Attachment G

Drainage Report

DRAINAGE REPORT

FOR THE

PERMANENTE QUARRY

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FOR REVIEW ONLY

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EXECUTIVE SUMMARY

Lehigh Southwest Cement Company is processing a Reclamation Plan Amendment and Conditional Use Permit application for the Permanente Quarry (the Project). The Permanente Quarry currently includes an estimated 537 acres of mining related disturbance. The Reclamation Plan Amendment would cover 1,105 acres, representing existing and planned mining disturbance as well as additional buffer areas (Project Area) that will not be affected by the Project. The Conditional Use Permit application covers 117 acres of the Project Area, and represents a portion of a 206.5 acre future extraction area.

The purpose of this Drainage Report is to perform an evaluation of the changes in surface drainage that would occur as a result of the mining and reclamation activities proposed by the Project. This report also provides analysis and design for drainage and sediment control facilities required in connection with the implementation of the Project. The information in this report includes the following:

- The Project has been designed with sediment controls. The primary sediment control measures are a series of drainage swales and desiltation basins, which will provide protection during operational and reclamation activities. Other best management practices (BMPs) for sediment controls (landscaping, etc.) will be employed, as necessary.

- New desiltation basins will be constructed at the South Quarry, North Quarry, and Topsoil Storage Area. The basins have been designed using criteria from the State Water Resources Control Board (SWRCB) and Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).

- The drainage controls will allow the Project to meet the storm water conveyance requirements within Santa Clara County's 2007 *Drainage Manual*, and as set forth in the Surface Mining and Reclamation Act (SMARA) (*California Code of Regulations*, Title 14, Section 3706), which collectively require storm water facilities to convey the 10- and 20-year storms, and safely release 100-year flows.

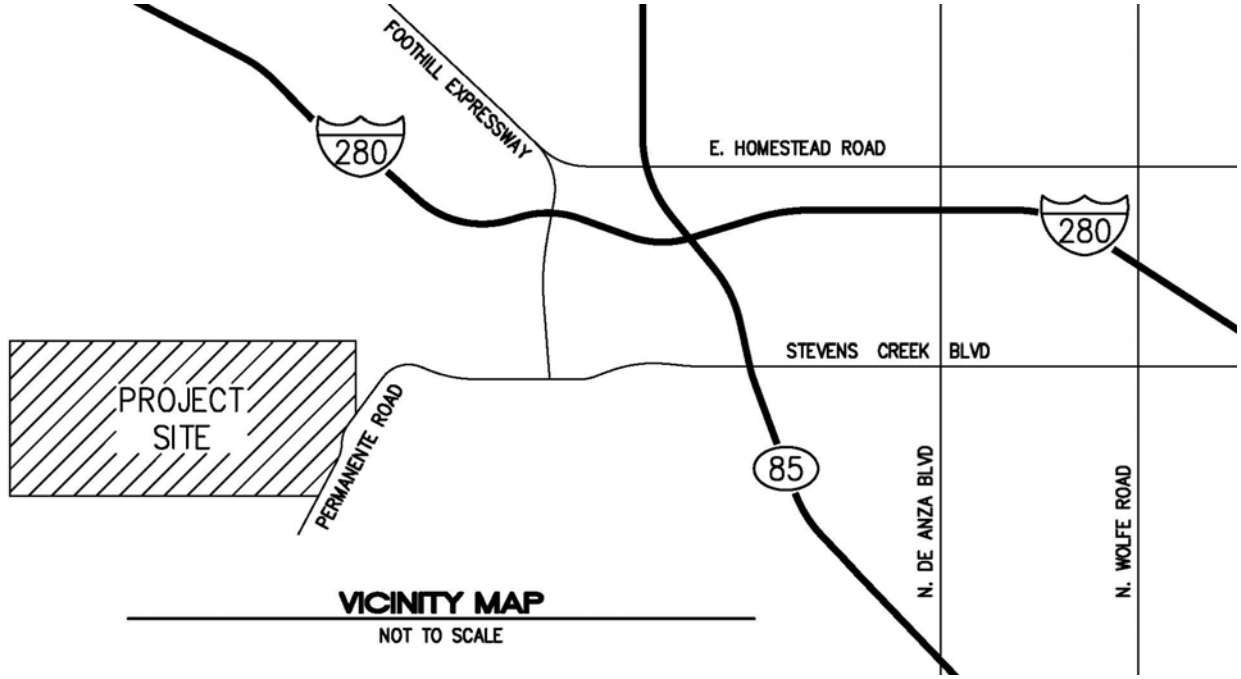
- The Project will not change the amount of impervious and pervious surfaces within the Project Area, and as a result the overall flow volumes will not change.

- The reclaimed South Quarry will not significantly alter the overall 25- or 100-year flow rates entering Monte Bello Creek or Permanente Creek. Consequently, the downstream creek flow will experience minimal impact from the South Quarry.

- After reclamation, surface runoff from the North Quarry and adjacent West Materials Storage Area will be directly conveyed into Permanente Creek. The project will not significantly alter the overall 25- or 100-year flow rates from these areas. The runoff entering Permanente Creek will more closely reflect the conditions prior to mining-related activities at the North Quarry and West Materials Storage Area.

INTRODUCTION

Lehigh Southwest Cement Company operates the Permanente Quarry, which is located west of the city of Cupertino in Santa Clara County (see the Vicinity Map). Quarrying operations have occurred at the site since the early 1900's. A Reclamation Plan Amendment and Conditional Use Permit are being processed for existing and proposed portions of the site. The proposed regions include the Central Materials Storage Area (CMSA), West Materials Storage Area (WMSA), North Quarry, South Quarry, and Topsoil Storage Area.



The CMSA is an overburden storage area within the northeast portion of the site. The CMSA will be constructed from an elevation of approximately 775 to 1,270 feet. Benches will generally lie at 40-foot vertical intervals, and a perimeter road will be graded around the CMSA. The overall slope including the inter-bench slopes and benches will be approximately 2.6 to 1 according to Golder Associates, Inc. (Golder). A series of drainage ditches, swales, and sedimentation basins will provide drainage control for the CMSA. An April 2009 Reclamation Plan Amendment is being processed for the East Materials Storage Area (EMSA), which is immediately east of the CMSA. The sedimentation basins constructed by the EMSA will also ultimately serve the CMSA. The currently proposed Reclamation Plan Amendment addresses reclamation activities for the CMSA, which will involve additional overburden storage above and adjacent to the areas proposed in the April 2009 amendment.

The WMSA has historically been used for overburden material storage and is near capacity. As part of the proposed Reclamation Plan Amendment, the WMSA will extend approximately from elevation 1,500 to 1,975 feet, and be graded with 2.5 to 1 slopes on the north and west faces. The south and east faces will be graded with benches at approximately 50-foot vertical intervals and inter-bench slopes. Golder has indicated that the overall slope on the south and east faces will be

approximately 3 to 1 or less. The benches will contain drainage ditches to convey storm flows. An existing unpaved road provides access along the south edge of the WMSA.

The North Quarry is immediately east of the WMSA and north of Permanente Creek. The North Quarry has historically been and is currently being used for extraction. The current mining plan contemplates extraction down to an elevation of approximately 440 feet. The proposed Reclamation Plan Amendment calls for backfilling to raise the pit floor to a minimum elevation of 990 feet. Under ultimate conditions, the North Quarry slopes will contain benches at 50-foot vertical intervals with inter-bench slopes. Golder has indicated that the overall slope will be approximately 2.5 to 1 or less. The combined North Quarry and WMSA will have a maximum elevation of approximately 1,975 feet. Under the final reclamation, storm runoff from the North Quarry and WMSA will be conveyed to Permanente Creek.

The South Quarry is a proposed extraction area located on the hillside south of Permanente Creek. The South Quarry is within the Permanente Creek and Monte Bello Creek watersheds. The South Quarry extraction will extend down to an elevation of approximately 925 feet. After reaching this ultimate depth, the South Quarry pit floor will be backfilled to an elevation of at least 1,110 feet. The final South Quarry slopes will contain benches at 50-foot vertical intervals with inter-bench slopes, and an overall slope estimated by Golder of approximately 3 to 1 in the upper elevations of the South Quarry with some steeper cut slopes below. Drainage ditches will convey the majority of the storm runoff to Permanente Creek and a small portion to Monte Bello Creek.

The Topsoil Storage Area is a planned topsoil stockpile area located east of the South Quarry. The Topsoil Storage Area will be used to temporarily store topsoil generated from mineral extraction activities occurring during project implementation. The topsoil will be used to support revegetation that is proposed for final reclamation of the South Quarry and other areas covered by the Reclamation Plan Amendment. The revegetation will consist of native grasses and shrubs, oak trees, pine trees, and riparian scrub/forest.

This report contains drainage analyses of the post-reclamation flow rates from the proposed CMSA, WMSA, North Quarry, South Quarry, and Topsoil Storage Area. Santa Clara County's 2007 *Drainage Manual* indicates that new storm drain systems and channels shall be designed to convey the 10-year storm without surcharge, and a safe release shall be provided for the 100-year flow. Furthermore, the Surface Mining and Reclamation Act (SMARA) states that erosion control methods shall be designed for the 20-year storm, and shall control erosion and sedimentation during operations in the CMSA as well as after reclamation is complete in the CMSA (see *California Code of Regulations*, Title 14, Section 3706). The *Drainage Manual* provides parameters for the 25-year storm event, but not the 20-year event. The 25-year event was analyzed in this report in order to satisfy the requirements for the 10- and 20-year events. Since the 25-year event is greater than these two events, the 25-year results will provide a greater factor-of-safety in the drainage design. The 100-year event was also analyzed in accordance with the *Drainage Manual* criteria.

Furthermore, this report contains analyses for several temporary desiltation basins that will be constructed around the CMSA, South Quarry, North Quarry, and Topsoil Storage Area

perimeters. The basins, as well as other interim erosion control measures, will be used until the vegetation establishes. The desiltation basins have been sized according to criteria from the State Water Resources Control Board (SWRCB) and the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).

HYDROLOGIC ANALYSES

Hydrologic analyses were performed for the existing (pre-project) and proposed (post-project or reclaimed) conditions. The Santa Clara County 2007 *Drainage Manual* allows the rational method for drainage areas smaller than 200 acres (with no detention, no substantial surface storage effect, and no large areas of pervious soils) and the unit hydrograph method for areas greater than 200 acres. The rational method was used to analyze the CMSA, South Quarry, and Topsoil Storage Area because the independent major drainage areas (i.e., drainage areas with independent outfall locations) within these were less than 200 acres. On the other hand, the unit hydrograph method was used to analyze the combined WMSA/North Quarry. The hydrologic analyses were performed for the 25- and 100-year storm events.

Rational Method

The rational method input parameters are summarized below and the supporting data is included in Appendix A:

- Rainfall Intensity: The 25- and 100-year intensity-duration-frequency curves were established using the Return Period-Duration-Specific (TDS) Regional Equation. The mean annual precipitation values used in the TDS equation for the CMSA, Topsoil Storage Area, and South Quarry are 22, 24, and 26 inches, respectively.

- Drainage area: The proposed condition (i.e., post-reclamation) drainage basins were delineated from either the base topography prepared for the site (flown in 2007 and 2008 with field adjustments in 2009) or the proposed Reclamation Plan Amendment grading representing the ultimate CMSA (Phase 5), South Quarry (Phase 5 – Backfill), and Topsoil Storage Area (Phase 5) configurations. The existing condition (pre-project) drainage basins were delineated from the base topography. The overall existing condition drainage areas were set equal to the overall proposed condition drainage areas to allow a comparison of the results. The Rational Method Work Maps in the map pocket at the back of this report contain the existing topography, proposed grading, basin boundaries, rational method node numbers, and basin areas.

- Hydrologic soil groups: The hydrologic soil group was determined from "Figure 1, Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin" in SCVURPPP's May 2004, *C.3. Stormwater Handbook.* The soil type at the site is entirely within group B. Discussions with Golder have indicated that the reclaimed hydrologic soil group will be similar to the undisturbed soil group.

- Runoff coefficients: The existing and proposed site conditions within the project footprint contain negligible impervious surfaces. Nearly the entire study area was assigned a runoff

coefficient based on shrub land (C = 0.10 for soil group B) since the existing conditions contain grasses, shrubs, and trees. In addition, the reclaimed land forms will be revegetated with grasses, shrubs, and trees. Some portions of the tributary undisturbed surfaces were assigned a coefficient associated with the agricultural land use category (C = 0.15 for soil group B) to represent disturbed areas with less transpiration.

- Flow lengths and elevations: The flow lengths and elevations were obtained from the topographic mapping and Reclamation Plan Amendment. The initial time of concentration for each initial subarea was calculated using a spreadsheet based on the Kirpich equation from the *Drainage Manual.*

The rational method analyses were performed using the CivilDesign Universal Rational Method Hydrology Program. This program was customized to meet the Santa Clara County hydrologic criteria. The County's intensity-duration data was input into the program. The times of concentration for initial subareas were calculated using a spreadsheet of the Kirpich equation, which is included in Appendix A. The initial time of concentration values from the spreadsheet were entered as user-specified data in the program. After the initial subarea is modeled, the program can route the flow in channels, streets, pipes, etc. The channel routing routine was used to model the flow in natural drainages and proposed ditches. The program also allows for flow in separate streams to be confluenced.

The runoff coefficients for some subareas were based on area averaged weighting that was developed using a spreadsheet, which is included in Appendix A. As described above, the majority of the subareas were categorized as shrub land, but a few also included the agricultural land category, which required a weighted average to be determined. The CivilDesign program requires a land use to be entered (e.g., undeveloped dense cover, undeveloped average cover, etc.). However, the runoff coefficients used by the program were based on user-defined values, rather than the program specified land use and soil group. Therefore, while the land uses listed in the output provide a general description of the land use, they were not used for determination of the runoff coefficients.

The overall 25- and 100-year existing and proposed condition rational method output for each region are included in Appendix A and summarized in Table 1. The results show that the reclaimed project will maintain or reduce the pre-project 25- and 100-year flow rates from each overall region.

		Pre-Project		**Post-Project**	
Region	**Area, ac**	**25-Year Flow, cfs[1]**	**100-Year Flow, cfs**	**25-Year Flow, cfs**	**100-Year Flow, cfs**
CMSA	139.61	26	32	22	27
South Quarry	240.35	52	63	41	50
Topsoil Storage Area	53.08	10.2	12.5	10.2	12.5

[1] cubic feet per second

Table 1. Summary of Overall Rational Method Results

Each region contains several major basins as shown on the Rational Method Work Maps at the back of this report. Each major basin flows to a common location or locations, and can also contain minor (or sub) basins. The rational method node numbering is based on the major basin number. For instance, rational method nodes 100, 101, 102, etc. are in Major Basin 100; nodes 200, 201, 202, etc. are in Major Basin 200; and so on. The rational method results for each minor and major basin and at each node number are contained within the output in Appendix A.

The majority of the project's surface runoff will flow into Permanente Creek, and a small portion of the South Quarry will flow into Monte Bello Creek. The rational method results indicate that the existing condition 25- and 100-year flows into Monte Bello Creek from the South Quarry are 9.6 and 11.7 cfs, respectively. The post-reclamation 25- and 100-year flows into Monte Bello Creek from the South Quarry are 4.5 and 5.6 cfs, respectively. The overall existing condition 25- and 100-year flows into Permanente Creek from the combined CMSA, South Quarry, and Topsoil Storage Area are 78 and 96 cfs, respectively. The post-reclamation 25- and 100-year flows into Permanente Creek from these regions are 68 and 84 cfs, respectively. These comparisons show that there is a net decrease in flow to both Monte Bello Creek and Permanente Creek due to the effect of reclamation at the CMSA, South Quarry, and Topsoil Storage Area.

Unit Hydrograph Method

The North Quarry and WMSA are located within a single major drainage area that will ultimately flow into Permanente Creek when the site is reclaimed. The major drainage area is larger than 200 acres, so the unit hydrograph method was used to analyze these regions. The unit hydrograph input parameters are summarized below and the supporting data is included in Appendix B:

- Rainfall Pattern: The 24-hour, 5-minute rainfall pattern given in Appendix D of the *Drainage Manual* was used. The 25- and 100-year, 24-hour precipitation values were determined using the TDS equation and are 6.15 and 7.63 inches, respectively.

- Drainage area: The proposed condition (i.e., post-reclamation) drainage basin was delineated from either the base topography prepared for the site (flown in 2007 and 2008 with field adjustments in 2009) or the proposed Reclamation Plan Amendment grading representing the ultimate (Phase 5) North Quarry and WMSA configurations. The existing (i.e., pre-project) condition drainage basin was set equal to the proposed condition to allow a comparison of the results. The Unit Hydrograph Work Maps in the map pocket at the back of this report contain the existing topography, proposed grading, basin boundary, flow path, centroid, and basin area.

- Hydrologic soil groups: The hydrologic soil group was determined from "Figure 1, Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin" in SCVURPPP's May 2004, *C.3. Stormwater Handbook.* The soil type at the site is entirely within group B.

- Curve Number: The existing and proposed site conditions within the project footprint contain negligible impervious surfaces. The curve number was based on the shrub land

category (CN = 43 for good cover, soil group B, and AMC II) since the reclaimed land forms will be revegetated with grasses, shrubs, and trees. The CN was adjusted to AMC II-1/2 (CN = 53) for the 25- and 100-year analyses. The initial abstraction was equal to 0.2(100/CN) – 10 = 1.77 inches.

- SCS Lag: The SCS lag was calculated using the formula in the *Drainage Manual.* The flow lengths, elevations, effective slope, and the centroid were obtained from the topographic mapping and/or Reclamation Plan Amendment design. The existing and proposed condition watershed roughnesses were assigned a value of 0.07 to represent a drainage basin with minimal urbanization. The duration of the unit hydrograph was calculated based on 1/4 the lag time. From this, the SCS was estimated to be 0.64 hours for existing conditions and 0.47 hours for proposed conditions.

The US Army Corps of Engineers' HEC-1 program was used for the unit hydrograph analyses. The results are included in Appendix B and summarized in Table 2. The results indicate that the post-project flow rates from the WMSA/North Quarry will increase slightly. However, the overall flow rate generated by all of the project regions (North Quarry, South Quarry, CMSA, WMSA, and Topsoil Storage Area) will be reduced. Although the overall flow rate is reduced, the post-project runoff into Permanente Creek will increase over existing conditions because much of the surface runoff from the WMSA and North Quarry footprint are currently stored in the bottom of the existing pit at the North Quarry. On the other hand, the post-project runoff will be closer to the historic, undisturbed site conditions.

		Pre-Project		**Post-Project**	
Region	**Area, ac**	**25-Year Flow, cfs**	**100-Year Flow, cfs**	**25-Year Flow, cfs**	**100-Year Flow, cfs**
WMSA/North Quarry	375.24	49	72	51	77

Table 2. Summary of Unit Hydrograph Method Results

HYDRAULIC ANALYSES

A series of drainage ditches (or swales) will be installed along the inside edge of the benches and perimeter roads of the project areas. The drawings propose a semi-circular ditch that is 3-feet wide and 1.5-feet deep along the benches and down drains, and a semi-circular ditch that is 4-feet wide and 2-feet deep along the perimeter road. The ditches along the steep perimeter roads, down drains, or exhibiting erosion following construction should be lined with grouted riprap or an equivalent material to prevent erosion. Normal depth analyses were performed to verify the ditch sizing and are included following this report text. The analyses were performed for both ditch sizes assuming a 1 percent longitudinal slope and roughness coefficient of 0.04. The results show that the bench ditches will have a capacity of 8.6 cfs and the road ditches will have a capacity of 18.5 cfs. A review of the rational method flow rates indicates that these can convey the 25-year flows. Furthermore, the benches and perimeter road are proposed with a cross-slope of 2 percent towards the ditches, which provides for additional flow conveyance capacity and freeboard.

DESILTATION BASIN ANALYSES

The primary water quality pollutant generated from the Reclamation Plan Amendment areas will be sediment since the site will be used for extraction or to store overburden material. The final slopes, benches, and pads will be planted with grasses, shrubs, and trees to prevent erosion. In the interim period before the vegetation has established, best management practices including temporary desiltation basins will be installed. The temporary desiltation basins will be constructed at several locations along the perimeter of the South Quarry and Topsoil Storage Area as shown on the work maps at the back of this report. Desiltation basins serving the CMSA will be constructed by the EMSA under separate permit. The desiltation basins will be maintained until the vegetation has established. The backfilled pit floor of the North Quarry and South Quarry will also be designed to capture sediment. Two methodologies have been considered for sizing the perimeter desiltation basins. First, SCVURPPP outlines volume-based treatment control sizing in their *C.3. Stormwater Handbook.* Second, the State Water Resources Control Board (SWRCB) *Water Quality Order 99-08-DWQ* provides sediment basin sizing criteria.

The SCVURPPP's preferred method for sizing volume-based treatment controls is to use the California Stormwater BMP Handbook approach, which is included in the *C.3. Stormwater Handbook.* An analysis using this approach is given in Appendix C for the drainage area tributary to each perimeter desiltation basin. A spreadsheet is included in Appendix C containing the results for each basin.

The SWRCB procedure is recommended for construction sites with exposed surfaces, which is appropriate for the project. Their procedure is based on the equation:

$A_S = 1.2Q / V_S$ where As is the minimum surface area for trapping soil particles of a certain size, sf
Q is the discharge, cfs
V_S is the settling velocity, fps

The SWRCB recommends that Q be based on the 10-year event. However, the 25-year event was used in order to meet the Surface Mining and Reclamation Act's 20-year event requirement for erosion control. A particle size distribution was provided by Golder Associates, Inc. that generally represents the waste rock that will be stored. The distribution is included in Appendix C and shows that nearly 93 percent of the material will be larger than 0.074 mm (No. 200 sieve size). Sediment smaller than the No. 200 sieve typically occur in suspension and are less prone to settling. The Regional Water Quality Control Board, San Francisco Bay Region's *Erosion and Sediment Control Field Manual* provides settling velocities for several particle sizes. The settling velocity for a particle size of 0.05 mm (0.0062 feet per second) was selected because this size is smaller than 0.074 mm. A spreadsheet was created for the SWRCB equation and is included in Appendix C.

The desiltation basins shall be constructed to exceed the volume from the SCVURPPP equation and the surface area from the SWRCB equation. The SWRCB recommends that the basin length

be twice the width, and the storage depth be between 3 to 5 feet. The desiltation basins shall also meet these criteria as applied to the calculated volume and surface area.

The outlet works for the desiltation basins were designed to pass the 100-year flow rates. The North Quarry basin has the greatest flow rate at 77 cfs. The outlet works for this shall consist of a 42-inch riser connected to a 42-inch pipe. Water that exits through the riser will initially behave as weir flow. As the water continues to rise above the riser it will behave as orifice flow. Both weir and orifice analyses were performed for the riser to account for either condition. The results indicate that the 100-year flow can pond up to 1.8 feet above the top of riser. A normal depth analysis was used to confirm that a 42-inch diameter pipe can convey the 100-year flow rate. The North Quarry weir, orifice, and normal depth analyses are included in Appendix C.

The outlet works for the remaining desiltation basins consist of a minimum 24-inch riser connected to an outflow pipe and an emergency spillway. Both weir and orifice analyses were performed for the riser to account for either condition. The analyses were based on the maximum proposed condition 100-year flow rate into a desiltation basin (12.7 cfs) and are included in Appendix C. The analyses show that the 100-year flow can pond up to 0.8 feet above the riser. Consequently, the emergency spillways shall be set 1-foot above the top of riser. A broad-crested weir analysis was used to size an emergency spillway that can convey the maximum 100-year flow rate. The analysis is included in Appendix C and shows that a weir with a 10-foot width can convey the flow at a 0.6 foot depth. Finally, a normal depth analysis was performed to verify the capacity of the 24-inch pipe that conveys flow from the riser out of a desiltation basin. The analysis shows that the pipe can convey the maximum 100-year flow rate with a normal depth of 1.1 feet. The riprap at the pipe outlet has been sized based on the outflow velocity.

CONCLUSION

Drainage analyses have been performed for the Central Materials Storage Area, West Materials Storage Area, North Quarry, South Quarry, and Topsoil Storage Area proposed at the Permanente Quarry. These regions will be used for extractive activities or to store overburden material and topsoil. The reclamation will ultimately include revegetation with native materials. There are minimal impervious areas proposed under the Reclamation Plan Amendment. As a result, the proposed reclamation will have a low runoff potential and will not impact the overall surface flow volumes. Temporary best management practices will be used at the site until the vegetation is established. The BMPs include desiltation basins, which have been sized based on the SCVURPPP and SWRCB guidelines. As a result, the site has been designed for both the required design and water quality flow rates, and meets SMARA's standards (*California Code of Regulations*, Title 14, Section 3706) for erosion and sediment control.

Worksheet for Ditch on Benches

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.01000	ft/ft
Constructed Depth	1.50	ft
Normal Depth	1.50	ft
Constructed Top Width	3.00	ft

Results

Discharge	8.59	ft^3/s
Flow Area	3.00	ft^2
Wetted Perimeter	4.44	ft
Hydraulic Radius	0.68	ft
Top Width	3.00	ft
Critical Depth	1.07	ft
Critical Slope	0.03929	ft/ft
Velocity	2.86	ft/s
Velocity Head	0.13	ft
Specific Energy	1.63	ft
Froude Number	0.50	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	1.07	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.03929	ft/ft

Worksheet for Ditch on Perimeter Road

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.01000	ft/ft
Constructed Depth	2.00	ft
Normal Depth	2.00	ft
Constructed Top Width	4.00	ft

Results

Discharge	18.49	ft^3/s
Flow Area	5.33	ft^2
Wetted Perimeter	5.92	ft
Hydraulic Radius	0.90	ft
Top Width	4.00	ft
Critical Depth	1.46	ft
Critical Slope	0.03569	ft/ft
Velocity	3.47	ft/s
Velocity Head	0.19	ft
Specific Energy	2.19	ft
Froude Number	0.53	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	1.46	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.03569	ft/ft

APPENDIX A

HYDROLOGIC INPUT DATA

AND ANALYSES

RATIONAL METHOD INPUT DATA

25-Year Return Period (CMSA)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	22	0.2898	3.478
10	0.287566	0.004930	22	0.3960	2.376
15	0.348021	0.005594	22	0.4711	1.884
30	0.443761	0.008719	22	0.6356	1.271
60	0.508791	0.016680	22	0.8758	0.876
120	0.612629	0.031025	22	1.2952	0.648
180	0.689252	0.044264	22	1.6631	0.554
360	0.693566	0.083195	22	2.5239	0.421

100-Year Return Period (CMSA)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.269993	0.003580	22	0.3488	4.185
10	0.315263	0.007312	22	0.4761	2.857
15	0.421360	0.006957	22	0.5744	2.298
30	0.553934	0.009857	22	0.7708	1.542
60	0.626608	0.019201	22	1.0490	1.049
120	0.732944	0.036193	22	1.5292	0.765
180	0.816471	0.051981	22	1.9601	0.653
360	0.776677	0.101053	22	2.9998	0.500

25-Year Return Period (Topsoil Area)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	24	0.2952	3.543
10	0.287566	0.004930	24	0.4059	2.435
15	0.348021	0.005594	24	0.4823	1.929
30	0.443761	0.008719	24	0.6530	1.306
60	0.508791	0.016680	24	0.9091	0.909
120	0.612629	0.031025	24	1.3572	0.679
180	0.689252	0.044264	24	1.7516	0.584
360	0.693566	0.083195	24	2.6902	0.448

100-Year Return Period (Topsoil Area)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.269993	0.003580	24	0.3559	4.271
10	0.315263	0.007312	24	0.4908	2.945
15	0.421360	0.006957	24	0.5883	2.353
30	0.553934	0.009857	24	0.7905	1.581
60	0.626608	0.019201	24	1.0874	1.087
120	0.732944	0.036193	24	1.6016	0.801
180	0.816471	0.051981	24	2.0640	0.688
360	0.776677	0.101053	24	3.2019	0.534

25-Year Return Period (South Quarry)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	26	0.3006	3.607
10	0.287566	0.004930	26	0.4157	2.494
15	0.348021	0.005594	26	0.4935	1.974
30	0.443761	0.008719	26	0.6705	1.341
60	0.508791	0.016680	26	0.9425	0.942
120	0.612629	0.031025	26	1.4193	0.710
180	0.689252	0.044264	26	1.8401	0.613
360	0.693566	0.083195	26	2.8566	0.476

100-Year Return Period (South Quarry)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.269993	0.003580	26	0.3631	4.357
10	0.315263	0.007312	26	0.5054	3.032
15	0.421360	0.006957	26	0.6022	2.409
30	0.553934	0.009857	26	0.8102	1.620
60	0.626608	0.019201	26	1.1258	1.126
120	0.732944	0.036193	26	1.6740	0.837
180	0.816471	0.051981	26	2.1680	0.723
360	0.776677	0.101053	26	3.4041	0.567

25-Year Return Period (WMSA/North Quarry)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	28	0.3060	3.672
10	0.287566	0.004930	28	0.4256	2.554
15	0.348021	0.005594	28	0.5047	2.019
30	0.443761	0.008719	28	0.6879	1.376
60	0.508791	0.016680	28	0.9758	0.976
120	0.612629	0.031025	28	1.4813	0.741
180	0.689252	0.044264	28	1.9286	0.643
360	0.693566	0.083195	28	3.0230	0.504
24-hour	0.675008	0.195496	28	6.1489	for UH calc

100-Year Return Period (WMSA/North Quarry)

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.269993	0.003580	28	0.3702	4.443
10	0.315263	0.007312	28	0.5200	3.120
15	0.421360	0.006957	28	0.6162	2.465
30	0.553934	0.009857	28	0.8299	1.660
60	0.626608	0.019201	28	1.1642	1.164
120	0.732944	0.036193	28	1.7463	0.873
180	0.816471	0.051981	28	2.2719	0.757
360	0.776677	0.101053	28	3.6062	0.601
24-hour	0.814046	0.243391	28	7.6290	for UH calc

KIRPICH EQUATION FOR INITIAL SUBAREAS

Existing Conditions

Central Materials Storage Area

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
10-11	1,355.0	1,050.0	919	0.33	12.3
15-16	920.0	780.0	203	0.69	10.5
20-21	1,073.7	890.0	581	0.32	11.6
30-31	1,477.4	1,340.0	833	0.16	12.8
40-41	754.0	694.0	442	0.14	11.8
50-51	970.0	865.0	561	0.19	11.9

South Quarry

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
100-101	1842.0	1600.0	790	0.31	12.1
200-201	1710.0	1390.0	956	0.33	12.3
205-206	1955.0	1580.0	913	0.41	12.1
210-211	1685.0	1250.0	647	0.67	11.3
215-216	1873.0	1490.0	872	0.44	12.0
220-221	1842.0	1520.0	875	0.37	12.1
225-226	1842.0	1440.0	974	0.41	12.2
230-231	1830.0	1500.0	800	0.41	11.9
235-236	1792.0	1460.0	735	0.45	11.7
240-241	1755.0	1450.0	617	0.49	11.4
245-246	1692.0	1270.0	967	0.44	12.1
250-251	1542.0	1410.0	781	0.17	12.6
255-256	1415.0	1330.0	300	0.28	11.0
260-261	1453.0	1340.0	508	0.22	11.7
265-266	1531.0	1340.0	660	0.29	11.9

Topsoil Area

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
100-101	1603.0	1330.0	892	0.31	12.3

Proposed Conditions

Central Materials Storage Area

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
10-11	1355.0	1050.0	919	0.33	12.3
20-21	1073.7	890.0	581	0.32	11.6
30-31	1012.0	880.0	634	0.21	12.1
40-41	754.0	694.0	442	0.14	11.8
100-101	1477.4	1340.0	833	0.16	12.8
110-111	1340.2	1160.0	769	0.23	12.3
200-201	1164.0	910.2	952	0.27	12.6
210-211	779.0	735.0	120	0.37	10.5
300-301	860.0	855.5	443	0.01	15.0
400-401	900.0	895.5	453	0.01	15.1
410-411	645.0	635.6	908	0.01	18.6
500-501	1020.0	910.0	823	0.13	13.0
600-601	840.0	769.0	499	0.14	12.0
700-701	710.0	690.0	641	0.03	14.3

South Quarry

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
100-101	2000.0	1898.0	306	0.33	11.0
110-111	1813.0	1768.8	100	0.44	10.4
200-201	1599.0	1550.0	123	0.40	10.5
210-211	1302.0	1251.0	70	0.73	10.2
300-301	1245.0	1180.0	661	0.10	12.8
400-401	1622.6	1610.1	748	0.02	16.2
410-411	1589.5	1580.0	475	0.02	14.0
420-421	1600.0	1550.0	109	0.46	10.4
500-501	1670.0	1656.4	570	0.02	14.4
600-601	1363.0	1300.0	942	0.07	14.3
700-701	1409.0	1350.0	691	0.09	13.1
800-801	1399.0	1370.0	136	0.21	10.6
810-811	1466.0	1310.0	711	0.22	12.2
820-821	1609.0	1320.0	572	0.51	11.3
830-831	1640.0	1278.0	752	0.48	11.7
840-841	1650.0	1340.0	649	0.48	11.5
850-851	1358.0	1240.0	257	0.46	10.8
860-861	1532.0	1415.0	289	0.40	10.9

Topsoil Area

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
100-101	1603.0	1330.0	892	0.31	12.3
200-201	1284.0	947.3	870	0.39	12.1

RATIONAL METHOD INPUT DATA

Existing Condition Runoff Coefficients (Soil Type B)

CMSA

Nodes	% Shrub Land	% Agriculture	C
12-13	65	35	0.12
13-14	10	90	0.15
21-22	60	40	0.12
22-23	40	60	0.13
23-24	70	30	0.13
31-32	50	50	0.12
40-41	100	--	0.10

Topsoil Area

Nodes	% Shrub Land	% Agriculture	C
102-103	90	10	0.11

Proposed Condition Runoff Coefficients (Soil Type B)

CMSA

Nodes	% Shrub Land	% Agriculture	C
101-102	65	35	0.12
201-202	80	20	0.11
All Others	100	--	0.10

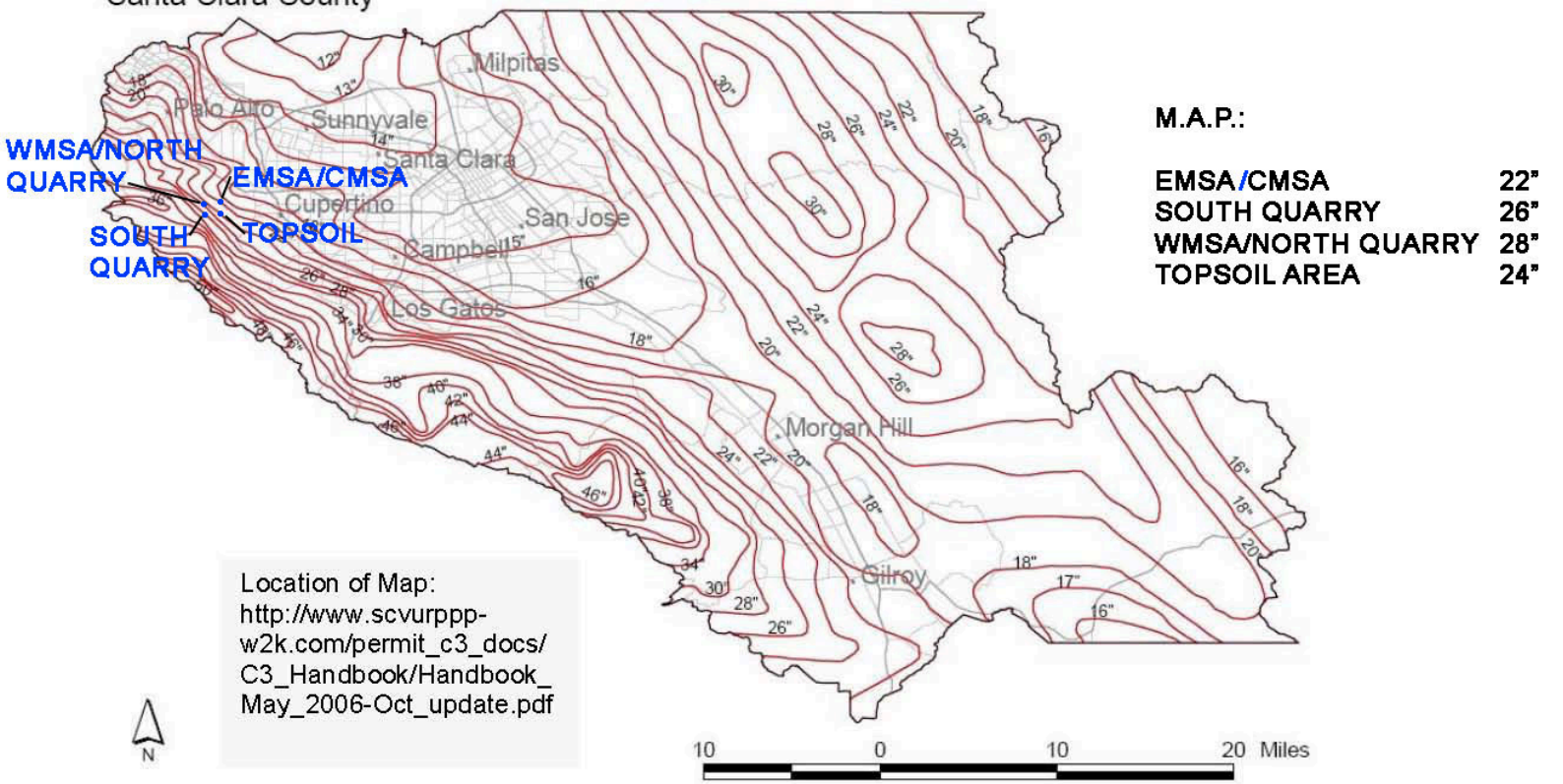
Topsoil Area

Nodes	% Shrub Land	% Agriculture	C
101-102	90	10	0.11

Table B-2: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

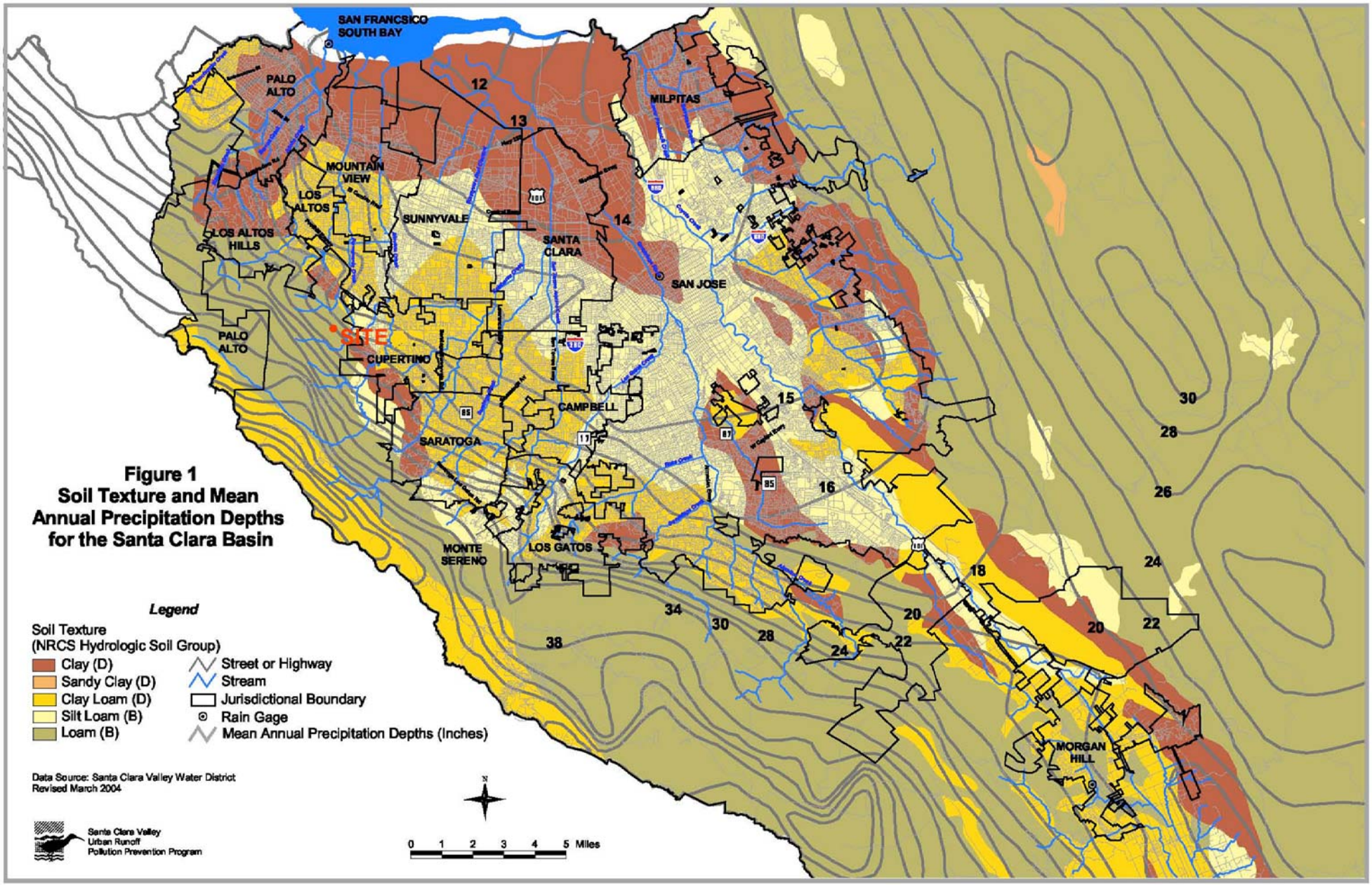
Return Period/Duration	$A_{T,D}$	$B_{T,D}$
25-YR RETURN PERIOD		
5-min	0.230641	0.002691
10-min	0.287566	0.004930
15-min	0.348021	0.005594
30-min	0.443761	0.008719
1-hr	0.508791	0.016680
2-hr	0.612629	0.031025
3-hr	0.689252	0.044264
6-hr	0.693566	0.083195
12-hr	0.725892	0.132326
24-hr	0.675008	0.195496
48-hr	0.989588	0.264703
72-hr	0.967854	0.316424
50-YR RETURN PERIOD		
5-min	0.249324	0.003241
10-min	0.300971	0.006161
15-min	0.384016	0.006315
30-min	0.496301	0.009417
1-hr	0.568345	0.017953
2-hr	0.672662	0.033694
3-hr	0.754661	0.048157
6-hr	0.740666	0.092105
12-hr	0.779967	0.147303
24-hr	0.747121	0.219673
48-hr	1.108358	0.295510
72-hr	1.075643	0.353143
100-YR RETURN PERIOD		
5-min	0.269993	0.003580
10-min	0.315263	0.007312
15-min	0.421360	0.006957
30-min	0.553934	0.009857
1-hr	0.626608	0.019201
2-hr	0.732944	0.036193
3-hr	0.816471	0.051981
6-hr	0.776677	0.101053
12-hr	0.821859	0.162184
24-hr	0.814046	0.243391
48-hr	1.210895	0.325943
72-hr	1.175000	0.389038

Figure A-2
Mean Annual Precipitation Map
Santa Clara County



SOURCE: Santa Clara Valley Water District, Mean Annual Precipitation Map, San Francisco & Monterey Bay Region, 1998

Figure A-2: Mean Annual Precipitation, Santa Clara County


SAN FRANCISCO SOUTH BAY
PALO ALTO
MOUNTAIN VIEW
LOS ALTOS
LOS ALTOS HILLS
SUNNYVALE
SANTA CLARA
MILPITAS
SAN JOSE
SITE
CUPERTINO
CAMPBELL
SARATOGA
LOS GATOS
MONTE SERENO
MORGAN HILL
12
13
14
15
16
18
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22
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34
38
Figure 1
Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin
Legend
Soil Texture
(NRCS Hydrologic Soil Group)
Clay (D)
Sandy Clay (D)
Clay Loam (D)
Silt Loam (B)
Loam (B)
Street or Highway
Stream
Jurisdictional Boundary
Rain Gage
Mean Annual Precipitation Depths (Inches)
Data Source: Santa Clara Valley Water District
Revised March 2004
Santa Clara Valley
Urban Runoff
Pollution Prevention Program
N
0 1 2 3 4 5 Miles

In Table 3-1 Soil Types B, C and D are based on the SCS classification of HSG. This designation is a standard designation used by the SCS and has been defined for Santa Clara County in existing SCS publications. D-type soils are less permeable than are C-type soils, which are, in turn, less permeable than B-type soils.

Table 3-1: Runoff Coefficients for Rational Formula

Land Use	C for Soil Type		
	B	C	D
Low Density Residential	0.30	0.40	0.45
Medium Density Residential	0.50	0.55	0.60
High Density Residential	0.70	0.70	0.75
Commercial	0.80	0.80	0.80
Industrial	0.70	0.75	0.75
Parks	0.20	0.30	0.35
Agricultural	0.15	0.35	0.40
Urban Open Space	0.10	0.35	0.45
Shrub Land	0.10	0.20	0.30
Paved / Impervious Surface	0.85	0.85	0.85

The Rational Method implies that this ratio is fixed for a given drainage basin. Studies have shown, however, that the coefficient may vary with respect to prior wetting and seasonal conditions (antecedent moisture). It has also been observed that as rainfall intensity increases, soil permeability decreases. One may sense that runoff coefficients should increase with rainfall intensity.

Applying such non-linearities over relatively small urbanized drainage basins does not necessarily improve hydrologic precision enough to offset the more difficult computations, so using a constant runoff coefficient is standard in Santa Clara County. For watersheds with significant variation in antecedent moisture conditions, soil types, or other complexities, however; the hydrograph method described in Chapter 4 should be employed regardless of basin size.

EXISTING CONDITION
(PRE-PROJECT)
ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

CMSA
Existing Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.478(In.)
2	10.000		2.376(In.)
3	15.000		1.884(In.)
4	30.000		1.271(In.)
5	60.000		0.876(In.)
6	120.000		0.648(In.)
7	180.000		0.554(In.)
8	360.000		0.421(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   919.000(Ft.)
Top (of initial area) elevation =  1355.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.33188  s(%)=      33.19
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.150(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.281(CFS)
Total initial stream area =        5.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Channel length thru subarea  =   587.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      2.645(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =      2.645(CFS)
Depth of flow =   0.092(Ft.), Average velocity =   2.814(Ft/s)
Channel flow top width =   10.369(Ft.)
Flow Velocity =    2.81(Ft/s)
Travel time  =    3.48 min.
Time of concentration =   15.78 min.
Critical depth =      0.129(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.852(In/Hr) for a    25.0 year storm
Subarea runoff =      2.351(CFS) for     12.690(Ac.)
Total runoff =      3.632(CFS)      Total area =      18.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Channel length thru subarea  =  1040.000(Ft.)
Channel base width      =   10.000(Ft.)
```

```
Slope or 'Z' of left channel bank =  10.000
Slope or 'Z' of right channel bank =  10.000
Estimated mean flow rate at midpoint of channel =      6.679(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      6.679(CFS)
Depth of flow =   0.163(Ft.), Average velocity =   3.515(Ft/s)
Channel flow top width =   13.267(Ft.)
Flow Velocity =    3.52(Ft/s)
Travel time  =    4.93 min.
Time of concentration =   20.71 min.
Critical depth =      0.223(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.651(In/Hr) for a    25.0 year storm
Subarea runoff =      6.200(CFS) for     31.300(Ac.)
Total runoff =      9.832(CFS)      Total area =      49.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   720.000(Ft.)
Channel length thru subarea  =   636.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     11.130(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     11.130(CFS)
Depth of flow =   0.164(Ft.), Average velocity =   6.552(Ft/s)
Channel flow top width =   10.658(Ft.)
Flow Velocity =    6.55(Ft/s)
Travel time  =    1.62 min.
Time of concentration =   22.33 min.
Critical depth =      0.328(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.585(In/Hr) for a    25.0 year storm
Subarea runoff =      3.135(CFS) for     13.190(Ac.)
Total runoff =     12.967(CFS)      Total area =      63.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     63.140(Ac.)
Runoff from this stream =     12.967(CFS)
Time of concentration =   22.33 min.
Rainfall intensity =     1.585(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   203.000(Ft.)
Top (of initial area) elevation =   920.000(Ft.)
Bottom (of initial area) elevation =   780.000(Ft.)
Difference in elevation =   140.000(Ft.)
Slope =    0.68966  s(%)=      68.97
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.327(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.814(CFS)
Total initial stream area =        3.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.500(Ac.)
Runoff from this stream =      0.814(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.327(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
      12.967       0.814
Area of streams before confluence:
       63.140        3.500
Results of confluence:
Total flow rate =     13.782(CFS)
Time of concentration =    22.325 min.
Effective stream area after confluence =     66.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     66.640(Ac.)
Runoff from this stream =     13.782(CFS)
Time of concentration =   22.33 min.
Rainfall intensity =     1.585(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
```

```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   581.000(Ft.)
Top (of initial area) elevation =  1074.000(Ft.)
Bottom (of initial area) elevation =   890.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.31670  s(%)=      31.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.600 min.
Rainfall intensity =      2.219(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.579(CFS)
Total initial stream area =        2.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   890.000(Ft.)
Downstream point elevation =   830.000(Ft.)
Channel length thru subarea  =  1040.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.501(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.501(CFS)
Depth of flow =   0.072(Ft.), Average velocity =   2.033(Ft/s)
Channel flow top width =   10.434(Ft.)
Flow Velocity =    2.03(Ft/s)
Travel time  =    8.53 min.
Time of concentration =   20.13 min.
Critical depth =      0.088(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.674(In/Hr) for a    25.0 year storm
Subarea runoff =      1.670(CFS) for      8.310(Ac.)
Total runoff =      2.249(CFS)      Total area =      10.920(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   830.000(Ft.)
Downstream point elevation =   700.000(Ft.)
Channel length thru subarea  =  1602.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.153(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
```

```
Flow(q) thru subarea =      3.153(CFS)
Depth of flow =   0.102(Ft.), Average velocity =   3.030(Ft/s)
Channel flow top width =   10.408(Ft.)
Flow Velocity =    3.03(Ft/s)
Travel time  =    8.81 min.
Time of concentration =   28.94 min.
Critical depth =      0.145(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.314(In/Hr) for a    25.0 year storm
Subarea runoff =      1.500(CFS) for      8.780(Ac.)
Total runoff =      3.749(CFS)      Total area =      19.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   700.000(Ft.)
Downstream point elevation =   556.000(Ft.)
Channel length thru subarea  =  1910.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      7.004(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      7.004(CFS)
Depth of flow =   0.168(Ft.), Average velocity =   4.034(Ft/s)
Channel flow top width =   10.672(Ft.)
Flow Velocity =    4.03(Ft/s)
Travel time  =    7.89 min.
Time of concentration =   36.83 min.
Critical depth =      0.244(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.181(In/Hr) for a    25.0 year storm
Subarea runoff =      4.848(CFS) for     34.210(Ac.)
Total runoff =      8.597(CFS)      Total area =      53.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     53.910(Ac.)
Runoff from this stream =      8.597(CFS)
Time of concentration =   36.83 min.
Rainfall intensity =     1.181(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
```

```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   833.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   137.400(Ft.)
Slope =    0.16495  s(%)=      16.49
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.100(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.376(CFS)
Total initial stream area =        1.790(Ac.)


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Process from Point/Station       31.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1152.000(Ft.)
Channel length thru subarea  =  1475.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      1.720(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.720(CFS)
Depth of flow =   0.068(Ft.), Average velocity =   1.896(Ft/s)
Channel flow top width =   16.776(Ft.)
Flow Velocity =    1.90(Ft/s)
Travel time  =   12.96 min.
Time of concentration =   25.76 min.
Critical depth =      0.084(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.444(In/Hr) for a    25.0 year storm
Subarea runoff =      2.218(CFS) for     12.800(Ac.)
Total runoff =      2.594(CFS)      Total area =      14.590(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     14.590(Ac.)
Runoff from this stream =      2.594(CFS)
Time of concentration =   25.76 min.
Rainfall intensity =     1.444(In/Hr)
Program is now starting with Main Stream No. 4
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   442.000(Ft.)
Top (of initial area) elevation =   754.000(Ft.)
Bottom (of initial area) elevation =   694.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.13575  s(%)=      13.57
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.800 min.
Rainfall intensity =      2.199(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.453(CFS)
Total initial stream area =        2.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      2.060(Ac.)
Runoff from this stream =      0.453(CFS)
Time of concentration =   11.80 min.
Rainfall intensity =     2.199(In/Hr)
Program is now starting with Main Stream No. 5


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =   970.000(Ft.)
Bottom (of initial area) elevation =   865.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.18717  s(%)=      18.72
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.189(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.162(CFS)
Total initial stream area =        0.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       52.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
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Upstream point elevation =   865.000(Ft.)
Downstream point elevation =   821.700(Ft.)
Channel length thru subarea  =   615.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.345(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.345(CFS)
Depth of flow =   0.032(Ft.), Average velocity =   0.917(Ft/s)
Channel flow top width =   13.235(Ft.)
Flow Velocity =    0.92(Ft/s)
Travel time  =   11.17 min.
Time of concentration =   23.07 min.
Critical depth =      0.031(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.554(In/Hr) for a    25.0 year storm
Subarea runoff =      0.260(CFS) for      1.670(Ac.)
Total runoff =      0.422(CFS)      Total area =       2.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       52.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =      2.410(Ac.)
Runoff from this stream =      0.422(CFS)
Time of concentration =   23.07 min.
Rainfall intensity =     1.554(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
      13.782       8.597       2.594       0.453       0.422
Area of streams before confluence:
       66.640       53.910       14.590        2.060        2.410


Results of confluence:
Total flow rate =     25.848(CFS)
Time of concentration =    22.325 min.
Effective stream area after confluence  =    139.610(Ac.)
End of computations, total study area =         139.610 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

CMSA
Existing Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.185(In.)
2	10.000		2.857(In.)
3	15.000		2.298(In.)
4	30.000		1.542(In.)
5	60.000		1.049(In.)
6	120.000		0.765(In.)
7	180.000		0.653(In.)
8	360.000		0.500(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   919.000(Ft.)
Top (of initial area) elevation =  1355.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.33188  s(%)=      33.19
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.600(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.550(CFS)
Total initial stream area =        5.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1050.000(Ft.)
Downstream point elevation =   920.000(Ft.)
Channel length thru subarea  =   587.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.199(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =      3.199(CFS)
Depth of flow =   0.103(Ft.), Average velocity =   3.031(Ft/s)
Channel flow top width =   10.414(Ft.)
Flow Velocity =    3.03(Ft/s)
Travel time  =    3.23 min.
Time of concentration =   15.53 min.
Critical depth =      0.146(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.271(In/Hr) for a   100.0 year storm
Subarea runoff =      2.882(CFS) for     12.690(Ac.)
Total runoff =      4.432(CFS)      Total area =      18.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   850.000(Ft.)
Channel length thru subarea  =  1040.000(Ft.)
Channel base width      =   10.000(Ft.)
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```
Slope or 'Z' of left channel bank =  10.000
Slope or 'Z' of right channel bank =  10.000
Estimated mean flow rate at midpoint of channel =      8.151(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      8.151(CFS)
Depth of flow =   0.183(Ft.), Average velocity =   3.762(Ft/s)
Channel flow top width =   13.663(Ft.)
Flow Velocity =    3.76(Ft/s)
Travel time  =    4.61 min.
Time of concentration =   20.14 min.
Critical depth =      0.250(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.039(In/Hr) for a   100.0 year storm
Subarea runoff =      7.659(CFS) for     31.300(Ac.)
Total runoff =     12.091(CFS)      Total area =      49.950(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   850.000(Ft.)
Downstream point elevation =   720.000(Ft.)
Channel length thru subarea  =   636.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     13.687(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     13.687(CFS)
Depth of flow =   0.186(Ft.), Average velocity =   7.091(Ft/s)
Channel flow top width =   10.744(Ft.)
Flow Velocity =    7.09(Ft/s)
Travel time  =    1.49 min.
Time of concentration =   21.63 min.
Critical depth =      0.379(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.964(In/Hr) for a   100.0 year storm
Subarea runoff =      3.885(CFS) for     13.190(Ac.)
Total runoff =     15.976(CFS)      Total area =      63.140(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     63.140(Ac.)
Runoff from this stream =     15.976(CFS)
Time of concentration =   21.63 min.
Rainfall intensity =     1.964(In/Hr)
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Process from Point/Station       15.000 to Point/Station       16.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   203.000(Ft.)
Top (of initial area) elevation =   920.000(Ft.)
Bottom (of initial area) elevation =   780.000(Ft.)
Difference in elevation =   140.000(Ft.)
Slope =    0.68966  s(%)=      68.97
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.801(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.980(CFS)
Total initial stream area =        3.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.500(Ac.)
Runoff from this stream =      0.980(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.801(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.976       0.980
Area of streams before confluence:
       63.140        3.500
Results of confluence:
Total flow rate =     16.957(CFS)
Time of concentration =    21.630 min.
Effective stream area after confluence =     66.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     66.640(Ac.)
Runoff from this stream =     16.957(CFS)
Time of concentration =   21.63 min.
Rainfall intensity =     1.964(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
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```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   581.000(Ft.)
Top (of initial area) elevation =  1074.000(Ft.)
Bottom (of initial area) elevation =   890.000(Ft.)
Difference in elevation =   184.000(Ft.)
Slope =    0.31670  s(%)=      31.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.600 min.
Rainfall intensity =      2.678(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.699(CFS)
Total initial stream area =        2.610(Ac.)


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Process from Point/Station       21.000 to Point/Station       22.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   890.000(Ft.)
Downstream point elevation =   830.000(Ft.)
Channel length thru subarea  =  1040.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.812(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.812(CFS)
Depth of flow =   0.081(Ft.), Average velocity =   2.187(Ft/s)
Channel flow top width =   10.485(Ft.)
Flow Velocity =    2.19(Ft/s)
Travel time  =    7.93 min.
Time of concentration =   19.53 min.
Critical depth =      0.100(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.070(In/Hr) for a   100.0 year storm
Subarea runoff =      2.064(CFS) for      8.310(Ac.)
Total runoff =      2.763(CFS)      Total area =      10.920(Ac.)


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Process from Point/Station       22.000 to Point/Station       23.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   830.000(Ft.)
Downstream point elevation =   700.000(Ft.)
Channel length thru subarea  =  1602.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.874(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
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Flow(q) thru subarea =      3.874(CFS)
Depth of flow =   0.115(Ft.), Average velocity =   3.283(Ft/s)
Channel flow top width =   10.461(Ft.)
Flow Velocity =    3.28(Ft/s)
Travel time  =    8.13 min.
Time of concentration =   27.66 min.
Critical depth =      0.166(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.660(In/Hr) for a   100.0 year storm
Subarea runoff =      1.895(CFS) for      8.780(Ac.)
Total runoff =      4.658(CFS)      Total area =      19.700(Ac.)


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Process from Point/Station       23.000 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   700.000(Ft.)
Downstream point elevation =   556.000(Ft.)
Channel length thru subarea  =  1910.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      8.702(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      8.702(CFS)
Depth of flow =   0.191(Ft.), Average velocity =   4.383(Ft/s)
Channel flow top width =   10.765(Ft.)
Flow Velocity =    4.38(Ft/s)
Travel time  =    7.26 min.
Time of concentration =   34.92 min.
Critical depth =      0.281(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.461(In/Hr) for a   100.0 year storm
Subarea runoff =      5.998(CFS) for     34.210(Ac.)
Total runoff =     10.656(CFS)      Total area =      53.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     53.910(Ac.)
Runoff from this stream =     10.656(CFS)
Time of concentration =   34.92 min.
Rainfall intensity =     1.461(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** INITIAL AREA EVALUATION ****
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```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   833.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   137.400(Ft.)
Slope =    0.16495  s(%)=      16.49
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.455(CFS)
Total initial stream area =        1.790(Ac.)


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Process from Point/Station       31.000 to Point/Station       32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1152.000(Ft.)
Channel length thru subarea  =  1475.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      2.084(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.084(CFS)
Depth of flow =   0.075(Ft.), Average velocity =   2.012(Ft/s)
Channel flow top width =   17.524(Ft.)
Flow Velocity =    2.01(Ft/s)
Travel time  =   12.22 min.
Time of concentration =   25.02 min.
Critical depth =      0.094(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.793(In/Hr) for a   100.0 year storm
Subarea runoff =      2.754(CFS) for     12.800(Ac.)
Total runoff =      3.210(CFS)      Total area =      14.590(Ac.)


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Process from Point/Station       31.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     14.590(Ac.)
Runoff from this stream =      3.210(CFS)
Time of concentration =   25.02 min.
Rainfall intensity =     1.793(In/Hr)
Program is now starting with Main Stream No. 4
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   442.000(Ft.)
Top (of initial area) elevation =   754.000(Ft.)
Bottom (of initial area) elevation =   694.000(Ft.)
Difference in elevation =    60.000(Ft.)
Slope =    0.13575  s(%)=      13.57
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.800 min.
Rainfall intensity =      2.656(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.547(CFS)
Total initial stream area =        2.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      2.060(Ac.)
Runoff from this stream =      0.547(CFS)
Time of concentration =   11.80 min.
Rainfall intensity =     2.656(In/Hr)
Program is now starting with Main Stream No. 5


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       51.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =   970.000(Ft.)
Bottom (of initial area) elevation =   865.000(Ft.)
Difference in elevation =   105.000(Ft.)
Slope =    0.18717  s(%)=      18.72
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.645(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.196(CFS)
Total initial stream area =        0.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       52.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
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```
Upstream point elevation =   865.000(Ft.)
Downstream point elevation =   821.700(Ft.)
Channel length thru subarea  =   615.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.417(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.417(CFS)
Depth of flow =   0.036(Ft.), Average velocity =   0.979(Ft/s)
Channel flow top width =   13.606(Ft.)
Flow Velocity =    0.98(Ft/s)
Travel time  =   10.47 min.
Time of concentration =   22.37 min.
Critical depth =      0.036(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.926(In/Hr) for a   100.0 year storm
Subarea runoff =      0.322(CFS) for      1.670(Ac.)
Total runoff =      0.517(CFS)      Total area =       2.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       52.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =      2.410(Ac.)
Runoff from this stream =      0.517(CFS)
Time of concentration =   22.37 min.
Rainfall intensity =     1.926(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
      16.957      10.656       3.210       0.547       0.517
Area of streams before confluence:
       66.640       53.910       14.590        2.060        2.410


Results of confluence:
Total flow rate =     31.887(CFS)
Time of concentration =    21.630 min.
Effective stream area after confluence  =    139.610(Ac.)
End of computations, total study area =         139.610 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

South Quarry
Existing Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.607(In.)
2	10.000		2.494(In.)
3	15.000		1.974(In.)
4	30.000		1.341(In.)
5	60.000		0.942(In.)
6	120.000		0.710(In.)
7	180.000		0.613(In.)
8	360.000		0.476(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   956.000(Ft.)
Top (of initial area) elevation =  1710.000(Ft.)
Bottom (of initial area) elevation =  1390.000(Ft.)
Difference in elevation =   320.000(Ft.)
Slope =    0.33473  s(%)=      33.47
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.255(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.435(CFS)
Total initial stream area =       10.800(Ac.)


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Process from Point/Station      200.000 to Point/Station      201.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.800(Ac.)
Runoff from this stream =      2.435(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     2.255(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   913.000(Ft.)
Top (of initial area) elevation =  1955.000(Ft.)
Bottom (of initial area) elevation =  1580.000(Ft.)
Difference in elevation =   375.000(Ft.)
Slope =    0.41073  s(%)=      41.07
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.276(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.535(CFS)
Total initial stream area =       11.140(Ac.)


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Process from Point/Station      206.000 to Point/Station      207.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
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Upstream point elevation =  1580.000(Ft.)
Downstream point elevation =  1260.000(Ft.)
Channel length thru subarea  =  1124.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      5.332(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      5.332(CFS)
Depth of flow =   0.261(Ft.), Average velocity =   5.793(Ft/s)
Channel flow top width =    4.045(Ft.)
Flow Velocity =    5.79(Ft/s)
Travel time  =    3.23 min.
Time of concentration =   15.33 min.
Critical depth =      0.418(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.960(In/Hr) for a    25.0 year storm
Subarea runoff =      4.817(CFS) for     24.580(Ac.)
Total runoff =      7.352(CFS)      Total area =      35.720(Ac.)


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Process from Point/Station      206.000 to Point/Station      207.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     35.720(Ac.)
Runoff from this stream =      7.352(CFS)
Time of concentration =   15.33 min.
Rainfall intensity =     1.960(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   647.000(Ft.)
Top (of initial area) elevation =  1685.000(Ft.)
Bottom (of initial area) elevation =  1250.000(Ft.)
Difference in elevation =   435.000(Ft.)
Slope =    0.67233  s(%)=      67.23
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.300 min.
Rainfall intensity =      2.359(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.873(CFS)
Total initial stream area =        7.940(Ac.)


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Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
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Along Main Stream number: 1 in normal stream number 3
Stream flow area =      7.940(Ac.)
Runoff from this stream =      1.873(CFS)
Time of concentration =   11.30 min.
Rainfall intensity =     2.359(In/Hr)


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Process from Point/Station      215.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   872.000(Ft.)
Top (of initial area) elevation =  1873.000(Ft.)
Bottom (of initial area) elevation =  1490.000(Ft.)
Difference in elevation =   383.000(Ft.)
Slope =    0.43922  s(%)=      43.92
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.000 min.
Rainfall intensity =      2.286(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.073(CFS)
Total initial stream area =        9.070(Ac.)


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Process from Point/Station      216.000 to Point/Station      217.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1490.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Channel length thru subarea  =   770.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.218(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      4.218(CFS)
Depth of flow =   0.195(Ft.), Average velocity =   6.032(Ft/s)
Channel flow top width =    4.170(Ft.)
Flow Velocity =    6.03(Ft/s)
Travel time  =    2.13 min.
Time of concentration =   14.13 min.
Critical depth =      0.348(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.065(In/Hr) for a    25.0 year storm
Subarea runoff =      3.873(CFS) for     18.760(Ac.)
Total runoff =      5.947(CFS)      Total area =      27.830(Ac.)


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Process from Point/Station      216.000 to Point/Station      217.000
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**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     27.830(Ac.)
Runoff from this stream =      5.947(CFS)
Time of concentration =   14.13 min.
Rainfall intensity =     2.065(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   875.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1520.000(Ft.)
Difference in elevation =   322.000(Ft.)
Slope =    0.36800  s(%)=      36.80
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.276(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.222(CFS)
Total initial stream area =        5.370(Ac.)


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Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
--------------------------------------------------------------------------------
Upstream point elevation =  1520.000(Ft.)
Downstream point elevation =  1100.000(Ft.)
Channel length thru subarea  =   921.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      2.124(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.124(CFS)
Depth of flow =   0.113(Ft.), Average velocity =   5.289(Ft/s)
Channel flow top width =    4.127(Ft.)
Flow Velocity =    5.29(Ft/s)
Travel time  =    2.90 min.
Time of concentration =   15.00 min.
Critical depth =      0.219(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.974(In/Hr) for a    25.0 year storm
Subarea runoff =      1.565(CFS) for      7.930(Ac.)
Total runoff =      2.787(CFS)      Total area =      13.300(Ac.)


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Process from Point/Station      221.000 to Point/Station      222.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     13.300(Ac.)
Runoff from this stream =      2.787(CFS)
Time of concentration =   15.00 min.
Rainfall intensity =     1.974(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       2.435       7.352       1.873       5.947       2.787
Area of streams before confluence:
       10.800       35.720        7.940       27.830       13.300
Results of confluence:
Total flow rate =     20.395(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence =     95.590(Ac.)


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Process from Point/Station      200.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     95.590(Ac.)
Runoff from this stream =     20.395(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     2.255(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   974.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =   402.000(Ft.)
Slope =    0.41273  s(%)=      41.27
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.200 min.
Rainfall intensity =      2.265(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.461(CFS)
Total initial stream area =        6.450(Ac.)


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Process from Point/Station      226.000 to Point/Station      227.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1160.000(Ft.)
Channel length thru subarea  =   653.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      3.258(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.258(CFS)
Depth of flow =   0.127(Ft.), Average velocity =   4.562(Ft/s)
Channel flow top width =    6.268(Ft.)
Flow Velocity =    4.56(Ft/s)
Travel time  =    2.39 min.
Time of concentration =   14.59 min.
Critical depth =      0.219(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.017(In/Hr) for a    25.0 year storm
Subarea runoff =      3.201(CFS) for     15.870(Ac.)
Total runoff =      4.662(CFS)      Total area =      22.320(Ac.)


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Process from Point/Station      226.000 to Point/Station      227.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     22.320(Ac.)
Runoff from this stream =      4.662(CFS)
Time of concentration =   14.59 min.
Rainfall intensity =     2.017(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      231.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1830.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =   330.000(Ft.)
Slope =    0.41250  s(%)=      41.25
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.296(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.544(CFS)
Total initial stream area =       11.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =  1500.000(Ft.)
Downstream point elevation =  1230.000(Ft.)
Channel length thru subarea  =   813.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      4.239(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      4.239(CFS)
Depth of flow =   0.159(Ft.), Average velocity =   4.600(Ft/s)
Channel flow top width =    6.590(Ft.)
Flow Velocity =    4.60(Ft/s)
Travel time  =    2.95 min.
Time of concentration =   14.85 min.
Critical depth =      0.258(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.990(In/Hr) for a    25.0 year storm
Subarea runoff =      2.937(CFS) for     14.760(Ac.)
Total runoff =      5.482(CFS)      Total area =      25.840(Ac.)


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Process from Point/Station      231.000 to Point/Station      232.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     25.840(Ac.)
Runoff from this stream =      5.482(CFS)
Time of concentration =   14.85 min.
Rainfall intensity =     1.990(In/Hr)


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Process from Point/Station      235.000 to Point/Station      236.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   735.000(Ft.)
Top (of initial area) elevation =  1792.000(Ft.)
Bottom (of initial area) elevation =  1460.000(Ft.)
Difference in elevation =   332.000(Ft.)
Slope =    0.45170  s(%)=      45.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.317(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.860(CFS)
Total initial stream area =        3.710(Ac.)


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Process from Point/Station      236.000 to Point/Station      237.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1220.000(Ft.)
Channel length thru subarea  =   670.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.399(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.399(CFS)
Depth of flow =   0.151(Ft.), Average velocity =   4.606(Ft/s)
Channel flow top width =    3.905(Ft.)
Flow Velocity =    4.61(Ft/s)
Travel time  =    2.42 min.
Time of concentration =   14.12 min.
Critical depth =      0.248(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.065(In/Hr) for a    25.0 year storm
Subarea runoff =      2.744(CFS) for     13.290(Ac.)
Total runoff =      3.604(CFS)      Total area =      17.000(Ac.)


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Process from Point/Station      236.000 to Point/Station      237.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 3
Stream flow area =     17.000(Ac.)
Runoff from this stream =      3.604(CFS)
Time of concentration =   14.12 min.
Rainfall intensity =     2.065(In/Hr)


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Process from Point/Station      240.000 to Point/Station      241.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   617.000(Ft.)
Top (of initial area) elevation =  1755.000(Ft.)
Bottom (of initial area) elevation =  1450.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.49433  s(%)=      49.43
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.400 min.
Rainfall intensity =      2.348(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.686(CFS)
Total initial stream area =        2.920(Ac.)


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Process from Point/Station      241.000 to Point/Station      242.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   546.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      1.526(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.526(CFS)
Depth of flow =   0.084(Ft.), Average velocity =   3.356(Ft/s)
Channel flow top width =    5.839(Ft.)
Flow Velocity =    3.36(Ft/s)
Travel time  =    2.71 min.
Time of concentration =   14.11 min.
Critical depth =      0.137(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.066(In/Hr) for a    25.0 year storm
Subarea runoff =      1.480(CFS) for      7.160(Ac.)
Total runoff =      2.165(CFS)      Total area =      10.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      242.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 4
Stream flow area =     10.080(Ac.)
Runoff from this stream =      2.165(CFS)
Time of concentration =   14.11 min.
Rainfall intensity =     2.066(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   967.000(Ft.)
Top (of initial area) elevation =  1692.000(Ft.)
Bottom (of initial area) elevation =  1270.000(Ft.)
Difference in elevation =   422.000(Ft.)
Slope =    0.43640  s(%)=      43.64
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.276(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.415(CFS)
Total initial stream area =        6.220(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 5
Stream flow area =      6.220(Ac.)
Runoff from this stream =      1.415(CFS)
Time of concentration =   12.10 min.
Rainfall intensity =     2.276(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       4.662       5.482       3.604       2.165       1.415
Area of streams before confluence:
       22.320       25.840       17.000       10.080        6.220
Results of confluence:
Total flow rate =     17.329(CFS)
Time of concentration =    14.586 min.
Effective stream area after confluence =     81.460(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      246.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     81.460(Ac.)
Runoff from this stream =     17.329(CFS)
Time of concentration =   14.59 min.
Rainfall intensity =     2.017(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      251.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   781.000(Ft.)
Top (of initial area) elevation =  1542.000(Ft.)
Bottom (of initial area) elevation =  1410.000(Ft.)
Difference in elevation =   132.000(Ft.)
Slope =    0.16901  s(%)=      16.90
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.224(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.379(CFS)
Total initial stream area =        6.200(Ac.)


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Process from Point/Station      251.000 to Point/Station      252.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =  1410.000(Ft.)
Downstream point elevation =  1270.000(Ft.)
Channel length thru subarea  =   484.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.198(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.198(CFS)
Depth of flow =   0.153(Ft.), Average velocity =   4.166(Ft/s)
Channel flow top width =    3.916(Ft.)
Flow Velocity =    4.17(Ft/s)
Travel time  =    1.94 min.
Time of concentration =   14.54 min.
Critical depth =      0.234(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.022(In/Hr) for a    25.0 year storm
Subarea runoff =      1.490(CFS) for      7.370(Ac.)
Total runoff =      2.869(CFS)      Total area =      13.570(Ac.)


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Process from Point/Station      251.000 to Point/Station      252.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =     13.570(Ac.)
Runoff from this stream =      2.869(CFS)
Time of concentration =   14.54 min.
Rainfall intensity =     2.022(In/Hr)


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Process from Point/Station      255.000 to Point/Station      256.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1415.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =    85.000(Ft.)
Slope =    0.28333  s(%)=      28.33
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.000 min.
Rainfall intensity =      2.390(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.349(CFS)
Total initial stream area =        1.460(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      255.000 to Point/Station      256.000
```

```
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      1.460(Ac.)
Runoff from this stream =      0.349(CFS)
Time of concentration =   11.00 min.
Rainfall intensity =     2.390(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   508.000(Ft.)
Top (of initial area) elevation =  1453.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   113.000(Ft.)
Slope =    0.22244  s(%)=      22.24
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.317(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.429(CFS)
Total initial stream area =        1.850(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 3
Stream flow area =      1.850(Ac.)
Runoff from this stream =      0.429(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.317(In/Hr)


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Process from Point/Station      265.000 to Point/Station      266.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   660.000(Ft.)
Top (of initial area) elevation =  1531.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   191.000(Ft.)
Slope =    0.28939  s(%)=      28.94
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.296(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.928(CFS)
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Total initial stream area =        4.040(Ac.)


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Process from Point/Station      265.000 to Point/Station      266.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 4
Stream flow area =      4.040(Ac.)
Runoff from this stream =      0.928(CFS)
Time of concentration =   11.90 min.
Rainfall intensity =     2.296(In/Hr)

Total of 4 streams to confluence:
Flow rates before confluence point:
       2.869       0.349       0.429       0.928
Area of streams before confluence:
       13.570        1.460        1.850        4.040
Results of confluence:
Total flow rate =      4.574(CFS)
Time of concentration =    14.536 min.
Effective stream area after confluence =     20.920(Ac.)


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Process from Point/Station      250.000 to Point/Station      266.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     20.920(Ac.)
Runoff from this stream =      4.574(CFS)
Time of concentration =   14.54 min.
Rainfall intensity =     2.022(In/Hr)

Total of 3 main streams to confluence:
Flow rates before confluence point:
      20.395      17.329       4.574
Area of streams before confluence:
       95.590       81.460       20.920


Results of confluence:
Total flow rate =     42.298(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence  =    197.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      266.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    197.970(Ac.)
Runoff from this stream =     42.298(CFS)
Time of concentration =   12.30 min.
```

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Rainfall intensity =     2.255(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   790.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1600.000(Ft.)
Difference in elevation =   242.000(Ft.)
Slope =    0.30633  s(%)=      30.63
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.276(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      9.646(CFS)
Total initial stream area =       42.390(Ac.)


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Process from Point/Station      100.000 to Point/Station      101.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     42.390(Ac.)
Runoff from this stream =      9.646(CFS)
Time of concentration =   12.10 min.
Rainfall intensity =     2.276(In/Hr)

Total of 2 main streams to confluence:
Flow rates before confluence point:
      42.298       9.646
Area of streams before confluence:
      197.970       42.390


Results of confluence:
Total flow rate =     51.944(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence  =    240.360(Ac.)
End of computations, total study area =         240.360 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

South Quarry
Existing Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.357(In.)
2	10.000		3.032(In.)
3	15.000		2.409(In.)
4	30.000		1.620(In.)
5	60.000		1.126(In.)
6	120.000		0.837(In.)
7	180.000		0.723(In.)
8	360.000		0.567(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
```

```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   956.000(Ft.)
Top (of initial area) elevation =  1710.000(Ft.)
Bottom (of initial area) elevation =  1390.000(Ft.)
Difference in elevation =   320.000(Ft.)
Slope =    0.33473  s(%)=      33.47
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.745(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.965(CFS)
Total initial stream area =       10.800(Ac.)


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Process from Point/Station      200.000 to Point/Station      201.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.800(Ac.)
Runoff from this stream =      2.965(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     2.745(In/Hr)


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Process from Point/Station      205.000 to Point/Station      206.000
**** INITIAL AREA EVALUATION ****
```

```
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   913.000(Ft.)
Top (of initial area) elevation =  1955.000(Ft.)
Bottom (of initial area) elevation =  1580.000(Ft.)
Difference in elevation =   375.000(Ft.)
Slope =    0.41073  s(%)=      41.07
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.770(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      3.086(CFS)
Total initial stream area =       11.140(Ac.)


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Process from Point/Station      206.000 to Point/Station      207.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =  1580.000(Ft.)
Downstream point elevation =  1260.000(Ft.)
Channel length thru subarea  =  1124.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      6.491(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      6.491(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   6.185(Ft/s)
Channel flow top width =    4.171(Ft.)
Flow Velocity =    6.18(Ft/s)
Travel time  =    3.03 min.
Time of concentration =   15.13 min.
Critical depth =      0.469(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.402(In/Hr) for a   100.0 year storm
Subarea runoff =      5.905(CFS) for     24.580(Ac.)
Total runoff =      8.991(CFS)      Total area =      35.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     35.720(Ac.)
Runoff from this stream =      8.991(CFS)
Time of concentration =   15.13 min.
Rainfall intensity =     2.402(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   647.000(Ft.)
Top (of initial area) elevation =  1685.000(Ft.)
Bottom (of initial area) elevation =  1250.000(Ft.)
Difference in elevation =   435.000(Ft.)
Slope =    0.67233  s(%)=      67.23
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.300 min.
Rainfall intensity =      2.870(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.279(CFS)
Total initial stream area =        7.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      7.940(Ac.)
Runoff from this stream =      2.279(CFS)
Time of concentration =   11.30 min.
Rainfall intensity =     2.870(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   872.000(Ft.)
Top (of initial area) elevation =  1873.000(Ft.)
Bottom (of initial area) elevation =  1490.000(Ft.)
Difference in elevation =   383.000(Ft.)
Slope =    0.43922  s(%)=      43.92
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.000 min.
Rainfall intensity =      2.783(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.524(CFS)
Total initial stream area =        9.070(Ac.)


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Process from Point/Station      216.000 to Point/Station      217.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1490.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Channel length thru subarea  =   770.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.134(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      5.134(CFS)
Depth of flow =   0.218(Ft.), Average velocity =   6.437(Ft/s)
Channel flow top width =    4.309(Ft.)
Flow Velocity =    6.44(Ft/s)
Travel time  =    1.99 min.
Time of concentration =   13.99 min.
Critical depth =      0.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.534(In/Hr) for a   100.0 year storm
Subarea runoff =      4.755(CFS) for     18.760(Ac.)
Total runoff =      7.279(CFS)      Total area =      27.830(Ac.)


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Process from Point/Station      216.000 to Point/Station      217.000
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```
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     27.830(Ac.)
Runoff from this stream =      7.279(CFS)
Time of concentration =   13.99 min.
Rainfall intensity =     2.534(In/Hr)


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Process from Point/Station      220.000 to Point/Station      221.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   875.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1520.000(Ft.)
Difference in elevation =   322.000(Ft.)
Slope =    0.36800  s(%)=      36.80
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.770(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.488(CFS)
Total initial stream area =        5.370(Ac.)


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Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1520.000(Ft.)
Downstream point elevation =  1100.000(Ft.)
Channel length thru subarea  =   921.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      2.586(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.586(CFS)
Depth of flow =   0.126(Ft.), Average velocity =   5.648(Ft/s)
Channel flow top width =    4.261(Ft.)
Flow Velocity =    5.65(Ft/s)
Travel time  =    2.72 min.
Time of concentration =   14.82 min.
Critical depth =      0.246(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.432(In/Hr) for a   100.0 year storm
Subarea runoff =      1.928(CFS) for      7.930(Ac.)
Total runoff =      3.416(CFS)      Total area =      13.300(Ac.)


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Process from Point/Station      221.000 to Point/Station      222.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     13.300(Ac.)
Runoff from this stream =      3.416(CFS)
Time of concentration =   14.82 min.
Rainfall intensity =     2.432(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       2.965       8.991       2.279       7.279       3.416
Area of streams before confluence:
       10.800       35.720        7.940       27.830       13.300
Results of confluence:
Total flow rate =     24.929(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence =     95.590(Ac.)


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Process from Point/Station      200.000 to Point/Station      222.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     95.590(Ac.)
Runoff from this stream =     24.929(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     2.745(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      226.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   974.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =   402.000(Ft.)
Slope =    0.41273  s(%)=      41.27
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.200 min.
Rainfall intensity =      2.758(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.779(CFS)
Total initial stream area =        6.450(Ac.)


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Process from Point/Station      226.000 to Point/Station      227.000
**** IMPROVED CHANNEL TRAVEL TIME ****
--------------------------------------------------------------------------------
```

```
Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1160.000(Ft.)
Channel length thru subarea  =   653.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      3.967(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.967(CFS)
Depth of flow =   0.142(Ft.), Average velocity =   4.887(Ft/s)
Channel flow top width =    6.421(Ft.)
Flow Velocity =    4.89(Ft/s)
Travel time  =    2.23 min.
Time of concentration =   14.43 min.
Critical depth =      0.246(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.480(In/Hr) for a   100.0 year storm
Subarea runoff =      3.936(CFS) for     15.870(Ac.)
Total runoff =      5.715(CFS)      Total area =      22.320(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      227.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     22.320(Ac.)
Runoff from this stream =      5.715(CFS)
Time of concentration =   14.43 min.
Rainfall intensity =     2.480(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      231.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1830.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =   330.000(Ft.)
Slope =    0.41250  s(%)=      41.25
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.795(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      3.097(CFS)
Total initial stream area =       11.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =  1500.000(Ft.)
Downstream point elevation =  1230.000(Ft.)
Channel length thru subarea  =   813.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      5.160(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      5.160(CFS)
Depth of flow =   0.178(Ft.), Average velocity =   4.919(Ft/s)
Channel flow top width =    6.781(Ft.)
Flow Velocity =    4.92(Ft/s)
Travel time  =    2.75 min.
Time of concentration =   14.65 min.
Critical depth =      0.289(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.452(In/Hr) for a   100.0 year storm
Subarea runoff =      3.619(CFS) for     14.760(Ac.)
Total runoff =      6.716(CFS)      Total area =      25.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     25.840(Ac.)
Runoff from this stream =      6.716(CFS)
Time of concentration =   14.65 min.
Rainfall intensity =     2.452(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      236.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   735.000(Ft.)
Top (of initial area) elevation =  1792.000(Ft.)
Bottom (of initial area) elevation =  1460.000(Ft.)
Difference in elevation =   332.000(Ft.)
Slope =    0.45170  s(%)=      45.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.820(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.046(CFS)
Total initial stream area =        3.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      236.000 to Point/Station      237.000
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**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1220.000(Ft.)
Channel length thru subarea  =   670.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.920(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.920(CFS)
Depth of flow =   0.169(Ft.), Average velocity =   4.925(Ft/s)
Channel flow top width =    4.014(Ft.)
Flow Velocity =    4.93(Ft/s)
Travel time  =    2.27 min.
Time of concentration =   13.97 min.
Critical depth =      0.281(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.538(In/Hr) for a   100.0 year storm
Subarea runoff =      3.373(CFS) for     13.290(Ac.)
Total runoff =      4.419(CFS)      Total area =      17.000(Ac.)


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Process from Point/Station      236.000 to Point/Station      237.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 3
Stream flow area =     17.000(Ac.)
Runoff from this stream =      4.419(CFS)
Time of concentration =   13.97 min.
Rainfall intensity =     2.538(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      241.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   617.000(Ft.)
Top (of initial area) elevation =  1755.000(Ft.)
Bottom (of initial area) elevation =  1450.000(Ft.)
Difference in elevation =   305.000(Ft.)
Slope =    0.49433  s(%)=      49.43
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.400 min.
Rainfall intensity =      2.858(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.834(CFS)
Total initial stream area =        2.920(Ac.)


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Process from Point/Station      241.000 to Point/Station      242.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   546.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      1.857(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.857(CFS)
Depth of flow =   0.094(Ft.), Average velocity =   3.604(Ft/s)
Channel flow top width =    5.942(Ft.)
Flow Velocity =    3.60(Ft/s)
Travel time  =    2.52 min.
Time of concentration =   13.92 min.
Critical depth =      0.154(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.543(In/Hr) for a   100.0 year storm
Subarea runoff =      1.821(CFS) for      7.160(Ac.)
Total runoff =      2.655(CFS)      Total area =      10.080(Ac.)


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Process from Point/Station      241.000 to Point/Station      242.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 4
Stream flow area =     10.080(Ac.)
Runoff from this stream =      2.655(CFS)
Time of concentration =   13.92 min.
Rainfall intensity =     2.543(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      246.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   967.000(Ft.)
Top (of initial area) elevation =  1692.000(Ft.)
Bottom (of initial area) elevation =  1270.000(Ft.)
Difference in elevation =   422.000(Ft.)
Slope =    0.43640  s(%)=      43.64
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.770(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.723(CFS)
Total initial stream area =        6.220(Ac.)
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Process from Point/Station      245.000 to Point/Station      246.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 5
Stream flow area =      6.220(Ac.)
Runoff from this stream =      1.723(CFS)
Time of concentration =   12.10 min.
Rainfall intensity =     2.770(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       5.715       6.716       4.419       2.655       1.723
Area of streams before confluence:
       22.320       25.840       17.000       10.080        6.220
Results of confluence:
Total flow rate =     21.229(CFS)
Time of concentration =    14.427 min.
Effective stream area after confluence =     81.460(Ac.)


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Process from Point/Station      225.000 to Point/Station      246.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     81.460(Ac.)
Runoff from this stream =     21.229(CFS)
Time of concentration =   14.43 min.
Rainfall intensity =     2.480(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      251.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   781.000(Ft.)
Top (of initial area) elevation =  1542.000(Ft.)
Bottom (of initial area) elevation =  1410.000(Ft.)
Difference in elevation =   132.000(Ft.)
Slope =    0.16901  s(%)=      16.90
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.708(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.679(CFS)
Total initial stream area =        6.200(Ac.)


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Process from Point/Station      251.000 to Point/Station      252.000
**** IMPROVED CHANNEL TRAVEL TIME ****
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```
Upstream point elevation =  1410.000(Ft.)
Downstream point elevation =  1270.000(Ft.)
Channel length thru subarea  =   484.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.677(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.677(CFS)
Depth of flow =   0.171(Ft.), Average velocity =   4.456(Ft/s)
Channel flow top width =    4.026(Ft.)
Flow Velocity =    4.46(Ft/s)
Travel time  =    1.81 min.
Time of concentration =   14.41 min.
Critical depth =      0.266(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.482(In/Hr) for a   100.0 year storm
Subarea runoff =      1.830(CFS) for      7.370(Ac.)
Total runoff =      3.509(CFS)      Total area =      13.570(Ac.)


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Process from Point/Station      251.000 to Point/Station      252.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =     13.570(Ac.)
Runoff from this stream =      3.509(CFS)
Time of concentration =   14.41 min.
Rainfall intensity =     2.482(In/Hr)


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Process from Point/Station      255.000 to Point/Station      256.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   300.000(Ft.)
Top (of initial area) elevation =  1415.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =    85.000(Ft.)
Slope =    0.28333  s(%)=      28.33
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.000 min.
Rainfall intensity =      2.907(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.424(CFS)
Total initial stream area =        1.460(Ac.)


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Process from Point/Station      255.000 to Point/Station      256.000
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**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      1.460(Ac.)
Runoff from this stream =      0.424(CFS)
Time of concentration =   11.00 min.
Rainfall intensity =     2.907(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      260.000 to Point/Station      261.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   508.000(Ft.)
Top (of initial area) elevation =  1453.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   113.000(Ft.)
Slope =    0.22244  s(%)=      22.24
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.820(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.522(CFS)
Total initial stream area =        1.850(Ac.)


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Process from Point/Station      260.000 to Point/Station      261.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 3
Stream flow area =      1.850(Ac.)
Runoff from this stream =      0.522(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.820(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      265.000 to Point/Station      266.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   660.000(Ft.)
Top (of initial area) elevation =  1531.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   191.000(Ft.)
Slope =    0.28939  s(%)=      28.94
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.900 min.
Rainfall intensity =      2.795(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.129(CFS)
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Total initial stream area =        4.040(Ac.)


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Process from Point/Station      265.000 to Point/Station      266.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 4
Stream flow area =      4.040(Ac.)
Runoff from this stream =      1.129(CFS)
Time of concentration =   11.90 min.
Rainfall intensity =     2.795(In/Hr)

Total of 4 streams to confluence:
Flow rates before confluence point:
       3.509       0.424       0.522       1.129
Area of streams before confluence:
       13.570        1.460        1.850        4.040
Results of confluence:
Total flow rate =      5.584(CFS)
Time of concentration =    14.410 min.
Effective stream area after confluence =     20.920(Ac.)


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Process from Point/Station      250.000 to Point/Station      266.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     20.920(Ac.)
Runoff from this stream =      5.584(CFS)
Time of concentration =   14.41 min.
Rainfall intensity =     2.482(In/Hr)

Total of 3 main streams to confluence:
Flow rates before confluence point:
      24.929      21.229       5.584
Area of streams before confluence:
       95.590       81.460       20.920


Results of confluence:
Total flow rate =     51.742(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence  =    197.970(Ac.)


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Process from Point/Station      200.000 to Point/Station      266.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    197.970(Ac.)
Runoff from this stream =     51.742(CFS)
Time of concentration =   12.30 min.
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Rainfall intensity =     2.745(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   790.000(Ft.)
Top (of initial area) elevation =  1842.000(Ft.)
Bottom (of initial area) elevation =  1600.000(Ft.)
Difference in elevation =   242.000(Ft.)
Slope =    0.30633  s(%)=      30.63
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.770(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =     11.743(CFS)
Total initial stream area =       42.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     42.390(Ac.)
Runoff from this stream =     11.743(CFS)
Time of concentration =   12.10 min.
Rainfall intensity =     2.770(In/Hr)

Total of 2 main streams to confluence:
Flow rates before confluence point:
      51.742      11.743
Area of streams before confluence:
      197.970       42.390


Results of confluence:
Total flow rate =     63.485(CFS)
Time of concentration =    12.300 min.
Effective stream area after confluence  =    240.360(Ac.)
End of computations, total study area =         240.360 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

Topsoil Storage Area
Existing Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.543(In.)
2	10.000		2.435(In.)
3	15.000		1.929(In.)
4	30.000		1.306(In.)
5	60.000		0.909(In.)
6	120.000		0.679(In.)
7	180.000		0.584(In.)
8	360.000		0.448(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   892.000(Ft.)
Top (of initial area) elevation =  1603.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   273.000(Ft.)
Slope =    0.30605  s(%)=      30.61
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.202(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.969(CFS)
Total initial stream area =        4.400(Ac.)


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Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   680.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      2.408(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.408(CFS)
Depth of flow =   0.198(Ft.), Average velocity =   3.212(Ft/s)
Channel flow top width =    4.582(Ft.)
Flow Velocity =    3.21(Ft/s)
Travel time  =    3.53 min.
Time of concentration =   15.83 min.
Critical depth =      0.242(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.895(In/Hr) for a    25.0 year storm
Subarea runoff =      2.476(CFS) for     13.070(Ac.)
Total runoff =      3.445(CFS)      Total area =      17.470(Ac.)


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Process from Point/Station      266.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    15.83 min.
Rainfall intensity =      1.895(In/Hr) for a    25.0 year storm
Subarea runoff =      0.765(CFS) for      4.040(Ac.)
```

```
Total runoff =      4.211(CFS)      Total area =      21.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1240.000(Ft.)
Downstream point elevation =   680.000(Ft.)
Channel length thru subarea  =  2010.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      7.696(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      7.696(CFS)
Depth of flow =   0.315(Ft.), Average velocity =   6.203(Ft/s)
Channel flow top width =    4.888(Ft.)
Flow Velocity =    6.20(Ft/s)
Travel time  =    5.40 min.
Time of concentration =   21.23 min.
Critical depth =      0.496(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.670(In/Hr) for a    25.0 year storm
Subarea runoff =      5.948(CFS) for     35.610(Ac.)
Total runoff =     10.158(CFS)      Total area =      57.120(Ac.)
End of computations, total study area =          57.120 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/29/10

Topsoil Storage Area
Existing Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.271(In.)
2	10.000		2.945(In.)
3	15.000		2.353(In.)
4	30.000		1.581(In.)
5	60.000		1.087(In.)
6	120.000		0.801(In.)
7	180.000		0.688(In.)
8	360.000		0.534(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   892.000(Ft.)
Top (of initial area) elevation =  1603.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   273.000(Ft.)
Slope =    0.30605  s(%)=      30.61
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.673(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.176(CFS)
Total initial stream area =        4.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   680.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      2.923(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.923(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   3.416(Ft/s)
Channel flow top width =    4.763(Ft.)
Flow Velocity =    3.42(Ft/s)
Travel time  =    3.32 min.
Time of concentration =   15.62 min.
Critical depth =      0.273(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.321(In/Hr) for a   100.0 year storm
Subarea runoff =      3.034(CFS) for     13.070(Ac.)
Total runoff =      4.210(CFS)      Total area =      17.470(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      266.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    15.62 min.
Rainfall intensity =      2.321(In/Hr) for a   100.0 year storm
Subarea runoff =      0.938(CFS) for      4.040(Ac.)
```

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Total runoff =      5.148(CFS)      Total area =      21.510(Ac.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1240.000(Ft.)
Downstream point elevation =   680.000(Ft.)
Channel length thru subarea  =  2010.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      9.408(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.408(CFS)
Depth of flow =   0.352(Ft.), Average velocity =   6.600(Ft/s)
Channel flow top width =    5.109(Ft.)
Flow Velocity =    6.60(Ft/s)
Travel time  =    5.08 min.
Time of concentration =   20.69 min.
Critical depth =      0.555(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.060(In/Hr) for a   100.0 year storm
Subarea runoff =      7.336(CFS) for     35.610(Ac.)
Total runoff =     12.483(CFS)      Total area =      57.120(Ac.)
End of computations, total study area =          57.120 (Ac.)
```

PROPOSED CONDITION
(RECLAIMED POST-PROJECT)
ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 05/20/10

CMSA
Proposed Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.478(In.)
2	10.000		2.376(In.)
3	15.000		1.884(In.)
4	30.000		1.271(In.)
5	60.000		0.876(In.)
6	120.000		0.648(In.)
7	180.000		0.554(In.)
8	360.000		0.421(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   833.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   137.400(Ft.)
Slope =    0.16495  s(%)=      16.49
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.100(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.391(CFS)
Total initial stream area =        1.860(Ac.)


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Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1269.000(Ft.)
Channel length thru subarea  =  1088.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      1.822(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.822(CFS)
Depth of flow =   0.084(Ft.), Average velocity =   1.530(Ft/s)
Channel flow top width =   18.389(Ft.)
Flow Velocity =    1.53(Ft/s)
Travel time  =   11.85 min.
Time of concentration =   24.65 min.
Critical depth =      0.087(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.490(In/Hr) for a    25.0 year storm
Subarea runoff =      2.436(CFS) for     13.630(Ac.)
Total runoff =      2.827(CFS)      Total area =      15.490(Ac.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1269.000(Ft.)
Downstream point elevation =  1080.000(Ft.)
Channel length thru subarea  =  1845.000(Ft.)
Channel base width      =    2.000(Ft.)
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Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.533(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.533(CFS)
Depth of flow =   0.329(Ft.), Average velocity =   4.605(Ft/s)
Channel flow top width =    3.976(Ft.)
Flow Velocity =    4.61(Ft/s)
Travel time  =    6.68 min.
Time of concentration =   31.33 min.
Critical depth =      0.434(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.254(In/Hr) for a    25.0 year storm
Subarea runoff =      2.343(CFS) for     18.690(Ac.)
Total runoff =      5.170(CFS)      Total area =      34.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1080.000(Ft.)
Downstream point elevation =  1000.000(Ft.)
Channel length thru subarea  =   770.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.374(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.374(CFS)
Depth of flow =   0.359(Ft.), Average velocity =   4.862(Ft/s)
Channel flow top width =    4.155(Ft.)
Flow Velocity =    4.86(Ft/s)
Travel time  =    2.64 min.
Time of concentration =   33.97 min.
Critical depth =      0.477(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.219(In/Hr) for a    25.0 year storm
Subarea runoff =      0.329(CFS) for      2.700(Ac.)
Total runoff =      5.499(CFS)      Total area =      36.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     36.880(Ac.)
Runoff from this stream =      5.499(CFS)
Time of concentration =   33.97 min.
Rainfall intensity =     1.219(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   769.000(Ft.)
Top (of initial area) elevation =  1340.200(Ft.)
Bottom (of initial area) elevation =  1160.000(Ft.)
Difference in elevation =   180.200(Ft.)
Slope =    0.23433  s(%)=      23.43
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.150(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.275(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1160.000(Ft.)
Downstream point elevation =  1010.000(Ft.)
Channel length thru subarea  =   843.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.527(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.527(CFS)
Depth of flow =   0.085(Ft.), Average velocity =   2.815(Ft/s)
Channel flow top width =    2.423(Ft.)
Flow Velocity =    2.82(Ft/s)
Travel time  =    4.99 min.
Time of concentration =   17.29 min.
Critical depth =      0.123(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.790(In/Hr) for a    25.0 year storm
Subarea runoff =      0.419(CFS) for      2.340(Ac.)
Total runoff =      0.694(CFS)      Total area =       3.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1010.000(Ft.)
Downstream point elevation =  1000.000(Ft.)
Channel length thru subarea  =   639.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
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Estimated mean flow rate at midpoint of channel =      0.899(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.899(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   1.541(Ft/s)
Channel flow top width =    2.944(Ft.)
Flow Velocity =    1.54(Ft/s)
Travel time  =    6.91 min.
Time of concentration =   24.20 min.
Critical depth =      0.174(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.508(In/Hr) for a    25.0 year storm
Subarea runoff =      0.323(CFS) for      2.140(Ac.)
Total runoff =      1.017(CFS)      Total area =       5.760(Ac.)


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Process from Point/Station      112.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.760(Ac.)
Runoff from this stream =      1.017(CFS)
Time of concentration =   24.20 min.
Rainfall intensity =     1.508(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.499       1.017
Area of streams before confluence:
       36.880        5.760
Results of confluence:
Total flow rate =      6.516(CFS)
Time of concentration =    33.967 min.
Effective stream area after confluence =     42.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      114.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1000.000(Ft.)
Downstream point elevation =   858.800(Ft.)
Channel length thru subarea  =  1833.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      7.595(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      7.595(CFS)
Depth of flow =   0.465(Ft.), Average velocity =   4.817(Ft/s)
Channel flow top width =    4.788(Ft.)
Flow Velocity =    4.82(Ft/s)
Travel time  =    6.34 min.
Time of concentration =   40.31 min.
```

```
Critical depth =      0.574(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.135(In/Hr) for a    25.0 year storm
Subarea runoff =      1.604(CFS) for     14.130(Ac.)
Total runoff =      8.120(CFS)      Total area =      56.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   858.800(Ft.)
Downstream point elevation =   695.000(Ft.)
Channel length thru subarea  =  1430.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      8.837(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      8.837(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   5.797(Ft/s)
Channel flow top width =    4.721(Ft.)
Flow Velocity =    5.80(Ft/s)
Travel time  =    4.11 min.
Time of concentration =   44.42 min.
Critical depth =      0.625(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.081(In/Hr) for a    25.0 year storm
Subarea runoff =      1.083(CFS) for     10.020(Ac.)
Total runoff =      9.203(CFS)      Total area =      66.790(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      115.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     66.790(Ac.)
Runoff from this stream =      9.203(CFS)
Time of concentration =   44.42 min.
Rainfall intensity =     1.081(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   952.000(Ft.)
Top (of initial area) elevation =  1164.000(Ft.)
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```
Bottom (of initial area) elevation =   910.200(Ft.)
Difference in elevation =   253.800(Ft.)
Slope =    0.26660  s(%)=      26.66
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.120(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.804(CFS)
Total initial stream area =        3.790(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   910.200(Ft.)
Downstream point elevation =   765.000(Ft.)
Channel length thru subarea  =   383.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      2.611(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.611(CFS)
Depth of flow =   0.071(Ft.), Average velocity =   2.695(Ft/s)
Channel flow top width =   17.140(Ft.)
Flow Velocity =    2.69(Ft/s)
Travel time  =    2.37 min.
Time of concentration =   14.97 min.
Critical depth =      0.106(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.887(In/Hr) for a    25.0 year storm
Subarea runoff =      3.539(CFS) for     17.050(Ac.)
Total runoff =      4.343(CFS)      Total area =      20.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     20.840(Ac.)
Runoff from this stream =      4.343(CFS)
Time of concentration =   14.97 min.
Rainfall intensity =     1.887(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   120.000(Ft.)
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Top (of initial area) elevation =   779.000(Ft.)
Bottom (of initial area) elevation =   735.000(Ft.)
Difference in elevation =    44.000(Ft.)
Slope =    0.36667  s(%)=      36.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.327(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.419(CFS)
Total initial stream area =        1.800(Ac.)


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Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.800(Ac.)
Runoff from this stream =      0.419(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.327(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.343       0.419
Area of streams before confluence:
       20.840        1.800
Results of confluence:
Total flow rate =      4.762(CFS)
Time of concentration =    14.969 min.
Effective stream area after confluence =     22.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.640(Ac.)
Runoff from this stream =      4.762(CFS)
Time of concentration =   14.97 min.
Rainfall intensity =     1.887(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   443.000(Ft.)
Top (of initial area) elevation =   860.000(Ft.)
Bottom (of initial area) elevation =   855.500(Ft.)
Difference in elevation =     4.500(Ft.)
```

```
Slope =    0.01016  s(%)=       1.02
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   15.000 min.
Rainfall intensity =      1.884(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.090(CFS)
Total initial stream area =        0.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   855.500(Ft.)
Downstream point elevation =   726.000(Ft.)
Channel length thru subarea  =   311.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.437(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      0.437(CFS)
Depth of flow =   0.059(Ft.), Average velocity =   3.484(Ft/s)
Channel flow top width =    2.237(Ft.)
Flow Velocity =    3.48(Ft/s)
Travel time  =    1.49 min.
Time of concentration =   16.49 min.
Critical depth =      0.109(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.823(In/Hr) for a    25.0 year storm
Subarea runoff =      0.671(CFS) for      3.680(Ac.)
Total runoff =      0.761(CFS)      Total area =       4.160(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   726.000(Ft.)
Downstream point elevation =   570.000(Ft.)
Channel length thru subarea  =   700.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.271(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.271(CFS)
Depth of flow =   0.134(Ft.), Average velocity =   4.190(Ft/s)
Channel flow top width =    2.535(Ft.)
Flow Velocity =    4.19(Ft/s)
Travel time  =    2.78 min.
Time of concentration =   19.27 min.
Critical depth =      0.215(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.709(In/Hr) for a    25.0 year storm
Subarea runoff =      0.952(CFS) for      5.570(Ac.)
Total runoff =      1.713(CFS)      Total area =       9.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      9.730(Ac.)
Runoff from this stream =      1.713(CFS)
Time of concentration =   19.27 min.
Rainfall intensity =     1.709(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   453.000(Ft.)
Top (of initial area) elevation =   900.000(Ft.)
Bottom (of initial area) elevation =   895.500(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00993  s(%)=       0.99
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   15.100 min.
Rainfall intensity =      1.880(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.113(CFS)
Total initial stream area =        0.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   895.500(Ft.)
Downstream point elevation =   801.000(Ft.)
Channel length thru subarea  =  1554.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.856(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.856(CFS)
Depth of flow =   0.155(Ft.), Average velocity =   2.388(Ft/s)
Channel flow top width =    2.621(Ft.)
Flow Velocity =    2.39(Ft/s)
Travel time  =   10.85 min.
```

```
Time of concentration =   25.95 min.
Critical depth =      0.168(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.437(In/Hr) for a    25.0 year storm
Subarea runoff =      1.136(CFS) for      7.910(Ac.)
Total runoff =      1.249(CFS)      Total area =       8.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   801.000(Ft.)
Downstream point elevation =   757.000(Ft.)
Channel length thru subarea  =   553.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.655(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.655(CFS)
Depth of flow =   0.210(Ft.), Average velocity =   3.254(Ft/s)
Channel flow top width =    2.841(Ft.)
Flow Velocity =    3.25(Ft/s)
Travel time  =    2.83 min.
Time of concentration =   28.78 min.
Critical depth =      0.254(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.321(In/Hr) for a    25.0 year storm
Subarea runoff =      0.730(CFS) for      5.530(Ac.)
Total runoff =      1.980(CFS)      Total area =      14.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   757.000(Ft.)
Downstream point elevation =   599.200(Ft.)
Channel length thru subarea  =   703.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      2.628(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.628(CFS)
Depth of flow =   0.204(Ft.), Average velocity =   5.366(Ft/s)
Channel flow top width =    2.814(Ft.)
Flow Velocity =    5.37(Ft/s)
Travel time  =    2.18 min.
Time of concentration =   30.96 min.
Critical depth =      0.336(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.258(In/Hr) for a    25.0 year storm
Subarea runoff =      1.158(CFS) for      9.200(Ac.)
Total runoff =      3.137(CFS)      Total area =      23.240(Ac.)


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Process from Point/Station      404.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   599.200(Ft.)
Downstream point elevation =   561.200(Ft.)
Channel length thru subarea  =   410.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      3.251(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.251(CFS)
Depth of flow =   0.283(Ft.), Average velocity =   4.031(Ft/s)
Channel flow top width =    3.698(Ft.)
Flow Velocity =    4.03(Ft/s)
Travel time  =    1.70 min.
Time of concentration =   32.66 min.
Critical depth =      0.359(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.236(In/Hr) for a    25.0 year storm
Subarea runoff =      0.209(CFS) for      1.690(Ac.)
Total runoff =      3.346(CFS)      Total area =      24.930(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     24.930(Ac.)
Runoff from this stream =      3.346(CFS)
Time of concentration =   32.66 min.
Rainfall intensity =     1.236(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      410.000 to Point/Station      411.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   908.000(Ft.)
Top (of initial area) elevation =   645.000(Ft.)
Bottom (of initial area) elevation =   635.600(Ft.)
Difference in elevation =     9.400(Ft.)
Slope =    0.01035  s(%)=       1.04
Manual entry of initial area time of concentration, TC
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Initial area time of concentration =   18.600 min.
Rainfall intensity =      1.737(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.511(CFS)
Total initial stream area =        2.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   635.600(Ft.)
Downstream point elevation =   561.200(Ft.)
Channel length thru subarea  =   178.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.511(CFS)
Depth of flow =   0.065(Ft.), Average velocity =   3.695(Ft/s)
Channel flow top width =    2.260(Ft.)
Flow Velocity =    3.70(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   19.40 min.
Critical depth =      0.121(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      2.940(Ac.)
Runoff from this stream =      0.511(CFS)
Time of concentration =   19.40 min.
Rainfall intensity =     1.704(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.346       0.511
Area of streams before confluence:
       24.930        2.940
Results of confluence:
Total flow rate =      3.857(CFS)
Time of concentration =    32.657 min.
Effective stream area after confluence =     27.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   561.200(Ft.)
Downstream point elevation =   556.400(Ft.)
Channel length thru subarea  =   381.000(Ft.)
Channel base width      =    2.000(Ft.)
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Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.222(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.222(CFS)
Depth of flow =   0.546(Ft.), Average velocity =   2.126(Ft/s)
Channel flow top width =    5.275(Ft.)
Flow Velocity =    2.13(Ft/s)
Travel time  =    2.99 min.
Time of concentration =   35.64 min.
Critical depth =      0.418(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.197(In/Hr) for a    25.0 year storm
Subarea runoff =      0.632(CFS) for      5.280(Ac.)
Total runoff =      4.489(CFS)      Total area =      33.150(Ac.)


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Process from Point/Station      405.000 to Point/Station      412.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     33.150(Ac.)
Runoff from this stream =      4.489(CFS)
Time of concentration =   35.64 min.
Rainfall intensity =     1.197(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
       9.203       4.762       1.713       4.489
Area of streams before confluence:
       66.790       22.640        9.730       33.150


Results of confluence:
Total flow rate =     20.167(CFS)
Time of concentration =    44.420 min.
Effective stream area after confluence  =    132.310(Ac.)


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Process from Point/Station      100.000 to Point/Station      400.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    132.310(Ac.)
Runoff from this stream =     20.167(CFS)
Time of concentration =   44.42 min.
Rainfall intensity =     1.081(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   823.000(Ft.)
Top (of initial area) elevation =  1020.000(Ft.)
Bottom (of initial area) elevation =   910.000(Ft.)
Difference in elevation =   110.000(Ft.)
Slope =    0.13366  s(%)=      13.37
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.000 min.
Rainfall intensity =      2.081(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.412(CFS)
Total initial stream area =        1.980(Ac.)


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Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   910.000(Ft.)
Downstream point elevation =   822.000(Ft.)
Channel length thru subarea  =   566.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.602(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.602(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   2.790(Ft/s)
Channel flow top width =    2.567(Ft.)
Flow Velocity =    2.79(Ft/s)
Travel time  =    3.38 min.
Time of concentration =   16.38 min.
Critical depth =      0.132(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.828(In/Hr) for a    25.0 year storm
Subarea runoff =      0.334(CFS) for      1.830(Ac.)
Total runoff =      0.746(CFS)      Total area =       3.810(Ac.)


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Process from Point/Station      501.000 to Point/Station      502.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.810(Ac.)
Runoff from this stream =      0.746(CFS)
Time of concentration =   16.38 min.
Rainfall intensity =     1.828(In/Hr)
Program is now starting with Main Stream No. 3
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   499.000(Ft.)
Top (of initial area) elevation =   840.000(Ft.)
Bottom (of initial area) elevation =   769.000(Ft.)
Difference in elevation =    71.000(Ft.)
Slope =    0.14228  s(%)=      14.23
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.000 min.
Rainfall intensity =      2.179(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.207(CFS)
Total initial stream area =        0.950(Ac.)


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Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   769.000(Ft.)
Downstream point elevation =   710.000(Ft.)
Channel length thru subarea  =   576.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.349(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.349(CFS)
Depth of flow =   0.078(Ft.), Average velocity =   2.011(Ft/s)
Channel flow top width =    2.466(Ft.)
Flow Velocity =    2.01(Ft/s)
Travel time  =    4.77 min.
Time of concentration =   16.77 min.
Critical depth =      0.094(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.812(In/Hr) for a    25.0 year storm
Subarea runoff =      0.236(CFS) for      1.300(Ac.)
Total runoff =      0.443(CFS)      Total area =       2.250(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      601.000 to Point/Station      602.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.250(Ac.)
Runoff from this stream =      0.443(CFS)
```

```
Time of concentration =   16.77 min.
Rainfall intensity =     1.812(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   641.000(Ft.)
Top (of initial area) elevation =   710.000(Ft.)
Bottom (of initial area) elevation =   690.000(Ft.)
Difference in elevation =    20.000(Ft.)
Slope =    0.03120  s(%)=       3.12
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.300 min.
Rainfall intensity =      1.953(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.242(CFS)
Total initial stream area =        1.240(Ac.)


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Process from Point/Station      700.000 to Point/Station      701.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      1.240(Ac.)
Runoff from this stream =      0.242(CFS)
Time of concentration =   14.30 min.
Rainfall intensity =     1.953(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      20.167       0.746       0.443       0.242
Area of streams before confluence:
      132.310        3.810        2.250        1.240


Results of confluence:
Total flow rate =     21.598(CFS)
Time of concentration =    44.420 min.
Effective stream area after confluence  =    139.610(Ac.)
End of computations, total study area =         139.610 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 05/20/10

CMSA
Proposed Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.185(In.)
2	10.000		2.857(In.)
3	15.000		2.298(In.)
4	30.000		1.542(In.)
5	60.000		1.049(In.)
6	120.000		0.765(In.)
7	180.000		0.653(In.)
8	360.000		0.500(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   833.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   137.400(Ft.)
Slope =    0.16495  s(%)=      16.49
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.544(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.473(CFS)
Total initial stream area =        1.860(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1340.000(Ft.)
Downstream point elevation =  1269.000(Ft.)
Channel length thru subarea  =  1088.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      2.207(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.207(CFS)
Depth of flow =   0.093(Ft.), Average velocity =   1.621(Ft/s)
Channel flow top width =   19.297(Ft.)
Flow Velocity =    1.62(Ft/s)
Travel time  =   11.19 min.
Time of concentration =   23.99 min.
Critical depth =      0.097(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.845(In/Hr) for a   100.0 year storm
Subarea runoff =      3.018(CFS) for     13.630(Ac.)
Total runoff =      3.491(CFS)      Total area =      15.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1269.000(Ft.)
Downstream point elevation =  1080.000(Ft.)
Channel length thru subarea  =  1845.000(Ft.)
Channel base width      =    2.000(Ft.)
```

```
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.597(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.597(CFS)
Depth of flow =   0.368(Ft.), Average velocity =   4.895(Ft/s)
Channel flow top width =    4.210(Ft.)
Flow Velocity =    4.89(Ft/s)
Travel time  =    6.28 min.
Time of concentration =   30.27 min.
Critical depth =      0.484(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.538(In/Hr) for a   100.0 year storm
Subarea runoff =      2.874(CFS) for     18.690(Ac.)
Total runoff =      6.364(CFS)      Total area =      34.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1080.000(Ft.)
Downstream point elevation =  1000.000(Ft.)
Channel length thru subarea  =   770.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      6.616(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      6.616(CFS)
Depth of flow =   0.400(Ft.), Average velocity =   5.160(Ft/s)
Channel flow top width =    4.403(Ft.)
Flow Velocity =    5.16(Ft/s)
Travel time  =    2.49 min.
Time of concentration =   32.76 min.
Critical depth =      0.531(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.497(In/Hr) for a   100.0 year storm
Subarea runoff =      0.404(CFS) for      2.700(Ac.)
Total runoff =      6.768(CFS)      Total area =      36.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     36.880(Ac.)
Runoff from this stream =      6.768(CFS)
Time of concentration =   32.76 min.
Rainfall intensity =     1.497(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   769.000(Ft.)
Top (of initial area) elevation =  1340.200(Ft.)
Bottom (of initial area) elevation =  1160.000(Ft.)
Difference in elevation =   180.200(Ft.)
Slope =    0.23433  s(%)=      23.43
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.600(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.333(CFS)
Total initial stream area =        1.280(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      112.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1160.000(Ft.)
Downstream point elevation =  1010.000(Ft.)
Channel length thru subarea  =   843.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.637(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.637(CFS)
Depth of flow =   0.095(Ft.), Average velocity =   3.012(Ft/s)
Channel flow top width =    2.473(Ft.)
Flow Velocity =    3.01(Ft/s)
Travel time  =    4.67 min.
Time of concentration =   16.97 min.
Critical depth =      0.139(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.199(In/Hr) for a   100.0 year storm
Subarea runoff =      0.515(CFS) for      2.340(Ac.)
Total runoff =      0.847(CFS)      Total area =       3.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1010.000(Ft.)
Downstream point elevation =  1000.000(Ft.)
Channel length thru subarea  =   639.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
```

```
Estimated mean flow rate at midpoint of channel =      1.098(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.098(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   1.642(Ft/s)
Channel flow top width =    3.057(Ft.)
Flow Velocity =    1.64(Ft/s)
Travel time  =    6.48 min.
Time of concentration =   23.45 min.
Critical depth =      0.197(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.872(In/Hr) for a   100.0 year storm
Subarea runoff =      0.401(CFS) for      2.140(Ac.)
Total runoff =      1.248(CFS)      Total area =       5.760(Ac.)


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Process from Point/Station      112.000 to Point/Station      104.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.760(Ac.)
Runoff from this stream =      1.248(CFS)
Time of concentration =   23.45 min.
Rainfall intensity =     1.872(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.768       1.248
Area of streams before confluence:
       36.880        5.760
Results of confluence:
Total flow rate =      8.016(CFS)
Time of concentration =    32.759 min.
Effective stream area after confluence =     42.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      114.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1000.000(Ft.)
Downstream point elevation =   858.800(Ft.)
Channel length thru subarea  =  1833.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      9.345(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.345(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   5.101(Ft/s)
Channel flow top width =    5.097(Ft.)
Flow Velocity =    5.10(Ft/s)
Travel time  =    5.99 min.
Time of concentration =   38.75 min.
```

```
Critical depth =      0.641(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.398(In/Hr) for a   100.0 year storm
Subarea runoff =      1.976(CFS) for     14.130(Ac.)
Total runoff =      9.992(CFS)      Total area =      56.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      115.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   858.800(Ft.)
Downstream point elevation =   695.000(Ft.)
Channel length thru subarea  =  1430.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =     10.874(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     10.874(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   6.140(Ft/s)
Channel flow top width =    5.025(Ft.)
Flow Velocity =    6.14(Ft/s)
Travel time  =    3.88 min.
Time of concentration =   42.63 min.
Critical depth =      0.695(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.334(In/Hr) for a   100.0 year storm
Subarea runoff =      1.337(CFS) for     10.020(Ac.)
Total runoff =     11.329(CFS)      Total area =      66.790(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      115.000 to Point/Station      115.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     66.790(Ac.)
Runoff from this stream =     11.329(CFS)
Time of concentration =   42.63 min.
Rainfall intensity =     1.334(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   952.000(Ft.)
Top (of initial area) elevation =  1164.000(Ft.)
```

```
Bottom (of initial area) elevation =   910.200(Ft.)
Difference in elevation =   253.800(Ft.)
Slope =    0.26660  s(%)=      26.66
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.600 min.
Rainfall intensity =      2.566(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.973(CFS)
Total initial stream area =        3.790(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   910.200(Ft.)
Downstream point elevation =   765.000(Ft.)
Channel length thru subarea  =   383.000(Ft.)
Channel base width      =   10.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      3.160(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.160(CFS)
Depth of flow =   0.079(Ft.), Average velocity =   2.857(Ft/s)
Channel flow top width =   17.922(Ft.)
Flow Velocity =    2.86(Ft/s)
Travel time  =    2.23 min.
Time of concentration =   14.83 min.
Critical depth =      0.119(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.317(In/Hr) for a   100.0 year storm
Subarea runoff =      4.345(CFS) for     17.050(Ac.)
Total runoff =      5.317(CFS)      Total area =      20.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     20.840(Ac.)
Runoff from this stream =      5.317(CFS)
Time of concentration =   14.83 min.
Rainfall intensity =     2.317(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   120.000(Ft.)
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```
Top (of initial area) elevation =   779.000(Ft.)
Bottom (of initial area) elevation =   735.000(Ft.)
Difference in elevation =    44.000(Ft.)
Slope =    0.36667  s(%)=      36.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.801(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.504(CFS)
Total initial stream area =        1.800(Ac.)


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Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.800(Ac.)
Runoff from this stream =      0.504(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.801(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.317       0.504
Area of streams before confluence:
       20.840        1.800
Results of confluence:
Total flow rate =      5.822(CFS)
Time of concentration =    14.834 min.
Effective stream area after confluence =     22.640(Ac.)


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Process from Point/Station      202.000 to Point/Station      211.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     22.640(Ac.)
Runoff from this stream =      5.822(CFS)
Time of concentration =   14.83 min.
Rainfall intensity =     2.317(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   443.000(Ft.)
Top (of initial area) elevation =   860.000(Ft.)
Bottom (of initial area) elevation =   855.500(Ft.)
Difference in elevation =     4.500(Ft.)
```

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Slope =    0.01016  s(%)=       1.02
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   15.000 min.
Rainfall intensity =      2.298(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.110(CFS)
Total initial stream area =        0.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   855.500(Ft.)
Downstream point elevation =   726.000(Ft.)
Channel length thru subarea  =   311.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.533(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      0.533(CFS)
Depth of flow =   0.067(Ft.), Average velocity =   3.750(Ft/s)
Channel flow top width =    2.267(Ft.)
Flow Velocity =    3.75(Ft/s)
Travel time  =    1.38 min.
Time of concentration =   16.38 min.
Critical depth =      0.125(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.228(In/Hr) for a   100.0 year storm
Subarea runoff =      0.820(CFS) for      3.680(Ac.)
Total runoff =      0.930(CFS)      Total area =       4.160(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   726.000(Ft.)
Downstream point elevation =   570.000(Ft.)
Channel length thru subarea  =   700.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.553(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.553(CFS)
Depth of flow =   0.150(Ft.), Average velocity =   4.488(Ft/s)
Channel flow top width =    2.602(Ft.)
Flow Velocity =    4.49(Ft/s)
Travel time  =    2.60 min.
Time of concentration =   18.98 min.
Critical depth =      0.244(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.097(In/Hr) for a   100.0 year storm
Subarea runoff =      1.168(CFS) for      5.570(Ac.)
Total runoff =      2.099(CFS)      Total area =       9.730(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      9.730(Ac.)
Runoff from this stream =      2.099(CFS)
Time of concentration =   18.98 min.
Rainfall intensity =     2.097(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   453.000(Ft.)
Top (of initial area) elevation =   900.000(Ft.)
Bottom (of initial area) elevation =   895.500(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00993  s(%)=       0.99
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   15.100 min.
Rainfall intensity =      2.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.138(CFS)
Total initial stream area =        0.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   895.500(Ft.)
Downstream point elevation =   801.000(Ft.)
Channel length thru subarea  =  1554.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.044(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.044(CFS)
Depth of flow =   0.174(Ft.), Average velocity =   2.554(Ft/s)
Channel flow top width =    2.697(Ft.)
Flow Velocity =    2.55(Ft/s)
Travel time  =   10.14 min.
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```
Time of concentration =   25.24 min.
Critical depth =      0.191(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.782(In/Hr) for a   100.0 year storm
Subarea runoff =      1.409(CFS) for      7.910(Ac.)
Total runoff =      1.547(CFS)      Total area =       8.510(Ac.)


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Process from Point/Station      402.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   801.000(Ft.)
Downstream point elevation =   757.000(Ft.)
Channel length thru subarea  =   553.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      2.050(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.050(CFS)
Depth of flow =   0.237(Ft.), Average velocity =   3.487(Ft/s)
Channel flow top width =    2.950(Ft.)
Flow Velocity =    3.49(Ft/s)
Travel time  =    2.64 min.
Time of concentration =   27.89 min.
Critical depth =      0.289(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.649(In/Hr) for a   100.0 year storm
Subarea runoff =      0.912(CFS) for      5.530(Ac.)
Total runoff =      2.459(CFS)      Total area =      14.040(Ac.)


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Process from Point/Station      403.000 to Point/Station      404.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   757.000(Ft.)
Downstream point elevation =   599.200(Ft.)
Channel length thru subarea  =   703.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.264(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.264(CFS)
Depth of flow =   0.230(Ft.), Average velocity =   5.757(Ft/s)
Channel flow top width =    2.922(Ft.)
Flow Velocity =    5.76(Ft/s)
Travel time  =    2.04 min.
Time of concentration =   29.92 min.
Critical depth =      0.383(Ft.)
 Adding area flow to channel
```

```
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.546(In/Hr) for a   100.0 year storm
Subarea runoff =      1.422(CFS) for      9.200(Ac.)
Total runoff =      3.881(CFS)      Total area =      23.240(Ac.)


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Process from Point/Station      404.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   599.200(Ft.)
Downstream point elevation =   561.200(Ft.)
Channel length thru subarea  =   410.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.022(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.022(CFS)
Depth of flow =   0.317(Ft.), Average velocity =   4.293(Ft/s)
Channel flow top width =    3.904(Ft.)
Flow Velocity =    4.29(Ft/s)
Travel time  =    1.59 min.
Time of concentration =   31.51 min.
Critical depth =      0.406(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.517(In/Hr) for a   100.0 year storm
Subarea runoff =      0.256(CFS) for      1.690(Ac.)
Total runoff =      4.137(CFS)      Total area =      24.930(Ac.)


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Process from Point/Station      404.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     24.930(Ac.)
Runoff from this stream =      4.137(CFS)
Time of concentration =   31.51 min.
Rainfall intensity =     1.517(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      410.000 to Point/Station      411.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   908.000(Ft.)
Top (of initial area) elevation =   645.000(Ft.)
Bottom (of initial area) elevation =   635.600(Ft.)
Difference in elevation =     9.400(Ft.)
Slope =    0.01035  s(%)=       1.04
Manual entry of initial area time of concentration, TC
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```
Initial area time of concentration =   18.600 min.
Rainfall intensity =      2.117(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.622(CFS)
Total initial stream area =        2.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      405.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   635.600(Ft.)
Downstream point elevation =   561.200(Ft.)
Channel length thru subarea  =   178.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.622(CFS)
Depth of flow =   0.073(Ft.), Average velocity =   3.974(Ft/s)
Channel flow top width =    2.292(Ft.)
Flow Velocity =    3.97(Ft/s)
Travel time  =    0.75 min.
Time of concentration =   19.35 min.
Critical depth =      0.137(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      405.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      2.940(Ac.)
Runoff from this stream =      0.622(CFS)
Time of concentration =   19.35 min.
Rainfall intensity =     2.079(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.137       0.622
Area of streams before confluence:
       24.930        2.940
Results of confluence:
Total flow rate =      4.760(CFS)
Time of concentration =    31.512 min.
Effective stream area after confluence =     27.870(Ac.)


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Process from Point/Station      405.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   561.200(Ft.)
Downstream point elevation =   556.400(Ft.)
Channel length thru subarea  =   381.000(Ft.)
Channel base width      =    2.000(Ft.)
```

```
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.211(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.211(CFS)
Depth of flow =   0.606(Ft.), Average velocity =   2.251(Ft/s)
Channel flow top width =    5.637(Ft.)
Flow Velocity =    2.25(Ft/s)
Travel time  =    2.82 min.
Time of concentration =   34.33 min.
Critical depth =      0.469(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.471(In/Hr) for a   100.0 year storm
Subarea runoff =      0.777(CFS) for      5.280(Ac.)
Total runoff =      5.536(CFS)      Total area =      33.150(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      412.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     33.150(Ac.)
Runoff from this stream =      5.536(CFS)
Time of concentration =   34.33 min.
Rainfall intensity =     1.471(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      11.329       5.822       2.099       5.536
Area of streams before confluence:
       66.790       22.640        9.730       33.150


Results of confluence:
Total flow rate =     24.786(CFS)
Time of concentration =    42.630 min.
Effective stream area after confluence  =    132.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      400.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    132.310(Ac.)
Runoff from this stream =     24.786(CFS)
Time of concentration =   42.63 min.
Rainfall intensity =     1.334(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   823.000(Ft.)
Top (of initial area) elevation =  1020.000(Ft.)
Bottom (of initial area) elevation =   910.000(Ft.)
Difference in elevation =   110.000(Ft.)
Slope =    0.13366  s(%)=      13.37
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.000 min.
Rainfall intensity =      2.522(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.499(CFS)
Total initial stream area =        1.980(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   910.000(Ft.)
Downstream point elevation =   822.000(Ft.)
Channel length thru subarea  =   566.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.730(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.730(CFS)
Depth of flow =   0.106(Ft.), Average velocity =   2.981(Ft/s)
Channel flow top width =    2.634(Ft.)
Flow Velocity =    2.98(Ft/s)
Travel time  =    3.17 min.
Time of concentration =   16.17 min.
Critical depth =      0.148(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.239(In/Hr) for a   100.0 year storm
Subarea runoff =      0.410(CFS) for      1.830(Ac.)
Total runoff =      0.909(CFS)      Total area =       3.810(Ac.)


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Process from Point/Station      501.000 to Point/Station      502.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.810(Ac.)
Runoff from this stream =      0.909(CFS)
Time of concentration =   16.17 min.
Rainfall intensity =     2.239(In/Hr)
Program is now starting with Main Stream No. 3
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   499.000(Ft.)
Top (of initial area) elevation =   840.000(Ft.)
Bottom (of initial area) elevation =   769.000(Ft.)
Difference in elevation =    71.000(Ft.)
Slope =    0.14228  s(%)=      14.23
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.000 min.
Rainfall intensity =      2.633(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.250(CFS)
Total initial stream area =        0.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =   769.000(Ft.)
Downstream point elevation =   710.000(Ft.)
Channel length thru subarea  =   576.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.421(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.421(CFS)
Depth of flow =   0.087(Ft.), Average velocity =   2.150(Ft/s)
Channel flow top width =    2.520(Ft.)
Flow Velocity =    2.15(Ft/s)
Travel time  =    4.47 min.
Time of concentration =   16.47 min.
Critical depth =      0.105(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.224(In/Hr) for a   100.0 year storm
Subarea runoff =      0.289(CFS) for      1.300(Ac.)
Total runoff =      0.539(CFS)      Total area =       2.250(Ac.)


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Process from Point/Station      601.000 to Point/Station      602.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.250(Ac.)
Runoff from this stream =      0.539(CFS)
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Time of concentration =   16.47 min.
Rainfall intensity =     2.224(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   641.000(Ft.)
Top (of initial area) elevation =   710.000(Ft.)
Bottom (of initial area) elevation =   690.000(Ft.)
Difference in elevation =    20.000(Ft.)
Slope =    0.03120  s(%)=       3.12
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.300 min.
Rainfall intensity =      2.376(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.295(CFS)
Total initial stream area =        1.240(Ac.)


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Process from Point/Station      700.000 to Point/Station      701.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      1.240(Ac.)
Runoff from this stream =      0.295(CFS)
Time of concentration =   14.30 min.
Rainfall intensity =     2.376(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      24.786       0.909       0.539       0.295
Area of streams before confluence:
      132.310        3.810        2.250        1.240


Results of confluence:
Total flow rate =     26.529(CFS)
Time of concentration =    42.630 min.
Effective stream area after confluence  =    139.610(Ac.)
End of computations, total study area =         139.610 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/14/10

South Quarry
Proposed Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.607(In.)
2	10.000		2.494(In.)
3	15.000		1.974(In.)
4	30.000		1.341(In.)
5	60.000		0.942(In.)
6	120.000		0.710(In.)
7	180.000		0.613(In.)
8	360.000		0.476(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   306.000(Ft.)
Top (of initial area) elevation =  2000.000(Ft.)
Bottom (of initial area) elevation =  1898.000(Ft.)
Difference in elevation =   102.000(Ft.)
Slope =    0.33333  s(%)=      33.33
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.000 min.
Rainfall intensity =      2.390(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.237(CFS)
Total initial stream area =        0.990(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1898.000(Ft.)
Downstream point elevation =  1802.400(Ft.)
Channel length thru subarea  =   341.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.618(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.618(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   3.492(Ft/s)
Channel flow top width =    2.327(Ft.)
Flow Velocity =    3.49(Ft/s)
Travel time  =    1.63 min.
Time of concentration =   12.63 min.
Critical depth =      0.137(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.221(In/Hr) for a    25.0 year storm
Subarea runoff =      0.708(CFS) for      3.190(Ac.)
Total runoff =      0.945(CFS)      Total area =       4.180(Ac.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1802.400(Ft.)
Downstream point elevation =  1751.600(Ft.)
Channel length thru subarea  =   203.000(Ft.)
Channel base width      =    2.000(Ft.)
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Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.945(CFS)
Depth of flow =   0.109(Ft.), Average velocity =   3.921(Ft/s)
Channel flow top width =    2.435(Ft.)
Flow Velocity =    3.92(Ft/s)
Travel time  =    0.86 min.
Time of concentration =   13.49 min.
Critical depth =      0.180(Ft.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.180(Ac.)
Runoff from this stream =      0.945(CFS)
Time of concentration =   13.49 min.
Rainfall intensity =     2.131(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   100.000(Ft.)
Top (of initial area) elevation =  1813.000(Ft.)
Bottom (of initial area) elevation =  1768.800(Ft.)
Difference in elevation =    44.200(Ft.)
Slope =    0.44200  s(%)=      44.20
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.400 min.
Rainfall intensity =      2.452(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.083(CFS)
Total initial stream area =        0.340(Ac.)


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Process from Point/Station      111.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1768.800(Ft.)
Downstream point elevation =  1751.600(Ft.)
Channel length thru subarea  =   773.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.383(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
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Flow(q) thru subarea =      0.383(CFS)
Depth of flow =   0.130(Ft.), Average velocity =   1.302(Ft/s)
Channel flow top width =    2.520(Ft.)
Flow Velocity =    1.30(Ft/s)
Travel time  =    9.90 min.
Time of concentration =   20.30 min.
Critical depth =      0.101(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.750(In/Hr) for a    25.0 year storm
Subarea runoff =      0.427(CFS) for      2.440(Ac.)
Total runoff =      0.510(CFS)      Total area =       2.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.780(Ac.)
Runoff from this stream =      0.510(CFS)
Time of concentration =   20.30 min.
Rainfall intensity =     1.750(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.945       0.510
Area of streams before confluence:
        4.180        2.780
Results of confluence:
Total flow rate =      1.456(CFS)
Time of concentration =    13.490 min.
Effective stream area after confluence =      6.960(Ac.)


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Process from Point/Station      103.000 to Point/Station      112.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1751.600(Ft.)
Downstream point elevation =  1606.000(Ft.)
Channel length thru subarea  =   420.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      2.793(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.793(CFS)
Depth of flow =   0.186(Ft.), Average velocity =   6.332(Ft/s)
Channel flow top width =    2.744(Ft.)
Flow Velocity =    6.33(Ft/s)
Travel time  =    1.11 min.
Time of concentration =   14.60 min.
Critical depth =      0.348(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
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Rainfall intensity =      2.016(In/Hr) for a    25.0 year storm
Subarea runoff =      2.578(CFS) for     12.790(Ac.)
Total runoff =      4.034(CFS)      Total area =      19.750(Ac.)


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Process from Point/Station      112.000 to Point/Station      113.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1606.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Channel length thru subarea  =   903.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.338(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.338(CFS)
Depth of flow =   0.508(Ft.), Average velocity =   2.425(Ft/s)
Channel flow top width =    5.047(Ft.)
Flow Velocity =    2.42(Ft/s)
Travel time  =    6.21 min.
Time of concentration =   20.80 min.
Critical depth =      0.422(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.729(In/Hr) for a    25.0 year storm
Subarea runoff =      0.515(CFS) for      2.980(Ac.)
Total runoff =      4.549(CFS)      Total area =      22.730(Ac.)


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Process from Point/Station      112.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.730(Ac.)
Runoff from this stream =      4.549(CFS)
Time of concentration =   20.80 min.
Rainfall intensity =     1.729(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   123.000(Ft.)
Top (of initial area) elevation =  1599.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    49.000(Ft.)
Slope =    0.39837  s(%)=      39.84
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Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.442(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.093(CFS)
Total initial stream area =        0.380(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1523.300(Ft.)
Channel length thru subarea  =  1132.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.706(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.706(CFS)
Depth of flow =   0.183(Ft.), Average velocity =   1.634(Ft/s)
Channel flow top width =    2.730(Ft.)
Flow Velocity =    1.63(Ft/s)
Travel time  =   11.54 min.
Time of concentration =   22.04 min.
Critical depth =      0.148(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.677(In/Hr) for a    25.0 year storm
Subarea runoff =      0.842(CFS) for      5.020(Ac.)
Total runoff =      0.935(CFS)      Total area =       5.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Time of concentration =    22.04 min.
Rainfall intensity =      1.677(In/Hr) for a    25.0 year storm
Subarea runoff =      0.528(CFS) for      3.150(Ac.)
Total runoff =      1.463(CFS)      Total area =       8.550(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1523.300(Ft.)
Downstream point elevation =  1420.400(Ft.)
Channel length thru subarea  =   304.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      2.646(CFS)
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Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.646(CFS)
Depth of flow =   0.181(Ft.), Average velocity =   6.170(Ft/s)
Channel flow top width =    2.726(Ft.)
Flow Velocity =    6.17(Ft/s)
Travel time  =    0.82 min.
Time of concentration =   22.86 min.
Critical depth =      0.336(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.642(In/Hr) for a    25.0 year storm
Subarea runoff =      2.271(CFS) for     13.830(Ac.)
Total runoff =      3.734(CFS)      Total area =      22.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1420.400(Ft.)
Downstream point elevation =  1258.000(Ft.)
Channel length thru subarea  =   508.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      5.495(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.495(CFS)
Depth of flow =   0.280(Ft.), Average velocity =   7.665(Ft/s)
Channel flow top width =    3.120(Ft.)
Flow Velocity =    7.66(Ft/s)
Travel time  =    1.10 min.
Time of concentration =   23.97 min.
Critical depth =      0.516(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.595(In/Hr) for a    25.0 year storm
Subarea runoff =      3.370(CFS) for     21.120(Ac.)
Total runoff =      7.103(CFS)      Total area =      43.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1258.000(Ft.)
Downstream point elevation =  1226.000(Ft.)
Channel length thru subarea  =   341.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      7.297(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      7.297(CFS)
```

```
Depth of flow =   0.459(Ft.), Average velocity =   5.442(Ft/s)
Channel flow top width =    3.837(Ft.)
Flow Velocity =    5.44(Ft/s)
Travel time  =    1.04 min.
Time of concentration =   25.01 min.
Critical depth =      0.602(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.551(In/Hr) for a    25.0 year storm
Subarea runoff =      0.368(CFS) for      2.370(Ac.)
Total runoff =      7.471(CFS)      Total area =      45.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     45.870(Ac.)
Runoff from this stream =      7.471(CFS)
Time of concentration =   25.01 min.
Rainfall intensity =     1.551(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =    70.000(Ft.)
Top (of initial area) elevation =  1302.000(Ft.)
Bottom (of initial area) elevation =  1251.000(Ft.)
Difference in elevation =    51.000(Ft.)
Slope =    0.72857  s(%)=      72.86
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.200 min.
Rainfall intensity =      2.473(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.057(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1251.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   574.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.276(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
```

```
Flow(q) thru subarea =      0.276(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   1.073(Ft/s)
Channel flow top width =    2.662(Ft.)
Flow Velocity =    1.07(Ft/s)
Travel time  =    8.92 min.
Time of concentration =   19.12 min.
Critical depth =      0.080(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.800(In/Hr) for a    25.0 year storm
Subarea runoff =      0.319(CFS) for      1.770(Ac.)
Total runoff =      0.376(CFS)      Total area =       2.000(Ac.)


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Process from Point/Station      212.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1240.000(Ft.)
Downstream point elevation =  1226.000(Ft.)
Channel length thru subarea  =   645.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.467(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.467(CFS)
Depth of flow =   0.144(Ft.), Average velocity =   1.333(Ft/s)
Channel flow top width =    2.863(Ft.)
Flow Velocity =    1.33(Ft/s)
Travel time  =    8.06 min.
Time of concentration =   27.18 min.
Critical depth =      0.112(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.460(In/Hr) for a    25.0 year storm
Subarea runoff =      0.142(CFS) for      0.970(Ac.)
Total runoff =      0.517(CFS)      Total area =       2.970(Ac.)


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Process from Point/Station      212.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.970(Ac.)
Runoff from this stream =      0.517(CFS)
Time of concentration =   27.18 min.
Rainfall intensity =     1.460(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.471       0.517
Area of streams before confluence:
       45.870        2.970
Results of confluence:
```

```
Total flow rate =      7.988(CFS)
Time of concentration =    25.014 min.
Effective stream area after confluence =     48.840(Ac.)


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Process from Point/Station      205.000 to Point/Station      213.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1226.000(Ft.)
Downstream point elevation =  1223.000(Ft.)
Channel length thru subarea  =   332.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      8.300(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      8.300(CFS)
Depth of flow =   0.727(Ft.), Average velocity =   2.027(Ft/s)
Channel flow top width =    9.267(Ft.)
Flow Velocity =    2.03(Ft/s)
Travel time  =    2.73 min.
Time of concentration =   27.74 min.
Critical depth =      0.535(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.436(In/Hr) for a    25.0 year storm
Subarea runoff =      0.547(CFS) for      3.810(Ac.)
Total runoff =      8.535(CFS)      Total area =      52.650(Ac.)


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Process from Point/Station      205.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     52.650(Ac.)
Runoff from this stream =      8.535(CFS)
Time of concentration =   27.74 min.
Rainfall intensity =     1.436(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   661.000(Ft.)
Top (of initial area) elevation =  1245.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =    65.000(Ft.)
Slope =    0.09834  s(%)=       9.83
```

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Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.203(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.335(CFS)
Total initial stream area =        1.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1120.000(Ft.)
Channel length thru subarea  =   535.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.542(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.542(CFS)
Depth of flow =   0.098(Ft.), Average velocity =   2.417(Ft/s)
Channel flow top width =    2.587(Ft.)
Flow Velocity =    2.42(Ft/s)
Travel time  =    3.69 min.
Time of concentration =   16.49 min.
Critical depth =      0.123(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.911(In/Hr) for a    25.0 year storm
Subarea runoff =      0.359(CFS) for      1.880(Ac.)
Total runoff =      0.694(CFS)      Total area =       3.400(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1120.000(Ft.)
Downstream point elevation =  1100.000(Ft.)
Channel length thru subarea  =   946.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      3.042(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.042(CFS)
Depth of flow =   0.404(Ft.), Average velocity =   2.340(Ft/s)
Channel flow top width =    4.427(Ft.)
Flow Velocity =    2.34(Ft/s)
Travel time  =    6.74 min.
Time of concentration =   23.23 min.
Critical depth =      0.348(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
```

```
Rainfall intensity =      1.627(In/Hr) for a    25.0 year storm
Subarea runoff =      3.742(CFS) for     23.000(Ac.)
Total runoff =      4.436(CFS)      Total area =      26.400(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     26.400(Ac.)
Runoff from this stream =      4.436(CFS)
Time of concentration =   23.23 min.
Rainfall intensity =     1.627(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   748.000(Ft.)
Top (of initial area) elevation =  1622.600(Ft.)
Bottom (of initial area) elevation =  1610.100(Ft.)
Difference in elevation =    12.500(Ft.)
Slope =    0.01671  s(%)=       1.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   16.200 min.
Rainfall intensity =      1.923(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.419(CFS)
Total initial stream area =        2.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1610.100(Ft.)
Downstream point elevation =  1598.300(Ft.)
Channel length thru subarea  =   710.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.644(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.644(CFS)
Depth of flow =   0.192(Ft.), Average velocity =   1.411(Ft/s)
Channel flow top width =    2.767(Ft.)
Flow Velocity =    1.41(Ft/s)
Travel time  =    8.39 min.
Time of concentration =   24.59 min.
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Critical depth =      0.141(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.569(In/Hr) for a    25.0 year storm
Subarea runoff =      0.367(CFS) for      2.340(Ac.)
Total runoff =      0.787(CFS)      Total area =       4.520(Ac.)


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Process from Point/Station      402.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1598.300(Ft.)
Downstream point elevation =  1547.800(Ft.)
Channel length thru subarea  =   112.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.787(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   4.434(Ft/s)
Channel flow top width =    2.328(Ft.)
Flow Velocity =    4.43(Ft/s)
Travel time  =    0.42 min.
Time of concentration =   25.01 min.
Critical depth =      0.160(Ft.)


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Process from Point/Station      402.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      4.520(Ac.)
Runoff from this stream =      0.787(CFS)
Time of concentration =   25.01 min.
Rainfall intensity =     1.552(In/Hr)


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Process from Point/Station      410.000 to Point/Station      411.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  1589.500(Ft.)
Bottom (of initial area) elevation =  1580.000(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.02000  s(%)=       2.00
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.000 min.
Rainfall intensity =      2.078(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.216(CFS)
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Total initial stream area =        1.040(Ac.)


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Process from Point/Station      411.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1580.000(Ft.)
Downstream point elevation =  1547.800(Ft.)
Channel length thru subarea  =  1651.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.835(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.835(CFS)
Depth of flow =   0.212(Ft.), Average velocity =   1.621(Ft/s)
Channel flow top width =    2.850(Ft.)
Flow Velocity =    1.62(Ft/s)
Travel time  =   16.97 min.
Time of concentration =   30.97 min.
Critical depth =      0.166(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.328(In/Hr) for a    25.0 year storm
Subarea runoff =      0.792(CFS) for      5.960(Ac.)
Total runoff =      1.008(CFS)      Total area =       7.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =      1.008(CFS)
Time of concentration =   30.97 min.
Rainfall intensity =     1.328(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.787       1.008
Area of streams before confluence:
        4.520        7.000
Results of confluence:
Total flow rate =      1.794(CFS)
Time of concentration =    25.009 min.
Effective stream area after confluence =     11.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1547.800(Ft.)
Downstream point elevation =  1494.100(Ft.)
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Channel length thru subarea  =   318.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.794(CFS)
Depth of flow =   0.177(Ft.), Average velocity =   4.299(Ft/s)
Channel flow top width =    2.709(Ft.)
Flow Velocity =    4.30(Ft/s)
Travel time  =    1.23 min.
Time of concentration =   26.24 min.
Critical depth =      0.266(Ft.)


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Process from Point/Station      403.000 to Point/Station      412.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     11.520(Ac.)
Runoff from this stream =      1.794(CFS)
Time of concentration =   26.24 min.
Rainfall intensity =     1.500(In/Hr)


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Process from Point/Station      420.000 to Point/Station      421.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   109.000(Ft.)
Top (of initial area) elevation =  1600.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.45872  s(%)=      45.87
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.400 min.
Rainfall intensity =      2.452(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.105(CFS)
Total initial stream area =        0.430(Ac.)


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Process from Point/Station      421.000 to Point/Station      422.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1530.000(Ft.)
Channel length thru subarea  =   886.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.462(CFS)
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Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.462(CFS)
Depth of flow =   0.145(Ft.), Average velocity =   1.396(Ft/s)
Channel flow top width =    2.579(Ft.)
Flow Velocity =    1.40(Ft/s)
Travel time  =   10.58 min.
Time of concentration =   20.98 min.
Critical depth =      0.113(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.722(In/Hr) for a    25.0 year storm
Subarea runoff =      0.501(CFS) for      2.910(Ac.)
Total runoff =      0.606(CFS)      Total area =       3.340(Ac.)


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Process from Point/Station      422.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1530.000(Ft.)
Downstream point elevation =  1494.100(Ft.)
Channel length thru subarea  =  1651.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.160(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.160(CFS)
Depth of flow =   0.248(Ft.), Average velocity =   1.870(Ft/s)
Channel flow top width =    2.994(Ft.)
Flow Velocity =    1.87(Ft/s)
Travel time  =   14.72 min.
Time of concentration =   35.69 min.
Critical depth =      0.203(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.265(In/Hr) for a    25.0 year storm
Subarea runoff =      0.772(CFS) for      6.100(Ac.)
Total runoff =      1.378(CFS)      Total area =       9.440(Ac.)


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Process from Point/Station      422.000 to Point/Station      412.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      9.440(Ac.)
Runoff from this stream =      1.378(CFS)
Time of concentration =   35.69 min.
Rainfall intensity =     1.265(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.794       1.378
Area of streams before confluence:
```

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       11.520        9.440
Results of confluence:
Total flow rate =      3.172(CFS)
Time of concentration =    26.242 min.
Effective stream area after confluence =     20.960(Ac.)


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Process from Point/Station      412.000 to Point/Station      423.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1494.100(Ft.)
Downstream point elevation =  1360.000(Ft.)
Channel length thru subarea  =   836.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      4.902(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.902(CFS)
Depth of flow =   0.319(Ft.), Average velocity =   5.832(Ft/s)
Channel flow top width =    3.275(Ft.)
Flow Velocity =    5.83(Ft/s)
Travel time  =    2.39 min.
Time of concentration =   28.63 min.
Critical depth =      0.484(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.399(In/Hr) for a    25.0 year storm
Subarea runoff =      3.198(CFS) for     22.860(Ac.)
Total runoff =      6.370(CFS)      Total area =      43.820(Ac.)


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Process from Point/Station      423.000 to Point/Station      424.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1360.000(Ft.)
Downstream point elevation =  1159.000(Ft.)
Channel length thru subarea  =   919.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      8.109(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      8.109(CFS)
Depth of flow =   0.223(Ft.), Average velocity =  14.874(Ft/s)
Channel flow top width =    2.892(Ft.)
Flow Velocity =   14.87(Ft/s)
Travel time  =    1.03 min.
Time of concentration =   29.66 min.
Critical depth =      0.641(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.355(In/Hr) for a    25.0 year storm
```

```
Subarea runoff =      3.242(CFS) for     23.920(Ac.)
Total runoff =      9.612(CFS)      Total area =      67.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      424.000 to Point/Station      425.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1159.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Channel length thru subarea  =   474.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      9.974(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.974(CFS)
Depth of flow =   0.820(Ft.), Average velocity =   3.339(Ft/s)
Channel flow top width =    5.281(Ft.)
Flow Velocity =    3.34(Ft/s)
Travel time  =    2.37 min.
Time of concentration =   32.03 min.
Critical depth =      0.719(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.314(In/Hr) for a    25.0 year storm
Subarea runoff =      0.670(CFS) for      5.100(Ac.)
Total runoff =     10.282(CFS)      Total area =      72.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      424.000 to Point/Station      425.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     72.840(Ac.)
Runoff from this stream =     10.282(CFS)
Time of concentration =   32.03 min.
Rainfall intensity =     1.314(In/Hr)
Program is now starting with Main Stream No. 5


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   570.000(Ft.)
Top (of initial area) elevation =  1670.000(Ft.)
Bottom (of initial area) elevation =  1656.400(Ft.)
Difference in elevation =    13.600(Ft.)
Slope =    0.02386  s(%)=       2.39
Manual entry of initial area time of concentration, TC
```

```
Initial area time of concentration =   14.400 min.
Rainfall intensity =      2.036(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.157(CFS)
Total initial stream area =        0.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1656.400(Ft.)
Downstream point elevation =  1650.000(Ft.)
Channel length thru subarea  =   663.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.410(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.410(CFS)
Depth of flow =   0.168(Ft.), Average velocity =   0.973(Ft/s)
Channel flow top width =    3.010(Ft.)
Flow Velocity =    0.97(Ft/s)
Travel time  =   11.36 min.
Time of concentration =   25.76 min.
Critical depth =      0.104(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.520(In/Hr) for a    25.0 year storm
Subarea runoff =      0.378(CFS) for      2.490(Ac.)
Total runoff =      0.535(CFS)      Total area =       3.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1485.000(Ft.)
Channel length thru subarea  =  1445.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.931(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.931(CFS)
Depth of flow =   0.133(Ft.), Average velocity =   2.921(Ft/s)
Channel flow top width =    2.797(Ft.)
Flow Velocity =    2.92(Ft/s)
Travel time  =    8.25 min.
Time of concentration =   34.00 min.
Critical depth =      0.172(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.288(In/Hr) for a    25.0 year storm
```

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Subarea runoff =      0.621(CFS) for      4.820(Ac.)
Total runoff =      1.156(CFS)      Total area =       8.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1485.000(Ft.)
Downstream point elevation =  1360.000(Ft.)
Channel length thru subarea  =  1414.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.687(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.687(CFS)
Depth of flow =   0.200(Ft.), Average velocity =   3.245(Ft/s)
Channel flow top width =    3.200(Ft.)
Flow Velocity =    3.25(Ft/s)
Travel time  =    7.26 min.
Time of concentration =   41.27 min.
Critical depth =      0.246(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.191(In/Hr) for a    25.0 year storm
Subarea runoff =      0.885(CFS) for      7.430(Ac.)
Total runoff =      2.041(CFS)      Total area =      15.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =     15.510(Ac.)
Runoff from this stream =      2.041(CFS)
Time of concentration =   41.27 min.
Rainfall intensity =     1.191(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
       4.549       8.535       4.436      10.282       2.041
Area of streams before confluence:
       22.730       52.650       26.400       72.840       15.510


Results of confluence:
Total flow rate =     29.844(CFS)
Time of concentration =    20.803 min.
Effective stream area after confluence  =    190.130(Ac.)


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Process from Point/Station      100.000 to Point/Station      500.000
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**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    190.130(Ac.)
Runoff from this stream =     29.844(CFS)
Time of concentration =   20.80 min.
Rainfall intensity =     1.729(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   942.000(Ft.)
Top (of initial area) elevation =  1363.000(Ft.)
Bottom (of initial area) elevation =  1300.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.06688  s(%)=       6.69
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.300 min.
Rainfall intensity =      2.047(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.501(CFS)
Total initial stream area =        2.450(Ac.)


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Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
--------------------------------------------------------------------------------
Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1242.000(Ft.)
Channel length thru subarea  =   943.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.825(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.825(CFS)
Depth of flow =   0.148(Ft.), Average velocity =   2.281(Ft/s)
Channel flow top width =    2.888(Ft.)
Flow Velocity =    2.28(Ft/s)
Travel time  =    6.89 min.
Time of concentration =   21.19 min.
Critical depth =      0.160(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.713(In/Hr) for a    25.0 year storm
Subarea runoff =      0.541(CFS) for      3.160(Ac.)
Total runoff =      1.043(CFS)      Total area =       5.610(Ac.)
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Process from Point/Station      601.000 to Point/Station      602.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.610(Ac.)
Runoff from this stream =      1.043(CFS)
Time of concentration =   21.19 min.
Rainfall intensity =     1.713(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   691.000(Ft.)
Top (of initial area) elevation =  1409.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =    59.000(Ft.)
Slope =    0.08538  s(%)=       8.54
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.100 min.
Rainfall intensity =      2.172(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.341(CFS)
Total initial stream area =        1.570(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      701.000 to Point/Station      702.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1209.000(Ft.)
Channel length thru subarea  =   737.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.043(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.043(CFS)
Depth of flow =   0.125(Ft.), Average velocity =   3.722(Ft/s)
Channel flow top width =    2.499(Ft.)
Flow Velocity =    3.72(Ft/s)
Travel time  =    3.30 min.
Time of concentration =   16.40 min.
Critical depth =      0.191(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.915(In/Hr) for a    25.0 year storm
```

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Subarea runoff =      1.239(CFS) for      6.470(Ac.)
Total runoff =      1.580(CFS)      Total area =       8.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    16.40 min.
Rainfall intensity =      1.915(In/Hr) for a    25.0 year storm
Subarea runoff =      0.393(CFS) for      2.050(Ac.)
Total runoff =      1.972(CFS)      Total area =      10.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      701.000 to Point/Station      702.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     10.090(Ac.)
Runoff from this stream =      1.972(CFS)
Time of concentration =   16.40 min.
Rainfall intensity =     1.915(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      800.000 to Point/Station      801.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   136.000(Ft.)
Top (of initial area) elevation =  1399.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =    29.000(Ft.)
Slope =    0.21324  s(%)=      21.32
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.600 min.
Rainfall intensity =      2.432(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.114(CFS)
Total initial stream area =        0.470(Ac.)


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Process from Point/Station      801.000 to Point/Station      802.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1370.000(Ft.)
Downstream point/station elevation =  1330.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.114(CFS)
Nearest computed pipe diameter  =      3.00(In.)
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Calculated individual pipe flow  =     0.114(CFS)
Normal flow depth in pipe =    1.06(In.)
Flow top width inside pipe =    2.87(In.)
Critical Depth =    2.44(In.)
Pipe flow velocity =      7.35(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    10.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      801.000 to Point/Station      802.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      0.470(Ac.)
Runoff from this stream =      0.114(CFS)
Time of concentration =   10.99 min.
Rainfall intensity =     2.391(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      810.000 to Point/Station      811.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   711.000(Ft.)
Top (of initial area) elevation =  1466.000(Ft.)
Bottom (of initial area) elevation =  1310.000(Ft.)
Difference in elevation =   156.000(Ft.)
Slope =    0.21941  s(%)=      21.94
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.200 min.
Rainfall intensity =      2.265(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.801(CFS)
Total initial stream area =        7.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      811.000 to Point/Station      812.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1310.000(Ft.)
Downstream point/station elevation =  1220.000(Ft.)
Pipe length  =   230.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.801(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.801(CFS)
Normal flow depth in pipe =    3.05(In.)
Flow top width inside pipe =    6.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.99(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    12.41 min.
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Process from Point/Station      811.000 to Point/Station      812.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      7.950(Ac.)
Runoff from this stream =      1.801(CFS)
Time of concentration =   12.41 min.
Rainfall intensity =     2.243(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      820.000 to Point/Station      821.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   572.000(Ft.)
Top (of initial area) elevation =  1609.000(Ft.)
Bottom (of initial area) elevation =  1320.000(Ft.)
Difference in elevation =   289.000(Ft.)
Slope =    0.50524  s(%)=      50.52
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.300 min.
Rainfall intensity =      2.359(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.059(CFS)
Total initial stream area =        4.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      821.000 to Point/Station      822.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1320.000(Ft.)
Downstream point/station elevation =  1260.000(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.059(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.059(CFS)
Normal flow depth in pipe =    2.33(In.)
Flow top width inside pipe =    5.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.08(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    11.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      821.000 to Point/Station      822.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 3
Stream flow area =      4.490(Ac.)
Runoff from this stream =      1.059(CFS)
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Time of concentration =   11.49 min.
Rainfall intensity =     2.339(In/Hr)


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Process from Point/Station      830.000 to Point/Station      831.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   752.000(Ft.)
Top (of initial area) elevation =  1640.000(Ft.)
Bottom (of initial area) elevation =  1278.000(Ft.)
Difference in elevation =   362.000(Ft.)
Slope =    0.48138  s(%)=      48.14
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.317(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.668(CFS)
Total initial stream area =        7.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      831.000 to Point/Station      832.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1278.000(Ft.)
Downstream point/station elevation =  1230.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.668(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.668(CFS)
Normal flow depth in pipe =    3.38(In.)
Flow top width inside pipe =    5.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.67(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    11.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      831.000 to Point/Station      832.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 4
Stream flow area =      7.200(Ac.)
Runoff from this stream =      1.668(CFS)
Time of concentration =   11.93 min.
Rainfall intensity =     2.294(In/Hr)


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Process from Point/Station      840.000 to Point/Station      841.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
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UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   649.000(Ft.)
Top (of initial area) elevation =  1650.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   310.000(Ft.)
Slope =    0.47766  s(%)=      47.77
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.500 min.
Rainfall intensity =      2.338(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.667(CFS)
Total initial stream area =        7.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      841.000 to Point/Station      842.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1340.000(Ft.)
Downstream point/station elevation =  1210.000(Ft.)
Pipe length  =   390.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.667(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.667(CFS)
Normal flow depth in pipe =    3.05(In.)
Flow top width inside pipe =    6.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.62(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    11.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      841.000 to Point/Station      842.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 5
Stream flow area =      7.130(Ac.)
Runoff from this stream =      1.667(CFS)
Time of concentration =   11.89 min.
Rainfall intensity =     2.297(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       0.114       1.801       1.059       1.668       1.667
Area of streams before confluence:
        0.470        7.950        4.490        7.200        7.130
Results of confluence:
Total flow rate =      6.310(CFS)
Time of concentration =    10.990 min.
Effective stream area after confluence =     27.240(Ac.)


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Process from Point/Station      800.000 to Point/Station      840.000
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**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     27.240(Ac.)
Runoff from this stream =      6.310(CFS)
Time of concentration =   10.99 min.
Rainfall intensity =     2.391(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      850.000 to Point/Station      851.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   257.000(Ft.)
Top (of initial area) elevation =  1358.000(Ft.)
Bottom (of initial area) elevation =  1240.000(Ft.)
Difference in elevation =   118.000(Ft.)
Slope =    0.45914  s(%)=      45.91
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      2.411(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.547(CFS)
Total initial stream area =        2.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      851.000 to Point/Station      852.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =  1240.000(Ft.)
Downstream point/station elevation =  1200.000(Ft.)
Pipe length  =  1250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.547(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.547(CFS)
Normal flow depth in pipe =    3.16(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    4.52(In.)
Pipe flow velocity =      5.22(Ft/s)
Travel time through pipe =    3.99 min.
Time of concentration (TC) =    14.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      851.000 to Point/Station      852.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      2.270(Ac.)
Runoff from this stream =      0.547(CFS)
Time of concentration =   14.79 min.
Rainfall intensity =     1.996(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      860.000 to Point/Station      861.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   289.000(Ft.)
Top (of initial area) elevation =  1532.000(Ft.)
Bottom (of initial area) elevation =  1415.000(Ft.)
Difference in elevation =   117.000(Ft.)
Slope =    0.40484  s(%)=      40.48
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.900 min.
Rainfall intensity =      2.400(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.314(CFS)
Total initial stream area =        1.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      861.000 to Point/Station      862.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1415.000(Ft.)
Downstream point/station elevation =  1390.000(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.314(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.314(CFS)
Normal flow depth in pipe =    1.90(In.)
Flow top width inside pipe =    2.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.59(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    11.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      862.000 to Point/Station      863.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1282.000(Ft.)
Channel length thru subarea  =   340.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      0.759(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.759(CFS)
Depth of flow =   0.079(Ft.), Average velocity =   2.847(Ft/s)
Channel flow top width =    3.785(Ft.)
Flow Velocity =    2.85(Ft/s)
Travel time  =    1.99 min.
```

```
Time of concentration =   13.07 min.
Critical depth =      0.117(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.174(In/Hr) for a    25.0 year storm
Subarea runoff =      0.805(CFS) for      3.700(Ac.)
Total runoff =      1.119(CFS)      Total area =       5.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      863.000 to Point/Station      864.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1282.000(Ft.)
Downstream point/station elevation =  1200.000(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.119(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.119(CFS)
Normal flow depth in pipe =    2.31(In.)
Flow top width inside pipe =    5.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.01(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    13.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      863.000 to Point/Station      864.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 3
Stream flow area =      5.010(Ac.)
Runoff from this stream =      1.119(CFS)
Time of concentration =   13.29 min.
Rainfall intensity =     2.152(In/Hr)

Total of 3 streams to confluence:
Flow rates before confluence point:
       6.310       0.547       1.119
Area of streams before confluence:
       27.240        2.270        5.010
Results of confluence:
Total flow rate =      7.976(CFS)
Time of concentration =    10.990 min.
Effective stream area after confluence =     34.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      800.000 to Point/Station      864.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     34.520(Ac.)
Runoff from this stream =      7.976(CFS)
Time of concentration =   10.99 min.
```

```
Rainfall intensity =     2.391(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      29.844       1.043       1.972       7.976
Area of streams before confluence:
      190.130        5.610       10.090       34.520


Results of confluence:
Total flow rate =     40.835(CFS)
Time of concentration =    20.803 min.
Effective stream area after confluence  =    240.350(Ac.)
End of computations, total study area =         240.350 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/14/10

South Quarry
Proposed Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.357(In.)
2	10.000		3.032(In.)
3	15.000		2.409(In.)
4	30.000		1.620(In.)
5	60.000		1.126(In.)
6	120.000		0.837(In.)
7	180.000		0.723(In.)
8	360.000		0.567(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   306.000(Ft.)
Top (of initial area) elevation =  2000.000(Ft.)
Bottom (of initial area) elevation =  1898.000(Ft.)
Difference in elevation =   102.000(Ft.)
Slope =    0.33333  s(%)=      33.33
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.000 min.
Rainfall intensity =      2.907(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.288(CFS)
Total initial stream area =        0.990(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1898.000(Ft.)
Downstream point elevation =  1802.400(Ft.)
Channel length thru subarea  =   341.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.752(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.752(CFS)
Depth of flow =   0.092(Ft.), Average velocity =   3.748(Ft/s)
Channel flow top width =    2.367(Ft.)
Flow Velocity =    3.75(Ft/s)
Travel time  =    1.52 min.
Time of concentration =   12.52 min.
Critical depth =      0.154(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.718(In/Hr) for a   100.0 year storm
Subarea runoff =      0.867(CFS) for      3.190(Ac.)
Total runoff =      1.155(CFS)      Total area =       4.180(Ac.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1802.400(Ft.)
Downstream point elevation =  1751.600(Ft.)
Channel length thru subarea  =   203.000(Ft.)
Channel base width      =    2.000(Ft.)
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Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.155(CFS)
Depth of flow =   0.122(Ft.), Average velocity =   4.208(Ft/s)
Channel flow top width =    2.489(Ft.)
Flow Velocity =    4.21(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   13.32 min.
Critical depth =      0.203(Ft.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.180(Ac.)
Runoff from this stream =      1.155(CFS)
Time of concentration =   13.32 min.
Rainfall intensity =     2.618(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   100.000(Ft.)
Top (of initial area) elevation =  1813.000(Ft.)
Bottom (of initial area) elevation =  1768.800(Ft.)
Difference in elevation =    44.200(Ft.)
Slope =    0.44200  s(%)=      44.20
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.400 min.
Rainfall intensity =      2.982(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.101(CFS)
Total initial stream area =        0.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1768.800(Ft.)
Downstream point elevation =  1751.600(Ft.)
Channel length thru subarea  =   773.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.465(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
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Flow(q) thru subarea =      0.465(CFS)
Depth of flow =   0.146(Ft.), Average velocity =   1.393(Ft/s)
Channel flow top width =    2.583(Ft.)
Flow Velocity =    1.39(Ft/s)
Travel time  =    9.25 min.
Time of concentration =   19.65 min.
Critical depth =      0.114(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.164(In/Hr) for a   100.0 year storm
Subarea runoff =      0.528(CFS) for      2.440(Ac.)
Total runoff =      0.629(CFS)      Total area =       2.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.780(Ac.)
Runoff from this stream =      0.629(CFS)
Time of concentration =   19.65 min.
Rainfall intensity =     2.164(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.155       0.629
Area of streams before confluence:
        4.180        2.780
Results of confluence:
Total flow rate =      1.785(CFS)
Time of concentration =    13.320 min.
Effective stream area after confluence =      6.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      112.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1751.600(Ft.)
Downstream point elevation =  1606.000(Ft.)
Channel length thru subarea  =   420.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.424(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.424(CFS)
Depth of flow =   0.209(Ft.), Average velocity =   6.772(Ft/s)
Channel flow top width =    2.836(Ft.)
Flow Velocity =    6.77(Ft/s)
Travel time  =    1.03 min.
Time of concentration =   14.35 min.
Critical depth =      0.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
```

```
Rainfall intensity =      2.489(In/Hr) for a   100.0 year storm
Subarea runoff =      3.184(CFS) for     12.790(Ac.)
Total runoff =      4.969(CFS)      Total area =      19.750(Ac.)


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Process from Point/Station      112.000 to Point/Station      113.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1606.000(Ft.)
Downstream point elevation =  1590.000(Ft.)
Channel length thru subarea  =   903.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.343(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.343(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   2.567(Ft/s)
Channel flow top width =    5.383(Ft.)
Flow Velocity =    2.57(Ft/s)
Travel time  =    5.86 min.
Time of concentration =   20.22 min.
Critical depth =      0.477(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.135(In/Hr) for a   100.0 year storm
Subarea runoff =      0.636(CFS) for      2.980(Ac.)
Total runoff =      5.605(CFS)      Total area =      22.730(Ac.)


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Process from Point/Station      112.000 to Point/Station      113.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.730(Ac.)
Runoff from this stream =      5.605(CFS)
Time of concentration =   20.22 min.
Rainfall intensity =     2.135(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   123.000(Ft.)
Top (of initial area) elevation =  1599.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    49.000(Ft.)
Slope =    0.39837  s(%)=      39.84
```

```
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.970(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.113(CFS)
Total initial stream area =        0.380(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1523.300(Ft.)
Channel length thru subarea  =  1132.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.858(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.858(CFS)
Depth of flow =   0.204(Ft.), Average velocity =   1.744(Ft/s)
Channel flow top width =    2.817(Ft.)
Flow Velocity =    1.74(Ft/s)
Travel time  =   10.82 min.
Time of concentration =   21.32 min.
Critical depth =      0.168(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.077(In/Hr) for a   100.0 year storm
Subarea runoff =      1.042(CFS) for      5.020(Ac.)
Total runoff =      1.155(CFS)      Total area =       5.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      202.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Time of concentration =    21.32 min.
Rainfall intensity =      2.077(In/Hr) for a   100.0 year storm
Subarea runoff =      0.654(CFS) for      3.150(Ac.)
Total runoff =      1.809(CFS)      Total area =       8.550(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1523.300(Ft.)
Downstream point elevation =  1420.400(Ft.)
Channel length thru subarea  =   304.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.273(CFS)
```

```
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.273(CFS)
Depth of flow =   0.205(Ft.), Average velocity =   6.619(Ft/s)
Channel flow top width =    2.821(Ft.)
Flow Velocity =    6.62(Ft/s)
Travel time  =    0.77 min.
Time of concentration =   22.09 min.
Critical depth =      0.383(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.036(In/Hr) for a   100.0 year storm
Subarea runoff =      2.816(CFS) for     13.830(Ac.)
Total runoff =      4.625(CFS)      Total area =      22.380(Ac.)


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Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1420.400(Ft.)
Downstream point elevation =  1258.000(Ft.)
Channel length thru subarea  =   508.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      6.808(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      6.808(CFS)
Depth of flow =   0.316(Ft.), Average velocity =   8.192(Ft/s)
Channel flow top width =    3.263(Ft.)
Flow Velocity =    8.19(Ft/s)
Travel time  =    1.03 min.
Time of concentration =   23.12 min.
Critical depth =      0.582(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.982(In/Hr) for a   100.0 year storm
Subarea runoff =      4.186(CFS) for     21.120(Ac.)
Total runoff =      8.811(CFS)      Total area =      43.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1258.000(Ft.)
Downstream point elevation =  1226.000(Ft.)
Channel length thru subarea  =   341.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      9.051(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.051(CFS)
```

```
Depth of flow =   0.516(Ft.), Average velocity =   5.791(Ft/s)
Channel flow top width =    4.063(Ft.)
Flow Velocity =    5.79(Ft/s)
Travel time  =    0.98 min.
Time of concentration =   24.10 min.
Critical depth =      0.680(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.930(In/Hr) for a   100.0 year storm
Subarea runoff =      0.457(CFS) for      2.370(Ac.)
Total runoff =      9.269(CFS)      Total area =      45.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     45.870(Ac.)
Runoff from this stream =      9.269(CFS)
Time of concentration =   24.10 min.
Rainfall intensity =     1.930(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =    70.000(Ft.)
Top (of initial area) elevation =  1302.000(Ft.)
Bottom (of initial area) elevation =  1251.000(Ft.)
Difference in elevation =    51.000(Ft.)
Slope =    0.72857  s(%)=      72.86
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.200 min.
Rainfall intensity =      3.007(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.069(CFS)
Total initial stream area =        0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1251.000(Ft.)
Downstream point elevation =  1240.000(Ft.)
Channel length thru subarea  =   574.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.335(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
```

```
Flow(q) thru subarea =      0.335(CFS)
Depth of flow =   0.123(Ft.), Average velocity =   1.146(Ft/s)
Channel flow top width =    2.741(Ft.)
Flow Velocity =    1.15(Ft/s)
Travel time  =    8.35 min.
Time of concentration =   18.55 min.
Critical depth =      0.091(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.222(In/Hr) for a   100.0 year storm
Subarea runoff =      0.393(CFS) for      1.770(Ac.)
Total runoff =      0.463(CFS)      Total area =       2.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1240.000(Ft.)
Downstream point elevation =  1226.000(Ft.)
Channel length thru subarea  =   645.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.575(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.575(CFS)
Depth of flow =   0.162(Ft.), Average velocity =   1.427(Ft/s)
Channel flow top width =    2.972(Ft.)
Flow Velocity =    1.43(Ft/s)
Travel time  =    7.53 min.
Time of concentration =   26.08 min.
Critical depth =      0.128(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.826(In/Hr) for a   100.0 year storm
Subarea runoff =      0.177(CFS) for      0.970(Ac.)
Total runoff =      0.640(CFS)      Total area =       2.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.970(Ac.)
Runoff from this stream =      0.640(CFS)
Time of concentration =   26.08 min.
Rainfall intensity =     1.826(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.269       0.640
Area of streams before confluence:
       45.870        2.970
Results of confluence:
```

```
Total flow rate =      9.908(CFS)
Time of concentration =    24.101 min.
Effective stream area after confluence =     48.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      213.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1226.000(Ft.)
Downstream point elevation =  1223.000(Ft.)
Channel length thru subarea  =   332.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =     10.295(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     10.295(CFS)
Depth of flow =   0.800(Ft.), Average velocity =   2.143(Ft/s)
Channel flow top width =   10.004(Ft.)
Flow Velocity =    2.14(Ft/s)
Travel time  =    2.58 min.
Time of concentration =   26.68 min.
Critical depth =      0.594(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.794(In/Hr) for a   100.0 year storm
Subarea runoff =      0.684(CFS) for      3.810(Ac.)
Total runoff =     10.592(CFS)      Total area =      52.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      213.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     52.650(Ac.)
Runoff from this stream =     10.592(CFS)
Time of concentration =   26.68 min.
Rainfall intensity =     1.794(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   661.000(Ft.)
Top (of initial area) elevation =  1245.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =    65.000(Ft.)
Slope =    0.09834  s(%)=       9.83
```

```
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.800 min.
Rainfall intensity =      2.683(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.408(CFS)
Total initial stream area =        1.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1120.000(Ft.)
Channel length thru subarea  =   535.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.660(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.660(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   2.586(Ft/s)
Channel flow top width =    2.658(Ft.)
Flow Velocity =    2.59(Ft/s)
Travel time  =    3.45 min.
Time of concentration =   16.25 min.
Critical depth =      0.139(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.343(In/Hr) for a   100.0 year storm
Subarea runoff =      0.441(CFS) for      1.880(Ac.)
Total runoff =      0.848(CFS)      Total area =       3.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1120.000(Ft.)
Downstream point elevation =  1100.000(Ft.)
Channel length thru subarea  =   946.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      3.718(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.718(CFS)
Depth of flow =   0.449(Ft.), Average velocity =   2.476(Ft/s)
Channel flow top width =    4.692(Ft.)
Flow Velocity =    2.48(Ft/s)
Travel time  =    6.37 min.
Time of concentration =   22.62 min.
Critical depth =      0.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
```

```
Rainfall intensity =      2.008(In/Hr) for a   100.0 year storm
Subarea runoff =      4.619(CFS) for     23.000(Ac.)
Total runoff =      5.468(CFS)      Total area =      26.400(Ac.)


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Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     26.400(Ac.)
Runoff from this stream =      5.468(CFS)
Time of concentration =   22.62 min.
Rainfall intensity =     2.008(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   748.000(Ft.)
Top (of initial area) elevation =  1622.600(Ft.)
Bottom (of initial area) elevation =  1610.100(Ft.)
Difference in elevation =    12.500(Ft.)
Slope =    0.01671  s(%)=       1.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   16.200 min.
Rainfall intensity =      2.346(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.511(CFS)
Total initial stream area =        2.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1610.100(Ft.)
Downstream point elevation =  1598.300(Ft.)
Channel length thru subarea  =   710.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.786(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.786(CFS)
Depth of flow =   0.215(Ft.), Average velocity =   1.506(Ft/s)
Channel flow top width =    2.859(Ft.)
Flow Velocity =    1.51(Ft/s)
Travel time  =    7.86 min.
Time of concentration =   24.06 min.
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```
Critical depth =      0.160(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.933(In/Hr) for a   100.0 year storm
Subarea runoff =      0.452(CFS) for      2.340(Ac.)
Total runoff =      0.964(CFS)      Total area =       4.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1598.300(Ft.)
Downstream point elevation =  1547.800(Ft.)
Channel length thru subarea  =   112.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.964(CFS)
Depth of flow =   0.092(Ft.), Average velocity =   4.772(Ft/s)
Channel flow top width =    2.370(Ft.)
Flow Velocity =    4.77(Ft/s)
Travel time  =    0.39 min.
Time of concentration =   24.45 min.
Critical depth =      0.182(Ft.)


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Process from Point/Station      402.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      4.520(Ac.)
Runoff from this stream =      0.964(CFS)
Time of concentration =   24.45 min.
Rainfall intensity =     1.912(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      410.000 to Point/Station      411.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  1589.500(Ft.)
Bottom (of initial area) elevation =  1580.000(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.02000  s(%)=       2.00
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.000 min.
Rainfall intensity =      2.534(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.263(CFS)
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Total initial stream area =        1.040(Ac.)


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Process from Point/Station      411.000 to Point/Station      403.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1580.000(Ft.)
Downstream point elevation =  1547.800(Ft.)
Channel length thru subarea  =  1651.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.019(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.019(CFS)
Depth of flow =   0.238(Ft.), Average velocity =   1.728(Ft/s)
Channel flow top width =    2.952(Ft.)
Flow Velocity =    1.73(Ft/s)
Travel time  =   15.92 min.
Time of concentration =   29.92 min.
Critical depth =      0.188(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.624(In/Hr) for a   100.0 year storm
Subarea runoff =      0.968(CFS) for      5.960(Ac.)
Total runoff =      1.232(CFS)      Total area =       7.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =      1.232(CFS)
Time of concentration =   29.92 min.
Rainfall intensity =     1.624(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.964       1.232
Area of streams before confluence:
        4.520        7.000
Results of confluence:
Total flow rate =      2.195(CFS)
Time of concentration =    24.450 min.
Effective stream area after confluence =     11.520(Ac.)


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Process from Point/Station      403.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1547.800(Ft.)
Downstream point elevation =  1494.100(Ft.)
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Channel length thru subarea  =   318.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.195(CFS)
Depth of flow =   0.199(Ft.), Average velocity =   4.597(Ft/s)
Channel flow top width =    2.797(Ft.)
Flow Velocity =    4.60(Ft/s)
Travel time  =    1.15 min.
Time of concentration =   25.60 min.
Critical depth =      0.301(Ft.)


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Process from Point/Station      403.000 to Point/Station      412.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     11.520(Ac.)
Runoff from this stream =      2.195(CFS)
Time of concentration =   25.60 min.
Rainfall intensity =     1.851(In/Hr)


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Process from Point/Station      420.000 to Point/Station      421.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   109.000(Ft.)
Top (of initial area) elevation =  1600.000(Ft.)
Bottom (of initial area) elevation =  1550.000(Ft.)
Difference in elevation =    50.000(Ft.)
Slope =    0.45872  s(%)=      45.87
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.400 min.
Rainfall intensity =      2.982(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.128(CFS)
Total initial stream area =        0.430(Ac.)


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Process from Point/Station      421.000 to Point/Station      422.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1550.000(Ft.)
Downstream point elevation =  1530.000(Ft.)
Channel length thru subarea  =   886.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.562(CFS)
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```
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.562(CFS)
Depth of flow =   0.162(Ft.), Average velocity =   1.492(Ft/s)
Channel flow top width =    2.648(Ft.)
Flow Velocity =    1.49(Ft/s)
Travel time  =    9.90 min.
Time of concentration =   20.30 min.
Critical depth =      0.129(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.130(In/Hr) for a   100.0 year storm
Subarea runoff =      0.620(CFS) for      2.910(Ac.)
Total runoff =      0.748(CFS)      Total area =       3.340(Ac.)


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Process from Point/Station      422.000 to Point/Station      412.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1530.000(Ft.)
Downstream point elevation =  1494.100(Ft.)
Channel length thru subarea  =  1651.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.431(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.431(CFS)
Depth of flow =   0.280(Ft.), Average velocity =   1.998(Ft/s)
Channel flow top width =    3.119(Ft.)
Flow Velocity =    2.00(Ft/s)
Travel time  =   13.77 min.
Time of concentration =   34.07 min.
Critical depth =      0.230(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.553(In/Hr) for a   100.0 year storm
Subarea runoff =      0.947(CFS) for      6.100(Ac.)
Total runoff =      1.696(CFS)      Total area =       9.440(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      422.000 to Point/Station      412.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      9.440(Ac.)
Runoff from this stream =      1.696(CFS)
Time of concentration =   34.07 min.
Rainfall intensity =     1.553(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.195       1.696
Area of streams before confluence:
```

```
       11.520        9.440
Results of confluence:
Total flow rate =      3.891(CFS)
Time of concentration =    25.603 min.
Effective stream area after confluence =     20.960(Ac.)


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Process from Point/Station      412.000 to Point/Station      423.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1494.100(Ft.)
Downstream point elevation =  1360.000(Ft.)
Channel length thru subarea  =   836.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      6.012(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      6.012(CFS)
Depth of flow =   0.357(Ft.), Average velocity =   6.206(Ft/s)
Channel flow top width =    3.428(Ft.)
Flow Velocity =    6.21(Ft/s)
Travel time  =    2.25 min.
Time of concentration =   27.85 min.
Critical depth =      0.543(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.733(In/Hr) for a   100.0 year storm
Subarea runoff =      3.962(CFS) for     22.860(Ac.)
Total runoff =      7.853(CFS)      Total area =      43.820(Ac.)


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Process from Point/Station      423.000 to Point/Station      424.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1360.000(Ft.)
Downstream point elevation =  1159.000(Ft.)
Channel length thru subarea  =   919.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      9.996(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      9.996(CFS)
Depth of flow =   0.251(Ft.), Average velocity =  15.908(Ft/s)
Channel flow top width =    3.004(Ft.)
Flow Velocity =   15.91(Ft/s)
Travel time  =    0.96 min.
Time of concentration =   28.81 min.
Critical depth =      0.719(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.683(In/Hr) for a   100.0 year storm
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Subarea runoff =      4.025(CFS) for     23.920(Ac.)
Total runoff =     11.877(CFS)      Total area =      67.740(Ac.)


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Process from Point/Station      424.000 to Point/Station      425.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1159.000(Ft.)
Downstream point elevation =  1150.000(Ft.)
Channel length thru subarea  =   474.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =     12.324(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     12.324(CFS)
Depth of flow =   0.912(Ft.), Average velocity =   3.534(Ft/s)
Channel flow top width =    5.648(Ft.)
Flow Velocity =    3.53(Ft/s)
Travel time  =    2.24 min.
Time of concentration =   31.05 min.
Critical depth =      0.805(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.603(In/Hr) for a   100.0 year storm
Subarea runoff =      0.817(CFS) for      5.100(Ac.)
Total runoff =     12.695(CFS)      Total area =      72.840(Ac.)


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Process from Point/Station      424.000 to Point/Station      425.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     72.840(Ac.)
Runoff from this stream =     12.695(CFS)
Time of concentration =   31.05 min.
Rainfall intensity =     1.603(In/Hr)
Program is now starting with Main Stream No. 5


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Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   570.000(Ft.)
Top (of initial area) elevation =  1670.000(Ft.)
Bottom (of initial area) elevation =  1656.400(Ft.)
Difference in elevation =    13.600(Ft.)
Slope =    0.02386  s(%)=       2.39
Manual entry of initial area time of concentration, TC
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```
Initial area time of concentration =   14.400 min.
Rainfall intensity =      2.484(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.191(CFS)
Total initial stream area =        0.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1656.400(Ft.)
Downstream point elevation =  1650.000(Ft.)
Channel length thru subarea  =   663.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      0.500(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.500(CFS)
Depth of flow =   0.188(Ft.), Average velocity =   1.037(Ft/s)
Channel flow top width =    3.130(Ft.)
Flow Velocity =    1.04(Ft/s)
Travel time  =   10.66 min.
Time of concentration =   25.06 min.
Critical depth =      0.117(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.880(In/Hr) for a   100.0 year storm
Subarea runoff =      0.468(CFS) for      2.490(Ac.)
Total runoff =      0.659(CFS)      Total area =       3.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      503.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1485.000(Ft.)
Channel length thru subarea  =  1445.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.147(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.147(CFS)
Depth of flow =   0.150(Ft.), Average velocity =   3.128(Ft/s)
Channel flow top width =    2.898(Ft.)
Flow Velocity =    3.13(Ft/s)
Travel time  =    7.70 min.
Time of concentration =   32.76 min.
Critical depth =      0.195(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.575(In/Hr) for a   100.0 year storm
```

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Subarea runoff =      0.759(CFS) for      4.820(Ac.)
Total runoff =      1.418(CFS)      Total area =       8.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1485.000(Ft.)
Downstream point elevation =  1360.000(Ft.)
Channel length thru subarea  =  1414.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.070(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.070(CFS)
Depth of flow =   0.224(Ft.), Average velocity =   3.458(Ft/s)
Channel flow top width =    3.344(Ft.)
Flow Velocity =    3.46(Ft/s)
Travel time  =    6.81 min.
Time of concentration =   39.57 min.
Critical depth =      0.277(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.462(In/Hr) for a   100.0 year storm
Subarea runoff =      1.087(CFS) for      7.430(Ac.)
Total runoff =      2.505(CFS)      Total area =      15.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =     15.510(Ac.)
Runoff from this stream =      2.505(CFS)
Time of concentration =   39.57 min.
Rainfall intensity =     1.462(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
       5.605      10.592       5.468      12.695       2.505
Area of streams before confluence:
       22.730       52.650       26.400       72.840       15.510


Results of confluence:
Total flow rate =     36.864(CFS)
Time of concentration =    20.217 min.
Effective stream area after confluence  =    190.130(Ac.)


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Process from Point/Station      100.000 to Point/Station      500.000
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**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    190.130(Ac.)
Runoff from this stream =     36.864(CFS)
Time of concentration =   20.22 min.
Rainfall intensity =     2.135(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   942.000(Ft.)
Top (of initial area) elevation =  1363.000(Ft.)
Bottom (of initial area) elevation =  1300.000(Ft.)
Difference in elevation =    63.000(Ft.)
Slope =    0.06688  s(%)=       6.69
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.300 min.
Rainfall intensity =      2.496(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.612(CFS)
Total initial stream area =        2.450(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1242.000(Ft.)
Channel length thru subarea  =   943.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.006(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.006(CFS)
Depth of flow =   0.166(Ft.), Average velocity =   2.433(Ft/s)
Channel flow top width =    2.994(Ft.)
Flow Velocity =    2.43(Ft/s)
Travel time  =    6.46 min.
Time of concentration =   20.76 min.
Critical depth =      0.180(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.106(In/Hr) for a   100.0 year storm
Subarea runoff =      0.665(CFS) for      3.160(Ac.)
Total runoff =      1.277(CFS)      Total area =       5.610(Ac.)
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Process from Point/Station      601.000 to Point/Station      602.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.610(Ac.)
Runoff from this stream =      1.277(CFS)
Time of concentration =   20.76 min.
Rainfall intensity =     2.106(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      700.000 to Point/Station      701.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   691.000(Ft.)
Top (of initial area) elevation =  1409.000(Ft.)
Bottom (of initial area) elevation =  1350.000(Ft.)
Difference in elevation =    59.000(Ft.)
Slope =    0.08538  s(%)=       8.54
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.100 min.
Rainfall intensity =      2.646(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.415(CFS)
Total initial stream area =        1.570(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      701.000 to Point/Station      702.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1209.000(Ft.)
Channel length thru subarea  =   737.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      1.271(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.271(CFS)
Depth of flow =   0.140(Ft.), Average velocity =   3.986(Ft/s)
Channel flow top width =    2.560(Ft.)
Flow Velocity =    3.99(Ft/s)
Travel time  =    3.08 min.
Time of concentration =   16.18 min.
Critical depth =      0.215(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.347(In/Hr) for a   100.0 year storm
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Subarea runoff =      1.518(CFS) for      6.470(Ac.)
Total runoff =      1.934(CFS)      Total area =       8.040(Ac.)


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Process from Point/Station      702.000 to Point/Station      702.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Time of concentration =    16.18 min.
Rainfall intensity =      2.347(In/Hr) for a   100.0 year storm
Subarea runoff =      0.481(CFS) for      2.050(Ac.)
Total runoff =      2.415(CFS)      Total area =      10.090(Ac.)


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Process from Point/Station      701.000 to Point/Station      702.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     10.090(Ac.)
Runoff from this stream =      2.415(CFS)
Time of concentration =   16.18 min.
Rainfall intensity =     2.347(In/Hr)
Program is now starting with Main Stream No. 4


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Process from Point/Station      800.000 to Point/Station      801.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   136.000(Ft.)
Top (of initial area) elevation =  1399.000(Ft.)
Bottom (of initial area) elevation =  1370.000(Ft.)
Difference in elevation =    29.000(Ft.)
Slope =    0.21324  s(%)=      21.32
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.600 min.
Rainfall intensity =      2.957(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.139(CFS)
Total initial stream area =        0.470(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      801.000 to Point/Station      802.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1370.000(Ft.)
Downstream point/station elevation =  1330.000(Ft.)
Pipe length  =   172.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.139(CFS)
Nearest computed pipe diameter  =      3.00(In.)
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Calculated individual pipe flow  =     0.139(CFS)
Normal flow depth in pipe =    1.18(In.)
Flow top width inside pipe =    2.93(In.)
Critical Depth =    2.65(In.)
Pipe flow velocity =      7.76(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    10.97 min.


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Process from Point/Station      801.000 to Point/Station      802.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      0.470(Ac.)
Runoff from this stream =      0.139(CFS)
Time of concentration =   10.97 min.
Rainfall intensity =     2.911(In/Hr)


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Process from Point/Station      810.000 to Point/Station      811.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   711.000(Ft.)
Top (of initial area) elevation =  1466.000(Ft.)
Bottom (of initial area) elevation =  1310.000(Ft.)
Difference in elevation =   156.000(Ft.)
Slope =    0.21941  s(%)=      21.94
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.200 min.
Rainfall intensity =      2.758(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.193(CFS)
Total initial stream area =        7.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      811.000 to Point/Station      812.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1310.000(Ft.)
Downstream point/station elevation =  1220.000(Ft.)
Pipe length  =   230.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.193(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     2.193(CFS)
Normal flow depth in pipe =    3.43(In.)
Flow top width inside pipe =    5.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.86(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    12.40 min.
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Process from Point/Station      811.000 to Point/Station      812.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      7.950(Ac.)
Runoff from this stream =      2.193(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     2.733(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      820.000 to Point/Station      821.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   572.000(Ft.)
Top (of initial area) elevation =  1609.000(Ft.)
Bottom (of initial area) elevation =  1320.000(Ft.)
Difference in elevation =   289.000(Ft.)
Slope =    0.50524  s(%)=      50.52
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.300 min.
Rainfall intensity =      2.870(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.289(CFS)
Total initial stream area =        4.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      821.000 to Point/Station      822.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1320.000(Ft.)
Downstream point/station elevation =  1260.000(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.289(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.289(CFS)
Normal flow depth in pipe =    2.59(In.)
Flow top width inside pipe =    5.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.89(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    11.48 min.


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Process from Point/Station      821.000 to Point/Station      822.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 3
Stream flow area =      4.490(Ac.)
Runoff from this stream =      1.289(CFS)
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Time of concentration =   11.48 min.
Rainfall intensity =     2.848(In/Hr)


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Process from Point/Station      830.000 to Point/Station      831.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   752.000(Ft.)
Top (of initial area) elevation =  1640.000(Ft.)
Bottom (of initial area) elevation =  1278.000(Ft.)
Difference in elevation =   362.000(Ft.)
Slope =    0.48138  s(%)=      48.14
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.820(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.031(CFS)
Total initial stream area =        7.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      831.000 to Point/Station      832.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1278.000(Ft.)
Downstream point/station elevation =  1230.000(Ft.)
Pipe length  =   200.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.031(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     2.031(CFS)
Normal flow depth in pipe =    3.84(In.)
Flow top width inside pipe =    5.76(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.32(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    11.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      831.000 to Point/Station      832.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 4
Stream flow area =      7.200(Ac.)
Runoff from this stream =      2.031(CFS)
Time of concentration =   11.92 min.
Rainfall intensity =     2.793(In/Hr)


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Process from Point/Station      840.000 to Point/Station      841.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
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UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   649.000(Ft.)
Top (of initial area) elevation =  1650.000(Ft.)
Bottom (of initial area) elevation =  1340.000(Ft.)
Difference in elevation =   310.000(Ft.)
Slope =    0.47766  s(%)=      47.77
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.500 min.
Rainfall intensity =      2.845(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      2.029(CFS)
Total initial stream area =        7.130(Ac.)


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Process from Point/Station      841.000 to Point/Station      842.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1340.000(Ft.)
Downstream point/station elevation =  1210.000(Ft.)
Pipe length  =   390.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.029(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     2.029(CFS)
Normal flow depth in pipe =    3.44(In.)
Flow top width inside pipe =    5.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.41(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    11.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      841.000 to Point/Station      842.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 5
Stream flow area =      7.130(Ac.)
Runoff from this stream =      2.029(CFS)
Time of concentration =   11.87 min.
Rainfall intensity =     2.799(In/Hr)

Total of 5 streams to confluence:
Flow rates before confluence point:
       0.139       2.193       1.289       2.031       2.029
Area of streams before confluence:
        0.470        7.950        4.490        7.200        7.130
Results of confluence:
Total flow rate =      7.679(CFS)
Time of concentration =    10.970 min.
Effective stream area after confluence =     27.240(Ac.)


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Process from Point/Station      800.000 to Point/Station      840.000
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**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 1
Stream flow area =     27.240(Ac.)
Runoff from this stream =      7.679(CFS)
Time of concentration =   10.97 min.
Rainfall intensity =     2.911(In/Hr)


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Process from Point/Station      850.000 to Point/Station      851.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   257.000(Ft.)
Top (of initial area) elevation =  1358.000(Ft.)
Bottom (of initial area) elevation =  1240.000(Ft.)
Difference in elevation =   118.000(Ft.)
Slope =    0.45914  s(%)=      45.91
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      2.932(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.666(CFS)
Total initial stream area =        2.270(Ac.)


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Process from Point/Station      851.000 to Point/Station      852.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1240.000(Ft.)
Downstream point/station elevation =  1200.000(Ft.)
Pipe length  =  1250.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.666(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.666(CFS)
Normal flow depth in pipe =    3.57(In.)
Flow top width inside pipe =    5.89(In.)
Critical Depth =    4.95(In.)
Pipe flow velocity =      5.47(Ft/s)
Travel time through pipe =    3.81 min.
Time of concentration (TC) =    14.61 min.


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Process from Point/Station      851.000 to Point/Station      852.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      2.270(Ac.)
Runoff from this stream =      0.666(CFS)
Time of concentration =   14.61 min.
Rainfall intensity =     2.457(In/Hr)
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Process from Point/Station      860.000 to Point/Station      861.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   289.000(Ft.)
Top (of initial area) elevation =  1532.000(Ft.)
Bottom (of initial area) elevation =  1415.000(Ft.)
Difference in elevation =   117.000(Ft.)
Slope =    0.40484  s(%)=      40.48
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.900 min.
Rainfall intensity =      2.920(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.383(CFS)
Total initial stream area =        1.310(Ac.)


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Process from Point/Station      861.000 to Point/Station      862.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1415.000(Ft.)
Downstream point/station elevation =  1390.000(Ft.)
Pipe length  =   105.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.383(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     0.383(CFS)
Normal flow depth in pipe =    2.20(In.)
Flow top width inside pipe =    2.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.92(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    11.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      862.000 to Point/Station      863.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1390.000(Ft.)
Downstream point elevation =  1282.000(Ft.)
Channel length thru subarea  =   340.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   5.000
Slope or 'Z' of right channel bank =   5.000
Estimated mean flow rate at midpoint of channel =      0.923(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.923(CFS)
Depth of flow =   0.088(Ft.), Average velocity =   3.049(Ft/s)
Channel flow top width =    3.880(Ft.)
Flow Velocity =    3.05(Ft/s)
Travel time  =    1.86 min.
```

```
Time of concentration =   12.94 min.
Critical depth =      0.133(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.666(In/Hr) for a   100.0 year storm
Subarea runoff =      0.987(CFS) for      3.700(Ac.)
Total runoff =      1.369(CFS)      Total area =       5.010(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      863.000 to Point/Station      864.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1282.000(Ft.)
Downstream point/station elevation =  1200.000(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.369(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.369(CFS)
Normal flow depth in pipe =    2.59(In.)
Flow top width inside pipe =    5.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.90(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    13.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      863.000 to Point/Station      864.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 4 in normal stream number 3
Stream flow area =      5.010(Ac.)
Runoff from this stream =      1.369(CFS)
Time of concentration =   13.14 min.
Rainfall intensity =     2.641(In/Hr)

Total of 3 streams to confluence:
Flow rates before confluence point:
       7.679       0.666       1.369
Area of streams before confluence:
       27.240        2.270        5.010
Results of confluence:
Total flow rate =      9.714(CFS)
Time of concentration =    10.970 min.
Effective stream area after confluence =     34.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      800.000 to Point/Station      864.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     34.520(Ac.)
Runoff from this stream =      9.714(CFS)
Time of concentration =   10.97 min.
```

```
Rainfall intensity =     2.911(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      36.864       1.277       2.415       9.714
Area of streams before confluence:
      190.130        5.610       10.090       34.520


Results of confluence:
Total flow rate =     50.270(CFS)
Time of concentration =    20.217 min.
Effective stream area after confluence  =    240.350(Ac.)
End of computations, total study area =         240.350 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/14/10

Topsoil Storage Area
Proposed Conditions
25-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.543(In.)
2	10.000		2.435(In.)
3	15.000		1.929(In.)
4	30.000		1.306(In.)
5	60.000		0.909(In.)
6	120.000		0.679(In.)
7	180.000		0.584(In.)
8	360.000		0.448(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   892.000(Ft.)
Top (of initial area) elevation =  1603.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   273.000(Ft.)
Slope =    0.30605  s(%)=      30.61
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.202(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.969(CFS)
Total initial stream area =        4.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Channel length thru subarea  =  1681.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      3.674(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.674(CFS)
Depth of flow =   0.216(Ft.), Average velocity =   4.410(Ft/s)
Channel flow top width =    4.726(Ft.)
Flow Velocity =    4.41(Ft/s)
Travel time  =    6.35 min.
Time of concentration =   18.65 min.
Critical depth =      0.313(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.777(In/Hr) for a    25.0 year storm
Subarea runoff =      4.803(CFS) for     24.570(Ac.)
Total runoff =      5.772(CFS)      Total area =      28.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   950.000(Ft.)
Downstream point/station elevation =   680.000(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.772(CFS)
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```
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.772(CFS)
Normal flow depth in pipe =    5.31(In.)
Flow top width inside pipe =    8.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.28(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    19.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     28.970(Ac.)
Runoff from this stream =      5.772(CFS)
Time of concentration =   19.40 min.
Rainfall intensity =     1.746(In/Hr)


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Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   870.000(Ft.)
Top (of initial area) elevation =  1284.000(Ft.)
Bottom (of initial area) elevation =   947.300(Ft.)
Difference in elevation =   336.700(Ft.)
Slope =    0.38701  s(%)=      38.70
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.222(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.953(CFS)
Total initial stream area =        4.290(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   947.300(Ft.)
Downstream point elevation =   900.000(Ft.)
Channel length thru subarea  =   421.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.191(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.191(CFS)
Depth of flow =   0.154(Ft.), Average velocity =   3.150(Ft/s)
Channel flow top width =    2.922(Ft.)
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```
Flow Velocity =    3.15(Ft/s)
Travel time  =    2.23 min.
Time of concentration =   14.33 min.
Critical depth =      0.199(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.997(In/Hr) for a    25.0 year storm
Subarea runoff =      0.427(CFS) for      2.140(Ac.)
Total runoff =      1.381(CFS)      Total area =       6.430(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   834.700(Ft.)
Channel length thru subarea  =   567.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.878(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.878(CFS)
Depth of flow =   0.197(Ft.), Average velocity =   3.675(Ft/s)
Channel flow top width =    3.183(Ft.)
Flow Velocity =    3.67(Ft/s)
Travel time  =    2.57 min.
Time of concentration =   16.90 min.
Critical depth =      0.262(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.850(In/Hr) for a    25.0 year storm
Subarea runoff =      0.857(CFS) for      4.630(Ac.)
Total runoff =      2.237(CFS)      Total area =      11.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   834.700(Ft.)
Downstream point elevation =   741.000(Ft.)
Channel length thru subarea  =   856.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      3.084(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.084(CFS)
Depth of flow =   0.263(Ft.), Average velocity =   4.206(Ft/s)
Channel flow top width =    3.578(Ft.)
Flow Velocity =    4.21(Ft/s)
Travel time  =    3.39 min.
Time of concentration =   20.29 min.
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```
Critical depth =      0.348(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.709(In/Hr) for a    25.0 year storm
Subarea runoff =      1.431(CFS) for      8.370(Ac.)
Total runoff =      3.668(CFS)      Total area =      19.430(Ac.)


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Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   741.000(Ft.)
Downstream point elevation =   671.300(Ft.)
Channel length thru subarea  =   692.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      4.110(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.110(CFS)
Depth of flow =   0.314(Ft.), Average velocity =   4.449(Ft/s)
Channel flow top width =    3.884(Ft.)
Flow Velocity =    4.45(Ft/s)
Travel time  =    2.59 min.
Time of concentration =   22.88 min.
Critical depth =      0.410(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.602(In/Hr) for a    25.0 year storm
Subarea runoff =      0.750(CFS) for      4.680(Ac.)
Total runoff =      4.418(CFS)      Total area =      24.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.110(Ac.)
Runoff from this stream =      4.418(CFS)
Time of concentration =   22.88 min.
Rainfall intensity =     1.602(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.772       4.418
Area of streams before confluence:
       28.970       24.110
Results of confluence:
Total flow rate =     10.190(CFS)
Time of concentration =    19.397 min.
Effective stream area after confluence =     53.080(Ac.)
End of computations, total study area =          53.080 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 04/14/10

Topsoil Storage Area
Proposed Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		4.271(In.)
2	10.000		2.945(In.)
3	15.000		2.353(In.)
4	30.000		1.581(In.)
5	60.000		1.087(In.)
6	120.000		0.801(In.)
7	180.000		0.688(In.)
8	360.000		0.534(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   892.000(Ft.)
Top (of initial area) elevation =  1603.000(Ft.)
Bottom (of initial area) elevation =  1330.000(Ft.)
Difference in elevation =   273.000(Ft.)
Slope =    0.30605  s(%)=      30.61
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.300 min.
Rainfall intensity =      2.673(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.176(CFS)
Total initial stream area =        4.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Upstream point elevation =  1330.000(Ft.)
Downstream point elevation =   950.000(Ft.)
Channel length thru subarea  =  1681.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =      4.459(CFS)
Manning's 'N'    = 0.050
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.459(CFS)
Depth of flow =   0.240(Ft.), Average velocity =   4.687(Ft/s)
Channel flow top width =    4.922(Ft.)
Flow Velocity =    4.69(Ft/s)
Travel time  =    5.98 min.
Time of concentration =   18.28 min.
Critical depth =      0.348(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.184(In/Hr) for a   100.0 year storm
Subarea runoff =      5.904(CFS) for     24.570(Ac.)
Total runoff =      7.080(CFS)      Total area =      28.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   950.000(Ft.)
Downstream point/station elevation =   680.000(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.080(CFS)
```

```
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     7.080(CFS)
Normal flow depth in pipe =    6.11(In.)
Flow top width inside pipe =    8.41(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.19(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    18.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     28.970(Ac.)
Runoff from this stream =      7.080(CFS)
Time of concentration =   18.99 min.
Rainfall intensity =     2.148(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   870.000(Ft.)
Top (of initial area) elevation =  1284.000(Ft.)
Bottom (of initial area) elevation =   947.300(Ft.)
Difference in elevation =   336.700(Ft.)
Slope =    0.38701  s(%)=      38.70
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.696(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      1.157(CFS)
Total initial stream area =        4.290(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   947.300(Ft.)
Downstream point elevation =   900.000(Ft.)
Channel length thru subarea  =   421.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      1.445(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.445(CFS)
Depth of flow =   0.171(Ft.), Average velocity =   3.353(Ft/s)
Channel flow top width =    3.029(Ft.)
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```
Flow Velocity =    3.35(Ft/s)
Travel time  =    2.09 min.
Time of concentration =   14.19 min.
Critical depth =      0.225(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.449(In/Hr) for a   100.0 year storm
Subarea runoff =      0.524(CFS) for      2.140(Ac.)
Total runoff =      1.681(CFS)      Total area =       6.430(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   834.700(Ft.)
Channel length thru subarea  =   567.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      2.286(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.286(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   3.907(Ft/s)
Channel flow top width =    3.320(Ft.)
Flow Velocity =    3.91(Ft/s)
Travel time  =    2.42 min.
Time of concentration =   16.61 min.
Critical depth =      0.293(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.270(In/Hr) for a   100.0 year storm
Subarea runoff =      1.051(CFS) for      4.630(Ac.)
Total runoff =      2.732(CFS)      Total area =      11.060(Ac.)


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Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =   834.700(Ft.)
Downstream point elevation =   741.000(Ft.)
Channel length thru subarea  =   856.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      3.765(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      3.765(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   4.464(Ft/s)
Channel flow top width =    3.758(Ft.)
Flow Velocity =    4.46(Ft/s)
Travel time  =    3.20 min.
Time of concentration =   19.81 min.
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```
Critical depth =      0.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.106(In/Hr) for a   100.0 year storm
Subarea runoff =      1.762(CFS) for      8.370(Ac.)
Total runoff =      4.494(CFS)      Total area =      19.430(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------
Upstream point elevation =   741.000(Ft.)
Downstream point elevation =   671.300(Ft.)
Channel length thru subarea  =   692.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Estimated mean flow rate at midpoint of channel =      5.035(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.035(CFS)
Depth of flow =   0.350(Ft.), Average velocity =   4.720(Ft/s)
Channel flow top width =    4.099(Ft.)
Flow Velocity =    4.72(Ft/s)
Travel time  =    2.44 min.
Time of concentration =   22.25 min.
Critical depth =      0.461(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.980(In/Hr) for a   100.0 year storm
Subarea runoff =      0.927(CFS) for      4.680(Ac.)
Total runoff =      5.421(CFS)      Total area =      24.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.110(Ac.)
Runoff from this stream =      5.421(CFS)
Time of concentration =   22.25 min.
Rainfall intensity =     1.980(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.080       5.421
Area of streams before confluence:
       28.970       24.110
Results of confluence:
Total flow rate =     12.500(CFS)
Time of concentration =    18.991 min.
Effective stream area after confluence =     53.080(Ac.)
End of computations, total study area =          53.080 (Ac.)
```

APPENDIX B

UNIT HYDROGRAPH ANALYSES

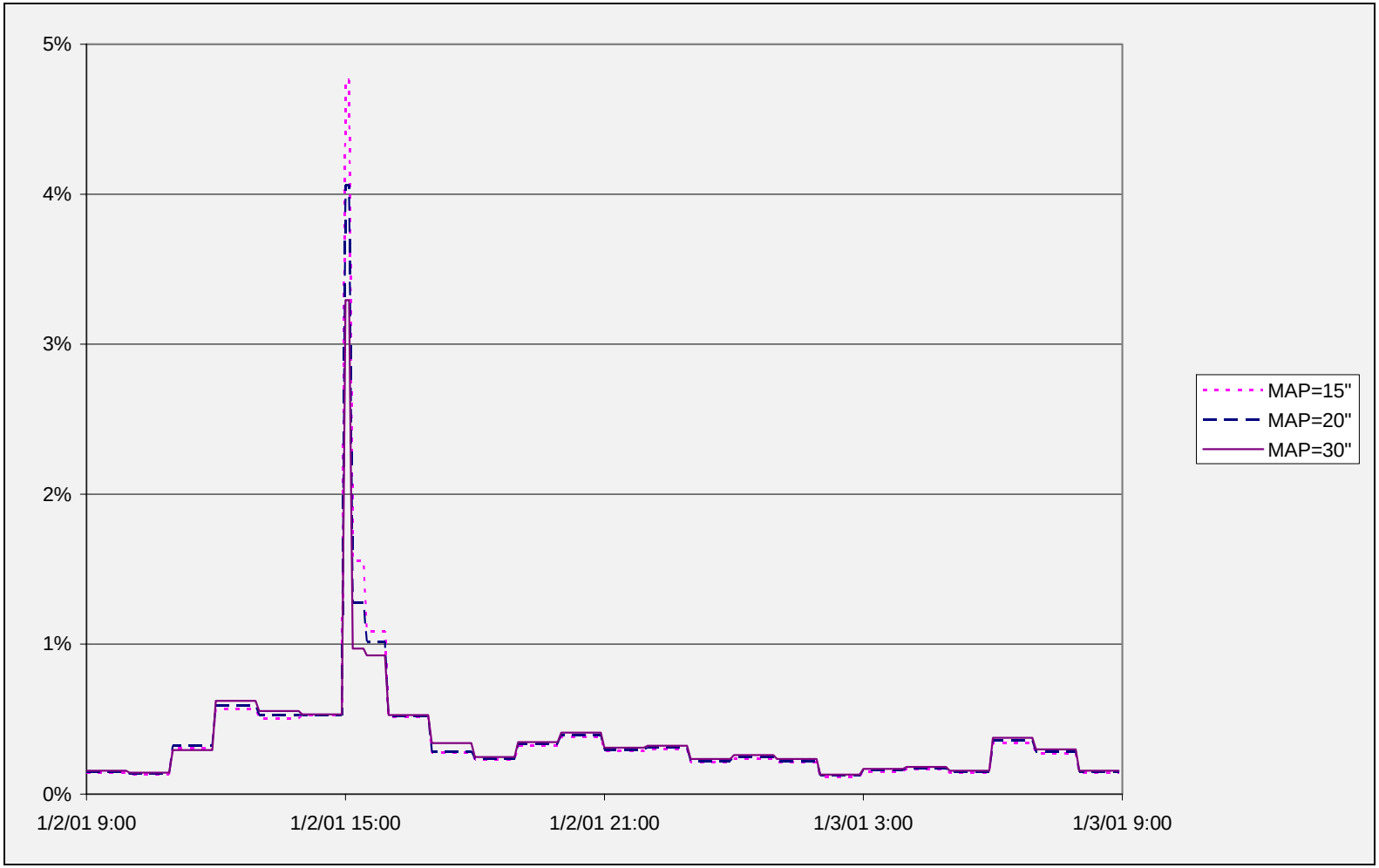

Figure D-1: Normalized Rainfall Pattern

Table D-1: Fractions of Total Rainfall for 24-Hour, 5-Minute Pattern

Time Starting	Fraction of Total Rainfall (%) *MAP=15″*	Fraction of Total Rainfall (%) *MAP=20″*	Fraction of Total Rainfall (%) *MAP=30″*
0:00	0.1412	0.1482	0.1558
1:00	0.1294	0.1358	0.1429
2:00	0.3080	0.3223	0.2945
3:00	0.5667	0.5930	0.6214
4:00	0.5051	0.5285	0.5538
5:00	0.5272	0.5266	0.5324
6:00	4.760	4.060	3.2950
6:10	1.554	1.275	0.9700
6:30	1.085	1.0169	0.9253
7:00	0.5177	0.5229	0.5263
8:00	0.2763	0.2860	0.3410
9:00	0.2302	0.2384	0.2478
10:00	0.3223	0.3337	0.3469
11:00	0.3799	0.3933	0.4089
12:00	0.2878	0.2979	0.3098
13:00	0.2993	0.3099	0.3222
14:00	0.2118	0.2223	0.2338
15:00	0.2353	0.2470	0.2597
16:00	0.2118	0.2223	0.2338
17:00	0.1177	0.1235	0.1299
18:00	0.1530	0.1605	0.1688
19:00	0.1647	0.1729	0.1818
20:00	0.1412	0.1482	0.1558
21:00	0.3412	0.3581	0.3766
22:00	0.2706	0.2840	0.2987
23:00	0.1412	0.1482	0.1558

Table E-1: Curve Numbers for AMC II

Land Use Type	Hydrologic Condition	Hydrologic Soil Group A	B	C	D
Open Water (100% Impervious)	good				
	fair				
	poor				
Low Density Residential (25% Impervious)	good	35	48	66	70
	fair	44	58	71	74
	poor	64	68	78	79
High Density Residential (50% Impervious)	good	35	48	65	70
	fair	44	58	71	74
	poor	64	68	78	79
Commercial/Industrial (80% Impervious)	good	35	48	65	70
	fair	44	58	71	74
	poor	64	68	78	79
Bare Rock/Sand/Clay (Imperviousness Varies)					
Quarries/Gravel Pits (0 % Impervious)	good	0	0	0	0
	fair	0	0	0	0
	poor	0	0	0	0
Deciduous Forest (0% Impervious)	good	27	30	41	48
	fair	35	48	57	63
	poor	48	66	74	79
Evergreen Forest (0% Impervious)	good	37	43	62	70
	fair	45	57	69	80
	poor	58	71	85	90
Mixed Forest	good	32	36	51	59
	fair	40	52	63	72
	poor	53	68	80	85
Shrub Land (0% Impervious)	good	27	43	60	68
	fair	35	51	65	72
	poor	48	62	72	78
Orchards (1% Impervious)	good	39	52	66	71
	fair	43	65	76	82
	poor	57	73	82	86
Vineyards (1% Impervious)	good	64	70	77	80
	fair	67	75	82	85
	poor	71	80	87	90
Grassland (0% Impervious)	good	38	50	69	76
	fair	48	60	74	80
	poor	58	70	80	84
Pasture/Hay (0% Impervious)	good	34	50	69	76
	fair	44	60	74	80
	poor	64	70	80	84
Row Crops (1% Impervious)	good	64	70	77	80
	fair	67	75	82	85
	poor	71	80	87	90
Small Grains (0% Impervious)	good	48	58	70	74
	fair	49	59	71	75
	poor	50	60	71	75
Fallow (1% Impervious)	good	64	68	78	79
	fair	70	77	84	86
	poor	77	86	91	94
Urban Recreational (10% Impervious)	good	34	48	66	70
	fair	44	58	71	74
	poor	64	64	78	79

Table E-2: Conversion of AMC II Curve Numbers to Other AMC Values

AMC II	AMC I	AMC III	AMC II-1/4	AMC II-1/2	AMC II	AMC I	AMC III	AMC II-1/4	AMC II-1/2
100	100	100	100	100	61	41	78	65.5	70
99	97	100	99.5	100	60	40	78	64.5	69
98	94	99	98.5	99	59	39	77	63.5	68
97	91	99	97.5	98	58	38	76	62.5	67
96	89	99	97	98	57	37	75	61.5	66
95	87	98	96	97	56	36	75	61	66
94	85	98	95	96	55	35	74	60	65
93	83	98	94.5	96	54	34	73	59	64
92	81	97	93.5	95	53	33	72	58	63
91	80	97	92.5	94	52	32	71	57	62
90	78	96	91.5	93	51	31	70	56	61
89	76	96	91	93	50	31	70	55	60
88	75	95	90	92	49	30	69	54	59
87	73	95	89	91	48	29	68	53	58
86	72	94	88	90	47	28	67	52	57
85	70	94	87.5	90	46	27	66	51	56
84	68	93	86.5	89	45	26	65	50	55
83	67	93	85.5	88	44	25	64	49	54
82	66	92	84.5	87	43	25	63	48	53
81	64	92	84	87	42	24	62	47	52
80	63	91	83	86	41	23	61	46	51
79	62	91	82	85	40	22	60	45	50
78	60	90	81	84	39	21	59	44	49
77	59	89	80	83	38	21	58	43	48
76	58	89	79.5	83	37	20	57	42	47
75	57	88	78.5	82	36	19	56	41	46
74	55	88	77.5	81	35	18	55	40	45
73	54	87	76.5	80	34	18	54	39	44
72	53	86	75.5	79	33	17	53	38	43
71	52	86	75	79	32	16	52	37	42
70	51	85	74	78	31	16	51	36	41
69	50	84	73	77	30	15	50	35	40
68	48	84	72	76	25	12	43	29.5	34
67	47	83	71	75	20	9	37	24.5	29
66	46	82	70	74	15	6	30	19	23
65	45	82	69.5	74	10	4	22	13	16
64	44	81	68.5	73	5	2	13	7	9
63	43	80	67.5	72	0	0	0	0	0

EXISTING CONDITION
(PRE-PROJECT)
ANALYSES

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   29APR10  TIME  22:03:58   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
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DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   WEST MATERIALS STORAGE AREA & NORTH QUARRY
              2        ID   EXISTING CONDITIONS
              3        ID   25-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    6.15
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.5863
             40        LS    1.77      53
             41        UD     .64
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (---->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW

7 WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JUN  1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   29APR10  TIME  22:03:58  *
*                                      *
****************************************
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```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

WEST MATERIALS STORAGE AREA & NORTH QUARRY
EXISTING CONDITIONS
25-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO	OUTPUT CONTROL VARIABLES			
	IPRNT		5	PRINT CONTROL
	IPLOT		2	PLOT CONTROL
	QSCAL		0.	HYDROGRAPH PLOT SCALE
IT	HYDROGRAPH TIME DATA			
	NMIN		5	MINUTES IN COMPUTATION INTERVAL
	IDATE	1	0	STARTING DATE
	ITIME		0000	STARTING TIME
	NQ		300	NUMBER OF HYDROGRAPH ORDINATES
	NDDATE	2	0	ENDING DATE
	NDTIME		0055	ENDING TIME
	ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

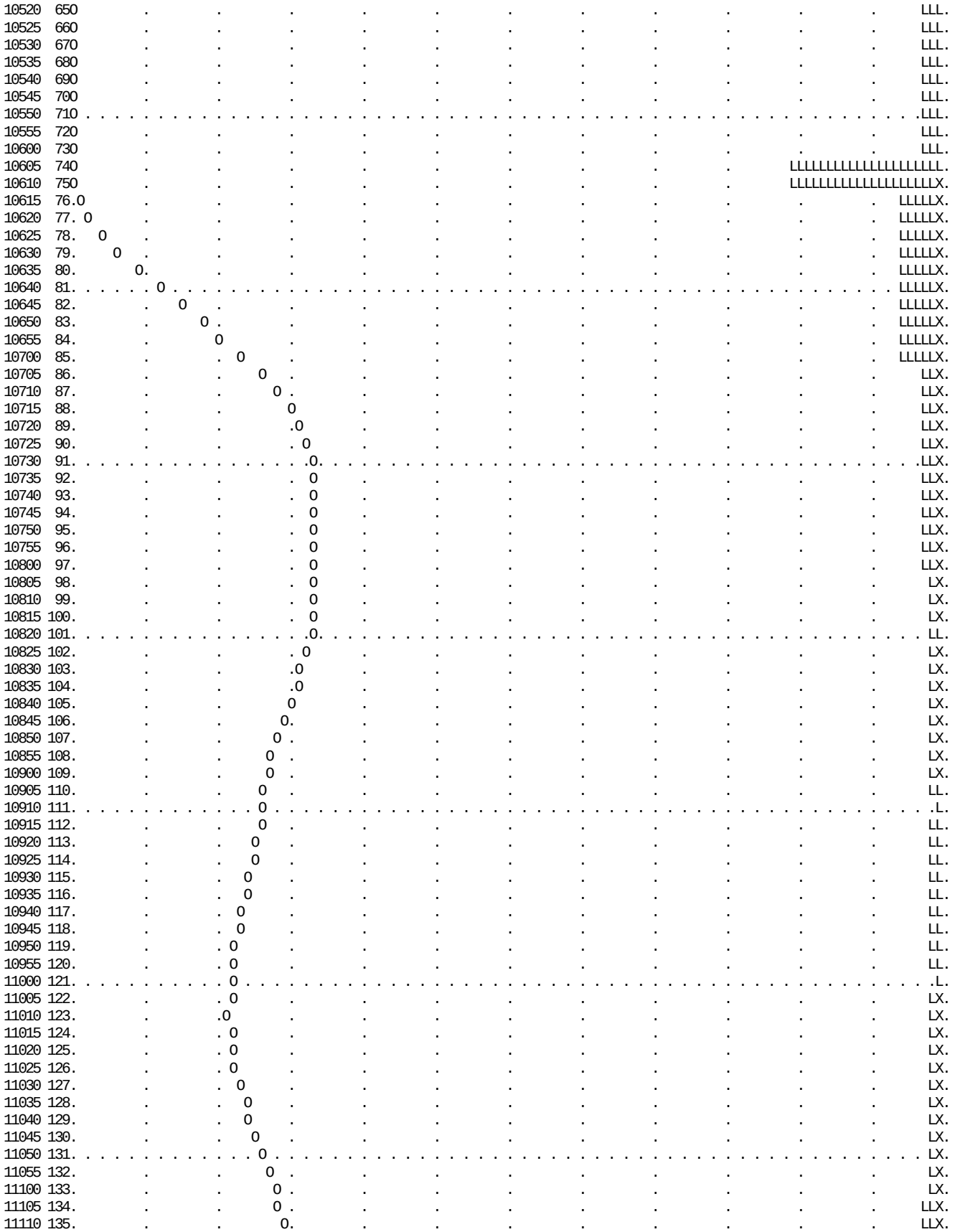
ENGLISH UNITS

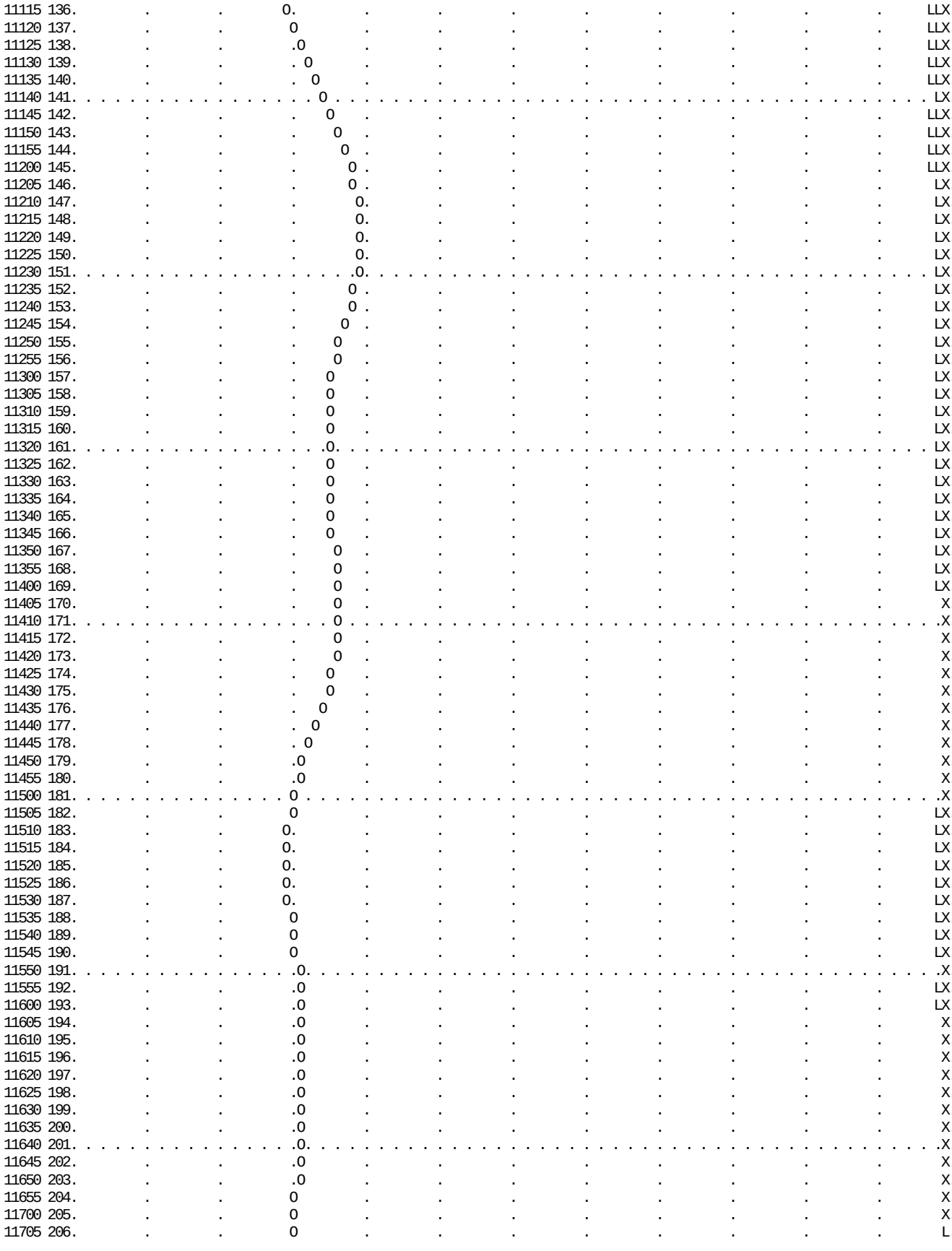
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

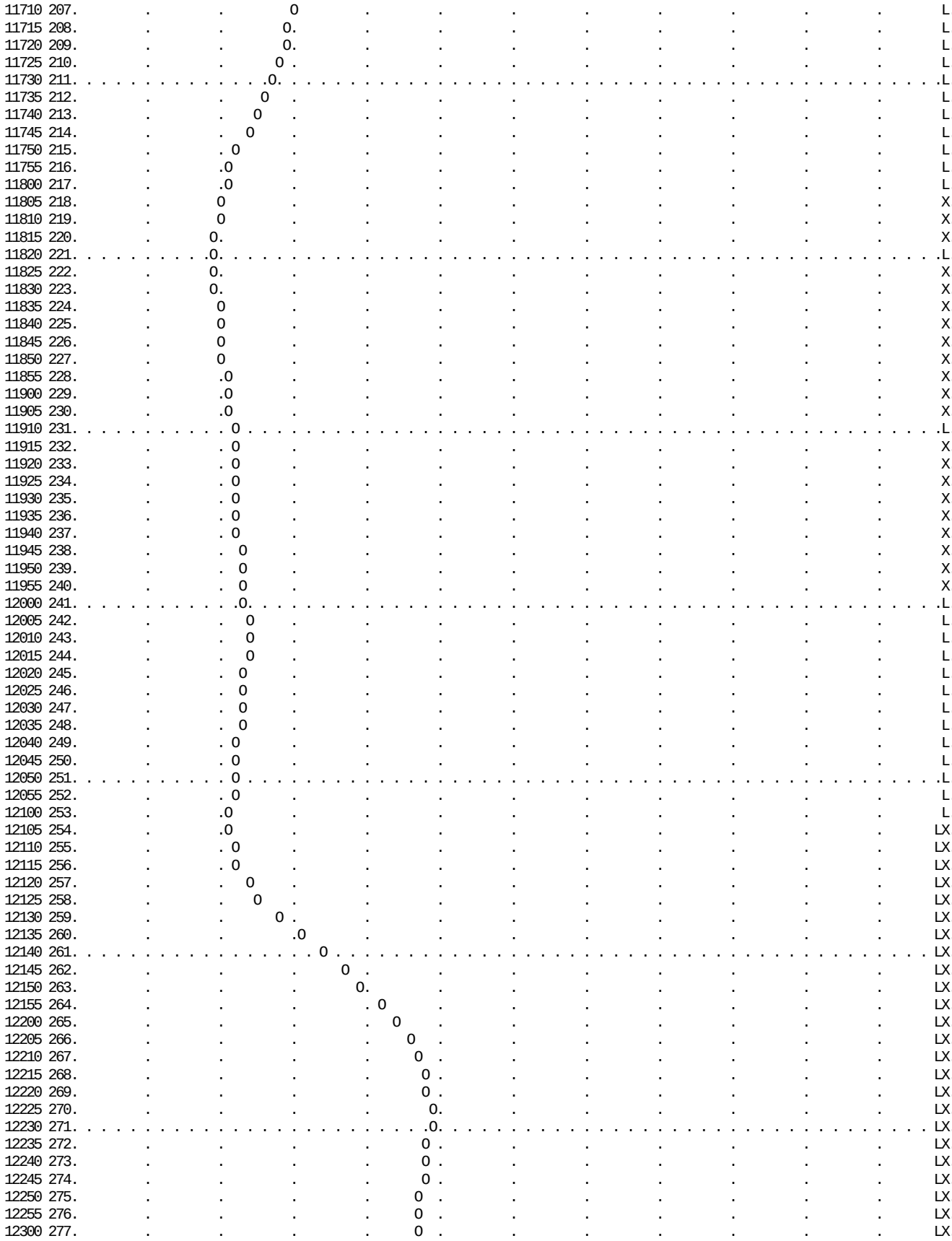
STATION WMSA-NQ

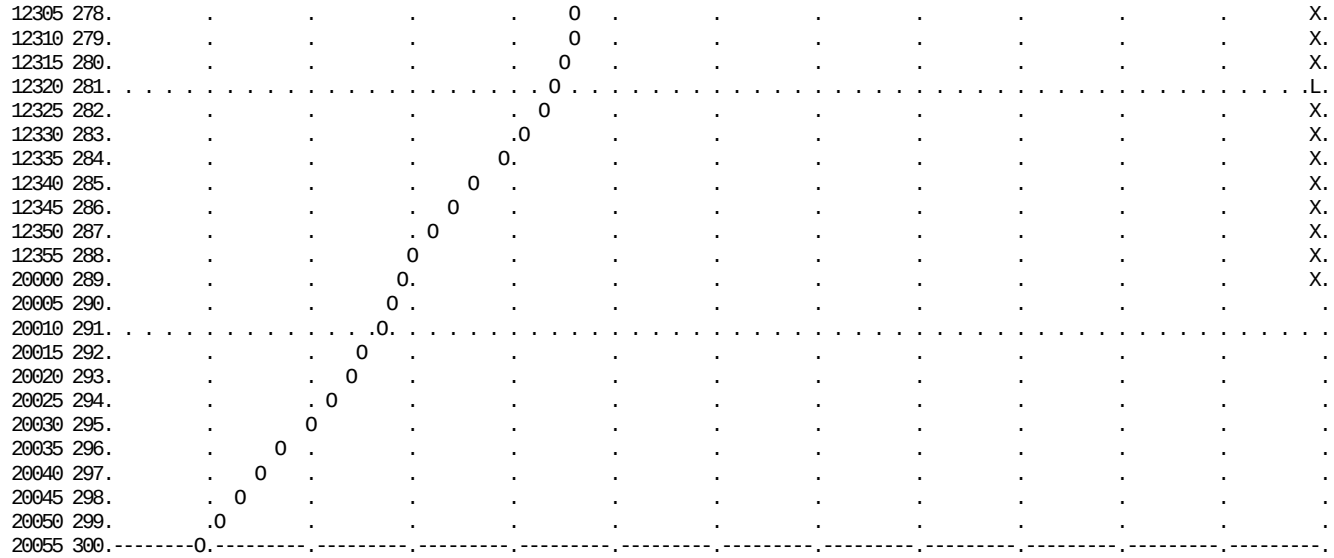
(O) OUTFLOW

	0.	10.	20.	30.	40.	50.	0.	0.	0.	0.	0.	0.	0.
											(L) PRECIP,	(X) EXCESS	
	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.1	.0
DAHRMN	PER												
10000	10												
10005	20												L.
10010	30												L.
10015	40												L.
10020	50												L.
10025	60												L.
10030	70												L.
10035	80												L.
10040	90												L.
10045	100												L.
10050	110												L.
10055	120												L.
10100	130												L.
10105	140												L.
10110	150												L.
10115	160												L.
10120	170												L.
10125	180												L.
10130	190												L.
10135	200												L.
10140	210												L.
10145	220												L.
10150	230												L.
10155	240												L.
10200	250												L.
10205	260												LL.
10210	270												LL.
10215	280												LL.
10220	290												LL.
10225	300												LL.
10230	310												LL.
10235	320												LL.
10240	330												LL.
10245	340												LL.
10250	350												LL.
10255	360												LL.
10300	370												LL.
10305	380												LLLL.
10310	390												LLLL.
10315	400												LLLL.
10320	410												LLLL.
10325	420												LLLL.
10330	430												LLLL.
10335	440												LLLL.
10340	450												LLLL.
10345	460												LLLL.
10350	470												LLLL.
10355	480												LLLL.
10400	490												LLLL.
10405	500												LLL.
10410	510												LLL.
10415	520												LLL.
10420	530												LLL.
10425	540												LLL.
10430	550												LLL.
10435	560												LLL.
10440	570												LLL.
10445	580												LLL.
10450	590												LLL.
10455	600												LLL.
10500	610												LLL.
10505	620												LLL.
10510	630												LLL.
10515	640												LLL.









RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	49.	22.50	33.	23.	22.	.59		

*** NORMAL END OF HEC-1 ***

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   29APR10  TIME  22:03:38   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                       *DIAGRAM
*** FREE ***
            1          ID   WEST MATERIALS STORAGE AREA & NORTH QUARRY
            2          ID   EXISTING CONDITIONS
            3          ID   100-YEAR FLOW RATE
            4          ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
            5          IT       5       0       0     300
            6          IO       5       2

            7          KK WMSA-NQ
            8          IN       5
            9          PB    7.63
           10          PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
           11          PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
           12          PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
           13          PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
           14          PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
           15          PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
           16          PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
           17          PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
           18          PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
           19          PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
           20          PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
           21          PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
           22          PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
           23          PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
           24          PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
           25          PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
           26          PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
           27          PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
           28          PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
           29          PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
           30          PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
           31          PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
           32          PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
           33          PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
           34          PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
           35          PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
           36          PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
           37          PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
           38          PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
           39          BA  0.5863
           40          LS    1.77      53
           41          UD     .64
           42          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    7     WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JUN  1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   29APR10  TIME  22:03:38  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

WEST MATERIALS STORAGE AREA & NORTH QUARRY
EXISTING CONDITIONS
100-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

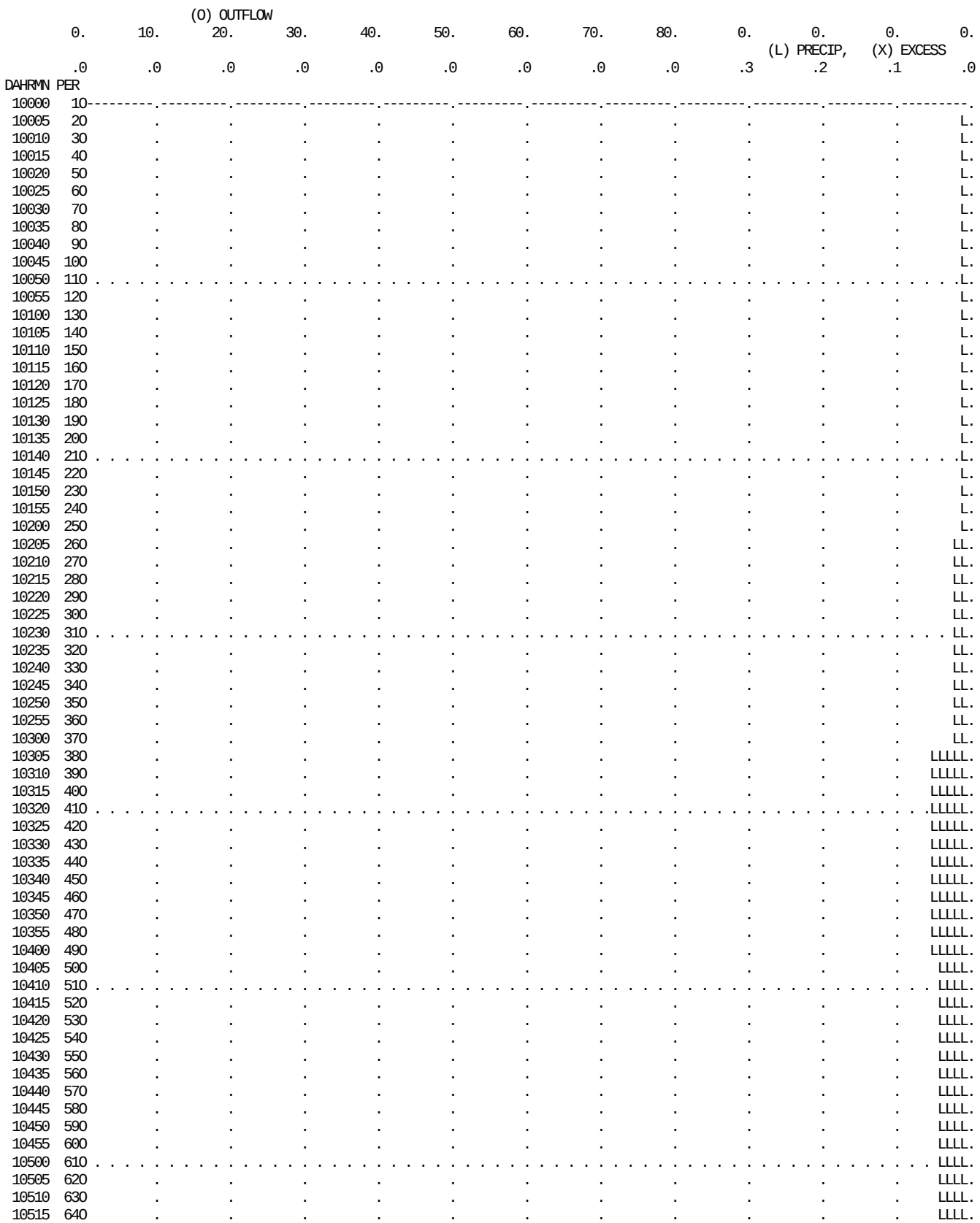
6 IO	OUTPUT CONTROL VARIABLES			
	IPRNT		5	PRINT CONTROL
	IPLOT		2	PLOT CONTROL
	QSCAL		0.	HYDROGRAPH PLOT SCALE
IT	HYDROGRAPH TIME DATA			
	NMIN		5	MINUTES IN COMPUTATION INTERVAL
	IDATE	1	0	STARTING DATE
	ITIME		0000	STARTING TIME
	NQ		300	NUMBER OF HYDROGRAPH ORDINATES
	NDDATE	2	0	ENDING DATE
	NDTIME		0055	ENDING TIME
	ICENT		19	CENTURY MARK

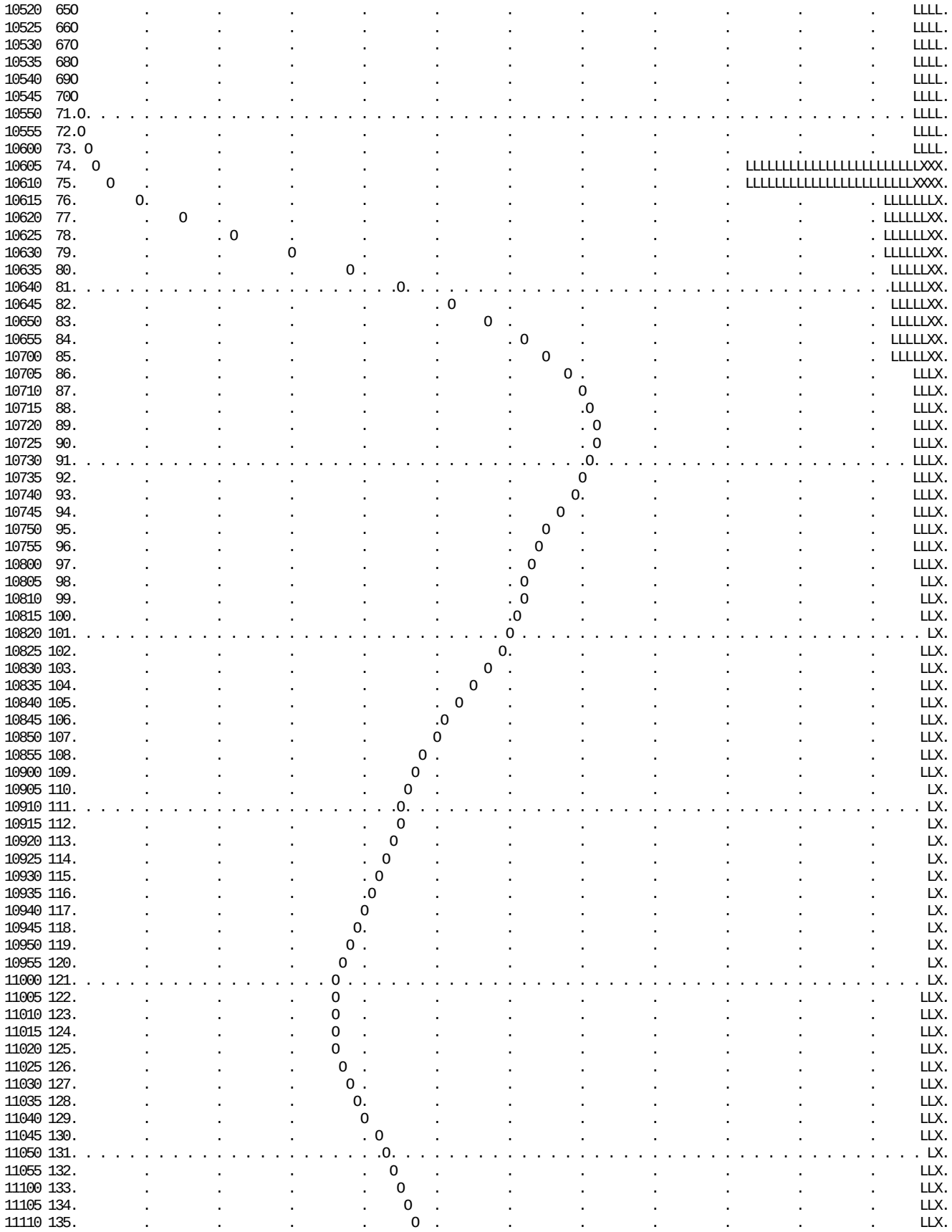
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

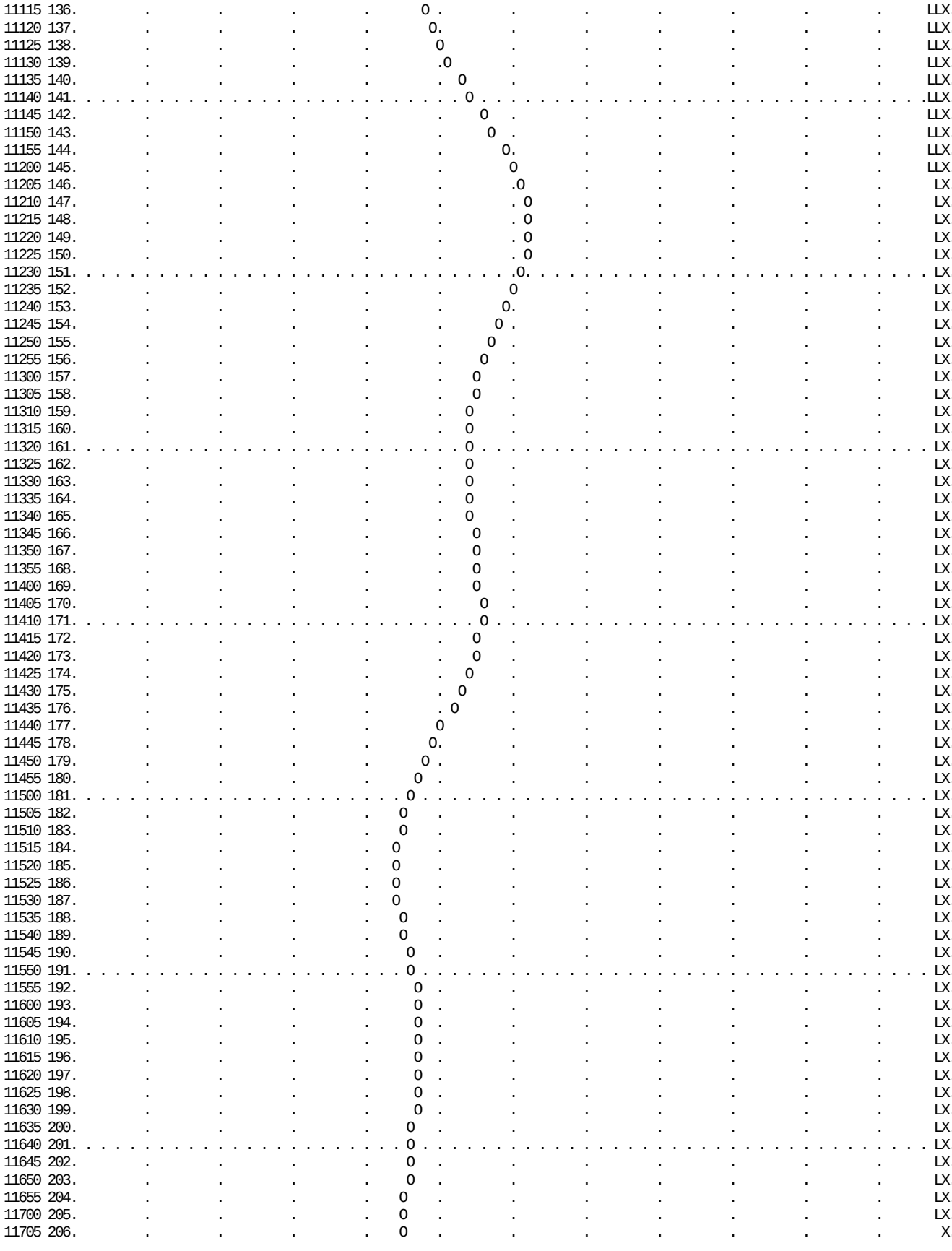
ENGLISH UNITS

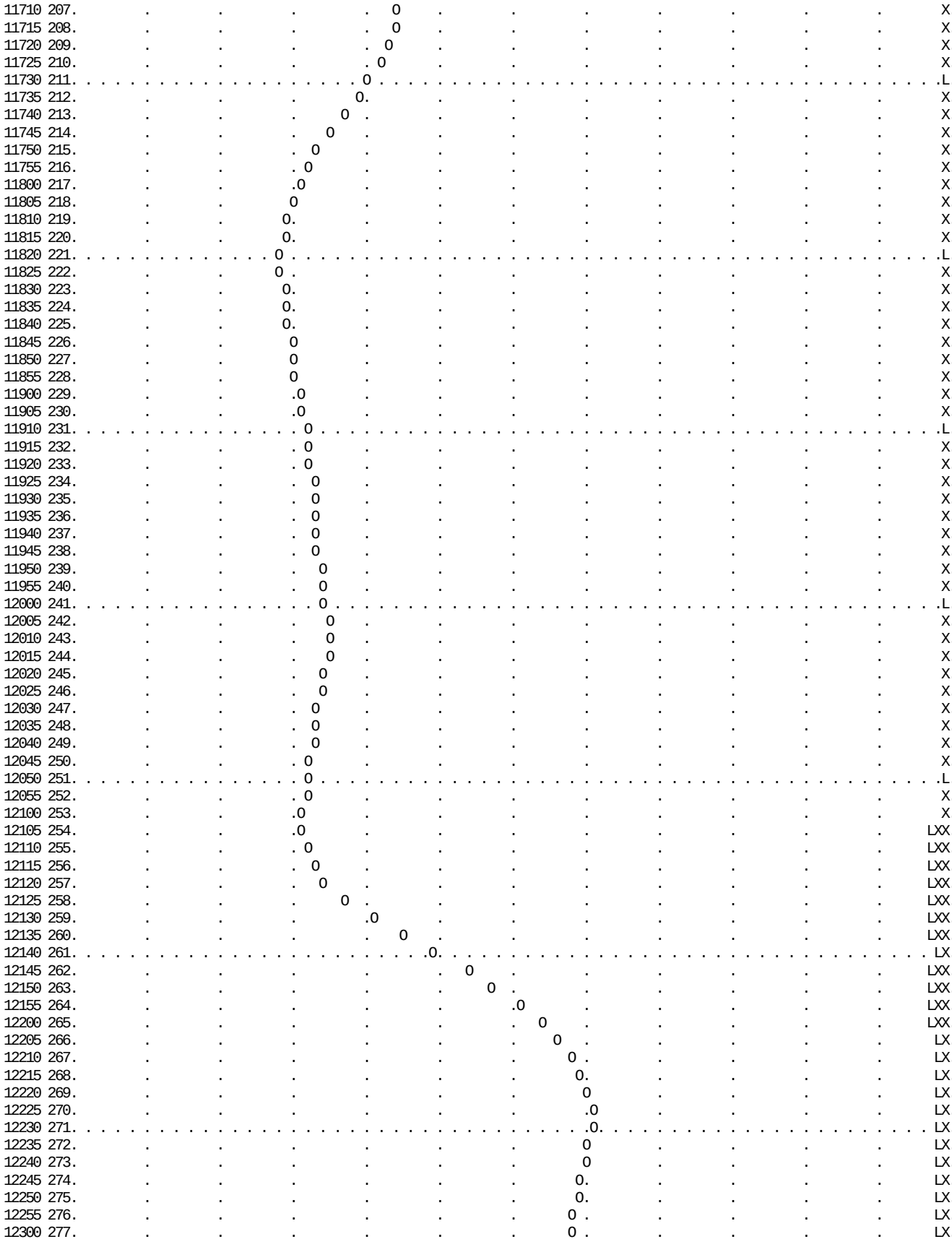
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

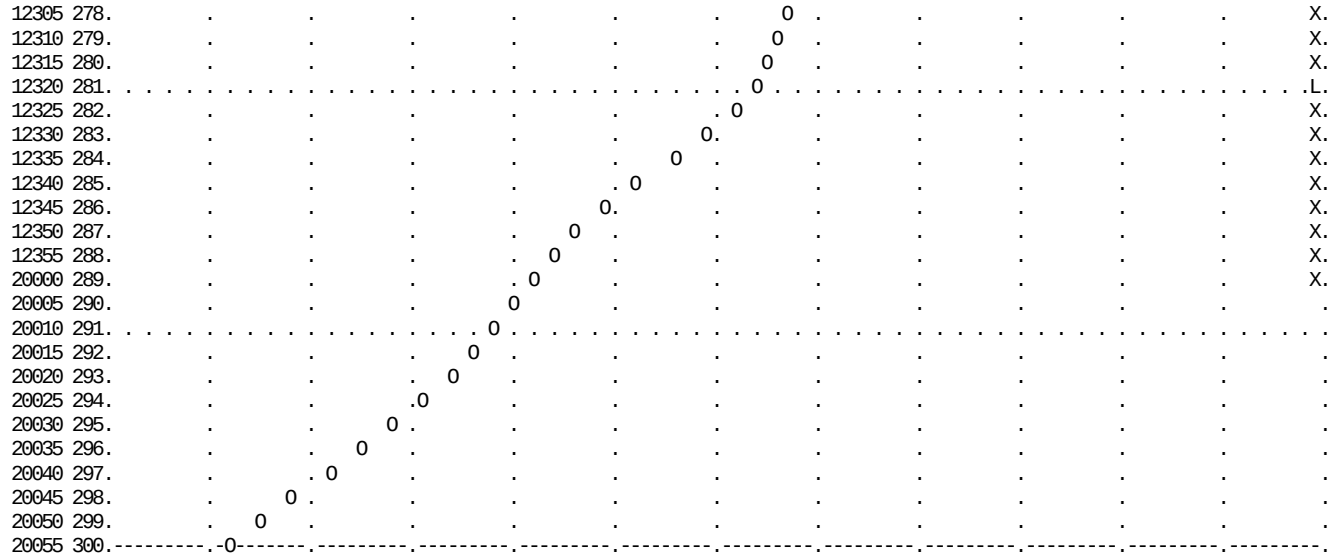
STATION WMSA-NQ











RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	72.	7.42	53.	37.	35.	.59		

*** NORMAL END OF HEC-1 ***

PROPOSED CONDITION
(RECLAIMED POST-PROJECT)
ANALYSES

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   14APR10  TIME  18:58:06   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   WEST MATERIALS STORAGE AREA & NORTH QUARRY
              2        ID   PROPOSED CONDITIONS
              3        ID   25-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    6.15
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.5863
             40        LS    1.77      53
             41        UD     .47
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    7     WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   14APR10  TIME  18:58:06   *
*                                       *
*****************************************
```

```
************************************
*                                  *
*    U.S. ARMY CORPS OF ENGINEERS  *
*    HYDROLOGIC ENGINEERING CENTER *
*          609 SECOND STREET       *
*       DAVIS, CALIFORNIA 95616    *
*           (916) 756-1104         *
*                                  *
************************************
```

WEST MATERIALS STORAGE AREA & NORTH QUARRY
PROPOSED CONDITIONS
25-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

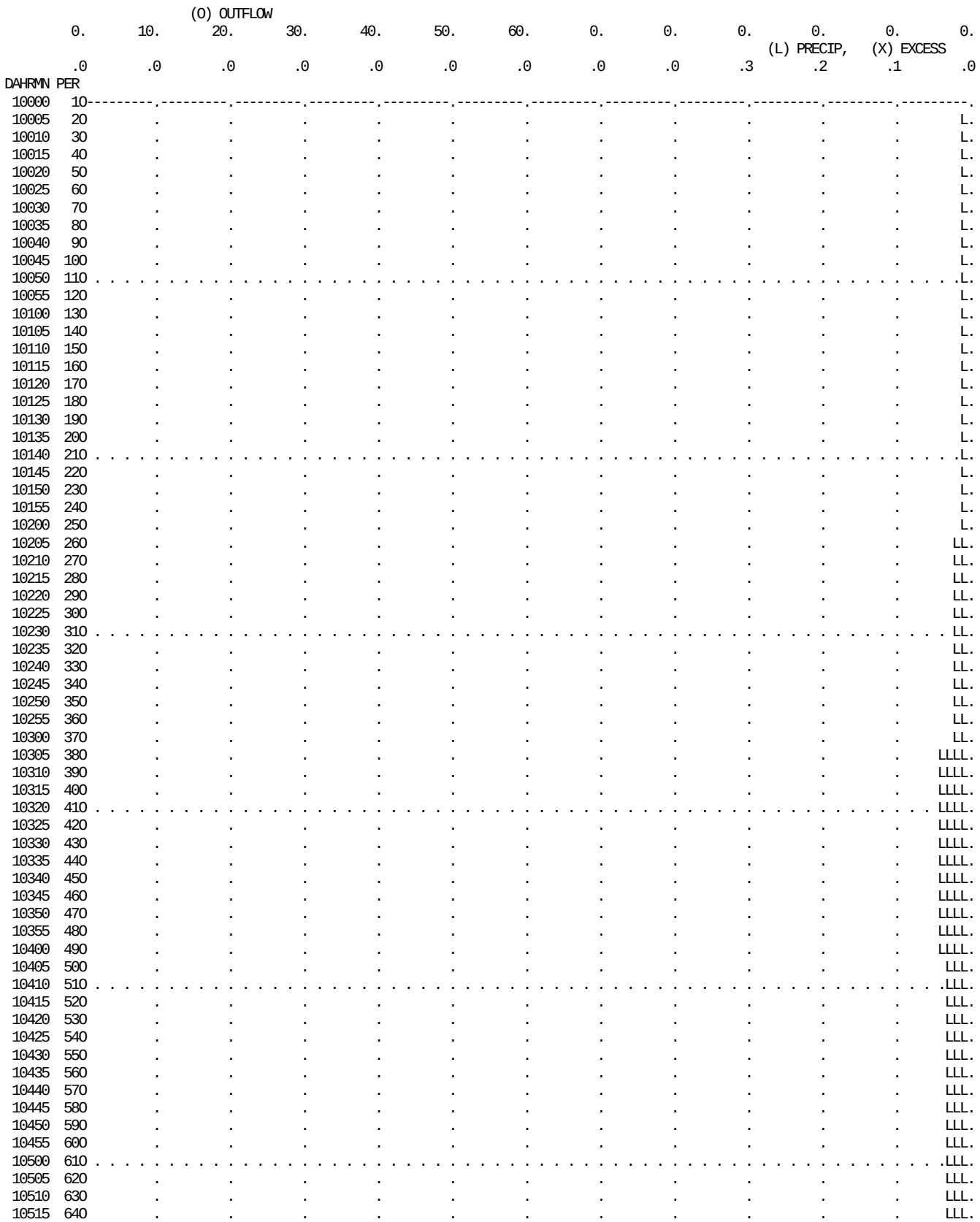
6 IO	OUTPUT CONTROL VARIABLES			
	IPRNT		5	PRINT CONTROL
	IPLOT		2	PLOT CONTROL
	QSCAL		0.	HYDROGRAPH PLOT SCALE
IT	HYDROGRAPH TIME DATA			
	NMIN		5	MINUTES IN COMPUTATION INTERVAL
	IDATE	1	0	STARTING DATE
	ITIME		0000	STARTING TIME
	NQ		300	NUMBER OF HYDROGRAPH ORDINATES
	NDDATE	2	0	ENDING DATE
	NDTIME		0055	ENDING TIME
	ICENT		19	CENTURY MARK

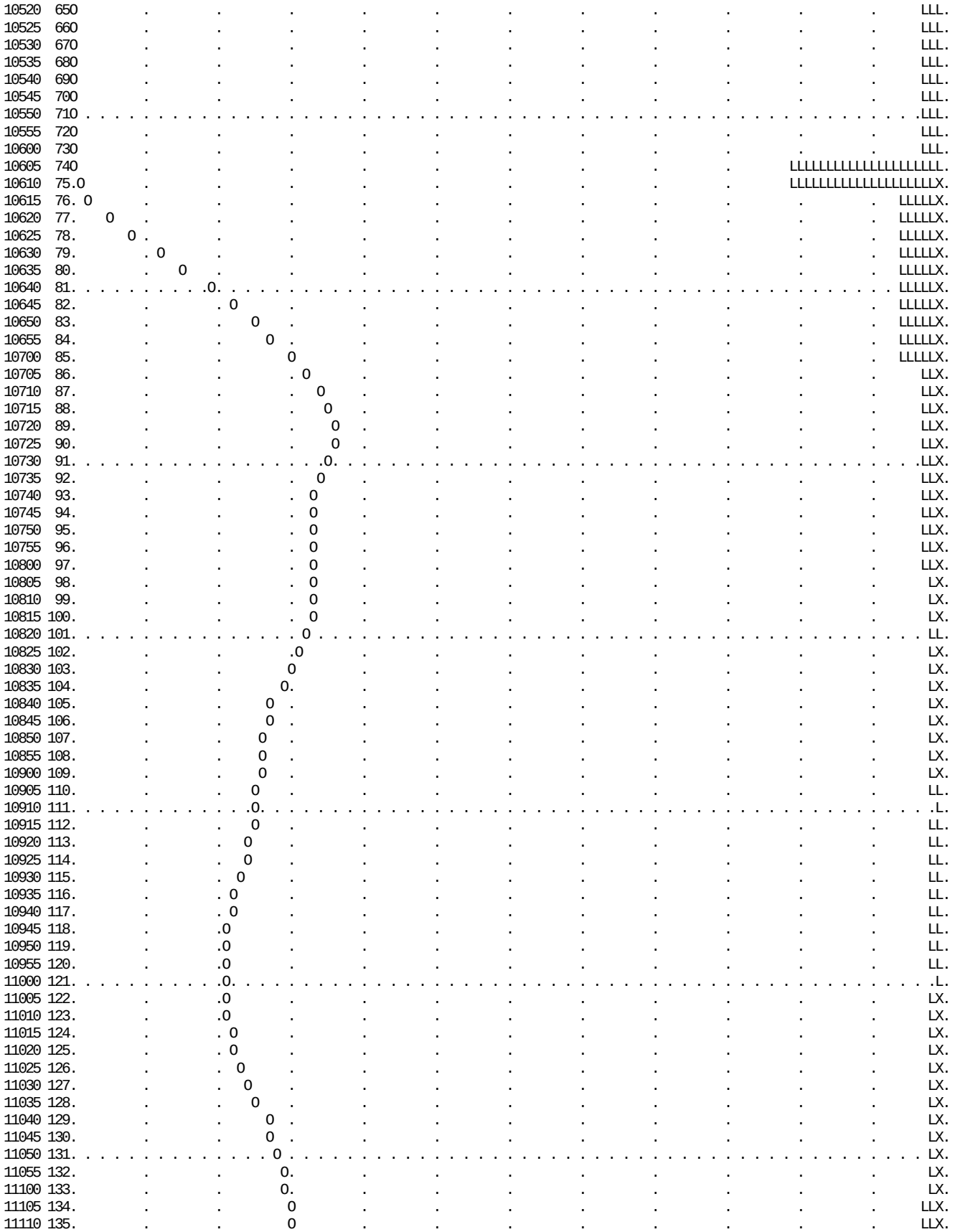
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

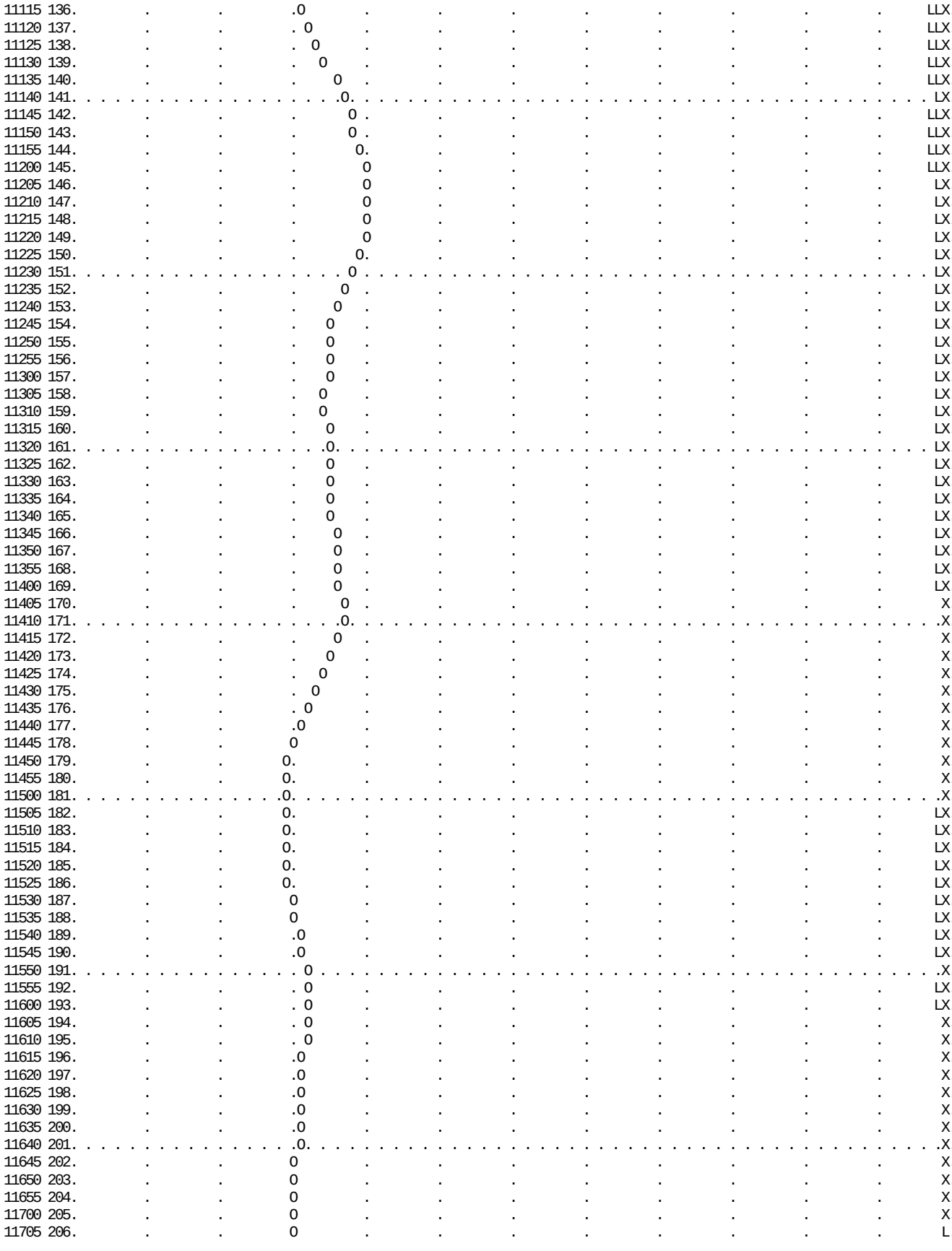
ENGLISH UNITS

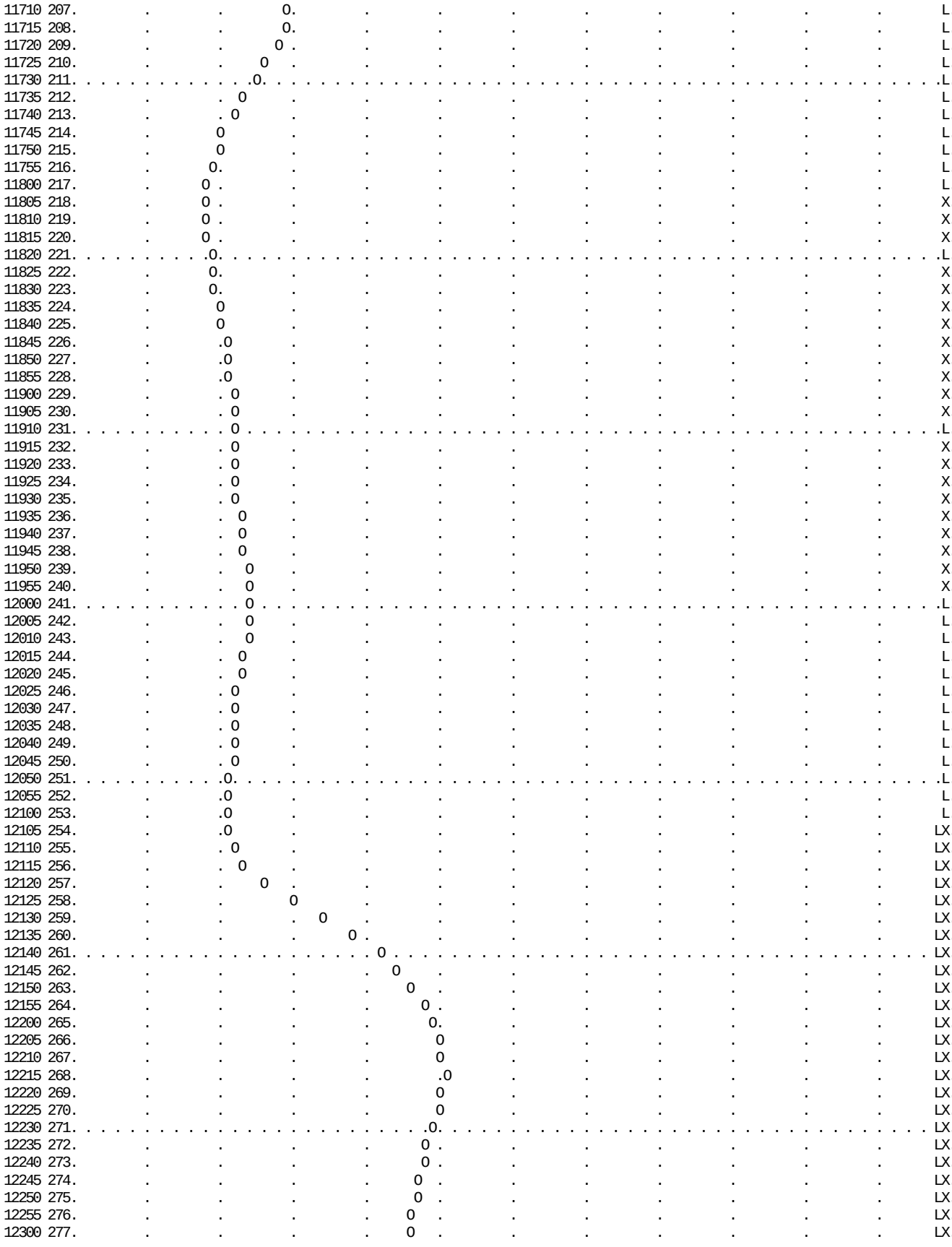
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

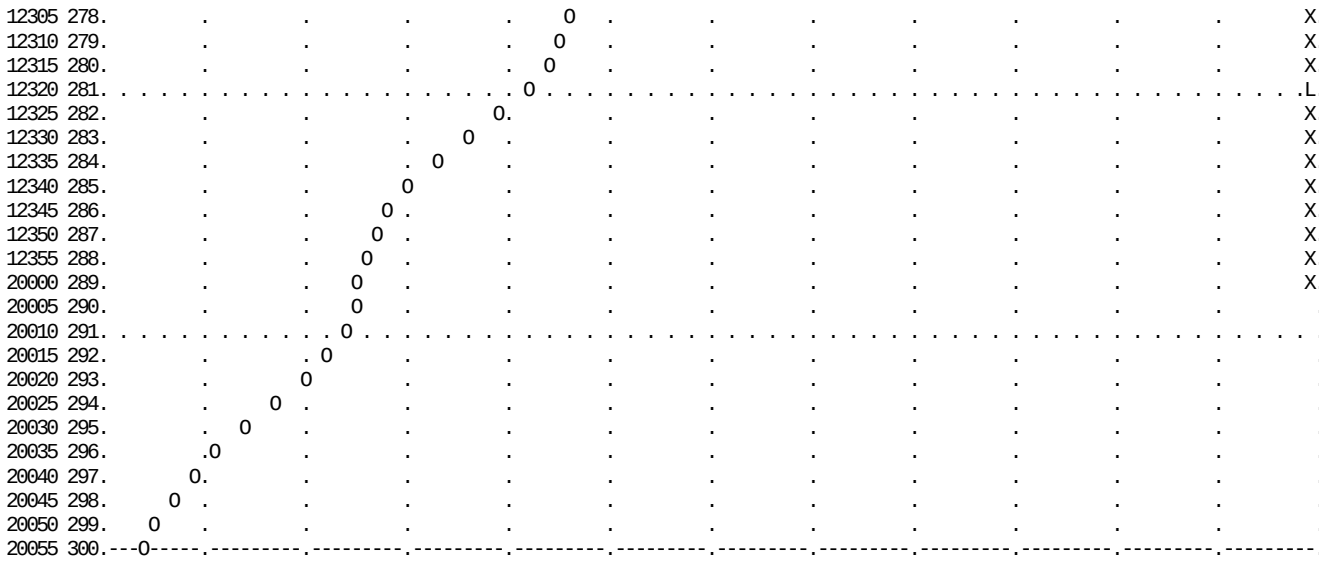
STATION WMSA-NQ







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12345 286.
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12355 288.
20000 289.
20005 290.
20010 291.
20015 292.
20020 293.
20025 294.
20030 295.
20035 296.
20040 297.
20045 298.
20050 299.
20055 300.

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	51.	22.25	33.	23.	22.	.59		

*** NORMAL END OF HEC-1 ***

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   14APR10  TIME  17:33:26   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.....10

                       *DIAGRAM
*** FREE ***
              1        ID   WEST MATERIALS STORAGE AREA & NORTH QUARRY
              2        ID   PROPOSED CONDITIONS
              3        ID   100-YEAR FLOW RATE
              4        ID   COUNTY OF SANTA CLARA HYDROGRAPH METHOD
              5        IT       5       0       0     300
              6        IO       5       2

              7        KK WMSA-NQ
              8        IN       5
              9        PB    7.63
             10        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             11        PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
             12        PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             13        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
             14        PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
             15        PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
             16        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             17        PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
             18        PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
             19        PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
             20        PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
             21        PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
             22        PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
             23        PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
             24        PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
             25        PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
             26        PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
             27        PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             28        PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
             29        PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
             30        PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
             31        PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
             32        PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
             33        PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
             34        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
             35        PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
             36        PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
             37        PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
             38        PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
             39        BA  0.5863
             40        LS    1.77      53
             41        UD     .47
             42        ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    7     WMSA-NQ

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   14APR10  TIME  17:33:26   *
*                                       *
*****************************************
```

```
************************************
*                                  *
*    U.S. ARMY CORPS OF ENGINEERS  *
*    HYDROLOGIC ENGINEERING CENTER *
*          609 SECOND STREET       *
*       DAVIS, CALIFORNIA 95616    *
*           (916) 756-1104         *
*                                  *
************************************
```

WEST MATERIALS STORAGE AREA & NORTH QUARRY
PROPOSED CONDITIONS
100-YEAR FLOW RATE
COUNTY OF SANTA CLARA HYDROGRAPH METHOD

6 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	2	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

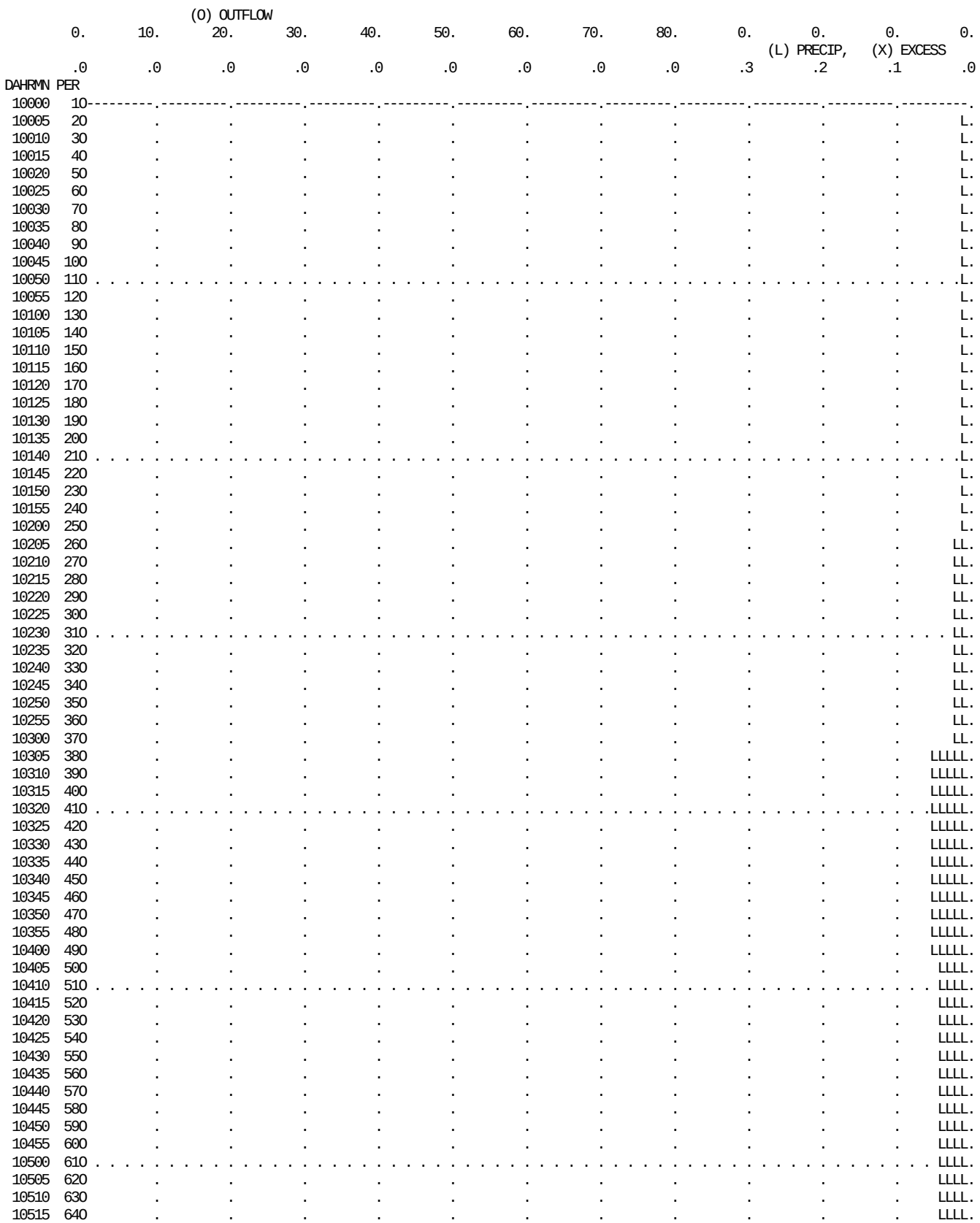
NMIN	5	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2 0	ENDING DATE
NDTIME	0055	ENDING TIME
ICENT	19	CENTURY MARK

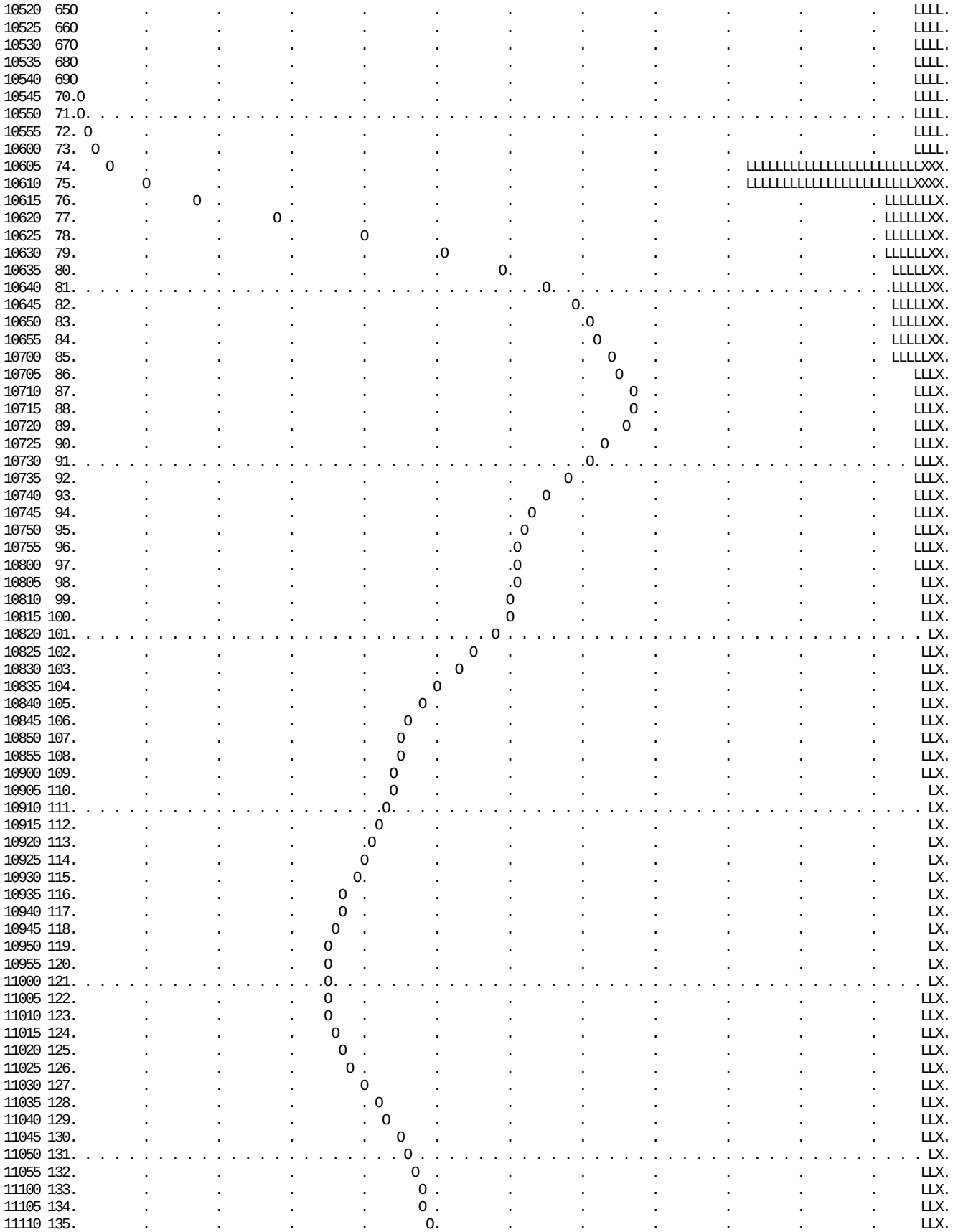
COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

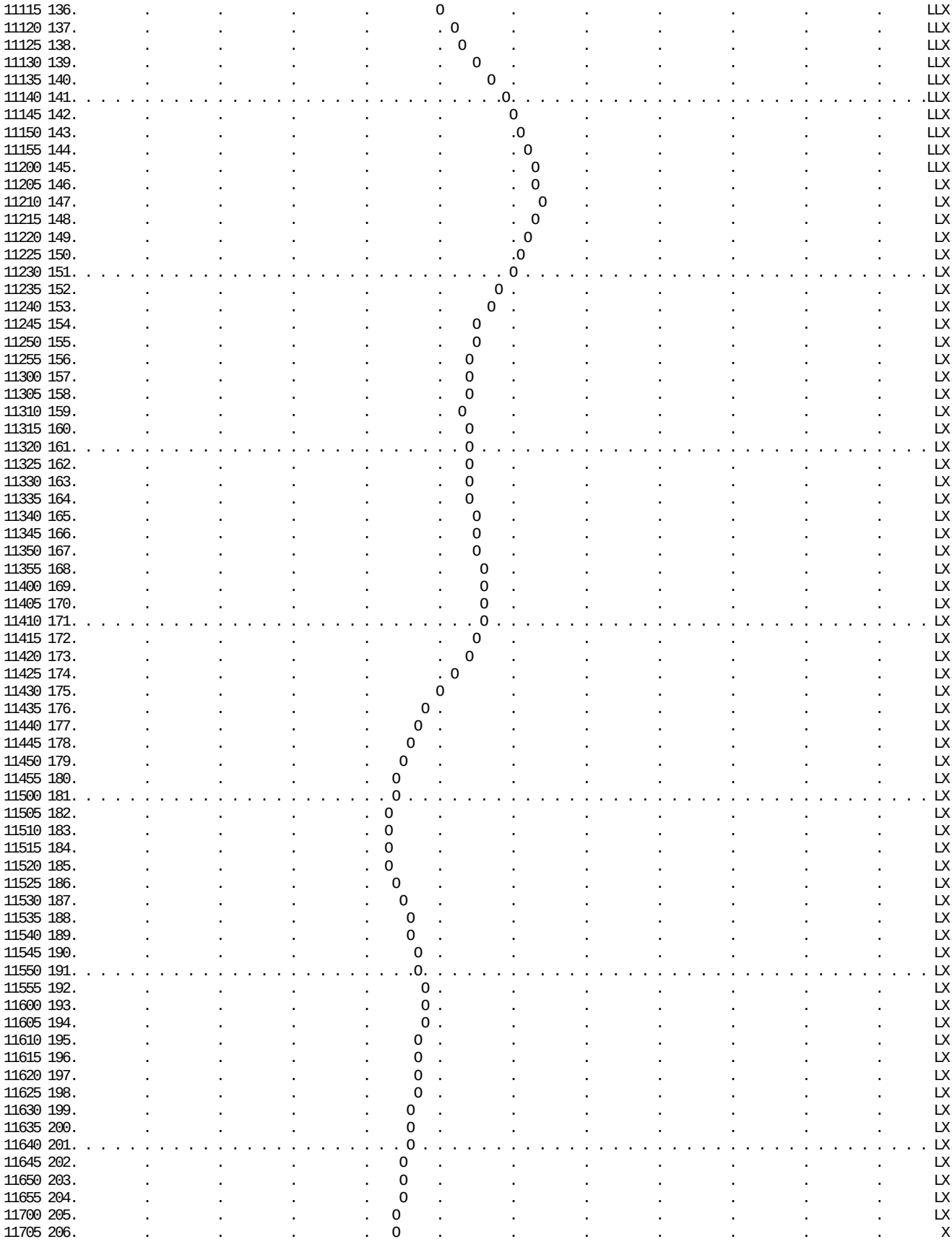
ENGLISH UNITS

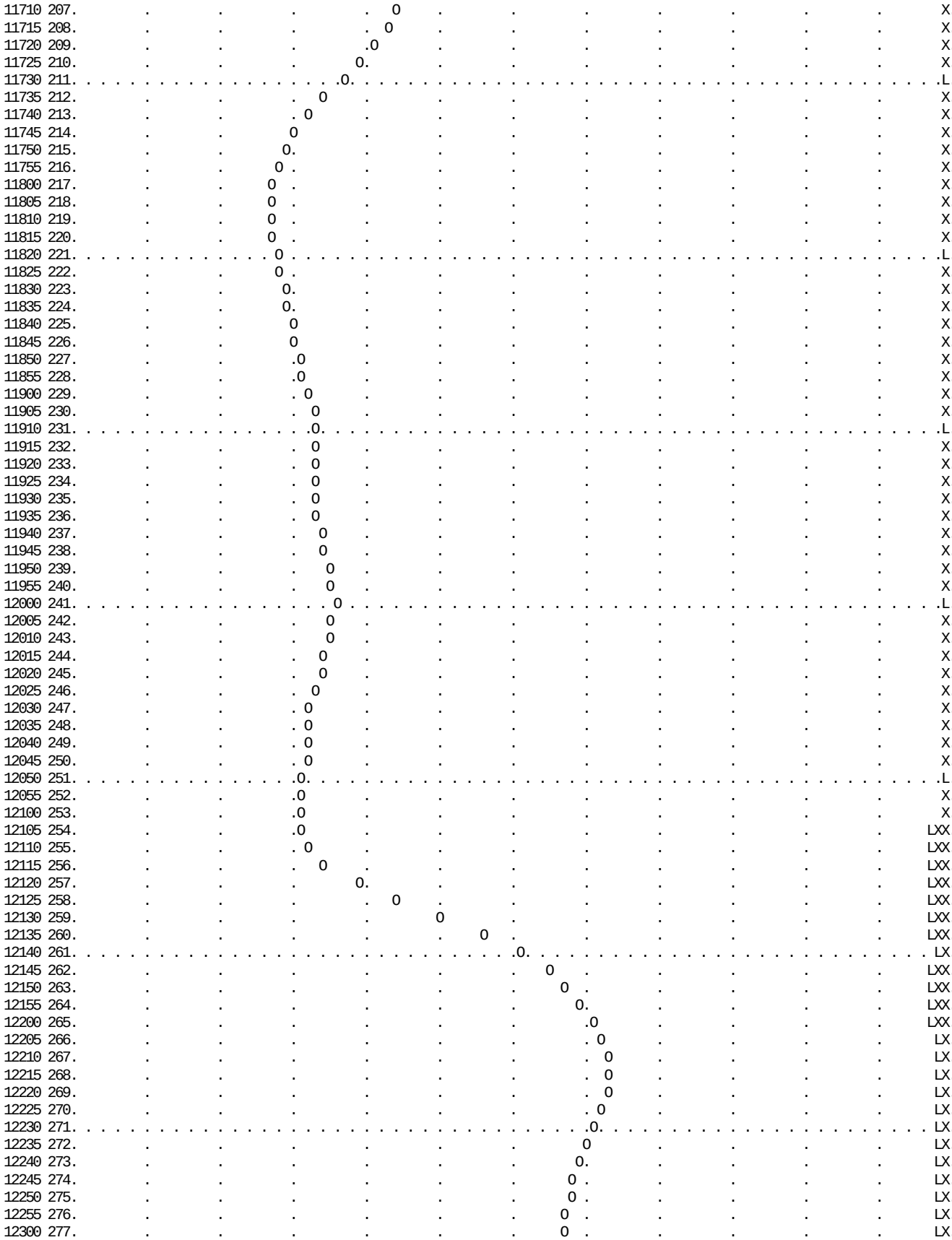
DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

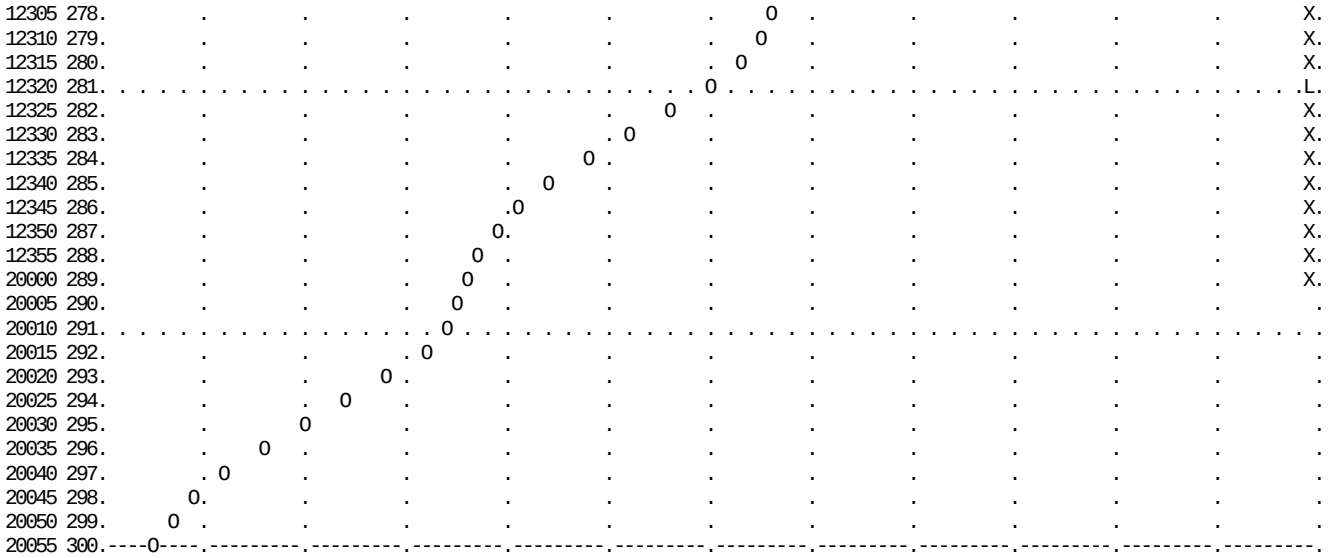
STATION WMSA-NQ










12305 278.
12310 279.
12315 280.
12320 281.
12325 282.
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12340 285.
12345 286.
12350 287.
12355 288.
20000 289.
20005 290.
20010 291.
20015 292.
20020 293.
20025 294.
20030 295.
20035 296.
20040 297.
20045 298.
20050 299.
20055 300.

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	WMSA-NQ	77.	7.25	54.	37.	35.	.59		

*** NORMAL END OF HEC-1 ***

APPENDIX C

DESILTATION BASIN ANALYSES

DESILTATION BASIN SIZING

Proposed Desiltation Basin Sizing using SWRCB Equation

Region	Desiltation Basin	Hydrology Study Node Number	Drainage Area, ac	Q25, cfs	As, sf	Minimum Basin Length, ft	Minimum Basin Width, ft
EMSA	30A	412	33.15	4.5	871	42	21
EMSA	30B	404	23.24	3.1	600	35	17
EMSA	30C	701	1.24	0.2	39	9	4
EMSA	30D	602	2.25	0.4	77	12	6
EMSA	30E	502	3.81	0.7	135	16	8
EMSA	31B	304	9.73	1.7	329	26	13
EMSA	31C	115	66.79	9.2	1,781	60	30
South Quarry	40A	213	52.65	8.5	1,645	57	29
South Quarry	40B	303	26.40	4.4	852	41	21
South Quarry	40C	425	72.84	10.3	1,994	63	32
South Quarry	40D	702	10.09	2.0	387	28	14
South Quarry	40E	602	5.61	1.0	194	20	10
South Quarry	40F	504	15.51	2.0	387	28	14
South Quarry	40G	113	22.73	4.5	871	42	21
North Quarry	50A	101	375.24	51.0	9,871	141	70
Topsoil Area	60A	205	24.11	4.4	852	41	21

Region	Desiltation Basin	Hydrology Study Node Number	Drainage Area, ac	Rain Gage Correction Factor	Unit Basin Storage Volume, in	BMP Volume, ac-ft	BMP Volume, cf
EMSA	30A	412	33.15	1.6	0.01	0.0444	1,932
EMSA	30B	404	23.24	1.6	0.01	0.0311	1,355
EMSA	30C	701	1.24	1.6	0.01	0.0017	72
EMSA	30D	602	2.25	1.6	0.01	0.0030	131
EMSA	30E	502	3.81	1.6	0.01	0.0051	222
EMSA	31B	304	9.73	1.6	0.01	0.0130	567
EMSA	31C	115	66.79	1.6	0.01	0.0894	3,893
South Quarry	40A	213	52.65	1.9	0.01	0.0833	3,627
South Quarry	40B	303	26.40	1.9	0.01	0.0418	1,819
South Quarry	40C	425	72.84	1.9	0.01	0.1152	5,018
South Quarry	40D	702	10.09	1.9	0.01	0.0160	695
South Quarry	40E	602	5.61	1.9	0.01	0.0089	386
South Quarry	40F	504	15.51	1.9	0.01	0.0245	1,068
South Quarry	40G	113	22.73	1.9	0.01	0.0359	1,566
North Quarry	50A	101	375.24	2.0	0.01	0.6391	27,839
Topsoil Area	60A	205	24.11	1.8	0.01	0.0352	1,533

Notes:
BMP Volume = Rain Gage Correction Factor x Unit Basin Storage Volume x Drainage Area
Rain gage correction factor = Site M.A.P. / Gage M.A.P. = Site M.A.P. / 13.7 (Site M.A.P. given in Appendix A)
CMSA flows into desiltation basins in EMSA

Attachment IV-1
Sizing Criteria Worksheets

These worksheets are designed to assist municipal staff and development project proponents in sizing stormwater treatment controls. Figures used in the computations can be found at the back of these worksheets.

I. Type of Treatment Measure Proposed for Project

1. Does the treatment measure (or part of a series of measures) operate based on the volume of water treated (i.e., detains an amount of runoff for a certain amount of time to allow solids and pollutants to settle to the bottom)? (See Table 1 for examples.)

_x_ Yes ____ No

If Yes, continue to Section II.—Sizing for Volume-Based Treatment Controls on page 2.
If No, continue to next question.

2. Does the treatment measure (or part of a series of measures) operate based on continuous flow of runoff through the device? (See Table 1 for examples.)

___ Yes _x_ No

If Yes, continue to Section III.—Sizing for Flow-Based Treatment Controls on page 8.

Table 1: Examples Of Volume-Based And Flow-Based Controls

Volume-based Controls	Flow-based Controls
Extended detention (dry) ponds	Vegetated swales
Wet ponds	Vegetated buffer strips
Infiltration trench	Media filters
Infiltration basin	Hydrodynamic separators
Bioretention areas	Wet vaults
Constructed wetlands	Other proprietary treatment devices

Attachment IV-1
Sizing for Volume-Based Treatment Controls

Section B — Sizing Volume-Based Treatment Controls based on the Adapted California Stormwater BMP Handbook Approach

The equation that will be used to size the BMP is:

BMP Volume = (Correction Factor) X (Unit Storage) X (Drainage Area to the BMP)

Step 1. Determine the drainage area for the BMP, A = varies acres

See spreadsheet for area tributary to each desiltation basin

Step 2. Determine the watershed impervious ratio, "*i*", which is the amount of impervious area in the drainage area to the BMP divided by the drainage area, or the percent of impervious area in the drainage area divided by 100.

a) Estimate the amount of impervious surface (rooftops, hardscape, streets, and sidewalks, etc.) in the area draining to the BMP = 0 acres

b) Calculate the watershed impervious ratio, *i*:

i = amount of impervious area (acres)/drainage area for the BMP (acres)

i = (**Step 2.a.**)/(**Step 1**) = 0 (range: 0-1)

Percent impervious area= i/100 = _____%

Step 3. Determine from Figure 1 the mean annual precipitation (MAP_{site}) at the project site location: (see Section II. Step 4 for more explanation.)

MAP_{site} = varies inches

EMSA = 22", S. Quarry = 26"
N. Quarry = 28", Topsoil Area = 24"

Step 4 Identify the reference rain gage closest to the project site from the following list and record the MAP_{gage}:

MAP_{gage} = 13.7 inches

Reference Rain Gages	**Mean Annual Precipitation (MAP_{gage}) (in)**
San Jose Airport	13.9
Palo Alto	13.7 <==
Gilroy	18.2
Morgan Hill	19.5

Attachment IV-1
Sizing for Volume-Based Treatment Controls

Section B —Adapted California Stormwater BMP Handbook Approach (continued)

Step 5 Determine the rain gage correction factor for the precipitation at the site using the information from **Step 3** and **Step 4**.

Correction Factor = MAP_{site} (**Step 3**)/MAP_{gage} (**Step 4**)

Correction Factor = see spreadsheet

Step 6. Identify representative soil type for the BMP drainage area.

a) Identify from Figure 1, the soil type that is representative of the pervious portion of the project shown here in order of increasing infiltration capability:

____ Clay ____ Sandy Clay ____ Clay Loam

____ Silt Loam __x__ Loam See Figure 1 in Appendix A

b) Does the site planning allow for protection of natural areas and associated vegetation and soils so that the soils outside the building footprint are not graded/compacted? yes

If your answer is no, and the soil will be compacted during site preparation and grading, the soil's infiltration ability will be decreased. Modify your answer to a soil with a lower infiltration rate (e.g., Silt Loam to Clay Loam or Clay).

Modified soil type: N/A

7. Determine the average slope for the drainage area for the BMP: > 15 %

8. Determine the unit basin storage volume from sizing curves.

a) Slope ≤ 1%,

Use the figure entitled "Unit Basin Volume for 80% Capture, 1% Slope" corresponding to the nearest rain gage: Figure 2-A, B, C, or D for San Jose, Palo Alto, Gilroy and Morgan Hill, respectively. Find the percent imperviousness of the drainage area (see answer to **Step 2**, above) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage on the y-axis.

Unit Basin Storage $(UBS)_{1\%}$ = _____(inches)

b) Slope ≥ 15%

*Use the figure entitled "Unit Basin Volume for 80% Capture, 15% Slope" corresponding to the nearest rain gage: Figure 3-A, B, C, or D for San Jose, Palo Alto, Gilroy and Morgan Hill, respectively. Find the percent imperviousness of the drainage area (see answer to **Step 2**, above) on the x-axis. From there, find the line corresponding to the soil type (from **Step 6**), and obtain the unit basin storage on the y-axis.*

Unit Basin Storage $UBS_{15\%}$ = 0.01 (inches)

Attachment IV-1
Sizing for Volume-Based Treatment Controls

Section B —Adapted California Stormwater BMP Handbook Approach (continued)

c) Slope > 1% and < 15%

*Find the unit basin volumes for 1% and 15% using the techniques in **Steps 8a** and **8b** and interpolate by appling a slope correction factor per the following formula:*

UBS_x= Unit Basin Storage of intermediate slope, x

$UBS_x = UBS_{1\%} + (UBS_{15\%} - UBS_1)*(x-1) / (15\% - 1\%)$
= (**Step 8a**) + (**Step 8b**- **Step 8a**) * (x-1)/15%-1%)

Unit Basin Storage volume = _____(inches)
(corrected for slope of site)

9. Size the BMP, using the following equation:

BMP Volume = Rain Gage Correction Factor * Unit Basin Storage Volume * Drainage Area

BMP Volume = (**Step 5**) * (**Step 8** unit storage) * (**Step 1** Drainage area) * 1 foot/12 in.

BMP Volume = _____ acre-feet See spreadsheet for results

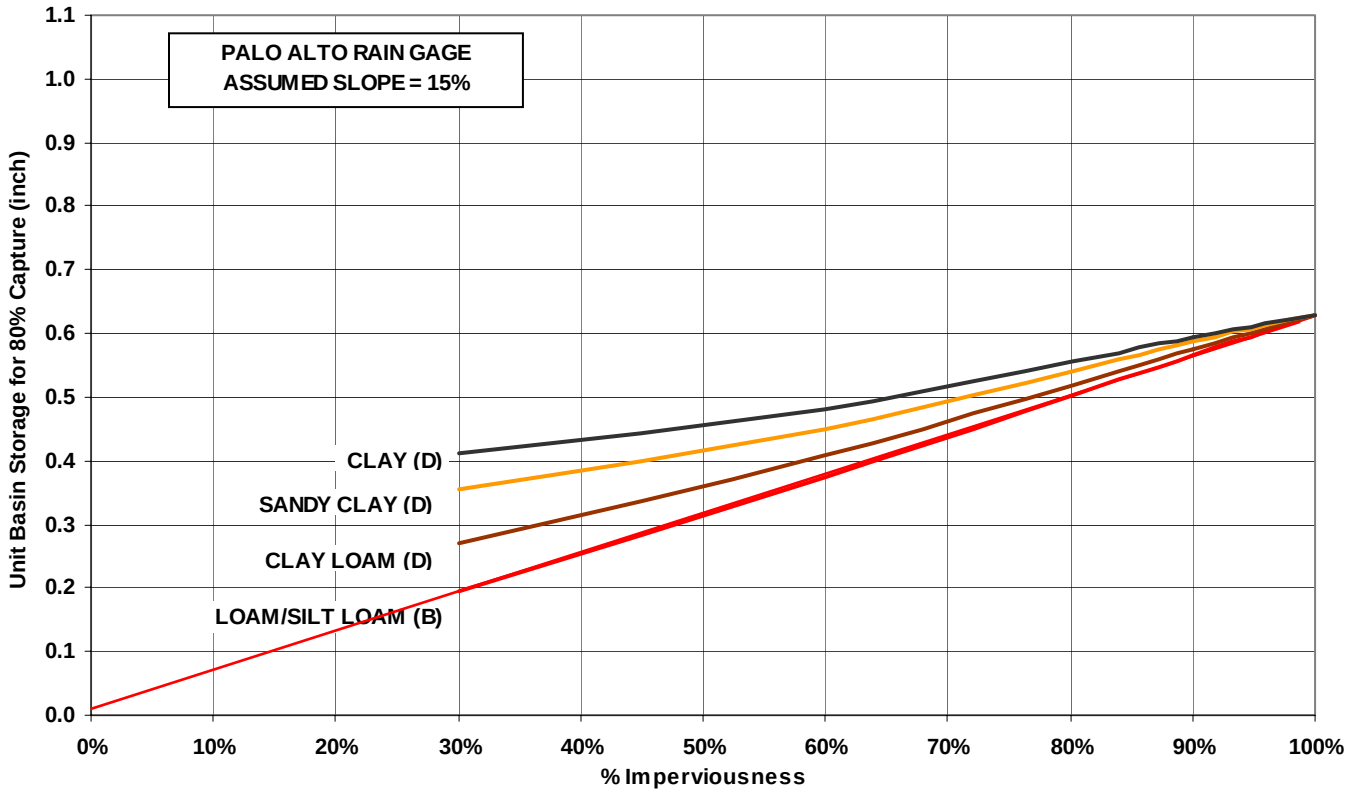
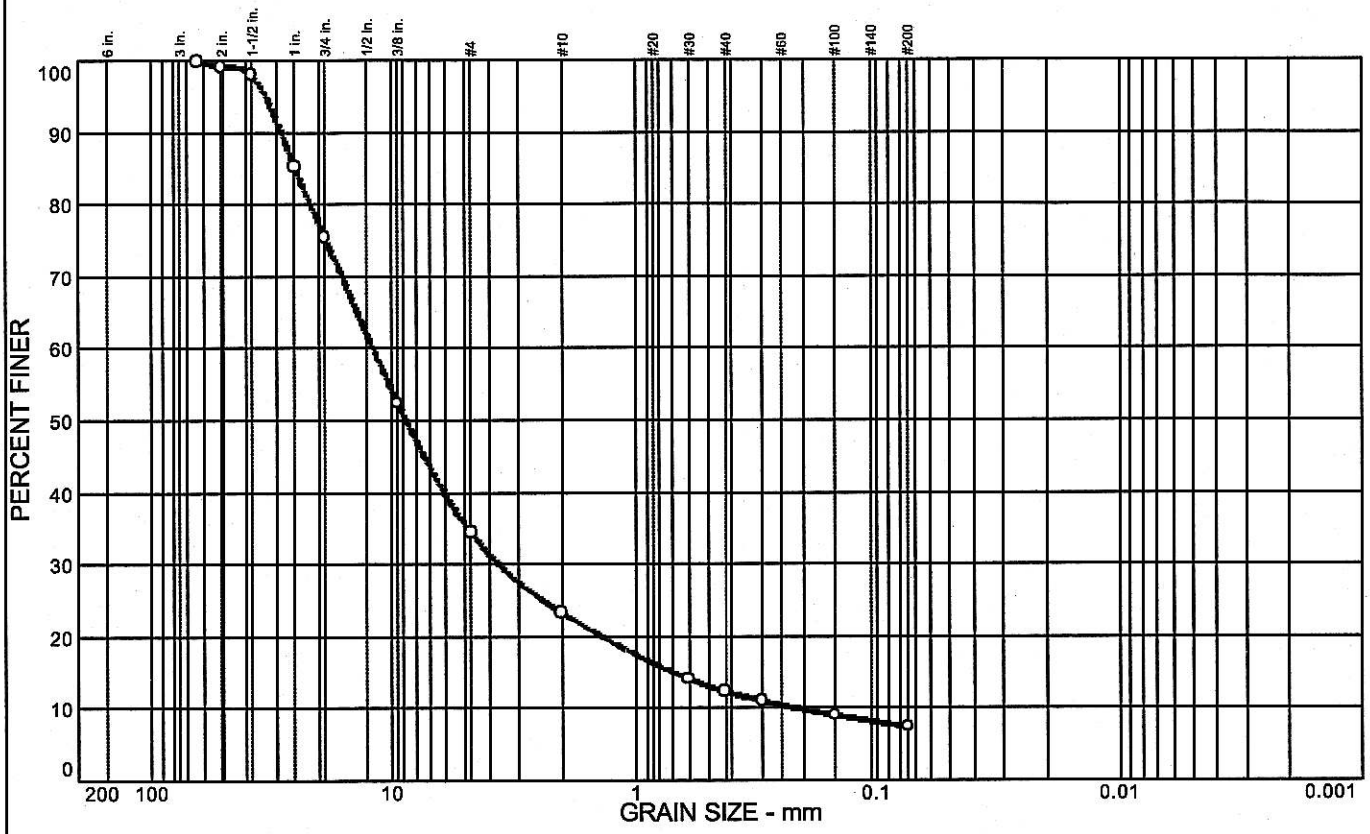


Figure 3-B Unit Basin Volume for 80% Capture - <u>Palo Alto Rain Gage</u>

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o		65.6	27.0	7.4					

SIEVE inches size	PERCENT FINER o		
2.5	100.0		
2	99.2		
1.5	98.0		
1	85.3		
3/4	75.5		
3/8	52.4		
	GRAIN SIZE		
D_{60}	12.0		
D_{30}	3.65		
D_{10}	0.220		
	COEFFICIENTS		
C_c	5.05		
C_u	54.84		

SIEVE number size	PERCENT FINER o		
#4	34.4		
#10	23.3		
#30	14.1		
#40	12.4		
#50	11.0		
#100	9.0		
#200	7.4		

SOIL DESCRIPTION

o Gray Poorly Graded GRAVEL w/ Silt & Sand

REMARKS:

o

o Source: TC-1

WASTE ROCK - EMSA

COOPER TESTING LABORATORY

Client: Golder Associates

Project: Hanson - 063-7109

Project No.: 287-036

Figure

Worksheet for Circular Orifice for North Quarry Riser

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	77.00	ft^3/s
Centroid Elevation	100.00	ft
Tailwater Elevation	90.00	ft
Discharge Coefficient	0.60	
Diameter	3.50	ft

Results

Headwater Elevation	102.76	ft
Headwater Height Above Centroid	2.76	ft
Tailwater Height Above Centroid	-10.00	ft
Flow Area	9.62	ft^2
Velocity	8.00	ft/s

Worksheet for Weir for North Quarry Riser

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	77.00	ft^3/s
Crest Elevation	100.00	ft
Weir Coefficient	3.00	US
Crest Length	11.00	ft

Results

Headwater Elevation	101.76	ft
Headwater Height Above Crest	1.76	ft
Flow Area	19.35	ft^2
Velocity	3.98	ft/s
Wetted Perimeter	14.52	ft
Top Width	11.00	ft

Worksheet for North Quarry Desilt Basin Pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.50	ft
Discharge	77.00	ft^3/s

Results

Normal Depth	2.29	ft
Flow Area	6.68	ft^2
Wetted Perimeter	6.60	ft
Hydraulic Radius	1.01	ft
Top Width	3.33	ft
Critical Depth	2.75	ft
Percent Full	65.5	%
Critical Slope	0.00638	ft/ft
Velocity	11.52	ft/s
Velocity Head	2.06	ft
Specific Energy	4.36	ft
Froude Number	1.43	
Maximum Discharge	108.22	ft^3/s
Discharge Full	100.60	ft^3/s
Slope Full	0.00586	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.54	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Orifice for Risers

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	12.70	ft^3/s
Centroid Elevation	100.00	ft
Tailwater Elevation	90.00	ft
Discharge Coefficient	0.60	
Diameter	2.00	ft

Results

Headwater Elevation	100.71	ft
Headwater Height Above Centroid	0.71	ft
Tailwater Height Above Centroid	-10.00	ft
Flow Area	3.14	ft^2
Velocity	4.04	ft/s

Worksheet for Weir for Risers

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	12.70	ft^3/s
Crest Elevation	100.00	ft
Weir Coefficient	3.00	US
Crest Length	6.28	ft

Results

Headwater Elevation	100.77	ft
Headwater Height Above Crest	0.77	ft
Flow Area	4.83	ft^2
Velocity	2.63	ft/s
Wetted Perimeter	7.82	ft
Top Width	6.28	ft

Worksheet for Desilt Basin Pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	2.00	ft
Discharge	12.70	ft^3/s

Results

Normal Depth	1.07	ft
Flow Area	1.71	ft^2
Wetted Perimeter	3.29	ft
Hydraulic Radius	0.52	ft
Top Width	1.99	ft
Critical Depth	1.28	ft
Percent Full	53.6	%
Critical Slope	0.00574	ft/ft
Velocity	7.41	ft/s
Velocity Head	0.85	ft
Specific Energy	1.92	ft
Froude Number	1.41	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.00315	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	53.58	%
Downstream Velocity	Infinity	ft/s

Worksheet for Broad Crested Weir for Spillway

Project Description

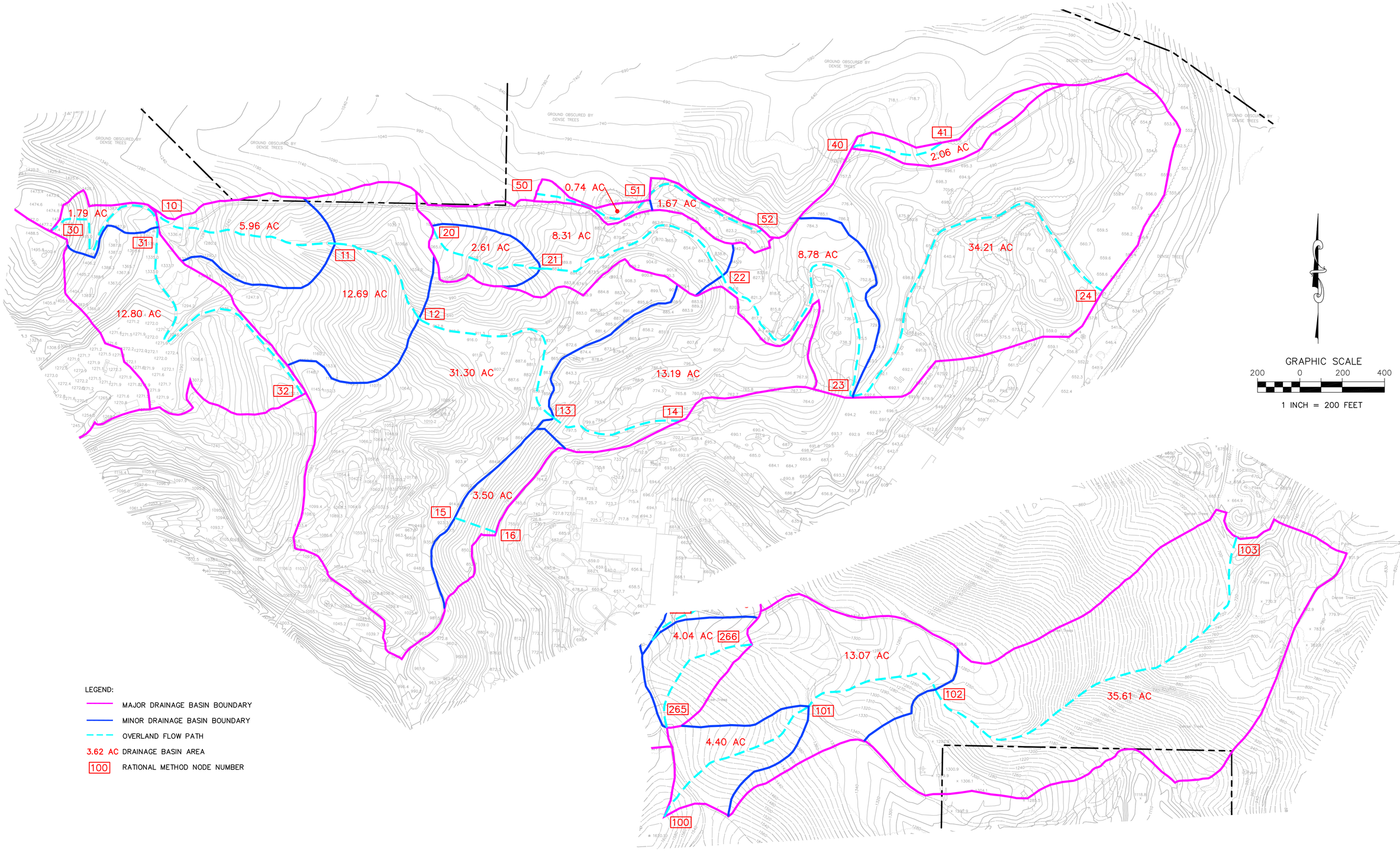
Solve For	Discharge

Input Data

Headwater Elevation		100.60	ft
Crest Elevation		100.00	ft
Tailwater Elevation		95.00	ft
Crest Surface Type	Gravel		
Crest Breadth		5.00	ft
Crest Length		10.00	ft

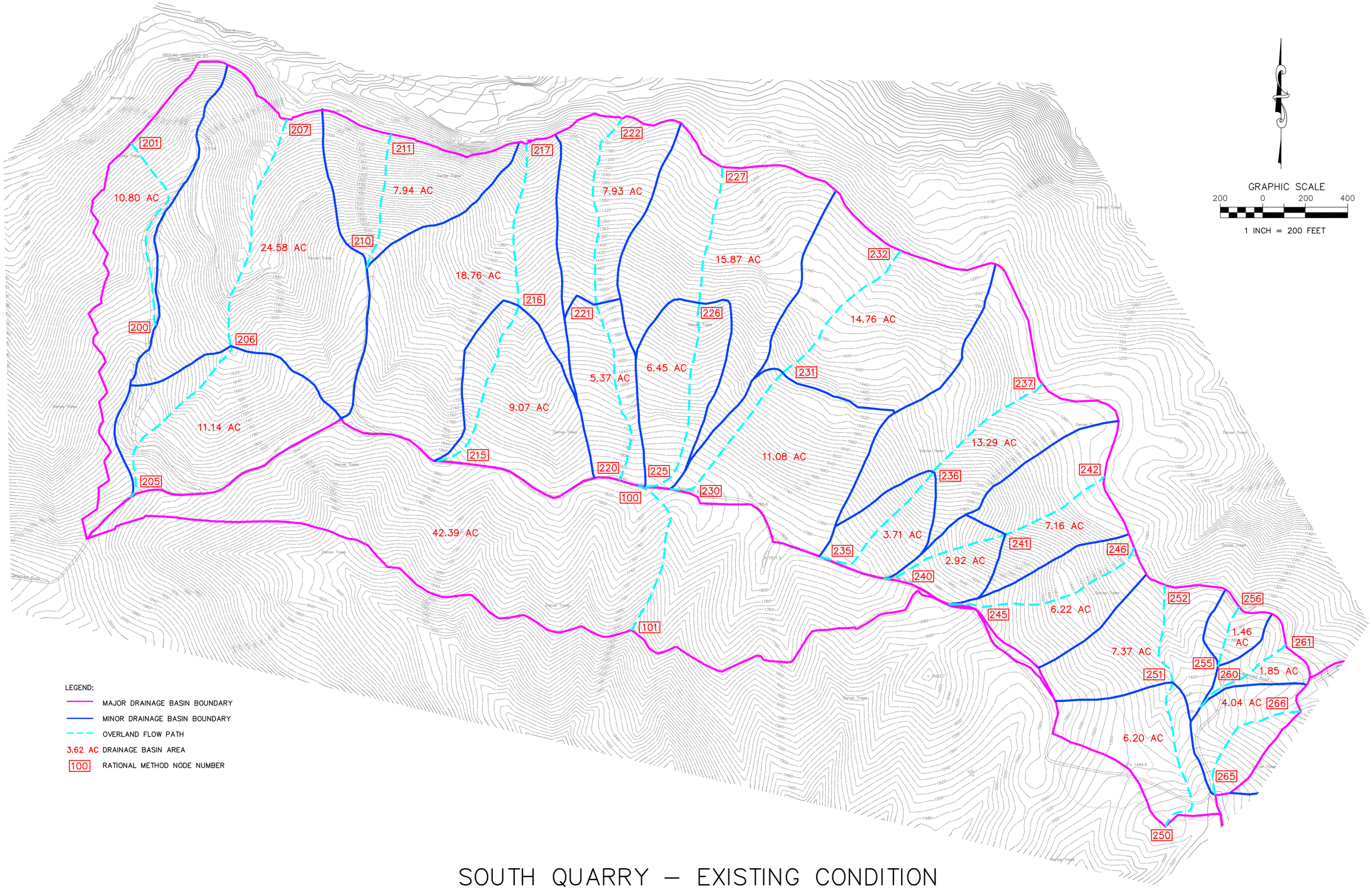
Results

Discharge	12.66	ft^3/s
Headwater Height Above Crest	0.60	ft
Tailwater Height Above Crest	-5.00	ft
Weir Coefficient	2.72	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.72	US
Flow Area	6.00	ft^2
Velocity	2.11	ft/s
Wetted Perimeter	11.20	ft
Top Width	10.00	ft



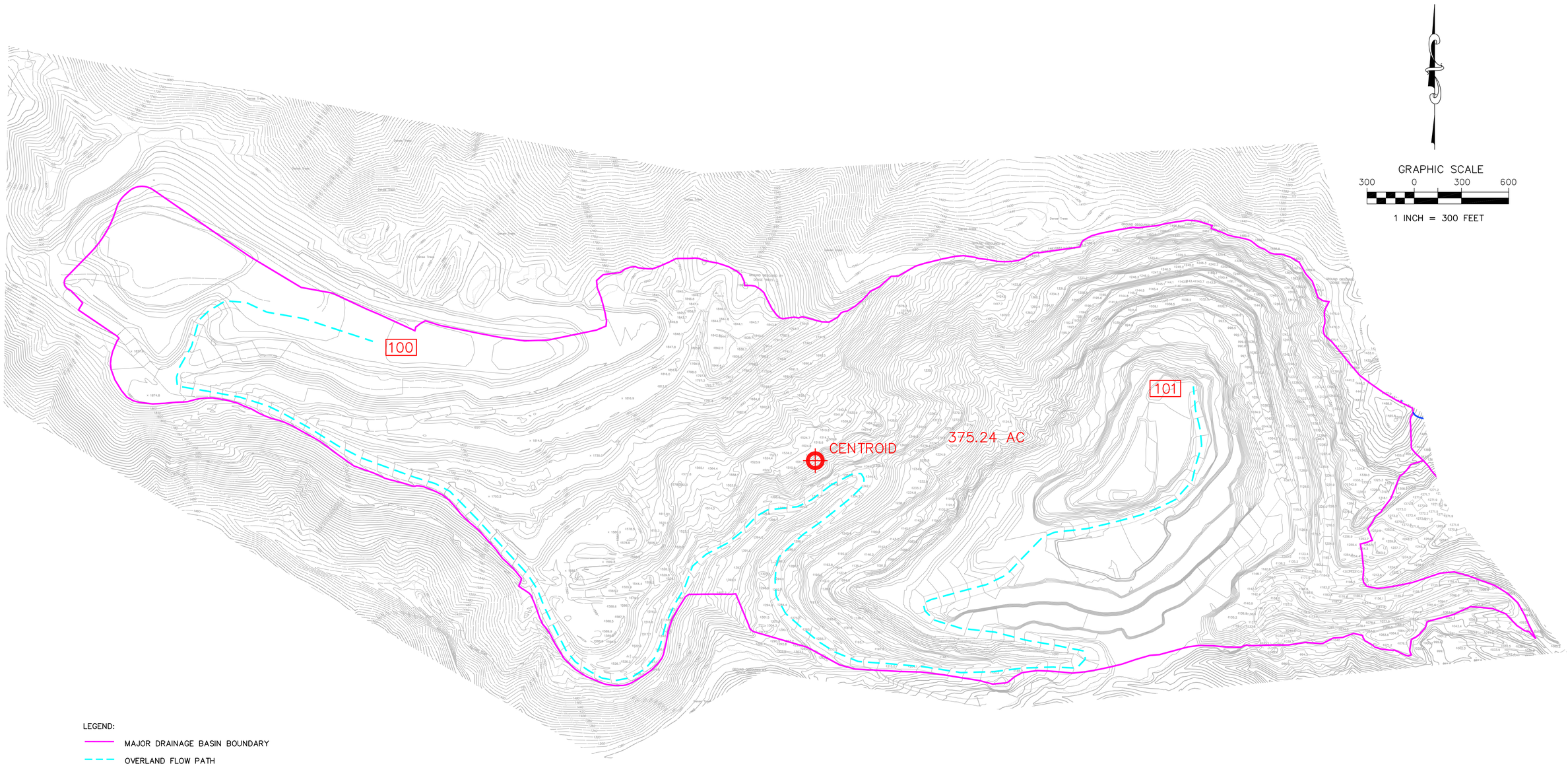
CMSA & TOPSOIL STORAGE AREA – EXISTING CONDITION

RATIONAL METHOD WORK MAP



SOUTH QUARRY – EXISTING CONDITION

RATIONAL METHOD WORK MAP

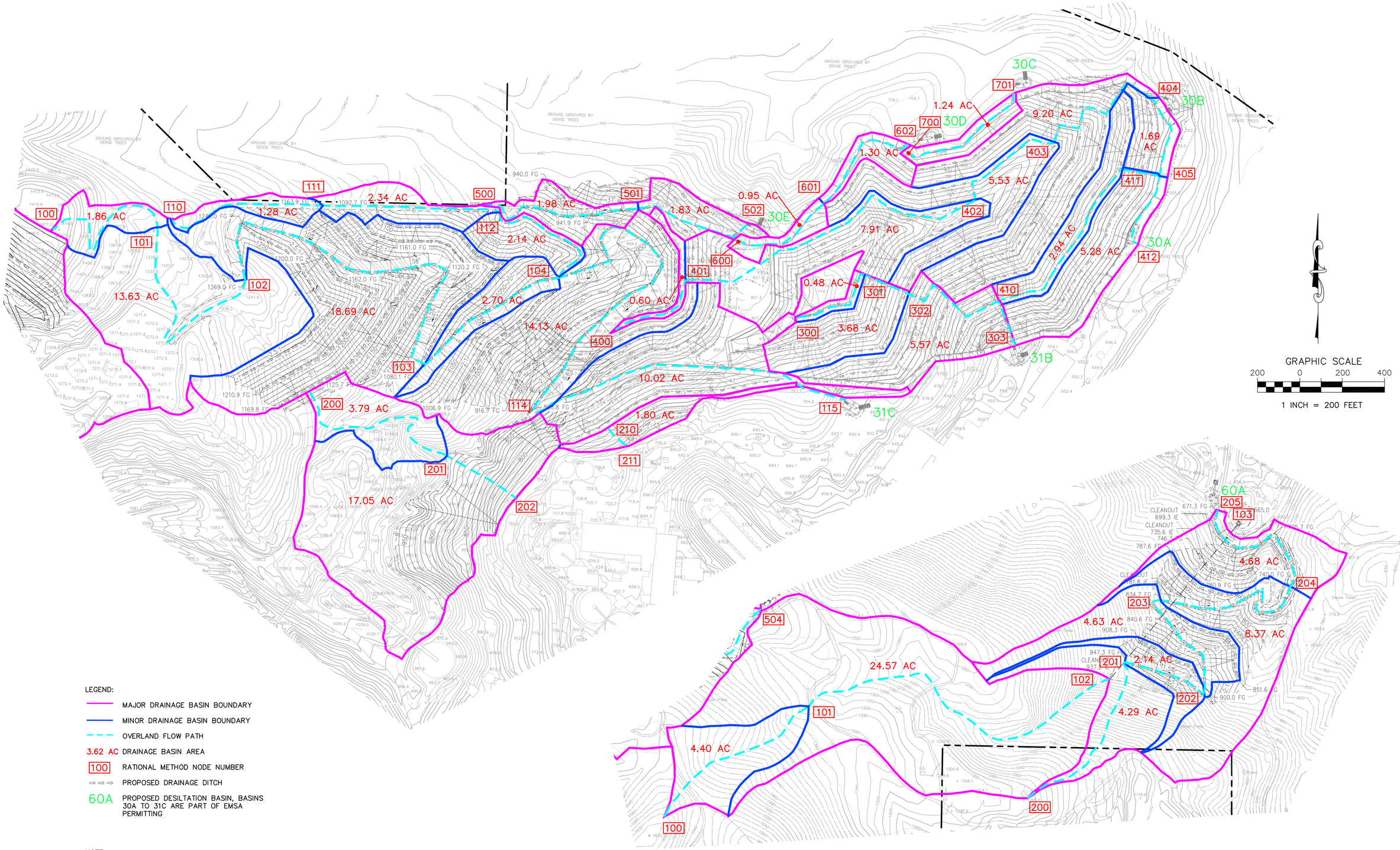


LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- 100 UNIT HYDROGRAPH NODE NUMBER

WMSA & NORTH QUARRY – EXISTING CONDITION

UNIT HYDROGRAPH WORK MAP



LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- MINOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- [100] RATIONAL METHOD NODE NUMBER
- ⇨⇨⇨ PROPOSED DRAINAGE DITCH
- 60A PROPOSED DESILTATION BASIN, BASINS 30A TO 31C ARE PART OF EMSA PERMITTING

NOTE:
THE DESILTATION BASINS ARE TEMPORARY AND WILL BE ALLOWED TO FILL ONCE THE VEGETATION ESTABLISHES. THE HYDROLOGIC ANALYSES WERE BASED ON THE FINAL POST-RECLAMATION CONDITIONS.

CMSA & TOPSOIL STORAGE AREA – PROPOSED CONDITION

RATIONAL METHOD WORK MAP

GRAPHIC SCALE

200 0 200 400

1 INCH = 200 FEET

LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- MINOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- 100 RATIONAL METHOD NODE NUMBER
- PROPOSED DRAINAGE DITCH
- 40A PROPOSED DESILTATION BASIN

NOTE:
THE DESILTATION BASINS ARE TEMPORARY AND WILL BE ALLOWED TO FILL ONCE THE VEGETATION ESTABLISHES. THE HYDROLOGIC ANALYSES WERE BASED ON THE FINAL POST–RECLAMATION CONDITIONS.

SOUTH QUARRY – PROPOSED CONDITION

RATIONAL METHOD WORK MAP

GRAPHIC SCALE

300 0 300 600

1 INCH = 300 FEET

100

CENTROID

375.24 AC

50A

101

PROPOSED
BRIDGE CROSSING

LEGEND:

- MAJOR DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW PATH
- 3.62 AC DRAINAGE BASIN AREA
- 100 UNIT HYDROGRAPH NODE NUMBER
- PROPOSED DRAINAGE DITCH
- 50A PROPOSED DESILTATION BASIN

NOTE:
THE HYDROLOGIC ANALYSES WERE BASED ON THE FINAL POST-RECLAMATION CONDITIONS.

WMSA & NORTH QUARRY – PROPOSED CONDITION

UNIT HYDROGRAPH WORK MAP