole
8		11.71	18	Cir	4.250	1424.62	1424.63	0.236	1427.35*	1427.40*	n/a	1428.08	3	Curb-Horiz
9		12.08	24	Cir	114.660	1427.12	1427.35	0.201	1429.96*	1430.29*	n/a	1430.52	7	Manhole
10		5.10	18	Cir	80.000	1427.45	1427.61	0.200	1430.52*	1430.70*	n/a	1430.83	9	Manhole
11		5.01	18	Cir	4.260	1427.71	1427.72	0.235	1430.83*	1430.84*	n/a	1430.97	10	Curb-Horiz
12		0.85	18	Cir	28.260	1427.71	1427.77	0.213	1430.83*	1430.84*	n/a	1430.84	10	Curb-Horiz
13		1.76	8	Cir	26.000	1427.12	1427.38	1.000	1429.96*	1430.51*	n/a	1430.91	7	DropGrate
14		17.46	30	Cir	29.740	1425.70	1425.76	0.202	1428.50*	1428.56*	n/a	1428.85	5	Curb-Horiz
15		9.91	24	Cir	36.525	1425.86	1425.93	0.192	1428.85*	1428.92*	n/a	1429.08	14	Curb-Horiz
16		8.82	18	Cir	31.870	1427.45	1427.52	0.220	1430.52*	1430.74*	n/a	1431.32	9	Curb-Horiz
17		4.68	12	Cir	36.770	1427.62	1427.69	0.190	1431.32*	1431.96*	n/a	1432.51	16	Curb-Horiz
14047 Line 2									Number of lines: 17			Run Date: 8/1/2019		
NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown).														

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)		(C)	Incr	Total	Inlet (min)					Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	
1	End	173.000	0.00	0.00	0.00	0.00	0.00	0.0	7.1	0.0	44.20	262.9	5.34	x 13.5 b	0.58	1423.35	1424.35	1424.11	1425.17	1430.19	1430.53	
2	1	5.730	0.00	0.00	0.00	0.00	0.00	0.0	7.1	0.0	40.37	199.0	9.65	48	1.92	1424.35	1424.46	1425.57	1426.36	1430.53	1430.41	
3	2	28.000	0.00	0.00	0.00	0.00	0.00	0.0	6.9	0.0	40.37	0.00	3.86	x 36 b	0.21	1424.46	1424.52	1427.09	1427.11	1430.41	1430.11	
4	3	217.330	0.00	0.00	0.00	0.00	0.00	0.0	6.1	0.0	29.54	0.00	4.41	36	0.20	1424.62	1425.05	1427.35	1427.71	1430.11	1432.26	
5	4	221.780	0.00	0.00	0.00	0.00	0.00	0.0	5.2	0.0	29.54	0.00	4.51	36	0.20	1425.15	1425.59	1427.80	1428.18	1432.26	1430.09	
6	5	430.450	0.00	0.00	0.00	0.00	0.00	0.0	2.6	0.0	13.84	0.00	2.84	30	0.20	1425.70	1426.56	1428.50	1428.96	1430.09	1431.63	
7	6	182.770	0.00	0.00	0.00	0.00	0.00	0.0	1.9	0.0	13.84	0.00	4.41	24	0.20	1426.66	1427.02	1428.98	1429.66	1431.63	1432.92	
8	3	4.250	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	11.71	0.00	6.62	18	0.24	1424.62	1424.63	1427.35	1427.40	1430.11	1430.42	
9	7	114.660	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	12.08	0.00	3.84	24	0.20	1427.12	1427.35	1429.96	1430.29	1432.92	1431.87	
10	9	80.000	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	5.10	0.00	2.89	18	0.20	1427.45	1427.61	1430.52	1430.70	1431.87	1431.54	
11	10	4.260	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.01	0.00	2.84	18	0.23	1427.71	1427.72	1430.83	1430.84	1431.54	1431.87	
12	10	28.260	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.85	0.00	0.48	18	0.21	1427.71	1427.77	1430.83	1430.84	1431.54	1431.87	
13	7	26.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.76	0.00	5.05	8	1.00	1427.12	1427.38	1429.96	1430.51	1432.92	1429.54	
14	5	29.740	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	17.46	0.00	3.56	30	0.20	1425.70	1425.76	1428.50	1428.56	1430.09	1429.39	
15	14	36.525	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	9.91	0.00	3.15	24	0.19	1425.86	1425.93	1428.85	1428.92	1429.39	1429.39	
16	9	31.870	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	8.82	0.00	4.99	18	0.22	1427.45	1427.52	1430.52	1430.74	1431.87	1432.25	
17	16	36.770	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.68	0.00	5.96	12	0.19	1427.62	1427.69	1431.32	1431.96	1432.25	1432.18	
14047 Line 2																Number of lines: 17				Run Date: 8/1/2019		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Inlet Report

Line No	Inlet ID	Q = CIA	Q carry	Q capt	Q Byp	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
		(cfs)	(cfs)	(cfs)	(cfs)		Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		44.20*	0.00	0.00	44.20	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		40.37*	144.30	184.67	0.00	Grate	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.667	0.020	0.013	295.78	14724.42	296.12	14724.42	24.0	1
3		40.37*	103.93	0.00	144.30	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	2
4		29.54*	74.40	0.00	103.93	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	3
5		29.54*	44.86	0.00	74.40	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	4
6		13.84*	31.02	0.00	44.86	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	5
7		13.84*	17.18	0.00	31.02	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	6
8		11.71*	0.00	11.71	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	2.84	138.81	2.84	138.81	0.0	3
9		12.08*	5.10	0.00	17.18	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	7
10		5.10*	0.00	0.00	5.10	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	9
11		5.01*	0.00	5.01	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.66	29.78	0.66	29.78	0.0	10
12		0.85*	0.00	0.85	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.17	5.55	0.17	5.55	0.0	10
13		1.76*	0.00	1.76	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	0.18	19.52	0.18	19.52	0.0	7
14		17.46*	0.00	17.46	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	6.11	302.35	6.11	302.35	0.0	5
15		9.91*	0.00	9.91	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	2.08	101.00	2.08	101.00	0.0	14
16		8.82*	0.00	8.82	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	1.68	81.08	1.68	81.08	0.0	9
17		4.68*	0.00	4.68	0.00	Curb	4.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.59	26.69	0.59	26.69	0.0	16
14047 Line 2														Number of lines: 17					Run Date: 8/1/2019			
NOTES: Inlet N-Values = 0.016; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 8/1/2019		
					C1 = 0.2 C2 = 0.5 C3 = 0.9	Increment (ac)	Sub-Total (ac)							Sum CA	Elev of Crown				Span	Pipe	Full Flow		Frequency: 100 yrs
												Elev of Invert									Proj: 14047Line 2.stm		
												(ft)			(ac)	(ac)		(min)	(min)	(in/hr)	Q (cfs)	(ft)	Up (ft)	Down (ft)	Fall (ft)	Size (in)	Slope (%)	Vel (ft/s)	Cap (cfs)	Line description
1	End	MH	0.015	173.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.09	2.06	0.00	0.00	44.20 44.20	1430.53	1425.17 1427.35 1424.35	1424.11 1426.35 1423.35	1.06 1.00	36 126 Box	0.61 0.58	5.34 8.35	44.20 262.9			
2	1	Grate	0.013	5.730	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.06	0.03	0.00	0.00	40.37 40.37	1430.41	1426.36 1428.46 1424.46	1425.57 1428.35 1424.35	0.78 0.11	48 48 Cir	13.66 1.92	9.65 15.84	40.37 199.0			
3	2	MH	0.013	28.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.93	0.14	0.00	0.00	40.37 40.37	1430.11	1427.11 1427.52 1424.52	1427.09 1427.46 1424.46	0.02 0.06	36 48 Box	0.07 0.21	3.86 0.00	40.37 0.00			
4	3	MH	0.013	217.330	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.06	0.87	0.00	0.00	29.54 29.54	1432.26	1427.71 1428.05 1425.05	1427.35 1427.62 1424.62	0.36 0.43	36 36 Cir	0.17 0.20	4.41 0.00	29.54 0.00			
5	4	MH	0.013	221.780	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.17	0.88	0.00	0.00	29.54 29.54	1430.09	1428.18 1428.59 1425.59	1427.80 1428.15 1425.15	0.38 0.44	36 36 Cir	0.17 0.20	4.51 0.00	29.54 0.00			
6	5	MH	0.013	430.450	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	2.63	2.54	0.00	0.00	13.84 13.84	1431.63	1428.96 1429.06 1426.56	1428.50 1428.20 1425.70	0.45 0.86	30 30 Cir	0.11 0.20	2.84 0.00	13.84 0.00			
7	6	MH	0.013	182.770	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	1.94	0.69	0.00	0.00	13.84 13.84	1432.92	1429.66 1429.02 1427.02	1428.98 1428.66 1426.66	0.68 0.36	24 24 Cir	0.37 0.20	4.41 0.00	13.84 0.00			
8	3	Curb	0.013	4.250	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.01	0.00	0.00	11.71 11.71	1430.42	1427.40 1426.13 1424.63	1427.35 1426.12 1424.62	0.05 0.01	18 18 Cir	1.25 0.24	6.62 0.00	11.71 0.00			
9	7	MH	0.013	114.660	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	1.44	0.50	0.00	0.00	12.08 12.08	1431.87	1430.29 1429.35 1427.35	1429.96 1429.12 1427.12	0.33 0.23	24 24 Cir	0.29 0.20	3.84 0.00	12.08 0.00			
10	9	MH	0.013	80.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.98	0.46	0.00	0.00	5.10 5.10	1431.54	1430.70 1429.11 1427.61	1430.52 1428.95 1427.45	0.19 0.16	18 18 Cir	0.24 0.20	2.89 0.00	5.10 0.00			
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 (in/hr) ; Time of flow in section is based on full flow.																						14047 Line 2	

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 8/1/2019	
					Total Flow	Elev of Crown						Span		Pipe	Full Flow	Frequency: 100 yrs						
						Elev of Invert										Proj: 14047Line 2.stm						
						Q	Up									Down	Fall	Size	Slope	Vel	Cap	Line description
(ft)	Increment (ac)	Sub-Total (ac)	Sum CA	(min)	(min)	(in/hr)	(cfs)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)								
11	10	Curb	0.013	4.260	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.03	0.00	0.00	5.01 5.01	1431.87	1430.84 1429.22 1427.72	1430.83 1429.21 1427.71	0.01 0.01	18 18 Cir	0.21 0.23	2.84 0.00	5.01 0.00		
12	10	Curb	0.013	28.260	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.98	0.00	0.00	0.85 0.85	1431.87	1430.84 1429.27 1427.77	1430.83 1429.21 1427.71	0.00 0.06	18 18 Cir	0.00 0.21	0.48 0.00	0.85 0.00		
13	7	DrGrt	0.013	26.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.09	0.00	0.00	1.76 1.76	1429.54	1430.51 1428.05 1427.38	1429.96 1427.79 1427.12	0.55 0.26	8 8 Cir	2.13 1.00	5.05 0.00	1.76 0.00		
14	5	Curb	0.013	29.740	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.19	0.14	0.00	0.00	17.46 17.46	1429.39	1428.56 1428.26 1425.76	1428.50 1428.20 1425.70	0.05 0.06	30 30 Cir	0.18 0.20	3.56 0.00	17.46 0.00		
15	14	Curb	0.013	36.525	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.19	0.00	0.00	9.91 9.91	1429.39	1428.92 1427.93 1425.93	1428.85 1427.86 1425.86	0.07 0.07	24 24 Cir	0.19 0.19	3.15 0.00	9.91 0.00		
16	9	Curb	0.013	31.870	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.10	0.11	0.00	0.00	8.82 8.82	1432.25	1430.74 1429.02 1427.52	1430.52 1428.95 1427.45	0.22 0.07	18 18 Cir	0.71 0.22	4.99 0.00	8.82 0.00		
17	16	Curb	0.013	36.770	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.10	0.00	0.00	4.68 4.68	1432.18	1431.96 1428.69 1427.69	1431.32 1428.62 1427.62	0.64 0.07	12 12 Cir	1.73 0.19	5.96 0.00	4.68 0.00		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 (in/hr) ; Time of flow in section is based on full flow.																						
14047 Line 2																						

MyReport

Line No.	Area Dn	Area Up	Byp Ln No	Coeff C1	Coeff C2	Coeff C3	Capac Full	Crit Depth	Cross Sl, Sw	Cross Sl, Sx	Curb Len	Defl Ang	Depth Dn	Depth Up	DnStm Ln No	Drng Area	Easting X	EGL Dn	EGL Up	Energy Loss	
	(sqft)	(sqft)		(C)	(C)	(C)	(cfs)	(ft)	(ft/ft)	(ft/ft)	(ft)	(Deg)	(ft)	(ft)		(ac)	(ft)	(ft)	(ft)	(ft)	
1	7.98	8.61	n/a	0.20	0.50	0.90	262.95	0.82	....	....	....	-12.000	0.76	0.82**	Outfall	0.00	383.83	1424.52	1425.58	0.000	
2	3.25	5.86	1	0.20	0.50	0.90	199.02	1.90	0.667	0.020	....	0.000	1.22	1.90**	1	0.00	389.43	1426.31	1427.09	0.000	
3	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	....	....	....	0.000	0.00	0.00**	2	0.00	416.82	1427.32	1427.35	0.000	
4	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	....	....	....	-90.000	0.00	0.00**	3	0.00	371.63	1427.65	1428.02	0.000	
5	0.00	0.00	4	0.20	0.50	0.90	0.00	0.00	....	....	....	13.000	0.00	0.00**	4	0.00	375.50	1428.11	1428.50	0.000	
6	0.00	0.00	5	0.20	0.50	0.90	0.00	0.00	....	....	....	13.000	0.00	0.00**	5	0.00	479.64	1428.63	1429.08	0.000	
7	0.00	0.00	6	0.20	0.50	0.90	0.00	0.00	....	....	....	-8.000	0.00	0.00**	6	0.00	498.74	1429.28	1429.96	0.000	
8	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	0.000	0.00	0.00**	3	0.00	420.98	1428.03	1428.08	0.000	
9	0.00	0.00	7	0.20	0.50	0.90	0.00	0.00	....	....	....	-8.255	0.00	0.00**	7	0.00	494.23	1430.19	1430.52	0.000	
10	0.00	0.00	9	0.20	0.50	0.90	0.00	0.00	....	....	....	-3.568	0.00	0.00**	9	0.00	486.12	1430.65	1430.83	0.000	
11	0.00	0.00	10	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	86.335	0.00	0.00**	10	0.00	490.32	1430.96	1430.97	0.000	
12	0.00	0.00	10	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	-92.513	0.00	0.00**	10	0.00	458.15	1430.84	1430.84	0.000	
13	0.00	0.00	7	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	78.840	0.00	0.00**	7	0.00	524.64	1430.36	1430.91	0.000	
14	0.00	0.00	5	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	100.183	0.00	0.00**	5	0.00	404.68	1428.70	1428.75	0.000	
15	0.00	0.00	14	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	-87.820	0.00	0.00**	14	0.00	413.12	1429.01	1429.08	0.000	
16	0.00	0.00	9	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	86.233	0.00	0.00**	9	0.00	525.93	1430.90	1431.13	0.000	
17	0.00	0.00	16	0.20	0.50	0.90	0.00	0.00	0.050	0.020	4.00	-87.998	0.00	0.00**	16	0.00	523.35	1431.87	1432.51	0.000	
14047 Line 2													Number of lines: 17				Date: 8/1/2019				
NOTES: ** Critical depth																					

Storm Sewers

MyReport

Flow Rate	Sf Ave	Sf Dn	Grate Area	Grate Len	Grate Width	Gnd/Rim El Dn	Gnd/Rim El Up	Gutter Depth	Gutter Slope	Gutter Spread	Gutter Width	HGL Dn	HGL Up	HGL Jnct	HGL Jmp Dn	HGL Jmp Up	Incr CxA	Incr Q	Inlet Depth	
(cfs)	(ft/ft)	(ft/ft)	(sqft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(cfs)	(ft)	
44.20	0.000	0.000	....	....	....	1430.19	1430.53	....	....	....	....	1424.11	1425.17	1425.17	....	....	0.00	44.20	....
40.37	0.000	0.000	2.00	2.00	2.00	1430.53	1430.41	295.78	Sag	14724.42	2.00	1425.57	1426.36	1426.36	....	....	0.00	40.37	296.12	
40.37	0.000	0.000	....	....	....	1430.41	1430.11	....	....	....	....	1427.09	1427.11	1427.35	....	....	0.00	40.37	....
29.54	0.000	0.000	....	....	....	1430.11	1432.26	....	....	....	....	1427.35	1427.71	1427.80	....	....	0.00	29.54	....
29.54	0.000	0.000	....	....	....	1432.26	1430.09	....	....	....	....	1427.80	1428.18	1428.50	....	....	0.00	29.54	....
13.84	0.000	0.000	....	....	....	1430.09	1431.63	....	....	....	....	1428.50	1428.96	1428.98	....	....	0.00	13.84	....
13.84	0.000	0.000	....	....	....	1431.63	1432.92	....	....	....	....	1428.98	1429.66	1429.96	....	....	0.00	13.84	....
11.71	0.000	0.000	....	....	....	1430.11	1430.42	2.84	Sag	138.81	2.00	1427.35	1427.40	1428.08	....	....	0.00	11.71	2.84	
12.08	0.000	0.000	....	....	....	1432.92	1431.87	....	....	....	....	1429.96	1430.29	1430.52	....	....	0.00	12.08	....
5.10	0.000	0.000	....	....	....	1431.87	1431.54	....	....	....	....	1430.52	1430.70	1430.83	....	....	0.00	5.10	....
5.01	0.000	0.000	....	....	....	1431.54	1431.87	0.66	Sag	29.78	2.00	1430.83	1430.84	1430.97	....	....	0.00	5.01	0.66	
0.85	0.000	0.000	....	....	....	1431.54	1431.87	0.17	Sag	5.55	2.00	1430.83	1430.84	1430.84	....	....	0.00	0.85	0.17	
1.76	0.000	0.000	2.00	2.00	2.00	1432.92	1429.54	0.18	Sag	19.52	2.00	1429.96	1430.51	1430.91	....	....	0.00	1.76	0.18	
17.46	0.000	0.000	....	....	....	1430.09	1429.39	6.11	Sag	302.35	2.00	1428.50	1428.56	1428.85	....	....	0.00	17.46	6.11	
9.91	0.000	0.000	....	....	....	1429.39	1429.39	2.08	Sag	101.00	2.00	1428.85	1428.92	1429.08	....	....	0.00	9.91	2.08	
8.82	0.000	0.000	....	....	....	1431.87	1432.25	1.68	Sag	81.08	2.00	1430.52	1430.74	1431.32	....	....	0.00	8.82	1.68	
4.68	0.000	0.000	....	....	....	1432.25	1432.18	0.59	Sag	26.69	2.00	1431.32	1431.96	1432.51	....	....	0.00	4.68	0.59	
14047 Line 2													Number of lines: 17			Date: 8/1/2019				
NOTES: ** Critical depth																				

Storm Sewers

MyReport

Inlet Eff	Inlet ID	Inlet Loc	Inlet Spread	Inlet Time	i Sys	i Inlet	Invert Dn	Invert Up	Jump Loc	Jump Len	Vel Hd Jmp Dn	Vel Hd Jmp Up	J-Loss Coeff	Junct Type	Known Q	Cost RCP	Cost CMP	Cost PVC	
(%)			(ft)	(min)	(in/hr)	(in/hr)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)			(cfs)				
....		Sag	....	0.0	0.00	0.00	1423.35	1424.35	....	....	0.00	0.00	0.15	MH	44.20	10,510	9,459	8,934	
100		Sag	14724.42	0.0	0.00	0.00	1424.35	1424.46	....	....	0.00	0.00	0.50	Grate	40.37	460	414	391	
....		Sag	....	0.0	0.00	0.00	1424.46	1424.52	....	....	0.00	0.00	1.00	MH	40.37	1,576	1,418	1,340	
....		Sag	....	0.0	0.00	0.00	1424.62	1425.05	....	....	0.00	0.00	0.27	MH	29.54	12,638	11,374	10,742	
....		Sag	....	0.0	0.00	0.00	1425.15	1425.59	....	....	0.00	0.00	1.00	MH	29.54	12,390	11,151	10,532	
....		Sag	....	0.0	0.00	0.00	1425.70	1426.56	....	....	0.00	0.00	0.17	MH	13.84	20,760	18,684	17,646	
....		Sag	....	0.0	0.00	0.00	1426.66	1427.02	....	....	0.00	0.00	0.98	MH	13.84	8,150	7,335	6,928	
100		Sag	138.81	0.0	0.00	0.00	1424.62	1424.63	....	....	0.00	0.00	1.00	Curb	11.71	280	252	238	
....		Sag	....	0.0	0.00	0.00	1427.12	1427.35	....	....	0.00	0.00	1.00	MH	12.08	5,158	4,642	4,384	
....		Sag	....	0.0	0.00	0.00	1427.45	1427.61	....	....	0.00	0.00	1.00	MH	5.10	3,208	2,887	2,727	
100		Sag	29.78	0.0	0.00	0.00	1427.71	1427.72	....	....	0.00	0.00	1.00	Curb	5.01	264	238	224	
100		Sag	5.55	0.0	0.00	0.00	1427.71	1427.77	....	....	0.00	0.00	1.00	Curb	0.85	1,100	990	935	
100		Sag	19.52	0.0	0.00	0.00	1427.12	1427.38	....	....	0.00	0.00	1.00	Dp-Grate	1.76	100	90	85	
100		Sag	302.35	0.0	0.00	0.00	1425.70	1425.76	....	....	0.00	0.00	1.50	Curb	17.46	1,400	1,260	1,190	
100		Sag	101.00	0.0	0.00	0.00	1425.86	1425.93	....	....	0.00	0.00	1.00	Curb	9.91	1,414	1,273	1,202	
100		Sag	81.08	0.0	0.00	0.00	1427.45	1427.52	....	....	0.00	0.00	1.50	Curb	8.82	1,380	1,242	1,173	
100		Sag	26.69	0.0	0.00	0.00	1427.62	1427.69	....	....	0.00	0.00	1.00	Curb	4.68	1,215	1,094	1,033	
14047 Line 2												Number of lines: 17				Date: 8/1/2019			
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 -- Return period = 100 Yrs. ; ** Critical depth																			

Storm Sewers

MyReport

Line ID	Line Length	Line Size	Line Slope	Line Type	Local Depr	n-val Gutter	n-val Pipe	Minor Loss	Northing Y	Pipe Travel	Q Byp	Q Capt	Q Carry	Line Rise	Runoff Coeff	Line Span	Area A1	Area A2	Area A3	Tc	
	(ft)	(in)	(%)		(in)			(ft)	(ft)	(min)	(cfs)	(cfs)	(cfs)	(in)	(C)	(in)	(ac)	(ac)	(ac)	(min)	
	173.000	36 x 126	0.58	Box	....	....	0.015	0.06	176.04	2.06	....	....	....	36	0.00	126	0.00	0.00	0.00	7.1	
	5.730	48	1.92	Cir	4.0	....	0.013	n/a	177.23	0.03	0.00	184.67	144.30	48	0.00	48	0.00	0.00	0.00	7.1	
	28.000	36 x 48	0.21	Box	....	....	0.013	n/a	183.06	0.14	....	....	....	36	0.00	48	0.00	0.00	0.00	6.9	
	217.330	36	0.20	Cir	....	....	0.013	n/a	395.64	0.87	....	....	....	36	0.00	36	0.00	0.00	0.00	6.1	
	221.780	36	0.20	Cir	....	....	0.013	n/a	617.38	0.88	....	....	....	36	0.00	36	0.00	0.00	0.00	5.2	
	430.450	30	0.20	Cir	....	....	0.013	n/a	1035.05	2.54	....	....	....	30	0.00	30	0.00	0.00	0.00	2.6	
	182.770	24	0.20	Cir	....	....	0.013	n/a	1216.82	0.69	....	....	....	24	0.00	24	0.00	0.00	0.00	1.9	
	4.250	18	0.24	Cir	0.0	....	0.013	n/a	183.94	0.01	0.00	11.71	0.00	18	0.00	18	0.00	0.00	0.00	0.0	
	114.660	24	0.20	Cir	....	....	0.013	n/a	1331.39	0.50	....	....	....	24	0.00	24	0.00	0.00	0.00	1.4	
	80.000	18	0.20	Cir	....	....	0.013	n/a	1410.97	0.46	....	....	....	18	0.00	18	0.00	0.00	0.00	1.0	
	4.260	18	0.23	Cir	0.0	....	0.013	n/a	1411.68	0.03	0.00	5.01	0.00	18	0.00	18	0.00	0.00	0.00	0.0	
	28.260	18	0.21	Cir	0.0	....	0.013	n/a	1406.88	0.98	0.00	0.85	0.00	18	0.00	18	0.00	0.00	0.00	0.0	
	26.000	8	1.00	Cir	....	....	0.013	n/a	1219.15	0.09	0.00	1.76	0.00	8	0.00	8	0.00	0.00	0.00	0.0	
	29.740	30	0.20	Cir	0.0	....	0.013	n/a	611.62	0.14	0.00	17.46	0.00	30	0.00	30	0.00	0.00	0.00	0.2	
	36.525	24	0.19	Cir	0.0	....	0.013	n/a	647.15	0.19	0.00	9.91	0.00	24	0.00	24	0.00	0.00	0.00	0.0	
	31.870	18	0.22	Cir	0.0	....	0.013	n/a	1334.73	0.11	0.00	8.82	0.00	18	0.00	18	0.00	0.00	0.00	0.1	
	36.770	12	0.19	Cir	0.0	....	0.013	n/a	1371.41	0.10	0.00	4.68	0.00	12	0.00	12	0.00	0.00	0.00	0.0	
	14047 Line 2													Number of lines: 17				Date: 8/1/2019			
NOTES: ** Critical depth																					

Storm Sewers

MyReport

Throat Ht	Total Area	Total CxA	Total Runoff	Vel Ave	Vel Dn	Vel Hd Dn	Vel Hd Up	Vel Up	Cover Dn	Cover Up	Storage			
(in)	(ac)		(cfs)	(ft/s)	(ft/s)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(cft)			
....	0.00	0.00	0.00	5.34	5.54	0.41	0.41	5.13	3.84	3.18	1435.00			
....	0.00	0.00	0.00	9.65	12.41	0.74	0.74	6.88	2.18	1.95	26.02			
....	0.00	0.00	0.00	3.86	3.83	0.00	0.00	3.89	2.95	2.59	0.00			
....	0.00	0.00	0.00	4.41	4.37	0.00	0.00	4.45	2.49	4.21	0.00			
....	0.00	0.00	0.00	4.51	4.47	0.00	0.00	4.55	4.11	1.50	0.00			
....	0.00	0.00	0.00	2.84	2.82	0.00	0.00	2.86	1.89	2.57	0.00			
....	0.00	0.00	0.00	4.41	4.41	0.00	0.00	4.41	2.97	3.90	0.00			
4.0	0.00	0.00	0.00	6.62	6.63	0.00	0.00	6.62	3.99	4.29	0.00			
....	0.00	0.00	0.00	3.84	3.85	0.00	0.00	3.84	3.80	2.52	0.00			
....	0.00	0.00	0.00	2.89	2.89	0.00	0.00	2.89	2.92	2.43	0.00			
4.0	0.00	0.00	0.00	2.84	2.84	0.00	0.00	2.84	2.33	2.65	0.00			
4.0	0.00	0.00	0.00	0.48	0.48	0.00	0.00	0.48	2.33	2.60	0.00			
....	0.00	0.00	0.00	5.05	5.05	0.00	0.00	5.05	5.13	1.49	0.00			
4.0	0.00	0.00	0.00	3.56	3.56	0.00	0.00	3.56	1.89	1.13	0.00			
4.0	0.00	0.00	0.00	3.15	3.16	0.00	0.00	3.15	1.53	1.46	0.00			
4.0	0.00	0.00	0.00	4.99	4.99	0.00	0.00	4.99	2.92	3.23	0.00			
4.0	0.00	0.00	0.00	5.96	5.96	0.00	0.00	5.96	3.63	3.49	0.00			
14047 Line 2												Number of lines: 17		
NOTES: ** Critical depth												Date: 8/1/2019		

Storm Sewers

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
1		User																		0.00
2		User																		0.00
3		User																		0.00
4		User																		0.00
5		User																		0.00
6		User																		0.00
7		User																		0.00
8		User																		0.00
9		User																		0.00
10		User																		0.00
11		User																		0.00
12		User																		0.00
13		User																		0.00
14		User																		0.00
15		User																		0.00
16		User																		0.00
17		User																		0.00
14047 Line 2					Min. Tc used for intensity calculations = 5 min							Number of lines: 17				Date: 8/1/2019				

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth	Area	Vel	Vel head (ft)	EGL elev (ft)	Sf		Invert elev (ft)	HGL elev (ft)	Depth	Area	Vel	Vel head (ft)	EGL elev (ft)	Sf	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in)	(cfs)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K)	(24)
1	36 126 B	44.20	1423.35	1424.11	0.76	7.98	5.54	0.41	1424.52	0.000	173.000	1424.35	1425.17	0.82**	8.61	5.13	0.41	1425.58	0.000	0.000	n/a	0.15	0.06
2	48	40.37	1424.35	1425.57	1.22*	3.25	12.41	0.74	1426.31	0.000	5.730	1424.46	1426.36	1.90**	5.86	6.88	0.74	1427.09	0.000	0.000	n/a	0.50	n/a
3	36 48 B	40.37	1424.46	1427.09	0.00	0.00	3.83	0.00	1427.09	0.000	28.000	1424.52	1427.11	0.00**	0.00	3.89	0.00	1427.11	0.000	0.000	0.000	1.00	n/a
4	36	29.54	1424.62	1427.35	0.00	0.00	4.37	0.00	1427.35	0.000	217.330	1425.05	1427.71	0.00**	0.00	4.45	0.00	1427.71	0.000	0.000	0.000	0.27	n/a
5	36	29.54	1425.15	1427.80	0.00	0.00	4.47	0.00	1427.80	0.000	221.780	1425.59	1428.18	0.00**	0.00	4.55	0.00	1428.18	0.000	0.000	0.000	1.00	n/a
6	30	13.84	1425.70	1428.50	0.00	0.00	2.82	0.00	1428.50	0.000	430.450	1426.56	1428.96	0.00**	0.00	2.86	0.00	1428.96	0.000	0.000	0.000	0.17	n/a
7	24	13.84	1426.66	1428.98	0.00	0.00	4.41	0.00	1428.98	0.000	182.770	1427.02	1429.66	0.00**	0.00	4.41	0.00	1429.66	0.000	0.000	0.000	0.98	n/a
8	18	11.71	1424.62	1427.35	0.00	0.00	6.63	0.00	1427.35	0.000	4.250	1424.63	1427.40	0.00**	0.00	6.62	0.00	1427.40	0.000	0.000	0.000	1.00	n/a
9	24	12.08	1427.12	1429.96	0.00	0.00	3.85	0.00	1429.96	0.000	114.660	1427.35	1430.29	0.00**	0.00	3.84	0.00	1430.29	0.000	0.000	0.000	1.00	n/a
10	18	5.10	1427.45	1430.52	0.00	0.00	2.89	0.00	1430.52	0.000	80.000	1427.61	1430.70	0.00**	0.00	2.89	0.00	1430.70	0.000	0.000	0.000	1.00	n/a
11	18	5.01	1427.71	1430.83	0.00	0.00	2.84	0.00	1430.83	0.000	4.260	1427.72	1430.84	0.00**	0.00	2.84	0.00	1430.84	0.000	0.000	0.000	1.00	n/a
12	18	0.85	1427.71	1430.83	0.00	0.00	0.48	0.00	1430.83	0.000	28.260	1427.77	1430.84	0.00**	0.00	0.48	0.00	1430.84	0.000	0.000	0.000	1.00	n/a
13	8	1.76	1427.12	1429.96	0.00	0.00	5.05	0.00	1429.96	0.000	26.000	1427.38	1430.51	0.00**	0.00	5.05	0.00	1430.51	0.000	0.000	0.000	1.00	n/a
14	30	17.46	1425.70	1428.50	0.00	0.00	3.56	0.00	1428.50	0.000	29.740	1425.76	1428.56	0.00**	0.00	3.56	0.00	1428.56	0.000	0.000	0.000	1.50	n/a
15	24	9.91	1425.86	1428.85	0.00	0.00	3.16	0.00	1428.85	0.000	36.525	1425.93	1428.92	0.00**	0.00	3.15	0.00	1428.92	0.000	0.000	0.000	1.00	n/a
16	18	8.82	1427.45	1430.52	0.00	0.00	4.99	0.00	1430.52	0.000	31.870	1427.52	1430.74	0.00**	0.00	4.99	0.00	1430.74	0.000	0.000	0.000	1.50	n/a
17	12	4.68	1427.62	1431.32	0.00	0.00	5.96	0.00	1431.32	0.000	36.770	1427.69	1431.96	0.00**	0.00	5.96	0.00	1431.96	0.000	0.000	0.000	1.00	n/a
14047 Line 2															Number of lines: 17					Run Date: 8/1/2019			
Notes: * Normal depth assumed.; ** Critical depth. ; c = cir e = ellip b = box																							

Hydraflow HGL Computation Procedure

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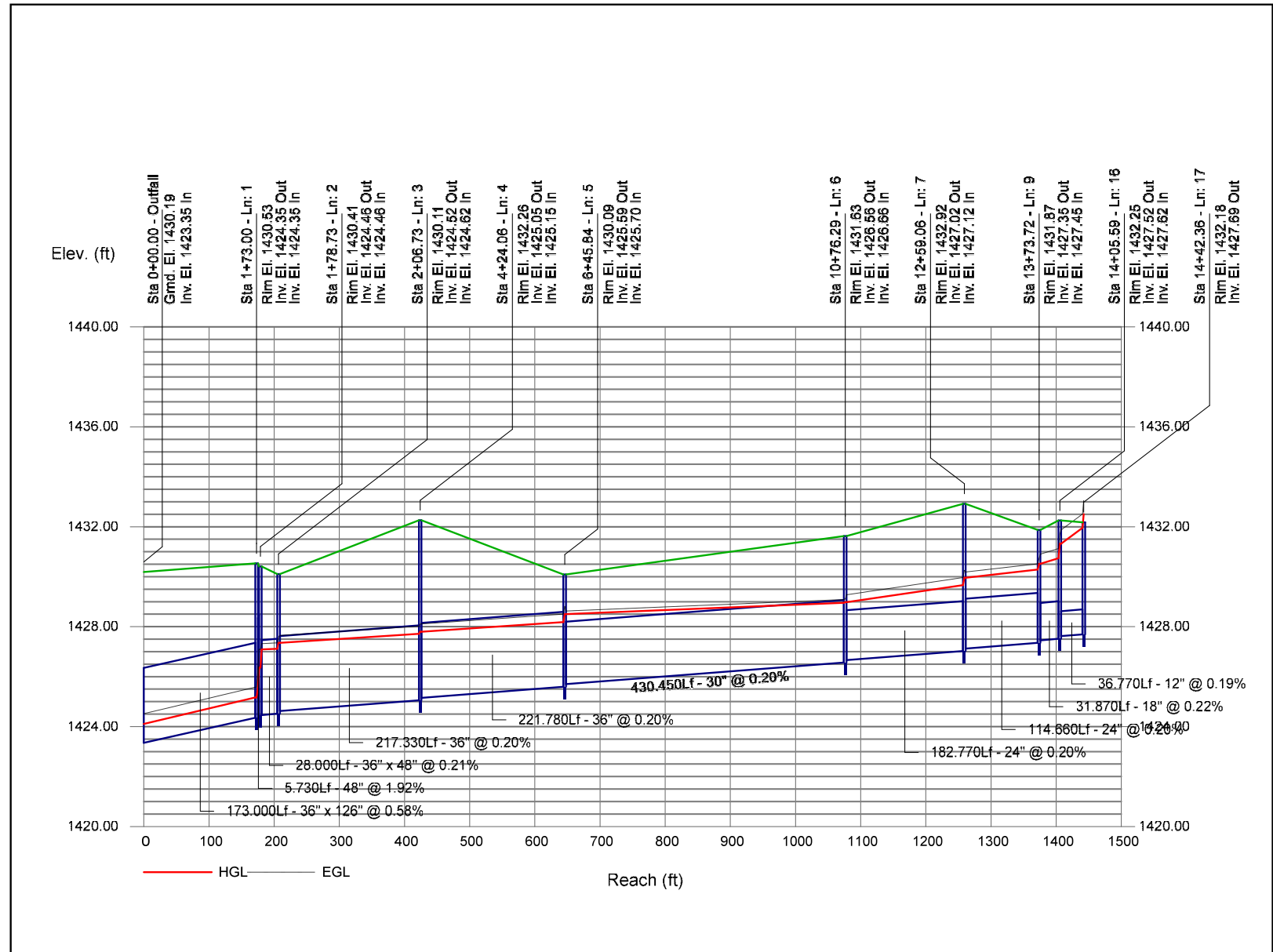
General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line size is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average $Sf/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Profile

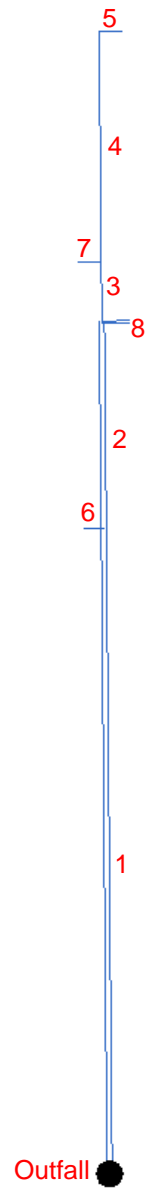
Proj. file: 14047Line 2.stm



Storm Sewers

Attachment J3.3
Hydraulic Calculations
Line 3 Run; East Side
of Property Along
Briggs Road

14047 Pipe size Line 3



Project File: 14047Line 3.stm

Number of lines: 8

Date: 8/1/2019

Storm Sewers v10.40

Structure Report

Page 1

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	New	None	1433.94	n/a	n/a	n/a	30	Cir (2b)	1428.80	30 12	Cir (2b) Cir	1428.81 1429.00
2		Manhole	1434.09	Rect	4.00	12.00	30	Cir (2b)	1429.40	30 18	Cir Cir (2b)	1429.41 1430.88
3		None	1433.64	n/a	n/a	n/a	30	Cir	1429.63	30 12	Cir Cir	1429.64 1429.17
4		Manhole	1435.02	Rect	7.00	12.00	30	Cir	1430.50	24	Cir	1431.71
5		None	1434.43	n/a	n/a	n/a	24	Cir	1434.43			
6		DropGrate	1432.20	Cir	4.00	4.00	12	Cir	1429.30			
7		DropGrate	1431.82	Cir	4.00	4.00	12	Cir	1429.63			
8		None	1434.94	n/a	n/a	n/a	18	Cir (2b)	1432.00			
14047 Pipe size Line 3							Number of Structures: 8			Run Date: 8/1/2019		

Storm Sewers v10.40

Storm Sewer Summary Report

Page 1

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	(2)	6.83	30	Cir(2b)	912.860	1426.98	1428.80	0.199	1427.71	1429.53	0.13	1429.66	End	None
2		6.83	30	Cir(2b)	293.230	1428.81	1429.40	0.201	1429.66	1430.11	0.14	1430.25	1	Manhole
3		6.64	30	Cir	84.290	1429.41	1429.63	0.261	1430.38	1430.60	n/a	1430.82	2	None
4		6.64	30	Cir	326.000	1429.64	1430.50	0.264	1430.82	1431.42	n/a	1431.68	3	Manhole
5		6.64	24	Cir	32.000	1431.71	1434.43	8.500	1432.14	1435.34	n/a	1435.34	4	None
6		2.66	12	Cir	28.410	1429.00	1429.30	1.056	1429.66	1430.00	n/a	1430.00	1	DropGrate
7		4.85	12	Cir	33.940	1429.17	1429.63	1.355	1430.82*	1431.45*	n/a	1432.04	3	DropGrate
8		6.83	18	Cir(2b)	38.760	1430.88	1432.00	2.890	1431.33	1432.59	n/a	1432.59	2	None
14047 Pipe size Line 3									Number of lines: 8			Run Date: 8/1/2019		
NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown).														

Storm Sewers v10.40

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	912.860	0.00	0.00	0.00	0.00	0.00	0.0	12.3	0.0	6.83	36.63	2.85	30(2b)	0.20	1426.98	1428.80	1427.71	1429.53	1431.45	1433.94	(2)
2	1	293.230	0.00	0.00	0.00	0.00	0.00	0.0	5.3	0.0	6.83	36.79	2.66	30(2b)	0.20	1428.81	1429.40	1429.66	1430.11	1433.94	1434.09	
3	2	84.290	0.00	0.00	0.00	0.00	0.00	0.0	4.3	0.0	6.64	0.00	3.78	30	0.26	1429.41	1429.63	1430.38	1430.60	1434.09	1433.64	
4	3	326.000	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	6.64	0.00	3.48	30	0.26	1429.64	1430.50	1430.82	1431.42	1433.64	1435.02	
5	4	32.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.64	0.00	9.10	24	8.50	1431.71	1434.43	1432.14	1435.34	1435.02	1434.43	
6	1	28.410	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.66	0.00	4.69	12	1.06	1429.00	1429.30	1429.66	1430.00	1433.94	1432.20	
7	3	33.940	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.85	0.00	6.18	12	1.36	1429.17	1429.63	1430.82	1431.45	1433.64	1431.82	
8	2	38.760	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.83	0.00	6.55	18(2b)	2.89	1430.88	1432.00	1431.33	1432.59	1434.09	1434.94	
14047 Pipe size Line 3																Number of lines: 8				Run Date: 8/1/2019		
NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Inlet Report

Page 1

Line No	Inlet ID	Q = CIA	Q carry	Q capt	Q Byp	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
		(cfs)	(cfs)	(cfs)	(cfs)		Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	New	6.83*	33.58	0.00	40.42	None	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		6.83*	26.75	0.00	33.58	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	1
3		6.64*	13.28	0.00	19.92	None	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.020	0.020	0.013	0.00	0.00	0.00	0.00	0.0	2
4		6.64*	6.64	0.00	13.28	MH	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	3
5		6.64*	0.00	0.00	6.64	None	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	4
6		2.66*	0.00	2.66	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	0.23	25.04	0.23	25.04	0.0	1
7		4.85*	0.00	4.85	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.013	0.34	36.43	0.34	36.43	0.0	3
8		6.83*	0.00	0.00	6.83	None	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.00	0.00	0.00	0.00	0.0	2
14047 Pipe size Line 3														Number of lines: 8				Run Date: 8/1/2019				
NOTES: Inlet N-Values = 0.016; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

Storm Sewers v10.40

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 8/1/2019	
					Total Flow	Elev of Crown						Span		Pipe	Full Flow	Frequency: 100 yrs						
						Elev of Invert										Proj: 14047Line 3.stm						
						Q	Up									Down	Fall	Size	Slope	Vel	Cap	Line description
(ft)	Increment (ac)	Sub-Total (ac)	Sum CA	(min)	(min)	(in/hr)	(cfs)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)								
1	End	None	0.013	912.860	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	12.33	21.86	0.00	0.00	6.83 6.83	1433.94	1429.53 1431.30 1428.80	1427.71 1429.48 1426.98	1.82 1.82	30 30 Cir	0.20 0.20	2.85 7.46	6.83 36.63	(2)	
2	1	MH	0.013	293.230	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.31	7.02	0.00	0.00	6.83 6.83	1434.09	1430.11 1431.90 1429.40	1429.66 1431.31 1428.81	0.45 0.59	30 30 Cir	0.15 0.20	2.66 7.50	6.83 36.79		
3	2	None	0.013	84.290	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	4.27	1.04	0.00	0.00	6.64 6.64	1433.64	1430.60 1432.13 1429.63	1430.38 1431.91 1429.41	0.22 0.22	30 30 Cir	0.26 0.26	3.78 0.00	6.64 0.00		
4	3	MH	0.013	326.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.25	4.02	0.00	0.00	6.64 6.64	1435.02	1431.42 1433.00 1430.50	1430.82 1432.14 1429.64	0.60 0.86	30 30 Cir	0.18 0.26	3.48 0.00	6.64 0.00		
5	4	None	0.013	32.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.25	0.00	0.00	6.64 6.64	1434.43	1435.34 1436.43 1434.43	1432.14 1433.71 1431.71	3.20 2.72	24 24 Cir	10.01 8.50	9.10 0.00	6.64 0.00		
6	1	DrGrt	0.013	28.410	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.14	0.00	0.00	2.66 2.66	1432.20	1430.00 1430.30 1429.30	1429.66 1430.00 1429.00	0.34 0.30	12 12 Cir	1.19 1.06	4.69 0.00	2.66 0.00		
7	3	DrGrt	0.013	33.940	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.09	0.00	0.00	4.85 4.85	1431.82	1431.45 1430.63 1429.63	1430.82 1430.17 1429.17	0.63 0.46	12 12 Cir	1.86 1.36	6.18 0.00	4.85 0.00		
8	2	None	0.013	38.760	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00	0.33	0.00	0.00	6.83 6.83	1434.94	1432.59 1433.50 1432.00	1431.33 1432.38 1430.88	1.26 1.12	18 18 Cir	3.26 2.89	6.55 0.00	6.83 0.00		
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 (in/hr) ; Time of flow in section is based on full flow.																						
14047 Pipe size Line 3																						

MyReport

Line No.	Area Dn	Area Up	Byp Ln No	Coeff C1	Coeff C2	Coeff C3	Capac Full	Crit Depth	Cross SI, Sw	Cross SI, Sx	Curb Len	Defl Ang	Depth Dn	Depth Up	DnStm Ln No	Drng Area	Easting X	EGL Dn	EGL Up	Energy Loss	
	(sqft)	(sqft)		(C)	(C)	(C)	(cfs)	(ft)	(ft/ft)	(ft/ft)	(ft)	(Deg)	(ft)	(ft)		(ac)	(ft)	(ft)	(ft)	(ft)	
1	2.40	2.40	n/a	0.20	0.50	0.90	36.63	0.51	....	....	....	-90.523	0.73	0.73	Outfall	0.00	257.55	1427.84	1429.66	1.808	
2	2.94	2.27	1	0.20	0.50	0.90	36.79	0.51	....	....	....	0.000	0.85	0.70	1	0.00	254.88	1429.74	1430.25	0.502	
3	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	....	....	....	0.000	0.00	0.00**	2	0.00	254.11	1430.60	1430.82	0.000	
4	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	....	....	....	0.000	0.00	0.00**	3	0.00	251.13	1430.95	1431.68	0.000	
5	0.00	0.00	4	0.20	0.50	0.90	0.00	0.00	....	....	....	90.000	0.00	0.00**	4	0.00	283.13	1432.49	1435.69	0.000	
6	0.00	0.00	1	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	-89.790	0.00	0.00**	1	0.00	229.14	1429.98	1430.32	0.000	
7	0.00	0.00	3	0.20	0.50	0.90	0.00	0.00	0.020	0.020	....	-90.000	0.00	0.00**	3	0.00	220.17	1431.41	1432.04	0.000	
8	0.00	0.00	2	0.20	0.50	0.90	0.00	0.00	....	....	....	90.000	0.00	0.00**	2	0.00	293.64	1431.77	1433.03	0.000	
14047 Pipe size Line 3													Number of lines: 8				Date: 8/1/2019				
NOTES: ** Critical depth																					

Storm Sewers

MyReport

Flow Rate	Sf Ave	Sf Dn	Grate Area	Grate Len	Grate Width	Gnd/Rim El Dn	Gnd/Rim El Up	Gutter Depth	Gutter Slope	Gutter Spread	Gutter Width	HGL Dn	HGL Up	HGL Jnct	HGL Jmp Dn	HGL Jmp Up	Incr CxA	Incr Q	Inlet Depth	
(cfs)	(ft/ft)	(ft/ft)	(sqft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)		(cfs)	(ft)	
6.83	0.198	0.199	....	....	....	1431.45	1433.94	....	....	....	....	1427.71	1429.53	1429.66	....	....	0.00	6.83	....
6.83	0.171	0.112	....	....	....	1433.94	1434.09	....	....	....	....	1429.66	1430.11	1430.25	....	....	0.00	6.83	....
6.64	0.000	0.000	....	....	....	1434.09	1433.64	....	....	....	....	1430.38	1430.60	1430.82	....	....	0.00	6.64	....
6.64	0.000	0.000	....	....	....	1433.64	1435.02	....	....	....	....	1430.82	1431.42	1431.68	....	....	0.00	6.64	....
6.64	0.000	0.000	....	....	....	1435.02	1434.43	....	....	....	....	1432.14	1435.34	1435.34	....	....	0.00	6.64	....
2.66	0.000	0.000	2.00	2.00	2.00	1433.94	1432.20	0.23	Sag	25.04	2.00	1429.66	1430.00	1430.00	....	....	0.00	2.66	0.23	
4.85	0.000	0.000	2.00	2.00	2.00	1433.64	1431.82	0.34	Sag	36.43	2.00	1430.82	1431.45	1432.04	....	....	0.00	4.85	0.34	
6.83	0.000	0.000	....	....	....	1434.09	1434.94	....	....	....	....	1431.33	1432.59	1432.59	....	....	0.00	6.83	....
14047 Pipe size Line 3													Number of lines: 8			Date: 8/1/2019				
NOTES: ** Critical depth																				

Storm Sewers

MyReport

Inlet Eff	Inlet ID	Inlet Loc	Inlet Spread	Inlet Time	i Sys	i Inlet	Invert Dn	Invert Up	Jump Loc	Jump Len	Vel Hd Jmp Dn	Vel Hd Jmp Up	J-Loss Coeff	Junct Type	Known Q	Cost RCP	Cost CMP	Cost PVC	
(%)			(ft)	(min)	(in/hr)	(in/hr)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)			(cfs)				
....	New	Sag	....	0.0	0.00	0.00	1426.98	1428.80	....	....	0.00	0.00	1.00	None	6.83	43,920	39,528	37,332	
....		Sag	....	0.0	0.00	0.00	1428.81	1429.40	....	....	0.00	0.00	1.00	MH	6.83	14,184	12,766	12,056	
....		Sag	....	0.0	0.00	0.00	1429.41	1429.63	....	....	0.00	0.00	1.00	None	6.64	4,152	3,737	3,529	
....		Sag	....	0.0	0.00	0.00	1429.64	1430.50	....	....	0.00	0.00	1.00	MH	6.64	15,768	14,191	13,403	
....		Sag	....	0.0	0.00	0.00	1431.71	1434.43	....	....	0.00	0.00	1.00	None	6.64	1,252	1,127	1,064	
100		Sag	25.04	0.0	0.00	0.00	1429.00	1429.30	....	....	0.00	0.00	1.00	Dp-Grate	2.66	910	819	774	
100		Sag	36.43	0.0	0.00	0.00	1429.17	1429.63	....	....	0.00	0.00	1.00	Dp-Grate	4.85	1,051	946	893	
....		Sag	....	0.0	0.00	0.00	1430.88	1432.00	....	....	0.00	0.00	1.00	None	6.83	1,332	1,199	1,132	
14047 Pipe size Line 3													Number of lines: 8			Date: 8/1/2019			
NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82 -- Return period = 100 Yrs. ; ** Critical depth																			

Storm Sewers

MyReport

Line ID	Line Length	Line Size	Line Slope	Line Type	Local Depr	n-val Gutter	n-val Pipe	Minor Loss	Northing Y	Pipe Travel	Q Byp	Q Capt	Q Carry	Line Rise	Runoff Coeff	Line Span	Area A1	Area A2	Area A3	Tc	
	(ft)	(in)	(%)		(in)			(ft)	(ft)	(min)	(cfs)	(cfs)	(cfs)	(in)	(C)	(in)	(ac)	(ac)	(ac)	(min)	
(2)	912.860	30(2b)	0.20	Cir	....	....	0.013	0.13	1023.27	21.86	....	....	....	30	0.00	30	0.00	0.00	0.00	12.3	
	293.230	30(2b)	0.20	Cir	....	....	0.013	0.14	1316.49	7.02	....	....	....	30	0.00	30	0.00	0.00	0.00	5.3	
	84.290	30	0.26	Cir	....	....	0.013	n/a	1400.78	1.04	....	....	....	30	0.00	30	0.00	0.00	0.00	4.3	
	326.000	30	0.26	Cir	....	....	0.013	n/a	1726.76	4.02	....	....	....	30	0.00	30	0.00	0.00	0.00	0.3	
	32.000	24	8.50	Cir	....	....	0.013	n/a	1727.06	0.25	....	....	....	24	0.00	24	0.00	0.00	0.00	0.0	
	28.410	12	1.06	Cir	....	....	0.013	n/a	1023.12	0.14	0.00	2.66	0.00	12	0.00	12	0.00	0.00	0.00	0.0	
	33.940	12	1.36	Cir	....	....	0.013	n/a	1400.47	0.09	0.00	4.85	0.00	12	0.00	12	0.00	0.00	0.00	0.0	
	38.760	18(2b)	2.89	Cir	....	....	0.013	n/a	1316.85	0.33	....	....	....	18	0.00	18	0.00	0.00	0.00	0.0	
14047 Pipe size Line 3												Number of lines: 8				Date: 8/1/2019					
NOTES: ** Critical depth																					

Storm Sewers

MyReport

Throat Ht	Total Area	Total Cx A	Total Runoff	Vel Ave	Vel Dn	Vel Hd Dn	Vel Hd Up	Vel Up	Cover Dn	Cover Up	Storage			
(in)	(ac)		(cfs)	(ft/s)	(ft/s)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(cft)			
....	0.00	0.00	0.00	2.85	2.85	0.13	0.13	2.84	1.97	2.64	2189.87			
....	0.00	0.00	0.00	2.66	2.32	0.08	0.14	3.01	2.63	2.19	763.49			
....	0.00	0.00	0.00	3.78	3.78	0.00	0.00	3.78	2.18	1.51	0.00			
....	0.00	0.00	0.00	3.48	2.91	0.00	0.00	4.06	1.50	2.02	0.00			
....	0.00	0.00	0.00	9.10	13.43	0.00	0.00	4.76	1.31	-2.00	0.00			
....	0.00	0.00	0.00	4.69	4.84	0.00	0.00	4.54	3.94	1.90	0.00			
....	0.00	0.00	0.00	6.18	6.18	0.00	0.00	6.18	3.47	1.19	0.00			
....	0.00	0.00	0.00	6.55	7.78	0.00	0.00	5.32	1.71	1.44	0.00			
14047 Pipe size Line 3										Number of lines: 8		Date: 8/1/2019		
NOTES: ** Critical depth														

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow								Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)	
1	(2)	User																		0.00	
2		User																		0.00	
3		User																		0.00	
4		User																		0.00	
5		User																		0.00	
6		User																		0.00	
7		User																		0.00	
8		User																		0.00	
14047 Pipe size Line 3					Min. Tc used for intensity calculations = 5 min							Number of lines: 8			Date: 8/1/2019						

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss		
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)				
(1)	(in)	(cfs)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K)	(23)	(ft)	(24)
1	30(2b)	6.83	1426.98	1427.71	0.73	2.40	2.85	0.13	1427.84	0.199	912.860	1428.80	1429.53	0.73	2.40	2.84	0.13	1429.66	0.197	0.198	1.808	1.00		0.13	
2	30(2b)	6.83	1428.81	1429.66	0.85	2.94	2.32	0.08	1429.74	0.112	293.230	1429.40	1430.11	0.70	2.27	3.01	0.14	1430.25	0.230	0.171	0.502	1.00		0.14	
3	30	6.64	1429.41	1430.38	0.00	0.00	3.78	0.00	1430.38	0.000	84.290	1429.63	1430.60	0.00**	0.00	3.78	0.00	1430.60	0.000	0.000	0.000	1.00		n/a	
4	30	6.64	1429.64	1430.82	0.00	0.00	2.91	0.00	1430.82	0.000	326.000	1430.50	1431.42	0.00**	0.00	4.06	0.00	1431.42	0.000	0.000	0.000	1.00		n/a	
5	24	6.64	1431.71	1432.14	0.00	0.00	13.43	0.00	1432.14	0.000	32.000	1434.43	1435.34	0.00**	0.00	4.76	0.00	1435.34	0.000	0.000	0.000	1.00		n/a	
6	12	2.66	1429.00	1429.66	0.00	0.00	4.84	0.00	1429.66	0.000	28.410	1429.30	1430.00	0.00**	0.00	4.54	0.00	1430.00	0.000	0.000	0.000	1.00		n/a	
7	12	4.85	1429.17	1430.82	0.00	0.00	6.18	0.00	1430.82	0.000	33.940	1429.63	1431.45	0.00**	0.00	6.18	0.00	1431.45	0.000	0.000	0.000	1.00		n/a	
8	18(2b)	6.83	1430.88	1431.33	0.00	0.00	7.78	0.00	1431.33	0.000	38.760	1432.00	1432.59	0.00**	0.00	5.32	0.00	1432.59	0.000	0.000	0.000	1.00		n/a	
14047 Pipe size Line 3															Number of lines: 8					Run Date: 8/1/2019					
Notes: ; ** Critical depth. ; c = cir e = ellip b = box																									

Hydraflow HGL Computation Procedure

Page 1

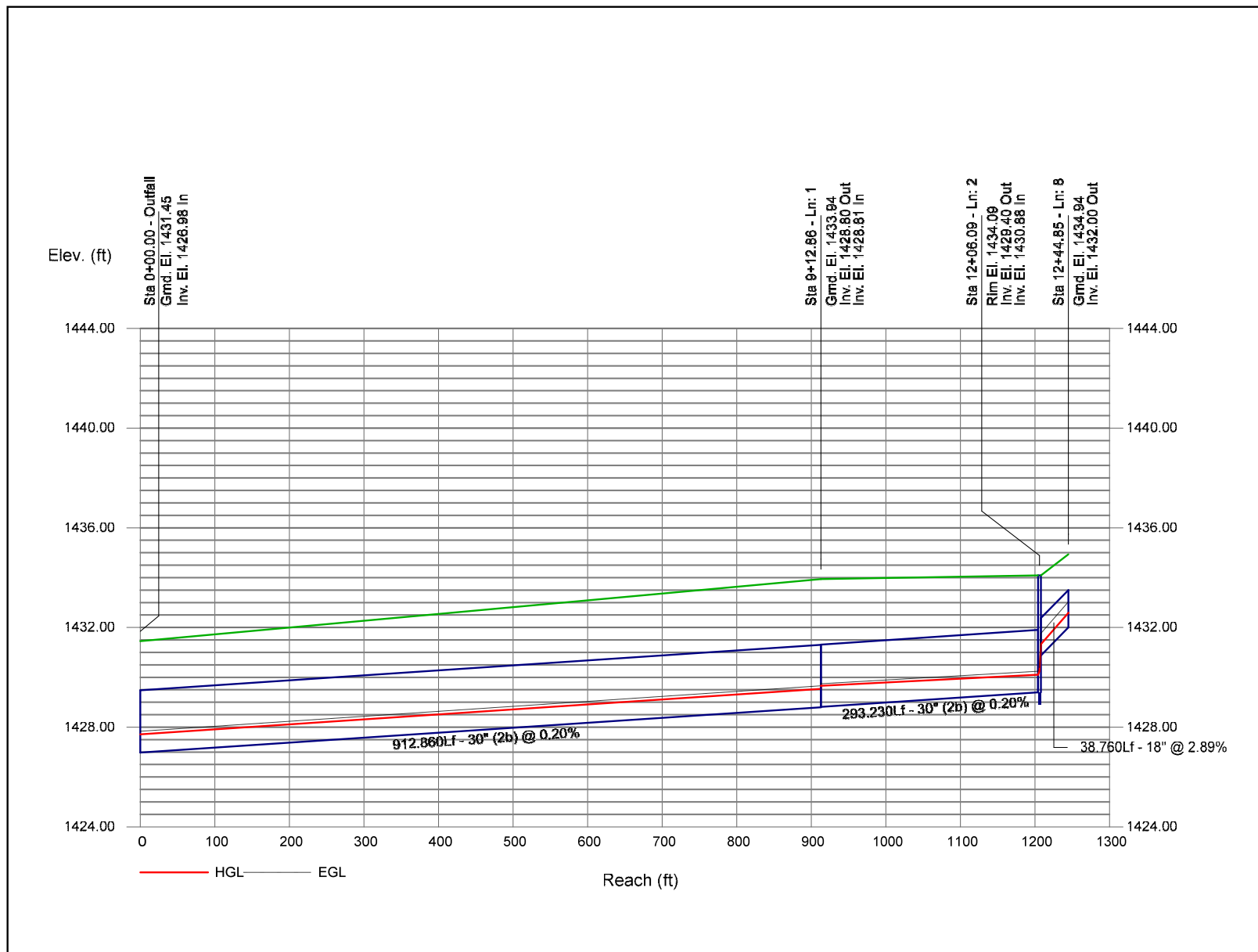
General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Profile

Proj. file: 14047Line 3.stm



Storm Sewers

J4. Summary of results

The results of the analysis show that for the given Pipe sizes and given flows calculated from the Civil D program that pipe size are adequate for the conditions set and should not cause a backup of flows.

Attachment K
HECRAS Calculations

Attachment K1
HECRAS Calculations
Purpose of Study

Offsite Flow Study

The flow rate information for the upstream Menifee Valley area and project site is based on FEMA data (Rick Eng. 2007) and Advanced Engineering Software (AES) model (Rick Eng. 2013) listed in Rick Engineering report. Storm frequency and precipitation data are shown in Table 1 for project offsite area. Figure 4 shows the range of AES model using Rational Method hydrology computer program based on Riverside County Flood Control & Water Conservation District (RCFC & WCD) 1978 Hydrology Manual. It is noted that a value of 0.8025 was adopted for runoff coefficient (C) with single-family area (1/4 acre lot). Flow rate in Menifee Valley area upstream of project site (Cross Section 12500) was 3024 cfs based on FEMA 100 year floodplain, in which 418.14 cfs was conveyed through project site channel to downstream in section E1 (shown in Table 2).

Table 1. Storm Frequency and Precipitation for Menifee Valley Creek Watershed

Storm Frequency	Precipitation (inches)
100-year, 1-hour	1.2

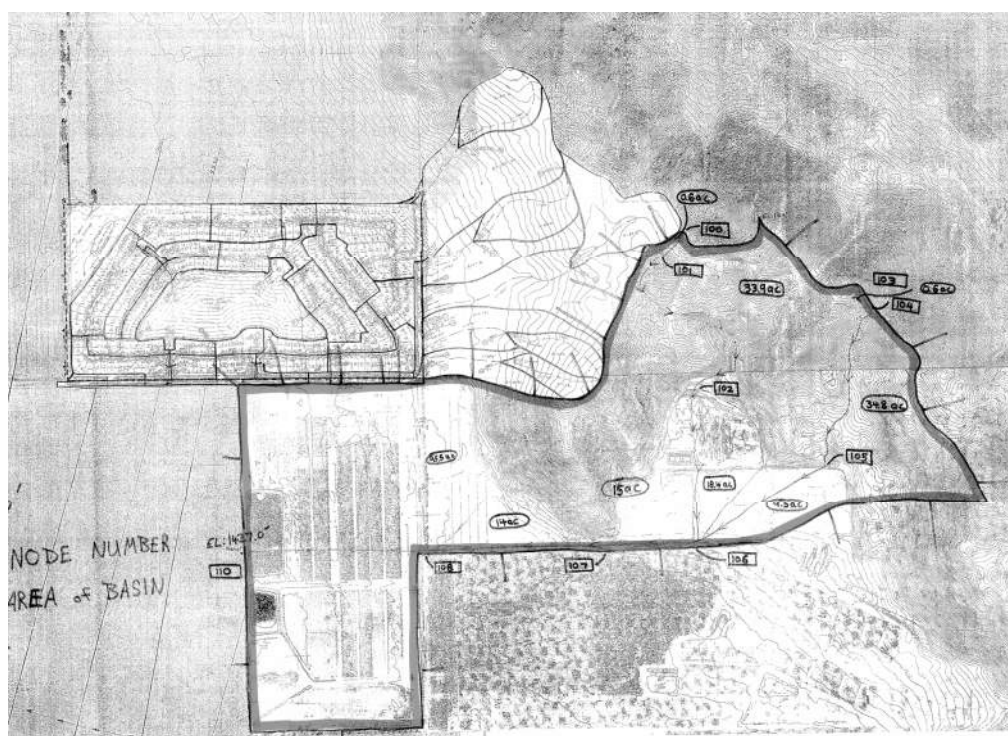


Fig.4 Rational Method for E1 area (source: Exhibit 1 – Hydrologic and Hydraulic Report for Menifee Valley Area Drainage Plan, Job Number 14795-B Dated December 13, 2006)

Table 2. Menifee Valley Area Peak Flow Rates

Hydraulic Reach	Location	Q(cfs)	Source
Meniffee	XS12500 (upstream floodplain)	3024	FEMA Q (Rick Eng. 2007)
Rockport Channel	Off-site, upstream end	418.14	AES Model (Rick Eng. 2013)
Meniffee	Downstream of project site	3024	FEMA Q (Rick Eng. 2007)

Floodplain Hydraulics Calculation

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Water-surface elevations for flood of the selected recurrence intervals were computed through use of the USACE HEC-RAS version 5.0.1 April 2016 computer program.

The proposed project site + the offsite flows discharge is 418.14 CFS according Rational method for Rick Engineering (see Fig 4. and Attachment D). This flow which in said report is known as Area E1 and encompasses the proposed site as well as an additional 147.73 Acres to the west. The initial calculations were based on ultimate conditions for the area and were designed with a run off coefficient of 0.79-0.89. This produced a high overall flow rate to be accounted for and size the channels that would be built under a maximum capacity situation. This Q was used to size the box Culvert parallel along Tres Lagos and modeled in WSPG (see section L) and for the exit point going to the POC.

Existing Floodplain Hydraulics Calculation

The proposed project was sized upon its own Q that is proposed for the proposed site. In addition to the site being sized the

a. Setting up Geometric data, river delineation and cross sections

Existing FEMA cross sections from Rick Engineering Drainage report are used as the upstream river delineation in HEC-RAS. Several channel cross sections are established from downstream to the upstream at Rockport project site station 10900 to 11950. This reach is labeled as "Rockport" in the program. The stationing mentioned in this study is mostly based on existing FEMA 100-yr floodplain study (Rick Eng. 2007).

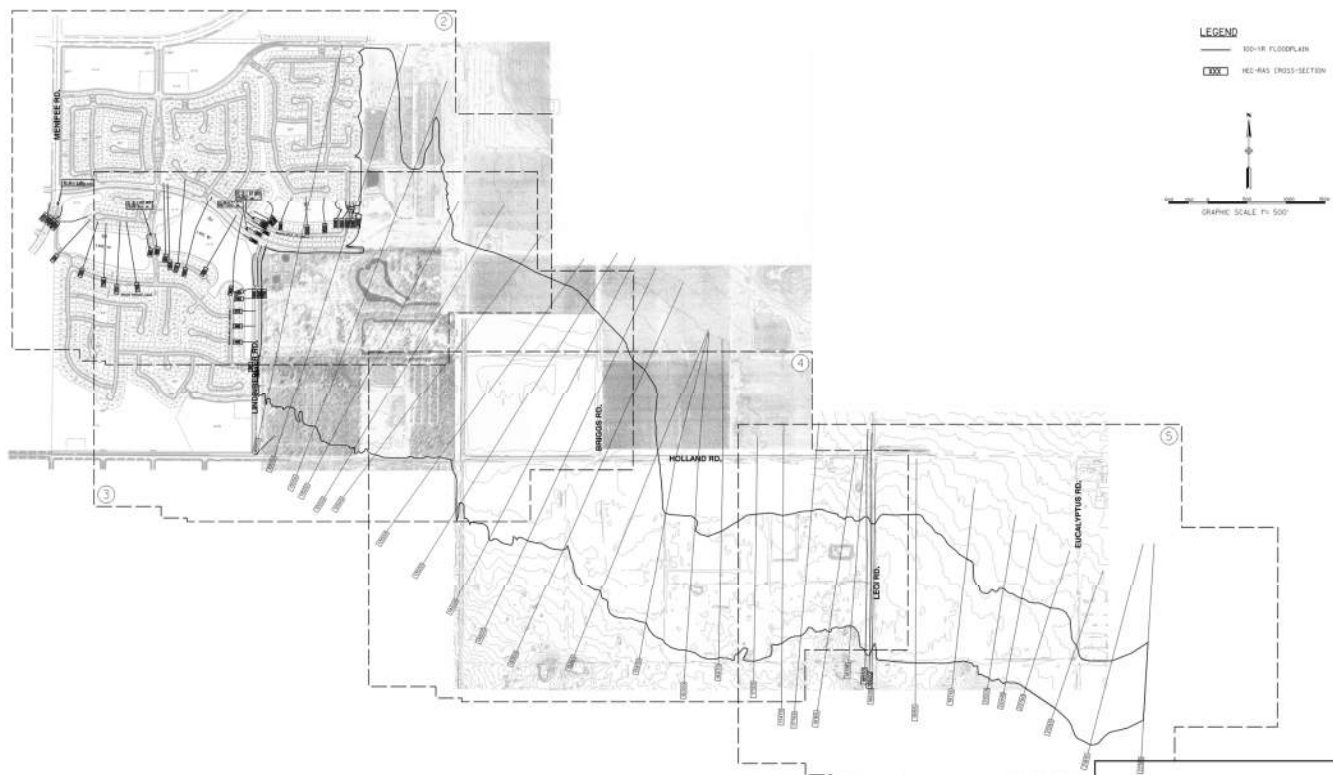


Fig. 5 FEMA Floodplain HEC-RAS Cross Sections based on Rick Engineering Model



Fig. 6 HEC-RAS Cross Sections with Rockport Ranch Development Channel Reach

b. Cross Sections

The cross section geometric data consists of the: X-Y coordinates, reach lengths, Manning's n values, location of levees, and contraction and expansion coefficients. There are 25 cross sections and 5 interpolated cross section as a data input to model the channel.

c. Steady flow water surface profiles

This analysis is used to calculate water surface profiles for steady gradually varied flow with sub-critical flow regime and is designed for application in flood management. The basic computational procedure is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction (Manning's equation) and contraction/expansion (coefficient multiplied by the change in velocity head). The momentum equation is utilized in situations where surface profile is rapidly varied.

Water surface profiles are computed from one cross section to the next by solving the energy equation with an iterative procedure called the standard step method as follows:

$$Z_2 + Y_2 + \frac{a_2 V_2^2}{2g} = Z_1 + Y_1 + \frac{a_1 V_1^2}{2g} + h_e \quad (1)$$

Where: Z_1, Z_2 = elevation of the main channel inverts

Y_1, Y_2 = depth of water at cross sections

V_1, V_2 = average velocities (total discharge/ total flow area)

a_1, a_2 = velocity weighting coefficients

g = gravitational acceleration

h_e = energy head loss

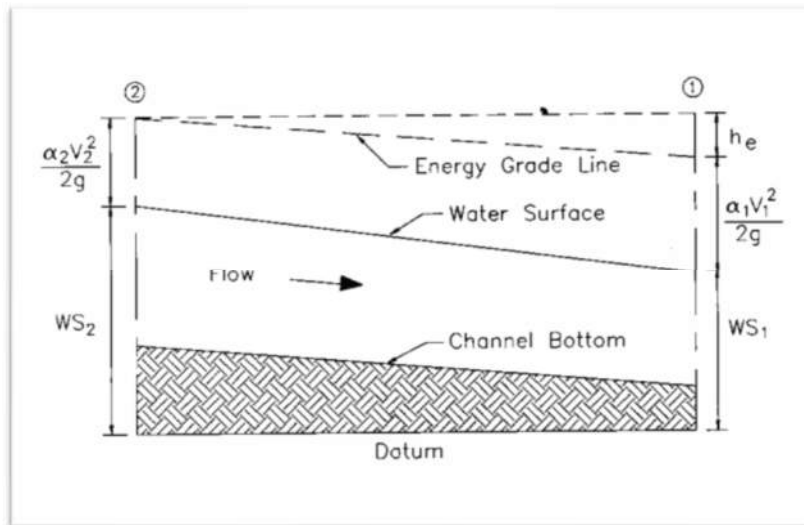


Fig. 7 Representation of terms in the energy equation

The energy head loss h_e between two cross sections is comprised of friction losses and contraction or expansion losses. The equation can be written as follows:

$$h_e = L\bar{S}_f + C \left| \frac{a_2 V_2^2}{2g} - \frac{a_1 V_1^2}{2g} \right| \quad (2)$$

Where:

L = discharge weighted reach length

\bar{S}_f = representative friction slope for reach between two section

C = expansion or contraction loss coefficient

The distance weighted reach length, L is calculated as:

$$L = \frac{L_{lob} \bar{Q}_{lob} + L_{ch} \bar{Q}_{ch} + L_{rob} \bar{Q}_{rob}}{\bar{Q}_{lob} + \bar{Q}_{ch} + \bar{Q}_{rob}} \quad (3)$$

Where:

L_{lob}, L_{ch}, L_{rob} = cross section reach lengths specified for flow in the left overbank, main channel, and right over bank, respectively

$\bar{Q}_{lob} + \bar{Q}_{ch} + \bar{Q}_{rob}$ = arithmetic average of the flows between section for the left overbank, main channel, and right over bank, respectively.

Once the existing cross sections were completed and entered with the corresponding flow rates, the HEC-RAS software created a water surface profile showing the surface elevations for selected 100 year storm event for all cross sections as shown in Table K1

The complete watershed floodplain HEC-RAS analysis with Rockport Ranch Development is provided in Appendix K3.

Table K1 Floodplain HEC-RAS
Profile WSE Summary Table

HEC-RAS Plan: Plan 08 River: 35 Reach: Site 1 Profile: 100 YR												
Reach	River Sta	Profile	Q Total (cfs)	Min Chl E (ft)	W.S. Elev (ft)	Chl W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Site 1	349.95	100 YR	271.77	1432.77	1432.38		1432.38	0.000007	0.16	1733.08	1380.97	0.02
Site 1	309.67	100 YR	271.77	1432.90	1432.38		1432.38	0.000001	0.07	3679.15	1823.72	0.01
Site 1	303.07	100 YR	271.77	1432.55	1432.38		1432.38	0.000002	0.10	2650.86	1587.18	0.01
Site 1	298.87	100 YR	271.77	1432.63	1432.38		1432.38	0.000004	0.12	3345.79	1784.79	0.02
Site 1	289	100 YR	271.77	1431.15	1432.37		1432.38	0.000037	0.50	548.49	739.44	0.10
Site 1	273.78	100 YR	271.77	1431.45	1432.26	1432.26	1432.37	0.005949	2.57	105.92	515.76	1.00
Site 1	262.4	100 YR	271.77	1431.62	1432.08	1432.08	1432.19	0.005418	2.60	104.51	491.86	0.99
Site 1	253.78	100 YR	271.77	1430.55	1431.76		1431.77	0.001028	0.97	279.50	582.42	0.25
Site 1	247.48	100 YR	271.77	1428.60	1431.76		1431.77	0.000156	0.56	438.84	567.65	0.11
Site 1	243.78	100 YR	271.77	1429.34	1431.76		1431.76	0.000272	0.66	411.73	564.42	0.14
Site 1	228.78	100 YR	271.77	1430.12	1431.73		1431.75	0.002154	1.21	224.59	589.59	0.35
Site 1	213.78	100 YR	271.77	1430.29	1431.71		1431.73	0.001207	1.01	268.99	597.16	0.27
Site 1	198.78	100 YR	271.77	1430.31	1431.70		1431.71	0.000962	0.95	265.80	586.15	0.24
Site 1	183.78	100 YR	271.77	1430.20	1431.69		1431.70	0.000785	0.90	301.71	576.32	0.22
Site 1	168.77	100 YR	271.77	1430.17	1431.67		1431.69	0.001039	0.98	276.04	565.06	0.25
Site 1	153.77	100 YR	271.77	1430.17	1431.65		1431.67	0.001505	1.11	243.83	551.14	0.30
Site 1	138.77	100 YR	271.77	1430.59	1431.46	1431.45	1431.60	0.020436	3.08	88.34	308.28	1.01

Project Site Hydraulics Analysis

a. HEC-RAS

USACE HEC-RAS version 5.0.1 April 2016 computer program was used to model the post-project condition for Reach along Briggs road to determine the low point and extents to which the existing road floods. The existing condition at Briggs Road reach flowing from Travels from north to south at terminates at the crossing of Briggs and Tres Lagos where the water will be picked up and conveyed in a proposed box culvert. HEC-RAS calculates water surface elevations using channel cross section geometric information, Manning's n values and boundary conditions etc.

Briggs Road Reach

Briggs Road Reach was analyzed perpendicularly toward off-site flow coming from Basin E1 per Rick Engineering's Drainage Study.

Briggs Rd Reach started at STA 138.77 to STA 349.95. This calculation is needed to show how much flow of 271.77 cfs flooding the existing street channel through the project site especially at the corner of Tres Lagos Dr and Briggs Rd.

A subcritical flow analysis was chosen and normal depth boundary condition were set for steady flow water surface profile computations. For a subcritical flow regime, boundary conditions are set at the downstream ends of the stream.

Normal depth boundary condition was chosen to represent actual stream conditions.

The slope in the normal depth represents the slope of the reach downstream of the downstream-most cross section. The slope was approximately calculated by using a topographic map and locating where topo lines cross the stream, then measured the stream-wise distance between them.

Table K.1 shows water surface profile for selected 100 year storm event for all cross sections. It is shown that the highest water level is at upstream station 349.95 is 1432.38 ft and the lowest is station 138.77 and 1431.35 ft above mean sea level. Copies of HEC-RAS analysis of offsite Briggs Road are located in Attachment section K3.

Table K.1 HEC-RAS Profile WSE Summary Table

HEC-RAS Plan: Plan 08 River: xs Reach: Site 1 Profile: 100 YR

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Site 1	349.95	100 YR	271.77	1426.77	1432.38		1432.38	0.000007	0.16	1733.08	1380.97	0.02
Site 1	308.67	100 YR	271.77	1428.90	1432.38		1432.38	0.000001	0.07	3679.15	1823.72	0.01
Site 1	303.07	100 YR	271.77	1429.58	1432.38		1432.38	0.000002	0.10	2630.66	1587.18	0.01
Site 1	298.87	100 YR	271.77	1429.63	1432.38		1432.38	0.000004	0.12	2345.79	1784.79	0.02
Site 1	289	100 YR	271.77	1431.15	1432.37		1432.38	0.000037	0.50	548.49	739.44	0.10
Site 1	273.78	100 YR	271.77	1431.46	1432.26	1432.26	1432.37	0.005549	2.57	105.92	515.76	1.00
Site 1	262.4	100 YR	271.77	1431.62	1432.08	1432.08	1432.19	0.005418	2.60	104.61	491.86	0.99
Site 1	253.78	100 YR	271.77	1430.55	1431.76		1431.77	0.001028	0.97	279.50	582.42	0.25
Site 1	247.48	100 YR	271.77	1428.60	1431.76		1431.77	0.000156	0.56	488.84	567.65	0.11
Site 1	243.78	100 YR	271.77	1429.34	1431.76		1431.76	0.000272	0.66	411.73	564.42	0.14
Site 1	228.78	100 YR	271.77	1430.12	1431.73		1431.75	0.002164	1.21	224.59	589.59	0.35
Site 1	213.78	100 YR	271.77	1430.29	1431.71		1431.73	0.001207	1.01	268.99	597.16	0.27
Site 1	198.78	100 YR	271.77	1430.31	1431.70		1431.71	0.000962	0.95	285.80	586.15	0.24
Site 1	183.78	100 YR	271.77	1430.20	1431.69		1431.70	0.000785	0.90	301.71	576.32	0.22
Site 1	168.77	100 YR	271.77	1430.17	1431.67		1431.69	0.001029	0.98	276.04	565.06	0.25
Site 1	153.77	100 YR	271.77	1430.17	1431.65		1431.67	0.001505	1.11	243.83	551.14	0.30
Site 1	138.77	100 YR	271.77	1430.53	1431.45	1431.45	1431.60	0.020436	3.08	88.34	308.28	1.01

Attachment K2
HECRAS Calculations
Existing Rick Engineering Study

**HYDROLOGIC AND HYDRAULIC REPORT
FOR
MENIFEE VALLEY AREA DRAINAGE PLAN**

**Job Number 14795-B
December 13, 2006
Revised: May 22, 2007
Revised: August 16, 2007**

RICK ENGINEERING COMPANY

ENGINEERING COMPANY

RICK ENGINEERING CO



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Appendices:

Appendix A:	Hydrologic Back-up
	<ul style="list-style-type: none"> • Back-up for HEC-1 Analysis • Split-flow calculation for Channels A & C
Appendix B:	Hydraulic Back-up
	<ul style="list-style-type: none"> • Riprap sizing at Lindenberger culvert outfall • Headloss calculation for culverts flowing full
Appendix C:	100-Year, 3-Hour HEC-1 Analyses for:
	<ul style="list-style-type: none"> • HEC-1 Analysis and Workmap for Drainage Areas: A, B, C, D3 • HEC-1 Analysis and Workmap for Drainage Areas: D1, D2, E1 • HEC-1 Analysis and Workmap for Drainage Areas: A, B, C, D1, D3 • HEC-1 Analysis and Workmap for Drainage Areas: A, B, C, D1 • HEC-1 Analysis and Workmap for Drainage Areas: A, B, C

Prepared by:
Rick Engineering Company – Water Resources Division

JJT:VT:ns/Report/14795-B.003
12-13-06
Revised: 5-22-07
Revised: 8-16-07

HEC-RAS Plan: MV-Interim Profile: FEMA Q100

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Upstream	15000	FEMA Q100	679.00	1430.53	1431.35		1431.37	0.001678	1.16	592.23	1780.12	0.28
Upstream	14500	FEMA Q100	679.00	1429.53	1430.35		1430.39	0.003726	1.61	421.13	1168.64	0.41
Upstream	14000	FEMA Q100	679.00	1428.53	1430.31		1430.32	0.000048	0.34	2036.66	2414.59	0.05
Upstream	13500	FEMA Q100	679.00	1428.73	1430.30		1430.30	0.000026	0.24	2666.61	2360.34	0.04
Upstream	13045	FEMA Q100	679.00	1427.80	1430.30		1430.30	0.000005	0.16	4341.95	2224.43	0.02
Upstream	13000	FEMA Q100	679.00	1428.03	1430.30		1430.30	0.000057	0.25	2724.92	1918.60	0.04
Upstream	12500	FEMA Q100	679.00	1428.00	1430.17		1430.18	0.001241	1.03	889.46	1192.73	0.16
Upstream	12000	FEMA Q100	679.00	1427.00	1429.90		1429.90	0.000421	0.60	1272.60	1471.13	0.09
Upstream	11500	FEMA Q100	679.00	1428.50	1429.58	1429.01	1429.59	0.002246	1.23	733.45	1843.11	0.21
Upstream	11000	FEMA Q100	679.00	1427.03	1427.74		1427.81	0.011821	2.08	343.53	603.81	0.44
split to Lake °C	10995	FEMA Q100	192.74	1423.00	1427.73		1427.73	0.000004	0.28	698.33	157.12	0.02
split to Lake °C	10980	FEMA Q100	192.74	1422.70	1427.72		1427.73	0.000030	0.80	240.83	116.17	0.06
split to Lake °C	10965	FEMA Q100	192.74	1422.70	1427.72		1427.73	0.000035	0.86	264.88	74.61	0.07
split to Lake °C	10950	FEMA Q100	192.74	1422.60	1427.71		1427.72	0.000044	0.97	199.01	133.40	0.08
split to Lake °C	10940	FEMA Q100	192.74	1409.00	1427.71		1427.71	0.000003	0.24	834.69	171.85	0.02
split to Lake °C	10930	FEMA Q100	192.74	1381.00	1427.71		1427.71	0.000001	0.12	1622.71	317.82	0.01
split to Lake °C	10920	F							0.12	1665.82	327.10	0.01
split to Lake °C	10910	F							0.13	1539.27	302.09	0.01
split to Lake °C	10900	F							0.19	1089.16	227.45	0.01
split to Lake °C	10880	F							0.32	639.98	156.04	0.02
split to Lake °C	10870	F							0.75	256.55	68.80	0.06
split to Lake °C	10860	F										
split to Lake °C	10850	F							0.77	249.91	70.03	0.06
split to Lake °C	10845	FEMA Q100	192.74	1422.00	1427.68		1427.69	0.000010	0.49	389.49	167.23	0.04
split to Lake °C	10840	FEMA Q100	192.74	1421.80	1427.68	1422.62	1427.68	0.000020	0.71	270.27	82.20	0.05
split to Lake °C	10830	Culvert										
split to Lake °C	10820	FEMA Q100	192.74	1421.60	1427.66		1427.67	0.000020	0.74	260.41	82.32	0.05
to Rancon	11700	FEMA Q100	2077.00	1422.00	1428.90		1429.00	0.000232	2.73	835.23	149.63	0.18
to Rancon	11600	FEMA Q100	2077.00	1415.00	1428.88		1428.97	0.000209	2.51	872.61	146.78	0.17
to Rancon	11500	FEMA Q100	2077.00	1415.00	1428.82		1428.94	0.000273	2.84	776.51	133.92	0.19
to Rancon	11400	FEMA Q100	2077.00	1415.00	1428.77		1428.88	0.000276	2.84	774.89	134.37	0.19
to Rancon	11300	FEMA Q100	2077.00	1415.00	1428.73		1428.84	0.000244	2.67	821.76	141.91	0.18
to Rancon	11200	FEMA Q100	2077.00	1410.00	1428.74		1428.79	0.000118	1.86	1159.49	191.70	0.13
to Rancon	11100	FEMA Q100	2077.00	1400.00	1428.75		1428.77	0.000051	1.22	1741.19	277.59	0.08
to Rancon	11040	FEMA Q100	2077.00	1400.00	1428.75		1428.76	0.000025	0.87	2422.06	378.77	0.06
to Rancon	11020	FEMA Q100	2077.00	1400.00	1428.75		1428.76	0.000022	0.82	2587.09	402.69	0.06
to Rancon	11000	FEMA Q100	2077.00	1400.00	1428.73		1428.76	0.000047	1.18	1807.45	287.80	0.08
to Rancon	10900	FEMA Q100	2077.00	1410.00	1428.69		1428.74	0.000122	1.89	1142.64	189.83	0.13
to Rancon	10800	FEMA Q100	2077.00	1410.00	1428.63		1428.72	0.000210	2.43	893.74	153.77	0.17
to Rancon	10700	FEMA Q100	2077.00	1410.00	1428.64		1428.68	0.000083	1.56	1374.00	225.92	0.11
to Rancon	10600	FEMA Q100	2077.00	1410.00	1428.59		1428.65	0.000159	2.12	1019.41	173.45	0.15
to Rancon	10500	FEMA Q100	2077.00	1415.00	1428.51		1428.62	0.000266	2.72	801.70	141.72	0.19
to Rancon	10400	FEMA Q100	2077.00	1415.00	1428.52		1428.58	0.000130	1.92	1123.10	192.83	0.13
to Rancon	10300	FEMA Q100	2077.00	1415.00	1428.38		1428.54	0.000428	3.38	650.57	119.94	0.24
to Rancon	10100	FEMA Q100	2077.00	1421.70	1428.34	1424.23	1428.47	0.000308	3.07	737.91	135.22	0.21
to Rancon	10001	Culvert										
to Rancon	9491	FEMA Q100	2077.00	1421.60	1428.02		1428.14	0.000299	2.77	749.58	117.40	0.19
to Rancon	9490	FEMA Q100	2077.00	1410.00	1427.91		1428.07	0.000405	3.29	663.41	118.19	0.23
to Rancon	9480	FEMA Q100	2077.00	1410.00	1427.82		1427.98	0.000424	3.34	656.07	120.00	0.24
to Rancon	9470	FEMA Q100	2077.00	1410.00	1427.72		1427.90	0.000468	3.47	628.08	115.91	0.25
to Rancon	9460	FEMA Q100	2077.00	1410.00	1427.65		1427.83	0.000482	3.49	630.14	119.59	0.25
to Rancon	9450	FEMA Q100	2077.00	1410.00	1427.57		1427.73	0.000453	3.35	649.12	120.97	0.24
RV10500 - 10000	10500	FEMA Q100	486.26	1425.50	1427.74		1427.74	0.000020	0.18	2674.97	1317.19	0.02
RV10500 - 10000	10000	FEMA Q100	486.26	1425.50	1427.73		1427.73	0.000019	0.26	1939.62	1302.37	0.03
RV10500 - 10000	9700	FEMA Q100	486.26	1424.00	1427.67		1427.71	0.000295	1.60	303.68	518.27	0.16
RV10500 - 10000	9600	FEMA Q100	486.26	1423.50	1427.65		1427.69	0.000290	1.57	327.52	113.68	0.09
RV10500 - 10000	9500	FEMA Q100	486.26	1422.80	1427.65		1427.67	0.000084	1.11	449.12	446.48	0.09
THROUGH LAKES	9400	FEMA Q100	3024.00	1352.00	1427.65		1427.66	0.000037	0.84	3658.60	626.63	0.06
THROUGH LAKES	9200	FEMA Q100	3024.00	1352.00	1427.63		1427.65	0.000052	0.98	3151.48	542.36	0.07
THROUGH LAKES	9000	FEMA Q100	3024.00	1352.00	1427.62		1427.63	0.000031	0.77	3992.12	683.87	0.06
THROUGH LAKES	8700	FEMA Q100	3024.00	1352.00	1427.61		1427.62	0.000044	0.90	3448.07	606.88	0.06
THROUGH LAKES	8600	FEMA Q100	3024.00	1373.00	1427.58		1427.61	0.000104	1.39	2171.53	444.91	0.10
THROUGH LAKES	8550	FEMA Q100	3024.00	1386.00	1427.55		1427.60	0.000175	1.81	1666.67	408.80	0.13
THROUGH LAKES	8500	FEMA Q100	3024.00	1417.50	1427.45	1420.46	1427.56	0.000215	2.72	1173.12	142.81	0.15
THROUGH LAKES	8200	Culvert										
THROUGH LAKES	8100	FEMA Q100	3024.00	1417.50	1427.33		1427.46	0.000240	2.86	1074.70	156.74	0.16
THROUGH LAKES	7900	FEMA Q100	3024.00	1367.00	1427.26		1427.38	0.000467	2.84	1063.19	521.55	0.21
THROUGH LAKES	7700	FEMA Q100	3024.00	1367.00	1427.25		1427.31	0.000223	1.97	1537.97	501.86	0.15
THROUGH LAKES	7500	FEMA Q100	3024.00	1367.00	1427.23		1427.28	0.000172	1.71	1766.68	482.77	0.13
THROUGH LAKES	7200	FEMA Q100	3024.00	1367.00	1427.21		1427.25	0.000118	1.41	2176.97	421.46	0.10
THROUGH LAKES	7100	FEMA Q100	3024.00	1367.00	1427.17		1427.21	0.000181	1.75	1750.76	559.10	0.13
THROUGH LAKES	7000	FEMA Q100	3024.00	1370.00	1427.14		1427.18	0.000148	1.56	1975.62	372.20	0.12
THROUGH LAKES	6900	FEMA Q100	3024.00	1421.60	1426.57		1427.09	0.000353	5.80	528.59	140.35	0.46
THROUGH LAKES	6899	FEMA Q100	3024.00	1421.30	1426.59	1424.35	1427.06	0.000303	5.50	549.47	140.50	0.43
THROUGH LAKES	6750	Bridge										
THROUGH LAKES	6700	FEMA Q100	3024.00	1421.20	1426.45		1426.87	0.000291	5.38	644.28	142.29	0.42
THROUGH LAKES	6688	FEMA Q100	3105.00	1421.20	1426.59		1426.70	0.000268	2.55	1221.81	429.44	0.26
THROUGH LAKES	6518	FEMA Q100	3105.00	1421.60	1426.56		1426.66	0.000182	2.46	1263.98	328.92	0.22
THROUGH LAKES	6189	FEMA Q100	3105.00	1421.00	1426.47		1426.59	0.000179	2.79	1114.22	236.06	0.23
THROUGH LAKES	5912	FEMA Q100	3105.00	1420.10	1426.45		1426.55	0.000111	2.48	1253.57	220.17	0.18
THROUGH LAKES	5721	FEMA Q100	3105.00	1420.40	1426.35		1426.50	0.000648	3.12	997.31	260.33	0.28

LEGEND

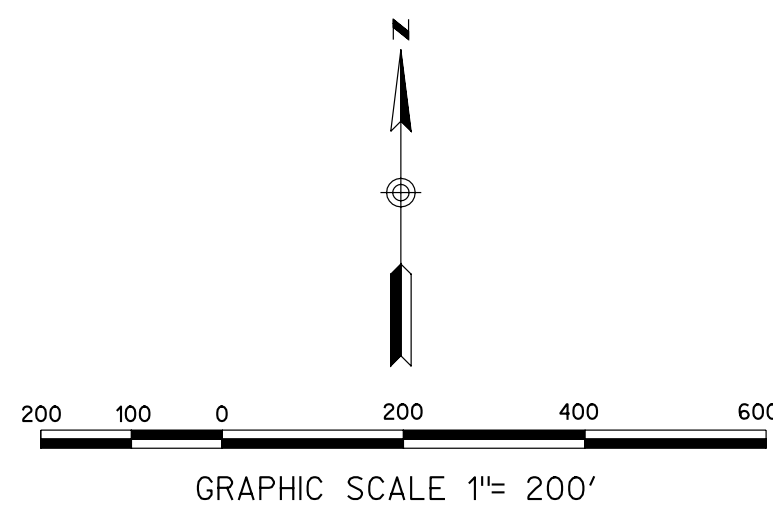
- Upstream values used at Briggs Road Crossing
- Downstream Value Used at POC



LEGEND

100-YR FLOODPLAIN

HEC-RAS CROSS-SECTION



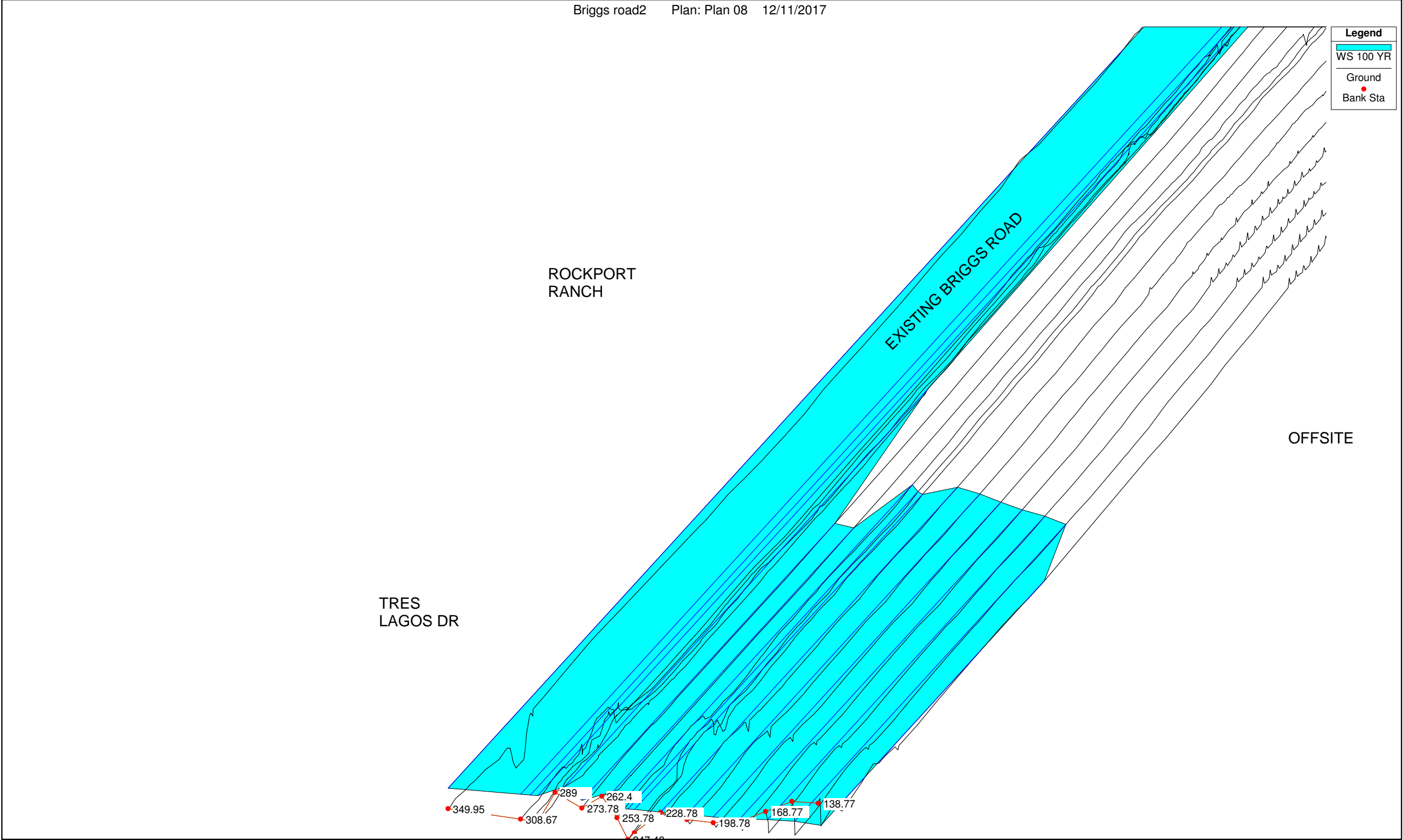
TRACT 30422

MENIFEE VALLEY AREA
DRAINAGE PLAN
PRE-PROJECT HEC-RAS
WORKMAP

J-14795-B
EXHIBIT 3 OF 5
Date: May 15, 2007

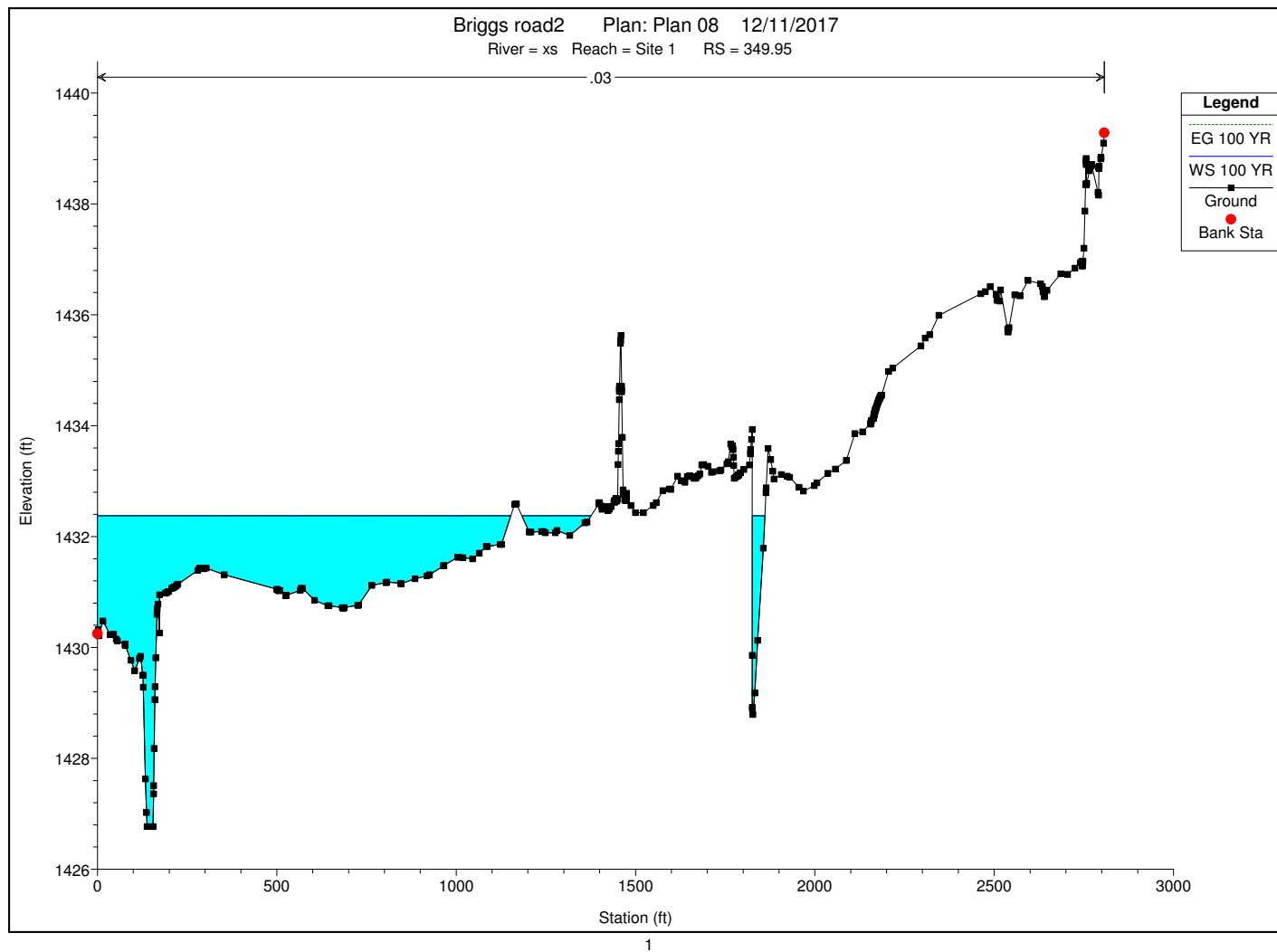
NOT FOR CONSTRUCTION - EXHIBIT FOR MENIFEE VALLEY AREA DRAINAGE PLAN

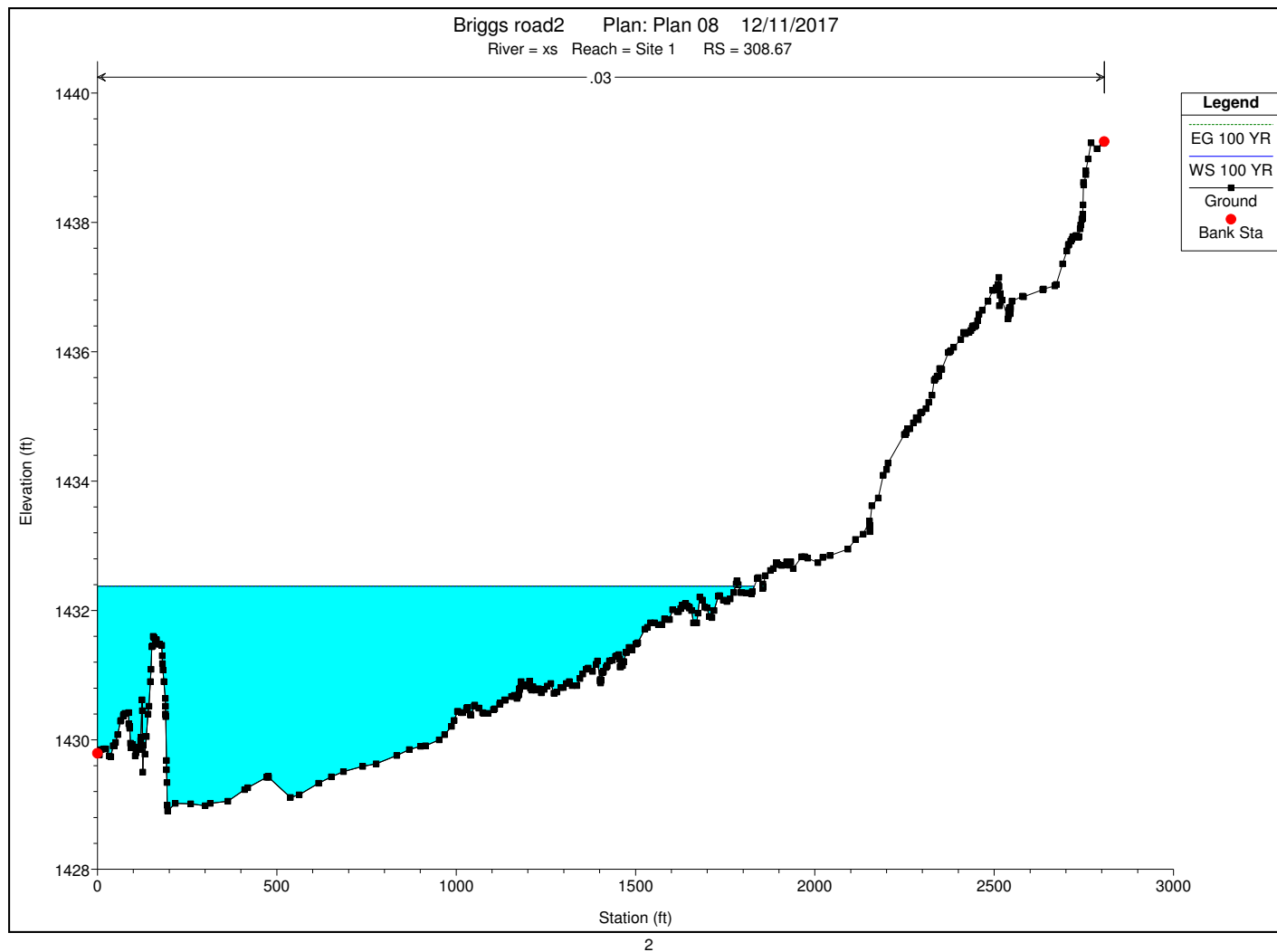
Attachment K3
HECRAS Calculations
Calculations from HECRAS

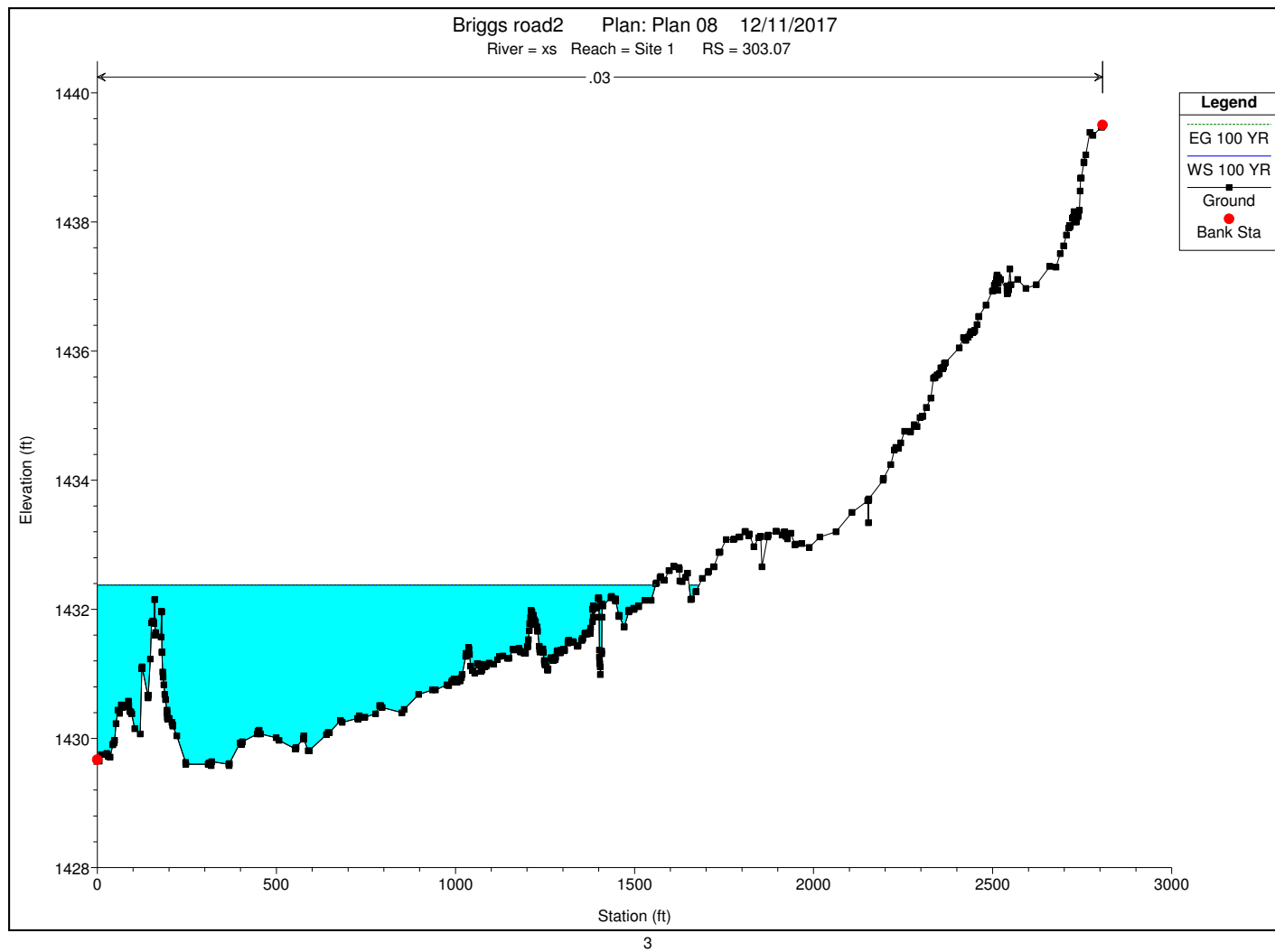


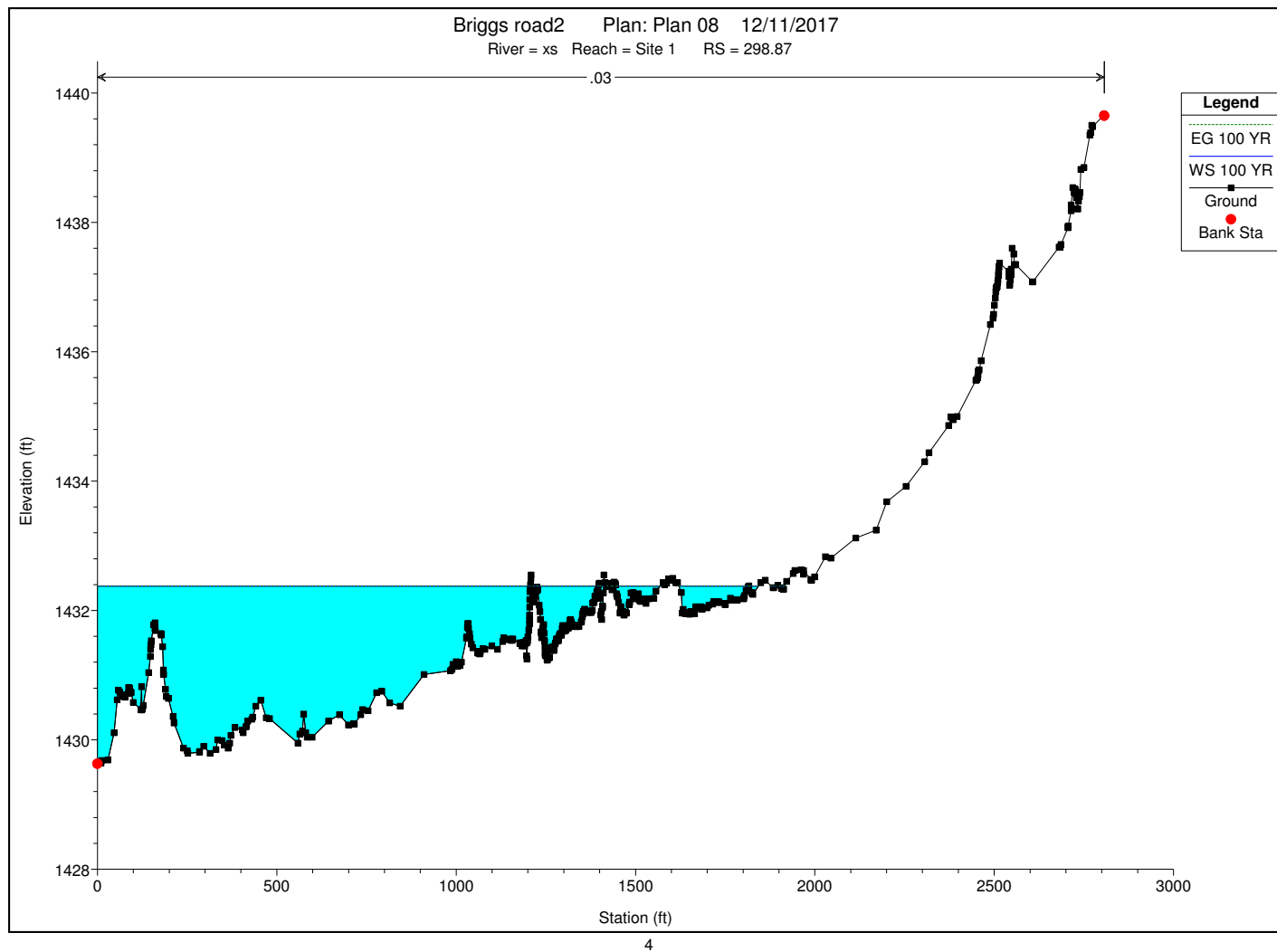
HEC-RAS Plan: Plan 08 River: xs Reach: Site 1 Profile: 100 YR

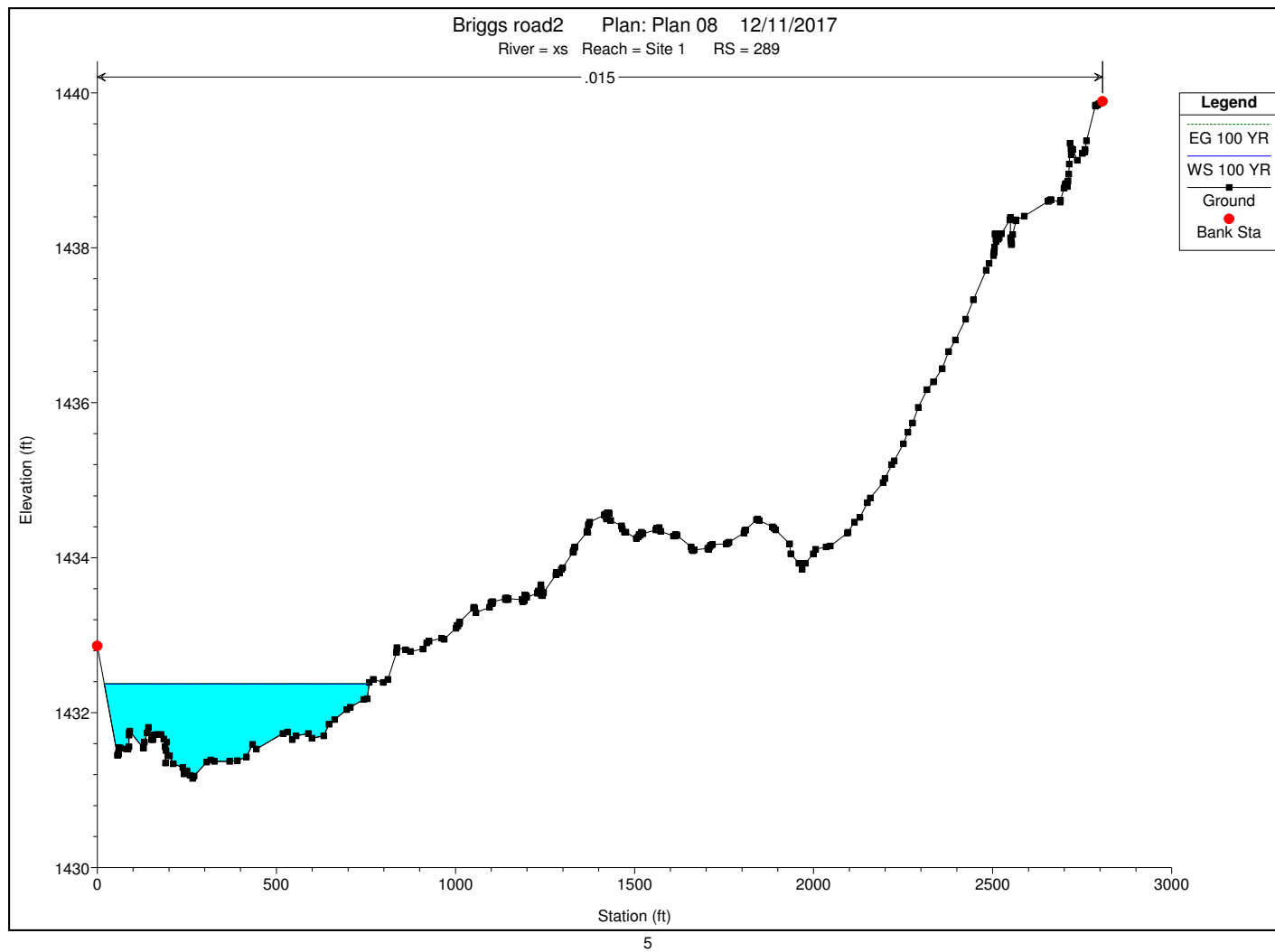
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Site 1	349.95	100 YR	271.77	1426.77	1432.38		1432.38	0.000007	0.16	1733.08	1380.97	0.02
Site 1	308.67	100 YR	271.77	1428.90	1432.38		1432.38	0.000001	0.07	3679.15	1823.72	0.01
Site 1	303.07	100 YR	271.77	1429.58	1432.38		1432.38	0.000002	0.10	2630.66	1587.18	0.01
Site 1	298.87	100 YR	271.77	1429.63	1432.38		1432.38	0.000004	0.12	2345.79	1784.79	0.02
Site 1	289	100 YR	271.77	1431.15	1432.37		1432.38	0.000037	0.50	548.49	739.44	0.10
Site 1	273.78	100 YR	271.77	1431.46	1432.26	1432.26	1432.37	0.005549	2.57	105.92	515.76	1.00
Site 1	262.4	100 YR	271.77	1431.62	1432.08	1432.08	1432.19	0.005418	2.60	104.61	491.86	0.99
Site 1	253.78	100 YR	271.77	1430.55	1431.76		1431.77	0.001028	0.97	279.50	582.42	0.25
Site 1	247.48	100 YR	271.77	1428.60	1431.76		1431.77	0.000156	0.56	488.84	567.65	0.11
Site 1	243.78	100 YR	271.77	1429.34	1431.76		1431.76	0.000272	0.66	411.73	564.42	0.14
Site 1	228.78	100 YR	271.77	1430.12	1431.73		1431.75	0.002164	1.21	224.59	589.59	0.35
Site 1	213.78	100 YR	271.77	1430.29	1431.71		1431.73	0.001207	1.01	268.99	597.16	0.27
Site 1	198.78	100 YR	271.77	1430.31	1431.70		1431.71	0.000962	0.95	285.80	586.15	0.24
Site 1	183.78	100 YR	271.77	1430.20	1431.69		1431.70	0.000785	0.90	301.71	576.32	0.22
Site 1	168.77	100 YR	271.77	1430.17	1431.67		1431.69	0.001029	0.98	276.04	565.06	0.25
Site 1	153.77	100 YR	271.77	1430.17	1431.65		1431.67	0.001505	1.11	243.83	551.14	0.30
Site 1	138.77	100 YR	271.77	1430.53	1431.45	1431.45	1431.60	0.020436	3.08	88.34	308.28	1.01

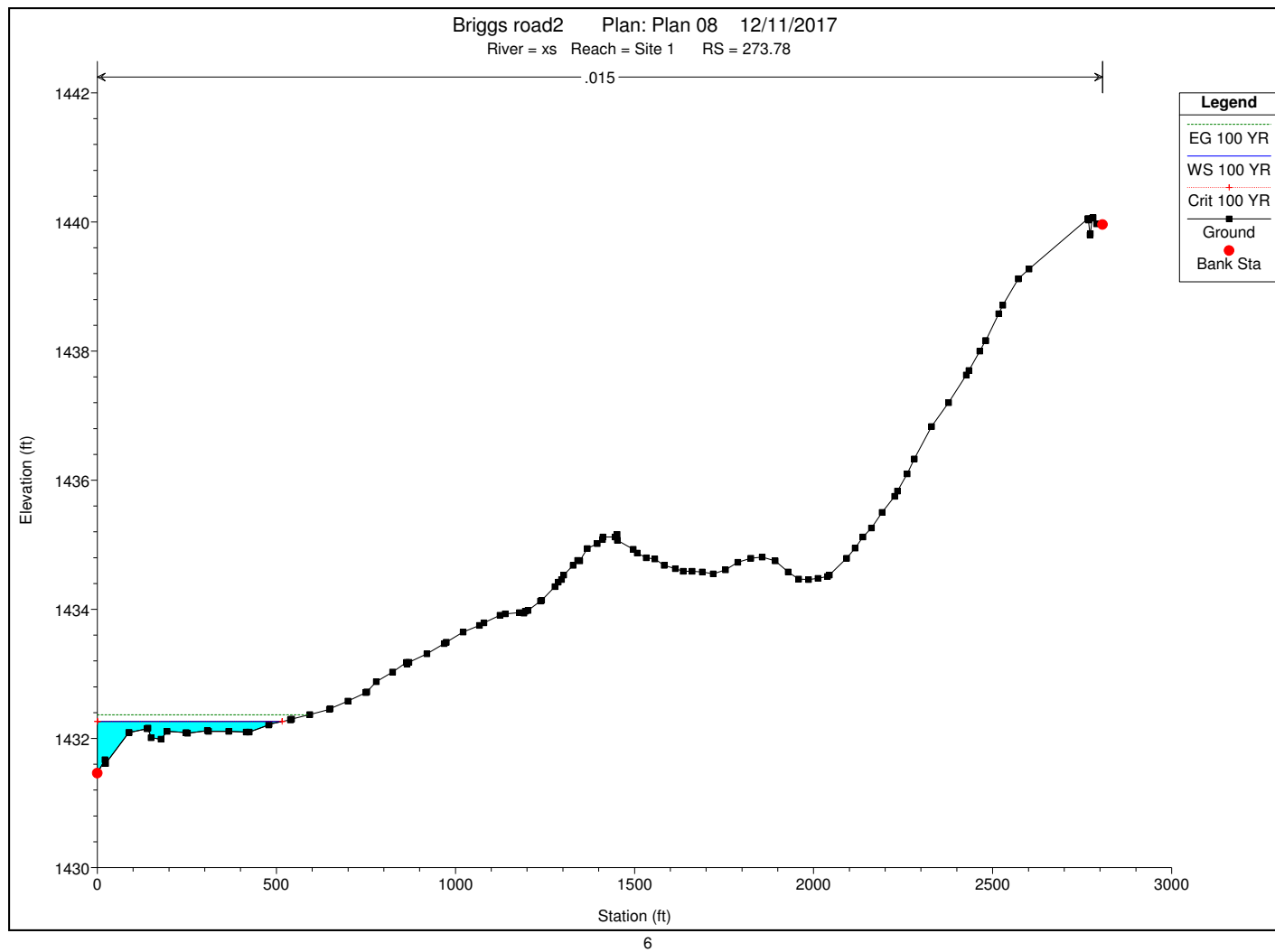


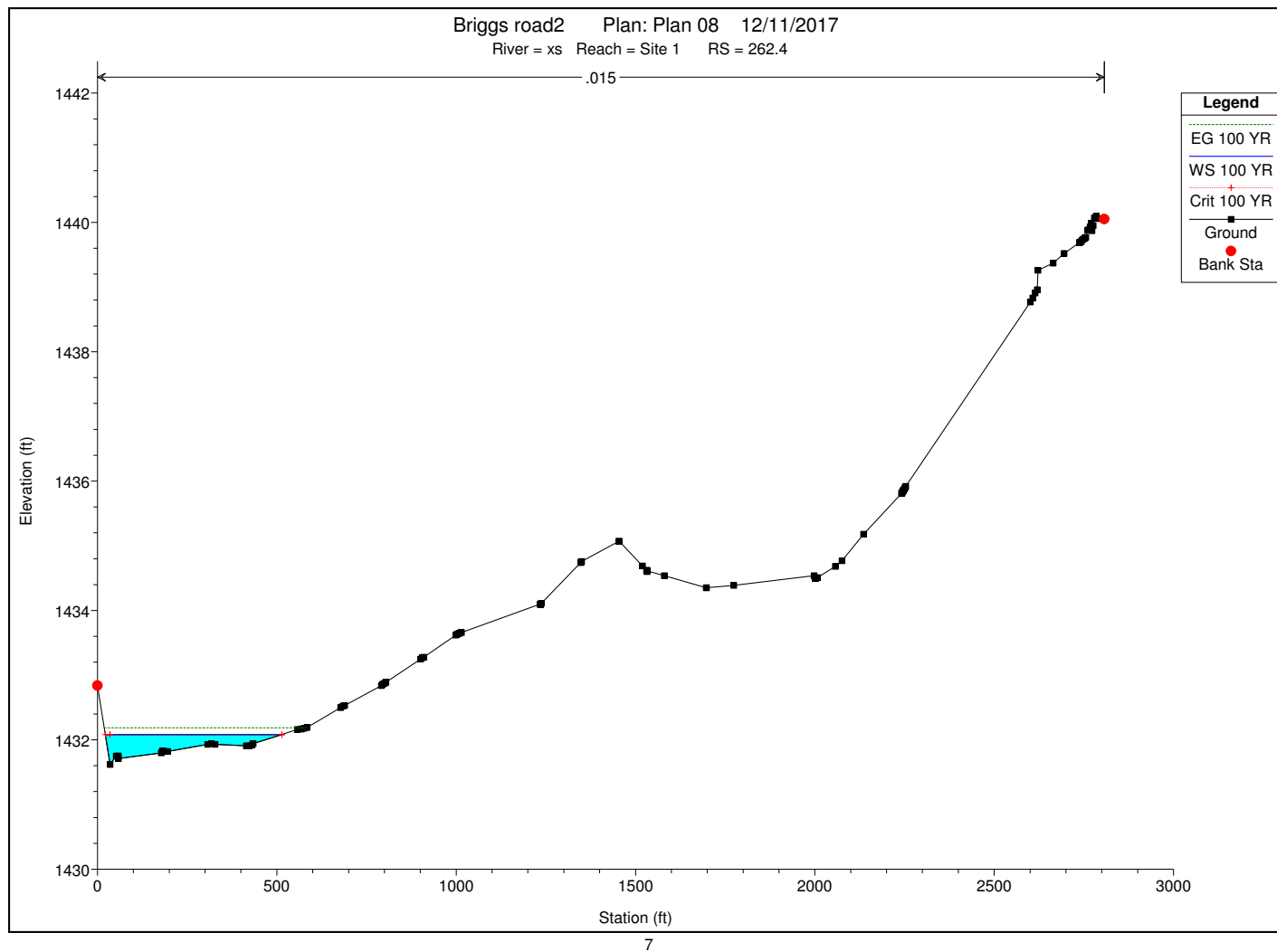


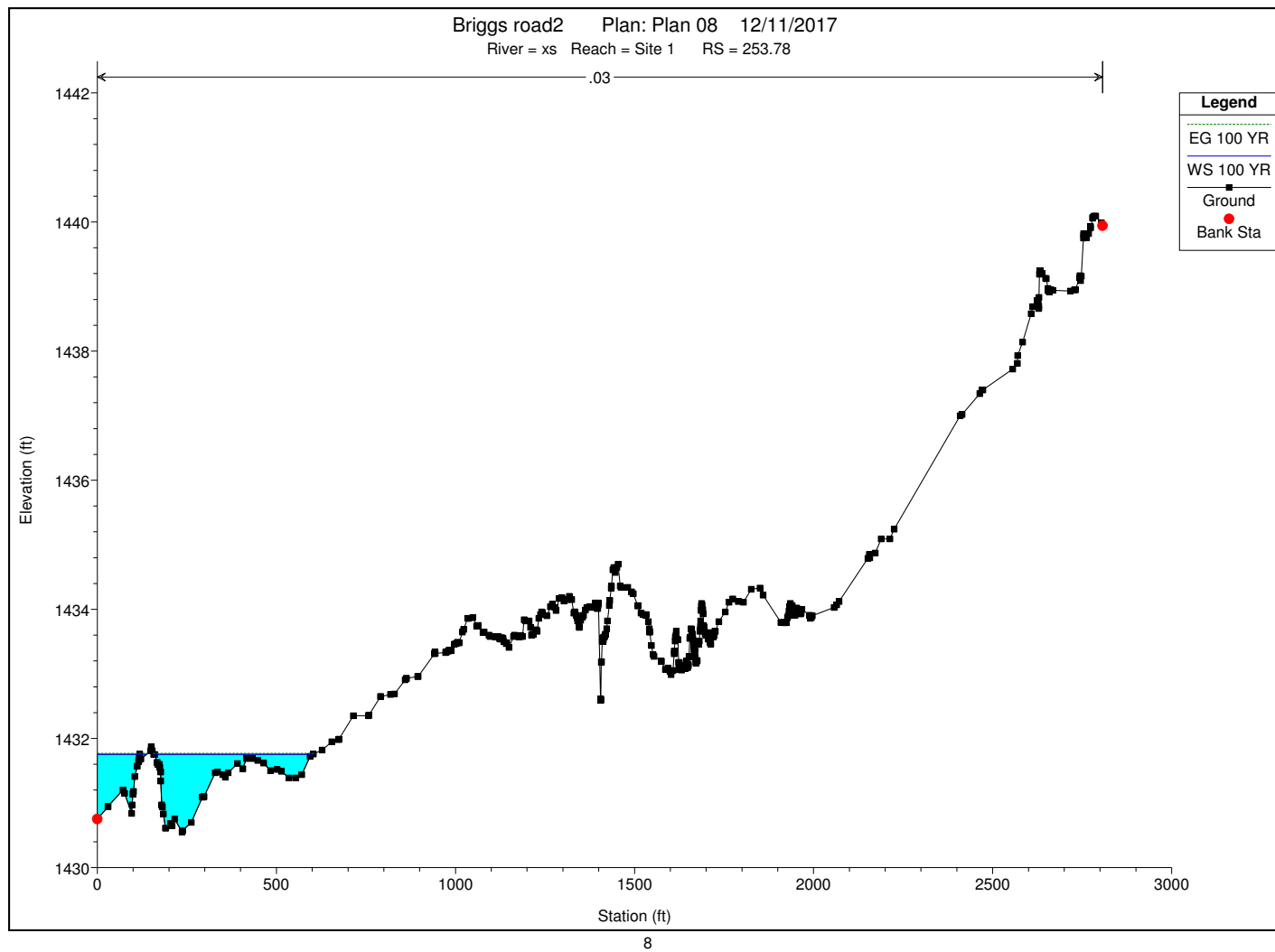


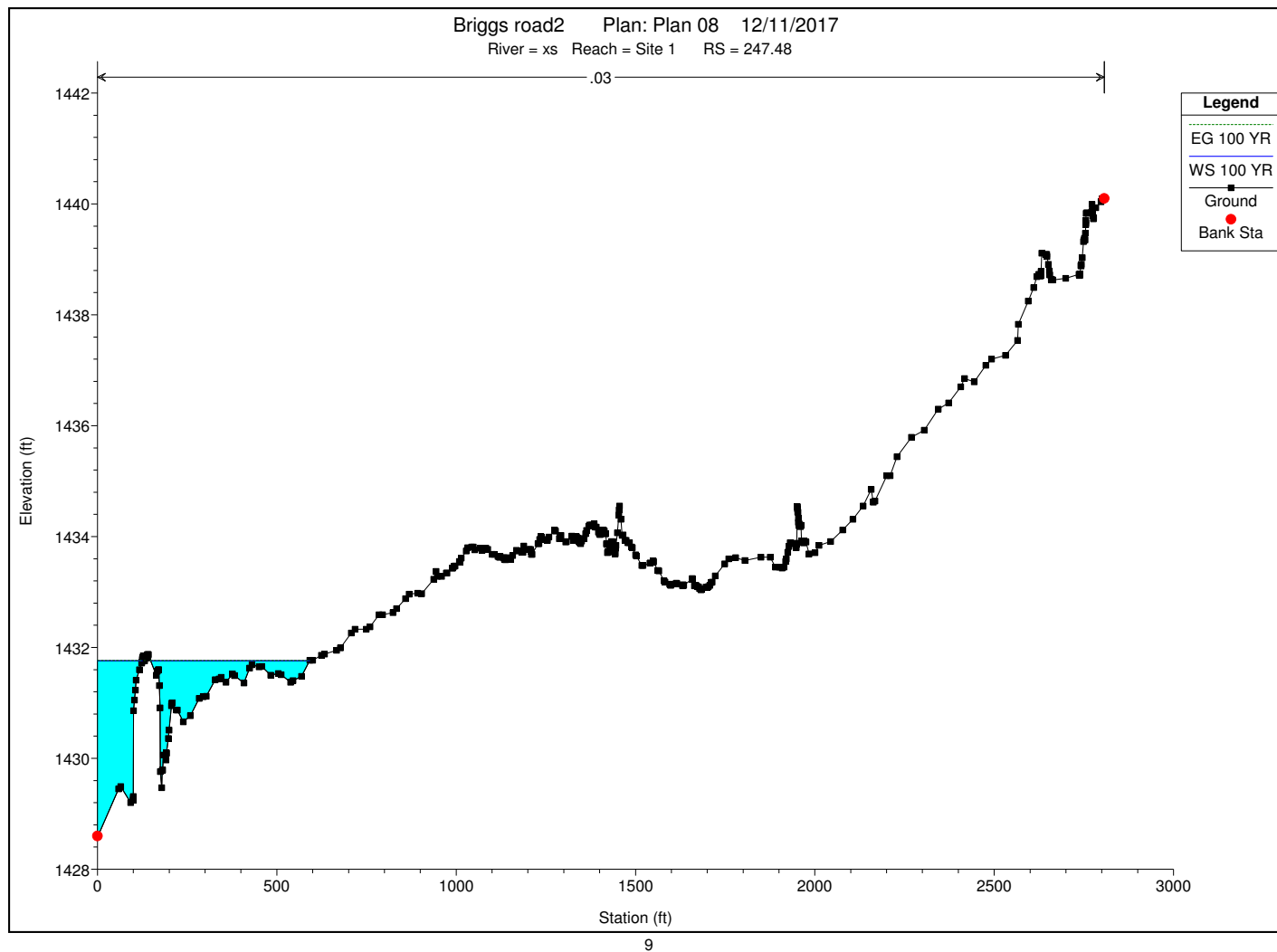


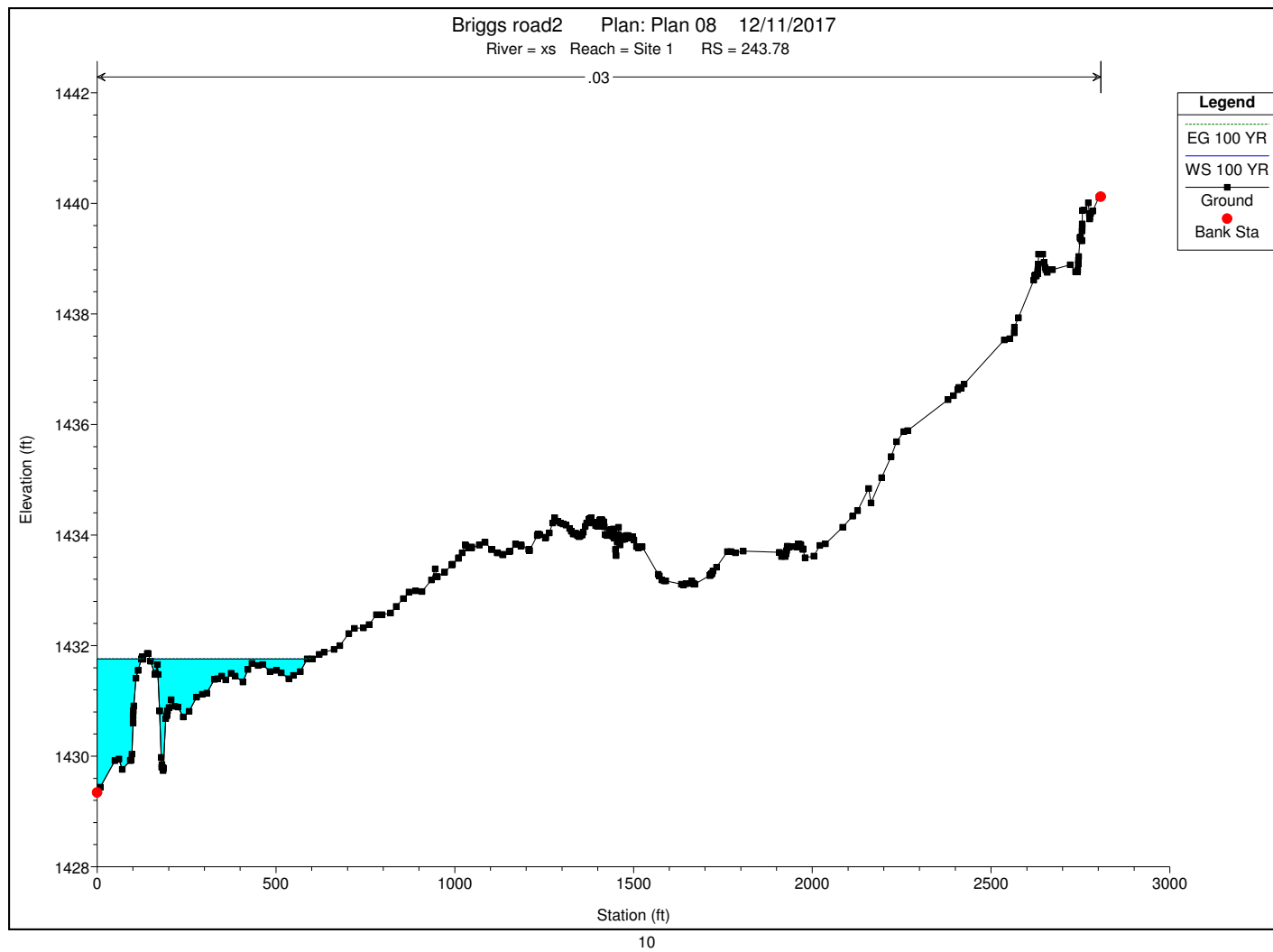


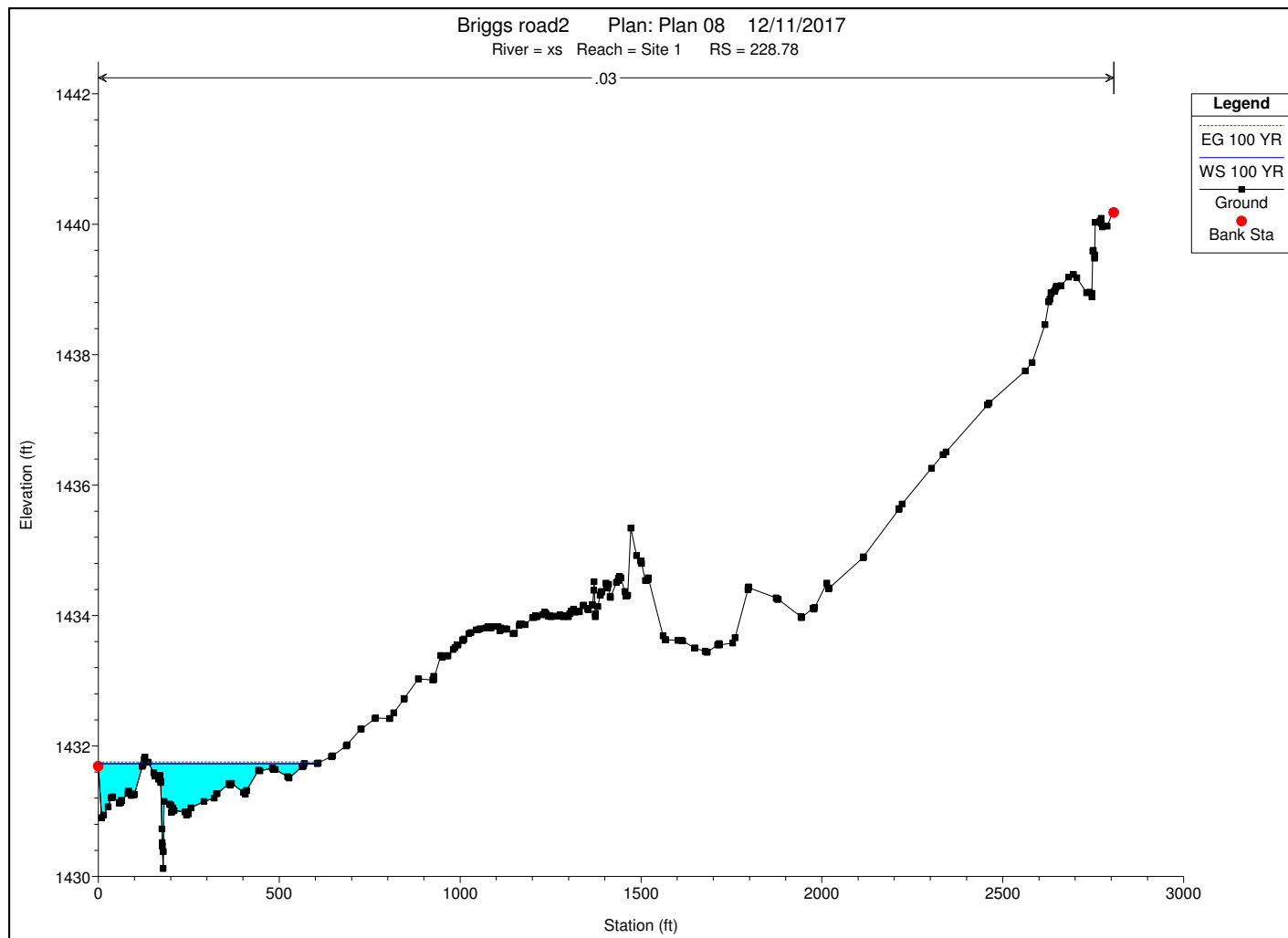


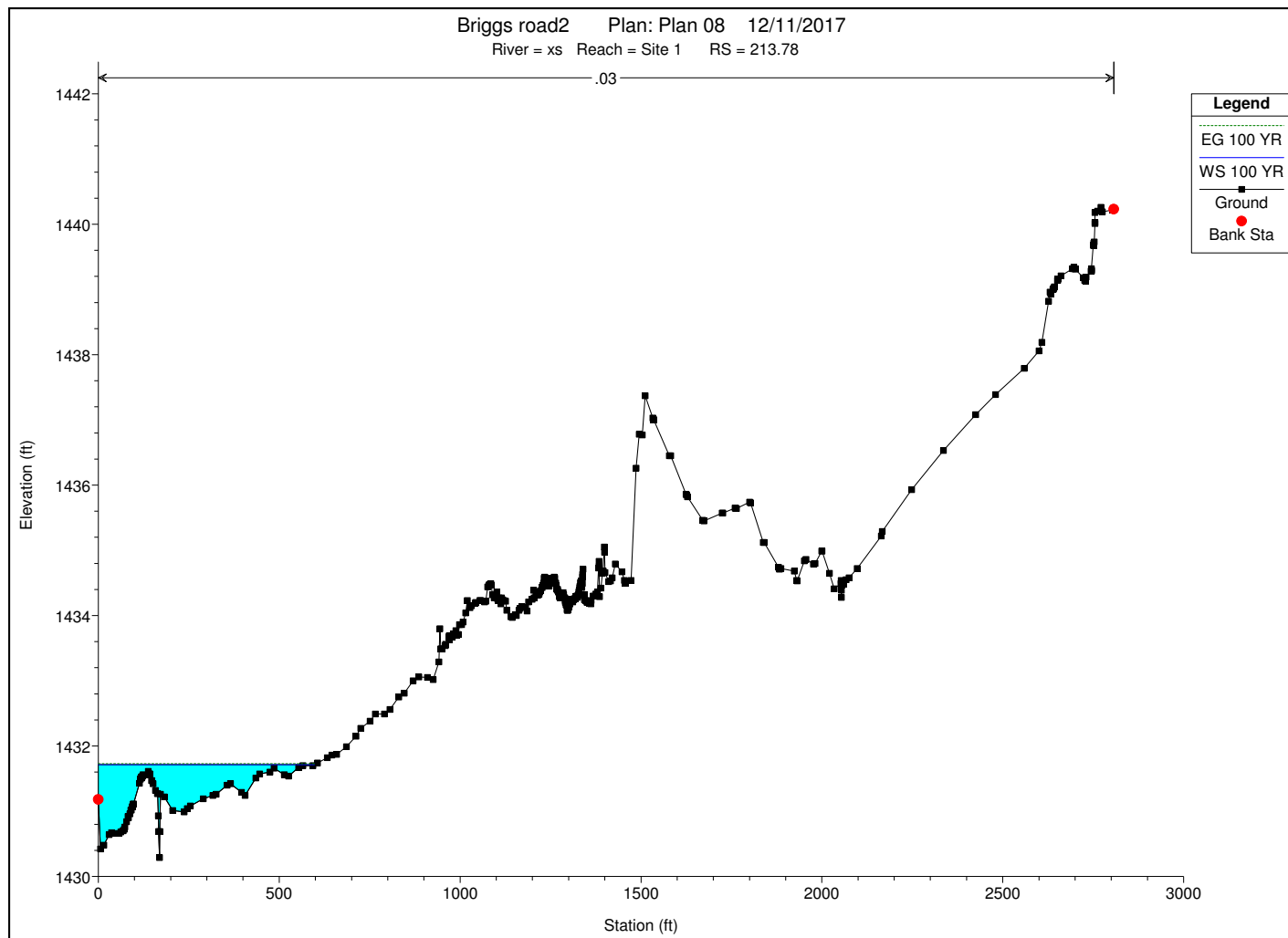


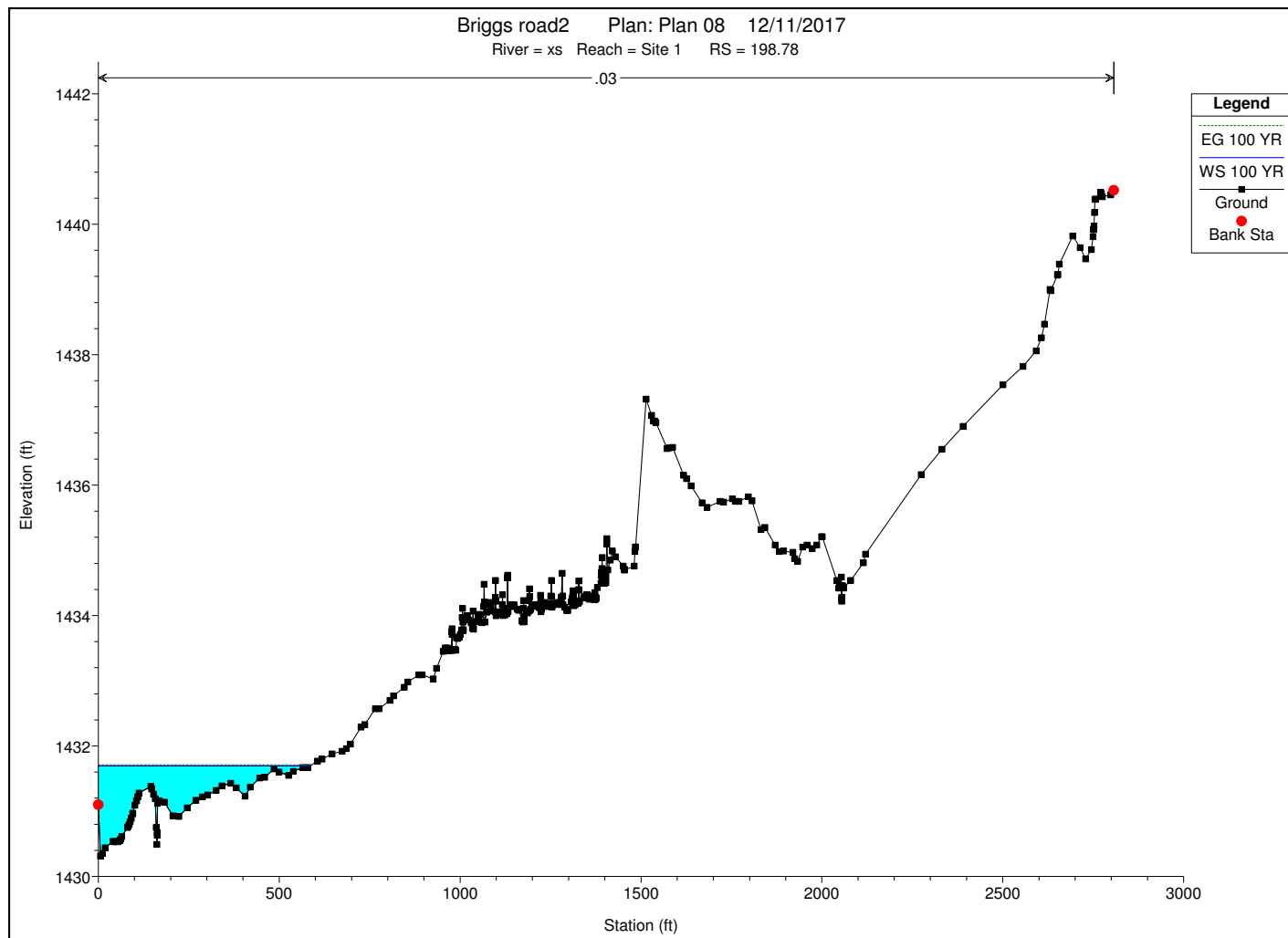




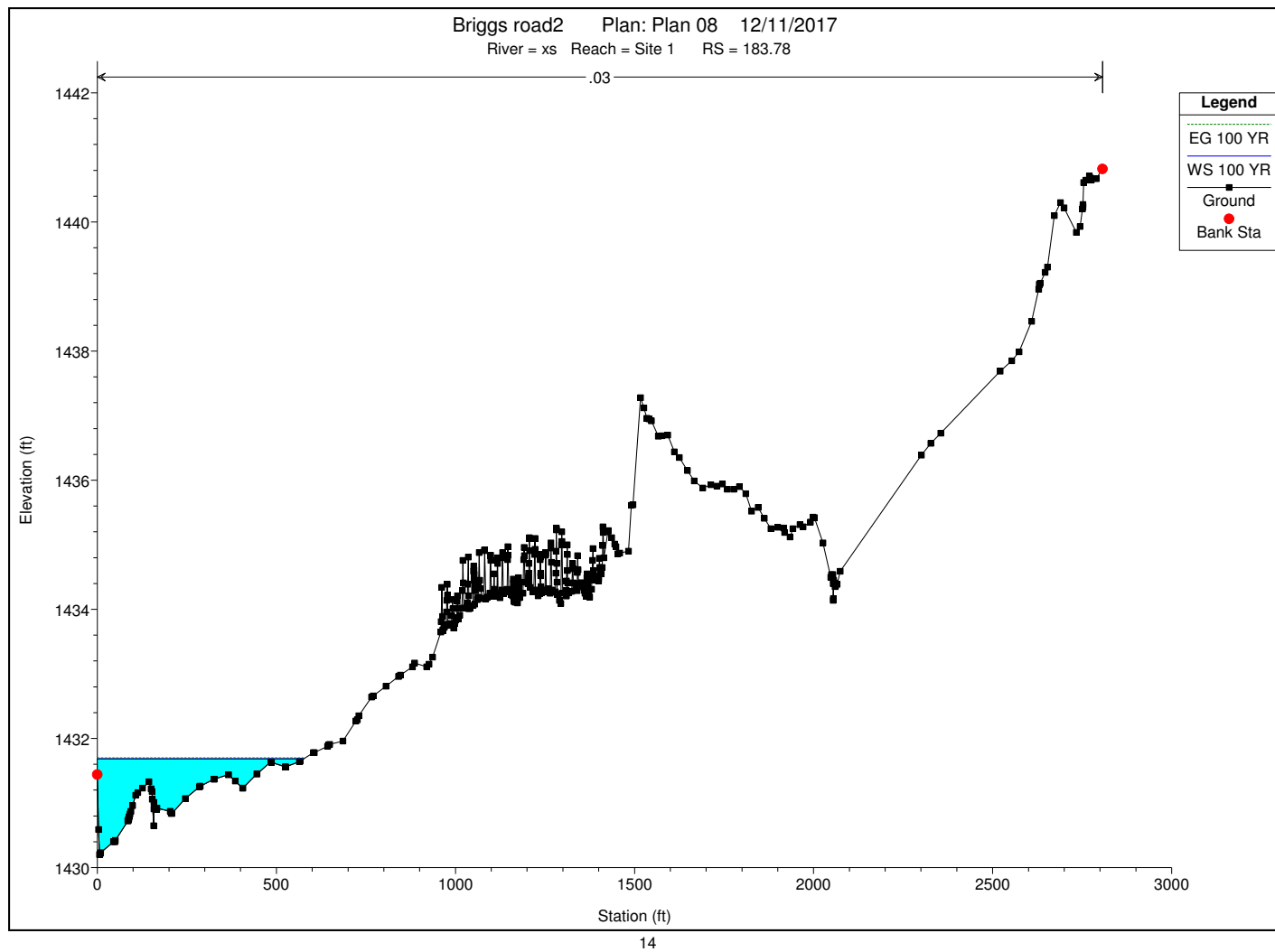


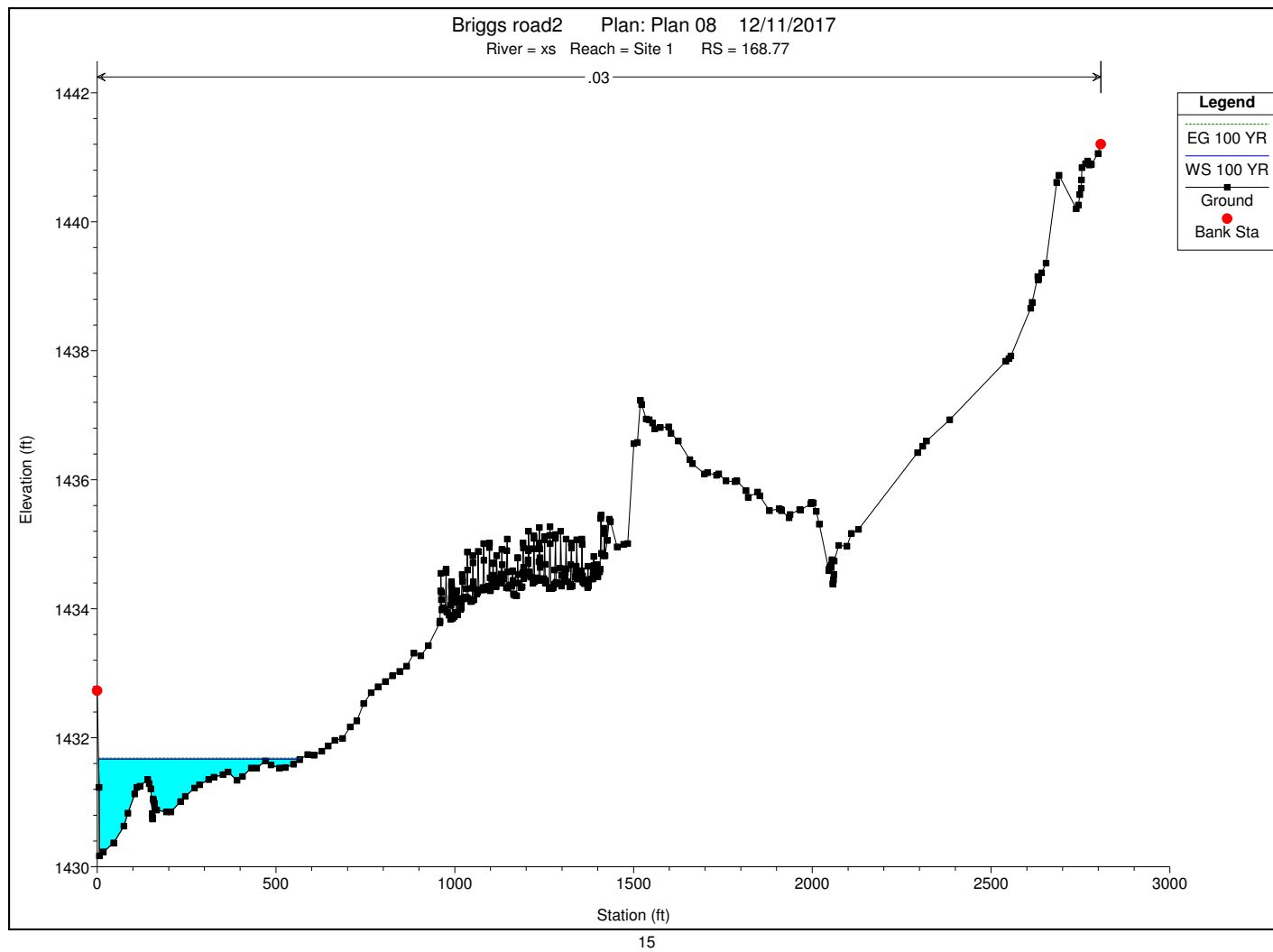


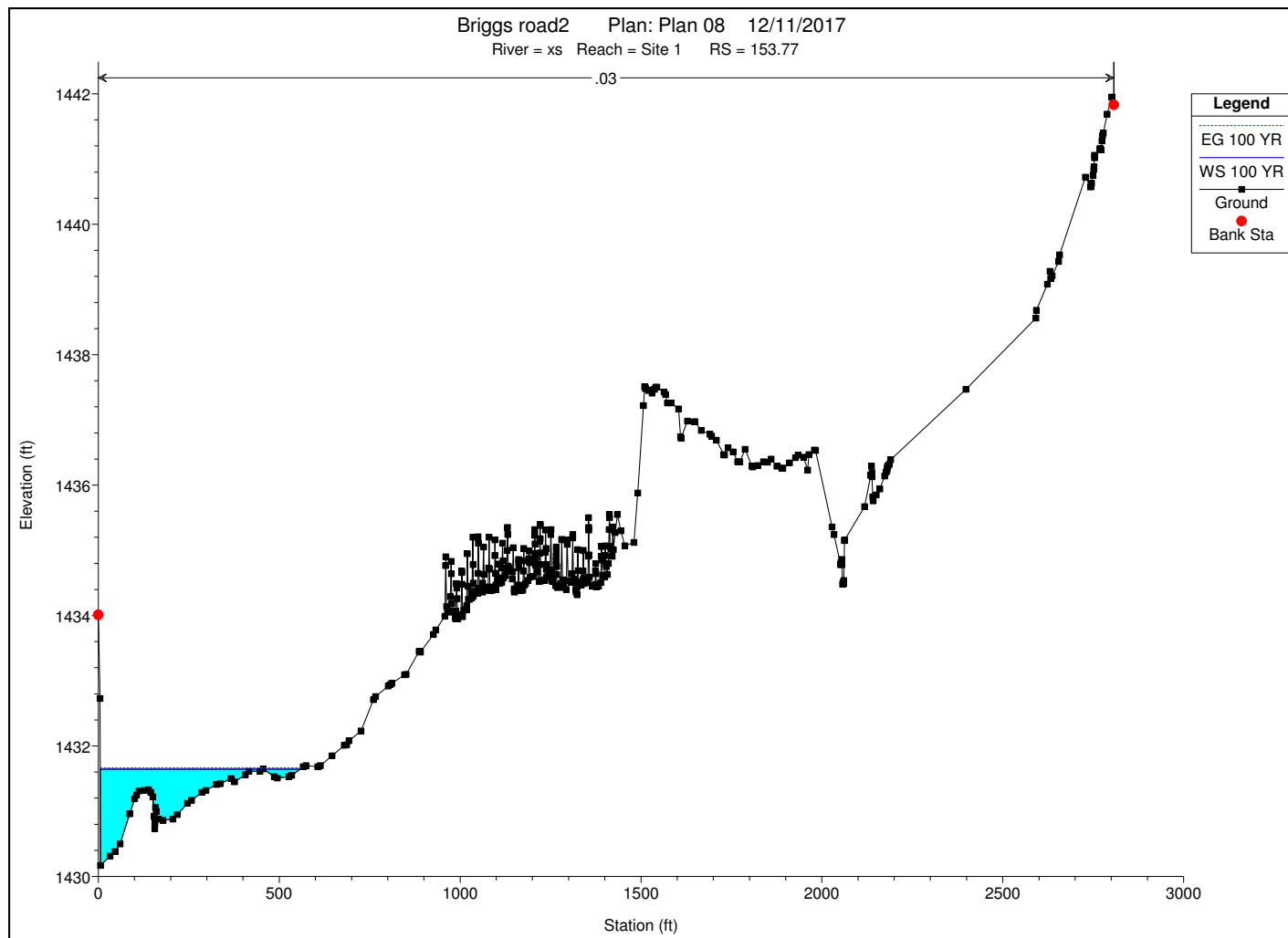




13







HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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PROJECT DATA
Project Title: Briggs road2
Project File : Briggsroad2.prj
Run Date and Time: 8/14/2017 3:58:10 PM

Project in English units

PLAN DATA

Plan Title: Plan 08
Plan File : q:\14\14047\Engineering\GPIP\Current\Storm\HYD\HECRAS\Briggsroad2.p08

Geometry Title: Briggs Road Reach
Geometry File : q:\14\14047\Engineering\GPIP\Current\Storm\HYD\HECRAS\Briggsroad2.g02

Flow Title : Rockport known WS
Flow File : q:\14\14047\Engineering\GPIP\Current\Storm\HYD\HECRAS\Briggsroad2.f04

Plan Summary Information:
Number of: Cross Sections = 17 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Rockport known WS
Flow File : q:\14\14047\Engineering\GPIP\Current\Storm\HYD\HECRAS\Briggsroad2.f04

Flow Data (cfs)

River	Reach	RS	100 YR
xs	Site 1	349.95	271.77

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
xs	Site 1	100 YR	Normal S =
0.05156			

GEOMETRY DATA

Geometry Title: Briggs Road Reach
 Geometry File : q:\14\14047\Engineering\GPIP\Current\Storm\HYD\HECRAS\Briggsroad2.g02

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 349.95

INPUT

Description:

Station	Elevation	Data	num=	306							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1430.25	1.88	1430.32	3.51	1430.21	14.89	1430.48	35.04	1430.23		
44.79	1430.24	52.35	1430.15	55.59	1430.12	76.68	1430.06	77.47	1430.04		
92.97	1429.77	103.48	1429.58	117.12	1429.8	120.44	1429.84	126.32	1429.5		
126.57	1429.5	127.23	1429.28	133.13	1427.63	136.92	1427.02	138.34	1426.77		
154.56	1426.77	156.28	1427.36	156.77	1427.51	158.11	1428.18	159.94	1429.06		
160.45	1429.29	162.66	1429.81	165.8	1430.6	166.64	1430.7	168.62	1430.78		
172.63	1430.26	173.28	1430.95	189.7	1430.98	193.4	1430.99	197.83	1431.01		
207.6	1431.07	211.03	1431.08	214.87	1431.09	219.1	1431.11	223.35	1431.14		
223.86	1431.14	279.28	1431.39	284.28	1431.43	289.86	1431.43	296.13	1431.42		
303.17	1431.43	353.55	1431.31	500.41	1431.05	503.15	1431.03	505.83	1431.02		
508.44	1431.03	524.93	1430.93	526.03	1430.94	565.29	1431.03	567.6	1431.07		
571.61	1431.07	605.32	1430.85	642.13	1430.75	645.32	1430.75	682.6	1430.72		
685.33	1430.71	687.99	1430.72	725.33	1430.76	727.54	1430.76	765.33	1431.12		
804.01	1431.17	805.33	1431.17	806.63	1431.18	845.34	1431.16	846.17	1431.15		
885.34	1431.24	918.28	1431.29	925.34	1431.31	964.51	1431.47	965.65	1431.48		
1004.4	1431.63	1006.13	1431.63	1018.58	1431.62	1045.96	1431.6	1064.5	1431.7		
1084.26	1431.82	1086.64	1431.82	1123.4	1431.86	1126.31	1431.86	1162.44	1432.58		
1164.15	1432.58	1167.97	1432.59	1203.9	1432.08	1208.22	1432.08	1237.92	1432.09		
1243.62	1432.09	1248.45	1432.07	1276.11	1432.07	1280.84	1432.11	1316.91	1432.02		
1359.04	1432.25	1364.57	1432.26	1397.55	1432.59	1397.98	1432.61	1398.86	1432.61		
1405.52	1432.55	1406.75	1432.49	1421.26	1432.54	1422.39	1432.51	1423.79	1432.47		
1425.15	1432.49	1427.2	1432.5	1431.71	1432.54	1439.76	1432.62	1440.59	1432.65		
1442.74	1432.62	1444.79	1432.69	1445.95	1432.68	1447.86	1432.64	1450.07	1432.68		
1451.45	1433.3	1452.07	1433.54	1452.49	1433.68	1454.53	1434.47	1454.95	1434.62		
1455.05	1434.67	1455.19	1434.71	1457.92	1435.49	1458.65	1435.54	1459.35	1435.63		
1461.18	1434.71	1461.3	1434.64	1461.38	1434.61	1463.2	1433.79	1465.43	1432.84		
1465.57	1432.76	1470.05	1432.66	1472.65	1432.65	1474.3	1432.71	1475.36	1432.78		
1486.88	1432.56	1499.82	1432.43	1522.04	1432.43	1548.9	1432.56	1557.59	1432.61		
1576.13	1432.83	1594.26	1432.86	1598.61	1432.85	1616.98	1433.09	1627.53	1433.01		
1637.44	1432.98	1644.56	1433.08	1648.46	1433.09	1651.09	1433.1	1662.59	1433.05		
1668.08	1433.05	1670.19	1433.08	1674.72	1433.1	1679.43	1433.13	1684.33	1433.29		
1689.69	1433.3	1701.74	1433.27	1711.69	1433.16	1716.58	1433.17	1734.23	1433.19		
1738.25	1433.2	1754.52	1433.31	1758.34	1433.35	1765.4	1433.67	1767.67	1433.62		
1770.25	1433.64	1770.43	1433.63	1770.83	1433.62	1771.47	1433.58	1771.72	1433.57		
1773.02	1433.43	1773.89	1433.28	1775.05	1433.05	1778.64	1433.07	1784.52	1433.09		
1786.83	1433.11	1787.84	1433.11	1791.84	1433.15	1792.23	1433.15	1802.17	1433.21		
1817.25	1433.29	1819.84	1433.49	1820.97	1433.57	1823.41	1433.75	1825.2	1433.93		
1825.54	1429.86	1825.56	1428.92	1825.97	1428.89	1827.57	1428.79	1832.49	1429.18		
1840.35	1430.13	1856.3	1431.79	1863.91	1432.79	1864.6	1432.88	1869.45	1433.59		
1877.11	1433.39	1882.69	1433.18	1886.45	1433.04	1906.3	1433.12	1923.24	1433.09		
1929.84	1433.07	1955.98	1432.89	1967.9	1432.82	1998.49	1432.92	2005.42	1432.97		
2036.17	1433.14	2057.08	1433.22	2087.78	1433.37	2111.58	1433.86	2132.93	1433.89		
2154.97	1434.04	2155.36	1434.03	2155.76	1434.03	2156.41	1434.05	2157.1	1434.07		
2157.81	1434.09	2163.49	1434.13	2163.77	1434.14	2164.08	1434.16	2164.42	1434.17		
2164.79	1434.18	2165.2	1434.2	2165.64	1434.21	2166.12	1434.22	2166.66	1434.24		

2167.24	1434.25	2167.89	1434.27	2168.6	1434.28	2169.23	1434.29	2169.41	1434.3
2169.53	1434.3	2171.09	1434.33	2172.57	1434.36	2173.98	1434.39	2175.32	1434.41
2176.59	1434.43	2177.81	1434.45	2178.97	1434.47	2180.08	1434.49	2181.15	1434.5
2182.17	1434.52	2183.16	1434.53	2184.11	1434.54	2185.02	1434.55	2185.9	1434.55
2205.83	1434.98	2217.06	1435.04	2295.81	1435.44	2307.88	1435.58	2320.28	1435.64
2346.09	1435.99	2462.64	1436.38	2475.58	1436.42	2488.88	1436.51	2505.51	1436.37
2508.06	1436.26	2515.3	1436.25	2517.66	1436.45	2537.78	1435.74	2538.89	1435.69
2539.06	1435.72	2541.42	1435.77	2557.35	1436.36	2571.9	1436.34	2594.45	1436.62
2629.62	1436.56	2634.97	1436.51	2635.98	1436.42	2639.56	1436.33	2640.49	1436.33
2647.44	1436.44	2685.46	1436.74	2704.79	1436.73	2725.46	1436.84	2740.4	1436.94
2743.34	1436.96	2744.96	1436.88	2746.28	1436.88	2747.35	1436.97	2750.15	1437.2
2753.09	1437.87	2754.81	1438.35	2755.33	1438.35	2755.92	1438.71	2755.98	1438.75
2756.03	1438.78	2756.16	1438.82	2756.48	1438.36	2756.49	1438.34	2757.92	1438.37
2765.51	1438.6	2770.45	1438.68	2771.51	1438.71	2789.33	1438.21	2791.56	1438.16
2791.75	1438.64	2791.76	1438.66	2791.79	1438.66	2792.11	1438.67	2792.38	1438.67
2792.88	1438.68	2796.87	1438.81	2797.61	1438.84	2797.74	1438.82	2805.18	1439.1
2807.24	1439.28								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	0	.03	2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
0	2807.24			41.29	41.28	41.29	.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 308.67

INPUT

Description:

Station	Elevation	Data	num=	380					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1429.79	5.27	1429.77	10.39	1429.85	17.17	1429.86	23.2	1429.86
32.85	1429.75	37.2	1429.74	43.29	1429.91	47.03	1429.91	50.34	1429.96
56.23	1430.08	64.27	1430.29	65.55	1430.3	72.27	1430.37	72.35	1430.38
72.79	1430.39	76.81	1430.41	86.29	1430.42	87.11	1430.25	89.6	1430.21
89.97	1430.18	91.97	1429.95	93.13	1429.88	97.94	1429.93	105.14	1429.75
107.11	1429.8	111.92	1429.89	118.92	1429.85	120.07	1429.99	120.57	1430.04
124.52	1430.62	125.18	1430.45	125.9	1429.5	127.2	1429.92	132.3	1429.78
135.82	1430.05	140.89	1430.4	143.15	1430.52	147.14	1430.9	149.29	1431.09
151.36	1431.44	153.61	1431.45	155.35	1431.6	157.09	1431.58	161.48	1431.5
162.1	1431.53	162.63	1431.54	163.26	1431.54	163.66	1431.55	163.95	1431.55
169.64	1431.48	173.25	1431.48	178.96	1431.46	180.31	1431.3	181.23	1431.18
182.13	1431.08	185.04	1430.9	189.21	1430.64	189.57	1430.52	189.91	1430.4
190	1430.36	191.97	1429.68	192.46	1429.54	193.27	1429.34	194.37	1428.99
195.29	1428.9	216.55	1429.02	259.82	1429.01	299.61	1428.98	314.24	1429.02
363.58	1429.05	410.01	1429.23	418.54	1429.26	471.63	1429.42	475.43	1429.43
475.63	1429.44	475.65	1429.43	475.92	1429.43	477.3	1429.42	538.07	1429.11
562.16	1429.15	616.52	1429.33	651.98	1429.43	685.97	1429.51	739.43	1429.59
777.05	1429.63	834.37	1429.76	869.66	1429.85	901.44	1429.9	914.16	1429.91
952.69	1430	967.99	1430.08	986.86	1430.21	994.17	1430.3	1003.36	1430.44
1004.6	1430.44	1014.36	1430.42	1017.78	1430.42	1028.32	1430.46	1029.64	1430.49
1030.46	1430.5	1039.73	1430.4	1040.2	1430.38	1041.33	1430.38	1050.61	1430.52
1050.9	1430.52	1052.03	1430.54	1063.16	1430.49	1063.97	1430.49	1073.73	1430.42
1076.04	1430.41	1088.45	1430.41	1104.1	1430.47	1107.35	1430.48	1121.25	1430.55
1122.19	1430.57	1134.94	1430.62	1136.59	1430.61	1154.11	1430.67	1160.46	1430.67
1162.09	1430.69	1169.44	1430.64	1171.3	1430.69	1172.14	1430.68	1174.6	1430.7
1175.88	1430.77	1175.98	1430.78	1176.26	1430.78	1177.6	1430.8	1181.51	1430.9
1188.9	1430.83	1195.09	1430.85	1204.16	1430.91	1206.91	1430.8	1210.36	1430.77
1214	1430.82	1221.74	1430.77	1229.61	1430.79	1237.64	1430.73	1237.8	1430.73
1245.21	1430.78	1254.19	1430.83	1263.57	1430.87	1272.27	1430.72	1281.23	1430.74
1292.44	1430.81	1299.05	1430.81	1307.7	1430.87	1315.18	1430.9	1322.99	1430.84
1336.38	1430.84	1344.89	1430.95	1352.78	1431.02	1362.21	1431.09	1368.09	1431.11
1380.34	1431.06	1390.14	1431.17	1393.73	1431.22	1401.46	1430.91	1401.7	1430.93
1401.99	1430.93	1402.09	1430.91	1402.82	1430.9	1402.88	1430.88	1404.08	1430.92
1408.69	1431.04	1409.61	1431.05	1410.2	1431.06	1418.07	1431.12	1420.4	1431.14
1420.81	1431.15	1427.56	1431.22	1427.72	1431.22	1435.81	1431.23	1443.89	1431.29
1447.78	1431.3	1453.71	1431.32	1455.91	1431.25	1456.91	1431.13	1458.82	1431.13

1459.64	1431.15	1460.92	1431.15	1462.36	1431.19	1463.22	1431.2	1464.1	1431.15
1466.3	1431.21	1467.2	1431.21	1474.11	1431.35	1475.31	1431.35	1482.09	1431.43
1485.28	1431.43	1490.26	1431.39	1501.32	1431.48	1503.68	1431.49	1506.06	1431.5
1526.27	1431.71	1533.36	1431.74	1542.18	1431.81	1553	1431.81	1563.58	1431.78
1573.35	1431.78	1581.18	1431.87	1590.35	1431.86	1595.05	1431.86	1603.63	1432.01
1616.84	1431.98	1620.19	1431.98	1626.01	1432.03	1630.72	1432.08	1631.19	1432.08
1635.95	1432.07	1638.16	1432.1	1640.04	1432.11	1643.53	1432.07	1649.87	1432.05
1649.93	1432.04	1650.11	1432.04	1656.35	1432	1661.59	1431.81	1670.92	1431.81
1674.34	1431.96	1679.44	1432.21	1686.83	1432.16	1693.01	1432.05	1698.98	1432.04
1705.79	1431.91	1712.9	1431.89	1718.86	1432	1731.19	1432.22	1734.36	1432.23
1744.95	1432.16	1754.76	1432.14	1763.62	1432.18	1773.55	1432.28	1780.5	1432.41
1782.89	1432.46	1783.13	1432.46	1786.44	1432.4	1793.12	1432.28	1796.41	1432.28
1809.65	1432.27	1823.33	1432.26	1825.46	1432.29	1839.94	1432.5	1842.22	1432.51
1854.8	1432.41	1855.37	1432.34	1855.47	1432.37	1856.07	1432.37	1861.76	1432.54
1876.39	1432.62	1884.09	1432.65	1893.04	1432.74	1893.1	1432.74	1897.98	1432.71
1906.93	1432.7	1908.67	1432.7	1921.37	1432.75	1923.31	1432.75	1925.84	1432.72
1928.19	1432.7	1933.19	1432.75	1939.68	1432.65	1963.32	1432.83	1971.53	1432.83
1980.07	1432.81	2008.22	1432.74	2022.57	1432.82	2042.23	1432.85	2092.12	1432.95
2113.41	1433.1	2134.28	1433.18	2152.07	1433.38	2152.75	1433.31	2152.82	1433.22
2152.88	1433.31	2153.12	1433.31	2159.12	1433.62	2176.54	1433.74	2190.85	1434.09
2199.88	1434.18	2204.23	1434.28	2249.3	1434.72	2251.95	1434.72	2254.56	1434.75
2258.61	1434.81	2264.93	1434.81	2274.54	1434.9	2282.39	1434.98	2288.43	1434.95
2294.45	1435.06	2299.11	1435.07	2309.8	1435.12	2317.46	1435.22	2326.74	1435.33
2332.63	1435.56	2336.2	1435.58	2340.46	1435.62	2342.89	1435.62	2345.13	1435.63
2347.92	1435.74	2350.24	1435.74	2351.88	1435.73	2353.8	1435.73	2372.29	1435.99
2376.51	1436	2379.27	1436.02	2387.16	1436.07	2406.64	1436.19	2415.47	1436.3
2420.05	1436.28	2429.93	1436.3	2435.12	1436.33	2438.27	1436.37	2440.43	1436.4
2442.65	1436.4	2444.91	1436.39	2447.01	1436.4	2449.03	1436.41	2453.95	1436.48
2457.36	1436.58	2466.88	1436.64	2482.49	1436.78	2495.91	1436.95	2505.29	1436.99
2506.88	1436.96	2508.85	1437	2510.38	1437.04	2511.45	1437.04	2513.28	1437.15
2513.66	1437.01	2514.35	1436.71	2516.46	1436.87	2516.95	1436.9	2521.58	1436.8
2539.13	1436.51	2540.05	1436.56	2540.4	1436.57	2541.08	1436.64	2542.25	1436.68
2544.31	1436.59	2545.48	1436.66	2545.75	1436.69	2549.27	1436.78	2579.08	1436.86
2581.84	1436.85	2635.56	1436.96	2637.46	1436.97	2669.19	1437.02	2672.75	1437.04
2690.73	1437.36	2702.91	1437.56	2706.9	1437.65	2707.69	1437.66	2708.01	1437.66
2713.45	1437.71	2716.37	1437.74	2719.04	1437.78	2725.69	1437.77	2727.65	1437.79
2728.51	1437.8	2729.37	1437.77	2734.23	1437.77	2736.23	1437.78	2739.73	1437.9
2741.19	1437.96	2744.12	1438.05	2746.61	1438.06	2747.27	1438.13	2747.72	1438.27
2749.07	1438.62	2749.61	1438.58	2755.47	1438.74	2755.74	1438.8	2762.4	1438.98
2770.36	1439.23	2786.94	1439.14	2803.14	1439.23	2805.62	1439.23	2807.24	1439.25

Manning's	n	Values	num=	3
Sta	n	Val	Sta	n
0	.03	0	.03	2807.24

Bank	Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
		0	2807.24		5.6	5.6	5.6		.1	.3

CROSS SECTION

RIVER: xs

REACH: Site 1 RS: 303.07

INPUT

Description:

Station	Elevation	Data	num=	490
Sta	Elev	Sta	Elev	Sta
0	1429.67	5.28	1429.65	11.33
35.74	1429.71	42.79	1429.9	42.98
52.32	1430.23	57.52	1430.44	62.38
71.52	1430.5	79.66	1430.49	85.74
90.7	1430.42	93.55	1430.41	95.5
119.3	1430.07	124.51	1431.08	124.73
140.46	1430.67	141.55	1430.63	141.64
151.17	1431.79	154.72	1431.81	154.86
157.98	1431.78	159.62	1432.15	161.97
179.36	1431.97	179.41	1431.96	180.23
183.81	1430.95	185.69	1430.83	188.53
195.05	1430.44	195.31	1430.33	195.87
208.39	1430.25	209.9	1430.21	210.82

247.16	1429.6	309.23	1429.6	311.61	1429.62	317.71	1429.58	319.26	1429.64
366.4	1429.6	367.83	1429.58	368.48	1429.61	398.44	1429.93	402.12	1429.92
402.9	1429.91	404.76	1429.95	446.36	1430.07	448.86	1430.11	452.16	1430.13
455.63	1430.07	499.37	1430.01	507.68	1429.97	552.27	1429.84	554.27	1429.84
554.96	1429.86	575.54	1430	576.09	1430.04	577.02	1429.99	588.85	1429.81
591.32	1429.81	639.7	1430.06	644.31	1430.09	647.91	1430.09	679.35	1430.28
683.89	1430.25	726.5	1430.31	727.95	1430.3	731.44	1430.35	747.05	1430.33
777.18	1430.38	788.25	1430.51	791.49	1430.51	795.13	1430.48	851.11	1430.4
857.12	1430.45	897.28	1430.68	935.73	1430.75	944.28	1430.75	976.68	1430.83
980.63	1430.82	981	1430.82	989.55	1430.87	990.31	1430.89	995.2	1430.91
996.38	1430.91	997.11	1430.92	1003.89	1430.92	1004.82	1430.87	1012.68	1430.89
1016.7	1430.94	1018.39	1430.99	1028.76	1431.27	1029.3	1431.28	1029.54	1431.28
1029.82	1431.31	1030.06	1431.32	1036.53	1431.41	1036.89	1431.39	1037.37	1431.38
1038.92	1431.3	1042.31	1431.12	1047.14	1431.05	1053.87	1431.01	1061.2	1431.16
1067.91	1431.14	1070.78	1431.04	1074.14	1431.06	1076.19	1431.15	1082.77	1431.11
1087.35	1431.13	1093.74	1431.17	1106.74	1431.15	1117.48	1431.22	1123	1431.27
1132.57	1431.28	1144.85	1431.24	1149.35	1431.24	1160.97	1431.38	1166.62	1431.37
1177.37	1431.4	1180.26	1431.35	1181.58	1431.34	1182.65	1431.34	1192.11	1431.32
1192.65	1431.33	1193.8	1431.33	1194.26	1431.32	1195.61	1431.32	1200.67	1431.42
1201.71	1431.42	1202.34	1431.43	1203.41	1431.53	1206.07	1431.67	1206.95	1431.78
1209.97	1431.88	1211.5	1431.98	1213.82	1431.96	1216.64	1431.91	1217.06	1431.91
1217.53	1431.88	1217.99	1431.77	1218.21	1431.77	1220.24	1431.84	1223.34	1431.81
1228.16	1431.73	1229.79	1431.66	1234.41	1431.43	1235.15	1431.39	1235.54	1431.37
1235.88	1431.35	1236.04	1431.34	1236.21	1431.34	1236.52	1431.35	1236.81	1431.36
1237.78	1431.36	1243.37	1431.37	1243.58	1431.38	1243.87	1431.39	1244.16	1431.34
1244.48	1431.33	1247.7	1431.21	1248.32	1431.19	1248.56	1431.18	1248.66	1431.16
1249.23	1431.16	1250.04	1431.14	1257.05	1431.06	1257.83	1431.06	1258.6	1431.08
1266.16	1431.25	1267.09	1431.25	1268.39	1431.23	1273.94	1431.21	1274.81	1431.24
1278.25	1431.22	1279.24	1431.24	1279.7	1431.26	1283.8	1431.35	1284.04	1431.35
1284.52	1431.34	1284.68	1431.35	1284.94	1431.36	1285.67	1431.36	1292.04	1431.33
1292.41	1431.33	1292.76	1431.34	1293	1431.33	1293.35	1431.33	1294.27	1431.37
1294.71	1431.36	1302.03	1431.38	1302.31	1431.36	1304.04	1431.36	1304.64	1431.37
1313.97	1431.48	1314.57	1431.48	1315.09	1431.49	1315.21	1431.5	1315.48	1431.5
1315.69	1431.51	1315.85	1431.51	1316.04	1431.52	1316.58	1431.5	1328.01	1431.5
1328.33	1431.49	1329.58	1431.49	1339.8	1431.43	1341.65	1431.43	1342.7	1431.44
1352.45	1431.52	1352.84	1431.52	1353.21	1431.53	1354.01	1431.53	1354.98	1431.55
1355.35	1431.55	1361.39	1431.62	1361.76	1431.63	1362.11	1431.63	1362.54	1431.62
1363.74	1431.62	1366.85	1431.63	1367.7	1431.62	1368.55	1431.62	1369.5	1431.63
1373.91	1431.65	1374.54	1431.64	1375.18	1431.64	1375.77	1431.63	1376.29	1431.63
1377.32	1431.71	1382.68	1431.81	1382.9	1432	1383.54	1432	1384.64	1432.05
1384.85	1431.88	1391.95	1432.02	1393.1	1432.02	1394.33	1432.03	1398.55	1432.17
1399.28	1432.18	1400.43	1432.17	1401.13	1431.88	1401.84	1431.37	1402.16	1431.26
1403.15	1431.17	1403.55	1431.11	1404.79	1430.99	1408.56	1431.31	1408.69	1431.35
1409.12	1431.88	1409.97	1432.08	1410.51	1432.06	1411.58	1432.05	1434.3	1432.19
1435.01	1432.18	1435.54	1432.18	1435.73	1432.19	1435.89	1432.2	1446.31	1432.16
1446.67	1432.16	1446.95	1432.14	1447.12	1432.13	1447.29	1432.13	1456.33	1431.91
1456.5	1431.9	1456.73	1431.89	1456.85	1431.89	1456.95	1431.9	1457.14	1431.9
1470.52	1431.73	1471.33	1431.73	1484.02	1431.96	1484.14	1431.97	1484.37	1431.97
1484.79	1431.99	1497.74	1432.02	1498.18	1432	1498.67	1432	1499.15	1432.01
1511.02	1432.05	1511.23	1432.05	1511.63	1432.04	1529.16	1432.14	1546.27	1432.14
1560.1	1432.4	1561.66	1432.41	1570.87	1432.49	1572.73	1432.51	1582.29	1432.45
1583.38	1432.45	1595.81	1432.6	1597.15	1432.6	1609.23	1432.67	1610.47	1432.66
1623.7	1432.65	1624.7	1432.63	1625.29	1432.62	1626.59	1432.44	1633.05	1432.43
1643.11	1432.5	1648.46	1432.56	1657.13	1432.15	1659.48	1432.16	1671.65	1432.27
1672.32	1432.28	1689.44	1432.48	1704.84	1432.57	1707.33	1432.59	1720.02	1432.66
1721.73	1432.66	1736.27	1432.88	1738.79	1432.89	1756.25	1433.08	1776.6	1433.08
1778.76	1433.09	1791.42	1433.12	1794.16	1433.12	1808.3	1433.2	1808.91	1433.2
1809.54	1433.21	1818.48	1433.14	1819.91	1433.17	1833.59	1432.97	1846.3	1433.11
1852.01	1433.13	1852.32	1433.13	1855.63	1432.66	1871.85	1433.12	1872.48	1433.14
1873.32	1433.15	1894.59	1433.21	1896.25	1433.21	1911.62	1433.15	1915.32	1433.15
1916.34	1433.19	1918.5	1433.2	1923.1	1433.13	1927.38	1433.09	1936.48	1433.18
1948.3	1433	1949.8	1433.01	1967.02	1433.02	1987.92	1432.96	2017.67	1433.12
2062.68	1433.2	2107.49	1433.5	2151.39	1433.68	2152.46	1433.69	2152.77	1433.34
2153.02	1433.69	2153.94	1433.69	2154.29	1433.71	2193.97	1434	2195.01	1434.03
2215.82	1434.24	2225.85	1434.47	2229.53	1434.51	2236.44	1434.5	2243.25	1434.58
2253.85	1434.76	2270.33	1434.75	2270.97	1434.76	2281.4	1434.86	2289.41	1434.83
2297.4	1434.97	2303.58	1434.99	2304.81	1434.99	2314.91	1435.13	2327.16	1435.27
2334.92	1435.58	2338.75	1435.6	2339.54	1435.59	2345.03	1435.63	2345.4	1435.63
2351.44	1435.65	2354.91	1435.74	2357.75	1435.74	2359.78	1435.73	2360.21	1435.73
2362.57	1435.75	2364.81	1435.81	2367.75	1435.82	2407	1436.05	2418.51	1436.21
2424.47	1436.17	2425.34	1436.17	2432.07	1436.22	2436.15	1436.26	2438.94	1436.3

2441.83	1436.3	2444.75	1436.29	2447.47	1436.3	2450.09	1436.32	2456.46	1436.41
2460.88	1436.53	2461.52	1436.54	2481.63	1436.71	2498.92	1436.93	2500.23	1436.93
2504.22	1437.02	2507.69	1437.02	2508.23	1437.05	2510.35	1437.11	2511.79	1437.16
2512.44	1437.18	2512.91	1437.16	2513.26	1437.08	2514.12	1436.94	2514.47	1436.94
2515.69	1437.05	2516.39	1437.14	2522.01	1437.11	2539.87	1436.93	2539.88	1437.01
2541.11	1436.96	2541.52	1436.89	2541.95	1436.9	2542.27	1436.94	2543.62	1436.97
2544.72	1436.95	2548.19	1437.27	2551.09	1437.03	2569.78	1437.11	2593.24	1436.97
2621.89	1437.03	2659.75	1437.31	2677.17	1437.3	2689.02	1437.51	2697.83	1437.63
2706.32	1437.8	2712.67	1437.91	2715.22	1437.92	2715.28	1437.94	2717.28	1437.94
2723.12	1438.06	2723.66	1438.06	2724.64	1438.07	2727.39	1438.16	2729.09	1438.13
2730.59	1438.03	2731.2	1438	2733.91	1438	2734.47	1438.03	2735.61	1438.07
2737.75	1438.11	2739.26	1438.09	2742.42	1438.18	2744.57	1438.48	2745.9	1438.68
2747.65	1438.68	2754.82	1438.92	2755.06	1438.93	2760.2	1439.04	2771.38	1439.39
2780.11	1439.34	2803.48	1439.47	2804.82	1439.47	2806.78	1439.49	2807.24	1439.5

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
0	2807.24		4.2	4.2	4.2	.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 298.87

INPUT

Description:

Station	Elevation	Data	num=	484					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1429.63	10.03	1429.64	12.03	1429.68	28.99	1429.69	46.55	1430.11
54.62	1430.62	58.36	1430.77	62.41	1430.74	67.74	1430.67	68.79	1430.7
69.9	1430.69	76.85	1430.66	85.91	1430.72	86.59	1430.81	89.29	1430.8
93.19	1430.74	93.54	1430.73	99.49	1430.58	120.99	1430.47	122.84	1430.82
123.63	1430.46	125.85	1430.48	127.74	1430.53	142.62	1431.04	147.09	1431.29
148.3	1431.4	149.12	1431.47	149.78	1431.53	156.8	1431.78	160.16	1431.72
160.52	1431.81	161.21	1431.69	176.62	1431.64	177.53	1431.64	177.78	1431.62
181.66	1431.44	183.5	1431.08	183.82	1431.01	184.1	1431.01	189.58	1430.78
191.83	1430.67	197.83	1430.64	210.57	1430.36	213.69	1430.26	239.62	1429.87
250.24	1429.83	251.5	1429.79	283.77	1429.81	284.6	1429.82	296.06	1429.9
313.8	1429.79	330.35	1429.85	334.62	1430	347.62	1429.99	353.16	1429.92
364.11	1429.87	368.89	1429.95	372.03	1430.07	383.43	1430.19	404.2	1430.15
406.19	1430.11	413.63	1430.2	415.64	1430.21	419.11	1430.29	430.2	1430.32
432.48	1430.35	441.35	1430.52	455.2	1430.61	470.12	1430.34	479.95	1430.33
559.13	1429.95	564.05	1430.09	571.37	1430.14	574.69	1430.4	580.4	1430.11
584.97	1430.04	598.47	1430.04	643.87	1430.29	674.63	1430.39	699.35	1430.23
714.22	1430.25	716.18	1430.24	733.71	1430.39	739.09	1430.47	754.3	1430.45
778.07	1430.73	792.77	1430.75	814.7	1430.57	843.35	1430.52	910.69	1431.01
984.62	1431.07	988.19	1431.09	988.4	1431.09	991.09	1431.17	997.25	1431.16
999.89	1431.21	1002.19	1431.2	1003.33	1431.15	1005.13	1431.14	1010.51	1431.15
1014.92	1431.2	1028.45	1431.57	1029.74	1431.59	1031.23	1431.74	1032.52	1431.8
1033.04	1431.8	1034.87	1431.72	1037.27	1431.64	1038.7	1431.57	1042.49	1431.48
1046.19	1431.42	1060.52	1431.34	1063.26	1431.35	1064.32	1431.37	1065.29	1431.33
1066.04	1431.33	1067.41	1431.36	1075.5	1431.41	1080.34	1431.4	1099.6	1431.45
1114.88	1431.4	1129.41	1431.52	1133.32	1431.58	1136.37	1431.55	1151.28	1431.56
1153.64	1431.54	1156.15	1431.54	1158.16	1431.56	1177.25	1431.49	1178.79	1431.5
1183.69	1431.45	1185.35	1431.46	1186.69	1431.5	1187.77	1431.5	1188.97	1431.51
1190	1431.46	1191.16	1431.45	1191.86	1431.49	1193.22	1431.49	1195.05	1431.54
1195.73	1431.53	1196.45	1431.51	1196.64	1431.3	1196.77	1431.25	1197.56	1431.5
1198.28	1431.54	1198.87	1431.53	1199.63	1431.59	1202.47	1431.7	1204.05	1431.93
1204.26	1431.85	1204.42	1431.79	1204.96	1432.05	1205.32	1432.17	1205.61	1432.29
1205.85	1432.33	1207.16	1432.4	1208.33	1432.49	1209.22	1432.55	1216.16	1432.26
1216.24	1432.22	1216.48	1432.16	1216.59	1432.13	1217.14	1432.16	1219.96	1432.22
1221.18	1432.32	1222.34	1432.32	1224.02	1432.3	1225.41	1432.36	1227.17	1432.32
1231.46	1432.08	1233.55	1431.98	1234.69	1431.86	1237.04	1431.67	1237.16	1431.65
1238.25	1431.58	1239.21	1431.62	1239.4	1431.62	1240.6	1431.71	1241.05	1431.69
1241.8	1431.73	1242.5	1431.76	1243.14	1431.78	1243.84	1431.78	1245	1431.65
1246.25	1431.54	1246.59	1431.52	1247.34	1431.43	1247.81	1431.34	1248.16	1431.32
1249.26	1431.3	1250.5	1431.3	1253.07	1431.24	1254.16	1431.23	1254.34	1431.24

1259.3 1431.27 1259.92 1431.27 1264.02 1431.38 1264.25 1431.39 1267.11 1431.42
 1267.57 1431.42 1268.21 1431.44 1271.95 1431.38 1272.95 1431.39 1275.66 1431.48
 1276.75 1431.5 1279.4 1431.56 1282.76 1431.57 1284.57 1431.53 1284.79 1431.54
 1285.46 1431.56 1287.86 1431.61 1288.17 1431.62 1289.41 1431.64 1290.52 1431.64
 1291.22 1431.63 1292.24 1431.64 1292.93 1431.62 1293.86 1431.62 1294.46 1431.65
 1295.72 1431.72 1296.18 1431.72 1297.29 1431.77 1298.4 1431.75 1299.18 1431.71
 1300.26 1431.68 1302.25 1431.68 1303.47 1431.69 1304.73 1431.71 1306.04 1431.7
 1307.51 1431.74 1308.64 1431.76 1312.62 1431.73 1313.01 1431.73 1315.22 1431.78
 1316.57 1431.83 1317.57 1431.85 1317.69 1431.85 1319.07 1431.86 1320.47 1431.82
 1321.63 1431.76 1323.25 1431.78 1325.12 1431.78 1327.56 1431.76 1329.02 1431.76
 1330.24 1431.75 1331.62 1431.76 1332.55 1431.76 1333.32 1431.75 1334.31 1431.77
 1335.12 1431.75 1335.69 1431.77 1337.27 1431.76 1339.45 1431.76 1340.96 1431.77
 1342.56 1431.75 1348.4 1431.82 1349.42 1431.84 1351.53 1431.9 1352.64 1431.94
 1353.35 1431.96 1354.18 1431.95 1355.55 1431.99 1357.81 1432.02 1358.44 1432.01
 1358.89 1432.02 1359.4 1432 1361.38 1431.98 1366.15 1431.98 1367.6 1431.97
 1368.78 1431.99 1371.75 1431.97 1372.98 1431.99 1373.75 1431.99 1375.29 1431.97
 1375.99 1431.97 1379.38 1432 1380.7 1432.11 1381.86 1432.12 1384.72 1432.13
 1386.74 1432.22 1389.12 1432.21 1391.93 1432.29 1395.14 1432.32 1397.18 1432.4
 1398.78 1432.42 1399.61 1432.42 1401.56 1432.19 1401.9 1432.19 1403.49 1431.93
 1404.45 1431.98 1405.67 1431.86 1408.06 1432.04 1408.17 1432.07 1410.72 1432.27
 1411.9 1432.55 1415.04 1432.43 1421.25 1432.37 1429.27 1432.42 1434.04 1432.32
 1437.6 1432.37 1440 1432.44 1443.45 1432.42 1444.7 1432.4 1446.74 1432.26
 1447.92 1432.23 1449.16 1432.21 1452.96 1432.12 1456.55 1431.96 1457.58 1431.97
 1458.55 1432.04 1460.2 1432.06 1466.03 1431.98 1467.24 1431.93 1468.55 1431.93
 1470.09 1431.96 1471.88 1431.97 1475.36 1431.96 1482.05 1432.09 1483.04 1432.13
 1483.83 1432.13 1487.11 1432.27 1492.88 1432.28 1495.7 1432.2 1498.83 1432.18
 1501.83 1432.24 1501.88 1432.24 1507.74 1432.26 1509.96 1432.16 1514.25 1432.14
 1521.87 1432.18 1529.22 1432.11 1536.96 1432.18 1551.23 1432.19 1556.88 1432.3
 1576.87 1432.43 1580.82 1432.4 1587.05 1432.42 1592.16 1432.49 1599.2 1432.47
 1604.14 1432.5 1611.85 1432.43 1617.06 1432.43 1627.98 1432.28 1630.25 1431.96
 1633.04 1432.02 1639.07 1431.95 1648.28 1431.97 1651.06 1431.94 1653.65 1431.98
 1657.99 1431.95 1664.54 1431.95 1668.12 1432.06 1672.2 1432.03 1683.52 1432.06
 1686.23 1432.02 1698.93 1432.04 1704.36 1432.08 1715.79 1432.1 1718.59 1432.14
 1731.28 1432.14 1733.86 1432.12 1749.14 1432.09 1751.04 1432.11 1764.81 1432.19
 1768.6 1432.16 1783.42 1432.16 1784.03 1432.17 1801.67 1432.18 1802.57 1432.2
 1803.46 1432.23 1808.16 1432.31 1809.1 1432.3 1813.55 1432.36 1814.57 1432.36
 1815.91 1432.38 1824.17 1432.28 1824.25 1432.27 1824.5 1432.27 1824.64 1432.28
 1827.19 1432.25 1849.05 1432.43 1861.64 1432.47 1883.83 1432.35 1885.73 1432.35
 1896.53 1432.39 1906.78 1432.35 1907.71 1432.34 1912.94 1432.33 1921.01 1432.45
 1939.83 1432.57 1944.34 1432.62 1961.55 1432.63 1968.6 1432.56 1968.77 1432.62
 1989.03 1432.48 1989.3 1432.47 1991.34 1432.47 1999.24 1432.52 2029.27 1432.83
 2044.74 1432.81 2113.92 1433.12 2170.58 1433.24 2200.81 1433.68 2254.16 1433.92
 2306.17 1434.3 2317.93 1434.44 2372.94 1434.86 2378.86 1434.99 2385.9 1434.95
 2397.01 1435 2449.2 1435.56 2451.92 1435.57 2453.32 1435.6 2454.68 1435.64
 2455.67 1435.7 2458.17 1435.72 2463.51 1435.86 2489.33 1436.42 2496.58 1436.52
 2498.52 1436.58 2500.25 1436.72 2503.44 1436.83 2504.44 1436.93 2505.36 1436.99
 2505.67 1436.98 2505.85 1436.99 2507.94 1437 2508.26 1437.01 2509.7 1437.07
 2510.23 1437.11 2511.46 1437.18 2512.14 1437.21 2512.51 1437.24 2513.75 1437.31
 2515.01 1437.37 2540.57 1437.24 2541.19 1437.16 2542.76 1437.03 2543.19 1437.04
 2544.95 1437.11 2546.47 1437.19 2546.63 1437.2 2547.64 1437.28 2550.19 1437.6
 2554.63 1437.51 2556.64 1437.34 2559.14 1437.35 2606.79 1437.08 2607.89 1437.08
 2680.66 1437.62 2683.94 1437.62 2686.16 1437.66 2705.82 1437.92 2705.96 1437.92
 2706.09 1437.93 2706.18 1437.94 2714.31 1438.18 2714.92 1438.27 2719.33 1438.54
 2722.29 1438.46 2724.4 1438.48 2725.04 1438.52 2727.03 1438.5 2728.55 1438.44
 2729.39 1438.38 2732.57 1438.21 2733.13 1438.21 2735.09 1438.33 2737.42 1438.4
 2738.22 1438.46 2739.3 1438.46 2741.77 1438.82 2750.56 1438.85 2766.8 1439.35
 2768.51 1439.39 2772.15 1439.5 2774.99 1439.48 2803.73 1439.65 2804.56 1439.65
 2804.95 1439.66 2805.4 1439.66 2805.9 1439.67 2807.24 1439.65

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	0	2807.24		9.87	9.87	9.87		.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 289

Description:

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Station Elevation Data      num=      277
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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1432.86	56.31	1431.45	57.02	1431.45	57.83	1431.46	58.54	1431.47
59.34	1431.49	60.02	1431.54	60.34	1431.55	61.9	1431.54	64.75	1431.54
81.96	1431.53	85.42	1431.53	87.63	1431.56	88.14	1431.56	88.69	1431.74
88.78	1431.71	90.43	1431.76	128.35	1431.54	128.76	1431.54	131.67	1431.62
139.7	1431.74	142.74	1431.81	152.25	1431.65	154.3	1431.65	156.81	1431.71
165.43	1431.72	177.77	1431.72	185.44	1431.66	189.2	1431.56	190.44	1431.35
191.52	1431.51	193.26	1431.62	201.71	1431.44	212.31	1431.34	238.58	1431.29
241.77	1431.21	250.39	1431.25	259.07	1431.19	266.07	1431.15	270.07	1431.18
305.33	1431.36	316.34	1431.39	327.28	1431.37	369.13	1431.37	390.99	1431.38
415.91	1431.43	433.2	1431.59	444.09	1431.53	518.27	1431.73	531.17	1431.75
544.59	1431.65	555.15	1431.7	589.41	1431.73	599.19	1431.67	631.95	1431.7
646.52	1431.85	662.3	1431.91	696.49	1432.04	706.05	1432.07	744.04	1432.17
753.78	1432.18	759.34	1432.39	770.12	1432.43	798.15	1432.39	811.2	1432.43
835.44	1432.78	836.1	1432.84	860.83	1432.81	874.25	1432.79	908.92	1432.82
919.4	1432.9	926.22	1432.92	961.11	1432.96	968.11	1432.95	968.19	1432.95
1001.58	1433.09	1004.27	1433.12	1006.75	1433.12	1010	1433.15	1012.3	1433.17
1050.69	1433.35	1051.89	1433.36	1053.88	1433.35	1057.05	1433.29	1095.54	1433.36
1098.36	1433.42	1100.55	1433.42	1102.06	1433.43	1103.15	1433.41	1104.84	1433.43
1138.83	1433.47	1140.05	1433.46	1141.25	1433.48	1142.56	1433.48	1144.27	1433.47
1146.2	1433.46	1147.81	1433.47	1185.71	1433.46	1187.83	1433.43	1189.69	1433.44
1191.26	1433.44	1192.39	1433.45	1193.74	1433.52	1197.1	1433.51	1198.04	1433.5
1198.75	1433.49	1229.04	1433.54	1231.64	1433.57	1237.74	1433.64	1238.71	1433.65
1239.36	1433.59	1239.8	1433.56	1240.22	1433.52	1240.48	1433.53	1240.89	1433.52
1241.4	1433.51	1241.95	1433.52	1243.24	1433.51	1246.09	1433.55	1280.1	1433.78
1282.16	1433.81	1285.1	1433.81	1290.99	1433.8	1295.5	1433.85	1299.61	1433.87
1327.98	1434.07	1330.06	1434.09	1332.12	1434.13	1333.51	1434.14	1366.93	1434.33
1367.87	1434.34	1369.58	1434.33	1370.97	1434.42	1372.29	1434.43	1374.06	1434.45
1374.99	1434.46	1415.44	1434.55	1418.08	1434.56	1419.57	1434.54	1420.59	1434.53
1421.53	1434.5	1422.04	1434.52	1422.58	1434.57	1424.62	1434.58	1427.44	1434.58
1429.97	1434.57	1433.8	1434.48	1464.02	1434.41	1466.3	1434.37	1471.83	1434.33
1476.15	1434.33	1505.06	1434.25	1510.19	1434.27	1513.11	1434.3	1516.03	1434.29
1519.81	1434.33	1523.15	1434.31	1559.63	1434.36	1562.46	1434.38	1565.7	1434.36
1568.8	1434.39	1573.17	1434.34	1608.77	1434.28	1613.04	1434.28	1615.28	1434.3
1618.51	1434.29	1658.05	1434.14	1659.72	14				

Manning's	n	Values		num=	3
Sta	n	Val	Sta	n	Val
0	.015		0	.015	2807.24 .015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	2807.24		15.23	15.22	15.23	.1
							.3

Briggs Road Analysis
100 year Flood Plain
Page 8 of 23

RIVER: xs
 REACH: Site 1 RS: 273.78

INPUT

Description:

Station	Elevation	Data	num=	113							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1431.46	20.93	1431.67	23.04	1431.61	87.91	1432.09	88.6	1432.09		
138.63	1432.15	141.06	1432.16	149.71	1432.01	177.82	1431.99	194.97	1432.11		
247.43	1432.09	251.42	1432.08	307.34	1432.12	310.34	1432.11	366.65	1432.11		
415.55	1432.1	424	1432.1	478.13	1432.21	479.3	1432.22	539.1	1432.29		
540.06	1432.29	542.66	1432.3	593.52	1432.37	648.01	1432.45	649.96	1432.46		
699.69	1432.58	750.14	1432.71	752.41	1432.72	779.19	1432.88	824.29	1433.03		
863.71	1433.18	864.53	1433.15	870.04	1433.18	920.4	1433.31	968.45	1433.47		
974.6	1433.49	1021.15	1433.65	1067.21	1433.75	1079.64	1433.79	1124.61	1433.91		
1138.65	1433.93	1178.79	1433.95	1190.91	1433.94	1195.38	1433.97	1202.21	1433.98		
1237.69	1434.13	1240.75	1434.14	1278	1434.35	1286.64	1434.42	1296	1434.46		
1302.32	1434.53	1328.53	1434.68	1340.85	1434.76	1347.02	1434.75	1368.28	1434.94		
1395.93	1435.02	1410.3	1435.08	1411.73	1435.12	1445.51	1435.12	1451.53	1435.16		
1452.14	1435.07	1496.19	1434.93	1507.67	1434.87	1532.73	1434.8	1556.48	1434.78		
1582.71	1434.68	1613.98	1434.63	1635.94	1434.59	1661.12	1434.59	1689.48	1434.58		
1719.93	1434.55	1754.02	1434.61	1788.35	1434.73	1824.39	1434.79	1856.15	1434.81		
1892.96	1434.75	1929.04	1434.58	1958.4	1434.47	1986.07	1434.46	2012.32	1434.48		
2038.7	1434.51	2044.34	1434.53	2092.37	1434.79	2115.88	1434.95	2138.16	1435.12		
2161.52	1435.26	2191.38	1435.5	2226.64	1435.75	2234.38	1435.83	2261.17	1436.1		
2281.17	1436.33	2329.74	1436.83	2377.21	1437.2	2426.52	1437.63	2434.13	1437.7		
2463.93	1438	2480.21	1438.16	2480.56	1438.16	2516.74	1438.58	2528.56	1438.71		
2571.82	1439.12	2572.03	1439.12	2601.83	1439.27	2765.89	1440.05	2766.17	1440.04		
2766.84	1440.05	2767.58	1440.03	2772.26	1439.8	2772.84	1439.82	2778.9	1440.06		
2780.37	1440.07	2790.36	1439.97	2807.24	1439.96						

Manning's n	Values	num=	3								
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.015	0	.015	2807.24	.015						

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
0	2807.24		11.38	11.38	11.38	.1	.3	

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 262.4

INPUT

Description:

Station	Elevation	Data	num=	100							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1432.84	35.08	1431.62	52.27	1431.75	58.33	1431.75	58.36	1431.71		
177.71	1431.8	181.63	1431.83	188.22	1431.82	195.26	1431.82	307.17	1431.93		
318.02	1431.94	327.9	1431.93	415.19	1431.91	423.29	1431.91	430.76	1431.92		
433.82	1431.94	557.6	1432.16	567.74	1432.17	569.3	1432.17	576.43	1432.18		
583.7	1432.19	678.13	1432.5	683.67	1432.52	689.29	1432.53	791.68	1432.84		
794.61	1432.86	799.55	1432.87	803.86	1432.89	803.95	1432.89	900.82	1433.25		
905.51	1433.27	909.99	1433.28	998.76	1433.62	1001.96	1433.63	1005.12	1433.64		
1009.68	1433.65	1014.97	1433.66	1234.34	1434.1	1234.77	1434.09	1234.92	1434.1		
1235.66	1434.1	1237.43	1434.11	1347.39	1434.74	1348.27	1434.75	1349.01	1434.75		
1349.96	1434.76	1453.74	1435.07	1454.73	1435.07	1519.56	1434.69	1530.61	1434.62		
1531.67	1434.62	1531.73	1434.61	1532.16	1434.61	1532.23	1434.6	1532.35	1434.62		
1532.85	1434.61	1580.39	1434.54	1697.01	1434.35	1698.01	1434.35	1773.6	1434.39		
1997.93	1434.54	2001.05	1434.5	2002.29	1434.5	2006.95	1434.51	2057.04	1434.68		
2075.53	1434.77	2135.88	1435.18	2241.64	1435.81	2243	1435.82	2244.61	1435.83		
2244.96	1435.84	2246.18	1435.85	2247.09	1435.86	2249.3	1435.88	2251.47	1435.9		
2253.72	1435.92	2601.17	1438.77	2607.26	1438.83	2613.99	1438.91	2619.86	1438.96		
2622.29	1439.26	2664.47	1439.37	2694.78	1439.52	2737.87	1439.69	2738.03	1439.69		
2741.09	1439.7	2744.62	1439.72	2748.39	1439.74	2752.19	1439.76	2755.81	1439.77		
2760.5	1439.88	2764.01	1439.89	2767.28	1439.93	2770.43	1439.99	2772.87	1439.87		
2776.32	1439.95	2779.1	1440.07	2784.55	1440.1	2788.45	1440.06	2807.24	1440.05		

Manning's n	Values	num=	3								
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Sta	n Val	Sta	n Val	Sta	n Val
0	.015	0	.015	2807.24	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	2807.24		8.62	8.62		.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 253.78

INPUT

Description:

Station	Elevation	Data	num=	414					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1430.75	29.43	1430.94	29.94	1430.95	71.05	1431.2	75.84	1431.15
95.57	1430.84	97.15	1430.97	99.18	1431.14	99.24	1431.14	101.15	1431.18
104.59	1431.41	111.86	1431.57	114.83	1431.64	115.69	1431.65	116.48	1431.67
117.22	1431.71	118.46	1431.76	121.38	1431.68	148.77	1431.81	150.49	1431.87
150.82	1431.86	152.98	1431.81	157.01	1431.75	160.2	1431.75	167.09	1431.63
168.95	1431.6	172.4	1431.6	173.85	1431.56	174.7	1431.55	176.74	1431.48
177.36	1431.34	179.65	1430.97	181.52	1430.94	184.26	1430.83	190.37	1430.61
190.8	1430.61	203.81	1430.68	208.72	1430.65	215.99	1430.75	236.28	1430.55
237.28	1430.57	237.69	1430.57	262.38	1430.7	293.06	1431.09	295.65	1431.09
297.63	1431.1	329.1	1431.47	335.34	1431.48	350.04	1431.44	357.43	1431.4
365.54	1431.47	391.38	1431.61	406.05	1431.53	415.9	1431.69	433.31	1431.69
447.83	1431.66	464.46	1431.62	483.8	1431.5	502.15	1431.52	514.25	1431.49
535.21	1431.39	553.62	1431.39	571.07	1431.44	593.73	1431.72	603.28	1431.76
627.32	1431.82	654.39	1431.95	673.07	1431.98	674.27	1431.99	714.8	1432.35
756.79	1432.35	757.63	1432.36	790.83	1432.65	791.45	1432.65	818.69	1432.68
829.71	1432.69	859.47	1432.91	862.93	1432.93	862.96	1432.93	894.59	1432.96
895.7	1432.96	941.28	1433.31	942.63	1433.34	943.18	1433.32	972.26	1433.33
974.56	1433.34	974.75	1433.34	979.58	1433.35	982.7	1433.37	987.39	1433.36
996.7	1433.46	1002.09	1433.47	1005.35	1433.49	1010.13	1433.48	1019.13	1433.65
1022.75	1433.69	1033.98	1433.86	1037.3	1433.86	1048.16	1433.87	1058.73	1433.74
1062.98	1433.75	1077.1	1433.64	1079.85	1433.65	1093.18	1433.6	1096.41	1433.58
1109.27	1433.58	1112.76	1433.57	1116.37	1433.58	1118.87	1433.58	1122.12	1433.55
1125.02	1433.54	1127.19	1433.56	1129.64	1433.56	1132.8	1433.55	1134.99	1433.5
1141.29	1433.47	1143.71	1433.48	1149.57	1433.41	1162.09	1433.58	1164.87	1433.6
1176.12	1433.58	1178.9	1433.57	1181.81	1433.59	1187.02	1433.58	1192.1	1433.84
1196.09	1433.82	1205.44	1433.82	1209.92	1433.72	1212.24	1433.6	1214.53	1433.61
1217.2	1433.61	1222.59	1433.67	1224.81	1433.68	1225.47	1433.67	1226.21	1433.68
1228.43	1433.66	1232.97	1433.86	1237.52	1433.92	1240.45	1433.96	1243.52	1433.95
1255.53	1433.9	1265.36	1434.04	1270.22	1434.08	1277.67	1434.03	1281.2	1433.98
1289.32	1434.17	1297.63	1434.18	1302.87	1434.13	1311.94	1434.15	1317.78	1434.2
1324.43	1434.15	1330.74	1433.94	1332.54	1433.96	1333.72	1433.96	1337.85	1433.91
1337.93	1433.9	1339.66	1433.87	1340.3	1433.87	1341.41	1433.82	1345.7	1433.73
1345.87	1433.73	1346.02	1433.72	1346.09	1433.72	1348.52	1433.83	1349.41	1433.83
1355.3	1433.88	1357.37	1433.91	1362.93	1433.99	1366.73	1434.03	1374.67	1434.04
1377.56	1434.04	1378.28	1434.03	1390.17	1434.1	1391.17	1434.08	1392.08	1434.08
1395.6	1434.02	1396.33	1434.01	1397.12	1434.02	1397.69	1434.06	1398.27	1434.08
1398.95	1434.1	1405.41	1432.59	1405.54	1432.59	1405.61	1432.6	1405.71	1432.61
1407.04	1433.18	1407.79	1433.19	1409.68	1433.5	1410.44	1433.53	1411.14	1433.56
1412.22	1433.5	1413.08	1433.54	1414.21	1433.57	1417.23	1433.58	1418.11	1433.61
1418.95	1433.61	1422.38	1433.7	1424.34	1433.82	1429.72	1434.06	1430.86	1434.14
1434.94	1434.33	1435.57	1434.36	1439.51	1434.61	1442.18	1434.65	1446.32	1434.57
1450.66	1434.65	1454.4	1434.7	1459.97	1434.36	1463	1434.34	1481.09	1434.34
1491.77	1434.27	1496	1434.24	1496.47	1434.24	1508.68	1434.06	1509.5	1434.05
1518.1	1433.94	1524	1433.92	1530.47	1433.91	1532.54	1433.92	1538.76	1433.81
1541.27	1433.7	1541.7	1433.65	1542.48	1433.65	1547.38	1433.44	1552.01	1433.3
1554.32	1433.27	1574.26	1433.2	1575.16	1433.19	1586.53	1433.07	1587.6	1433.07
1593.31	1433.09	1598.77	1433.04	1601.95	1432.99	1605.89	1433.05	1607.26	1433.05
1610.35	1433.31	1610.71	1433.35	1613.43	1433.51	1614.08	1433.57	1615.88	1433.6
1616.86	1433.66	1620.09	1433.53	1621.18	1433.53	1623.1	1433.18	1623.36	1433.17
1623.56	1433.07	1623.76	1433.07	1628.01	1433.13	1631.01	1433.06	1634.7	1433.08
1641.89	1433.08	1644.2	1433.17	1644.33	1433.18	1644.46	1433.18	1644.69	1433.2
1648.46	1433.1	1648.61	1433.11	1650.16	1433.13	1650.37	1433.15	1652.2	1433.26
1652.57	1433.27	1654.45	1433.55	1655.66	1433.57	1657.69	1433.7	1659.22	1433.69
1660.23	1433.63	1662.14	1433.61	1662.96	1433.54	1665.33	1433.44	1665.91	1433.38
1666.43	1433.36	1668.62	1433.26	1668.88	1433.26	1671.59	1433.17	1671.74	1433.18

1671.82	1433.18	1674.55	1433.21	1674.75	1433.2	1674.93	1433.2	1679.4	1433.46
1680.14	1433.51	1680.83	1433.51	1682.51	1433.66	1683.13	1433.68	1683.84	1433.73
1684.65	1433.82	1685.67	1433.98	1686.66	1434.05	1687.49	1434.09	1688.2	1434.06
1688.74	1434.07	1689.68	1434	1690.44	1433.99	1691.41	1433.93	1692.82	1433.75
1694.36	1433.73	1697.03	1433.62	1699.05	1433.6	1700.3	1433.6	1701.71	1433.63
1704.24	1433.64	1706.09	1433.54	1708.15	1433.55	1710.55	1433.49	1711.69	1433.49
1712.84	1433.46	1719.07	1433.57	1720.61	1433.57	1721.65	1433.6	1723.09	1433.64
1724.45	1433.66	1725.38	1433.66	1735.44	1433.81	1753.21	1433.96	1764.1	1434.11
1774.63	1434.16	1789.71	1434.12	1804.07	1434.11	1826.21	1434.31	1850.7	1434.33
1858.9	1434.22	1908.62	1433.8	1916.03	1433.8	1920.61	1433.79	1924.32	1433.8
1927.05	1433.87	1928.94	1433.9	1931.27	1433.97	1933.33	1434.04	1935.29	1434.09
1940.32	1434.06	1942.96	1433.91	1948.49	1433.91	1951.27	1434.02	1951.8	1434
1952.26	1434	1952.9	1434.02	1953.75	1434.01	1954.37	1434	1955.2	1433.97
1956.46	1433.96	1957.9	1433.95	1959.43	1433.95	1962.82	1433.93	1963.75	1433.93
1964.78	1433.94	1965.59	1433.94	1967.46	1434	1988.45	1433.91	1990.31	1433.86
1994.14	1433.87	1996.73	1433.9	2057.18	1434.03	2064.73	1434.07	2071.21	1434.12
2151.54	1434.79	2156.01	1434.85	2157.19	1434.8	2172.32	1434.87	2188.58	1435.09
2213	1435.09	2224.94	1435.24	2409.59	1437	2414.37	1437.02	2464.28	1437.34
2470.48	1437.4	2472.52	1437.4	2556.26	1437.72	2569.1	1437.81	2569.95	1437.93
2583.68	1438.14	2607.36	1438.58	2611.86	1438.69	2624.7	1438.78	2627.22	1438.75
2628.71	1438.67	2628.78	1438.66	2628.96	1438.7	2629.53	1438.83	2630.92	1439.19
2631.25	1439.24	2632.83	1439.24	2638.64	1439.2	2648.17	1439.13	2649.91	1439.12
2654.27	1438.97	2654.89	1438.94	2656.24	1438.93	2658.4	1438.92	2662.46	1438.95
2668.52	1438.94	2717.22	1438.93	2728.3	1438.95	2731.19	1438.95	2742.79	1439.14
2743.41	1439.17	2745.77	1439.09	2747.34	1439.16	2753.53	1439.75	2753.98	1439.8
2754.19	1439.82	2754.77	1439.82	2758.49	1439.79	2761.39	1439.76	2761.97	1439.76
2767.79	1439.82	2773.39	1439.93	2773.62	1439.91	2779.26	1440.06	2779.54	1440.07
2782.99	1440.09	2787.85	1440.09	2803.53	1439.99	2807.24	1439.94		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	2807.24		6.3	6.3	.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 247.48

INPUT

Description:

Station Elevation Data		num= 390	
Sta	Elev	Sta	Elev
0	1428.6	1.14	1428.6
99.06	1429.25	99.39	1429.25
103.19	1431.05	105.6	1431.23
123.7	1431.73	125.1	1431.78
137.02	1431.81	137.91	1431.81
141.2	1431.87	163.86	1431.5
170.33	1431.6	172.44	1431.31
180.43	1429.78	181.43	1429.79
192.48	1430.1	197.25	1430.36
207.99	1431	219.39	1430.87
283.63	1431.08	294.84	1431.11
345.1	1431.46	358.32	1431.37
424.4	1431.63	430.66	1431.69
504.38	1431.53	512.12	1431.51
591.83	1431.77	600.18	1431.77
676.99	1431.99	707.88	1432.26
784.64	1432.59	795.02	1432.59
868.87	1432.96	892.27	1432.98
947.29	1433.28	959.03	1433.28
990.58	1433.43	994.38	1433.46
1014.1	1433.61	1028.05	1433.74
1051.58	1433.76	1066.67	1433.79
1100.41	1433.68	1105.81	1433.68
1121.61	1433.63	1122.52	1433.64
1137.38	1433.58	1149.28	1433.62
		1151.82	1433.59
		1157.24	1433.66
		1168.07	1433.75

0	1429.34	8.54	1429.44	49.29	1429.92	60.76	1429.95	69.73	1429.76
92.22	1429.92	94.97	1429.93	97.28	1430.04	100.19	1430.6	100.36	1430.72
101.37	1430.82	102.49	1430.91	108.35	1431.41	114.53	1431.55	123.84	1431.76
125.81	1431.8	127.95	1431.75	140.02	1431.86	142.08	1431.86	149.34	1431.72
161.5	1431.48	162.41	1431.5	168.76	1431.66	169.96	1431.48	174.1	1430.82
174.13	1430.82	179.25	1429.98	180.56	1429.8	181.27	1429.85	184	1429.74
184.39	1429.79	185.2	1429.78	191.31	1430.68	195.13	1430.73	195.65	1430.76
196.64	1430.82	201.12	1430.88	206.59	1431.02	217.37	1430.9	225.68	1430.89
240.18	1430.71	257.06	1430.81	278.03	1431.07	294.29	1431.12	306.71	1431.14
327.9	1431.39	336.61	1431.4	348.22	1431.45	359.4	1431.38	374.73	1431.5
385.73	1431.45	407.87	1431.34	421.39	1431.57	433.02	1431.68	449.65	1431.64
462.15	1431.66	483.44	1431.53	501.25	1431.55	514.33	1431.51	536.04	1431.4
548.77	1431.46	568.48	1431.53	587.29	1431.76	601.08	1431.76	621.23	1431.84
634.87	1431.88	662.86	1431.93	678.51	1432	703.76	1432.22	719.7	1432.31
744.78	1432.32	760.71	1432.38	780.94	1432.56	797.05	1432.56	820.23	1432.59
836.1	1432.71	855.87	1432.85	872.27	1432.97	890.84	1432.99	908.25	1432.98
934.63	1433.19	945.33	1433.39	949.64	1433.25	951.2	1433.25	970.87	1433.33
971.19	1433.33	992.1	1433.46	992.39	1433.46	992.96	1433.47	993.29	1433.47
1010.71	1433.58	1010.84	1433.58	1011.08	1433.59	1021.03	1433.68	1029.5	1433.82
1031.35	1433.81	1038.6	1433.77	1046.71	1433.78	1047.01	1433.78	1047.3	1433.77
1068.77	1433.82	1069.07	1433.82	1084.14	1433.87	1084.66	1433.87	1102.69	1433.74
1103.71	1433.74	1118.62	1433.68	1119.71	1433.68	1133.56	1433.65	1134.23	1433.65
1135.02	1433.64	1152.49	1433.7	1153.07	1433.7	1154.32	1433.71	1169.88	1433.84
1170.75	1433.83	1184.99	1433.8	1185.69	1433.8	1186.13	1433.82	1206.74	1433.74
1207.62	1433.74	1208.04	1433.73	1208.25	1433.72	1208.72	1433.72	1230.96	1433.99
1231.66	1433.99	1232.21	1434.01	1233.12	1434.02	1237.6	1434.01	1253.04	1433.95
1253.88	1433.95	1254.57	1433.96	1264.26	1434.04	1273.97	1434.22	1279.84	1434.31
1287.65	1434.25	1295.38	1434.22	1302.7	1434.2	1311.2	1434.18	1321.06	1434.12
1325.8	1434.07	1331.48	1434.02	1331.58	1434.02	1336.36	1434.03	1336.54	1434.03
1336.62	1434.02	1339.79	1434.03	1339.89	1434.02	1340.29	1434.02	1342.89	1433.99
1347.95	1433.97	1348.52	1433.99	1350.52	1433.98	1352.4	1434	1356.55	1434
1359.3	1434.05	1364.78	1434.16	1368.85	1434.22	1375.78	1434.28	1378.43	1434.3
1379.92	1434.3	1381.48	1434.31	1385.98	1434.22	1390.09	1434.23	1393.75	1434.17
1397.03	1434.2	1397.82	1434.17	1398.56	1434.17	1400.14	1434.16	1400.9	1434.16
1402.25	1434.19	1403.4	1434.18	1406.16	1434.27	1407.33	1434.28	1410.18	1434.28
1411.73	1434.27	1413.37	1434.24	1416.13	1434.24	1418.24	1434.15	1420.97	1434.01
1425.81	1433.99	1431.48	1434.06	1432.87	1434.07	1434.37	1434.08	1435.81	1434.09
1437.05	1434.1	1440.22	1434.02	1441.24	1433.98	1442.29	1434.08	1443.86	1434.11
1446.26	1433.95	1449.17	1433.74	1451.28	1433.63	1454.18	1433.88	1456.58	1434.01
1458.26	1434.14	1462.08	1433.82	1463.2	1433.91	1465.91	1433.98	1470.33	1433.92
1474.95	1433.93	1479.55	1433.99	1484.33	1433.99	1486.97	1433.95	1496.86	1433.97
1501.25	1433.91	1508.57	1433.79	1514.08	1433.77	1521.07	1433.78	1524.01	1433.79
1569.06	1433.29	1572.6	1433.26	1578.96	1433.19	1585.23	1433.17	1590.01	1433.17
1634.06	1433.11	1639.4	1433.1	1646.78	1433.12	1663.16	1433.17	1664.98	1433.13
1666.62	1433.13	1667.66	1433.12	1668.4	1433.12	1669.32	1433.11	1671.12	1433.11
1713.34	1433.27	1714.29	1433.27	1715.67	1433.28	1717.14	1433.29	1718.62	1433.3
1719.68	1433.31	1722.62	1433.35	1732.24	1433.42	1762.91	1433.7	1772.29	1433.7
1784.96	1433.68	1806.88	1433.71	1907.77	1433.69	1913.94	1433.61	1923.75	1433.61
1925.48	1433.66	1926.57	1433.67	1928.13	1433.72	1929.48	1433.77	1930.69	1433.8
1933.43	1433.78	1941.84	1433.79	1958.2	1433.78	1960.73	1433.84	1961.56	1433.84
1962.39	1433.83	1963.25	1433.81	1964.07	1433.82	1964.91	1433.83	1967.4	1433.83
1968.05	1433.82	1973.1	1433.75	1973.87	1433.74	1979.72	1433.59	2004.18	1433.62
2020.73	1433.81	2036.58	1433.84	2084.79	1434.14	2112.88	1434.34	2126.72	1434.44
2157.47	1434.84	2164.31	1434.58	2194.25	1435.04	2220.43	1435.42	2235.44	1435.69
2255.91	1435.87	2266.98	1435.89	2379.94	1436.45	2394.86	1436.52	2406.79	1436.63
2409.82	1436.67	2416.55	1436.66	2424.68	1436.73	2537.03	1437.53	2551.84	1437.55
2564.83	1437.66	2565.59	1437.76	2576.32	1437.93	2619.24	1438.61	2622.3	1438.69
2624.63	1438.7	2625.72	1438.69	2626.45	1438.69	2629.84	1438.73	2630.64	1438.76
2630.98	1438.8	2631.74	1438.9	2632.96	1439.08	2644.59	1439.08	2647.7	1438.93
2651.18	1438.84	2653.34	1438.8	2656.9	1438.75	2671.4	1438.8	2721.02	1438.89
2736.72	1438.76	2740.8	1438.76	2742.02	1438.79	2743.39	1438.9	2744.29	1438.97
2744.93	1439.04	2749.26	1439.38	2749.41	1439.38	2749.6	1439.39	2749.8	1439.38
2750.53	1439.36	2753.27	1439.32	2754.49	1439.5	2755.02	1439.56	2755.19	1439.63
2755.87	1439.87	2760.5	1439.88	2772.36	1440.01	2774.93	1439.81	2775.76	1439.72
2776.12	1439.75	2778.51	1439.82	2783.7	1439.86	2801.73	1440.11	2807.24	1440.12

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
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CROSS SECTION

INPUT

Station Elevation Data			num=		276							
Sta	Elev		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1431.69		8.98	1430.9	14.38	1430.94	26.78	1431.07	35	1431.21		
37.32	1431.21		39.43	1431.22	57.37	1431.12	59.48	1431.13	61.37	1431.14		
62.98	1431.16		64.33	1431.17	82.08	1431.27	82.78	1431.29	83.37	1431.3		
83.85	1431.31		91.24	1431.24	91.69	1431.25	92.06	1431.26	93.86	1431.25		
95.54	1431.25		95.95	1431.26	97.56	1431.25	97.98	1431.26	99.51	1431.26		
121.64	1431.69		123.29	1431.71	126.93	1431.79	127.46	1431.8	129.05	1431.83		
135.41	1431.75		137.87	1431.75	153.08	1431.59	155.82	1431.54	166.42	1431.49		
169.9	1431.55		172.39	1431.45	172.68	1431.44	175.63	1430.73	176.56	1430.52		
176.8	1430.47		178.81	1430.12	179.46	1430.38	181.42	1431.15	197.13	1431.1		
200.13	1431.09		202.25	1430.98	204.13	1431	205.88	1431.05	209.34	1431.01		
239.47	1430.99		243.9	1430.94	249.07	1430.96	255.48	1431.05	292.26	1431.15		
320.33	1431.2		326.1	1431.27	328.48	1431.27	361.07	1431.42	363.95	1431.4		
367.91	1431.43		400.77	1431.29	406.1	1431.26	409.35	1431.32	442.75	1431.63		
446.45	1431.62		480.77	1431.66	485.11	1431.64	488.73	1431.64	523.47	1431.53		
527.46	1431.51		562.81	1431.68	566	1431.69	569.06	1431.73	604.9	1431.73		
607.72	1431.74		644.28	1431.84	647.54	1431.85	684.87	1432	687.2	1432.02		
725.13	1432.26		726.78	1432.26	765.33	1432.42	766.1	1432.43	805.44	1432.42		
805.64	1432.42		816.78	1432.51	845.18	1432.72	845.51	1432.73	884.73	1433.03		
885.51	1433.03		924.27	1433.01	925.52	1433.01	926.71	1433.03	926.92	1433.07		
927.26	1433.03		947.03	1433.39	950.35	1433.36	964.05	1433.38	965.2	1433.38		
966.42	1433.39		980.97	1433.48	985.67	1433.51	991.37	1433.55	993.97	1433.55		
1006.51	1433.62		1007.98	1433.62	1009.95	1433.64	1024.17	1433.72	1029.99	1433.74		
1044.45	1433.78		1048.89	1433.78	1054.77	1433.8	1070.66	1433.81	1077.12	1433.83		
1085.6	1433.81		1087.5	1433.83	1105.07	1433.83	1109.59	1433.77	1111.07	1433.78		
1112.83	1433.81		1123.29	1433.79	1125.82	1433.8	1129.12	1433.79	1146.12	1433.72		
1150.35	1433.73		1163.31	1433.85	1165.73	1433.87	1169.82	1433.87	1180.03	1433.86		
1200.64	1433.97		1204.65	1433.97	1208.81	1434	1212.24	1433.98	1228.13	1434.01		
1233.83	1434.05		1237.73	1434.03	1243.94	1433.99	1247.99	1434	1251.21	1433.98		
1259.29	1433.99		1263.82	1433.99	1275.74	1434.01	1281.07	1433.99	1285.21	1433.98		
1287.27	1433.99		1288.52	1433.99	1289.5	1434	1299.74					

0	.03	0	.03	2807.24	.03
Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr. Expan.
0	2807.24	15	15	15	.1 .3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 213.78

INPUT

Description:

Station	Elevation	Data	num=	371							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1431.18	5.63	1430.42	14.96	1430.48	29.62	1430.64	36.34	1430.67		
41.17	1430.66	56.51	1430.66	62.24	1430.68	68.49	1430.7	71.47	1430.72		
73.6	1430.76	78.06	1430.84	81.69	1430.92	83.42	1430.9	86.95	1430.96		
89.81	1431.02	91.14	1431.02	93.7	1431.07	94.41	1431.07	96.6	1431.11		
97.36	1431.11	113.55	1431.43	116.51	1431.49	118.31	1431.52	119.37	1431.51		
120.91	1431.53	121.95	1431.54	123.24	1431.56	137.77	1431.61	140.77	1431.56		
141.13	1431.57	142.12	1431.57	147.63	1431.47	147.91	1431.47	151.25	1431.42		
157.83	1431.32	163.17	1431.27	163.8	1431.27	165.58	1430.93	166.79	1430.69		
169.29	1430.29	169.87	1430.69	171.51	1431.26	182.6	1431.22	205.64	1431.01		
237.35	1430.99	245.64	1431.04	254.13	1431.08	290.23	1431.19	316.3	1431.24		
325.56	1431.26	355.99	1431.4	365.65	1431.42	395.53	1431.29	405.66	1431.24		
435.08	1431.51	445.66	1431.57	474.62	1431.6	485.66	1431.66	514.17	1431.56		
525.66	1431.54	553.71	1431.67	565.67	1431.7	593.26	1431.7	605.67	1431.74		
632.8	1431.82	645.67	1431.86	658.84	1431.87	685.67	1431.99	711.89	1432.15		
725.68	1432.27	751.44	1432.38	765.68	1432.49	790.98	1432.49	805.68	1432.56		
830.53	1432.75	845.68	1432.81	870.07	1433	885.69	1433.06	909.62	1433.05		
925.69	1433.02	941.17	1433.29	943.82	1433.8	946.94	1433.49	950.23	1433.49		
958.95	1433.54	959.92	1433.56	968.96	1433.67	969.62	1433.69	970.02	1433.68		
970.2	1433.63	970.32	1433.63	970.49	1433.66	977.66	1433.68	978.42	1433.67		
981.37	1433.72	988.17	1433.77	990.98	1433.7	994.8	1433.71	998.16	1433.86		
1004.18	1433.86	1008.32	1433.9	1015.17	1434.04	1019.93	1434.23	1027.28	1434.12		
1031	1434.15	1041.52	1434.19	1043.35	1434.2	1054.41	1434.23	1057.09	1434.23		
1067.87	1434.21	1070.69	1434.22	1076.07	1434.44	1079.39	1434.47	1082.27	1434.48		
1084.51	1434.49	1086.25	1434.47	1089.26	1434.32	1093.93	1434.27	1098.32	1434.27		
1101.61	1434.36	1103.73	1434.25	1105.42	1434.23	1107.65	1434.27	1112.25	1434.18		
1113.38	1434.22	1114.82	1434.27	1117.01	1434.24	1121.29	1434.23	1125.47	1434.22		
1129.07	1434.08	1140.3	1433.98	1144.36	1433.97	1152	1434.01	1155.47	1434		
1162.45	1434.08	1166.28	1434.11	1170.86	1434.14	1181.24	1434.13	1184.88	1434.07		
1189.31	1434.21	1198.9	1434.25	1202.86	1434.39	1204.49	1434.27	1212.72	1434.35		
1214.15	1434.31	1215.38	1434.32	1216.65	1434.33	1218.08	1434.33	1219.88	1434.36		
1221.87	1434.38	1226.99	1434.43	1228.97	1434.46	1229.98	1434.45	1230.92	1434.5		
1232.06	1434.57	1233.11	1434.59	1234.67	1434.55	1235.84	1434.58	1237.86	1434.47		
1238.08	1434.46	1241.51	1434.5	1244.35	1434.45	1248.09	1434.52	1253.33	1434.57		
1254.4	1434.57	1259.63	1434.59	1261.53	1434.57	1264.2	1434.5	1265.83	1434.46		
1267	1434.41	1268.3	1434.39	1269.74	1434.4	1271.95	1434.36	1274.06	1434.29		
1276.33	1434.27	1278.13	1434.32	1283.98	1434.32	1285.18	1434.35	1285.97	1434.32		
1288.48	1434.27	1289.26	1434.27	1290.08	1434.23	1290.84	1434.2	1293.03	1434.17		
1293.67	1434.16	1294.54	1434.24	1295.25	1434.22	1296.18	1434.09	1296.26	1434.09		
1296.33	1434.08	1297.74	1434.08	1298.32	1434.09	1300.01	1434.13	1300.1	1434.13		
1301.84	1434.17	1302.49	1434.18	1305.87	1434.25	1308.07	1434.25	1309.46	1434.24		
1310.06	1434.24	1311.3	1434.21	1312.56	1434.24	1312.8	1434.24	1314.37	1434.25		
1314.53	1434.25	1316.19	1434.26	1318.35	1434.26	1319.65	1434.29	1321.52	1434.29		
1322.55	1434.3	1323.78	1434.28	1324.59	1434.29	1325.5	1434.3	1326.78	1434.32		
1328.2	1434.36	1329.29	1434.39	1330.49	1434.43	1330.96	1434.45	1332.93	1434.5		
1333.02	1434.51	1333.55	1434.51	1335.17	1434.53	1336.2	1434.44	1336.84	1434.5		
1337.78	1434.49	1338.29	1434.59	1338.62	1434.63	1339.83	1434.71	1343.22	1434.32		
1343.97	1434.24	1346.38	1434.23	1348.91	1434.22	1351.02	1434.2	1352.82	1434.22		
1355.5	1434.22	1357.92	1434.19	1359.77	1434.19	1361.43	1434.18	1362.52	1434.23		
1367.91	1434.3	1374.78	1434.33	1377.63	1434.32	1379.29	1434.36	1382.82	1434.73		
1383.77	1434.83	1383.97	1434.75	1385.31	1434.29	1389.4	1434.42	1393.23	1434.65		
1395.09	1434.68	1395.44	1434.68	1398.85	1435.05	1399.58	1434.97	1400.79	1434.66		
1410.63	1434.52	1415.78	1434.53	1420.36	1434.58	1428.74	1434.79	1447.47	1434.67		
1454.33	1434.54	1456.1	1434.5	1457.25	1434.5	1472.56	1434.54	1486.54	1436.26		
1495.02	1436.78	1503.96	1436.77	1511.39	1437.37	1532.68	1437.03	1533.76	1437.01		
1534.58	1437	1535.37	1437	1578.48	1436.45	1582.29	1436.45	1624.31	1435.86		
1626.03	1435.85	1628.81	1435.82	1670.99	1435.46	1674.3	1435.45	1724.39	1435.57		

1726.42	1435.57	1760.15	1435.65	1761.76	1435.64	1763.73	1435.64	1800.54	1435.74
1803.01	1435.73	1837.89	1435.12	1840.65	1435.12	1879.89	1434.74	1883.16	1434.71
1886.51	1434.72	1923.69	1434.68	1930.32	1434.54	1931.7	1434.53	1951.63	1434.84
1956.17	1434.86	1976.68	1434.79	1981.23	1434.8	1999.6	1434.99	2000.44	1434.99
2020.96	1434.65	2034.37	1434.41	2052.41	1434.49	2053.17	1434.54	2053.72	1434.39
2054.04	1434.28	2054.93	1434.47	2054.99	1434.49	2055.51	1434.48	2056.08	1434.49
2057.79	1434.5	2058.69	1434.48	2060.06	1434.48	2067.23	1434.55	2075.2	1434.58
2097.41	1434.72	2164	1435.22	2167.18	1435.29	2248.14	1435.93	2335.79	1436.53
2425.27	1437.08	2479.9	1437.39	2559.07	1437.79	2600.31	1438.06	2608.37	1438.19
2626.46	1438.82	2630.41	1438.96	2633.09	1438.93	2633.42	1438.93	2638.82	1439
2639.38	1439	2640.14	1439.01	2641.16	1439.02	2642.49	1439.04	2651.41	1439.14
2651.84	1439.14	2652.76	1439.16	2653.07	1439.16	2660.76	1439.21	2692.88	1439.32
2695.24	1439.32	2696.88	1439.34	2700.95	1439.31	2722.44	1439.18	2726.81	1439.14
2728.07	1439.14	2729.23	1439.13	2730.26	1439.19	2744.04	1439.28	2744.79	1439.28
2744.83	1439.29	2744.88	1439.29	2744.95	1439.3	2745.32	1439.32	2750.04	1439.68
2750.47	1439.68	2751.37	1439.71	2751.89	1439.67	2753.16	1439.73	2754.62	1440.01
2754.76	1440.03	2755.19	1440.18	2761.92	1440.2	2771.43	1440.26	2772.22	1440.25
2775.36	1440.19	2803.83	1440.22	2805.58	1440.24	2806.63	1440.24	2807.04	1440.23
2807.24	1440.23								

Manning's	n	Values	num=	3
Sta	n	Val	Sta	n
0	.03	0	.03	2807.24
				.03

Bank	Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	0	2807.24		15	15		15		.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 198.78

INPUT

Description:

Station	Elevation	Data	num=	354
Sta	Elev	Sta	Elev	Sta
0	1431.1	5.8	1430.31	11.06
1430.35	19.33	1430.44	40.62	1430.54
43.32	1430.53	51.87	1430.53	55.07
64.79	1430.61	80.73	1430.75	82.83
91.07	1430.89	95.14	1430.96	95.46
105.39	1431.16	108.78	1431.22	109.13
147.36	1431.34	152.61	1431.26	157.23
162.39	1430.63	162.83	1430.67	163.54
205.82	1430.93	222.69	1430.92	245.82
301.71	1431.25	325.78	1431.32	341.33
405.83	1431.23	420.42	1431.37	445.83
499.51	1431.6	525.84	1431.55	539.05
605.84	1431.77	618.14	1431.8	645.83
697.23	1432.03	725.85	1432.29	736.78
805.86	1432.7	815.87	1432.77	845.86
894.96	1433.09	925.86	1433.03	934.89
960.37	1433.5	964.38	1433.49	965.36
976.01	1433.47	977.27	1433.75	977.5
980.51	1433.47	985.16	1433.48	988.46
990.7	1433.67	993.31	1433.65	998.01
1005.72	1433.97	1006.52	1434.11	1007.69
1009.12	1433.78	1018.57	1433.99	1019.22
1030.86	1433.89	1031.17	1433.89	1033.68
1036.62	1433.86	1037.17	1433.79	1042.92
1052.54	1434.02	1053.94	1434.01	1059.6
1065.05	1434.14	1066.28	1434.48	1067.38
1080.03	1434.17	1080.72	1434.18	1081.35
1084.25	1434.19	1085.72	1434.14	1092.87
1098.03	1434.54	1098.91	1434.22	1099.57
1115.42	1434.06	1116.24	1434.17	1117.37
1119.91	1434.01	1124.71	1434.01	1129.28
1131.56	1434.61	1131.63	1434.58	1132.46
1147.66	1434.14	1148.32	1434.17	1149.01
1161.48	1434.09	1162.1	1434.08	1162.54
1173.51	1433.9	1174.73	1434.11	1175.56

1186.66	1434.04	1189.78	1434.07	1190.66	1434.23	1191.87	1434.41	1192.21	1434.29
1192.99	1434.08	1195.13	1434.1	1203.34	1434.15	1204.32	1434.15	1206.13	1434.14
1207.31	1434.17	1208.16	1434.17	1219.52	1434.12	1219.6	1434.12	1219.69	1434.13
1222.11	1434.31	1222.84	1434.21	1223.45	1434.06	1224.57	1434.1	1224.64	1434.1
1233.95	1434.2	1237.99	1434.16	1240.46	1434.14	1249.19	1434.17	1249.91	1434.18
1250.69	1434.3	1252.36	1434.54	1253.24	1434.29	1253.69	1434.13	1255.82	1434.16
1256.7	1434.17	1257.59	1434.18	1268.05	1434.2	1274.81	1434.17	1278.55	1434.21
1279.67	1434.21	1279.98	1434.28	1282	1434.65	1283.7	1434.3	1284.34	1434.17
1288.67	1434.13	1294.15	1434.08	1295.09	1434.08	1295.19	1434.09	1295.93	1434.09
1296.6	1434.08	1297.41	1434.08	1307.14	1434.21	1310.33	1434.26	1310.82	1434.29
1311.92	1434.31	1312.45	1434.38	1313.2	1434.28	1314.26	1434.16	1314.62	1434.15
1317.89	1434.17	1325.92	1434.19	1327.04	1434.4	1327.64	1434.53	1328.51	1434.39
1329.25	1434.21	1330.12	1434.22	1341.21	1434.27	1342.41	1434.27	1342.83	1434.28
1343.83	1434.28	1344.35	1434.29	1344.9	1434.29	1350.48	1434.32	1351.19	1434.32
1357.71	1434.25	1358.12	1434.28	1359.06	1434.28	1361.12	1434.3	1370.39	1434.25
1372.03	1434.24	1372.44	1434.29	1373.11	1434.35	1375.02	1434.28	1375.7	1434.26
1376.03	1434.27	1379.29	1434.43	1389.64	1434.5	1390.22	1434.61	1390.63	1434.66
1391.67	1434.72	1392.92	1434.89	1393.37	1434.58	1393.49	1434.51	1398.83	1434.5
1402.93	1434.51	1403.39	1434.6	1405.84	1435.18	1406.09	1435.1	1408.25	1434.7
1415.32	1434.85	1421.24	1434.99	1429.9	1434.9	1450.99	1434.76	1453.55	1434.71
1454.22	1434.7	1454.65	1434.7	1481.5	1434.76	1483.26	1434.98	1484.33	1435.05
1485.46	1435.05	1514.01	1437.32	1529.45	1437.07	1534.18	1436.98	1537.75	1436.98
1541.21	1436.96	1572.28	1436.56	1578.41	1436.57	1587.49	1436.58	1617.87	1436.15
1625.74	1436.1	1638.39	1435.99	1668.85	1435.73	1682.4	1435.66	1718.7	1435.75
1728.3	1435.74	1752.72	1435.79	1760.66	1435.75	1770.32	1435.75	1796.7	1435.82
1807.04	1435.76	1832.13	1435.32	1842.81	1435.35	1871.03	1435.08	1882.08	1434.98
1893.41	1434.99	1920.03	1434.97	1924.78	1434.87	1932.89	1434.83	1947.08	1435.05
1959.06	1435.08	1973.68	1435.03	1986.12	1435.08	1999.17	1435.21	2001.4	1435.21
2041.56	1434.54	2046.32	1434.42	2048.37	1434.46	2053.7	1434.59	2054.37	1434.28
2054.48	1434.22	2054.62	1434.25	2055.59	1434.46	2058.45	1434.45	2060.04	1434.42
2079.8	1434.54	2114.87	1434.81	2120.91	1434.94	2274.65	1436.16	2331.78	1436.55
2390.11	1436.9	2500.55	1437.54	2556.08	1437.82	2592.62	1438.06	2607.24	1438.26
2615.26	1438.47	2630.57	1439	2632.02	1438.98	2633.44	1438.99	2651.2	1439.22
2652.55	1439.23	2656.29	1439.39	2693.22	1439.82	2714.03	1439.64	2729.39	1439.47
2744.7	1439.61	2749.42	1439.81	2751.07	1439.92	2751.31	1439.92	2752.42	1439.97
2753.52	1440.18	2754.84	1440.38	2757.08	1440.39	2770.88	1440.49	2772.95	1440.47
2775.23	1440.42	2798.21	1440.45	2805.99	1440.52	2807.24	1440.52		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
0	2807.24		15	15	15	.1		.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 183.78

INPUT

Description:

Station	Elevation	Data	num= 394	Sta	Elev	Sta	Elev	Sta	Elev
0	1431.44	3.14	1430.59	5.98	1430.2	7.17	1430.21	9.04	1430.23
44.9	1430.4	48.62	1430.4	49.23	1430.41	49.91	1430.42	85.03	1430.72
85.42	1430.73	85.86	1430.73	86.36	1430.74	86.97	1430.75	87.73	1430.76
88.76	1430.78	89.81	1430.8	91.3	1430.83	93.72	1430.87	98.5	1430.96
107.22	1431.12	113.25	1431.16	125.97	1431.23	144.24	1431.33	149.97	1431.22
152.57	1431.18	153.42	1431.06	156.93	1430.65	157.71	1430.91	158.1	1431.01
164.99	1430.9	166.24	1430.92	203.15	1430.87	205.99	1430.84	208.04	1430.84
245.99	1431.07	284.84	1431.25	286.16	1431.26	287.12	1431.26	326	1431.37
326.67	1431.37	366	1431.44	366.22	1431.44	384.98	1431.34	405.76	1431.23
406	1431.23	445.31	1431.45	446.01	1431.45	484.85	1431.64	486.01	1431.63
524.4	1431.56	526.01	1431.56	563.94	1431.64	566.01	1431.65	603.49	1431.78
606.02	1431.78	643.14	1431.88	646	1431.9	648.93	1431.91	686.02	1431.96
722.12	1432.27	726.02	1432.29	730.01	1432.35	766.02	1432.64	770.49	1432.66
806.03	1432.81	840.76	1432.96	846.03	1432.98	880.3	1433.11	886.03	1433.17
919.85	1433.11	926.04	1433.15	935.84	1433.26	959.26	1433.65	959.86	1433.81
961.78	1434.34	964	1433.89	964.76	1433.68	965.14	1433.67	968.89	1433.72

974.2 1433.77 975.36 1433.96 976.05 1434.14 977.1 1434.39 977.52 1434.22
 978.76 1433.75 986.12 1433.78 988.92 1433.77 989.63 1433.9 991.67 1434.15
 992.74 1434.01 994.84 1433.71 997.26 1433.78 1000.09 1433.83 1003.42 1433.87
 1004.97 1434.13 1005.64 1434.21 1007.29 1434.02 1008.43 1433.85 1012.16 1433.91
 1018.21 1434.02 1019.07 1434.29 1020.37 1434.76 1021.82 1434.41 1023.54 1434.02
 1030.46 1434.02 1032.72 1434.04 1033.07 1434.1 1033.79 1434.39 1035.95 1434.81
 1037.03 1434.21 1037.54 1434.01 1038.07 1434.01 1040.5 1434.02 1048.85 1434.06
 1050.54 1434.59 1050.97 1434.67 1051.55 1434.61 1052.17 1434.54 1052.61 1434.45
 1052.92 1434.38 1053.3 1434.29 1054.05 1434.08 1061.27 1434.15 1063.36 1434.19
 1064.13 1434.36 1066.04 1434.88 1067.78 1434.45 1068.34 1434.32 1078.54 1434.17
 1079.32 1434.17 1081.36 1434.92 1081.38 1434.92 1081.42 1434.91 1084.52 1434.16
 1089.05 1434.19 1096.01 1434.25 1097.51 1434.83 1097.97 1434.84 1098.58 1434.76
 1099.88 1434.24 1101.92 1434.24 1105.7 1434.21 1105.74 1434.2 1105.75 1434.21
 1107.69 1434.55 1109.18 1434.31 1109.34 1434.28 1109.6 1434.28 1115.37 1434.2
 1115.62 1434.25 1117.45 1434.8 1118.01 1434.71 1119.43 1434.21 1124.55 1434.18
 1129.07 1434.3 1131.04 1434.8 1131.41 1434.88 1133.78 1434.25 1133.82 1434.25
 1133.99 1434.24 1143.99 1434.31 1145.51 1434.77 1146.51 1434.97 1147.1 1434.84
 1149.15 1434.27 1155.77 1434.23 1159.65 1434.21 1161.11 1434.4 1161.72 1434.47
 1162.45 1434.3 1162.94 1434.26 1163.38 1434.12 1166.48 1434.11 1173.4 1434.1
 1174.77 1434.28 1175.37 1434.41 1175.9 1434.43 1176.19 1434.49 1176.92 1434.37
 1177.44 1434.31 1178.24 1434.18 1180.09 1434.19 1188.74 1434.25 1190.8 1434.77
 1191.73 1434.96 1192.27 1434.83 1193.54 1434.42 1202.26 1434.4 1204.08 1434.4
 1204.34 1434.47 1204.41 1434.49 1204.48 1434.51 1204.65 1434.56 1205.07 1434.71
 1206.35 1435.11 1206.37 1435.1 1206.98 1434.91 1208.74 1434.34 1215.39 1434.27
 1219.01 1434.27 1220.86 1434.85 1221.87 1435.1 1222.34 1434.93 1223.71 1434.3
 1230.99 1434.21 1234.75 1434.24 1236.59 1434.77 1237.09 1434.85 1237.31 1434.81
 1238.12 1434.56 1238.25 1434.52 1238.93 1434.35 1239.14 1434.31 1239.27 1434.29
 1239.3 1434.29 1239.39 1434.26 1239.9 1434.26 1249.85 1434.27 1251.85 1434.86
 1251.95 1434.88 1252.09 1434.84 1254.12 1434.29 1258.24 1434.32 1264.22 1434.25
 1266.49 1434.95 1266.74 1435.03 1267.76 1434.73 1269.25 1434.29 1270.96 1434.3
 1279.03 1434.27 1280.51 1434.56 1281.12 1434.9 1281.69 1435.23 1281.77 1435.26
 1281.79 1435.24 1282.77 1434.71 1283.48 1434.42 1284.07 1434.23 1286.09 1434.24
 1290.04 1434.14 1294.43 1434.09 1296.32 1435 1296.78 1435.2 1297.25 1435.05
 1299.46 1434.25 1309.11 1434.21 1309.57 1434.21 1309.67 1434.24 1309.83 1434.29
 1310.17 1434.44 1311.8 1435 1312.42 1434.85 1313.01 1434.6 1313.48 1434.41
 1313.98 1434.27 1316.96 1434.26 1324.34 1434.28 1326.51 1434.63 1327.16 1434.71
 1327.79 1434.63 1328.92 1434.41 1335.71 1434.34 1339.51 1434.29 1340.55 1434.57
 1341.33 1434.83 1342.46 1434.61 1343.77 1434.4 1350.29 1434.39 1351.31 1434.41
 1352.4 1434.41 1355.46 1434.38 1355.95 1434.36 1356.77 1434.36 1357.24 1434.35
 1358.2 1434.34 1360.38 1434.29 1361.78 1434.25 1364.66 1434.2 1366.88 1434.49
 1367.5 1434.55 1368.74 1434.39 1370.17 1434.22 1372.58 1434.22 1374.96 1434.19
 1380.01 1434.31 1380.88 1434.45 1382.97 1434.76 1384.1 1434.94 1385.29 1434.6
 1385.51 1434.53 1385.56 1434.52 1385.75 1434.51 1390.53 1434.46 1398.43 1434.45
 1398.88 1434.45 1399.38 1434.44 1399.64 1434.45 1399.99 1434.49 1402.07 1434.79
 1403.22 1434.65 1404.51 1434.55 1406.87 1434.55 1409.88 1434.65 1411.03 1434.99
 1412.06 1435.28 1412.6 1435.19 1414.51 1434.8 1425.84 1435.2 1426.47 1435.22
 1436.54 1435.11 1444.65 1435.01 1448.13 1434.97 1453.43 1434.86 1458.62 1434.87
 1483.31 1434.9 1491.05 1435.61 1495.87 1435.62 1516.63 1437.28 1526.22 1437.12
 1534.6 1436.96 1540.93 1436.95 1547.05 1436.92 1566.08 1436.68 1576.8 1436.69
 1592.69 1436.7 1611.43 1436.44 1625.45 1436.35 1647.97 1436.15 1666.7 1435.99
 1690.5 1435.88 1713 1435.93 1730.18 1435.91 1745.29 1435.94 1759.55 1435.86
 1776.91 1435.86 1792.86 1435.9 1811.06 1435.79 1826.38 1435.52 1844.98 1435.58
 1862.16 1435.41 1881 1435.25 1900.32 1435.27 1916.37 1435.26 1919.23 1435.19
 1934.07 1435.12 1942.53 1435.25 1961.95 1435.31 1970.69 1435.28 1991.01 1435.35
 1998.75 1435.43 2002.37 1435.42 2026.19 1435.03 2047.84 1434.5 2049.94 1434.54
 2054.18 1434.54 2054.43 1434.4 2054.83 1434.14 2054.97 1434.17 2056.12 1434.45
 2057.62 1434.41 2060.18 1434.35 2062.18 1434.37 2065.74 1434.39 2074.64 1434.59
 2301.15 1436.39 2327.77 1436.57 2354.95 1436.73 2521.19 1437.69 2553.09 1437.85
 2574.08 1437.99 2609.2 1438.46 2628.45 1438.96 2630.73 1439.04 2630.95 1439.03
 2633.47 1439.05 2646.35 1439.22 2653.17 1439.3 2672.16 1440.1 2689.57 1440.3
 2699.37 1440.22 2733.79 1439.84 2744.62 1439.93 2750.84 1440.2 2751.99 1440.23
 2752.27 1440.27 2754.48 1440.61 2760.67 1440.65 2770.33 1440.71 2773.67 1440.68
 2775.09 1440.65 2789.42 1440.67 2806.16 1440.82 2807.24 1440.82

Manning's	n	Values	num=	3
Sta	n	Val	Sta	n
0	.03	0	.03	2807.24

Bank	Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	0	2807.24		15	15.01		15		.1	.3

CROSS SECTION

RIVER: xs

REACH: Site 1

RS: 168.77

INPUT

Description:

Station	Elevation	Data	num=	380	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1432.73	5.46	1431.23	6.09	1430.17	16.89	1430.23	46.15	1430.37			
74.74	1430.63	86.15	1430.83	104.87	1431.13	111.25	1431.23	119.81	1431.25			
141.65	1431.35	145.53	1431.29	149.87	1431.21	153.82	1430.82	154.64	1430.74			
154.74	1430.76	156.36	1431.05	157.73	1431.02	160.75	1430.98	166.16	1430.88			
193.38	1430.85	206.16	1430.85	232.92	1431.01	246.17	1431.09	272.47	1431.22			
286.17	1431.27	312.01	1431.35	326.17	1431.39	351.56	1431.43	366.17	1431.47			
391.1	1431.34	406.18	1431.4	430.65	1431.53	446.18	1431.53	470.19	1431.64			
486.18	1431.58	509.74	1431.53	526.18	1431.54	549.28	1431.59	566.19	1431.66			
588.83	1431.74	606.19	1431.73	628.44	1431.79	646.18	1431.87	664.34	1431.96			
686.19	1431.99	707.47	1432.17	726.2	1432.26	745.35	1432.53	766.19	1432.7			
785.84	1432.79	806.2	1432.87	826.1	1432.96	846.21	1433.03	865.65	1433.11			
886.21	1433.31	905.19	1433.27	926.21	1433.43	958.1	1433.78	958.81	1433.79			
958.88	1433.81	960.27	1434.28	961.03	1434.55	962.43	1434.25	962.81	1434.14			
963.6	1433.98	967.22	1434.02	973.44	1433.99	975.6	1434.56	975.93	1434.61			
976.05	1434.59	977.93	1433.95	984.01	1433.9	988.51	1433.84	989.56	1434.05			
990.04	1434.16	990.85	1434.34	991	1434.42	991.1	1434.36	991.55	1434.31			
991.75	1434.26	992.1	1434.16	994.21	1433.85	998.64	1433.88	1002.62	1433.94			
1004.47	1434.19	1005.22	1434.28	1006.23	1434.1	1007.39	1433.91	1016.62	1433.99			
1018.09	1434.01	1018.49	1434.1	1018.76	1434.16	1020.63	1434.53	1021.15	1434.44			
1021.89	1434.42	1023.18	1434.15	1029.62	1434.18	1032.51	1434.18	1032.92	1434.31			
1035.32	1434.88	1035.79	1434.6	1037.03	1434.16	1045.01	1434.11	1048.69	1434.12			
1049.47	1434.32	1050.74	1434.82	1051.17	1434.71	1051.92	1434.42	1052.22	1434.32			
1053.26	1434.14	1061.96	1434.23	1062.66	1434.25	1062.76	1434.27	1065.37	1434.89			
1067.74	1434.29	1078.4	1434.29	1078.53	1434.33	1080.59	1435.01	1081.72	1434.75			
1083.52	1434.3	1088.69	1434.33	1095.45	1434.35	1096.93	1434.95	1097.17	1435.02			
1098.83	1434.48	1099.27	1434.35	1099.43	1434.28	1100.09	1434.29	1105.29	1434.46			
1105.64	1434.52	1106.84	1434.7	1106.98	1434.71	1109.1	1434.44	1109.11	1434.44			
1115.28	1434.34	1115.31	1434.34	1115.33	1434.35	1117.47	1434.82	1119.04	1434.48			
1119.45	1434.43	1126.55	1434.42	1128.98	1434.4	1129.74	1434.54	1131.59	1434.92			
1132.9	1434.68	1133.57	1434.51	1136.59	1434.47	1144.11	1434.33	1145.79	1434.9			
1146.61	1435.08	1148.11	1434.57	1149.42	1434.32	1154.16	1434.37	1159.57	1434.35			
1161.65	1434.58	1161.76	1434.59	1162.47	1434.44	1163.78	1434.23	1166.85	1434.21			
1173.37	1434.2	1176.13	1434.79	1176.17	1434.79	1177.5	1434.53	1178.34	1434.4			
1186.12	1434.33	1188.66	1434.34	1189.65	1434.56	1191.32	1435.02	1191.63	1434.94			
1192.73	1434.64	1193.37	1434.47	1201.96	1434.52	1204.23	1434.52	1204.91	1434.7			
1205.14	1434.76	1205.6	1434.9	1206.67	1435.2	1207.53	1434.93	1208.77	1434.57			
1212.19	1434.49	1218.83	1434.4	1221.34	1435.09	1221.48	1435.13	1222.06	1434.93			
1223.38	1434.42	1231.66	1434.48	1234.59	1434.45	1235.42	1434.73	1236.23	1435.02			
1236.88	1435.26	1237.78	1434.93	1238.25	1434.79	1238.74	1434.64	1239.32	1434.45			
1241.26	1434.44	1249.24	1434.47	1251.37	1435.07	1251.51	1435.12	1252.67	1434.69			
1253.35	1434.44	1253.45	1434.4	1253.92	1434.4	1263.94	1434.31	1265.71	1435.14			
1266.3	1435.27	1267.03	1435.01	1268.54	1434.33	1272.04	1434.31	1275.15	1434.33			
1278.72	1434.38	1279.69	1434.6	1281.34	1435.09	1281.56	1435.15	1283.36	1434.41			
1283.4	1434.4	1283.49	1434.4	1294.23	1434.39	1294.84	1434.63	1296.31	1435.2			
1298.61	1434.52	1299.14	1434.35	1305.39	1434.42	1309.02	1434.46	1309.66	1434.56			
1311.55	1435.08	1312.58	1434.62	1313.51	1434.42	1322.54	1434.34	1323.49	1434.34			
1323.64	1434.38	1324.76	1434.68	1326.04	1435.02	1326.3	1434.94	1328.51	1434.35			
1337.98	1434.49	1339.3	1434.51	1339.42	1434.56	1339.48	1434.57	1339.82	1434.66			
1341.29	1435.07	1343.57	1434.48	1343.61	1434.47	1343.63	1434.46	1343.77	1434.46			
1353.63	1434.48	1354.06	1434.59	1355.75	1435.08	1356.07	1435	1357.84	1434.51			
1357.94	1434.46	1358.1	1434.42	1358.45	1434.42	1359.86	1434.41	1362.96	1434.39			
1371.22	1434.33	1371.54	1434.45	1372.5	1434.66	1373.37	1434.41	1373.67	1434.35			
1383.55	1434.46	1386.31	1434.46	1386.51	1434.52	1387.36	1434.61	1388.48	1434.81			
1389.22	1434.67	1389.81	1434.59	1392.94	1434.53	1396.09	1434.53	1397.33	1434.65			
1397.61	1434.68	1397.87	1434.66	1399.9	1434.51	1400.08	1434.5	1400.22	1434.5			
1404.9	1434.57	1406.67	1434.61	1408.73	1435.4	1408.85	1435.45	1408.91	1435.44			
1410.99	1434.86	1414.36	1434.85	1416.98	1434.82	1418.37	1435.17	1418.64	1435.25			
1418.71	1435.24	1420.37	1434.82	1426.06	1435.06	1432.06	1435.39	1435.79	1435.35			
1454.27	1434.96	1472.39	1435	1483.91	1435.01	1500.7	1436.56	1511.15	1436.58			
1519.25	1437.23	1523	1437.17	1535.02	1436.94	1544.1	1436.93	1552.89	1436.88			
1559.87	1436.79	1575.19	1436.81	1597.89	1436.82	1604.99	1436.72	1625.16	1436.6			

1657.56	1436.31	1664.56	1436.25	1698.6	1436.09	1707.31	1436.11	1732.06	1436.07
1737.87	1436.09	1758.44	1435.98	1783.5	1435.97	1789.02	1435.98	1815.09	1435.83
1820.62	1435.73	1847.15	1435.81	1853.29	1435.75	1879.92	1435.52	1907.23	1435.55
1912.71	1435.54	1913.69	1435.52	1935.26	1435.41	1937.98	1435.46	1964.84	1435.54
1967.69	1435.53	1995.9	1435.63	1998.33	1435.65	2003.33	1435.64	2010.82	1435.51
2019.41	1435.31	2046.9	1434.59	2047.07	1434.6	2047.41	1434.62	2048.12	1434.62
2049.13	1434.64	2050.62	1434.65	2052.49	1434.67	2055.3	1434.76	2055.31	1434.76
2057.18	1434.38	2058.06	1434.4	2058.66	1434.44	2059.01	1434.45	2060.75	1434.53
2061.48	1434.74	2074.03	1434.98	2096.73	1434.97	2109.18	1435.17	2129.14	1435.23
2294.45	1436.42	2309.13	1436.52	2319.42	1436.6	2384.36	1436.93	2541.84	1437.84
2550.1	1437.88	2555.54	1437.92	2611.15	1438.66	2614.84	1438.75	2630.82	1439.15
2631.69	1439.1	2633.5	1439.11	2641.49	1439.21	2653.79	1439.36	2683.42	1440.61
2690.46	1440.72	2738.19	1440.2	2744.53	1440.26	2748.18	1440.42	2751.94	1440.52
2752.87	1440.65	2754.12	1440.84	2764.26	1440.9	2769.78	1440.94	2774.4	1440.9
2774.96	1440.88	2780.63	1440.89	2798.92	1441.06	2805.86	1441.2	2807.24	1441.2

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	0	2807.24		15	15	.1	.3

CROSS SECTION

RIVER: xs
 REACH: Site 1 RS: 153.77

INPUT

Description:

Station Elevation Data		num= 407	
Sta	Elev	Sta	Elev
0	1434.01	4.66	1432.73
60.09	1430.5	86.33	1430.96
125.35	1431.32	139.04	1431.33
155.79	1430.73	156.38	1430.82
178.72	1430.86	206.34	1430.88
286.34	1431.29	297.36	1431.32
376.45	1431.45	406.35	1431.56
486.35	1431.53	495.08	1431.51
574.17	1431.7	606.36	1431.68
686.37	1432.02	692.81	1432.08
801.19	1432.92	806.38	1432.94
886.38	1433.45	890.53	1433.44
960.11	1434.77	960.46	1434.9
968.78	1434.05	972.58	1434.07
977.15	1434.18	986.83	1433.97
989.85	1434.49	990.66	1434.42
1002.11	1434.01	1004.66	1434.66
1010.24	1434.08	1017.72	1434.09
1020.25	1434.95	1021.86	1434.45
1032.51	1434.37	1035.02	1435.2
1041.34	1434.35	1047.56	1434.34
1050.07	1435.21	1050.35	1435.11
1062.59	1434.5	1064.76	1435.05
1077.78	1434.44	1078.66	1434.73
1085.24	1434.38	1087.79	1434.39
1098	1434.65	1098.59	1434.47
1104.88	1434.57	1104.94	1434.58
1109.24	1434.5	1115.18	1434.51
1119.67	1434.58	1125.74	1434.61
1131.31	1435.35	1131.69	1435.24
1144.62	1434.67	1146.63	1435.04
1159.48	1434.47	1161.32	1434.82
1166.76	1434.39	1168.2	1434.38
1176.67	1434.84	1178.14	1434.47
1191.01	1434.99	1191.5	1434.87
1203.87	1434.6	1206.07	1435.23
1208	1434.9	1208.08	1434.9
1218.67	1434.52	1219.44	1434.78

1221.37	1435.38	1221.71	1435.18	1223.01	1434.53	1232.61	1434.54	1234.14	1434.55
1235.28	1434.97	1236.25	1435.31	1237.18	1435.03	1238.2	1434.78	1238.38	1434.71
1238.69	1434.59	1244.49	1434.64	1244.79	1434.64	1248.67	1434.61	1250.77	1435.24
1251.06	1435.32	1252.52	1434.7	1252.93	1434.53	1255.58	1434.52	1263.78	1434.46
1264.81	1434.78	1264.98	1434.84	1265.42	1434.91	1265.91	1435.05	1266.1	1434.99
1266.96	1434.75	1267.38	1434.63	1268.09	1434.44	1268.94	1434.43	1278.2	1434.49
1280.85	1435.16	1280.92	1435.17	1282.66	1434.55	1282.91	1434.46	1286.7	1434.43
1293.74	1434.4	1295.76	1435.15	1295.79	1435.16	1295.83	1435.15	1296.14	1435.09
1298.63	1434.53	1306.47	1434.51	1308.7	1434.53	1309.39	1434.64	1311.19	1435.24
1311.39	1435.19	1313.17	1434.56	1319.12	1434.4	1320.59	1434.36	1323	1434.32
1323.48	1434.44	1325.29	1435.01	1326.8	1434.69	1327.41	1434.52	1334.99	1434.47
1339.05	1434.49	1339.72	1434.55	1340.04	1434.68	1340.6	1435	1342.17	1434.58
1342.45	1434.52	1342.6	1434.53	1342.8	1434.5	1343.31	1434.5	1352.76	1434.51
1354.11	1434.91	1354.73	1435.32	1355.28	1435.5	1355.32	1435.35	1355.64	1435.31
1356.43	1434.93	1357.37	1434.59	1365.16	1434.45	1368.79	1434.45	1373.46	1434.48
1374.05	1434.69	1374.5	1434.8	1375.42	1434.64	1376.1	1434.44	1382.65	1434.45
1388.66	1434.51	1390.3	1434.91	1390.94	1435.06	1392.27	1434.85	1393.66	1434.62
1394.86	1434.61	1399.64	1434.59	1400.77	1434.92	1401.17	1435.07	1404.12	1434.78
1404.29	1434.78	1404.73	1434.75	1407.22	1434.63	1409.9	1434.8	1411.62	1435.32
1412.52	1435.55	1412.8	1435.5	1414.58	1435.06	1416.11	1435.03	1420.44	1434.91
1421.95	1435.31	1422.11	1435.36	1422.22	1435.34	1423.99	1435.01	1428.59	1435.27
1435.24	1435.55	1443.89	1435.3	1455.11	1435.07	1480.83	1435.12	1490.95	1435.88
1507.15	1437.22	1510.35	1437.51	1511.03	1437.51	1511.98	1437.48	1520.84	1437.45
1530.45	1437.41	1537.13	1437.47	1540.76	1437.5	1543.71	1437.5	1563.64	1437.43
1567.6	1437.39	1572.85	1437.26	1583.47	1437.26	1603.85	1437.17	1609.55	1436.74
1610.86	1436.72	1628.33	1436.98	1648.02	1436.97	1649.17	1436.97	1667.13	1436.84
1690.76	1436.78	1694.92	1436.75	1708.7	1436.69	1728.68	1436.47	1730.94	1436.46
1740.59	1436.57	1754.85	1436.51	1767.34	1436.36	1772.85	1436.36	1787.57	1436.55
1807.01	1436.29	1809.13	1436.28	1822.67	1436.3	1838.27	1436.36	1850.01	1436.35
1859.99	1436.4	1875.3	1436.29	1890.23	1436.26	1891.89	1436.26	1910.83	1436.34
1927.18	1436.42	1934.64	1436.46	1949.49	1436.43	1960.64	1436.23	1964.35	1436.47
1979.59	1436.54	1982.34	1436.53	2028.49	1435.36	2033.48	1435.24	2051.9	1434.78
2052.89	1434.81	2054.48	1434.86	2055.06	1434.78	2057.51	1434.48	2058.39	1434.5
2059.28	1434.51	2059.67	1434.49	2060.76	1434.54	2062.82	1435.15	2062.86	1435.15
2063.3	1435.16	2118.19	1435.67	2135.23	1436.15	2137.49	1436.29	2138.22	1436.19
2138.74	1436.13	2140.66	1435.82	2142.09	1435.76	2150.11	1435.85	2160.44	1435.94
2173.68	1436.14	2177.85	1436.2	2180.13	1436.23	2180.34	1436.24	2180.82	1436.28
2182.49	1436.29	2185.95	1436.32	2189.95	1436.39	2197.82	1437.47	2591.72	1438.56
2593.26	1438.68	2623.13	1439.08	2630.9	1439.28	2632.82	1439.17	2633.52	1439.17
2636.64	1439.21	2654.41	1439.43	2656.9	1439.53	2728.62	1440.72	2742.59	1440.57
2744.44	1440.58	2745.51	1440.63	2749.91	1440.75	2751.87	1440.84	2752.48	1440.88
2753.47	1441.02	2753.77	1441.06	2767.86	1441.15	2769.23	1441.16	2771.91	1441.14
2774.18	1441.28	2776.22	1441.36	2777.87	1441.4	2788.29	1441.69	2801.29	1441.95
2801.58	1441.95	2807.24	1441.83						

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	0	.03
		2807.24	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
0	2807.24		15	15	15	.1		.3

CROSS SECTION

RIVER: xs

REACH: Site 1 RS: 138.77

INPUT

Description:

Station	Elevation	Data	num=	300
Sta	Elev	Sta	Elev	Sta
0	1434.04	3.32	1434.38	3.87
48.78	1430.53	87.72	1431.25	111.9
154.79	1431.21	156.29	1431.2	158.72
164.97	1430.9	166.64	1430.88	168.61
240.17	1431.15	273.87	1431.29	306.47
370.18	1431.57	400.37	1431.56	429.7
673.19	1432.42	706.72	1432.44	739.1
829.77	1433.31	858.16	1433.45	885.57
957.7	1434.18	958.27	1434.38	958.58

962.21	1434.28	971.42	1434.27	971.58	1434.27	971.65	1434.29	974.09	1435.02
975.51	1434.65	976.34	1434.31	980.8	1434.29	986.92	1434.14	988.27	1434.51
989.01	1434.68	989.55	1434.72	991.01	1434.46	992.01	1434.23	992.14	1434.16
992.39	1434.12	992.52	1434.11	992.61	1434.09	992.85	1434.06	994.58	1434.06
1001.72	1434.11	1003.87	1434.67	1004.46	1434.82	1006.07	1434.21	1006.3	1434.12
1006.62	1434.13	1010.86	1434.22	1017.39	1434.35	1017.67	1434.43	1017.83	1434.47
1018.34	1434.63	1019.95	1435.1	1022.16	1434.38	1022.25	1434.35	1022.26	1434.34
1022.27	1434.34	1022.79	1434.35	1031.1	1434.52	1031.78	1434.52	1031.89	1434.55
1034.55	1435.28	1034.75	1435.21	1036.15	1434.47	1037.91	1434.46	1047.64	1434.5
1048.43	1434.84	1049.69	1435.4	1051.67	1434.78	1052.26	1434.57	1060.5	1434.56
1061.26	1434.56	1061.69	1434.65	1064.21	1435.23	1065.71	1434.59	1065.99	1434.49
1067.1	1434.5	1077.06	1434.57	1078.8	1435.22	1079.23	1435.39	1081.16	1434.71
1081.36	1434.64	1081.49	1434.64	1084.02	1434.63	1093	1434.55	1094.09	1434.56
1094.38	1434.68	1094.89	1434.92	1095.4	1435.15	1097.23	1434.79	1097.63	1434.68
1098.11	1434.57	1098.79	1434.59	1104.68	1434.64	1105.06	1434.69	1106.31	1434.96
1107.7	1434.67	1108.22	1434.62	1114.79	1434.62	1115.77	1434.89	1116.78	1435.12
1116.91	1435.1	1119.53	1434.68	1125.16	1434.77	1129.02	1434.78	1130.28	1435.12
1131.46	1435.44	1132.84	1435.08	1133.55	1434.91	1141.9	1434.72	1144.14	1434.67
1144.99	1434.87	1146.77	1435.27	1149.14	1434.76	1149.6	1434.68	1156.49	1434.59
1159.43	1434.56	1160	1434.69	1160.18	1434.71	1161.05	1434.88	1161.41	1434.98
1162.05	1434.85	1162.42	1434.79	1162.67	1434.75	1163.72	1434.53	1171.4	1434.63
1173.04	1434.65	1173.64	1434.77	1175.57	1435.23	1177.4	1434.77	1177.81	1434.68
1187.45	1434.68	1188.03	1434.79	1188.67	1434.95	1190.38	1435.34	1191.04	1435.09
1192.33	1434.71	1198.18	1434.69	1201.23	1434.67	1203.4	1434.68	1203.97	1434.92
1204.06	1434.96	1204.3	1435	1204.45	1435.03	1204.67	1435.12	1204.99	1435.26
1205.67	1435.61	1205.8	1435.61	1208.26	1434.78	1215.6	1434.73	1218.13	1434.66
1219	1434.95	1219.68	1435.17	1220.79	1435.55	1221.18	1435.38	1222.6	1434.67
1232.42	1434.71	1233.54	1434.71	1233.71	1434.76	1233.8	1434.77	1233.9	1434.81
1234.08	1434.86	1235.9	1435.45	1236.85	1435.12	1237.03	1435.03	1237.24	1434.95
1238.06	1434.75	1240.86	1434.75	1248.23	1434.7	1250.4	1435.33	1250.58	1435.37
1251.79	1434.86	1252.36	1434.63	1252.45	1434.58	1261.3	1434.59	1263.42	1434.57
1263.96	1434.74	1264.16	1434.78	1264.21	1434.81	1264.44	1434.88	1265.52	1435.29
1266.34	1435	1267.41	1434.61	1267.85	1434.46	1274.42	1434.59	1277.69	1434.57
1278.78	1434.84	1280.44	1435.34	1281.25	1435.06	1282.42	1434.6	1292.67	1434.52
1293.2	1434.52	1293.29	1434.55	1295.46	1435.25	1297.72	1434.69	1297.84	1434.66
1298.42	1434.66	1308.19	1434.56	1310	1435.03	1310.5	1435.22	1311.3	1435.04
1312.48	1434.69	1320.16	1434.5	1322.58	1434.44	1323.48	1434.72	1324.59	1435.02
1326	1434.73	1326.79	1434.51	1330.21	1434.52	1338.3	1434.51	1339.4	1434.88
1339.98	1435.3	1340.31	1435.42	1341.05	1435.11	1342.25	1434.54	1352.21	1434.54
1352.79	1434.75	1353.09	1434.86	1353.28	1434.9	1354.03	1435.08	1354.38	1435.17
1354.74	1435.07	1356.84	1434.57	1370.38	1434.44	1372.72	1434.42	1373.06	1434.51
1374.67	1435.03	1375.43	1434.78	1376.43	1434.51	1387.81	1434.63	1389.43	1434.65
1389.62	1434.7	1391.5	1435.22	1391.92	1435.17	1394.34	1434.78	1396.63	1434.76
1400.79	1434.7	1402.74	1435.39	1405.49	1434.85	1405.57	1434.84	1405.74	1434.84
1411.11	1434.87	1412.97	1435.42	1413.36	1435.47	1413.52	1435.49	1413.8	1435.45
1415.8	1435	1417.49	1434.98	1421.77	1434.98	1423.58	1435.56	1424.38	1435.72
1425.26	1435.56	1426.7	1435.16	1431.73	1435.36	1437.2	1435.76	1453.19	1435.28
1477.62	1437.12	1506.95	1436.75	1534.11	1436.81	1557.02	1436.77	1584.5	1436.87
1611.31	1436.83	1634.61	1436.7	1691.44	1436.49	1758.88	1436.76	1870.46	1434.95
1898.52	1434.62	2105.64	1434.88	2653.29	1439.37	2707.66	1440.66	2777.82	1441.74
2782.1	1441.9	2790	1442.01	2800.38	1442.51	2804.24	1442.39	2807.24	1442.3

Manning's	n	Values	num=	3
Sta	n	Val	Sta	n
0		.03	0	.03
			2807.24	.03

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	0	2807.24		.1	.3

SUMMARY OF MANNING'S N VALUES

River:xs

Reach	River Sta.	n1	n2	n3
Site 1	349.95	.03	.03	.03
Site 1	308.67	.03	.03	.03
Site 1	303.07	.03	.03	.03
Site 1	298.87	.03	.03	.03

Site 1	289	.015	.015	.015
Site 1	273.78	.015	.015	.015
Site 1	262.4	.015	.015	.015
Site 1	253.78	.03	.03	.03
Site 1	247.48	.03	.03	.03
Site 1	243.78	.03	.03	.03
Site 1	228.78	.03	.03	.03
Site 1	213.78	.03	.03	.03
Site 1	198.78	.03	.03	.03
Site 1	183.78	.03	.03	.03
Site 1	168.77	.03	.03	.03
Site 1	153.77	.03	.03	.03
Site 1	138.77	.03	.03	.03

SUMMARY OF REACH LENGTHS

River: xs

Reach	River Sta.	Left	Channel	Right
Site 1	349.95	41.29	41.28	41.29
Site 1	308.67	5.6	5.6	5.6
Site 1	303.07	4.2	4.2	4.2
Site 1	298.87	9.87	9.87	9.87
Site 1	289	15.23	15.22	15.23
Site 1	273.78	11.38	11.38	11.38
Site 1	262.4	8.62	8.62	8.62
Site 1	253.78	6.3	6.3	6.3
Site 1	247.48	3.7	3.7	3.7
Site 1	243.78	15	15	15
Site 1	228.78	15	15	15
Site 1	213.78	15	15	15
Site 1	198.78	15	15	15
Site 1	183.78	15	15.01	15
Site 1	168.77	15	15	15
Site 1	153.77	15	15	15
Site 1	138.77			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: xs

Reach	River Sta.	Contr.	Expan.
Site 1	349.95	.1	.3
Site 1	308.67	.1	.3
Site 1	303.07	.1	.3
Site 1	298.87	.1	.3
Site 1	289	.1	.3
Site 1	273.78	.1	.3
Site 1	262.4	.1	.3
Site 1	253.78	.1	.3
Site 1	247.48	.1	.3
Site 1	243.78	.1	.3
Site 1	228.78	.1	.3
Site 1	213.78	.1	.3
Site 1	198.78	.1	.3
Site 1	183.78	.1	.3
Site 1	168.77	.1	.3
Site 1	153.77	.1	.3
Site 1	138.77	.1	.3

K4. Summary of results

The results of the analysis show that for the Existing conditions of Briggs road the events during a 100 years storm event do indeed flood the existing road. Measures are taking into account including the analysis of low points on the road to determine box culvert size to bring down level of flows and convey water downstream as quickly as possible.

Attachment L
WSPG Calculations

L1. Purpose of Study of WSPG

The purpose of the WSPG analysis is to show the modeled box culvert being conveyed from the east side of Briggs road along the proposed Tres Lagos and terminating at the POC on the west side of the property. This section is to show the HGL and flowlines of the proposed storm drain pipes and structures falls within tolerance of the available Q100 flows and adequately sized.

Attachment L2
WSPG Calculations
Calculations from WSPG

FILE: 14047boxculv.WSW

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PAGE 1

Program Package Serial Number: 7049

WATER SURFACE PROFILE LISTING

Date: 7-31-2019 Time:

2:58:51

	Invert	Depth	Water	Q	Vel	Vel	Energy	Super	Critical	Flow Top	Height/	Base Wt		
Station	No Wth													
Prs/Pip	Elev	(FT)	Elev	(CFS)	(FPS)	Head	Grd.El.	Elev	Depth	Width	Dia.-FT	or I.D.	ZL	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	
Type Ch														
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
844.386	1422.600	5.130	1427.730	324.95	.40	.00	1427.73	.00	.53	169.52	6.000	149.000	2.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
17.470	.0097					.0000	.00	5.13	.03	.71	.038	.00	2.00	
TRAP														
861.856	1422.770	4.960	1427.730	324.95	.41	.00	1427.73	.00	.53	168.84	6.000	149.000	2.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
61.050	.0020					.0000	.00	4.96	.03	1.15	.038	.00	2.00	
TRAP														
922.906	1422.890	4.841	1427.731	324.95	.42	.00	1427.73	.00	.53	168.36	6.000	149.000	2.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
WALL EXIT														
922.906	1422.890	4.841	1427.731	324.95	1.95	.06	1427.79	.00	1.34	37.00	4.500	37.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

20.790	.0006						.0001	.00	4.84	.16	2.10	.013	.00	.00
BOX														
943.696	1422.902	4.921	1427.823	324.95	1.95	.06	1427.88	.00	1.34	37.00	4.500	37.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TRANS STR	.0017						.0001	.00	4.92	.16		.013	.00	.00
BOX														
949.496	1422.912	4.902	1427.814	324.95	2.26	.08	1427.89	.00	1.47	32.00	4.500	32.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TRANS STR	.0016						.0002	.00	4.90	.19		.013	.00	.00
BOX														
955.296	1422.921	4.850	1427.771	324.95	3.28	.17	1427.94	.00	1.89	22.00	4.500	22.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TRANS STR	.0017						.0004	.00	4.85	.27		.013	.00	.00
BOX														
961.096	1422.931	4.842	1427.773	324.95	3.28	.17	1427.94	.00	1.89	22.00	4.500	22.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TRANS STR	.0017						.0004	.00	4.84	.27		.013	.00	.00
BOX														
966.896	1422.941	4.814	1427.755	324.95	3.61	.20	1427.96	.00	2.02	20.00	4.500	20.000	.00	
0 .0														
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
.104	.0763						.0004	.00	4.81	.30	.69	.013	.00	.00
BOX														

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Program Package Serial Number: 7049

WATER SURFACE PROFILE LISTING

Date: 7-31-2019 Time:

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```

*****
*****
| Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt |
| No Wth |      |      |   |     |     |         |      |          |          |         |         |
Station | Elev  | (FT) | Elev  | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL
| Prs/Pip |      |      |      |      |      |      |      |      |      |      |      |      |
L/Elem | Ch Slope |      |      |      |      | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR
| Type Ch |      |      |      |      |      |      |      |      |      |      |      |      |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
|*****|
|      |      |      |      |      |      |      |      |      |      |      |      |      |
967.000 | 1422.949 | 4.845 | 1427.794 | 324.95 | 3.61 | .20 | 1428.00 | .00 | 2.02 | 20.00 | 4.500 | 20.000 | .00
0 .0
|      |      |      |      |      |      |      |      |      |      |      |      |      |
328.592 | .0014 |      |      |      |      | .0004 | .15 | 4.84 | .30 | 2.41 | .013 | .00 | .00
BOX
|      |      |      |      |      |      |      |      |      |      |      |      |      |
1295.592 | 1423.421 | 4.518 | 1427.939 | 324.95 | 3.61 | .20 | 1428.14 | .00 | 2.02 | 20.00 | 4.500 | 20.000 | .00
0 .0
|      |      |      |      |      |      |      |      |      |      |      |      |      |
44.148 | .0015 |      |      |      |      | .0004 | .02 | .00 | .30 | 2.37 | .013 | .00 | .00
BOX
|      |      |      |      |      |      |      |      |      |      |      |      |      |
1339.740 | 1423.488 | 4.500 | 1427.988 | 324.95 | 3.61 | .20 | 1428.19 | 4.50 | 2.02 | 20.00 | 4.500 | 20.000 | .00
0 .0
|      |      |      |      |      |      |      |      |      |      |      |      |      |
41.405 | .0015 |      |      |      |      | .0002 | .01 | 4.50 | .30 | 2.37 | .013 | .00 | .00
BOX
|      |      |      |      |      |      |      |      |      |      |      |      |      |
1381.145 | 1423.551 | 4.440 | 1427.991 | 324.95 | 3.66 | .21 | 1428.20 | .00 | 2.02 | 20.00 | 4.500 | 20.000 | .00
0 .0
|      |      |      |      |      |      |      |      |      |      |      |      |      |
TRANS STR | .0013 |      |      |      |      | .0002 | .01 | 4.44 | .31 |      | .013 | .00 | .00
BOX

```

----- WARNING - Flow depth near top of box conduit -----													
1429.990 0 .0	1423.613	4.246	1427.859	324.95	5.16	.41	1428.27	.00	2.36	15.75	4.000	15.750	.00
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
93.137 BOX	.0000					.0011	.10	4.25	.45	4.00	.013	.00	.00
1523.127 0 .0	1423.615	4.346	1427.961	324.95	5.16	.41	1428.37	.00	2.36	15.75	4.000	15.750	.00
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
116.135 BOX	.0036					.0011	.13	4.35	.45	2.14	.013	.00	.00
1639.262 0 .0	1424.028	4.060	1428.088	324.95	5.16	.41	1428.50	.00	2.36	15.75	4.000	15.750	.00
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
JUNCT STR BOX	.0000					.0011	.00	4.06	.45		.013	.00	.00
1639.262 0 .0	1424.029	4.071	1428.100	322.67	5.12	.41	1428.51	.00	2.35	15.75	4.000	15.750	.00
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
59.544 BOX	.0023					.0011	.06	4.07	.45	2.47	.013	.00	.00

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WATER SURFACE PROFILE LISTING

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Date: 7-31-2019 Time:

Station	Invert No Wth Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL
|Prs/Pip													

L/Elem Type Ch	Ch	Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1698.806 0 .0	1424.164	4.000	1428.164	322.67	5.12	.41	1428.57	.00	2.35	15.75	4.000	15.750	.00	
86.586 BOX	.0023					.0005	.05	4.00	.45	2.47	.013	.00	.00	
1785.393 0 .0	1424.360	3.813	1428.173	322.67	5.37	.45	1428.62	.00	2.35	15.75	4.000	15.750	.00	
83.319 BOX	.0023					.0006	.05	3.81	.48	2.47	.013	.00	.00	
		----- WARNING - Flow depth near top of box conduit -----												
1868.712 0 .0	1424.549	3.635	1428.184	322.67	5.64	.49	1428.68	.00	2.35	15.75	4.000	15.750	.00	
80.388 BOX	.0023					.0007	.06	3.64	.52	2.47	.013	.00	.00	
		----- WARNING - Flow depth near top of box conduit -----												
1949.100 0 .0	1424.731	3.466	1428.197	322.67	5.91	.54	1428.74	.00	2.35	15.75	4.000	15.750	.00	
77.856 BOX	.0023					.0008	.06	3.47	.56	2.47	.013	.00	.00	
2026.956 0 .0	1424.907	3.305	1428.212	322.67	6.20	.60	1428.81	.00	2.35	15.75	4.000	15.750	.00	
75.843 BOX	.0023					.0010	.07	3.30	.60	2.47	.013	.00	.00	

2102.799	1425.079	3.151	1428.230	322.67	6.50	.66	1428.89	.00	2.35	15.75	4.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
74.573	.0023					.0011	.08	3.15	.65	2.47	.013	.00	.00
BOX													
2177.372	1425.248	3.005	1428.253	322.67	6.82	.72	1428.97	.00	2.35	15.75	4.000	15.750	.00
0 .0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
70.680	.0023					.0013	.09	3.00	.69	2.47	.013	.00	.00
BOX													

FILE: 14047boxculv.WSW

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Program Package Serial Number: 7049

WATER SURFACE PROFILE LISTING
2:58:51

Date: 7-31-2019 Time:

Station	Invert No Wth Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL
Prs/Pip	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR
L/Elem Type Ch													
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
2248.052	1425.408	2.872	1428.280	322.67	7.13	.79	1429.07	.00	2.35	15.75	4.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
HYDRAULIC JUMP													
2248.052	1425.408	1.896	1427.305	322.67	10.80	1.81	1429.12	.00	2.35	15.75	4.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-

22.832	.0023					.0054	.12	1.90	1.38	2.47	.013	.00	.00
BOX													
2270.884	1425.460	1.833	1427.293	322.67	11.18	1.94	1429.23	.00	2.35	15.75	4.000	15.750	.00
0 .0													
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
28.496	.0023					.0061	.17	1.83	1.45	2.47	.013	.00	.00
BOX													
2299.380	1425.525	1.748	1427.273	322.67	11.72	2.13	1429.41	.00	2.35	15.75	4.000	15.750	.00
0 .0													
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
JUNCT STR	.0000					.0046	.00	1.75	1.56		.013	.00	.00
BOX													
2299.380	1425.893	2.343	1428.236	320.49	8.68	1.17	1429.41	.00	2.34	15.75	4.000	15.750	.00
0 .0													
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
TRANS STR	.0000					.0026	.40	2.34	1.00		.013	.00	.00
BOX													
2453.002	1425.893	3.246	1429.139	320.49	6.78	.71	1429.85	.00	2.34	15.75	3.000	15.750	.00
0 .0													
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
64.628	.0019					.0026	.17	3.25	.69	2.60	.013	.00	.00
BOX													
2517.630	1426.017	3.289	1429.306	320.49	6.78	.71	1430.02	.00	2.34	15.75	3.000	15.750	.00
0 .0													
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
JUNCT STR	.0142					.0026	.04	3.29	.69		.013	.00	.00
BOX													
2534.580	1426.258	3.110	1429.368	318.47	6.74	.71	1430.07	.00	2.33	15.75	3.000	15.750	.00
0 .0													

28.528	.0001					.0026	.07	3.11	.69	3.00	.013	.00	.00
BOX													
2563.108	1426.260	3.180	1429.440	318.47	6.74	.71	1430.15	.00	2.33	15.75	3.000	15.750	.00
0 .0													
JUNCT STR	.0000					.0021	.00	3.18	.69		.013	.00	.00
BOX													

FILE: 14047boxculv.WSW
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Program Package Serial Number: 7049

WATER SURFACE PROFILE LISTING

Date: 7-31-2019 Time:

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*****
*****
| Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt |
| No Wth |      | Elev  | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL
| Prs/Pip |      |      |      |      |      |      |      |      |      |      |      |
L/Elem |Ch Slope |      |      |      |      | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR
| Type Ch |      |      |      |      |      |      |      |      |      |      |      |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
|*****|
|
2563.108 | 1426.211 | 3.454 | 1429.665 | 285.71 | 6.05 | .57 | 1430.23 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
|
46.217 | .0119 |      |      |      |      | .0021 | .10 | 3.45 | .62 | 1.33 | .013 | .00 | .00
BOX
|
2609.324 | 1426.760 | 3.000 | 1429.760 | 285.71 | 6.05 | .57 | 1430.33 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
|
7.658 | .0119 |      |      |      |      | .0010 | .01 | 3.00 | .62 | 1.33 | .013 | .00 | .00
BOX

```

2616.983	1426.851	2.859	1429.710	285.71	6.34	.62	1430.34	.00	2.17	15.75	3.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
6.632	.0119					.0011	.01	2.86	.66	1.33	.013	.00	.00
BOX													
----- WARNING - Flow depth near top of box conduit -----													
2623.615	1426.930	2.726	1429.656	285.71	6.65	.69	1430.34	.00	2.17	15.75	3.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
4.903	.0119					.0013	.01	2.73	.71	1.33	.013	.00	.00
BOX													
----- WARNING - Flow depth near top of box conduit -----													
2628.518	1426.988	2.616	1429.604	285.71	6.93	.75	1430.35	.00	2.17	15.75	3.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
HYDRAULIC JUMP													
2628.518	1426.988	1.777	1428.765	285.71	10.21	1.62	1430.38	.00	2.17	15.75	3.000	15.750	.00
0 .0	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-	-|-
1.750	.0119					.0048	.01	1.78	1.35	1.33	.013	.00	.00
BOX													
2630.269	1427.009	1.793	1428.801	285.71	10.12	1.59	1430.39	.00	2.17	15.75	3.000	15.750	.00
0 .0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
7.639	.0119					.0044	.03	1.79	1.33	1.33	.013	.00	.00
BOX													

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Program Package Serial Number: 7049

WATER SURFACE PROFILE LISTING
2:58:51

Date: 7-31-2019 Time:

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*****
*****
Invert | Depth | Water | Q | Vel | Vel | Energy | Super | Critical | Flow Top | Height/ | Base Wt |
Station | No Wth |
| Elev | (FT) | Elev | (CFS) | (FPS) | Head | Grd.El. | Elev | Depth | Width | Dia.-FT | or I.D. | ZL
| Prs/Pip |
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
L/Elem | Ch Slope |
| Type Ch |
*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****|*****
|*****|
|
2637.908 | 1427.099 | 1.880 | 1428.979 | 285.71 | 9.65 | 1.45 | 1430.43 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
4.913 | .0119 | .0038 | .02 | 1.88 | 1.24 | 1.33 | .013 | .00 | .00
BOX
|
2642.820 | 1427.158 | 1.972 | 1429.130 | 285.71 | 9.20 | 1.31 | 1430.44 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
2.704 | .0119 | .0033 | .01 | 1.97 | 1.15 | 1.33 | .013 | .00 | .00
BOX
|
2645.524 | 1427.190 | 2.068 | 1429.258 | 285.71 | 8.77 | 1.19 | 1430.45 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
.848 | .0119 | .0028 | .00 | 2.07 | 1.07 | 1.33 | .013 | .00 | .00
BOX
WALL ENTRANCE
|
2646.372 | 1427.200 | 2.171 | 1429.371 | 285.71 | 8.36 | 1.08 | 1430.46 | .00 | 2.17 | 15.75 | 3.000 | 15.750 | .00
0 .0
-|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|- -|-
|-

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FILE: 14047boxculv.WSW
2:58:14

W S P G W - EDIT LISTING - Version 14.06

Date: 7-31-2019 Time:

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT 1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIER/PIP	WIDTH	DIAMETER	WIDTH	DROP												
CD	1	3	0	.000	4.500	37.000	.000	.000	.00										
CD	2	3	0	.000	4.500	32.000	.000	.000	.00										
CD	3	3	0	.000	4.500	22.000	.000	.000	.00										
CD	4	3	0	.000	4.500	22.000	.000	.000	.00										
CD	5	3	0	.000	4.500	15.750	.000	.000	.00										
CD	6	3	0	.000	3.000	15.750	.000	.000	.00										
CD	7	4	2		2.500														
CD	8	4	1		1.500														
CD	9	1	0	.000	6.000	149.000	2.000	2.000	.00										
CD	10	3	0	.000	4.500	20.000	.000	.000	.00										
CD	11	3	0	.000	4.000	15.750	.000	.000	.00										
CD	12	3	0	.000	.300	5.750	.000	.000	.00										

W S P G W

NO 1

PAGE

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

HEADING LINE NO 2 IS -

HEADING LINE NO 3 IS -

W S P G W

NO 2

PAGE

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG
				844.386	1422.600	9	1427.730			
ELEMENT NO	2 IS A	REACH	U/S DATA	STATION	INVERT	SECT				
			PT MAN H	861.856	1422.770	9		.038	.000	.000
				31.492	0					
ELEMENT NO	3 IS A	REACH	U/S DATA	STATION	INVERT	SECT				
			PT MAN H	922.906	1422.890	9		.038	.000	.000
				.000	0					
ELEMENT NO	4 IS A	WALL EXIT	U/S DATA	STATION	INVERT	SECT				

ELEMENT NO	5	IS A REACH	922.906	1422.890	1				
		U/S DATA	*	*	*				
		PT MAN H	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
			943.696	1422.902	1	.013	.000	.000	
			.931	30					
ELEMENT NO	6	IS A TRANSITION	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	
			949.496	1422.912	2	.013	.000	.000	
ELEMENT NO	7	IS A TRANSITION	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	
			955.296	1422.921	3	.013	.000	.000	
ELEMENT NO	8	IS A TRANSITION	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	
			961.096	1422.931	4	.013	.000	.000	
ELEMENT NO	9	IS A TRANSITION	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	
			966.896	1422.941	10	.013	.000	.000	
ELEMENT NO	10	IS A REACH	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
		PT MAN H							
			967.000	1422.949	10	.013	.000	.000	
			58.330	0					
ELEMENT NO	11	IS A REACH	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
		PT MAN H							
			1295.592	1423.421	10	.013	.000	.000	
			.000	0					
ELEMENT NO	12	IS A REACH	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
		PT MAN H							
			1381.145	1423.551	10	.013	54.465	-90.000	
			.000	0					
ELEMENT NO	13	IS A TRANSITION	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	
			1429.990	1423.613	11	.013	.000	.000	
W S P G W									
NO 3									
WATER SURFACE PROFILE - ELEMENT CARD LISTING									
ELEMENT NO	14	IS A REACH	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
		PT MAN H							
			1523.127	1423.615	11	.013	.000	.000	
			-.291	0					
ELEMENT NO	15	IS A REACH	*	*	*				
		U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG
		PT MAN H							

PAGE

		1639.262	1424.028	11		.013			.000	.000		
		.000	0									
ELEMENT NO	16 IS A JUNCTION	*	*	*	*	*		*	*	*		
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3 PHI 4
		1639.262	1424.029	11	8	0	.013	2.274	.000	1424.250	.000	
		90.000	.000									
										RADIUS	ANGLE	
										.000	.000	
ELEMENT NO	17 IS A REACH	*	*	*								
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG
	PT MAN H											
		2299.380	1425.525	11			.013			.000	.000	
		.000	0									
ELEMENT NO	18 IS A JUNCTION	*	*	*	*	*		*		*	*	
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3 PHI 4
		2299.380	1425.893	11	8	0	.013	2.182	.000	1425.535	.000	
		90.000	.000									
										RADIUS	ANGLE	
										.000	.000	
ELEMENT NO	19 IS A TRANSITION	*	*	*								
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	
		2453.002	1425.893	6			.013			.000	.000	
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING												
ELEMENT NO	20 IS A REACH	*	*	*								
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG
	PT MAN H											
		2517.630	1426.017	6			.013			.000	.000	
		.000	0									
ELEMENT NO	21 IS A JUNCTION	*	*	*	*	*		*		*	*	
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3 PHI 4
		2534.580	1426.258	6	8	0	.013	2.026	.000	1426.250	.000	
		-90.000	.000									
										RADIUS	ANGLE	
										.000	.000	
W S P G W												
NO 4												
PAGE												
WATER SURFACE PROFILE - ELEMENT CARD LISTING												
ELEMENT NO	22 IS A REACH	*	*	*								
	U/S DATA	STATION	INVERT	SECT			N			RADIUS	ANGLE	ANG
	PT MAN H											
		2563.108	1426.260	6			.013			.000	.000	
		.000	0									
ELEMENT NO	23 IS A JUNCTION	*	*	*	*	*		*		*	*	
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3 PHI 4
		2563.108	1426.211	6	7	0	.013	32.753	.000	1426.360	.000	
		-45.000	.000									
										RADIUS	ANGLE	

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO	24	IS A	REACH	*	*	*							
			U/S DATA	STATION	INVERT	SECT	N		RADIUS	ANGLE	ANG		
			PT MAN H	2646.372	1427.200	6	.013		.000	.000			
				.000	0								

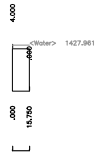
ELEMENT NO 25 IS A WALL ENTRANCE *

	U/S DATA	STATION	INVERT	SECT	FP
		2646.372	1427.200	6	.500

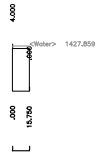
ELEMENT NO 26 IS A SYSTEM HEADWORKS *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	2646.372	1427.200	6	1427.200

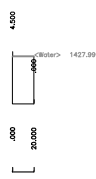
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Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.365 Mannings N = .013
Invert = 1425.613 Water Surface = 1427.891
BOX Velocity = 5.158 Flow = 324.948
[15] STATION = 1523.127



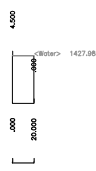
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Top Width = 15,750 Number of Piers/Pipes = 0
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Invert = 1425.613 Water Surface = 1427.891
BOX Velocity = 5.158 Flow = 324.948
[14] STATION = 1429.990



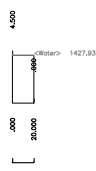
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Height = 4,000 Width = 20,000
TRANSITION
Top Width = 20,000 Number of Piers/Pipes = 0
Critical Depth = 2.016 Mannings N = .013
Invert = 1423.551 Water Surface = 1427.891
BOX Velocity = 3.658 Flow = 324.948
[13] STATION = 1381.145



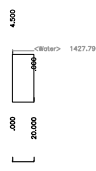
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Height = 4,000 Width = 20,000
TRANSITION
Top Width = 20,000 Number of Piers/Pipes = 0
Critical Depth = 2.016 Mannings N = .013
Invert = 1423.488 Water Surface = 1427.888
BOX Velocity = 3.611 Flow = 324.948
[12] STATION = 1339.740



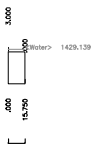
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Height = 4,000 Width = 20,000
TRANSITION
Top Width = 20,000 Number of Piers/Pipes = 0
Critical Depth = 2.016 Mannings N = .013
Invert = 1423.421 Water Surface = 1427.839
BOX Velocity = 3.611 Flow = 324.948
[11] STATION = 1295.592



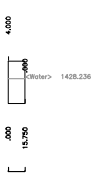
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Height = 4,000 Width = 20,000
TRANSITION
Top Width = 20,000 Number of Piers/Pipes = 0
Critical Depth = 2.016 Mannings N = .013
Invert = 1422.849 Water Surface = 1427.794
BOX Velocity = 3.611 Flow = 324.948
[10] STATION = 967.000



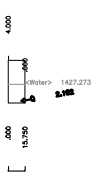
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Critical Depth = 2.343 Mannings N = .013
Invert = 1428.593 Water Surface = 1428.139
BOX Velocity = 6.183 Flow = 320.492
[30] STATION = 2453.002



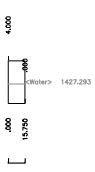
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TRANSITION
Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.343 Mannings N = .013
Invert = 1428.593 Water Surface = 1428.236
BOX Velocity = 6.685 Flow = 320.492
[29] STATION = 2299.360



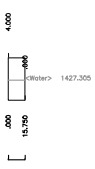
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Height = 4,000 Width = 15,750
JUNCTION
Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.353 Mannings N = .013
Invert = 1428.528 Water Surface = 1427.273
BOX Velocity = 11.723 Flow = 322.674
[28] STATION = 2299.360



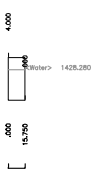
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Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.353 Mannings N = .013
Invert = 1428.460 Water Surface = 1427.293
BOX Velocity = 11.178 Flow = 322.674
[27] STATION = 2270.884



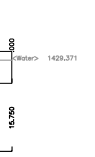
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Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.353 Mannings N = .013
Invert = 1428.408 Water Surface = 1427.325
BOX Velocity = 10.853 Flow = 322.674
[26] STATION = 2248.052



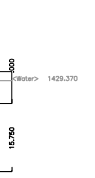
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HYD JUMP
Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.363 Mannings N = .013
Invert = 1428.408 Water Surface = 1428.280
BOX Velocity = 7.134 Flow = 322.674
[25] STATION = 2248.052



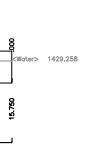
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HEADWORKS
Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2.170 Mannings N = .013
Invert = 1427.300 Water Surface = 1429.371
BOX Velocity = 8.355 Flow = 285.713
[45] STATION = 2646.372



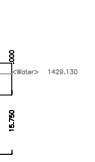
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Invert = 1427.200 Water Surface = 1429.370
BOX Velocity = 8.358 Flow = 285.713
[44] STATION = 2646.372



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Critical Depth = 2.170 Mannings N = .013
Invert = 1427.100 Water Surface = 1429.258
BOX Velocity = 8.771 Flow = 285.713
[43] STATION = 2645.524



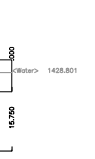
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Invert = 1427.050 Water Surface = 1429.130
BOX Velocity = 9.199 Flow = 285.713
[42] STATION = 2642.820



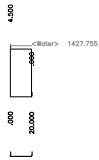
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Invert = 1427.000 Water Surface = 1428.978
BOX Velocity = 9.648 Flow = 285.713
[41] STATION = 2637.908



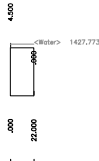
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Invert = 1427.000 Water Surface = 1428.801
BOX Velocity = 10.119 Flow = 285.713
[40] STATION = 2630.269



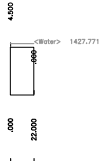
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Invert = 1422.941 Water Surface = 1427.755
BOX Velocity = 3.611 Flow = 324.948
[9] STATION = 966.896



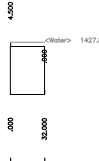
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Critical Depth = 1,892 Manning N = .013
Invert = 1422.831 Water Surface = 1427.773
BOX Velocity = 3.382 Flow = 324.948
[8] STATION = 961.096



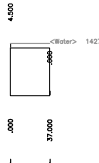
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Critical Depth = 1,892 Manning N = .013
Invert = 1422.921 Water Surface = 1427.771
BOX Velocity = 3.382 Flow = 324.948
[7] STATION = 955.296



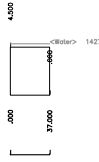
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Critical Depth = 1,474 Manning N = .013
Invert = 1422.812 Water Surface = 1427.814
BOX Velocity = 2.257 Flow = 324.948
[6] STATION = 949.496



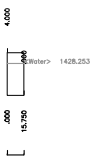
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Invert = 1422.802 Water Surface = 1427.823
BOX Velocity = 1.852 Flow = 324.948
[5] STATION = 943.696



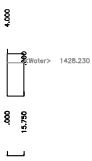
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TRANSITION
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Invert = 1422.880 Water Surface = 1427.731
BOX Velocity = 1.852 Flow = 324.948
[4] STATION = 922.906



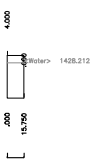
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Critical Depth = 2,353 Manning N = .013
Invert = 1425.248 Water Surface = 1428.253
BOX Velocity = 6.818 Flow = 322.874
[24] STATION = 2177.372



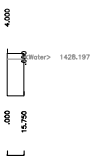
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Invert = 1425.079 Water Surface = 1428.230
BOX Velocity = 6.502 Flow = 322.874
[23] STATION = 2102.799



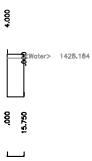
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Invert = 1424.807 Water Surface = 1428.212
BOX Velocity = 6.189 Flow = 322.874
[22] STATION = 2026.956



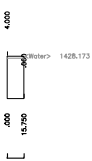
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Critical Depth = 2,353 Manning N = .013
Invert = 1424.731 Water Surface = 1428.197
BOX Velocity = 5.910 Flow = 322.874
[21] STATION = 1949.100



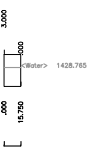
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Invert = 1424.549 Water Surface = 1428.184
BOX Velocity = 5.630 Flow = 322.874
[20] STATION = 1868.712



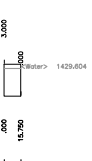
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Invert = 1424.360 Water Surface = 1428.173
BOX Velocity = 5.372 Flow = 322.874
[19] STATION = 1785.393



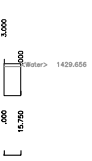
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Invert = 1426.988 Water Surface = 1428.765
BOX Velocity = 10.310 Flow = 285.713
[39] STATION = 2628.518



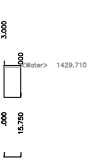
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Critical Depth = 2,170 Manning N = .013
Invert = 1426.988 Water Surface = 1428.604
BOX Velocity = 8.684 Flow = 285.713
[38] STATION = 2628.518



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Critical Depth = 2,170 Manning N = .013
Invert = 1426.930 Water Surface = 1428.656
BOX Velocity = 8.684 Flow = 285.713
[37] STATION = 2623.615



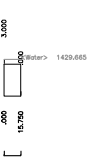
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Critical Depth = 2,170 Manning N = .013
Invert = 1426.851 Water Surface = 1428.710
BOX Velocity = 8.344 Flow = 285.713
[36] STATION = 2616.983

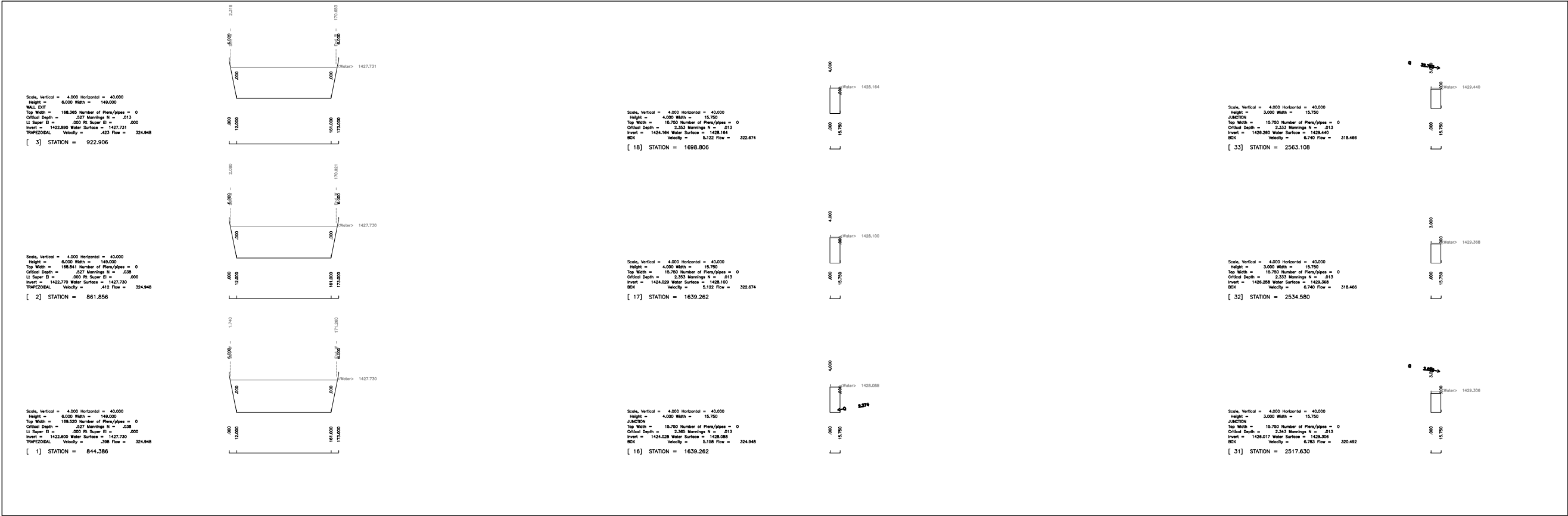


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Critical Depth = 2,170 Manning N = .013
Invert = 1426.780 Water Surface = 1428.760
BOX Velocity = 6.047 Flow = 285.713
[35] STATION = 2609.324



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Top Width = 15,750 Number of Piers/Pipes = 0
Critical Depth = 2,170 Manning N = .013
Invert = 1426.511 Water Surface = 1429.685
BOX Velocity = 5.047 Flow = 285.713
[34] STATION = 2563.108





Program Package Serial Number: 7049										Date: 7-31-2019 Time: 2:58:51 File: 14047boxculv.WSW									
[No.]	TYPE OPERATION	STATION (FT)	INV ELEV (FT)	WATER LEVEL (FT)	CHAN HT (FT)	TYPE CHANNEL	*N* #PIER/PIP	FLOW RATE (CFS)	VELOCITY (FT/S)	TOP WIDTH (FT)	CHAN WDT (FT)	PIER WIDTH (FT)	ZL	ZR	SUPEL RT B (FT)	SUPEL LT B (FT)	CRIT DPTH (FT)	RADIUS/<PT (FT)	RMKS (FT DR <)
[1]	SYSTEM OUTLET	844.386	1422.600	5.130	6.000	TRAPEZOIDAL	.038 0	324.948	.398	169.520	149.000	.000	2.000	2.000	.000	.000	.527	.000	
[2]	REACH	861.856	1422.770	4.960	6.000	TRAPEZOIDAL	.038 0	324.948	.412	168.841	149.000	.000	2.000	2.000	.000	.000	.527	31.492	
[3]	REACH	922.906	1422.890	4.841	6.000	TRAPEZOIDAL	.013 0	324.948	.423	168.365	149.000	.000	2.000	2.000	.000	.000	.527	.000	
[4]	WALL EXIT	922.906	1422.890	4.841	4.500	BOX	.013 0	324.948	1.952	37.000	37.000	.000	.000	.000	.000	.000	1.338	.000	
[5]	REACH	943.696	1422.902	4.921	4.500	BOX	.013 0	324.948	1.952	37.000	37.000	.000	.000	.000	.000	.000	1.338	.000	
[6]	TRANSITION	949.496	1422.912	4.902	4.500	BOX	.013 0	324.948	2.257	32.000	32.000	.000	.000	.000	.000	.000	1.474	.000	
[7]	TRANSITION	955.296	1422.921	4.850	4.500	BOX	.013 0	324.948	3.282	22.000	22.000	.000	.000	.000	.000	.000	1.892	.000	
[8]	TRANSITION	961.096	1422.931	4.842	4.500	BOX	.013 0	324.948	3.282	22.000	22.000	.000	.000	.000	.000	.000	1.892	.000	
[9]	TRANSITION	966.896	1422.941	4.814	4.500	BOX	.013 0	324.948	3.611	20.000	20.000	.000	.000	.000	.000	.000	2.016	.000	
[10]	REACH	967.000	1422.949	4.845	4.500	BOX	.013 0	324.948	3.611	20.000	20.000	.000	.000	.000	.000	.000	2.016	58.330	
[11]	REACH	1295.592	1423.421	4.518	4.500	BOX	.013 0	324.948	3.611	20.000	20.000	.000	.000	.000	.000	.000	2.016	54.465	
[12]	REACH	1339.740	1423.488	4.500	4.500	BOX	.013 0	324.948	3.611	20.000	20.000	.000	.000	.000	.000	.000	2.016	54.465	
[13]	REACH	1381.145	1423.551	4.440	4.500	BOX	.013 0	324.948	3.659	20.000	20.000	.000	.000	.000	.000	.000	2.016	.000	
[14]	TRANSITION	1429.990	1423.613	4.246	4.000	BOX	.013 0	324.948	5.158	15.750	15.750	.000	.000	.000	.000	.000	2.365	.000	
[15]	REACH	1523.127	1423.615	4.346	4.000	BOX	.013 0	324.948	5.158	15.750	15.750	.000	.000	.000	.000	.000	2.365	- .291	
[16]	REACH	1639.262	1424.028	4.060	4.000	BOX	.013 0	324.948	5.158	15.750	15.750	.000	.000	.000	.000	.000	2.365	.000	
[17]	JUNCTION	1639.262	1424.029	4.071	4.000	BOX	.013 0	322.674	5.122	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[18]	REACH	1698.806	1424.164	4.000	4.000	BOX	.013 0	322.674	5.122	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[19]	REACH	1785.393	1424.360	3.813	4.000	BOX	.013 0	322.674	5.373	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[20]	REACH	1868.712	1424.549	3.635	4.000	BOX	.013 0	322.674	5.635	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[21]	REACH	1949.100	1424.731	3.466	4.000	BOX	.013 0	322.674	5.910	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[22]	REACH	2026.956	1424.907	3.305	4.000	BOX	.013 0	322.674	6.199	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[23]	REACH	2102.799	1425.079	3.151	4.000	BOX	.013 0	322.674	6.502	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[24]	REACH	2177.372	1425.248	3.005	4.000	BOX	.013 0	322.674	6.819	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[25]	HYD JUMP	2248.052	1425.408	2.872	4.000	BOX	.013 0	322.674	7.134	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	HYD JUMP
[26]	REACH	2248.052	1425.408	1.897	4.000	BOX	.013 0	322.674	10.803	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[27]	REACH	2270.884	1425.460	1.833	4.000	BOX	.013 0	322.674	11.178	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[28]	REACH	2299.380	1425.525	1.748	4.000	BOX	.013 0	322.674	11.723	15.750	15.750	.000	.000	.000	.000	.000	2.353	.000	
[29]	JUNCTION	2299.380	1425.893	2.343	4.000	BOX	.013 0	320.492	8.685	15.750	15.750	.000	.000	.000	.000	.000	2.343	.000	
[30]	TRANSITION	2453.002	1425.893	3.246	3.000	BOX	.013 0	320.492	6.783	15.750	15.750	.000	.000	.000	.000	.000	2.343	.000	
[31]	REACH	2517.630	1426.017	3.289	3.000	BOX	.013 0	320.492	6.783	15.750	15.750	.000	.000	.000	.000	.000	2.343	.000	
[32]	JUNCTION	2534.580	1426.258	3.110	3.000	BOX	.013 0	318.466	6.740	15.750	15.750	.000	.000	.000	.000	.000	2.333	.000	
[33]	REACH	2563.108	1426.260	3.180	3.000	BOX	.013 0	318.466	6.740	15.750	15.750	.000	.000	.000	.000	.000	2.333	.000	
[34]	JUNCTION	2563.108	1426.211	3.454	3.000	BOX	.013 0	285.713	6.047	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[35]	REACH	2609.324	1426.760	3.000	3.000	BOX	.013 0	285.713	6.047	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[36]	REACH	2616.983	1426.851	2.859	3.000	BOX	.013 0	285.713	6.344	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[37]	REACH	2623.615	1426.930	2.726	3.000	BOX	.013 0	285.713	6.654	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[38]	HYD JUMP	2628.518	1426.988	2.616	3.000	BOX	.013 0	285.713	6.934	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	HYD JUMP
[39]	REACH	2628.518	1426.988	1.777	3.000	BOX	.013 0	285.713	10.210	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[40]	REACH	2630.269	1427.009	1.792	3.000	BOX	.013 0	285.713	10.119	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[41]	REACH	2637.908	1427.099	1.880	3.000	BOX	.013 0	285.713	9.648	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[42]	REACH	2642.820	1427.158	1.972	3.000	BOX	.013 0	285.713	9.199	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[43]	REACH	2645.524	1427.190	2.068	3.000	BOX	.013 0	285.713	8.771	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[44]	REACH	2646.372	1427.200	2.170	3.000	BOX	.013 0	285.713	8.359	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	
[45]	WALL ENTR	2646.372	1427.200	2.171	3.000	BOX	.013 0	285.713	8.355	15.750	15.750	.000	.000	.000	.000	.000	2.170	.000	

L3. Summary of results

The results of the analysis show that for the Proposed Box Culvert along Tres Lagos is adequately sized including a one foot freeboard inside the box culvert. The box culvert is able to hold the design flow conditions of 252.12 CFS and continue to acquire all the flow to route to the POC as dictated by the ultimate conditions.

Attachment M
Unit Hydrograph

M1. Purpose of Study of Unit Hydrograph

The purpose of the Unit Hydrograph analysis is to calculate the amount of water detained onsite which reduces the overall flow from onsite and will allow the site to be within the parameters set forth in the Ultimate Existing Conditions. The overall flow from site must not exceed 418.14 CFS and without mitigation the CFS is 427.81. After mitigation from the proposed Lake the water flow will be much lower than the unmitigated flow. This study analyzed the water for only onsite since offsite flow is assumed to be constant at maxed established water flows per Rick Engineering Report (Rick Engineering Study: the *Hydrologic and Hydraulic Report for Menifée Valley Area Drainage Plan: Job No 14795-B Dated August 16, 2007*). The Calculations following show this analysis.

Attachment M2
Unit Hydrograph
Calculations from
Unit Hydrograph

Unit Hydrograph - 2 Year Storm Event

2 YEAR Unit Hydrograph Analysis

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 07/29/19 File: Rockport12UHPost12.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6332

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Rockport Development
Unit Hydrograph
Post-Development 2 year Storm event
14047 Menifee Rockport Development

Drainage Area = 68.71(Ac.) = 0.107 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 68.71(Ac.) = 0.107 Sq. Mi.
Length along longest watercourse = 2414.00(Ft.)
Length along longest watercourse measured to centroid = 1485.87(Ft.)
Length along longest watercourse = 0.457 Mi.
Length along longest watercourse measured to centroid = 0.281 Mi.
Difference in elevation = 15.65(Ft.)
Slope along watercourse = 34.2303 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.141 Hr.
Lag time = 8.44 Min.
25% of lag time = 2.11 Min.
40% of lag time = 3.38 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	0.45	30.92

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	1.20	82.45

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 0.450(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.450(In)
Areal adjustment factor = 99.94 %
Adjusted average point rain = 0.450(In)

Sub-Area Data:

Riverside County Synthetic Unit Hydrology Method
Page 1 of 3

Area(Ac.) Runoff Index Impervious %
 68.710 75.00 0.700
 Total Area Entered = 68.71(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-1	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
75.0	57.0	0.501	0.700	0.185	1.000	0.185
Sum (F) =						0.185

Area averaged mean soil loss (F) (In/Hr) = 0.185

Minimum soil loss rate ((In/Hr)) = 0.093

(for 24 hour storm duration)

Soil loss rate (decimal) = 0.900

 Slope of intensity-duration curve for a 1 hour storm =0.5300

Unit Hydrograph
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	59.240	8.044
2	0.167	118.480	33.427
3	0.250	177.720	26.826
4	0.333	236.960	10.442
5	0.417	296.200	6.142
6	0.500	355.440	4.163
7	0.583	414.679	2.977
8	0.667	473.919	2.087
9	0.750	533.159	1.724
10	0.833	592.399	1.289
11	0.917	651.639	0.986
12	1.000	710.879	0.706
13	1.083	770.119	0.592
14	1.167	829.359	0.595
		Sum = 100.000	Sum= 69.247

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
			Max	Low	
1	0.08	3.40	0.183	(0.185)	0.165
2	0.17	4.70	0.254	(0.228)	0.068
3	0.25	4.70	0.254	(0.228)	0.068
4	0.33	5.10	0.275	(0.248)	0.090
5	0.42	5.80	0.313	(0.282)	0.128
6	0.50	5.90	0.318	(0.287)	0.133
7	0.58	7.10	0.383	(0.345)	0.198
8	0.67	8.70	0.470	(0.423)	0.284
9	0.75	13.20	0.712	(0.641)	0.527
10	0.83	29.70	1.603	(1.443)	1.418
11	0.92	7.70	0.416	(0.374)	0.230
12	1.00	4.00	0.216	(0.194)	0.031
(Loss Rate Not Used)					
Sum =	100.0				Sum = 3.2

Flood volume = Effective rainfall 0.27(In)
 times area 68.7(Ac.)/[(In)/(Ft.)] = 1.5(Ac.Ft)
 Total soil loss = 0.18(In)
 Total soil loss = 1.051(Ac.Ft)
 Total rainfall = 0.45(In)
 Flood volume = 66387.8 Cubic Feet
 Total soil loss = 45780.1 Cubic Feet

 Peak flow rate of this hydrograph = 47.743(CFS)

+++++ 1 - H O U R S T O R M +++++								
R u n o f f H y d r o g r a p h								

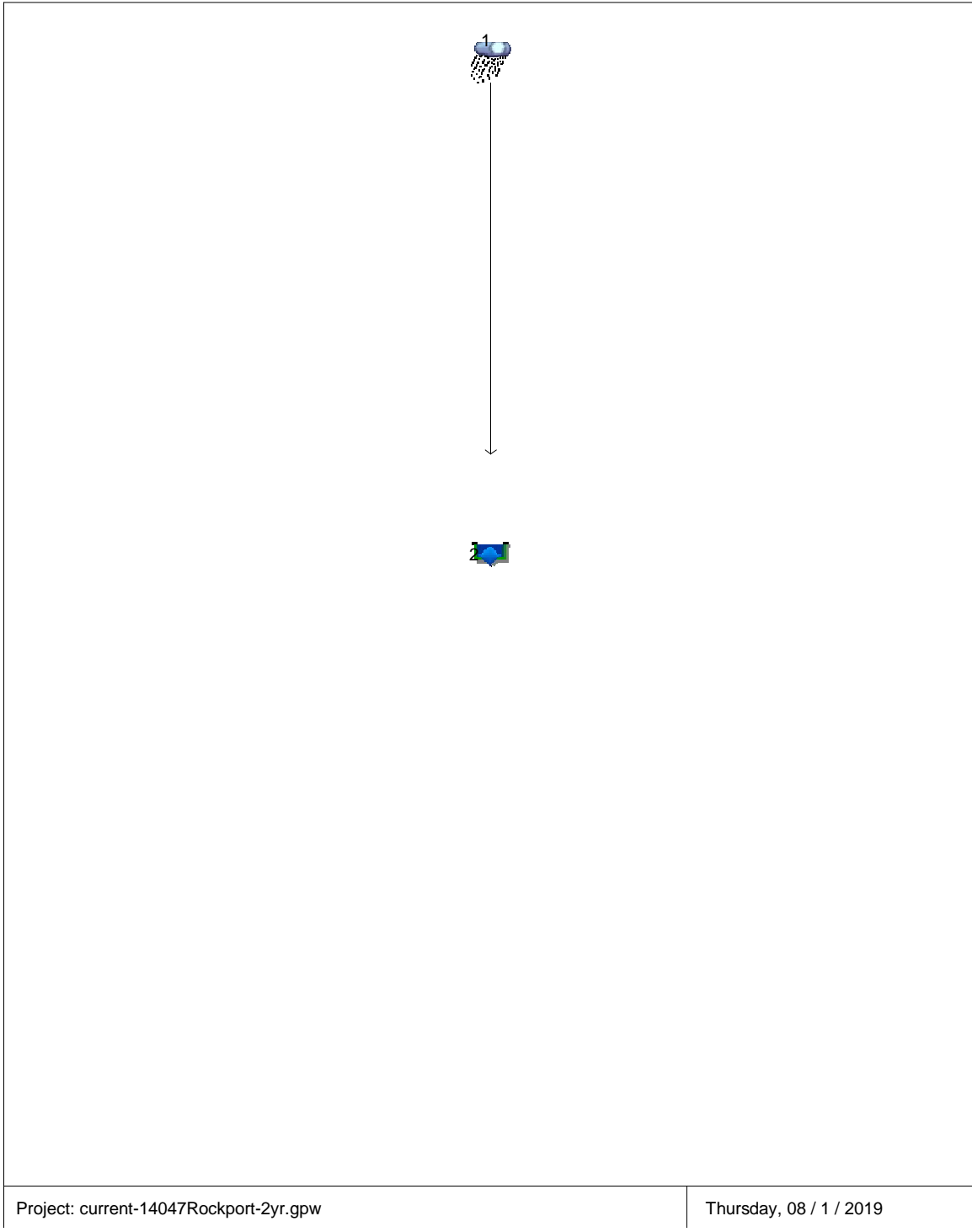
Hydrograph in 5 Minute intervals ((CFS))								

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0

0+ 5	0.0007	0.10	Q					
0+10	0.0063	0.81	Q					
0+15	0.0221	2.31	VQ					
0+20	0.0462	3.49	VQ					
0+25	0.0781	4.64	VQ					
0+30	0.1209	6.21	VQ					
0+35	0.1742	7.74	V	Q				
0+40	0.2453	10.32	V	Q				
0+45	0.3502	15.23	V		Q			
0+50	0.5440	28.14			V			
0+55	0.8728	47.74				Q		
1+ 0	1.1354	38.13				V		Q
1+ 5	1.2678	19.23			Q		VQ	
1+10	1.3440	11.06		Q			V	
1+15	1.3945	7.33		Q			V	
1+20	1.4305	5.22		Q			V	
1+25	1.4565	3.79		Q			V	
1+30	1.4769	2.96		Q			V	
1+35	1.4922	2.22		Q			V	
1+40	1.5037	1.67		Q			V	
1+45								

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Project: current-14047Rockport-2yr.gpw

Thursday, 08 / 1 / 2019

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Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	-----	-----	47.74	-----	-----	-----	-----	-----	-----	Inflow
2	Reservoir	1	-----	3.779	-----	-----	-----	-----	-----	-----	Outflow
Proj. file: current-14047Rockport-2yr.gpw										Thursday, 08 / 1 / 2019	

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	47.74	5	55	65,502	-----	-----	-----	Inflow
2	Reservoir	3.779	5	85	65,481	1	1423.62	56,074	Outflow
current-14047Rockport-2yr.gpw					Return Period: 2 Year			Thursday, 08 / 1 / 2019	

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Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

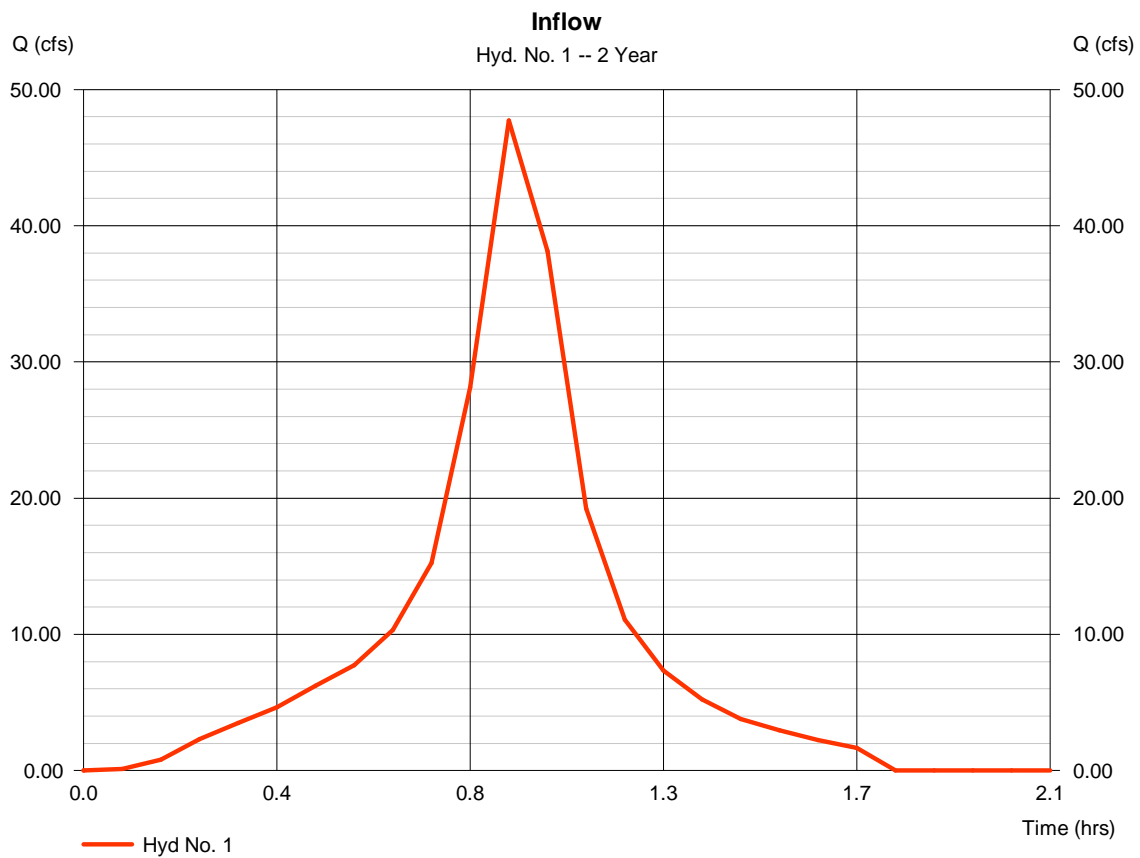
Thursday, 08 / 1 / 2019

Hyd. No. 1

Inflow

Hydrograph type = Manual
Storm frequency = 2 yrs
Time interval = 5 min

Peak discharge = 47.74 cfs
Time to peak = 0.92 hrs
Hyd. volume = 65,502 cuft



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Hydrograph Report

5

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

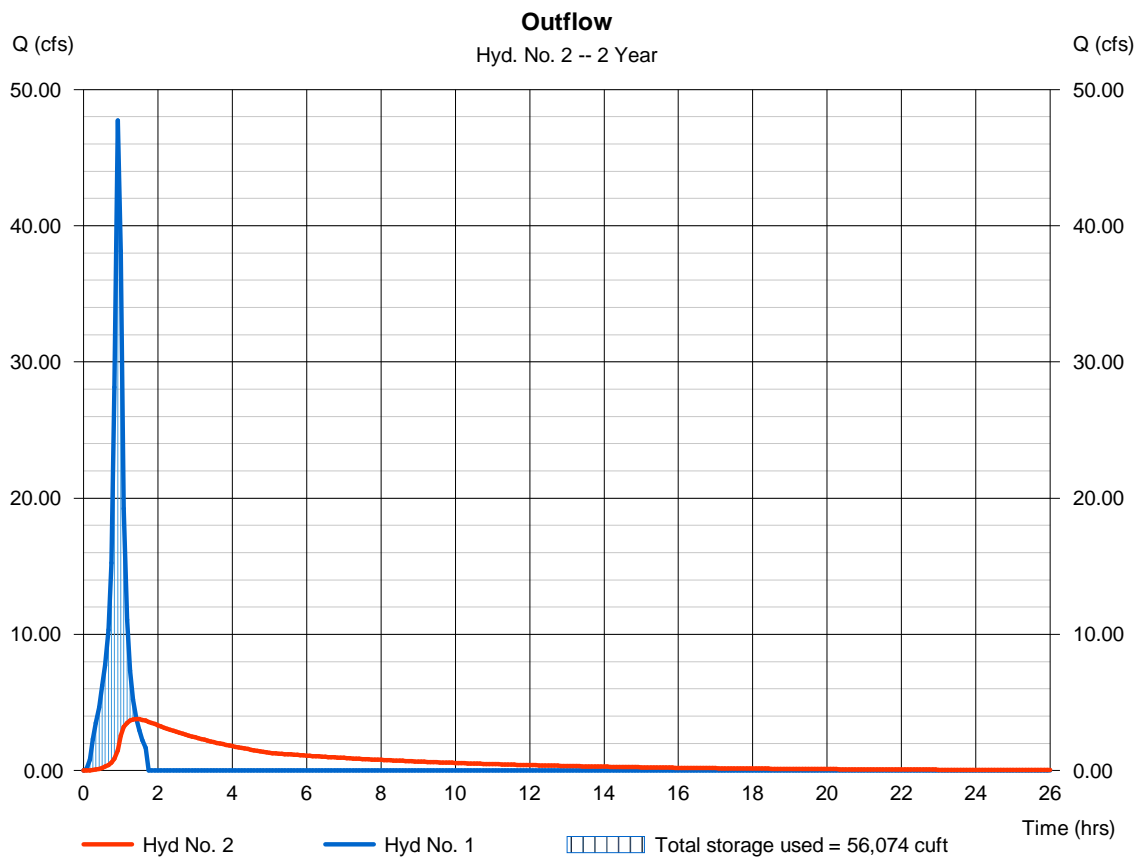
Hyd. No. 2

Outflow

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 5 min
Inflow hyd. No. = 1 - Inflow
Reservoir name = Pond

Peak discharge = 3.779 cfs
Time to peak = 1.42 hrs
Hyd. volume = 65,481 cuft
Max. Elevation = 1423.62 ft
Max. Storage = 56,074 cuft

Storage Indication method used.



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Pond Report

6

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

Pond No. 1 - Pond

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1423.35	n/a	0	0
1.30	1424.65	n/a	272,799	272,799

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 96.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1423.35	0.00	0.00	0.00
Length (ft)	= 210.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1423.35	0.00	---	---	---	---	---	---	---	---	---	0.000
1.30	272,799	1424.65	33.84 oc	---	---	---	---	---	---	---	---	---	33.84

Unit Hydrograph - 10 Year Storm Event

Attachment M2.1
Unit Hydrograph
Calculations from
Unit Hydrograph

10 Year Unit Hydrograph Analysis

Unit Hydrograph Analysis

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Study date 07/29/19 File: Rockport110UHPost110.out

+++++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6332

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Rockport Development
Unit Hydrograph-10 Year
Post-Development 10 Year Storm Event
14047 Menifee Rockport Development

Drainage Area = 68.71(Ac.) = 0.107 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 68.71(Ac.) = 0.107 Sq. Mi.
Length along longest watercourse = 2414.00(Ft.)
Length along longest watercourse measured to centroid = 1485.87(Ft.)
Length along longest watercourse = 0.457 Mi.
Length along longest watercourse measured to centroid = 0.281 Mi.
Difference in elevation = 15.65(Ft.)
Slope along watercourse = 34.2303 Ft./Mi.
Average Manning's 'N' = 0.025
Lag time = 0.141 Hr.
Lag time = 8.44 Min.
25% of lag time = 2.11 Min.
40% of lag time = 3.38 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	0.50	34.35

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	1.20	82.45

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 0.788(In)
Areal adjustment factor = 99.94 %
Adjusted average point rain = 0.787(In)

Sub-Area Data:

Riverside County Synthetic Unit Hydrology Method
Page 1 of 3

Area(Ac.) Runoff Index Impervious %
 68.710 75.00 0.700
 Total Area Entered = 68.71(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
75.0	75.0	0.303	0.700	0.112	1.000	0.112
Sum (F) =						0.112

Area averaged mean soil loss (F) (In/Hr) = 0.112

Minimum soil loss rate ((In/Hr)) = 0.056

(for 24 hour storm duration)

Soil loss rate (decimal) = 0.340

 Slope of intensity-duration curve for a 1 hour storm =0.5300

Unit Hydrograph
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	59.240	8.044
2	0.167	118.480	33.427
3	0.250	177.720	26.826
4	0.333	236.960	10.442
5	0.417	296.200	6.142
6	0.500	355.440	4.163
7	0.583	414.679	2.977
8	0.667	473.919	2.087
9	0.750	533.159	1.724
10	0.833	592.399	1.289
11	0.917	651.639	0.986
12	1.000	710.879	0.706
13	1.083	770.119	0.592
14	1.167	829.359	0.595
		Sum = 100.000	Sum= 69.247

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
			Max	Low	
1	0.08	3.40	0.321	(0.112)	0.109
2	0.17	4.70	0.444	(0.151)	0.332
3	0.25	4.70	0.444	(0.151)	0.332
4	0.33	5.10	0.482	(0.164)	0.370
5	0.42	5.80	0.548	(0.186)	0.436
6	0.50	5.90	0.558	(0.190)	0.445
7	0.58	7.10	0.671	(0.228)	0.559
8	0.67	8.70	0.822	(0.280)	0.710
9	0.75	13.20	1.247	(0.424)	1.135
10	0.83	29.70	2.807	(0.954)	2.695
11	0.92	7.70	0.728	(0.247)	0.616
12	1.00	4.00	0.378	(0.129)	0.266
(Loss Rate Not Used)					
Sum =	100.0				Sum = 8.1

Flood volume = Effective rainfall 0.68(In)
 times area 68.7(Ac.)/[(In)/(Ft.)] = 3.9(Ac.Ft)
 Total soil loss = 0.11(In)
 Total soil loss = 0.641(Ac.Ft)
 Total rainfall = 0.79(In)
 Flood volume = 168512.3 Cubic Feet
 Total soil loss = 27902.5 Cubic Feet

 Peak flow rate of this hydrograph = 98.005(CFS)

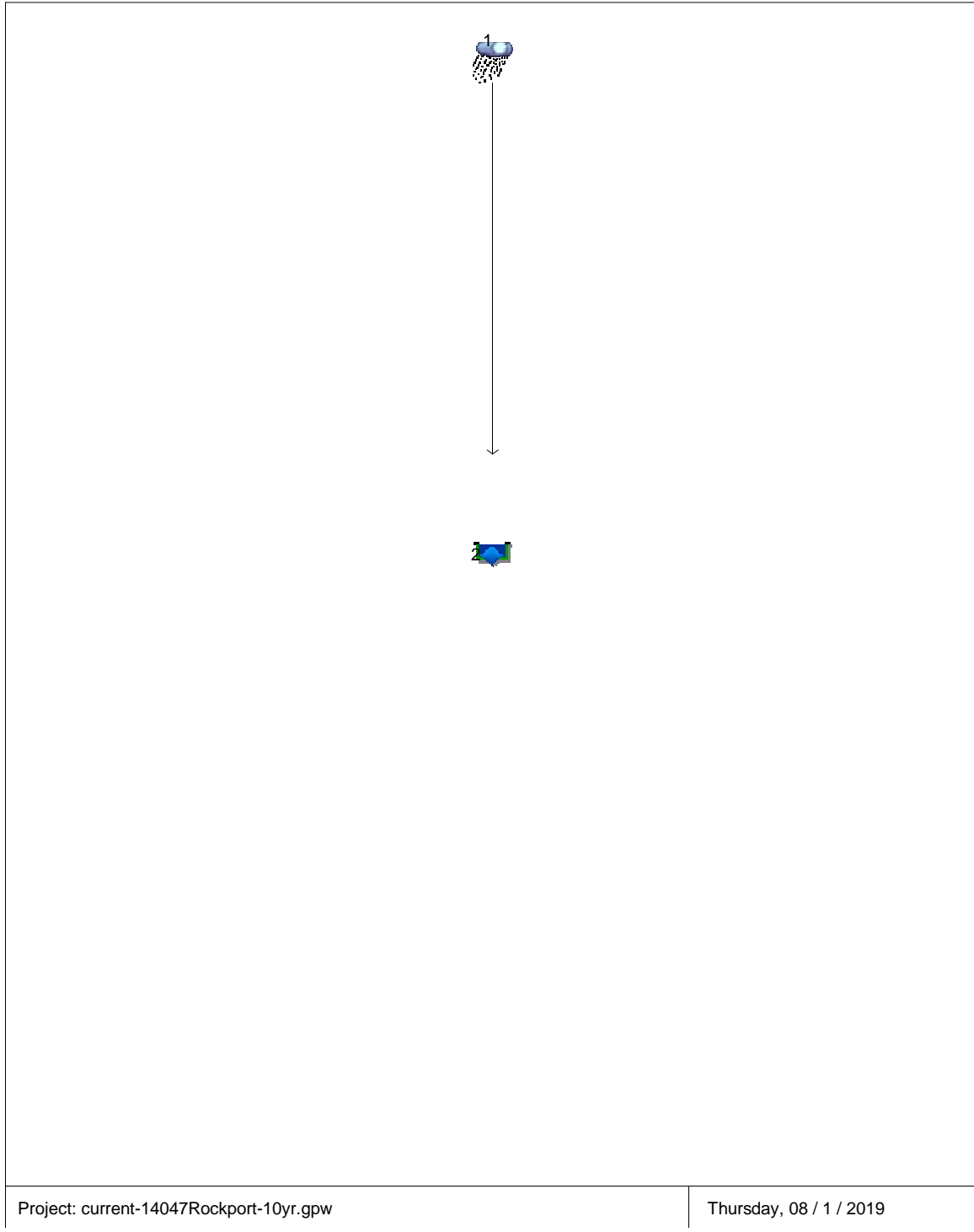
 ++++++
 1 - H O U R S T O R M
 R u n o f f H y d r o g r a p h

 Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	25.0	50.0	75.0	100.0
0+ 5	0.0081	1.18	Q					
0+10	0.0547	6.76	V Q					
0+15	0.1476	13.48	V Q					
0+20	0.2678	17.46	V Q					
0+25	0.4088	20.47	V Q					
0+30	0.5732	23.88	V Q					
0+35	0.7593	27.02	V Q					
0+40	0.9787	31.85	V Q					
0+45	1.2591	40.72	V Q					
0+50	1.6966	63.53	V Q					
0+55	2.3716	98.00	V Q					
1+ 0	2.9314	81.28	V Q					
1+ 5	3.2557	47.09	V Q					
1+10	3.4484	27.97	V Q					
1+15	3.5689	17.50	V Q					
1+20	3.6533	12.26	V Q					
1+25	3.7143	8.85	V Q					
1+30	3.7610	6.79	V Q					
1+35	3.7959	5.06	V Q					
1+40	3.8220	3.78	V Q					
1+45	3.8408	2.74	V Q					
1+50	3.8550	2.06	V Q					
1+55	3.8653	1.49	V Q					
2+ 0	3.8678	0.36	V Q					
2+ 5	3.8685	0.11	V Q					

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Project: current-14047Rockport-10yr.gpw

Thursday, 08 / 1 / 2019

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Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	-----	-----	-----	-----	-----	98.00	-----	-----	-----	Inflow
2	Reservoir	1	-----	-----	-----	-----	23.23	-----	-----	-----	Outflow

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	98.00	5	55	168,492	-----	-----	-----	Inflow
2	Reservoir	23.23	5	70	168,482	1	1423.92	119,197	Outflow
current-14047Rockport-10yr.gpw					Return Period: 10 Year			Thursday, 08 / 1 / 2019	

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Hydrograph Report

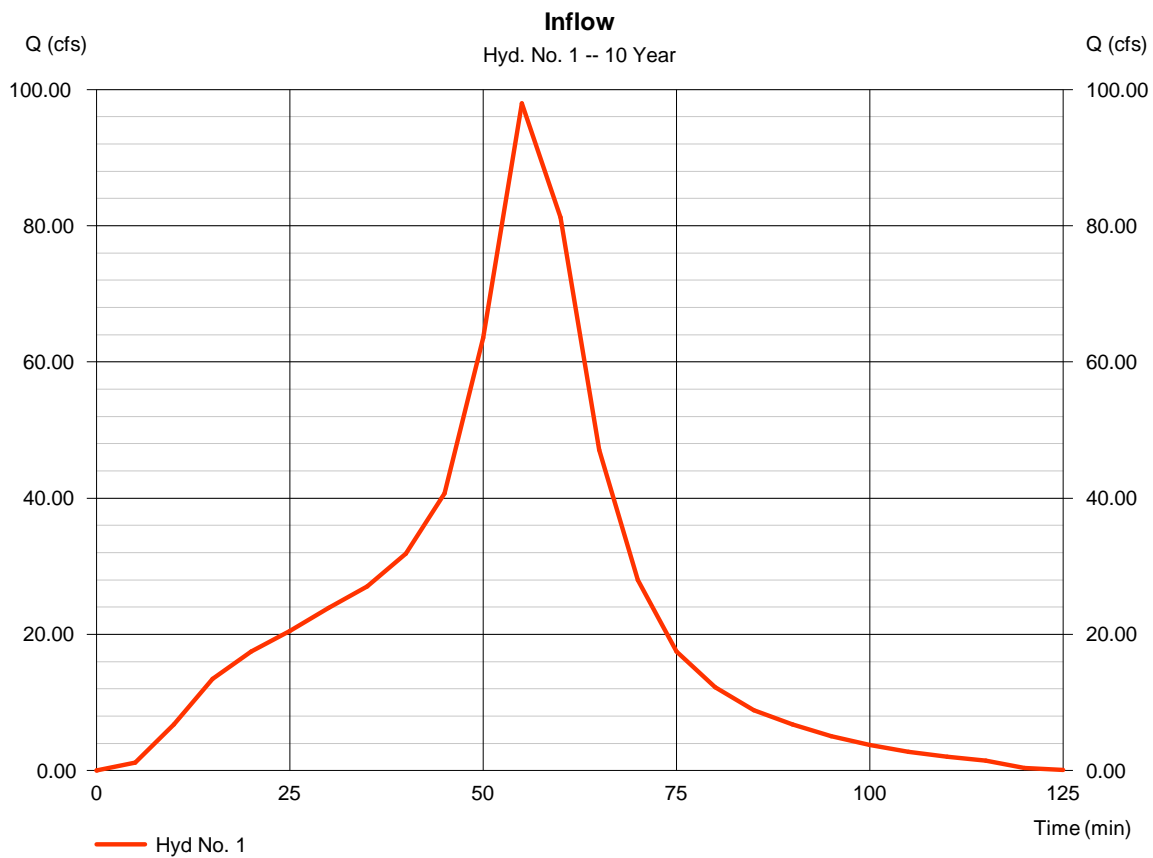
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

Hyd. No. 1

Inflow

Hydrograph type	= Manual	Peak discharge	= 98.00 cfs
Storm frequency	= 10 yrs	Time to peak	= 55 min
Time interval	= 5 min	Hyd. volume	= 168,492 cuft



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Hydrograph Report

5

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

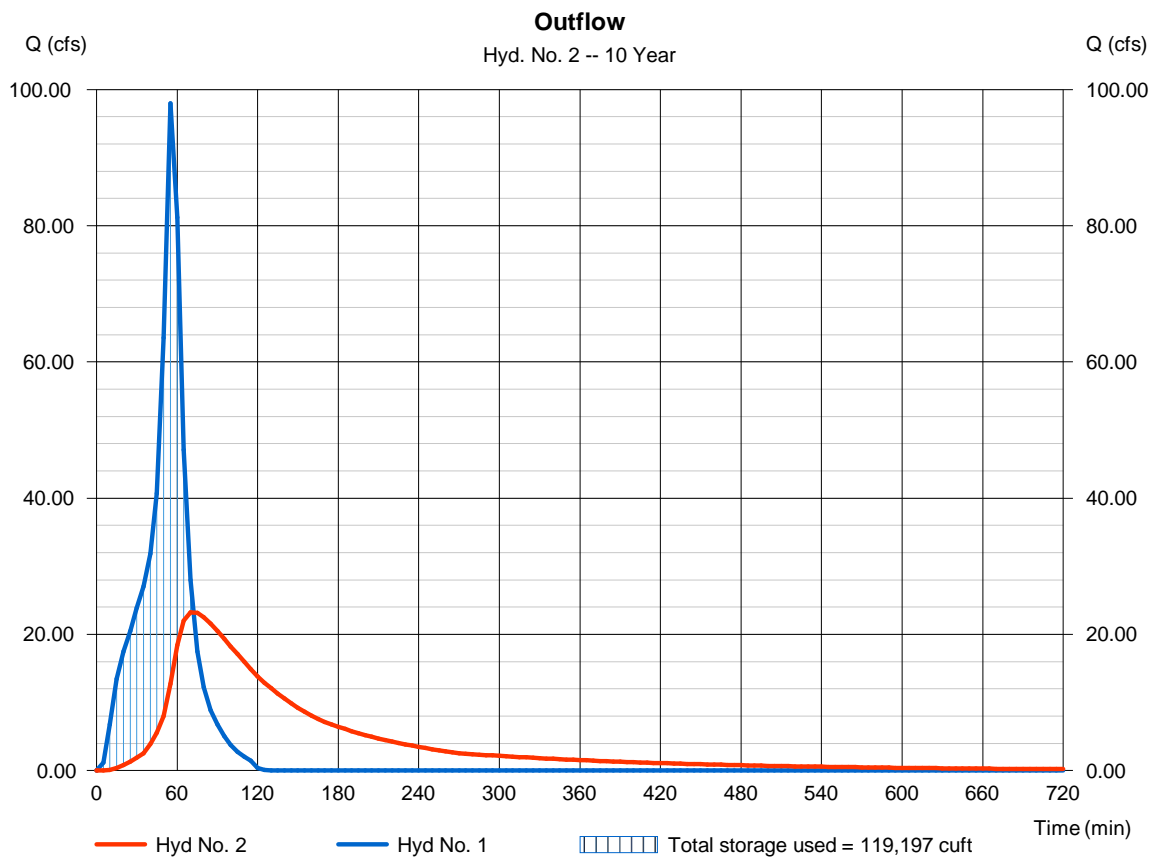
Thursday, 08 / 1 / 2019

Hyd. No. 2

Outflow

Hydrograph type	= Reservoir	Peak discharge	= 23.23 cfs
Storm frequency	= 10 yrs	Time to peak	= 70 min
Time interval	= 5 min	Hyd. volume	= 168,482 cuft
Inflow hyd. No.	= 1 - Inflow	Max. Elevation	= 1423.92 ft
Reservoir name	= Pond	Max. Storage	= 119,197 cuft

Storage Indication method used.



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Pond Report

6

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

Pond No. 1 - Pond

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1423.35	n/a	0	0
1.30	1424.65	n/a	272,799	272,799

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 96.00	0.00	0.00	0.00
No. Barrels	= 2	0	0	0
Invert El. (ft)	= 1423.35	0.00	0.00	0.00
Length (ft)	= 210.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1423.35	0.00	---	---	---	---	---	---	---	---	---	0.000
1.30	272,799	1424.65	67.67 oc	---	---	---	---	---	---	---	---	---	67.67

Unit Hydrograph - 100Year Storm Event

Attachment M2.2
Unit Hydrograph
Calculations from
Unit Hydrograph

100 Year Unit Hydrograph Analysis

Unit Hydrograph Analysis

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Study date 07/29/19 File: Rockport1100UHPPost1100.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6332

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Rockport Development
100 Year Unit Hydrograph
Post-Development 100 Year Storm Event
14047 Menifee Rockport Development

Drainage Area = 68.71(Ac.) = 0.107 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 68.71(Ac.) = 0.107 Sq. Mi.
Length along longest watercourse = 2414.00(Ft.)
Length along longest watercourse measured to centroid = 1485.87(Ft.)
Length along longest watercourse = 0.457 Mi.
Length along longest watercourse measured to centroid = 0.281 Mi.
Difference in elevation = 15.65(Ft.)
Slope along watercourse = 34.2303 Ft./Mi.
Average Manning's 'N' = 0.027
Lag time = 0.152 Hr.
Lag time = 9.12 Min.
25% of lag time = 2.28 Min.
40% of lag time = 3.65 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	0.50	34.35

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
68.71	1.20	82.45

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.94 %
Adjusted average point rain = 1.199(In)

Sub-Area Data:
Area(Ac.) Runoff Index Impervious %

Riverside County Synthetic Unit Hydrology Method
Page 1 of 3

68.710 75.00 0.700
Total Area Entered = 68.71(Ac.)

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
75.0	75.0	0.303	0.700	0.112	1.000	0.112
						Sum (F) = 0.112

Area averaged mean soil loss (F) (In/Hr) = 0.112
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil loss rate (decimal) = 0.340

Slope of intensity-duration curve for a 1 hour storm =0.5300

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	54.852	7.090
2	0.167	109.704	30.120
3	0.250	164.555	28.052
4	0.333	219.407	11.433
5	0.417	274.259	6.418
6	0.500	329.111	4.415
7	0.583	383.962	3.195
8	0.667	438.814	2.312
9	0.750	493.666	1.749
10	0.833	548.518	1.476
11	0.917	603.370	1.105
12	1.000	658.221	0.862
13	1.083	713.073	0.628
14	1.167	767.925	0.549
15	1.250	822.777	0.595
Sum = 100.000			Sum= 69.247

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
			Max	Low	
1	0.08	3.40	0.112	(0.166)	0.377
2	0.17	4.70	0.112	(0.230)	0.564
3	0.25	4.70	0.112	(0.230)	0.564
4	0.33	5.10	0.112	(0.250)	0.622
5	0.42	5.80	0.112	(0.284)	0.723
6	0.50	5.90	0.112	(0.289)	0.737
7	0.58	7.10	0.112	(0.347)	0.910
8	0.67	8.70	0.112	(0.426)	1.140
9	0.75	13.20	0.112	(0.646)	1.788
10	0.83	29.70	0.112	(1.453)	4.162
11	0.92	7.70	0.112	(0.377)	0.996
12	1.00	4.00	0.112	(0.196)	0.464
(Loss Rate Not Used)					
Sum =	100.0				Sum = 13.0

Flood volume = Effective rainfall 1.09(In)
times area 68.7(Ac.)/(In)/(Ft.)] = 6.2(Ac.Ft)
Total soil loss = 0.11(In)
Total soil loss = 0.642(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 271152.2 Cubic Feet
Total soil loss = 27962.2 Cubic Feet

Peak flow rate of this hydrograph = 145.961(CFS)

 1 - H O U R S T O R M
 R u n o f f H y d r o g r a p h

 Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0128	1.85	Q					
0+10	0.0861	10.64	V Q					
0+15	0.2367	21.88	V Q					
0+20	0.4350	28.78	V Q					
0+25	0.6666	33.64	V Q					
0+30	0.9347	38.92	VQ					
0+35	1.2369	43.89	VQ					
0+40	1.5880	50.97	Q					
0+45	2.0274	63.81		QV				
0+50	2.6882	95.94			V Q			
0+55	3.6934	145.96				V	Q	
1+ 0	4.5938	130.74					Q	V
1+ 5	5.1384	79.07			Q			V
1+10	5.4668	47.69		Q				V
1+15	5.6735	30.01		Q				V
1+20	5.8196	21.21		Q				V
1+25	5.9267	15.54		Q				V
1+30	6.0076	11.76		Q				V
1+35	6.0712	9.23		Q				V
1+40	6.1193	6.98		Q				V
1+45	6.1558	5.31		Q				V
1+50	6.1828	3.91		Q				V
1+55	6.2036	3.03		Q				V
2+ 0	6.2194	2.30		Q				V
2+ 5	6.2235	0.59		Q				V
2+10	6.2248	0.19		Q				V

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Project: current-14047Rockport-100yr.gpw

Thursday, 08 / 1 / 2019

Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	----	----	----	----	----	----	----	----	145.96	Inflow
2	Reservoir	1	----	----	----	----	----	----	----	24.35	Outflow
Proj. file: current-14047Rockport-100yr.gpw										Thursday, 08 / 1 / 2019	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	145.96	5	55	271,152	-----	-----	-----	Inflow
2	Reservoir	24.35	5	80	271,131	1	1424.35	208,756	Outflow
current-14047Rockport-100yr.gpw					Return Period: 100 Year			Thursday, 08 / 1 / 2019	

Hydrograph Report

4

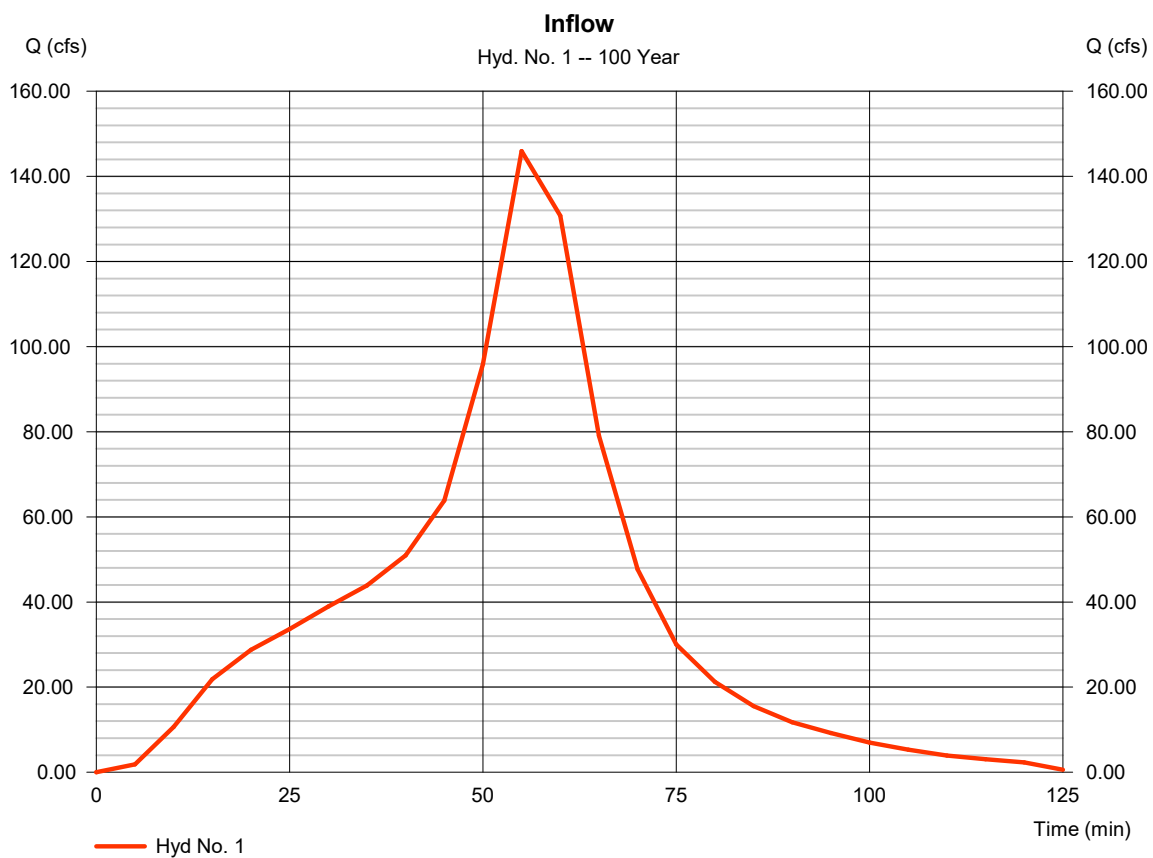
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

Hyd. No. 1

Inflow

Hydrograph type	= Manual	Peak discharge	= 145.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 55 min
Time interval	= 5 min	Hyd. volume	= 271,152 cuft



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

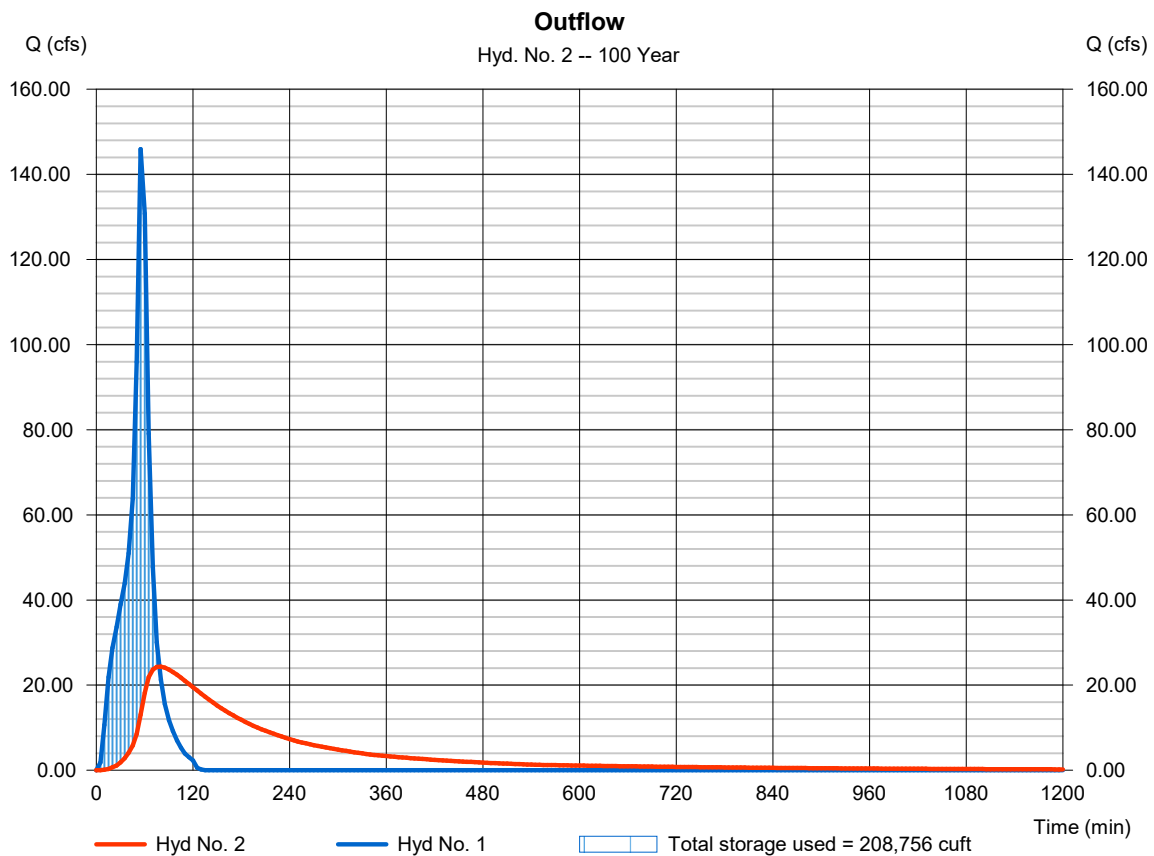
Thursday, 08 / 1 / 2019

Hyd. No. 2

Outflow

Hydrograph type	= Reservoir	Peak discharge	= 24.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 80 min
Time interval	= 5 min	Hyd. volume	= 271,131 cuft
Inflow hyd. No.	= 1 - Inflow	Max. Elevation	= 1424.35 ft
Reservoir name	= Pond	Max. Storage	= 208,756 cuft

Storage Indication method used.



Pond Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 08 / 1 / 2019

Pond No. 1 - Pond

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1423.35	n/a	0	0
1.30	1424.65	n/a	272,799	272,799

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 96.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1423.35	0.00	0.00	0.00
Length (ft)	= 210.00	0.00	0.00	0.00
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

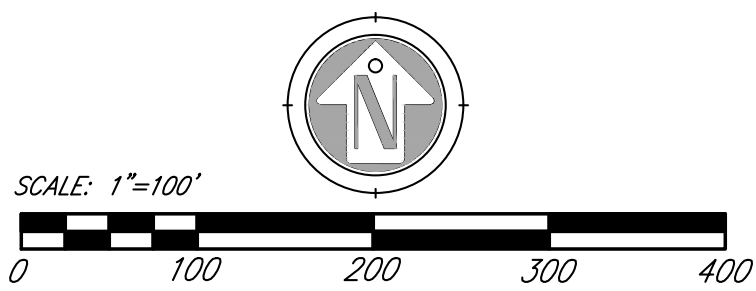
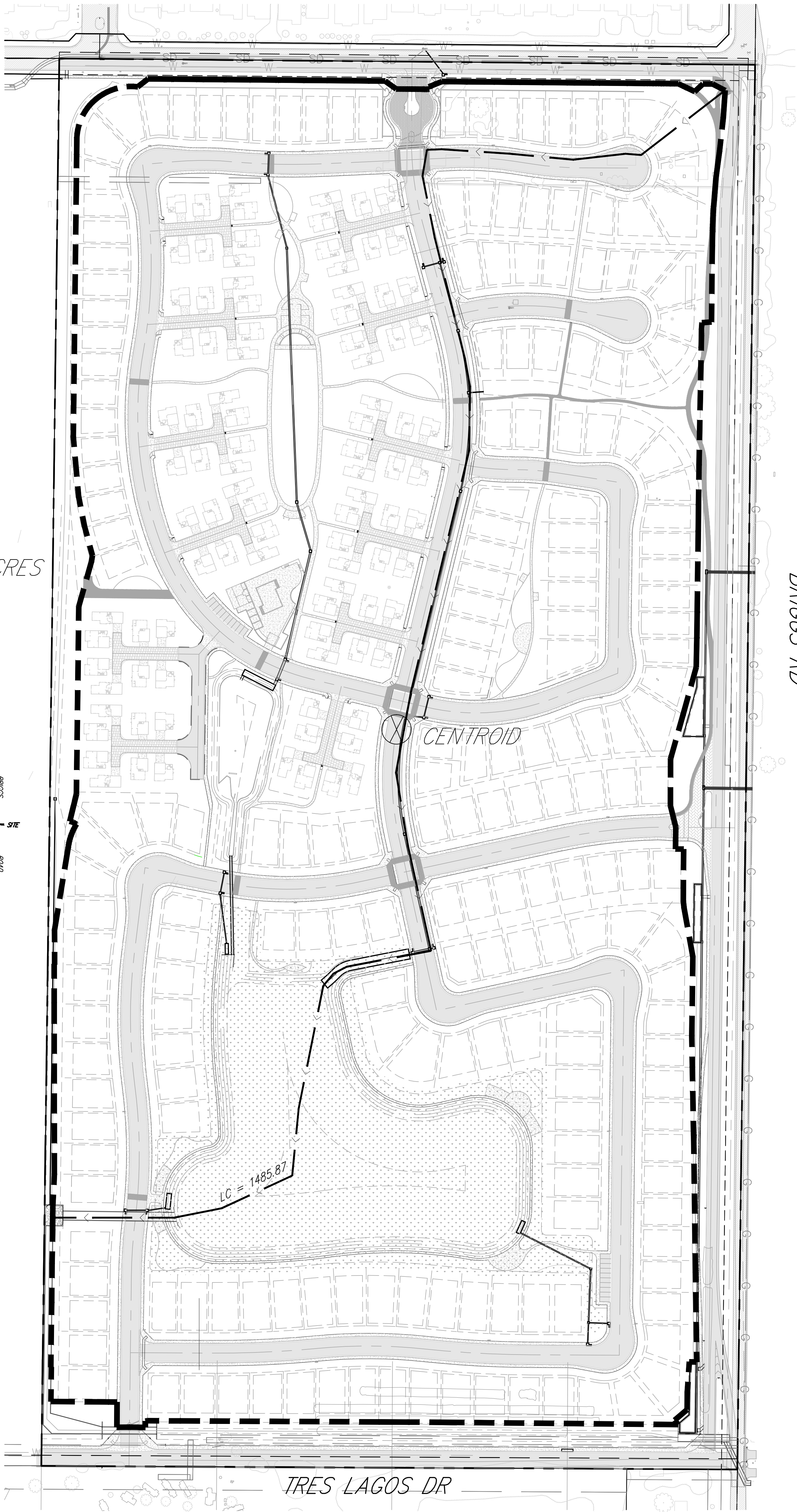
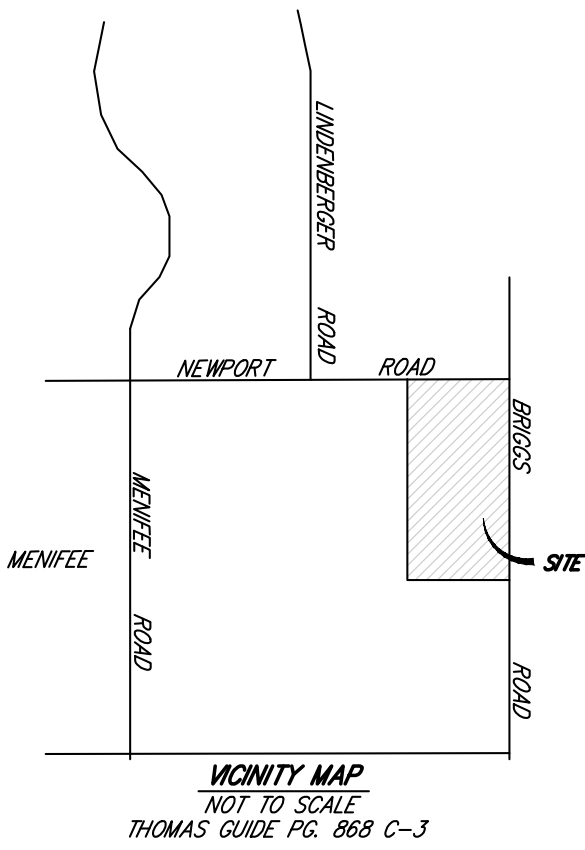
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

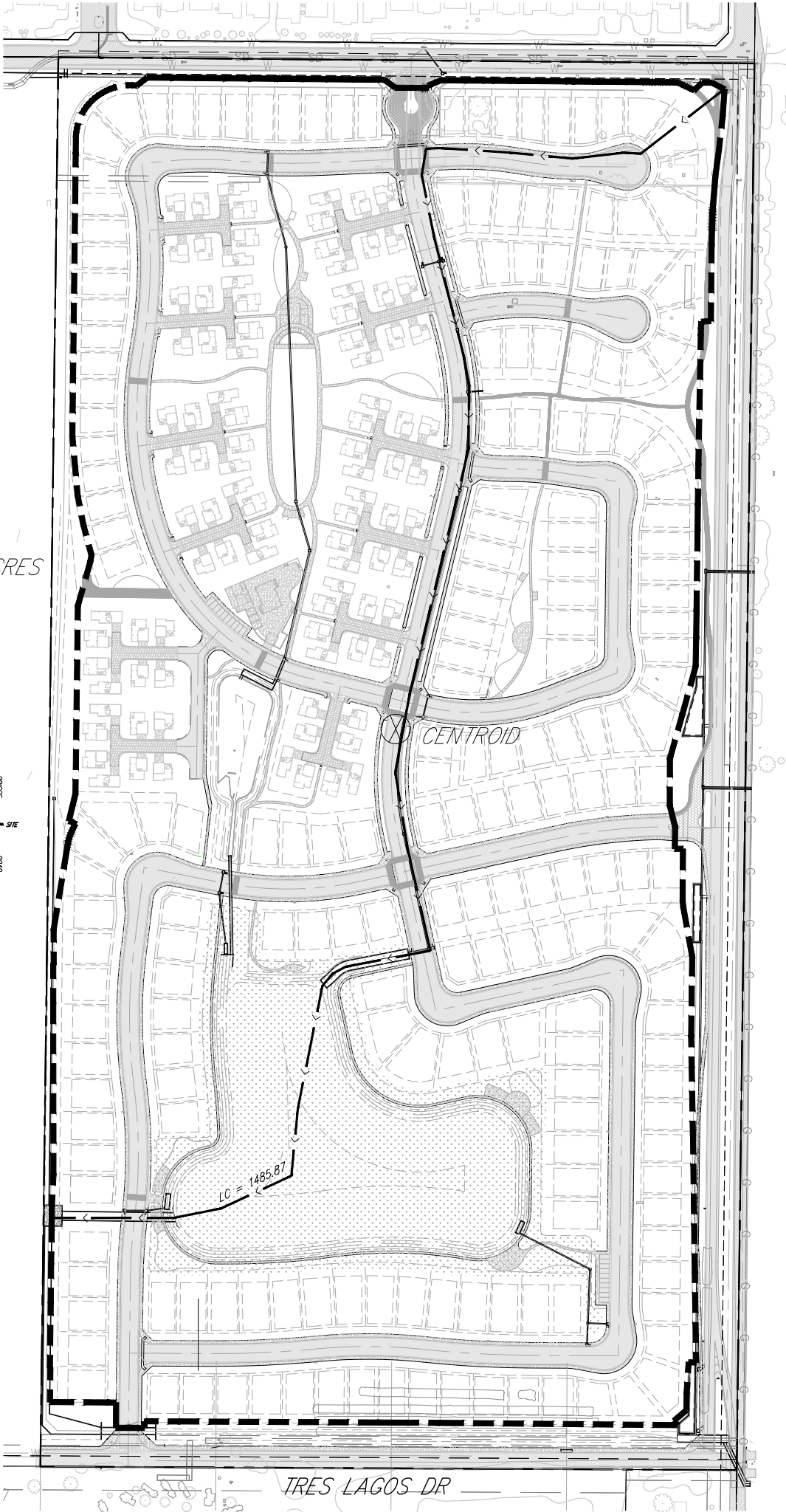
Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1423.35	0.00	---	---	---	---	---	---	---	---	---	0.000
1.30	272,799	1424.65	33.84 oc	---	---	---	---	---	---	---	---	---	33.84

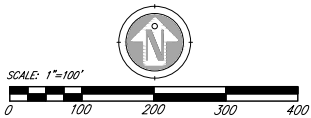
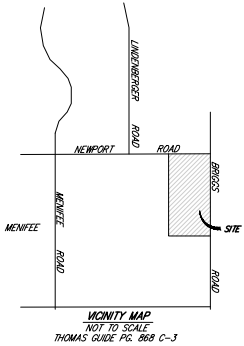


- WET POND
- CONCRETE
- A/C SURFACE
- DMA BOUNDARY

RECOMMENDED FOR APPROVAL		DEVELOPER:		TENTATIVE DMA MAP ROCKPORT RANCH		EXCEL ENGINEERING LAND PLANNING • ENGINEERING • SURVEYING 440 STATE PLACE, ESCROWED, CA 90209 PH (310) 495-5818 FX (310) 495-1588		FOR:		W.O.		DATE:	
DATE:		CHECKED BY:		DATE:									



68.42 ACRES



- WET POND
- CONCRETE
- A/C SURFACE
- DMA BOUNDARY

TENTATIVE DMA MAP
ROCKPORT RANCH

EXCEL
ENGINEERING
AND PLANNING
445 STATE ST., SUITE 200, CA 92033
PH (760) 45-8118 FX (760) 45-1980

DEVELOPER:

RECOMMENDED FOR APPROVAL

DATE: _____
CHECKED BY: _____
DATE: _____

DATE: _____
W.O. _____
FOR: _____

M3. Summary of results

The results of the analysis show that for the Proposed Lake the mitigated flows from the 2, 10 and, 100 year storm events are at lower flows than those of the established ultimate existing flows, and the onsite flows are lower than the existing onsite flows as shown in Table 6.4-1 in section 6 of the report.