DRAINAGE REPORT

FOR THE

PERMANENTE QUARRY

December 6, 2011

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EXECUTIVE SUMMARY

Lehigh Southwest Cement Company is processing a Reclamation Plan Amendment for the Permanente Quarry (the Project). The quarry site currently includes an estimated 614 acres of existing and planned mining-related disturbance. The Project will reclaim the existing mining disturbance in the North Quarry, West Materials Storage Area, East Materials Storage Area, Rock Plant, Permanente Creek Reclamation Area, and Surge Pile areas.

The purpose of this drainage report is to perform an evaluation of the changes in surface drainage that will occur as a result of the proposed mining and reclamation activities at the quarry. The body of this report addresses drainage for the North Quarry and West Materials Storage Area. A drainage report for the East Materials Storage Area was prepared on April 14, 2009 and is incorporated in this report and contained in Attachment 1. A letter report for the Permanente Creek Reclamation Area was prepared on December 6, 2011 and is incorporated in this report and contained in Appendix D. Reclamation of the Rock Plant and Surge Pile involve minor grading that will not significantly alter flow rates or patterns, so the drainage in these areas has not been evaluated.

This report includes analysis and design for drainage and sediment control facilities required for reclamation of the Project's North Quarry, West Materials Storage Area, East Materials Storage Area, and Permanente Creek Reclamation Area. 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 terraces and desiltation basins, which will provide protection during operational and reclamation activities. Other best management practices (BMPs) for sediment control (landscaping, etc.) will be employed, as necessary.

- New desiltation basins will be constructed. 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).

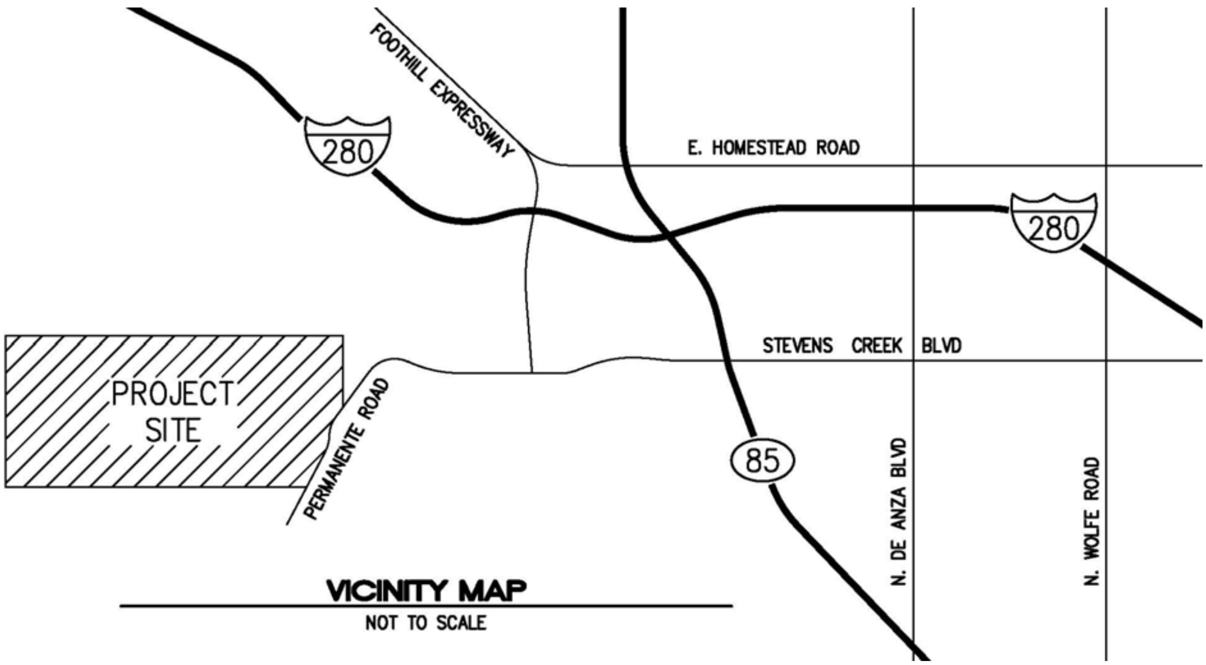
- Drainage controls will allow the Project to meet the storm water conveyance requirements within Santa Clara County's 2007 *Drainage Manual*, and as set forth in the Surface Mining and Reclamation Act (SMARA) (*California Code of Regulations*, Title 14, Section 3706), which collectively require storm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

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

- After reclamation, surface runoff from the North Quarry, West Materials Storage Area, East Materials Storage Area, and Permanente Creek Reclamation 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 quarry.

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 is being processed for existing and proposed portions of the site, including the West Materials Storage Area (WMSA), North Quarry, East Materials Storage Area (EMSA), Rock Plant, Surge Pile, and Permanente Creek Reclamation Area.



The WMSA is at the western end of the Reclamation Plan Amendment Area. The WMSA has historically been used for overburden material storage and is near or at capacity. As part of the proposed Reclamation Plan Amendment, the WMSA stockpile will be excavated and reduced to lower elevations with primarily south-facing slopes. The slopes will be meandering and intended to generally reflect natural, pre-quarry topography.

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 have maximum overall slope angles of 2.5 to 1 (horizontal to vertical) with benches at 50-foot vertical intervals and 2 to 1 inter-bench slopes. Under final reclamation, storm runoff from the North Quarry and WMSA will be conveyed to Permanente Creek.

The EMSA is a large fill area primarily used for storing overburden material. The EMSA will generally be reclaimed with maximum overall slope angles of 2.6 to 1 (horizontal to vertical), 2 to 1 inter-bench slopes, and be constructed from an elevation of just over 550 feet to just over 900 feet. Under final reclamation, storm runoff from the EMSA will be conveyed to Permanente

Creek. Drainage analyses for the EMSA are included in the April 14, 2009, *Drainage Report for Permanente Quarry East Materials Storage Area,* by Chang Consultants. The report is included in Attachment 1 of this report.

The Surge Pile is a large aggregate stockpile on an existing hillside area just over 1,500 feet southeast of the North Quarry. The stockpile will be removed to restore the historic hillside. Since the Surge Pile merely involves removing a stockpile, drainage analyses were not performed for this area.

The Rock Plant supports an existing aggregate processing plant and is located at the southeast corner of the Reclamation Plan Amendment area. The plant facilities and stockpiles will be removed from this area. Minor grading will be performed that preserves the existing surface runoff in a northeasterly direction towards Permanente Creek. Since the grading generally preserves the existing drainage pattern and all impervious surfaces will be removed, drainage analyses were not performed for this area.

This report contains drainage analyses of the post-reclamation flow rates from the proposed North Quarry, WMSA, and EMSA. 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 as well as after reclamation is complete (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 temporary desiltation basins that will be constructed at the North Quarry, WMSA, and EMSA. 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 in the North Quarry and WMSA (hydrologic analyses for the EMSA are included in Attachment 1). 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 independent major drainage areas (i.e., drainage areas with independent outfall locations) in the North Quarry and WMSA that are smaller than 200 acres. On the other hand, the unit hydrograph method (described in the second half of this section) was used to analyze the combined WMSA/North Quarry drainage area larger than 200 acres. 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 value used in the TDS equation is 28 inches.

- Drainage area: The proposed condition (i.e., post-reclamation) drainage basins were delineated from the base topography prepared for the site (flown in 2007 and 2008 with field adjustments in 2009) and the proposed Reclamation Plan Amendment grading representing the ultimate (Phase 2) configuration. The existing condition (pre-project) drainage basins were delineated from the base topography. The overall existing condition drainage area was set equal to the overall proposed condition drainage area 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 and a surface condition representative of a mineral extraction site. The current *Drainage Manual* provides a table (Table 3-1) of runoff coefficients for various land uses ranging from natural cover (parks, agricultural, open space, and shrub land) to development types (residential, commercial, industrial, and paved/impervious surfaces). The project site does not specifically fall within any of the *Drainage Manual's* land use categories. The pre-project site contains hilly terrain, with exposed rock/gravel surfaces, limited vegetal cover, and little surface storage. The post-project site will contain hill terrain, gravel/rock surfaces, hydroseeded and planted surfaces, and little surface storage. Since the current *Drainage Manual* does not specifically address the pre- and post-project conditions, Land Development Engineering provided Table 4 from the County's previous drainage manual as a guideline to develop a runoff coefficient for mined areas. For existing conditions, the selected values from Table 4 are a relief of 0.30, soil infiltration of 0.15, vegetal cover of 0.20, and surface storage of 0.15. This yields a runoff coefficient of 0.80. For proposed conditions, the same values for existing conditions were used except the vegetal cover was 0.10 to reflect a vegetated condition. The total proposed condition runoff coefficient is 0.70. It should be noted that the runoff coefficients from Table 4 can be higher that runoff coefficients based on the current drainage manual.

- 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 flow lengths in an initial subarea generally start at the most hydraulically distant (or highest) point in a drainage basin in accordance with the typical rational method procedure (this is discussed on page 17 of the *Drainage Manual)*. In some instances, a perimeter drainage basin (e.g., existing condition Basins 200, 400, and 500) can contain many potential flow paths within its initial subarea boundary, rather than a single well-defined flow path. In these instances, the flow path does not necessarily start at the highest point, but is located along the longest flow path within the initial subarea. This will generate the longest time of concentration and is in-line with the rational method concept of the "most hydraulically distant point."

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 flow paths. The program also allows for flow in separate streams to be confluenced.

The CivilDesign program requires a land use to be entered (e.g., undeveloped poor cover, etc.). However, the runoff coefficients used by the program were based on user-defined values defined above, 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 are included in Appendix A and summarized in Tables 1 and 2 for each major drainage basin.

Drainage Basin	Area, ac	25-Year Flow, cfs[1]	100-Year Flow, cfs
200	26.12	51	62
300	39.18	72	88
400	3.43	7	8
500	4.27	8	10
600	12.70	20	24

[1]cubic feet per second

Table 1. Summary of Overall Existing Condition Rational Method Results

Drainage Basin	Area, ac	25-Year Flow, cfs[1]	100-Year Flow, cfs
200	51.27	80	98
300	80.61	118	145

[1]cubic feet per second

Table 2. Summary of Overall Proposed Condition Rational Method Results

Unit Hydrograph Method

The majority of 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 existing and proposed condition 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 2) North Quarry and WMSA configurations. 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 existing condition was assigned a curve number of 86, which reflects barren cover (rock, eroded, and graded land) under soil group B and antecedent moisture condition II. The CN was adjusted to AMC II-1/2 (CN = 90) in accordance with County procedures. The proposed condition curve number was based on the shrub land category (CN = 62 for poor 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 = 71) for the 25- and 100-year analyses. The initial abstraction was equal to $0.2[(1000/CN) - 10]$ inches (or 0.22 for the existing condition and 0.82 for the proposed condition).

- 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 0.70 hours for the existing condition and 0.30 hours for the proposed condition.

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 3 and 4. The overall rational method and unit hydrograph post-project flow rates from the WMSA/North Quarry will be similar to the pre-project flow rates.

Region	Area, ac	25-Year Flow, cfs	100-Year Flow, cfs
WMSA/North Quarry	361.50	274	356

Table 3. Summary of Existing Condition Unit Hydrograph Method Results

Region	Area, ac	25-Year Flow, cfs	100-Year Flow, cfs
WMSA/North Quarry	315.32	150	235

Table 4. Summary of Proposed Condition Unit Hydrograph Method Results

The combined rational method and unit hydrograph results show that the project will result in an overall decrease in the 25- and 100-year flow rates. The combined 25-year flow rate reduces from 432 to 348 cfs, while the combined 100-year flow rate reduces from 548 to 478 cfs.

DESILTATION BASIN ANALYSES

The primary water quality pollutant generated from the North Quarry and WMSA will be sediment. 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 three locations along the project perimeter (at proposed condition rational method nodes 102, 204, and 304). The desiltation basins will be maintained until the vegetation has established. 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 or 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 contractor will be responsible for field fitting the basins based on the actual topographic conditions encountered during grading. From the available 10-foot contour interval topographic mapping and the proposed reclamation grading, the SCVURPPP method sizing will likely be easier to meet. At least one-foot of freeboard shall be provided in the basins.

The outlet works for the desiltation basins shall be sized to pass the 100-year flow rates. Normal depth analyses show that the minimum outlet pipes (assuming a 2 percent slope) for the basins at rational method nodes 102, 204, and 304 are a 54" RCP, 42" RCP, and 48" RCP. A riser shall be installed at the outlet works to allow sediment to be captured in the basins. Adjustments to the outlet pipe design may need to be made based on the actual field conditions.

The northerly and westerly graded slopes of the WMSA under Phase 1 will be temporary until Phase 2 develops. The area along the toe of the proposed slopes contain several existing depressions. Ditches will be added along the proposed slopes to direct the surface runoff from the slopes into the depressions for desilting. The depressions are naturally lined and intended to infiltrate the small tributary flows that are captured, so outlet facilities are not provided. The available storage volumes of the existing basins were estimated from the topographic mapping and range from 17,550 cubic feet to over 2,100,000 cubic feet. In comparison, the required storage volume of proposed desiltation basin 40A, which has a significantly larger tributary area, is 22,892 cubic feet. Based on this comparison, the existing depressions have ample storage for the potential sediment generated by the existing slopes. Similarly, the existing desiltation basin 40J has ample storage volume (54,000 cubic feet) for the tributary area.

CONCLUSION

Drainage analyses have been performed for the North Quarry, West Materials Storage Area, and East Materials Storage Area at the Permanente Quarry. The reclamation will ultimately include revegetation with overburden and topsoil materials for most areas. 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.

The Permanente Creek Reclamation Area includes some pre-SMARA slope areas along Permanente Creek. A letter report for the Permanente Creek Reclamation Area was prepared on December 6, 2011 and is and contained in Appendix D.

APPENDIX A

HYDROLOGIC INPUT DATA

AND ANALYSES

RATIONAL METHOD INPUT DATA

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

WMSA/North Quarry

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
200-202	1,750.0	1,650.0	156	0.64	10.5
300-302	1,977.0	1,842.0	721	0.19	12.4
400-402	1,860.0	1,716.0	278	0.52	10.8
500-502	1,500.4	1,355.0	386	0.38	11.1
600-602	1,183.4	1,100.0	1000	0.08	14.1

Proposed Conditions

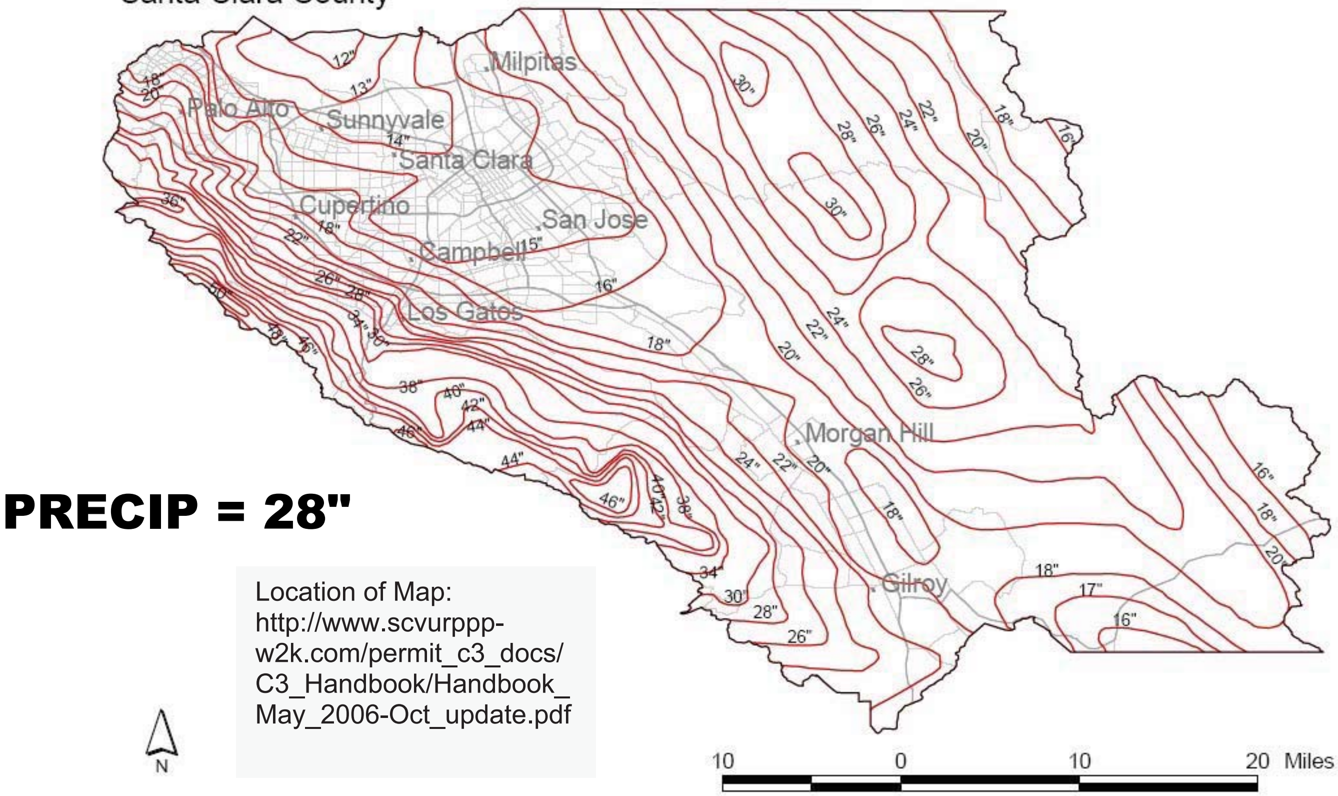
WMSA/North Quarry

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
200-202	1912.0	1650.0	932	0.28	12.5
300-302	1952.0	1810.0	468	0.30	11.4
310-312	1940.0	1800.0	942	0.15	13.2

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

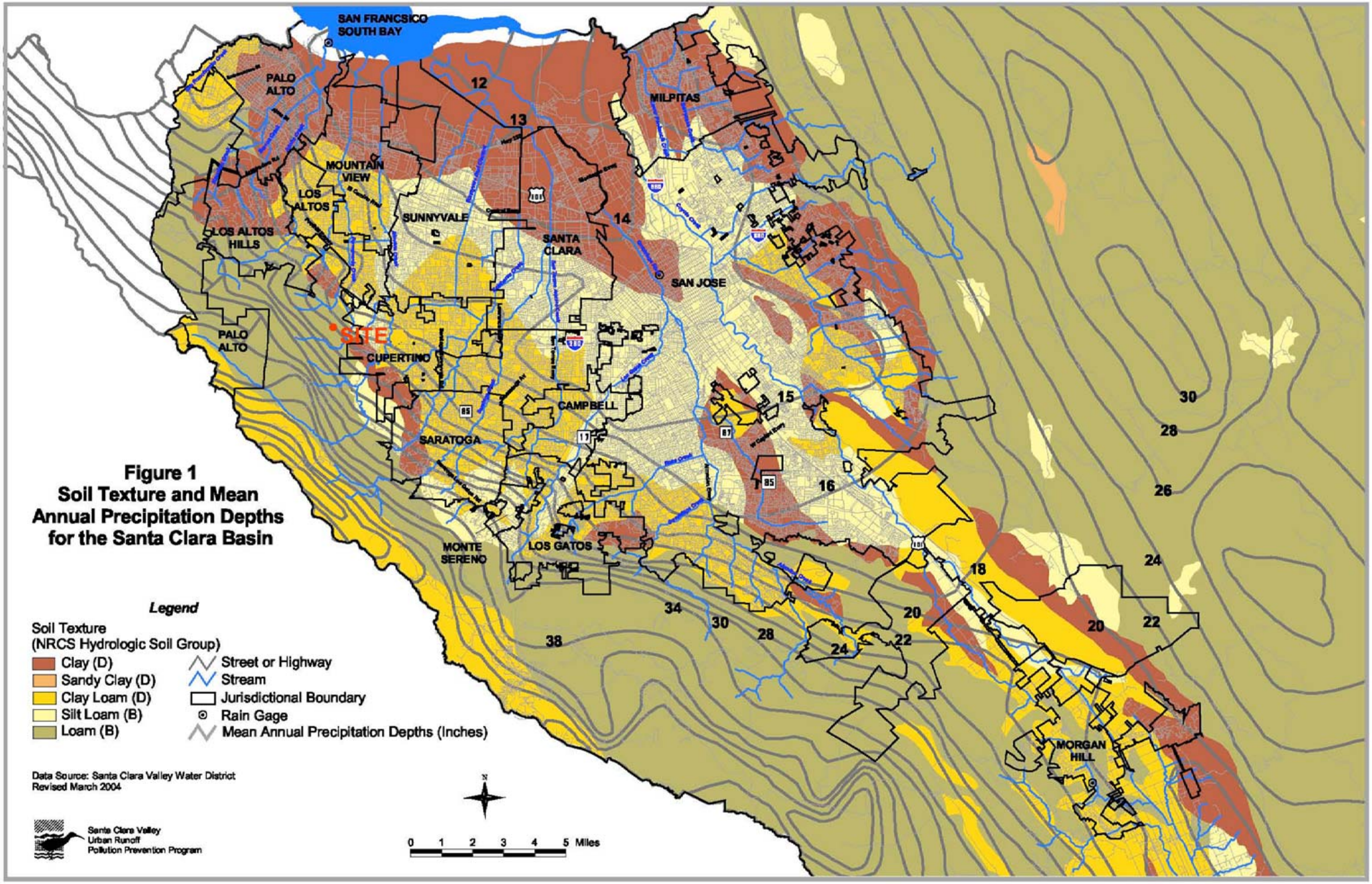


Figure 1
Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin

Table 4

Runoff Coefficients for Agricultural and Open Areas *

RUNOFF PRODUCING CHARACTERISTICS	WATERSHED CHARACTERISTICS: A RELIEF	B SOIL INFILTRATION	C VEGETAL COVER	D SURFACE STORAGE
EXTREME	0.40 Steep rugged terrain average slopes greater than 30%	0.20 No effective soil cover; either rock or thin soil mantle negligible infiltration capacity	0.20 No effective plant cover; bare or very sparse soil cover	0.20 Negligible; surface depression few and shallow; drainage ways steep and small, no ponds or marshes
HIGH	0.30 Hilly with average slopes of 10 to 30%	0.15 Slow to take up water; clay or other soil of low infiltration capacity such as heavy gumbo	0.15 Poor to fair; clean cultivated crops or poor natural cover; less than 10% of area under good cover	0.15 Low; well defined system of small drainage ways; no ponds or marshes
NORMAL	0.20 Rolling with average slopes of 5 to 10%	0.10 Normal, deep loam	0.10 Fair to good; about 50% of area in good grass land, woodland or equivalent cover	0.10 Normal; considerable surface depression storage; typical of prairie lands; lakes, ponds and marshes less than 20% of area
LOW	0.10 Relatively flat land average slopes 0 to 5%	0.05 High; deep sand or other soil that takes up water readily and rapidly	0.05 Good to excellent; about 90% of area in good grass land, woodland or equivalent cover	0.05 High; surface depression storage high; drainage system not sharply defined, Lg. flood plain storage; large number of ponds and marshes

NOTE: Runoff coefficient is equal to sum of coefficients from the appropriate block in Rows A, B, C and D.

* After H. L. Cook, as published in Engineering for Agricultural Drainage, by Harry B. Roe and Quincy C. Ayres, McGraw-Hill Book Co., Inc., New York, 1954, p. 105.

EXISTING CONDITION
(PRE-PROJECT)
ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 07/26/11

North Quarry and West Materials 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		3.672(In.)
2	10.000		2.554(In.)
3	15.000		2.019(In.)
4	30.000		1.376(In.)
5	60.000		0.976(In.)
6	120.000		0.741(In.)
7	180.000		0.643(In.)
8	360.000		0.504(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      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   156.000(Ft.)
Top (of initial area) elevation =  1750.000(Ft.)
Bottom (of initial area) elevation =  1650.000(Ft.)
Difference in elevation =   100.000(Ft.)
Slope =    0.64103  s(%)=      64.10
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      2.500(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     22.284(CFS)
Total initial stream area =       11.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1464.000(Ft.)
Channel length thru subarea  =   934.000(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 =     37.267(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     37.267(CFS)
Depth of flow =   0.762(Ft.), Average velocity =  13.866(Ft/s)
Channel flow top width =    5.050(Ft.)
Flow Velocity =   13.87(Ft/s)
Travel time  =    1.12 min.
Time of concentration =   11.62 min.
Critical depth =      1.391(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      2.380(In/Hr) for a    25.0 year storm
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Subarea runoff =     28.526(CFS) for     14.980(Ac.)
Total runoff =     50.811(CFS)   Total area =      26.120(Ac.)


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Process from Point/Station      202.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     26.120(Ac.)
Runoff from this stream =     50.811(CFS)
Time of concentration =   11.62 min.
Rainfall intensity =     2.380(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   721.000(Ft.)
Top (of initial area) elevation =  1977.000(Ft.)
Bottom (of initial area) elevation =  1842.000(Ft.)
Difference in elevation =   135.000(Ft.)
Slope =    0.18724  s(%)=      18.72
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.400 min.
Rainfall intensity =      2.297(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     72.003(CFS)
Total initial stream area =       39.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     39.180(Ac.)
Runoff from this stream =     72.003(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     2.297(In/Hr)
Program is now starting with Main Stream No. 3


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Process from Point/Station      400.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   278.000(Ft.)
Top (of initial area) elevation =  1860.000(Ft.)
Bottom (of initial area) elevation =  1716.000(Ft.)
Difference in elevation =   144.000(Ft.)
Slope =    0.51799  s(%)=      51.80
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      2.468(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      6.773(CFS)
Total initial stream area =        3.430(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      402.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      3.430(Ac.)
Runoff from this stream =      6.773(CFS)
Time of concentration =   10.80 min.
Rainfall intensity =     2.468(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   386.000(Ft.)
Top (of initial area) elevation =  1500.400(Ft.)
Bottom (of initial area) elevation =  1355.000(Ft.)
Difference in elevation =   145.400(Ft.)
Slope =    0.37668  s(%)=      37.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.100 min.
Rainfall intensity =      2.436(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      8.322(CFS)
Total initial stream area =        4.270(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      502.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      4.270(Ac.)
Runoff from this stream =      8.322(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     2.436(In/Hr)
Program is now starting with Main Stream No. 5


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1183.400(Ft.)
Bottom (of initial area) elevation =  1100.000(Ft.)
Difference in elevation =    83.400(Ft.)
Slope =    0.08340  s(%)=       8.34
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.100 min.
Rainfall intensity =      2.115(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      3.486(CFS)
Total initial stream area =        2.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      604.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1100.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Channel length thru subarea  =  1067.000(Ft.)
Channel base width    =    5.000(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 =     12.489(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     12.489(CFS)
Depth of flow =   0.422(Ft.), Average velocity =   5.069(Ft/s)
Channel flow top width =    6.686(Ft.)
Flow Velocity =    5.07(Ft/s)
```

```
Travel time  =    3.51 min.
Time of concentration =   17.61 min.
Critical depth =      0.539(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.907(In/Hr) for a    25.0 year storm
Subarea runoff =     16.234(CFS) for     10.640(Ac.)
Total runoff =     19.720(CFS)   Total area =      12.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      604.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =     12.700(Ac.)
Runoff from this stream =     19.720(CFS)
Time of concentration =   17.61 min.
Rainfall intensity =     1.907(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
      50.811      72.003       6.773       8.322      19.720
Area of streams before confluence:
       26.120       39.180        3.430        4.270       12.700


Results of confluence:
Total flow rate =    157.630(CFS)
Time of concentration =    11.623 min.
Effective stream area after confluence  =     85.700(Ac.)
End of computations, total study area =          85.700 (Ac.)
```

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          UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989- 2005 Version 7.1
     Rational Hydrology Study        Date: 07/26/11
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North Quarry and West Materials Storage Area
Existing Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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------------------------------------------------------------------------
 *********   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                     4.443(In.)
2                10.000                     3.120(In.)
3                15.000                     2.465(In.)
4                30.000                     1.660(In.)
5                60.000                     1.164(In.)
6               120.000                     0.873(In.)
7               180.000                     0.757(In.)
8               360.000                     0.601(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      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   156.000(Ft.)
Top (of initial area) elevation =  1750.000(Ft.)
Bottom (of initial area) elevation =  1650.000(Ft.)
Difference in elevation =   100.000(Ft.)
Slope =    0.64103  s(%)=      64.10
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.500 min.
Rainfall intensity =      3.055(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     27.222(CFS)
Total initial stream area =       11.140(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1464.000(Ft.)
Channel length thru subarea  =   934.000(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 =     45.524(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     45.524(CFS)
Depth of flow =   0.844(Ft.), Average velocity =  14.637(Ft/s)
Channel flow top width =    5.374(Ft.)
Flow Velocity =   14.64(Ft/s)
Travel time  =    1.06 min.
Time of concentration =   11.56 min.
Critical depth =      1.547(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      2.915(In/Hr) for a   100.0 year storm
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Subarea runoff =     34.935(CFS) for     14.980(Ac.)
Total runoff =     62.157(CFS)   Total area =      26.120(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     26.120(Ac.)
Runoff from this stream =     62.157(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     2.915(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   721.000(Ft.)
Top (of initial area) elevation =  1977.000(Ft.)
Bottom (of initial area) elevation =  1842.000(Ft.)
Difference in elevation =   135.000(Ft.)
Slope =    0.18724  s(%)=      18.72
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.400 min.
Rainfall intensity =      2.806(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     87.939(CFS)
Total initial stream area =       39.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     39.180(Ac.)
Runoff from this stream =     87.939(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     2.806(In/Hr)
Program is now starting with Main Stream No. 3


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Process from Point/Station      400.000 to Point/Station      402.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   278.000(Ft.)
Top (of initial area) elevation =  1860.000(Ft.)
Bottom (of initial area) elevation =  1716.000(Ft.)
Difference in elevation =   144.000(Ft.)
Slope =    0.51799  s(%)=      51.80
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.800 min.
Rainfall intensity =      3.015(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      8.274(CFS)
Total initial stream area =        3.430(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      402.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      3.430(Ac.)
Runoff from this stream =      8.274(CFS)
Time of concentration =   10.80 min.
Rainfall intensity =     3.015(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      502.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   386.000(Ft.)
Top (of initial area) elevation =  1500.400(Ft.)
Bottom (of initial area) elevation =  1355.000(Ft.)
Difference in elevation =   145.400(Ft.)
Slope =    0.37668  s(%)=      37.67
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.100 min.
Rainfall intensity =      2.976(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =     10.166(CFS)
Total initial stream area =        4.270(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      502.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      4.270(Ac.)
Runoff from this stream =     10.166(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     2.976(In/Hr)
Program is now starting with Main Stream No. 5


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      602.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1183.400(Ft.)
Bottom (of initial area) elevation =  1100.000(Ft.)
Difference in elevation =    83.400(Ft.)
Slope =    0.08340  s(%)=       8.34
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   14.100 min.
Rainfall intensity =      2.583(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      4.257(CFS)
Total initial stream area =        2.060(Ac.)


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Process from Point/Station      602.000 to Point/Station      604.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1100.000(Ft.)
Downstream point elevation =  1056.000(Ft.)
Channel length thru subarea  =  1067.000(Ft.)
Channel base width    =    5.000(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 =     15.249(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     15.249(CFS)
Depth of flow =   0.473(Ft.), Average velocity =   5.419(Ft/s)
Channel flow top width =    6.893(Ft.)
Flow Velocity =    5.42(Ft/s)
```

```
Travel time  =    3.28 min.
Time of concentration =   17.38 min.
Critical depth =      0.609(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      2.337(In/Hr) for a   100.0 year storm
Subarea runoff =     19.894(CFS) for     10.640(Ac.)
Total runoff =     24.151(CFS)   Total area =      12.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      604.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 5
Stream flow area =     12.700(Ac.)
Runoff from this stream =     24.151(CFS)
Time of concentration =   17.38 min.
Rainfall intensity =     2.337(In/Hr)

Total of 5 main streams to confluence:
Flow rates before confluence point:
      62.157      87.939       8.274      10.166      24.151
Area of streams before confluence:
       26.120       39.180        3.430        4.270       12.700


Results of confluence:
Total flow rate =    192.686(CFS)
Time of concentration =    11.564 min.
Effective stream area after confluence  =     85.700(Ac.)
End of computations, total study area =          85.700 (Ac.)
```

PROPOSED CONDITION

(POST-PROJECT)

ANALYSES

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 07/26/11

North Quarry and West Materials 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		3.672(In.)
2	10.000		2.554(In.)
3	15.000		2.019(In.)
4	30.000		1.376(In.)
5	60.000		0.976(In.)
6	120.000		0.741(In.)
7	180.000		0.643(In.)
8	360.000		0.504(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      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   932.000(Ft.)
Top (of initial area) elevation =  1912.000(Ft.)
Bottom (of initial area) elevation =  1650.000(Ft.)
Difference in elevation =   262.000(Ft.)
Slope =    0.28112  s(%)=      28.11
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.500 min.
Rainfall intensity =      2.287(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =     47.440(CFS)
Total initial stream area =       29.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1462.000(Ft.)
Channel length thru subarea  =  1001.000(Ft.)
Channel base width    =    5.000(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 =     64.750(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     64.750(CFS)
Depth of flow =   0.650(Ft.), Average velocity =  13.104(Ft/s)
Channel flow top width =   10.201(Ft.)
Flow Velocity =   13.10(Ft/s)
Travel time  =    1.27 min.
Time of concentration =   13.77 min.
Critical depth =      1.219(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.150(In/Hr) for a    25.0 year storm
```

```
Subarea runoff =     32.557(CFS) for     21.630(Ac.)
Total runoff =     79.998(CFS)   Total area =      51.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     51.270(Ac.)
Runoff from this stream =     79.998(CFS)
Time of concentration =   13.77 min.
Rainfall intensity =     2.150(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   468.000(Ft.)
Top (of initial area) elevation =  1952.000(Ft.)
Bottom (of initial area) elevation =  1810.000(Ft.)
Difference in elevation =   142.000(Ft.)
Slope =    0.30342  s(%)=      30.34
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.400 min.
Rainfall intensity =      2.404(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      8.129(CFS)
Total initial stream area =       4.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1810.000(Ft.)
Downstream point elevation =  1510.000(Ft.)
Channel length thru subarea  =  2189.000(Ft.)
Channel base width    =    5.000(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 =     66.939(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     66.939(CFS)
```

```
Depth of flow =   0.719(Ft.), Average velocity =  11.827(Ft/s)
Channel flow top width =   10.750(Ft.)
Flow Velocity =   11.83(Ft/s)
Travel time  =    3.08 min.
Time of concentration =   14.48 min.
Critical depth =      1.250(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.074(In/Hr) for a    25.0 year storm
Subarea runoff =    101.473(CFS) for     69.890(Ac.)
Total runoff =    109.601(CFS)   Total area =      74.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     74.720(Ac.)
Runoff from this stream =    109.601(CFS)
Time of concentration =   14.48 min.
Rainfall intensity =     2.074(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      312.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average 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 =  1940.000(Ft.)
Bottom (of initial area) elevation =  1800.000(Ft.)
Difference in elevation =   140.000(Ft.)
Slope =    0.14862  s(%)=      14.86
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.200 min.
Rainfall intensity =      2.212(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      3.963(CFS)
Total initial stream area =        2.560(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1800.000(Ft.)
Downstream point elevation =  1510.000(Ft.)
Channel length thru subarea  =  1335.000(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 =      6.541(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      6.541(CFS)
Depth of flow =   0.293(Ft.), Average velocity =   8.637(Ft/s)
Channel flow top width =    3.172(Ft.)
Flow Velocity =    8.64(Ft/s)
Travel time  =    2.58 min.
Time of concentration =   15.78 min.
Critical depth =      0.570(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.986(In/Hr) for a    25.0 year storm
Subarea runoff =      4.629(CFS) for      3.330(Ac.)
Total runoff =      8.592(CFS)   Total area =       5.890(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.890(Ac.)
Runoff from this stream =      8.592(CFS)
Time of concentration =   15.78 min.
Rainfall intensity =     1.986(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
     109.601       8.592
Area of streams before confluence:
       74.720        5.890
Results of confluence:
Total flow rate =    118.193(CFS)
Time of concentration =    14.485 min.
Effective stream area after confluence =     80.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     80.610(Ac.)
Runoff from this stream =    118.193(CFS)
Time of concentration =   14.48 min.
Rainfall intensity =     2.074(In/Hr)
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      79.998     118.193
Area of streams before confluence:
       51.270       80.610


Results of confluence:
Total flow rate =    198.191(CFS)
Time of concentration =    13.773 min.
Effective stream area after confluence  =    131.880(Ac.)
End of computations, total study area =         131.880 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 07/26/11

North Quarry and West Materials 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		4.443(In.)
2	10.000		3.120(In.)
3	15.000		2.465(In.)
4	30.000		1.660(In.)
5	60.000		1.164(In.)
6	120.000		0.873(In.)
7	180.000		0.757(In.)
8	360.000		0.601(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      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   932.000(Ft.)
Top (of initial area) elevation =  1912.000(Ft.)
Bottom (of initial area) elevation =  1650.000(Ft.)
Difference in elevation =   262.000(Ft.)
Slope =    0.28112  s(%)=      28.11
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.500 min.
Rainfall intensity =      2.793(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =     57.939(CFS)
Total initial stream area =       29.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1650.000(Ft.)
Downstream point elevation =  1462.000(Ft.)
Channel length thru subarea  =  1001.000(Ft.)
Channel base width    =    5.000(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 =     79.079(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     79.079(CFS)
Depth of flow =   0.722(Ft.), Average velocity =  13.881(Ft/s)
Channel flow top width =   10.777(Ft.)
Flow Velocity =   13.88(Ft/s)
Travel time  =    1.20 min.
Time of concentration =   13.70 min.
Critical depth =      1.359(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.635(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     39.897(CFS) for     21.630(Ac.)
Total runoff =     97.836(CFS)   Total area =      51.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     51.270(Ac.)
Runoff from this stream =     97.836(CFS)
Time of concentration =   13.70 min.
Rainfall intensity =     2.635(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      302.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   468.000(Ft.)
Top (of initial area) elevation =  1952.000(Ft.)
Bottom (of initial area) elevation =  1810.000(Ft.)
Difference in elevation =   142.000(Ft.)
Slope =    0.30342  s(%)=      30.34
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.400 min.
Rainfall intensity =      2.937(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      9.929(CFS)
Total initial stream area =       4.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1810.000(Ft.)
Downstream point elevation =  1510.000(Ft.)
Channel length thru subarea  =  2189.000(Ft.)
Channel base width    =    5.000(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 =     81.762(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     81.762(CFS)
```

```
Depth of flow =   0.797(Ft.), Average velocity =  12.520(Ft/s)
Channel flow top width =   11.379(Ft.)
Flow Velocity =   12.52(Ft/s)
Travel time  =    2.91 min.
Time of concentration =   14.31 min.
Critical depth =      1.375(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.555(In/Hr) for a   100.0 year storm
Subarea runoff =    124.992(CFS) for     69.890(Ac.)
Total runoff =    134.920(CFS)   Total area =      74.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     74.720(Ac.)
Runoff from this stream =    134.920(CFS)
Time of concentration =   14.31 min.
Rainfall intensity =     2.555(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      312.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average 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 =  1940.000(Ft.)
Bottom (of initial area) elevation =  1800.000(Ft.)
Difference in elevation =   140.000(Ft.)
Slope =    0.14862  s(%)=      14.86
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.200 min.
Rainfall intensity =      2.701(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      4.840(CFS)
Total initial stream area =        2.560(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      304.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1800.000(Ft.)
Downstream point elevation =  1510.000(Ft.)
Channel length thru subarea  =  1335.000(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 =      7.988(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      7.988(CFS)
Depth of flow =   0.328(Ft.), Average velocity =   9.186(Ft/s)
Channel flow top width =    3.310(Ft.)
Flow Velocity =    9.19(Ft/s)
Travel time  =    2.42 min.
Time of concentration =   15.62 min.
Critical depth =      0.633(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.432(In/Hr) for a   100.0 year storm
Subarea runoff =      5.668(CFS) for      3.330(Ac.)
Total runoff =     10.508(CFS)   Total area =       5.890(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.890(Ac.)
Runoff from this stream =     10.508(CFS)
Time of concentration =   15.62 min.
Rainfall intensity =     2.432(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
     134.920      10.508
Area of streams before confluence:
       74.720        5.890
Results of confluence:
Total flow rate =    145.428(CFS)
Time of concentration =    14.314 min.
Effective stream area after confluence =     80.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     80.610(Ac.)
Runoff from this stream =    145.428(CFS)
Time of concentration =   14.31 min.
Rainfall intensity =     2.555(In/Hr)
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      97.836     145.428
Area of streams before confluence:
       51.270       80.610


Results of confluence:
Total flow rate =    243.264(CFS)
Time of concentration =    13.702 min.
Effective stream area after confluence  =    131.880(Ac.)
End of computations, total study area =         131.880 (Ac.)
```

APPENDIX B

UNIT HYDROGRAPH ANALYSES

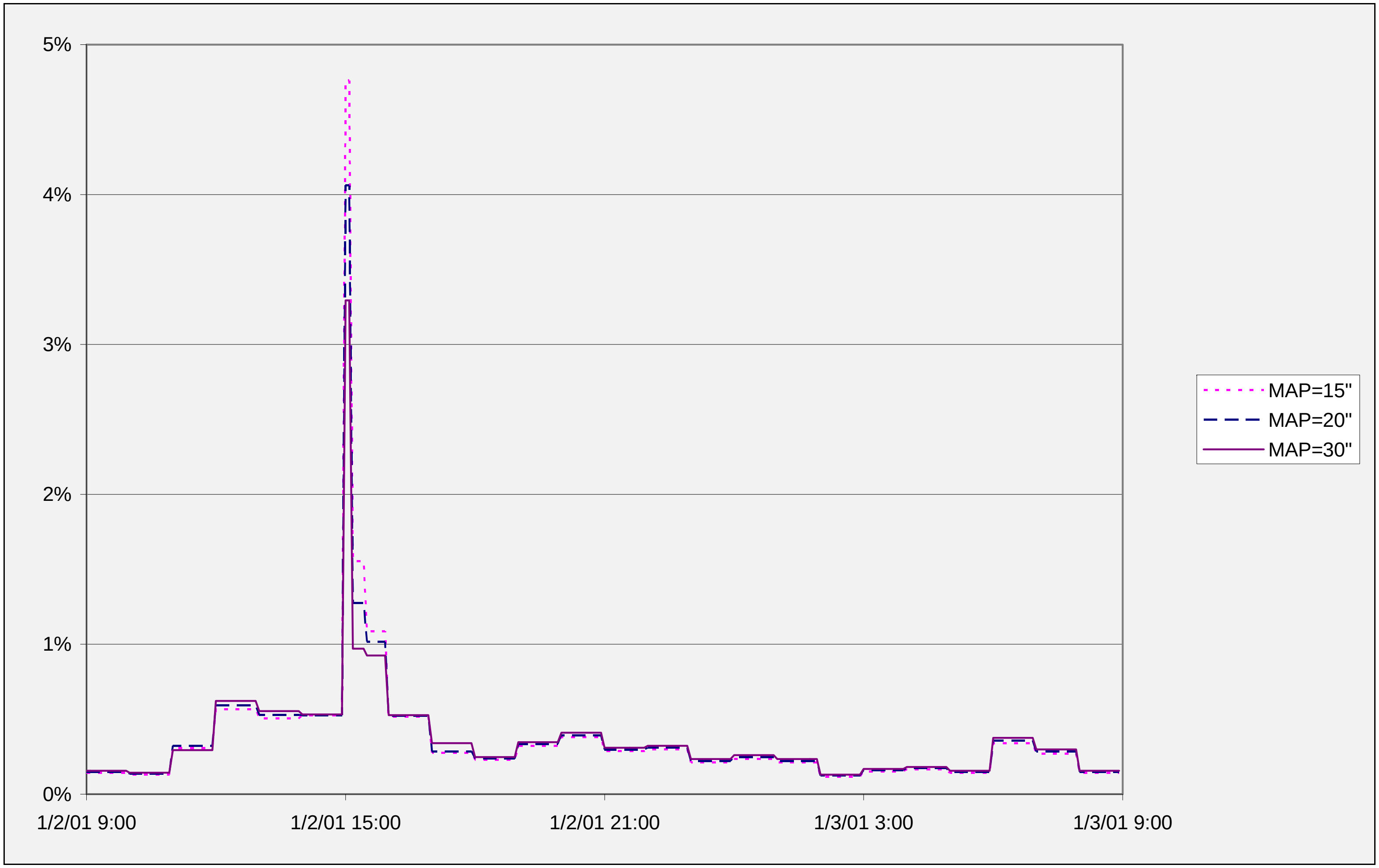

Figure D-1: Normalized Rainfall Pattern

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

Time Starting	Fraction of Total Rainfall (%)	Fraction of Total Rainfall (%)	Fraction of Total Rainfall (%)
	MAP=15″	*MAP=20″*	*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

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****************************************                                    ***************************************
*                                      *                                    *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN   1998               *                                    *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                                    *         609 SECOND STREET           *
*                                      *                                    *       DAVIS, CALIFORNIA 95616       *
*  RUN DATE   26JUL11  TIME  19:09:56  *                                    *           (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

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 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  0.5648
   40        LS    0.22      90
   41        UD     .70
   42        ZZ
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               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
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*****************************************                              ***************************************
*                                       *                              *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN   1998                *                              *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                 *                              *         609 SECOND STREET           *
*                                       *                              *      DAVIS, CALIFORNIA 95616        *
*  RUN DATE   26JUL11  TIME  19:09:56   *                              *          (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
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                                                         STATION  WMSA-NQ

                         (O) OUTFLOW
         0.       40.       80.      120.      160.      200.      240.      280.        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  34.O        .         .         .         .         .         .         .         .         .         .         .       LL.
 10250  35.O        .         .         .         .         .         .         .         .         .         .         .       LL.
 10255  36.O        .         .         .         .         .         .         .         .         .         .         .       LL.
 10300  37. O       .         .         .         .         .         .         .         .         .         .         .       LX.
 10305  38. O       .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10310  39. O       .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10315  40.  O      .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10320  41. . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLXX.
 10325  42.   O     .         .         .         .         .         .         .         .         .         .         .     LLXX.
 10330  43.    O    .         .         .         .         .         .         .         .         .         .         .     LLXX.
 10335  44.      O  .         .         .         .         .         .         .         .         .         .         .     LLXX.
 10340  45.       O .         .         .         .         .         .         .         .         .         .         .     LLXX.
 10345  46.        O.         .         .         .         .         .         .         .         .         .         .     LLXX.
 10350  47.         .O        .         .         .         .         .         .         .         .         .         .     LLXX.
 10355  48.         . O       .         .         .         .         .         .         .         .         .         .     LLXX.
 10400  49.         .  O      .         .         .         .         .         .         .         .         .         .     LLXX.
 10405  50.         .    O    .         .         .         .         .         .         .         .         .         .      LXX.
 10410  51. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LXX.
 10415  52.         .      O  .         .         .         .         .         .         .         .         .         .      LXX.
 10420  53.         .       O .         .         .         .         .         .         .         .         .         .      LXX.
 10425  54.         .        O.         .         .         .         .         .         .         .         .         .      LXX.
 10430  55.         .         O         .         .         .         .         .         .         .         .         .      LXX.
 10435  56.         .         O         .         .         .         .         .         .         .         .         .      LXX.
 10440  57.         .         .O        .         .         .         .         .         .         .         .         .      LXX.
 10445  58.         .         . O       .         .         .         .         .         .         .         .         .      LXX.
 10450  59.         .         . O       .         .         .         .         .         .         .         .         .      LXX.
 10455  60.         .         .  O      .         .         .         .         .         .         .         .         .      LXX.
 10500  61. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LXX.
 10505  62.         .         .   O     .         .         .         .         .         .         .         .         .      LXX.
 10510  63.         .         .   O     .         .         .         .         .         .         .         .         .      LXX.
 10515  64.         .         .   O     .         .         .         .         .         .         .         .         .      XXX.
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10520  65.         .         .    O    .         .         .         .         .         .         .         .      XXX.
10525  66.         .         .    O    .         .         .         .         .         .         .         .      XXX.
10530  67.         .         .    O    .         .         .         .         .         .         .         .      XXX.
10535  68.         .         .     O   .         .         .         .         .         .         .         .      XXX.
10540  69.         .         .     O   .         .         .         .         .         .         .         .      XXX.
10545  70.         .         .     O   .         .         .         .         .         .         .         .      XXX.
10550  71. . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LXX.
10555  72.         .         .      O  .         .         .         .         .         .         .         .      XXX.
10600  73.         .         .      O  .         .         .         .         .         .         .         .      XXX.
10605  74.         .         .       O .         .         .         .         .         .        LLLXXXXXXXXXXXXXXXXXX.
10610  75.         .         .         O         .         .         .         .         .        LLLXXXXXXXXXXXXXXXXXX.
10615  76.         .         .         .  O      .         .         .         .         .         .         .   XXXXXX.
10620  77.         .         .         .      O  .         .         .         .         .         .         .   XXXXXX.
10625  78.         .         .         .         .  O      .         .         .         .         .         .   XXXXXX.
10630  79.         .         .         .         .        O.         .         .         .         .         .   XXXXXX.
10635  80.         .         .         .         .         .     O   .         .         .         .         .   LXXXXX.
10640  81. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . LXXXXX.
10645  82.         .         .         .         .         .         .    O    .         .         .         .   LXXXXX.
10650  83.         .         .         .         .         .         .      O  .         .         .         .   LXXXXX.
10655  84.         .         .         .         .         .         .       O .         .         .         .   LXXXXX.
10700  85.         .         .         .         .         .         .        O.         .         .         .   LXXXXX.
10705  86.         .         .         .         .         .         .       O .         .         .         .      XXX.
10710  87.         .         .         .         .         .         .     O   .         .         .         .      XXX.
10715  88.         .         .         .         .         .         .   O     .         .         .         .      XXX.
10720  89.         .         .         .         .         .         . O       .         .         .         .      XXX.
10725  90.         .         .         .         .         .         O         .         .         .         .      XXX.
10730  91. . . . . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . .XXX.
10735  92.         .         .         .         .         .    O    .         .         .         .         .      XXX.
10740  93.         .         .         .         .         . O       .         .         .         .         .      XXX.
10745  94.         .         .         .         .        O.         .         .         .         .         .      XXX.
10750  95.         .         .         .         .      O  .         .         .         .         .         .      XXX.
10755  96.         .         .         .         .    O    .         .         .         .         .         .      XXX.
10800  97.         .         .         .         .  O      .         .         .         .         .         .      XXX.
10805  98.         .         .         .         .O        .         .         .         .         .         .       XX.
10810  99.         .         .         .        O.         .         .         .         .         .         .       XX.
10815 100.         .         .         .       O .         .         .         .         .         .         .       XX.
10820 101. . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
10825 102.         .         .         .    O    .         .         .         .         .         .         .       XX.
10830 103.         .         .         .   O     .         .         .         .         .         .         .       XX.
10835 104.         .         .         . O       .         .         .         .         .         .         .       XX.
10840 105.         .         .         .O        .         .         .         .         .         .         .       XX.
10845 106.         .         .         O         .         .         .         .         .         .         .       XX.
10850 107.         .         .       O .         .         .         .         .         .         .         .       XX.
10855 108.         .         .      O  .         .         .         .         .         .         .         .       XX.
10900 109.         .         .     O   .         .         .         .         .         .         .         .       XX.
10905 110.         .         .    O    .         .         .         .         .         .         .         .       LX.
10910 111. . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10915 112.         .         .   O     .         .         .         .         .         .         .         .       LX.
10920 113.         .         .  O      .         .         .         .         .         .         .         .       LX.
10925 114.         .         . O       .         .         .         .         .         .         .         .       LX.
10930 115.         .         .O        .         .         .         .         .         .         .         .       LX.
10935 116.         .         .O        .         .         .         .         .         .         .         .       LX.
10940 117.         .         O         .         .         .         .         .         .         .         .       LX.
10945 118.         .        O.         .         .         .         .         .         .         .         .       LX.
10950 119.         .        O.         .         .         .         .         .         .         .         .       LX.
10955 120.         .       O .         .         .         .         .         .         .         .         .       LX.
11000 121. . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11005 122.         .      O  .         .         .         .         .         .         .         .         .       XX.
11010 123.         .      O  .         .         .         .         .         .         .         .         .       XX.
11015 124.         .      O  .         .         .         .         .         .         .         .         .       XX.
11020 125.         .      O  .         .         .         .         .         .         .         .         .       XX.
11025 126.         .      O  .         .         .         .         .         .         .         .         .       XX.
11030 127.         .      O  .         .         .         .         .         .         .         .         .       XX.
11035 128.         .       O .         .         .         .         .         .         .         .         .       XX.
11040 129.         .       O .         .         .         .         .         .         .         .         .       XX.
11045 130.         .       O .         .         .         .         .         .         .         .         .       XX.
11050 131. . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11055 132.         .        O.         .         .         .         .         .         .         .         .       XX.
11100 133.         .         O         .         .         .         .         .         .         .         .       XX.
11105 134.         .         O         .         .         .         .         .         .         .         .      LXX.
11110 135.         .         O         .         .         .         .         .         .         .         .      LXX.
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11115 136.         .         .O        .         .         .         .         .         .         .         .         .      LXX.
11120 137.         .         .O        .         .         .         .         .         .         .         .         .      LXX.
11125 138.         .         .O        .         .         .         .         .         .         .         .         .      LXX.
11130 139.         .         . O       .         .         .         .         .         .         .         .         .      LXX.
11135 140.         .         . O       .         .         .         .         .         .         .         .         .      LXX.
11140 141. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11145 142.         .         .  O      .         .         .         .         .         .         .         .         .      LXX.
11150 143.         .         .   O     .         .         .         .         .         .         .         .         .      LXX.
11155 144.         .         .   O     .         .         .         .         .         .         .         .         .      LXX.
11200 145.         .         .   O     .         .         .         .         .         .         .         .         .      LXX.
11205 146.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11210 147.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11215 148.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11220 149.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11225 150.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11230 151. . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11235 152.         .         .   O     .         .         .         .         .         .         .         .         .       XX.
11240 153.         .         .   O     .         .         .         .         .         .         .         .         .       XX.
11245 154.         .         .  O      .         .         .         .         .         .         .         .         .       XX.
11250 155.         .         .  O      .         .         .         .         .         .         .         .         .       XX.
11255 156.         .         . O       .         .         .         .         .         .         .         .         .       XX.
11300 157.         .         . O       .         .         .         .         .         .         .         .         .       XX.
11305 158.         .         . O       .         .         .         .         .         .         .         .         .       XX.
11310 159.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11315 160.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11320 161. . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11325 162.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11330 163.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11335 164.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11340 165.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11345 166.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11350 167.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11355 168.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11400 169.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11405 170.         .         .O        .         .         .         .         .         .         .         .         .        X.
11410 171. . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11415 172.         .         O         .         .         .         .         .         .         .         .         .        X.
11420 173.         .         O         .         .         .         .         .         .         .         .         .        X.
11425 174.         .         O         .         .         .         .         .         .         .         .         .        X.
11430 175.         .         O         .         .         .         .         .         .         .         .         .        X.
11435 176.         .        O.         .         .         .         .         .         .         .         .         .        X.
11440 177.         .        O.         .         .         .         .         .         .         .         .         .        X.
11445 178.         .       O .         .         .         .         .         .         .         .         .         .        X.
11450 179.         .       O .         .         .         .         .         .         .         .         .         .        X.
11455 180.         .      O  .         .         .         .         .         .         .         .         .         .        X.
11500 181. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11505 182.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11510 183.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11515 184.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11520 185.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11525 186.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11530 187.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11535 188.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11540 189.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11545 190.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11550 191. . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11555 192.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11600 193.         .     O   .         .         .         .         .         .         .         .         .         .       XX.
11605 194.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11610 195.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11615 196.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11620 197.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11625 198.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11630 199.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11635 200.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11640 201. . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11645 202.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11650 203.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11655 204.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11700 205.         .    O    .         .         .         .         .         .         .         .         .         .        X.
11705 206.         .    O    .         .         .         .         .         .         .         .         .         .        X.
```

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11710 207.          .    O    .         .         .         .         .         .         .         .         .         .         .         X.
11715 208.          .    O    .         .         .         .         .         .         .         .         .         .         .         X.
11720 209.          .    O    .         .         .         .         .         .         .         .         .         .         .         X.
11725 210.          .   O     .         .         .         .         .         .         .         .         .         .         .         X.
11730 211. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11735 212.          .  O      .         .         .         .         .         .         .         .         .         .         .         X.
11740 213.          .  O      .         .         .         .         .         .         .         .         .         .         .         X.
11745 214.          . O       .         .         .         .         .         .         .         .         .         .         .         X.
11750 215.          . O       .         .         .         .         .         .         .         .         .         .         .         X.
11755 216.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11800 217.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11805 218.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11810 219.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11815 220.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11820 221. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11825 222.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11830 223.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11835 224.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11840 225.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11845 226.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11850 227.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11855 228.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11900 229.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11905 230.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11910 231. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11915 232.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11920 233.          O         .         .         .         .         .         .         .         .         .         .         .         X.
11925 234.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11930 235.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11935 236.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11940 237.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11945 238.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11950 239.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
11955 240.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12000 241. . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12005 242.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12010 243.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12015 244.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12020 245.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12025 246.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12030 247.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12035 248.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12040 249.          .O        .         .         .         .         .         .         .         .         .         .         .         X.
12045 250.          O         .         .         .         .         .         .         .         .         .         .         .         X.
12050 251. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12055 252.          O         .         .         .         .         .         .         .         .         .         .         .         X.
12100 253.          O         .         .         .         .         .         .         .         .         .         .         .         X.
12105 254.          O         .         .         .         .         .         .         .         .         .         .         .        XX.
12110 255.          O         .         .         .         .         .         .         .         .         .         .         .        XX.
12115 256.          O         .         .         .         .         .         .         .         .         .         .         .        XX.
12120 257.          .O        .         .         .         .         .         .         .         .         .         .         .        XX.
12125 258.          .O        .         .         .         .         .         .         .         .         .         .         .        XX.
12130 259.          . O       .         .         .         .         .         .         .         .         .         .         .        XX.
12135 260.          .  O      .         .         .         .         .         .         .         .         .         .         .        XX.
12140 261. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
12145 262.          .     O   .         .         .         .         .         .         .         .         .         .         .        XX.
12150 263.          .      O  .         .         .         .         .         .         .         .         .         .         .        XX.
12155 264.          .       O .         .         .         .         .         .         .         .         .         .         .        XX.
12200 265.          .        O.         .         .         .         .         .         .         .         .         .         .        XX.
12205 266.          .         O         .         .         .         .         .         .         .         .         .         .        XX.
12210 267.          .         O         .         .         .         .         .         .         .         .         .         .        XX.
12215 268.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12220 269.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12225 270.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12230 271. . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
12235 272.          .         . O       .         .         .         .         .         .         .         .         .         .        XX.
12240 273.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12245 274.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12250 275.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12255 276.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
12300 277.          .         .O        .         .         .         .         .         .         .         .         .         .        XX.
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12305 278.         .         .O        .         .         .         .         .         .         .         .        X.
12310 279.         .         O         .         .         .         .         .         .         .         .        X.
12315 280.         .         O         .         .         .         .         .         .         .         .        X.
12320 281. . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12325 282.         .        O.         .         .         .         .         .         .         .         .        X.
12330 283.         .       O .         .         .         .         .         .         .         .         .        X.
12335 284.         .      O  .         .         .         .         .         .         .         .         .        X.
12340 285.         .      O  .         .         .         .         .         .         .         .         .        X.
12345 286.         .     O   .         .         .         .         .         .         .         .         .        X.
12350 287.         .    O    .         .         .         .         .         .         .         .         .        X.
12355 288.         .   O     .         .         .         .         .         .         .         .         .        X.
20000 289.         .  O      .         .         .         .         .         .         .         .         .        X.
20005 290.         .  O      .         .         .         .         .         .         .         .         .         .
20010 291. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
20015 292.         .O        .         .         .         .         .         .         .         .         .         .
20020 293.         .O        .         .         .         .         .         .         .         .         .         .
20025 294.         O         .         .         .         .         .         .         .         .         .         .
20030 295.        O.         .         .         .         .         .         .         .         .         .         .
20035 296.       O .         .         .         .         .         .         .         .         .         .         .
20040 297.      O  .         .         .         .         .         .         .         .         .         .         .
20045 298.     O   .         .         .         .         .         .         .         .         .         .         .
20050 299.    O    .         .         .         .         .         .         .         .         .         .         .
20055 300.----O----.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
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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	274.	7.00	137.	76.	73.	.56		

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

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****************************************                    ***************************************
*                                      *                    *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *   U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                    *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                    *         609 SECOND STREET           *
*                                      *                    *      DAVIS, CALIFORNIA 95616        *
*  RUN DATE   26JUL11  TIME  18:52:09  *                    *          (916) 756-1104             *
*                                      *                    *                                     *
****************************************                    ***************************************
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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
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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  0.5648
  40          LS    0.22      90
  41          UD     .70
  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
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 *****************************************                                     ***************************************
 *                                       *                                     *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                     *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                     *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                     *         609 SECOND STREET           *
 *                                       *                                     *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   26JUL11  TIME  18:52:09   *                                     *          (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
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                                                                          STATION  WMSA-NQ

                                        (O) OUTFLOW
        0.       40.       80.      120.      160.      200.      240.      280.      320.      360.        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         .         .         .         .         .         .         .         .         .         .         .       LX.
10230  31.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
10235  32.O        .         .         .         .         .         .         .         .         .         .         .       LX.
10240  33.O        .         .         .         .         .         .         .         .         .         .         .       LX.
10245  34. O       .         .         .         .         .         .         .         .         .         .         .       LX.
10250  35. O       .         .         .         .         .         .         .         .         .         .         .       LX.
10255  36.  O      .         .         .         .         .         .         .         .         .         .         .       LX.
10300  37.   O     .         .         .         .         .         .         .         .         .         .         .       LX.
10305  38.   O     .         .         .         .         .         .         .         .         .         .         .    LLLXX.
10310  39.    O    .         .         .         .         .         .         .         .         .         .         .    LLLXX.
10315  40.     O   .         .         .         .         .         .         .         .         .         .         .    LLLXX.
10320  41. . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LLLXX.
10325  42.       O .         .         .         .         .         .         .         .         .         .         .    LLXXX.
10330  43.        O.         .         .         .         .         .         .         .         .         .         .    LLXXX.
10335  44.         .O        .         .         .         .         .         .         .         .         .         .    LLXXX.
10340  45.         .  O      .         .         .         .         .         .         .         .         .         .    LLXXX.
10345  46.         .    O    .         .         .         .         .         .         .         .         .         .    LLXXX.
10350  47.         .      O  .         .         .         .         .         .         .         .         .         .    LLXXX.
10355  48.         .        O.         .         .         .         .         .         .         .         .         .    LLXXX.
10400  49.         .         O         .         .         .         .         .         .         .         .         .    LLXXX.
10405  50.         .         . O       .         .         .         .         .         .         .         .         .     LXXX.
10410  51. . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LXXX.
10415  52.         .         .    O    .         .         .         .         .         .         .         .         .     LXXX.
10420  53.         .         .      O  .         .         .         .         .         .         .         .         .     LXXX.
10425  54.         .         .       O .         .         .         .         .         .         .         .         .     LXXX.
10430  55.         .         .        O.         .         .         .         .         .         .         .         .     LXXX.
10435  56.         .         .        O.         .         .         .         .         .         .         .         .     LXXX.
10440  57.         .         .         O         .         .         .         .         .         .         .         .     LXXX.
10445  58.         .         .         .O        .         .         .         .         .         .         .         .     LXXX.
10450  59.         .         .         .O        .         .         .         .         .         .         .         .     LXXX.
10455  60.         .         .         . O       .         .         .         .         .         .         .         .     LXXX.
10500  61. . . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LXXX.
10505  62.         .         .         .  O      .         .         .         .         .         .         .         .     LXXX.
10510  63.         .         .         .  O      .         .         .         .         .         .         .         .     LXXX.
10515  64.         .         .         .   O     .         .         .         .         .         .         .         .     LXXX.
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10520  65.         .         .         .   O     .         .         .         .         .         .         .     LXXX.
10525  66.         .         .         .   O     .         .         .         .         .         .         .     LXXX.
10530  67.         .         .         .    O    .         .         .         .         .         .         .     LXXX.
10535  68.         .         .         .    O    .         .         .         .         .         .         .     LXXX.
10540  69.         .         .         .    O    .         .         .         .         .         .         .     LXXX.
10545  70.         .         .         .    O    .         .         .         .         .         .         .     LXXX.
10550  71. . . . . . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LXXX.
10555  72.         .         .         .     O   .         .         .         .         .         .         .     LXXX.
10600  73.         .         .         .     O   .         .         .         .         .         .         .     XXXX.
10605  74.         .         .         .      O  .         .         .         .         .         .  LLLLXXXXXXXXXXXXXXXXXXXXXXX.
10610  75.         .         .         .        O.         .         .         .         .         .  LLLXXXXXXXXXXXXXXXXXXXXXXXX.
10615  76.         .         .         .         .  O      .         .         .         .         .         .         . LXXXXXXX.
10620  77.         .         .         .         .        O.         .         .         .         .         .         . LXXXXXXX.
10625  78.         .         .         .         .         .     O   .         .         .         .         .         . LXXXXXXX.
10630  79.         .         .         .         .         .         .    O    .         .         .         .         . LXXXXXXX.
10635  80.         .         .         .         .         .         .         .  O      .         .         .         .  XXXXXXX.
10640  81. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . O . . . . . . . . . . . . . . .LXXXXXX.
10645  82.         .         .         .         .         .         .         .         .   O     .         .         .  XXXXXXX.
10650  83.         .         .         .         .         .         .         .         .      O  .         .         .  XXXXXXX.
10655  84.         .         .         .         .         .         .         .         .        O.         .         .  XXXXXXX.
10700  85.         .         .         .         .         .         .         .         .        O.         .         .  XXXXXXX.
10705  86.         .         .         .         .         .         .         .         .       O .         .         .     XXXX.
10710  87.         .         .         .         .         .         .         .         .     O   .         .         .     XXXX.
10715  88.         .         .         .         .         .         .         .         .  O      .         .         .     XXXX.
10720  89.         .         .         .         .         .         .         .         O         .         .         .     XXXX.
10725  90.         .         .         .         .         .         .         .      O  .         .         .         .     XXXX.
10730  91. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . XXXX.
10735  92.         .         .         .         .         .         .         O         .         .         .         .     XXXX.
10740  93.         .         .         .         .         .         .      O  .         .         .         .         .     XXXX.
10745  94.         .         .         .         .         .         .  O      .         .         .         .         .     XXXX.
10750  95.         .         .         .         .         .         O         .         .         .         .         .     XXXX.
10755  96.         .         .         .         .         .      O  .         .         .         .         .         .     XXXX.
10800  97.         .         .         .         .         .    O    .         .         .         .         .         .     XXXX.
10805  98.         .         .         .         .         . O       .         .         .         .         .         .      LXX.
10810  99.         .         .         .         .         O         .         .         .         .         .         .      LXX.
10815 100.         .         .         .         .        O.         .         .         .         .         .         .      LXX.
10820 101. . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
10825 102.         .         .         .         .    O    .         .         .         .         .         .         .      LXX.
10830 103.         .         .         .         .  O      .         .         .         .         .         .         .      LXX.
10835 104.         .         .         .         .O        .         .         .         .         .         .         .      LXX.
10840 105.         .         .         .        O.         .         .         .         .         .         .         .      LXX.
10845 106.         .         .         .       O .         .         .         .         .         .         .         .      LXX.
10850 107.         .         .         .     O   .         .         .         .         .         .         .         .      LXX.
10855 108.         .         .         .   O     .         .         .         .         .         .         .         .      LXX.
10900 109.         .         .         .  O      .         .         .         .         .         .         .         .      LXX.
10905 110.         .         .         . O       .         .         .         .         .         .         .         .       XX.
10910 111. . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
10915 112.         .         .         O         .         .         .         .         .         .         .         .       XX.
10920 113.         .         .        O.         .         .         .         .         .         .         .         .       XX.
10925 114.         .         .       O .         .         .         .         .         .         .         .         .       XX.
10930 115.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
10935 116.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
10940 117.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
10945 118.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
10950 119.         .         .   O     .         .         .         .         .         .         .         .         .       XX.
10955 120.         .         .  O      .         .         .         .         .         .         .         .         .       XX.
11000 121. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11005 122.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11010 123.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11015 124.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11020 125.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11025 126.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11030 127.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11035 128.         .         . O       .         .         .         .         .         .         .         .         .      XXX.
11040 129.         .         .  O      .         .         .         .         .         .         .         .         .      XXX.
11045 130.         .         .  O      .         .         .         .         .         .         .         .         .      XXX.
11050 131. . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11055 132.         .         .   O     .         .         .         .         .         .         .         .         .      XXX.
11100 133.         .         .    O    .         .         .         .         .         .         .         .         .      XXX.
11105 134.         .         .    O    .         .         .         .         .         .         .         .         .      XXX.
11110 135.         .         .     O   .         .         .         .         .         .         .         .         .      XXX.
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11115 136.         .         .     O   .         .         .         .         .         .         .         .         .      XXX.
11120 137.         .         .     O   .         .         .         .         .         .         .         .         .      XXX.
11125 138.         .         .      O  .         .         .         .         .         .         .         .         .      XXX.
11130 139.         .         .      O  .         .         .         .         .         .         .         .         .      XXX.
11135 140.         .         .       O .         .         .         .         .         .         .         .         .      XXX.
11140 141. . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .XXX.
11145 142.         .         .        O.         .         .         .         .         .         .         .         .      XXX.
11150 143.         .         .         O         .         .         .         .         .         .         .         .      XXX.
11155 144.         .         .         O         .         .         .         .         .         .         .         .      XXX.
11200 145.         .         .         .O        .         .         .         .         .         .         .         .      XXX.
11205 146.         .         .         .O        .         .         .         .         .         .         .         .       XX.
11210 147.         .         .         .O        .         .         .         .         .         .         .         .       XX.
11215 148.         .         .         . O       .         .         .         .         .         .         .         .       XX.
11220 149.         .         .         . O       .         .         .         .         .         .         .         .       XX.
11225 150.         .         .         .O        .         .         .         .         .         .         .         .       XX.
11230 151. . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11235 152.         .         .         .O        .         .         .         .         .         .         .         .       XX.
11240 153.         .         .         O         .         .         .         .         .         .         .         .       XX.
11245 154.         .         .        O.         .         .         .         .         .         .         .         .       XX.
11250 155.         .         .        O.         .         .         .         .         .         .         .         .       XX.
11255 156.         .         .       O .         .         .         .         .         .         .         .         .       XX.
11300 157.         .         .       O .         .         .         .         .         .         .         .         .       XX.
11305 158.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
11310 159.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
11315 160.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
11320 161. . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11325 162.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11330 163.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11335 164.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11340 165.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11345 166.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11350 167.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11355 168.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11400 169.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11405 170.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11410 171. . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11415 172.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11420 173.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
11425 174.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11430 175.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
11435 176.         .         .   O     .         .         .         .         .         .         .         .         .       XX.
11440 177.         .         .  O      .         .         .         .         .         .         .         .         .       XX.
11445 178.         .         .  O      .         .         .         .         .         .         .         .         .       XX.
11450 179.         .         . O       .         .         .         .         .         .         .         .         .       XX.
11455 180.         .         . O       .         .         .         .         .         .         .         .         .       XX.
11500 181. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11505 182.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11510 183.         .         O         .         .         .         .         .         .         .         .         .       XX.
11515 184.         .         O         .         .         .         .         .         .         .         .         .       XX.
11520 185.         .         O         .         .         .         .         .         .         .         .         .       XX.
11525 186.         .         O         .         .         .         .         .         .         .         .         .       XX.
11530 187.         .         O         .         .         .         .         .         .         .         .         .       XX.
11535 188.         .         O         .         .         .         .         .         .         .         .         .       XX.
11540 189.         .         O         .         .         .         .         .         .         .         .         .       XX.
11545 190.         .         O         .         .         .         .         .         .         .         .         .       XX.
11550 191. . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11555 192.         .         O         .         .         .         .         .         .         .         .         .       XX.
11600 193.         .         O         .         .         .         .         .         .         .         .         .       XX.
11605 194.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11610 195.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11615 196.         .         .O        .         .         .         .         .         .         .         .         .       XX.
11620 197.         .         O         .         .         .         .         .         .         .         .         .       XX.
11625 198.         .         O         .         .         .         .         .         .         .         .         .       XX.
11630 199.         .         O         .         .         .         .         .         .         .         .         .       XX.
11635 200.         .         O         .         .         .         .         .         .         .         .         .       XX.
11640 201. . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11645 202.         .         O         .         .         .         .         .         .         .         .         .       XX.
11650 203.         .         O         .         .         .         .         .         .         .         .         .       XX.
11655 204.         .        O.         .         .         .         .         .         .         .         .         .       XX.
11700 205.         .        O.         .         .         .         .         .         .         .         .         .       XX.
11705 206.         .        O.         .         .         .         .         .         .         .         .         .        X.
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11710 207.         .        O.         .         .         .         .         .         .         .         .         .        X.
11715 208.         .        O.         .         .         .         .         .         .         .         .         .        X.
11720 209.         .       O .         .         .         .         .         .         .         .         .         .        X.
11725 210.         .       O .         .         .         .         .         .         .         .         .         .        X.
11730 211. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11735 212.         .      O  .         .         .         .         .         .         .         .         .         .        X.
11740 213.         .     O   .         .         .         .         .         .         .         .         .         .        X.
11745 214.         .    O    .         .         .         .         .         .         .         .         .         .        X.
11750 215.         .    O    .         .         .         .         .         .         .         .         .         .        X.
11755 216.         .   O     .         .         .         .         .         .         .         .         .         .        X.
11800 217.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11805 218.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11810 219.         . O       .         .         .         .         .         .         .         .         .         .        X.
11815 220.         . O       .         .         .         .         .         .         .         .         .         .        X.
11820 221. . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11825 222.         . O       .         .         .         .         .         .         .         .         .         .        X.
11830 223.         . O       .         .         .         .         .         .         .         .         .         .        X.
11835 224.         . O       .         .         .         .         .         .         .         .         .         .        X.
11840 225.         . O       .         .         .         .         .         .         .         .         .         .        X.
11845 226.         . O       .         .         .         .         .         .         .         .         .         .        X.
11850 227.         . O       .         .         .         .         .         .         .         .         .         .        X.
11855 228.         . O       .         .         .         .         .         .         .         .         .         .        X.
11900 229.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11905 230.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11910 231. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11915 232.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11920 233.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11925 234.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11930 235.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11935 236.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11940 237.         .  O      .         .         .         .         .         .         .         .         .         .        X.
11945 238.         .   O     .         .         .         .         .         .         .         .         .         .        X.
11950 239.         .   O     .         .         .         .         .         .         .         .         .         .        X.
11955 240.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12000 241. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12005 242.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12010 243.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12015 244.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12020 245.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12025 246.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12030 247.         .   O     .         .         .         .         .         .         .         .         .         .        X.
12035 248.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12040 249.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12045 250.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12050 251. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12055 252.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12100 253.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12105 254.         .  O      .         .         .         .         .         .         .         .         .         .      XXX.
12110 255.         .  O      .         .         .         .         .         .         .         .         .         .      XXX.
12115 256.         .  O      .         .         .         .         .         .         .         .         .         .      XXX.
12120 257.         .  O      .         .         .         .         .         .         .         .         .         .      XXX.
12125 258.         .   O     .         .         .         .         .         .         .         .         .         .      XXX.
12130 259.         .    O    .         .         .         .         .         .         .         .         .         .      XXX.
12135 260.         .      O  .         .         .         .         .         .         .         .         .         .      XXX.
12140 261. . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
12145 262.         .         O         .         .         .         .         .         .         .         .         .      XXX.
12150 263.         .         .O        .         .         .         .         .         .         .         .         .      XXX.
12155 264.         .         .  O      .         .         .         .         .         .         .         .         .      XXX.
12200 265.         .         .   O     .         .         .         .         .         .         .         .         .      XXX.
12205 266.         .         .    O    .         .         .         .         .         .         .         .         .       XX.
12210 267.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
12215 268.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
12220 269.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
12225 270.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
12230 271. . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
12235 272.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
12240 273.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
12245 274.         .         .      O  .         .         .         .         .         .         .         .         .       XX.
12250 275.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
12255 276.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
12300 277.         .         .     O   .         .         .         .         .         .         .         .         .       XX.
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12305 278.         .         .     O   .         .         .         .         .         .         .         .         .        X.
12310 279.         .         .    O    .         .         .         .         .         .         .         .         .        X.
12315 280.         .         .    O    .         .         .         .         .         .         .         .         .        X.
12320 281. . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12325 282.         .         .   O     .         .         .         .         .         .         .         .         .        X.
12330 283.         .         .  O      .         .         .         .         .         .         .         .         .        X.
12335 284.         .         . O       .         .         .         .         .         .         .         .         .        X.
12340 285.         .         .O        .         .         .         .         .         .         .         .         .        X.
12345 286.         .         O         .         .         .         .         .         .         .         .         .        X.
12350 287.         .       O .         .         .         .         .         .         .         .         .         .        X.
12355 288.         .      O  .         .         .         .         .         .         .         .         .         .        X.
20000 289.         .      O  .         .         .         .         .         .         .         .         .         .        X.
20005 290.         .     O   .         .         .         .         .         .         .         .         .         .         .
20010 291. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
20015 292.         .   O     .         .         .         .         .         .         .         .         .         .         .
20020 293.         .  O      .         .         .         .         .         .         .         .         .         .         .
20025 294.         .  O      .         .         .         .         .         .         .         .         .         .         .
20030 295.         .O        .         .         .         .         .         .         .         .         .         .         .
20035 296.         O         .         .         .         .         .         .         .         .         .         .         .
20040 297.        O.         .         .         .         .         .         .         .         .         .         .         .
20045 298.       O .         .         .         .         .         .         .         .         .         .         .         .
20050 299.      O  .         .         .         .         .         .         .         .         .         .         .         .
20055 300.-----O---.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
```

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	356.	7.00	180.	97.	94.	.56		

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

PROPOSED CONDITION

(POST-PROJECT)

ANALYSES

```
****************************************                         **************************************
*                                      *                         *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                         *   U.S. ARMY CORPS OF ENGINEERS     *
*             JUN   1998               *                         *   HYDROLOGIC ENGINEERING CENTER    *
*            VERSION 4.1               *                         *         609 SECOND STREET          *
*                                      *                         *      DAVIS, CALIFORNIA 95616       *
* RUN DATE   26JUL11  TIME  19:10:14   *                         *          (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  0.4927
   40        LS    0.82      71
   41        UD     .30
   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
```

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****************************************                               ***************************************
*                                      *                               *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                               *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN   1998               *                               *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                               *         609 SECOND STREET           *
*                                      *                               *      DAVIS, CALIFORNIA 95616        *
*  RUN DATE   26JUL11  TIME  19:10:14  *                               *          (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

                          (O) OUTFLOW
          0.       20.       40.       60.       80.      100.      120.      140.      160.        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  51.O.....................................................................................................................LLL.
10415  52.O         .         .         .         .         .         .         .         .         .         .         .      LLL.
10420  53. O        .         .         .         .         .         .         .         .         .         .         .      LLL.
10425  54.  O       .         .         .         .         .         .         .         .         .         .         .      LLL.
10430  55.   O      .         .         .         .         .         .         .         .         .         .         .      LLL.
10435  56.    O     .         .         .         .         .         .         .         .         .         .         .      LLL.
10440  57.    O     .         .         .         .         .         .         .         .         .         .         .      LLL.
10445  58.     O    .         .         .         .         .         .         .         .         .         .         .      LLX.
10450  59.      O   .         .         .         .         .         .         .         .         .         .         .      LLX.
10455  60.       O  .         .         .         .         .         .         .         .         .         .         .      LLX.
10500  61.........O.....................................................................................................LLX.
10505  62.          O         .         .         .         .         .         .         .         .         .         .      LLX.
10510  63.          O         .         .         .         .         .         .         .         .         .         .      LLX.
10515  64.          .O        .         .         .         .         .         .         .         .         .         .      LLX.
```

```
10520  65.          . O       .         .         .         .         .         .         .         .         .         .     LLX.
10525  66.          .  O      .         .         .         .         .         .         .         .         .         .     LLX.
10530  67.          .  O      .         .         .         .         .         .         .         .         .         .     LLX.
10535  68.          .   O     .         .         .         .         .         .         .         .         .         .     LLX.
10540  69.          .    O    .         .         .         .         .         .         .         .         .         .     LLX.
10545  70.          .    O    .         .         .         .         .         .         .         .         .         .     LLX.
10550  71. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LLX.
10555  72.          .      O  .         .         .         .         .         .         .         .         .         .     LLX.
10600  73.          .      O  .         .         .         .         .         .         .         .         .         .     LLX.
10605  74.          .         .O        .         .         .         .         .         .         .       LLLLLLLLLLLLLLXXXXXXX.
10610  75.          .         .         . O       .         .         .         .         .         .       LLLLLLLLLLLLXXXXXXXXX.
10615  76.          .         .         .         .         .O        .         .         .         .         .         .  LLLXXX.
10620  77.          .         .         .         .         .         .      O  .         .         .         .         .  LLLXXX.
10625  78.          .         .         .         .         .         .         .   O     .         .         .         .  LLLXXX.
10630  79.          .         .         .         .         .         .         .   O     .         .         .         .  LLLXXX.
10635  80.          .         .         .         .         .         .         O         .         .         .         .  LLLXXX.
10640  81. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . LLLXXX.
10645  82.          .         .         .         .         .         .         . O       .         .         .         .  LLLXXX.
10650  83.          .         .         .         .         .         O.        .         .         .         .         .  LLLXXX.
10655  84.          .         .         .         .         .        O .        .         .         .         .         .  LLLXXX.
10700  85.          .         .         .         .         .       O  .        .         .         .         .         .  LLLXXX.
10705  86.          .         .         .         .         .       O  .        .         .         .         .         .     LXX.
10710  87.          .         .         .         .         .   O     .         .         .         .         .         .     LXX.
10715  88.          .         .         .         .         . O       .         .         .         .         .         .     LXX.
10720  89.          .         .         .         .     O   .         .         .         .         .         .         .     LXX.
10725  90.          .         .         .         . O       .         .         .         .         .         .         .     LXX.
10730  91. . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LXX.
10735  92.          .         .         .       O .         .         .         .         .         .         .         .     LXX.
10740  93.          .         .         .      O  .         .         .         .         .         .         .         .     LXX.
10745  94.          .         .         .     O   .         .         .         .         .         .         .         .     LXX.
10750  95.          .         .         .     O   .         .         .         .         .         .         .         .     LXX.
10755  96.          .         .         .     O   .         .         .         .         .         .         .         .     LXX.
10800  97.          .         .         .     O   .         .         .         .         .         .         .         .     LXX.
10805  98.          .         .         .     O   .         .         .         .         .         .         .         .      LX.
10810  99.          .         .         .    O    .         .         .         .         .         .         .         .      LX.
10815 100.          .         .         .  O      .         .         .         .         .         .         .         .      LX.
10820 101. . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
10825 102.          .         .       O .         .         .         .         .         .         .         .         .      LX.
10830 103.          .         .     O   .         .         .         .         .         .         .         .         .      LX.
10835 104.          .         .    O    .         .         .         .         .         .         .         .         .      LX.
10840 105.          .         .    O    .         .         .         .         .         .         .         .         .      LX.
10845 106.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
10850 107.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
10855 108.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
10900 109.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
10905 110.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
10910 111. . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
10915 112.          .         . O       .         .         .         .         .         .         .         .         .      LX.
10920 113.          .         .O        .         .         .         .         .         .         .         .         .      LX.
10925 114.          .         O         .         .         .         .         .         .         .         .         .      LX.
10930 115.          .         O.        .         .         .         .         .         .         .         .         .      LX.
10935 116.          .         O.        .         .         .         .         .         .         .         .         .      LX.
10940 117.          .         O.        .         .         .         .         .         .         .         .         .      LX.
10945 118.          .         O.        .         .         .         .         .         .         .         .         .      LX.
10950 119.          .         O.        .         .         .         .         .         .         .         .         .      LX.
10955 120.          .         O.        .         .         .         .         .         .         .         .         .      LX.
11000 121. . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11005 122.          .         O.        .         .         .         .         .         .         .         .         .      LX.
11010 123.          .         O.        .         .         .         .         .         .         .         .         .      LX.
11015 124.          .         O         .         .         .         .         .         .         .         .         .      LX.
11020 125.          .         .O        .         .         .         .         .         .         .         .         .      LX.
11025 126.          .         .  O      .         .         .         .         .         .         .         .         .      LX.
11030 127.          .         .   O     .         .         .         .         .         .         .         .         .      LX.
11035 128.          .         .    O    .         .         .         .         .         .         .         .         .      LX.
11040 129.          .         .    O    .         .         .         .         .         .         .         .         .      LX.
11045 130.          .         .     O   .         .         .         .         .         .         .         .         .      LX.
11050 131. . . . . . . . . . . . . O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11055 132.          .         .     O   .         .         .         .         .         .         .         .         .      LX.
11100 133.          .         .     O   .         .         .         .         .         .         .         .         .      LX.
11105 134.          .         .     O   .         .         .         .         .         .         .         .         .     LXX.
11110 135.          .         .      O  .         .         .         .         .         .         .         .         .     LXX.
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11115 136.         .         .       O .         .         .         .         .         .         .         .      LXX.
11120 137.         .         .        O.         .         .         .         .         .         .         .      LXX.
11125 138.         .         .         O         .         .         .         .         .         .         .      LXX.
11130 139.         .         .         .O        .         .         .         .         .         .         .      LXX.
11135 140.         .         .         . O       .         .         .         .         .         .         .      LXX.
11140 141. . . . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11145 142.         .         .         . O       .         .         .         .         .         .         .      LXX.
11150 143.         .         .         . O       .         .         .         .         .         .         .      LXX.
11155 144.         .         .         .  O      .         .         .         .         .         .         .      LXX.
11200 145.         .         .         .  O      .         .         .         .         .         .         .      LXX.
11205 146.         .         .         .  O      .         .         .         .         .         .         .       LX.
11210 147.         .         .         . O       .         .         .         .         .         .         .       LX.
11215 148.         .         .         .O        .         .         .         .         .         .         .       LX.
11220 149.         .         .         O         .         .         .         .         .         .         .       LX.
11225 150.         .         .        O.         .         .         .         .         .         .         .       LX.
11230 151. . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11235 152.         .         .      O  .         .         .         .         .         .         .         .       LX.
11240 153.         .         .     O   .         .         .         .         .         .         .         .       LX.
11245 154.         .         .     O   .         .         .         .         .         .         .         .       LX.
11250 155.         .         .     O   .         .         .         .         .         .         .         .       LX.
11255 156.         .         .     O   .         .         .         .         .         .         .         .       LX.
11300 157.         .         .     O   .         .         .         .         .         .         .         .       LX.
11305 158.         .         .     O   .         .         .         .         .         .         .         .       LX.
11310 159.         .         .     O   .         .         .         .         .         .         .         .       LX.
11315 160.         .         .     O   .         .         .         .         .         .         .         .       LX.
11320 161. . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11325 162.         .         .      O  .         .         .         .         .         .         .         .       LX.
11330 163.         .         .      O  .         .         .         .         .         .         .         .       LX.
11335 164.         .         .      O  .         .         .         .         .         .         .         .       LX.
11340 165.         .         .      O  .         .         .         .         .         .         .         .       LX.
11345 166.         .         .      O  .         .         .         .         .         .         .         .       LX.
11350 167.         .         .      O  .         .         .         .         .         .         .         .       LX.
11355 168.         .         .      O  .         .         .         .         .         .         .         .       LX.
11400 169.         .         .      O  .         .         .         .         .         .         .         .       LX.
11405 170.         .         .      O  .         .         .         .         .         .         .         .        X.
11410 171. . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11415 172.         .         .    O    .         .         .         .         .         .         .         .        X.
11420 173.         .         .   O     .         .         .         .         .         .         .         .        X.
11425 174.         .         . O       .         .         .         .         .         .         .         .        X.
11430 175.         .         .O        .         .         .         .         .         .         .         .        X.
11435 176.         .         .O        .         .         .         .         .         .         .         .        X.
11440 177.         .         .O        .         .         .         .         .         .         .         .        X.
11445 178.         .         O         .         .         .         .         .         .         .         .        X.
11450 179.         .         O         .         .         .         .         .         .         .         .        X.
11455 180.         .         O         .         .         .         .         .         .         .         .        X.
11500 181. . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11505 182.         .         O         .         .         .         .         .         .         .         .       LX.
11510 183.         .         O         .         .         .         .         .         .         .         .       LX.
11515 184.         .         O         .         .         .         .         .         .         .         .       LX.
11520 185.         .         .O        .         .         .         .         .         .         .         .       LX.
11525 186.         .         .O        .         .         .         .         .         .         .         .       LX.
11530 187.         .         . O       .         .         .         .         .         .         .         .       LX.
11535 188.         .         . O       .         .         .         .         .         .         .         .       LX.
11540 189.         .         . O       .         .         .         .         .         .         .         .       LX.
11545 190.         .         .  O      .         .         .         .         .         .         .         .       LX.
11550 191. . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11555 192.         .         . O       .         .         .         .         .         .         .         .       LX.
11600 193.         .         . O       .         .         .         .         .         .         .         .       LX.
11605 194.         .         . O       .         .         .         .         .         .         .         .        X.
11610 195.         .         . O       .         .         .         .         .         .         .         .        X.
11615 196.         .         . O       .         .         .         .         .         .         .         .        X.
11620 197.         .         .O        .         .         .         .         .         .         .         .        X.
11625 198.         .         .O        .         .         .         .         .         .         .         .        X.
11630 199.         .         .O        .         .         .         .         .         .         .         .        X.
11635 200.         .         .O        .         .         .         .         .         .         .         .        X.
11640 201. . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11645 202.         .         .O        .         .         .         .         .         .         .         .        X.
11650 203.         .         O         .         .         .         .         .         .         .         .        X.
11655 204.         .         O         .         .         .         .         .         .         .         .        X.
11700 205.         .         O         .         .         .         .         .         .         .         .        X.
11705 206.         .         O         .         .         .         .         .         .         .         .        X.
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11710 207.         .         O         .         .         .         .         .         .         .         .         .        X.
11715 208.         .       O .         .         .         .         .         .         .         .         .        X.
11720 209.         .      O  .         .         .         .         .         .         .         .         .        X.
11725 210.         .    O    .         .         .         .         .         .         .         .         .        X.
11730 211. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
11735 212.         .  O      .         .         .         .         .         .         .         .         .        X.
11740 213.         . O       .         .         .         .         .         .         .         .         .        X.
11745 214.         . O       .         .         .         .         .         .         .         .         .        X.
11750 215.         . O       .         .         .         .         .         .         .         .         .        X.
11755 216.         . O       .         .         .         .         .         .         .         .         .        X.
11800 217.         . O       .         .         .         .         .         .         .         .         .        X.
11805 218.         . O       .         .         .         .         .         .         .         .         .        X.
11810 219.         . O       .         .         .         .         .         .         .         .         .        X.
11815 220.         .  O      .         .         .         .         .         .         .         .         .        X.
11820 221. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
11825 222.         .   O     .         .         .         .         .         .         .         .         .        X.
11830 223.         .   O     .         .         .         .         .         .         .         .         .        X.
11835 224.         .   O     .         .         .         .         .         .         .         .         .        X.
11840 225.         .   O     .         .         .         .         .         .         .         .         .        X.
11845 226.         .   O     .         .         .         .         .         .         .         .         .        X.
11850 227.         .    O    .         .         .         .         .         .         .         .         .        X.
11855 228.         .    O    .         .         .         .         .         .         .         .         .        X.
11900 229.         .    O    .         .         .         .         .         .         .         .         .        X.
11905 230.         .    O    .         .         .         .         .         .         .         .         .        X.
11910 231. . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
11915 232.         .    O    .         .         .         .         .         .         .         .         .        X.
11920 233.         .    O    .         .         .         .         .         .         .         .         .        X.
11925 234.         .    O    .         .         .         .         .         .         .         .         .        X.
11930 235.         .    O    .         .         .         .         .         .         .         .         .        X.
11935 236.         .    O    .         .         .         .         .         .         .         .         .        X.
11940 237.         .     O   .         .         .         .         .         .         .         .         .        X.
11945 238.         .     O   .         .         .         .         .         .         .         .         .        X.
11950 239.         .     O   .         .         .         .         .         .         .         .         .        X.
11955 240.         .     O   .         .         .         .         .         .         .         .         .        X.
12000 241. . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
12005 242.         .     O   .         .         .         .         .         .         .         .         .        X.
12010 243.         .    O    .         .         .         .         .         .         .         .         .        X.
12015 244.         .   O     .         .         .         .         .         .         .         .         .        X.
12020 245.         .   O     .         .         .         .         .         .         .         .         .        X.
12025 246.         .   O     .         .         .         .         .         .         .         .         .        X.
12030 247.         .   O     .         .         .         .         .         .         .         .         .        X.
12035 248.         .   O     .         .         .         .         .         .         .         .         .        X.
12040 249.         .   O     .         .         .         .         .         .         .         .         .        X.
12045 250.         .   O     .         .         .         .         .         .         .         .         .        X.
12050 251. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .L.
12055 252.         .   O     .         .         .         .         .         .         .         .         .        X.
12100 253.         .  O      .         .         .         .         .         .         .         .         .        X.
12105 254.         .   O     .         .         .         .         .         .         .         .         .       XX.
12110 255.         .    O    .         .         .         .         .         .         .         .         .       XX.
12115 256.         .        O.         .         .         .         .         .         .         .         .       XX.
12120 257.         .         .  O      .         .         .         .         .         .         .         .       XX.
12125 258.         .         .     O   .         .         .         .         .         .         .         .       XX.
12130 259.         .         .        O.         .         .         .         .         .         .         .       XX.
12135 260.         .         .         .O        .         .         .         .         .         .         .       XX.
12140 261. . . . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
12145 262.         .         .         . O       .         .         .         .         .         .         .       XX.
12150 263.         .         .         .  O      .         .         .         .         .         .         .       XX.
12155 264.         .         .         .  O      .         .         .         .         .         .         .       XX.
12200 265.         .         .         .  O      .         .         .         .         .         .         .       XX.
12205 266.         .         .         .  O      .         .         .         .         .         .         .       LX.
12210 267.         .         .         .  O      .         .         .         .         .         .         .       LX.
12215 268.         .         .         .  O      .         .         .         .         .         .         .       LX.
12220 269.         .         .         . O       .         .         .         .         .         .         .       LX.
12225 270.         .         .         .O        .         .         .         .         .         .         .       LX.
12230 271. . . . . . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
12235 272.         .         .        O.         .         .         .         .         .         .         .       LX.
12240 273.         .         .        O.         .         .         .         .         .         .         .       LX.
12245 274.         .         .        O.         .         .         .         .         .         .         .       XX.
12250 275.         .         .        O.         .         .         .         .         .         .         .       XX.
12255 276.         .         .        O.         .         .         .         .         .         .         .       XX.
12300 277.         .         .        O.         .         .         .         .         .         .         .       XX.
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12305 278.         .         .       O .         .         .         .         .         .         .         .         .        X.
12310 279.         .         .      O  .         .         .         .         .         .         .         .         .        X.
12315 280.         .         .    O    .         .         .         .         .         .         .         .         .        X.
12320 281. . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12325 282.         .        O.         .         .         .         .         .         .         .         .         .        X.
12330 283.         .      O  .         .         .         .         .         .         .         .         .         .        X.
12335 284.         .     O   .         .         .         .         .         .         .         .         .         .        X.
12340 285.         .    O    .         .         .         .         .         .         .         .         .         .        X.
12345 286.         .    O    .         .         .         .         .         .         .         .         .         .        X.
12350 287.         .    O    .         .         .         .         .         .         .         .         .         .        X.
12355 288.         .    O    .         .         .         .         .         .         .         .         .         .        X.
20000 289.         .    O    .         .         .         .         .         .         .         .         .         .        X.
20005 290.         .   O     .         .         .         .         .         .         .         .         .         .         .
20010 291. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
20015 292.         .O        .         .         .         .         .         .         .         .         .         .         .
20020 293.       O .         .         .         .         .         .         .         .         .         .         .         .
20025 294.     O   .         .         .         .         .         .         .         .         .         .         .         .
20030 295.   O     .         .         .         .         .         .         .         .         .         .         .         .
20035 296. O       .         .         .         .         .         .         .         .         .         .         .         .
20040 297. O       .         .         .         .         .         .         .         .         .         .         .         .
20045 298.O        .         .         .         .         .         .         .         .         .         .         .         .
20050 299.O        .         .         .         .         .         .         .         .         .         .         .         .
20055 3000---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
```

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	150.	6.42	68.	40.	38.	.49		

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

```
****************************************                                              ***************************************
*                                      *                                              *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                              *   U.S. ARMY CORPS OF ENGINEERS      *
*             JUN   1998               *                                              *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                                              *         609 SECOND STREET           *
*                                      *                                              *     DAVIS, CALIFORNIA 95616         *
*  RUN DATE   26JUL11  TIME  18:57:24  *                                              *         (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

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

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

KK WMSA-NQ
IN       5
PB    7.63
PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
PI  0.0015  0.0015  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014  0.0014   0.001
PI  0.0014  0.0014  0.0014  0.0014  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0062  0.0062  0.0062   0.006
PI  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0062  0.0055   0.005
PI  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055  0.0055   0.005
PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
PI  0.0053  0.0053  0.0345  0.0345  0.0103  0.0103  0.0103  0.0103  0.0094   0.009
PI  0.0094  0.0094  0.0094  0.0094  0.0053  0.0053  0.0053  0.0053  0.0053   0.005
PI  0.0053  0.0053  0.0053  0.0053  0.0053  0.0053  0.0033  0.0033  0.0033   0.003
PI  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0033  0.0025   0.002
PI  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025  0.0025   0.002
PI  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034  0.0034   0.003
PI  0.0034  0.0034  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041  0.0041   0.004
PI  0.0041  0.0041  0.0041  0.0041  0.0031  0.0031  0.0031  0.0031  0.0031   0.003
PI  0.0031  0.0031  0.0031  0.0031  0.0031  0.0031  0.0032  0.0032  0.0032   0.003
PI  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0032  0.0023   0.002
PI  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
PI  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026  0.0026   0.002
PI  0.0026  0.0026  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023  0.0023   0.002
PI  0.0023  0.0023  0.0023  0.0023  0.0013  0.0013  0.0013  0.0013  0.0013   0.001
PI  0.0013  0.0013  0.0013  0.0013  0.0013  0.0013  0.0017  0.0017  0.0017   0.001
PI  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0017  0.0018   0.001
PI  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018  0.0018   0.001
PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015   0.001
PI  0.0015  0.0015  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037  0.0037   0.003
PI  0.0037  0.0037  0.0037  0.0037  0.0030  0.0030  0.0030  0.0030  0.0030   0.003
PI  0.0030  0.0030  0.0030  0.0030  0.0030  0.0030  0.0015  0.0015  0.0015   0.001
PI  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015  0.0015
BA  0.4927
LS    0.82      71
UD     .30
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
```

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****************************************                                     ***************************************
*                                      *                                     *                                     *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                     *   U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                     *   HYDROLOGIC ENGINEERING CENTER     *
*           VERSION 4.1                *                                     *         609 SECOND STREET           *
*                                      *                                     *      DAVIS, CALIFORNIA 95616        *
*  RUN DATE   26JUL11  TIME  18:57:24  *                                     *          (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

                         (O) OUTFLOW
         0.       40.       80.      120.      160.      200.      240.        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         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10310  390         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10315  400         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10320  410 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LLLLL.
 10325  420         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10330  430         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10335  440         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10340  450         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10345  460         .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10350  47.O        .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10355  48.O        .         .         .         .         .         .         .         .         .         .         .    LLLLL.
 10400  49. O       .         .         .         .         .         .         .         .         .         .         .    LLLLX.
 10405  50.  O      .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10410  51. .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLLX.
 10415  52.   O     .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10420  53.    O    .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10425  54.    O    .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10430  55.     O   .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10435  56.      O  .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10440  57.      O  .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10445  58.       O .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10450  59.       O .         .         .         .         .         .         .         .         .         .         .     LLLX.
 10455  60.        O.         .         .         .         .         .         .         .         .         .         .     LLLX.
 10500  61. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLLX.
 10505  62.         O         .         .         .         .         .         .         .         .         .         .     LLLX.
 10510  63.         O         .         .         .         .         .         .         .         .         .         .     LLLX.
 10515  64.         .O        .         .         .         .         .         .         .         .         .         .     LLLX.
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10520  65.          .O        .         .         .         .         .         .         .         .         .     LLLX.
10525  66.          . O       .         .         .         .         .         .         .         .         .     LLLX.
10530  67.          . O       .         .         .         .         .         .         .         .         .     LLLX.
10535  68.          .  O      .         .         .         .         .         .         .         .         .     LLXX.
10540  69.          .  O      .         .         .         .         .         .         .         .         .     LLXX.
10545  70.          .  O      .         .         .         .         .         .         .         .         .     LLXX.
10550  71.  . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLXX.
10555  72.          .   O     .         .         .         .         .         .         .         .         .     LLXX.
10600  73.          .   O     .         .         .         .         .         .         .         .         .     LLXX.
10605  74.          .      O  .         .         .         .         .         .         .         .  LLLLLLLLLLLLLLLXXXXXXXXXXXX.
10610  75.          .         .     O   .         .         .         .         .         .         .  LLLLLLLLLLLLLLXXXXXXXXXXXXX.
10615  76.          .         .         .         O         .         .         .         .         .         . LLLLXXXX.
10620  77.          .         .         .         .         .  O      .         .         .         .         . LLLLXXXX.
10625  78.          .         .         .         .         .        O.         .         .         .         . LLLLXXXX.
10630  79.          .         .         .         .         .       O .         .         .         .         . LLLLXXXX.
10635  80.          .         .         .         .         .   O     .         .         .         .         .  LLLXXXX.
10640  81.  . . . . . . . . . . . . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LLLXXXX.
10645  82.          .         .         .         .     O   .         .         .         .         .         .  LLLXXXX.
10650  83.          .         .         .         .   O     .         .         .         .         .         .  LLLXXXX.
10655  84.          .         .         .         .  O      .         .         .         .         .         .  LLLXXXX.
10700  85.          .         .         .         . O       .         .         .         .         .         .  LLLXXXX.
10705  86.          .         .         .         . O       .         .         .         .         .         .     LXXX.
10710  87.          .         .         .         O         .         .         .         .         .         .     LXXX.
10715  88.          .         .         .       O .         .         .         .         .         .         .     LXXX.
10720  89.          .         .         .   O     .         .         .         .         .         .         .     LXXX.
10725  90.          .         .         .O        .         .         .         .         .         .         .     LXXX.
10730  91.  . . . . . . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LLXX.
10735  92.          .         .       O .         .         .         .         .         .         .         .     LXXX.
10740  93.          .         .      O  .         .         .         .         .         .         .         .     LXXX.
10745  94.          .         .     O   .         .         .         .         .         .         .         .     LXXX.
10750  95.          .         .     O   .         .         .         .         .         .         .         .     LXXX.
10755  96.          .         .     O   .         .         .         .         .         .         .         .     LXXX.
10800  97.          .         .     O   .         .         .         .         .         .         .         .     LXXX.
10805  98.          .         .     O   .         .         .         .         .         .         .         .      LXX.
10810  99.          .         .    O    .         .         .         .         .         .         .         .      LXX.
10815 100.          .         .  O      .         .         .         .         .         .         .         .      LXX.
10820 101.  . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
10825 102.          .         O         .         .         .         .         .         .         .         .      LXX.
10830 103.          .        O.         .         .         .         .         .         .         .         .      LXX.
10835 104.          .       O .         .         .         .         .         .         .         .         .      LXX.
10840 105.          .      O  .         .         .         .         .         .         .         .         .      LXX.
10845 106.          .      O  .         .         .         .         .         .         .         .         .      LXX.
10850 107.          .      O  .         .         .         .         .         .         .         .         .      LXX.
10855 108.          .      O  .         .         .         .         .         .         .         .         .      LXX.
10900 109.          .      O  .         .         .         .         .         .         .         .         .      LXX.
10905 110.          .      O  .         .         .         .         .         .         .         .         .       LX.
10910 111.  . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
10915 112.          .     O   .         .         .         .         .         .         .         .         .       LX.
10920 113.          .    O    .         .         .         .         .         .         .         .         .       LX.
10925 114.          .   O     .         .         .         .         .         .         .         .         .       LX.
10930 115.          .  O      .         .         .         .         .         .         .         .         .       LX.
10935 116.          .  O      .         .         .         .         .         .         .         .         .       LX.
10940 117.          .  O      .         .         .         .         .         .         .         .         .       LX.
10945 118.          .  O      .         .         .         .         .         .         .         .         .       LX.
10950 119.          .  O      .         .         .         .         .         .         .         .         .       LX.
10955 120.          .  O      .         .         .         .         .         .         .         .         .       LX.
11000 121.  . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11005 122.          .  O      .         .         .         .         .         .         .         .         .      LXX.
11010 123.          .  O      .         .         .         .         .         .         .         .         .      LXX.
11015 124.          .   O     .         .         .         .         .         .         .         .         .      LXX.
11020 125.          .    O    .         .         .         .         .         .         .         .         .      LXX.
11025 126.          .     O   .         .         .         .         .         .         .         .         .      LXX.
11030 127.          .      O  .         .         .         .         .         .         .         .         .      LXX.
11035 128.          .      O  .         .         .         .         .         .         .         .         .      LXX.
11040 129.          .      O  .         .         .         .         .         .         .         .         .      LXX.
11045 130.          .       O .         .         .         .         .         .         .         .         .      LXX.
11050 131.  . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11055 132.          .       O .         .         .         .         .         .         .         .         .      LXX.
11100 133.          .       O .         .         .         .         .         .         .         .         .      LXX.
11105 134.          .       O .         .         .         .         .         .         .         .         .      LXX.
11110 135.          .       O .         .         .         .         .         .         .         .         .      LXX.
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11115 136.         .        O.         .         .         .         .         .         .         .         .      LXX.
11120 137.         .         O         .         .         .         .         .         .         .         .      LXX.
11125 138.         .         .O        .         .         .         .         .         .         .         .      LXX.
11130 139.         .         .O        .         .         .         .         .         .         .         .      LXX.
11135 140.         .         . O       .         .         .         .         .         .         .         .      LXX.
11140 141. . . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .LXX.
11145 142.         .         . O       .         .         .         .         .         .         .         .      LXX.
11150 143.         .         . O       .         .         .         .         .         .         .         .      LXX.
11155 144.         .         . O       .         .         .         .         .         .         .         .      LXX.
11200 145.         .         . O       .         .         .         .         .         .         .         .      LXX.
11205 146.         .         . O       .         .         .         .         .         .         .         .       XX.
11210 147.         .         . O       .         .         .         .         .         .         .         .       XX.
11215 148.         .         .O        .         .         .         .         .         .         .         .       XX.
11220 149.         .         O         .         .         .         .         .         .         .         .       XX.
11225 150.         .        O.         .         .         .         .         .         .         .         .       XX.
11230 151. . . . . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11235 152.         .       O .         .         .         .         .         .         .         .         .       XX.
11240 153.         .       O .         .         .         .         .         .         .         .         .       XX.
11245 154.         .       O .         .         .         .         .         .         .         .         .       XX.
11250 155.         .       O .         .         .         .         .         .         .         .         .       XX.
11255 156.         .       O .         .         .         .         .         .         .         .         .       XX.
11300 157.         .       O .         .         .         .         .         .         .         .         .       XX.
11305 158.         .       O .         .         .         .         .         .         .         .         .       XX.
11310 159.         .       O .         .         .         .         .         .         .         .         .       XX.
11315 160.         .       O .         .         .         .         .         .         .         .         .       XX.
11320 161. . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
11325 162.         .       O .         .         .         .         .         .         .         .         .       XX.
11330 163.         .       O .         .         .         .         .         .         .         .         .       XX.
11335 164.         .       O .         .         .         .         .         .         .         .         .       XX.
11340 165.         .       O .         .         .         .         .         .         .         .         .       XX.
11345 166.         .       O .         .         .         .         .         .         .         .         .       XX.
11350 167.         .       O .         .         .         .         .         .         .         .         .       XX.
11355 168.         .       O .         .         .         .         .         .         .         .         .       XX.
11400 169.         .       O .         .         .         .         .         .         .         .         .       XX.
11405 170.         .       O .         .         .         .         .         .         .         .         .       LX.
11410 171. . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11415 172.         .      O  .         .         .         .         .         .         .         .         .       LX.
11420 173.         .     O   .         .         .         .         .         .         .         .         .       LX.
11425 174.         .    O    .         .         .         .         .         .         .         .         .       LX.
11430 175.         .   O     .         .         .         .         .         .         .         .         .       LX.
11435 176.         .   O     .         .         .         .         .         .         .         .         .       LX.
11440 177.         .   O     .         .         .         .         .         .         .         .         .       LX.
11445 178.         .   O     .         .         .         .         .         .         .         .         .       LX.
11450 179.         .   O     .         .         .         .         .         .         .         .         .       LX.
11455 180.         .   O     .         .         .         .         .         .         .         .         .       LX.
11500 181. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11505 182.         .  O      .         .         .         .         .         .         .         .         .       XX.
11510 183.         .  O      .         .         .         .         .         .         .         .         .       XX.
11515 184.         .   O     .         .         .         .         .         .         .         .         .       XX.
11520 185.         .   O     .         .         .         .         .         .         .         .         .       XX.
11525 186.         .   O     .         .         .         .         .         .         .         .         .       XX.
11530 187.         .    O    .         .         .         .         .         .         .         .         .       XX.
11535 188.         .    O    .         .         .         .         .         .         .         .         .       XX.
11540 189.         .    O    .         .         .         .         .         .         .         .         .       XX.
11545 190.         .    O    .         .         .         .         .         .         .         .         .       XX.
11550 191. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
11555 192.         .    O    .         .         .         .         .         .         .         .         .       XX.
11600 193.         .    O    .         .         .         .         .         .         .         .         .       XX.
11605 194.         .    O    .         .         .         .         .         .         .         .         .       LX.
11610 195.         .    O    .         .         .         .         .         .         .         .         .       LX.
11615 196.         .    O    .         .         .         .         .         .         .         .         .       LX.
11620 197.         .   O     .         .         .         .         .         .         .         .         .       LX.
11625 198.         .   O     .         .         .         .         .         .         .         .         .       LX.
11630 199.         .   O     .         .         .         .         .         .         .         .         .       LX.
11635 200.         .   O     .         .         .         .         .         .         .         .         .       LX.
11640 201. . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . LX.
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11650 203.         .   O     .         .         .         .         .         .         .         .         .       LX.
11655 204.         .  O      .         .         .         .         .         .         .         .         .       LX.
11700 205.         .   O     .         .         .         .         .         .         .         .         .       LX.
11705 206.         .  O      .         .         .         .         .         .         .         .         .        X.
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11710 207.          .  O      .         .         .         .         .         .         .         .         .         .        X.
11715 208.          . O       .         .         .         .         .         .         .         .         .         .        X.
11720 209.          .O        .         .         .         .         .         .         .         .         .         .        X.
11725 210.          O         .         .         .         .         .         .         .         .         .         .        X.
11730 211. . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11735 212.         O.         .         .         .         .         .         .         .         .         .         .        X.
11740 213.        O .         .         .         .         .         .         .         .         .         .         .        X.
11745 214.        O .         .         .         .         .         .         .         .         .         .         .        X.
11750 215.        O .         .         .         .         .         .         .         .         .         .         .        X.
11755 216.        O .         .         .         .         .         .         .         .         .         .         .        X.
11800 217.        O .         .         .         .         .         .         .         .         .         .         .        X.
11805 218.        O .         .         .         .         .         .         .         .         .         .         .        X.
11810 219.        O .         .         .         .         .         .         .         .         .         .         .        X.
11815 220.        O .         .         .         .         .         .         .         .         .         .         .        X.
11820 221. . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11825 222.         O.         .         .         .         .         .         .         .         .         .         .        X.
11830 223.         O.         .         .         .         .         .         .         .         .         .         .        X.
11835 224.         O.         .         .         .         .         .         .         .         .         .         .        X.
11840 225.         O.         .         .         .         .         .         .         .         .         .         .        X.
11845 226.          O         .         .         .         .         .         .         .         .         .         .        X.
11850 227.          O         .         .         .         .         .         .         .         .         .         .        X.
11855 228.          O         .         .         .         .         .         .         .         .         .         .        X.
11900 229.          O         .         .         .         .         .         .         .         .         .         .        X.
11905 230.          O         .         .         .         .         .         .         .         .         .         .        X.
11910 231. . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
11915 232.          O         .         .         .         .         .         .         .         .         .         .        X.
11920 233.          O         .         .         .         .         .         .         .         .         .         .        X.
11925 234.          O         .         .         .         .         .         .         .         .         .         .        X.
11930 235.          O         .         .         .         .         .         .         .         .         .         .        X.
11935 236.          O         .         .         .         .         .         .         .         .         .         .        X.
11940 237.          O         .         .         .         .         .         .         .         .         .         .        X.
11945 238.          .O        .         .         .         .         .         .         .         .         .         .        X.
11950 239.          .O        .         .         .         .         .         .         .         .         .         .        X.
11955 240.          .O        .         .         .         .         .         .         .         .         .         .        X.
12000 241. . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12005 242.          O         .         .         .         .         .         .         .         .         .         .        X.
12010 243.          O         .         .         .         .         .         .         .         .         .         .        X.
12015 244.          O         .         .         .         .         .         .         .         .         .         .        X.
12020 245.         O.         .         .         .         .         .         .         .         .         .         .        X.
12025 246.         O.         .         .         .         .         .         .         .         .         .         .        X.
12030 247.         O.         .         .         .         .         .         .         .         .         .         .        X.
12035 248.         O.         .         .         .         .         .         .         .         .         .         .        X.
12040 249.         O.         .         .         .         .         .         .         .         .         .         .        X.
12045 250.         O.         .         .         .         .         .         .         .         .         .         .        X.
12050 251. . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12055 252.         O.         .         .         .         .         .         .         .         .         .         .        X.
12100 253.         O.         .         .         .         .         .         .         .         .         .         .        X.
12105 254.         O.         .         .         .         .         .         .         .         .         .         .      LXX.
12110 255.          O         .         .         .         .         .         .         .         .         .         .      LXX.
12115 256.          . O       .         .         .         .         .         .         .         .         .         .      LXX.
12120 257.          .    O    .         .         .         .         .         .         .         .         .         .      LXX.
12125 258.          .      O  .         .         .         .         .         .         .         .         .         .      LXX.
12130 259.          .        O.         .         .         .         .         .         .         .         .         .      LXX.
12135 260.          .         O         .         .         .         .         .         .         .         .         .      LXX.
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12145 262.          .         .O        .         .         .         .         .         .         .         .         .      LXX.
12150 263.          .         . O       .         .         .         .         .         .         .         .         .      LXX.
12155 264.          .         . O       .         .         .         .         .         .         .         .         .      LXX.
12200 265.          .         . O       .         .         .         .         .         .         .         .         .      LXX.
12205 266.          .         . O       .         .         .         .         .         .         .         .         .       XX.
12210 267.          .         . O       .         .         .         .         .         .         .         .         .       XX.
12215 268.          .         . O       .         .         .         .         .         .         .         .         .       XX.
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12225 270.          .         O         .         .         .         .         .         .         .         .         .       XX.
12230 271. . . . . . . . . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . XX.
12235 272.          .        O.         .         .         .         .         .         .         .         .         .       XX.
12240 273.          .        O.         .         .         .         .         .         .         .         .         .       XX.
12245 274.          .        O.         .         .         .         .         .         .         .         .         .       XX.
12250 275.          .        O.         .         .         .         .         .         .         .         .         .       XX.
12255 276.          .        O.         .         .         .         .         .         .         .         .         .       XX.
12300 277.          .        O.         .         .         .         .         .         .         .         .         .       XX.
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12305 278.         .        O.         .         .         .         .         .         .         .         .         .        X.
12310 279.         .       O .         .         .         .         .         .         .         .         .         .        X.
12315 280.         .     O   .         .         .         .         .         .         .         .         .         .        X.
12320 281. . . . . . .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .X.
12325 282.         .  O      .         .         .         .         .         .         .         .         .         .        X.
12330 283.         .O        .         .         .         .         .         .         .         .         .         .        X.
12335 284.         O         .         .         .         .         .         .         .         .         .         .        X.
12340 285.         O         .         .         .         .         .         .         .         .         .         .        X.
12345 286.         O         .         .         .         .         .         .         .         .         .         .        X.
12350 287.         O         .         .         .         .         .         .         .         .         .         .        X.
12355 288.         O         .         .         .         .         .         .         .         .         .         .        X.
20000 289.         O         .         .         .         .         .         .         .         .         .         .        X.
20005 290.        O.         .         .         .         .         .         .         .         .         .         .         .
20010 291. . . O . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
20015 292.      O  .         .         .         .         .         .         .         .         .         .         .         .
20020 293.    O    .         .         .         .         .         .         .         .         .         .         .         .
20025 294.   O     .         .         .         .         .         .         .         .         .         .         .         .
20030 295. O       .         .         .         .         .         .         .         .         .         .         .         .
20035 296. O       .         .         .         .         .         .         .         .         .         .         .         .
20040 297.O        .         .         .         .         .         .         .         .         .         .         .         .
20045 298.O        .         .         .         .         .         .         .         .         .         .         .         .
20050 299O         .         .         .         .         .         .         .         .         .         .         .         .
20055 300O---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.---------.
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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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+					6-HOUR	24-HOUR	72-HOUR			
	HYDROGRAPH AT									
+		WMSA-NQ	235.	6.42	98.	56.	54.	.49		

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

APPENDIX C

DESILTATION BASIN ANALYSES

DESILTATION BASIN SIZING

Proposed Desiltation Basin Sizing using SCVURPPP Method

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
NQ+WMSA	40A	102	315.32	2.0	0.01	0.5255	22,892
WMSA	40B	204	51.27	2.0	0.01	0.0855	3,722
WMSA	40C	304	80.61	2.0	0.01	0.1344	5,852
Surge Pile	40I	N/A	4.83	2.0	0.01	0.0080	350

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)
BMP Volume for Surge Pile based on SCVURPPP Method Only Since Footprint is Small and Additional Binder/Mating will be Placed over Area

DESILTATION BASIN SIZING

Proposed Desiltation Basin Sizing using SWRCB Equation

Region	Desiltation Basin	Hydrology Study Node	Drainage Area, ac	Q25, cfs	As, sf	Minimum Basin Length, ft	Minimum Basin Width, ft
NQ+WMSA	40A	102	315.32	150.0	29,032	241	120
WMSA	40B	204	51.27	80.0	15,484	176	88
WMSA	40C	304	80.61	118.2	22,877	214	107

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} = 28 inches

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

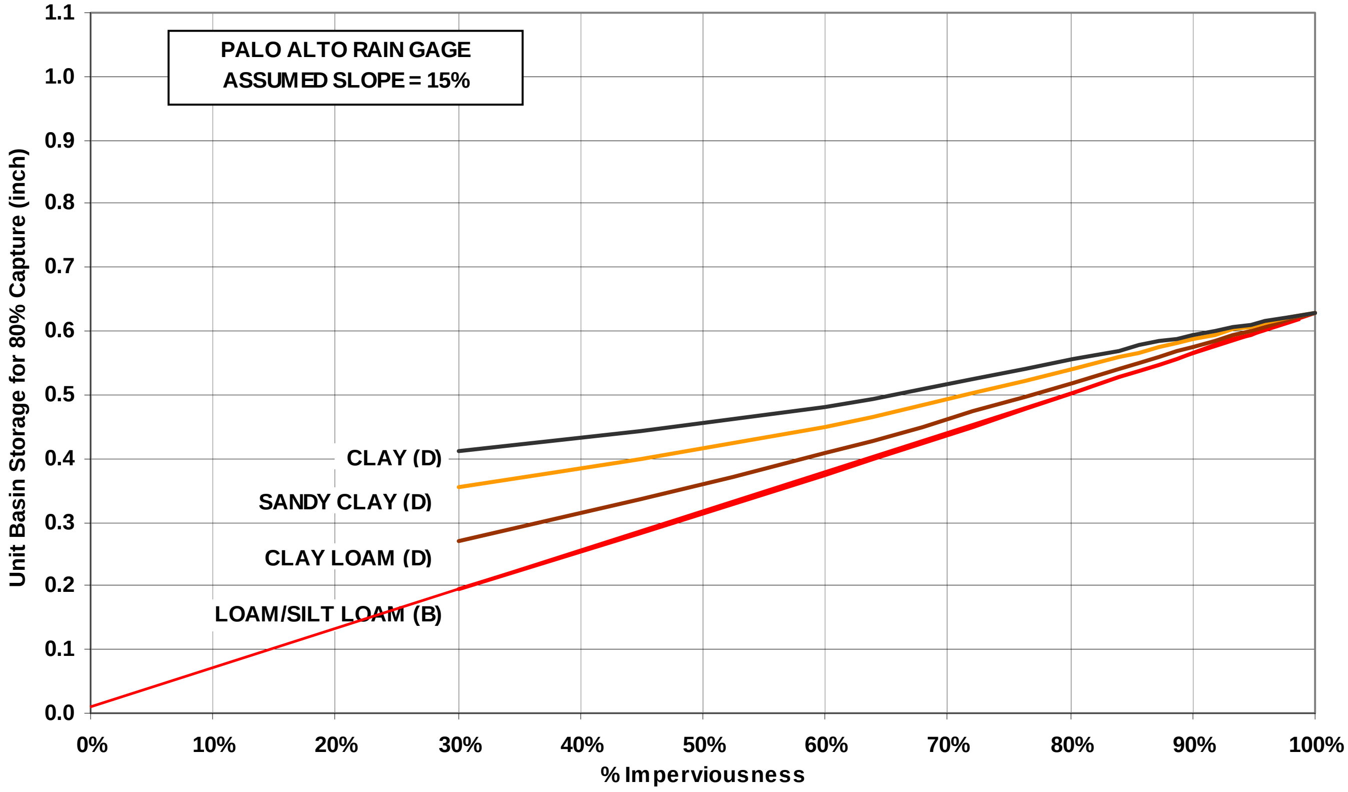
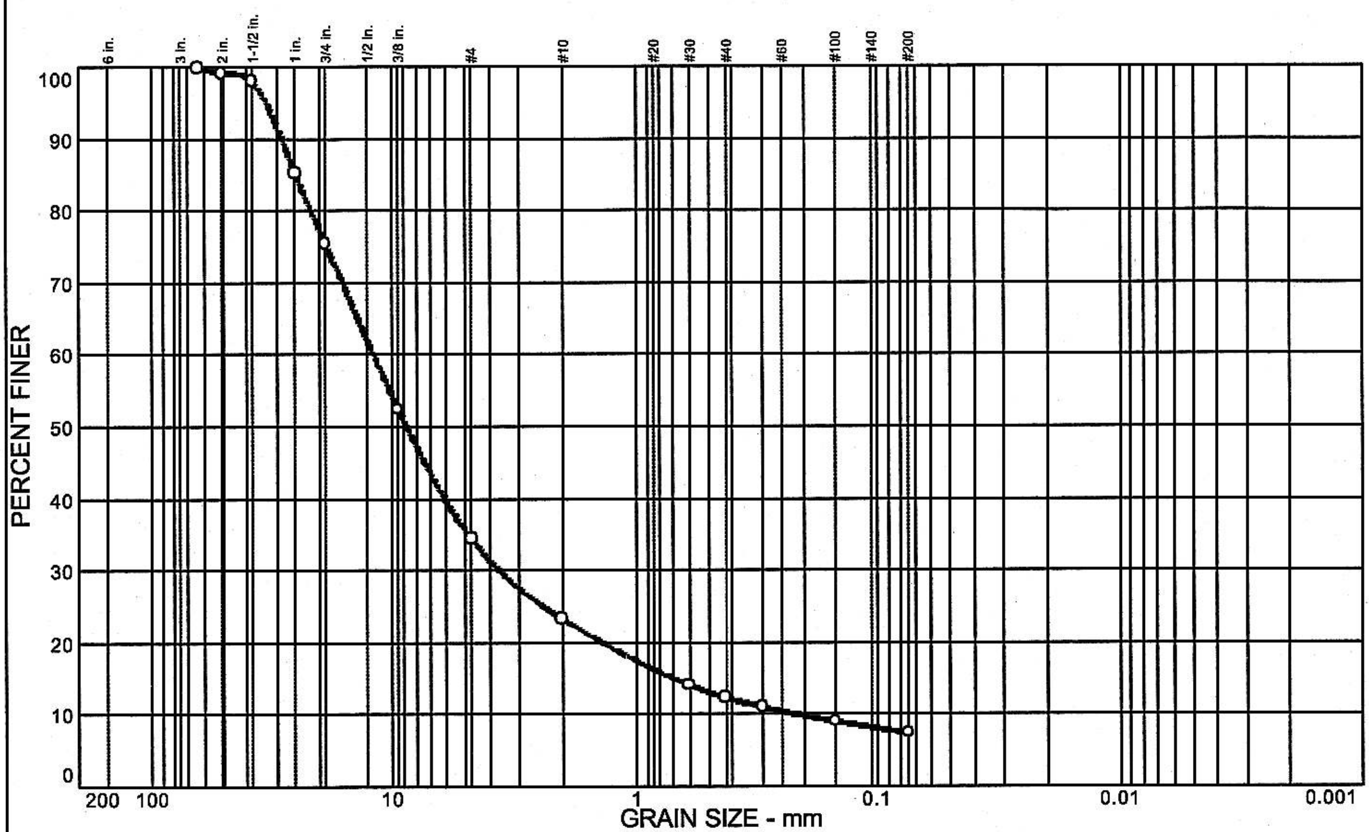


Figure 3-B Unit Basin Volume for 80% Capture - <u>Palo Alto Rain Gage</u>

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	ft³/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	ft²
Velocity	8.00	ft/s

APPENDIX D

DECEMBER 6, 2011 LETTER
COVERING
PERMANENTE CREEK RECLAMATION AREA

ChangConsultants
Civil Engineering◦Hydrology◦Hydraulics◦Sedimentation

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wayne@changconsultants.com

December 6, 2011

Mr. Marvin Howell
Hanson Aggregates Pacific Southwest, Inc.
P.O. Box 639069
San Diego, CA 92163-9069

Subject: Permanente Quarry Reclamation Plan – Additional Drainage-Related Improvements Adjacent to Permanente Creek

Dear Mr. Howell:

This letter describes the additional drainage and desiltation facilities being incorporated into the Reclamation Plan drawings for the Permanente Quarry. The facilities address additional requirements from the County of Santa Clara in regards to the pre-SMARA slopes south of the West Materials Storage Area (WMSA). In particular, the County has requested improvements to the drainage conditions in what is referred to as the Permanente Creek Reclamation Area and specifically the areas identified as Subarea 1 and Subarea 2. Subarea 1 is the south facing slope below the southwesterly portion of the WMSA. Subarea 2 is the south facing slope below the central portion of WMSA. The following describes the additional facilities and associated engineering analyses.

Subarea 1 contains a narrow earthen access path created by cut within the mid-slope area. The upper portion of the path slopes downward in a westerly direction until it reaches a switchback. Beyond the switchback the path slopes downward in an easterly direction for approximately 160 feet to a terminus. The County has identified two small desiltation basins that existed along the path in the past, evidenced by two widened locations along the path and displaced rock in the vicinity. One of the basins was within the upper portion of the path and the other was at the terminus. The proposed drainage improvements in this area include regrading of the path to create a drainage terrace. The terrace will include a 2 percent cross-slope towards the inner edge to prevent runoff from flowing over the outer slope face. In addition, two desiltation basins will be restored within the terrace at the same locations using current standards.

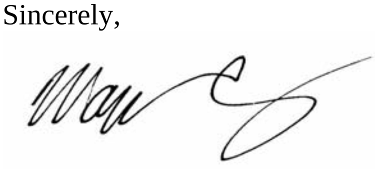
A rational method analysis was performed to determine the 100-year flow within the terrace. The criteria is outlined in Chang Consultants' September 1, 2011, *Drainage Report for the Permanente Quarry.* A work map is enclosed showing the drainage basin boundaries, drainage areas, and rational method node numbers. The attached rational method results show that the 100-year flow rate at the upper desiltation basin is 9.0 cubic feet per second (cfs) and at the lower desiltation basin is 11.1 cfs. The channel travel time routine in the results indicate that the normal depth in the terrace will be approximately 1.0 feet. The grading shall be performed to contain this flow depth within the terrace.

The desiltation basins will capture sediment generated from the disturbed terrace surface. The areas beyond this are undisturbed, native surfaces and will not generate sediment beyond what is naturally occurring. The Santa Clara Valley Urban Runoff Pollution Prevention Program criteria was used to determine the required desiltation basin volume to capture the terrace sediment. This criteria is outlined in Chang Consultant's September 2011 drainage report. The results are attached and show that 17 cubic feet of storage volume total needs to be captured by the two basins. The basins are 2 feet deep, so the surface area must be at least 8.5 square feet each. The surface area will be at least double this amount to provide a factor of safety.

Subarea 2 is below the two desiltation basins (Basin 40B and 40C) proposed as part of the WMSA reclamation. The County has required that the outlet pipes from these basins be extended towards the toe of the south facing slope beyond the majority of the boulders that have deposited near the toe. The reclamation plan drawings have been revised to reflect the extended pipe. Since the extended pipe does not affect the hydrology, the pipe sizes remain the same. Grouted riprap pads will be constructed to dissipate the flow exiting each pipe.

Finally, silt fences and fiber rolls have been added to the reclamation plan drawings. The County has requested silt fences along the toe of some slopes as well as fiber rolls on the faces of these slopes. The silt fences have been added at Subareas 1, 2, 3, 5, and 7. The silt fences will be placed along the southerly edge of the slopes resulting from mining activities. The silt fences will not extend beyond the ordinary high water mark along the north bank of Permanente Creek. The fiber rolls shall be installed at approximately 10 foot vertical spacing on the slopes in accordance with the reclamation plan maps and accepted criteria.

Sincerely,



Wayne W. Chang, M.S., P.E.

Enclosures

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 12/06/11

West Materials Storage Area
Proposed Conditions - Subarea 1
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		4.443(In.)
2	10.000		3.120(In.)
3	15.000		2.465(In.)
4	30.000		1.660(In.)
5	60.000		1.164(In.)
6	120.000		0.873(In.)
7	180.000		0.757(In.)
8	360.000		0.601(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

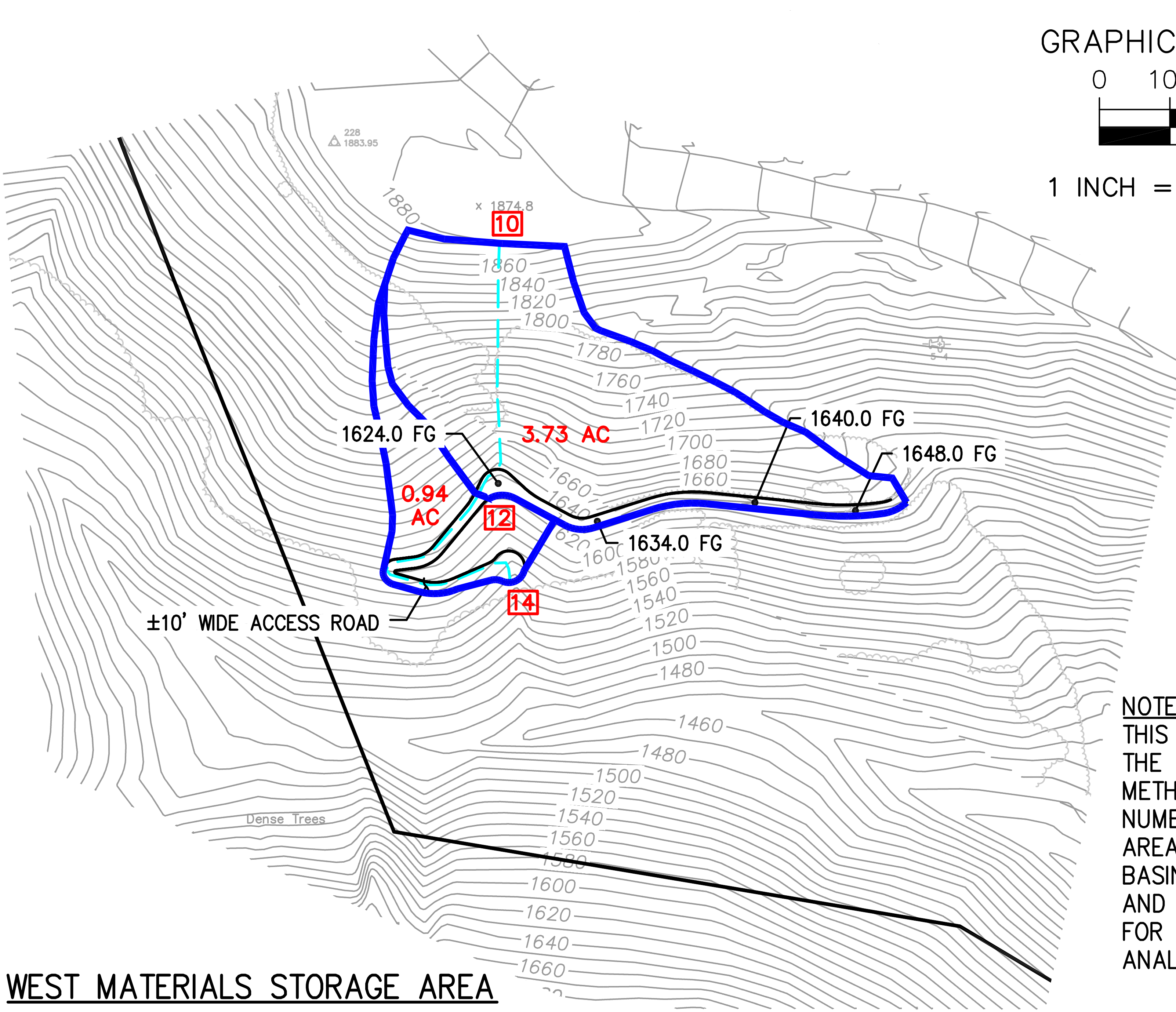
Stream flow confluence option used:

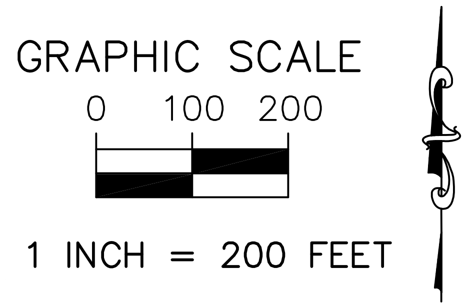
Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
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      12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   369.000(Ft.)
Top (of initial area) elevation =  1880.000(Ft.)
Bottom (of initial area) elevation =  1624.000(Ft.)
Difference in elevation =   256.000(Ft.)
Slope =    0.69377  s(%)=      69.38
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   10.900 min.
Rainfall intensity =      3.002(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff =      8.958(CFS)
Total initial stream area =       3.730(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      12.000 to Point/Station      14.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =  1624.000(Ft.)
Downstream point elevation =  1562.000(Ft.)
Channel length thru subarea  =   389.000(Ft.)
Channel base width    =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.500
Estimated mean flow rate at midpoint of channel =     10.087(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     10.087(CFS)
Depth of flow =   0.274(Ft.), Average velocity =   5.230(Ft/s)
Channel flow top width =   14.095(Ft.)
Flow Velocity =    5.23(Ft/s)
Travel time  =    1.24 min.
Time of concentration =   12.14 min.
Critical depth =      0.395(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.840(In/Hr) for a   100.0 year storm
Subarea runoff =      2.135(CFS) for      0.940(Ac.)
Total runoff =     11.094(CFS)   Total area =       4.670(Ac.)
End of computations, total study area =          4.670 (Ac.
```





NOTE:
THIS EXHIBIT SHOWS THE RATIONAL METHOD NODE NUMBERS, DRAINAGE AREAS, DRAINAGE BASIN BOUNDARIES, AND FLOW PATHS FOR THE SUBAREA 1 ANALYSIS.

WEST MATERIALS STORAGE AREA

SUBAREA 1 RATIONAL METHOD WORK MAP

DESILTATION BASIN SIZING

Proposed Desiltation Basin Sizing using SCVURPPP Method

Region	Drainage Area, ac	Rain Gage Correction Factor	Unit Basin Storage Volume, in	BMP Volume, ac-ft	BMP Volume, cf
Area 1	0.23	2.0	0.01	0.0004	17

Notes:
BMP Volume = Rain Gage Correction Factor x Unit Basin Storage Volume x Drainage Area (total volume for both basins)
Rain gage correction factor = Site M.A.P. / Gage M.A.P. = Site M.A.P. / 13.7
Drainage Area based on a 10' wide terrace

MAP POCKET

NORTH QUARRY & WEST MATERIALS STORAGE AREA

EXISTING CONDITION RATIONAL METHOD WORK MAP

NORTH QUARRY & WEST MATERIALS STORAGE AREA

PROPOSED CONDITION RATIONAL METHOD WORK MAP

ATTACHMENT 1

DRAINAGE REPORT

FOR

PERMANENTE QUARRY

EAST MATERIALS STORAGE AREA

April 14, 2009

Wayne W. Chang, MS, PE 46548

Chang Consultants
Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

P.O. Box 9496
Rancho Santa Fe, CA 92067
(858) 692-0760

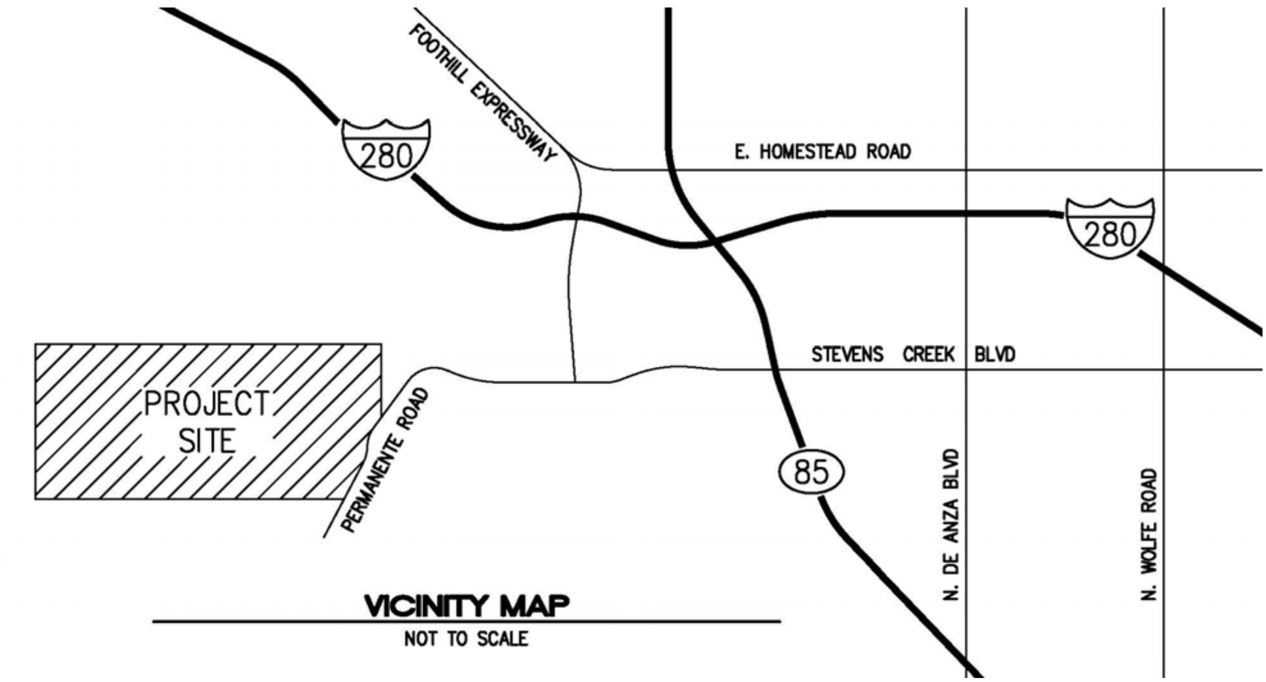
TABLE OF CONTENTS

APPENDICES

MAP POCKET

INTRODUCTION

Lehigh Southwest Cement Co. 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 is now being proposed for a portion of the site known as the East Materials Storage Area (EMSA). This report has been prepared for the proposed activities in the EMSA. The EMSA is a large fill area primarily used for storing overburden material. The EMSA will generally be reclaimed with 2 to 1 (horizontal to vertical) inter-bench slopes (approximately 2.6 to 1 slope overall), and be constructed from an elevation of just over 550 feet to just over 900 feet. Benches will lie at approximately 40-foot vertical intervals, and a perimeter road will be graded around the EMSA. A series of drainage ditches and swales will serve the EMSA. The EMSA slopes will be reclaimed with native grasses and shrubs. The north and east facing benches will also contain trees (oaks), while the south facing benches will contain some pines. The uppermost pad area will be planted with grasses, shrubs, and some trees (pines).



This report contains drainage analyses of the pre- and post-reclamation flow rates from the EMSA and its tributary 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 EMSA as well as after reclamation is complete in the EMSA (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 EMSA perimeter. 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 and proposed reclaimed conditions. The Santa Clara County 2007 *Drainage Manual* rational method procedure was used for the 25- and 100-year hydrologic analyses. 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 used in the TDS equation is 22 inches.

- Drainage area: The existing and proposed condition drainage basins were delineated from either the 10-foot contour interval base topography prepared for the EMSA (flown in 2008) or the proposed reclamation plan grading representing the ultimate EMSA configuration. 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. The overall existing condition drainage basin boundary was set equal to the overall proposed condition boundary to allow a comparison of results.

- 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.

- Runoff coefficients: The existing and proposed site conditions will contain negligible impervious surfaces. For existing conditions, the undisturbed areas were assigned a runoff coefficient associated with shrub land (C = 0.10 for soil group B). In addition, the existing condition disturbed surfaces were assigned a coefficient associated with the agricultural land use category (C = 0.15 for soil group B) because this represents an undeveloped condition with less transpiration. Under proposed conditions, nearly the entire area was assigned a runoff coefficient based on shrub land since the EMSA will be vegetated with grasses, shrubs, and trees.

- Flow lengths and elevations: The flow lengths and elevations were obtained from the topographic mapping and reclamation plan. The initial time of concentration 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 each subarea were based on an area average weighting and developed using a spreadsheet, which is included in Appendix A. The 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 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 25- and 100-year existing and proposed condition rational method output from the program are included in Appendix A and summarized in Table 1. The existing and proposed condition study areas were subdivided into four major drainage basins (10, 20, 30, and 40 for existing conditions; and 100, 200, 300, 400 for proposed conditions). The major basins also include smaller subareas (see the Rational Method Work Maps in the map pocket – the Proposed Condition Rational Method Work Map also contains seven temporary desiltation basins that are discussed later in this report and labeled 30A, 30B, 30C, 30D, 30E, 31B and 31C). The rational method node numbering is based on the major basin number. For instance, rational method nodes 10, 11, 12, etc. are in Major Basin 10; nodes 200, 201, 202, etc. are in Major Basin 200; and so on. Existing condition Major Basin 10 corresponds to proposed condition Major Basin 100, etc. Major Basins 10 and 100 outlet along the southerly portion of the EMSA. The runoff from these basins flows through the plant and ultimately into Permanente Creek. Major Basins 20 and 200 outlet towards the easterly portion of the EMSA and flow a short distance to Permanente Creek. Major Basins 30, 40, 300, and 400 outlet along the northerly portion of the EMSA into natural canyons.

Existing Condition			**Proposed Condition**		
Major Drainage Basin	**25-Year Flow, cfs**	**100-Year Flow, cfs**	**Major Drainage Basin**	**25-Year Flow, cfs**	**100-Year Flow, cfs**
10	13	16	100	11	14
20	9	11	200	8	10
30	0.6	0.7	300	0.6	0.7
40	0.5	0.6	400	0.6	0.8

Table 1. Summary of Rational Method Results

The Rational Method results indicate that reclamation at the proposed project will slightly reduce the 100-year runoff from the first three major basins. On the other hand, there will be a very minor increase of 0.1 cubic feet per second (cfs) during the 25-year storm and 0.2 cfs during the 100-year storm from Major Basin 400. These increases are so minor that they are considered to be negligible and will not cause adverse impacts. Riprap pads will be installed at the discharge points from Major Basin 400 to provide a safe release in accordance with the *Drainage Manual* criteria. These results indicate that reclamation will control erosion and sedimentation in compliance with SMARA's standards. Reclamation will also satisfy the drainage criteria of Santa Clara County.

HYDRAULIC ANALYSES

A series of drainage ditches (or swales) will be installed along the inside edge of the benches and perimeter road. The EMSA drawings propose a semi-circular ditch that is 3-feet wide and 1.5-feet deep along the benches, and a semi-circular ditch that is 4-feet wide and 2-feet deep along the perimeter road. The ditches along the perimeter road should be lined with grouted riprap or an equivalent material to prevent erosion. Normal depth analyses were performed to verify the capacity of the ditches. The largest proposed condition 100-year flow rate in the bench ditches will be approximately 5.5 cfs (near Rational Method Node 205). A normal depth analysis is included after this report text and shows that the ditches are capable of conveying this flow rate at a normal depth of approximately 1.0 feet. This is based on the minimum ditch longitudinal slope of 1 percent. The largest proposed condition 100-year flow rate in the perimeter road ditches is 14 cfs. The normal depth analysis shows that the ditches can convey this flow rate at a normal depth of 1.7 feet. Therefore, the perimeter road ditches can convey the required flow rate without surcharge. 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 EMSA will be sediment since the site will be used to store overburden material. The EMSA 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 desiltation basins will be installed. The temporary desiltation basins will be constructed at several locations along the perimeter of the EMSA to capture sediment. The Proposed Condition Rational Method Work Map contains the seven temporary desiltation basins, which are labeled 30A, 30B, 30C, 30D, 30E, 31B and 31C. Two methodologies have been considered for sizing the 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 B for the largest area tributary to a desiltation basin. The results yield a required storage volume of 3,404 cubic feet.

The SWRCB procedure is recommended for construction sites with exposed surfaces, which is appropriate for the EMSA. 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 in the EMSA. The distribution is included in Appendix B 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 B.

The desiltation basins were sized 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 also meet these criteria as applied to the calculated volume and surface area. The desiltation basins shown on the EMSA plans typically exceed the calculated values by a significant amount.

The outlet works for the desiltation basins were designed to pass the 100-year flow rates. The outlet works consist of a minimum 24-inch riser connected to an outflow pipe and an emergency spillway. 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 analyses were based on the maximum proposed condition 100-year flow rate into a desiltation basin (13.6 cfs) and are included in Appendix B. The analyses show that the 100-year flow can pond up to 0.8 feet above the riser. Consequently, the emergency spillway was 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 B 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 East Materials Storage Area proposed at the Permanente Quarry. The EMSA will be used to store overburden material and will ultimately be planted with native materials. There are no impervious areas proposed at the EMSA. As a result, the proposed reclamation will have a low runoff potential and will result in a slight overall reduction in flow rates. Temporary best management practices will be used at the site until the vegetation is established. The BMPs include desiltation basins, which have been sized with a greater capacity than required by the SCVURPPP and SWRCB guidelines. As a result, the EMSA 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	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	ft/ft
Constructed Depth	1.50	ft
Constructed Top Width	3.00	ft
Discharge	5.50	ft³/s

Results

Normal Depth	1.04	ft
Flow Area	1.74	ft²
Wetted Perimeter	3.39	ft
Hydraulic Radius	0.51	ft
Top Width	2.50	ft
Critical Depth	0.85	ft
Critical Slope	0.02225	ft/ft
Velocity	3.17	ft/s
Velocity Head	0.16	ft
Specific Energy	1.20	ft
Froude Number	0.67	
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	1.04	ft
Critical Depth	0.85	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.02225	ft/ft

Worksheet for Ditch on Perimeter Road

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.01000	ft/ft
Constructed Depth	2.00	ft
Constructed Top Width	4.00	ft
Discharge	14.00	ft^3/s

Results

Normal Depth	1.74	ft
Flow Area	4.33	ft^2
Wetted Perimeter	5.33	ft
Hydraulic Radius	0.81	ft
Top Width	3.73	ft
Critical Depth	1.27	ft
Critical Slope	0.03571	ft/ft
Velocity	3.23	ft/s
Velocity Head	0.16	ft
Specific Energy	1.90	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	1.74	ft
Critical Depth	1.27	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.03571	ft/ft

APPENDIX A

HYDROLOGIC INPUT DATA

AND ANALYSES

RATIONAL METHOD INPUT DATA

25-Year Return Period

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

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

Kirpich Equation for Initial Subareas

Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
10-11	1,355	1,050	919	0.33	12.3
20-21	1,074	890	581	0.32	11.6
30-31	1,012	880	634	0.21	12.1
40-41	754	694	442	0.14	11.8
110-111	777	725	140	0.37	10.5
200-201	1,074	904	581	0.29	11.7
210-211	860	856	443	0.01	15.0
220-221	645	636	919	0.01	18.9
300-301	1015	900	758	0.15	12.7
400-401	815	700	938	0.12	13.4
401-402	705	686	631	0.03	14.3

RATIONAL METHOD INPUT DATA

Existing Condition Runoff Coefficients (Soil Type B)

Nodes	% Shrub Land	% Agriculture	C
10-11	100	--	0.10
11-12	100	--	0.10
12-13	65	35	0.12
13-14	10	90	0.15
20-21	100	--	0.10
21-22	60	40	0.12
22-23	40	60	0.13
23-24	70	30	0.12
30-31	100	--	0.10
31-32	100	--	0.10
40-41	100	--	0.10

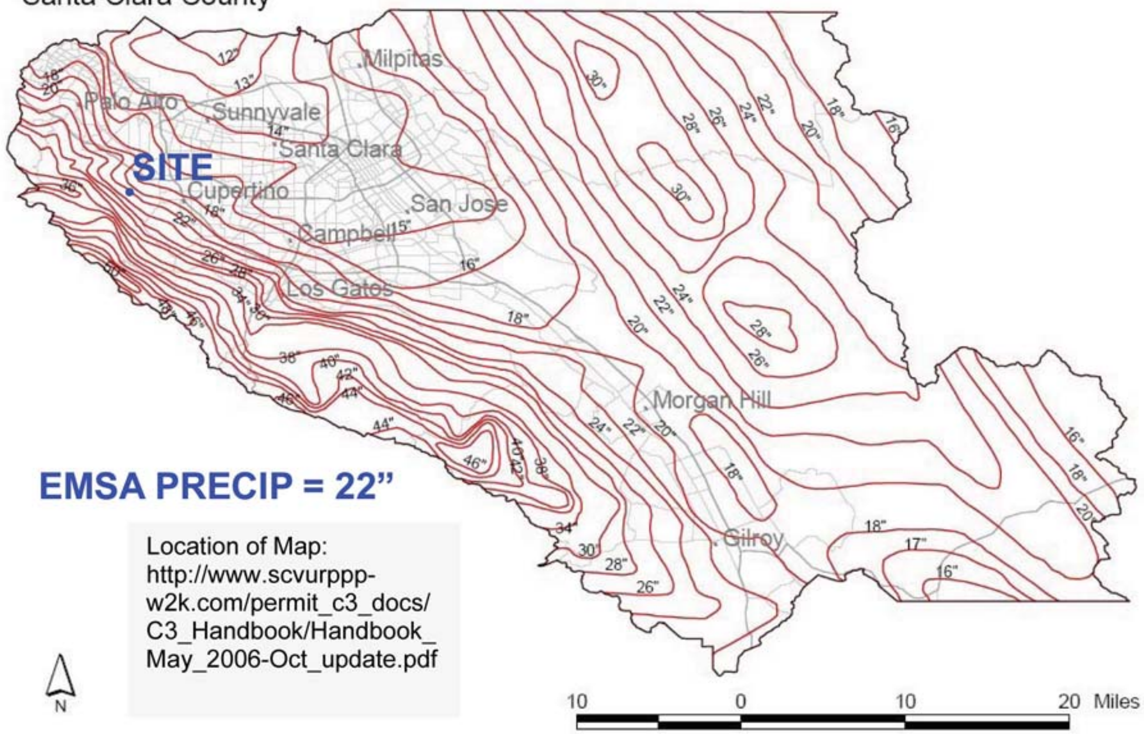
Proposed Condition Runoff Coefficients (Soil Type B)

Nodes	% Shrub Land	% Agriculture	C
102-103	65	35	0.12
All Others	100	--	0.10

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

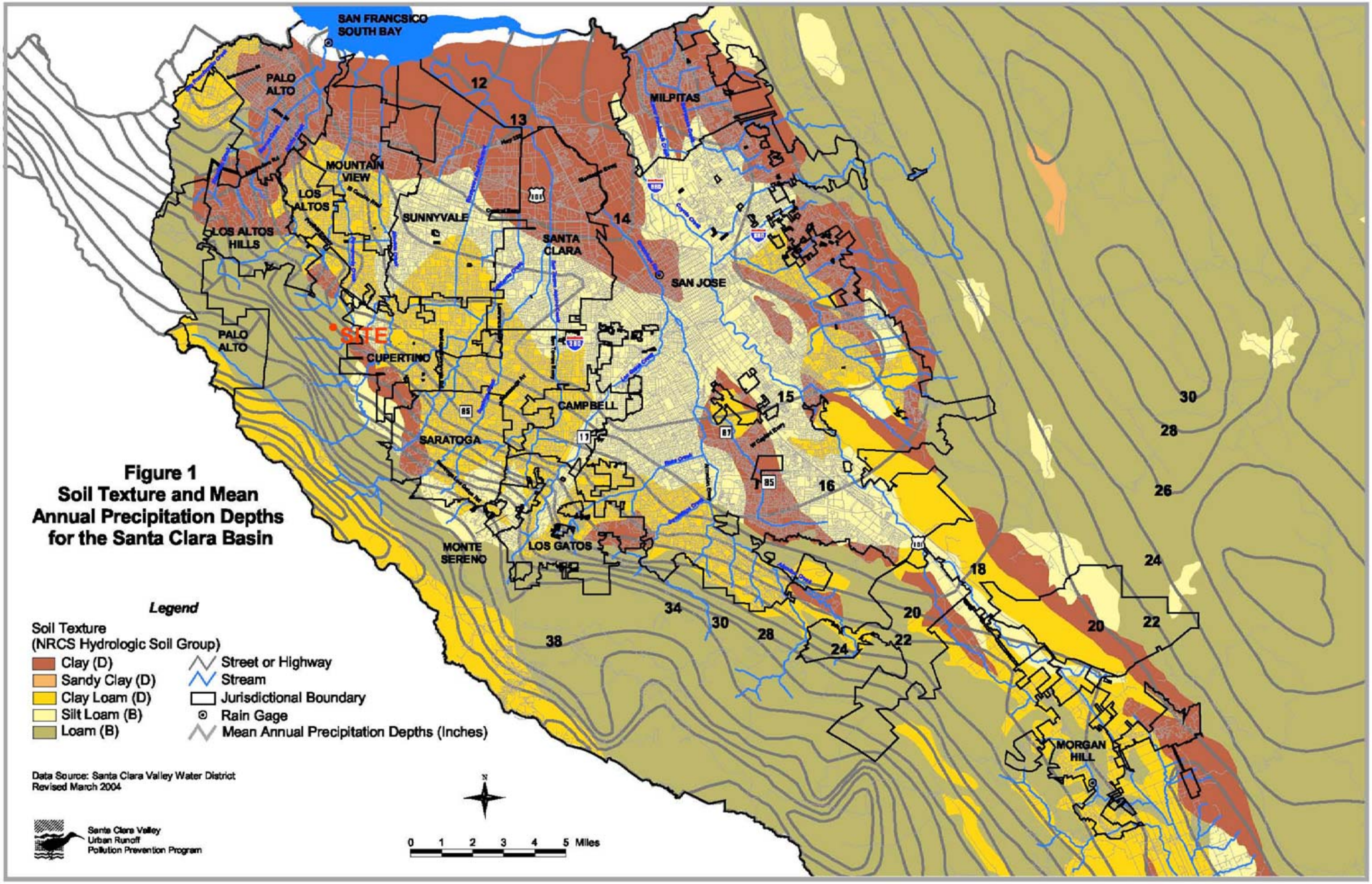


Figure 1
Soil Texture and Mean Annual Precipitation Depths for the Santa Clara Basin

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.

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 03/21/09

EMSA
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.)
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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 =      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 MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main 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)
Program is now starting with Main Stream No. 2
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      1.494(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.494(CFS)
Depth of flow =   0.072(Ft.), Average velocity =   2.029(Ft/s)
Channel flow top width =   10.432(Ft.)
Flow Velocity =    2.03(Ft/s)
Travel time  =    8.54 min.
Time of concentration =   20.14 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 =      1.657(CFS) for      8.250(Ac.)
Total runoff =      2.236(CFS)      Total area =      10.860(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.)
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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 =      3.142(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.142(CFS)
Depth of flow =   0.102(Ft.), Average velocity =   3.026(Ft/s)
Channel flow top width =   10.407(Ft.)
Flow Velocity =    3.03(Ft/s)
Travel time  =    8.82 min.
Time of concentration =   28.97 min.
Critical depth =      0.145(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.313(In/Hr) for a    25.0 year storm
Subarea runoff =      1.502(CFS) for      8.800(Ac.)
Total runoff =      3.739(CFS)      Total area =      19.660(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 =      7.038(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      7.038(CFS)
Depth of flow =   0.168(Ft.), Average velocity =   4.041(Ft/s)
Channel flow top width =   10.674(Ft.)
Flow Velocity =    4.04(Ft/s)
Travel time  =    7.88 min.
Time of concentration =   36.84 min.
Critical depth =      0.246(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.181(In/Hr) for a    25.0 year storm
Subarea runoff =      4.917(CFS) for     34.700(Ac.)
Total runoff =      8.656(CFS)      Total area =      54.360(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 =     54.360(Ac.)
Runoff from this stream =      8.656(CFS)
Time of concentration =   36.84 min.
Rainfall intensity =     1.181(In/Hr)
Program is now starting with Main Stream No. 3
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =   634.000(Ft.)
Top (of initial area) elevation =  1012.000(Ft.)
Bottom (of initial area) elevation =   880.000(Ft.)
Difference in elevation =   132.000(Ft.)
Slope =    0.20820  s(%)=      20.82
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.169(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.241(CFS)
Total initial stream area =       1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station      32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   880.000(Ft.)
Downstream point elevation =   821.900(Ft.)
Channel length thru subarea  =   597.000(Ft.)
Channel base width      =   20.000(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 =      0.460(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.460(CFS)
Depth of flow =   0.020(Ft.), Average velocity =   1.141(Ft/s)
Channel flow top width =   20.080(Ft.)
Flow Velocity =    1.14(Ft/s)
Travel time  =    8.72 min.
Time of concentration =   20.82 min.
Critical depth =      0.025(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.646(In/Hr) for a    25.0 year storm
Subarea runoff =      0.333(CFS) for      2.020(Ac.)
Total runoff =      0.573(CFS)      Total area =       3.130(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 =      3.130(Ac.)
Runoff from this stream =      0.573(CFS)
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```
Time of concentration =   20.82 min.
Rainfall intensity =     1.646(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.477(CFS)
Total initial stream area =        2.170(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 =      2.170(Ac.)
Runoff from this stream =      0.477(CFS)
Time of concentration =   11.80 min.
Rainfall intensity =     2.199(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      12.967       8.656       0.573       0.477
Area of streams before confluence:
       63.140       54.360        3.130        2.170


Results of confluence:
Total flow rate =     22.673(CFS)
Time of concentration =    22.325 min.
Effective stream area after confluence  =    122.800(Ac.)
End of computations, total study area =         122.800 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 03/21/09

EMSA
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

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station      14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main 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)
Program is now starting with Main Stream No. 2
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      2.678(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.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      1.804(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.804(CFS)
Depth of flow =   0.081(Ft.), Average velocity =   2.183(Ft/s)
Channel flow top width =   10.484(Ft.)
Flow Velocity =    2.18(Ft/s)
Travel time  =    7.94 min.
Time of concentration =   19.54 min.
Critical depth =      0.100(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.069(In/Hr) for a   100.0 year storm
Subarea runoff =      2.049(CFS) for      8.250(Ac.)
Total runoff =      2.748(CFS)      Total area =      10.860(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.)
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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 =      3.861(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.861(CFS)
Depth of flow =   0.115(Ft.), Average velocity =   3.278(Ft/s)
Channel flow top width =   10.460(Ft.)
Flow Velocity =    3.28(Ft/s)
Travel time  =    8.14 min.
Time of concentration =   27.68 min.
Critical depth =      0.164(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Rainfall intensity =      1.659(In/Hr) for a   100.0 year storm
Subarea runoff =      1.898(CFS) for      8.800(Ac.)
Total runoff =      4.645(CFS)      Total area =      19.660(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 =      8.744(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      8.744(CFS)
Depth of flow =   0.192(Ft.), Average velocity =   4.391(Ft/s)
Channel flow top width =   10.767(Ft.)
Flow Velocity =    4.39(Ft/s)
Travel time  =    7.25 min.
Time of concentration =   34.93 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 =      6.083(CFS) for     34.700(Ac.)
Total runoff =     10.728(CFS)      Total area =      54.360(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 =     54.360(Ac.)
Runoff from this stream =     10.728(CFS)
Time of concentration =   34.93 min.
Rainfall intensity =     1.461(In/Hr)
Program is now starting with Main Stream No. 3
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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 =   634.000(Ft.)
Top (of initial area) elevation =  1012.000(Ft.)
Bottom (of initial area) elevation =   880.000(Ft.)
Difference in elevation =   132.000(Ft.)
Slope =    0.20820  s(%)=      20.82
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.100 min.
Rainfall intensity =      2.622(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.291(CFS)
Total initial stream area =       1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station      32.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   880.000(Ft.)
Downstream point elevation =   821.900(Ft.)
Channel length thru subarea  =   597.000(Ft.)
Channel base width      =   20.000(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 =      0.556(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.556(CFS)
Depth of flow =   0.023(Ft.), Average velocity =   1.231(Ft/s)
Channel flow top width =   20.090(Ft.)
Flow Velocity =    1.23(Ft/s)
Travel time  =    8.09 min.
Time of concentration =   20.19 min.
Critical depth =      0.029(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.037(In/Hr) for a   100.0 year storm
Subarea runoff =      0.411(CFS) for      2.020(Ac.)
Total runoff =      0.702(CFS)      Total area =       3.130(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 =      3.130(Ac.)
Runoff from this stream =      0.702(CFS)
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Time of concentration =   20.19 min.
Rainfall intensity =     2.037(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =      0.576(CFS)
Total initial stream area =        2.170(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 =      2.170(Ac.)
Runoff from this stream =      0.576(CFS)
Time of concentration =   11.80 min.
Rainfall intensity =     2.656(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      15.976      10.728       0.702       0.576
Area of streams before confluence:
       63.140       54.360        3.130        2.170


Results of confluence:
Total flow rate =     27.984(CFS)
Time of concentration =    21.630 min.
Effective stream area after confluence  =    122.800(Ac.)
End of computations, total study area =         122.800 (Ac.)
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UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 03/23/09

EMSA
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

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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 =   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      101.000 to Point/Station      102.000
**** 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      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   860.000(Ft.)
Channel length thru subarea  =   812.000(Ft.)
Channel base width      =   10.000(Ft.)
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Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      6.334(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      6.334(CFS)
Depth of flow =   0.148(Ft.), Average velocity =   3.289(Ft/s)
Channel flow top width =   15.939(Ft.)
Flow Velocity =    3.29(Ft/s)
Travel time  =    4.11 min.
Time of concentration =   19.89 min.
Critical depth =      0.201(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      1.684(In/Hr) for a    25.0 year storm
Subarea runoff =      5.608(CFS) for     27.750(Ac.)
Total runoff =      9.240(CFS)      Total area =      46.400(Ac.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   860.000(Ft.)
Downstream point elevation =   694.000(Ft.)
Channel length thru subarea  =  1577.000(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 =     10.419(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     10.419(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   5.886(Ft/s)
Channel flow top width =    5.024(Ft.)
Flow Velocity =    5.89(Ft/s)
Travel time  =    4.47 min.
Time of concentration =   24.36 min.
Critical depth =      0.680(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.502(In/Hr) for a    25.0 year storm
Subarea runoff =      1.778(CFS) for     11.840(Ac.)
Total runoff =     11.018(CFS)      Total area =      58.240(Ac.)


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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 =     58.240(Ac.)
Runoff from this stream =     11.018(CFS)
Time of concentration =   24.36 min.
Rainfall intensity =     1.502(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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 =   140.000(Ft.)
Top (of initial area) elevation =   777.000(Ft.)
Bottom (of initial area) elevation =   725.000(Ft.)
Difference in elevation =    52.000(Ft.)
Slope =    0.37143  s(%)=      37.14
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 =      0.428(CFS)
Total initial stream area =       1.840(Ac.)


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Process from Point/Station      110.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.840(Ac.)
Runoff from this stream =      0.428(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.327(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.018       0.428
Area of streams before confluence:
       58.240       1.840
Results of confluence:
Total flow rate =     11.446(CFS)
Time of concentration =    24.356 min.
Effective stream area after confluence =     60.080(Ac.)


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Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     60.080(Ac.)
Runoff from this stream =     11.446(CFS)
Time of concentration =   24.36 min.
Rainfall intensity =     1.502(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station      200.000 to Point/Station      201.000
**** 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 =   904.000(Ft.)
Difference in elevation =   170.000(Ft.)
Slope =    0.29260  s(%)=      29.26
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.209(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.576(CFS)
Total initial stream area =        2.610(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   904.000(Ft.)
Downstream point elevation =   895.000(Ft.)
Channel length thru subarea  =   850.000(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 =      1.777(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.777(CFS)
Depth of flow =   0.134(Ft.), Average velocity =   0.798(Ft/s)
Channel flow top width =   23.354(Ft.)
Flow Velocity =    0.80(Ft/s)
Travel time  =   17.76 min.
Time of concentration =   29.46 min.
Critical depth =      0.086(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.293(In/Hr) for a    25.0 year storm
Subarea runoff =      1.406(CFS) for     10.870(Ac.)
Total runoff =      1.982(CFS)      Total area =      13.480(Ac.)


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Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   895.000(Ft.)
Downstream point elevation =   820.000(Ft.)
Channel length thru subarea  =   228.000(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  =    2.000(Ft.)
Flow(q) thru subarea =      1.982(CFS)
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Depth of flow =   0.155(Ft.), Average velocity =   5.545(Ft/s)
Channel flow top width =    2.619(Ft.)
Flow Velocity =    5.55(Ft/s)
Travel time  =    0.69 min.
Time of concentration =   30.14 min.
Critical depth =      0.281(Ft.)


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Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   820.000(Ft.)
Downstream point elevation =   803.000(Ft.)
Channel length thru subarea  =  1356.000(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 =      2.581(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.581(CFS)
Depth of flow =   0.425(Ft.), Average velocity =   1.852(Ft/s)
Channel flow top width =    4.552(Ft.)
Flow Velocity =    1.85(Ft/s)
Travel time  =   12.20 min.
Time of concentration =   42.34 min.
Critical depth =      0.316(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.108(In/Hr) for a    25.0 year storm
Subarea runoff =      0.903(CFS) for      8.150(Ac.)
Total runoff =      2.886(CFS)      Total area =      21.630(Ac.)


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Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   803.000(Ft.)
Downstream point elevation =   620.000(Ft.)
Channel length thru subarea  =  1102.000(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
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      2.886(CFS)
Depth of flow =   0.226(Ft.), Average velocity =   4.765(Ft/s)
Channel flow top width =    3.357(Ft.)
Flow Velocity =    4.76(Ft/s)
Travel time  =    3.85 min.
Time of concentration =   46.20 min.
Critical depth =      0.336(Ft.)


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Process from Point/Station      205.000 to Point/Station      206.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   620.000(Ft.)
Downstream point elevation =   552.000(Ft.)
Channel length thru subarea  =   356.000(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 =      3.908(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.908(CFS)
Depth of flow =   0.257(Ft.), Average velocity =   5.487(Ft/s)
Channel flow top width =    3.542(Ft.)
Flow Velocity =    5.49(Ft/s)
Travel time  =    1.08 min.
Time of concentration =   47.28 min.
Critical depth =      0.398(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.043(In/Hr) for a    25.0 year storm
Subarea runoff =      1.599(CFS) for     15.320(Ac.)
Total runoff =      4.484(CFS)      Total area =      36.950(Ac.)


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Process from Point/Station      205.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     36.950(Ac.)
Runoff from this stream =      4.484(CFS)
Time of concentration =   47.28 min.
Rainfall intensity =     1.043(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 =   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.)
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Process from Point/Station      211.000 to Point/Station      212.000
**** 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 =      0.434(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      0.434(CFS)
Depth of flow =   0.059(Ft.), Average velocity =   3.475(Ft/s)
Channel flow top width =    2.236(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 =      0.665(CFS) for      3.650(Ac.)
Total runoff =      0.756(CFS)      Total area =       4.130(Ac.)


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Process from Point/Station      212.000 to Point/Station      213.000
**** 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 =      1.262(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.262(CFS)
Depth of flow =   0.133(Ft.), Average velocity =   4.179(Ft/s)
Channel flow top width =    2.533(Ft.)
Flow Velocity =    4.18(Ft/s)
Travel time  =    2.79 min.
Time of concentration =   19.28 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 =      0.945(CFS) for      5.530(Ac.)
Total runoff =      1.701(CFS)      Total area =       9.660(Ac.)


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Process from Point/Station      212.000 to Point/Station      213.000
**** CONFLUENCE OF MINOR STREAMS ****
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Along Main Stream number: 2 in normal stream number 2
Stream flow area =      9.660(Ac.)
Runoff from this stream =      1.701(CFS)
Time of concentration =   19.28 min.
Rainfall intensity =     1.709(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 =   919.000(Ft.)
Top (of initial area) elevation =   645.000(Ft.)
Bottom (of initial area) elevation =   636.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.00979  s(%)=       0.98
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   18.900 min.
Rainfall intensity =      1.725(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.510(CFS)
Total initial stream area =        2.960(Ac.)


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Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   636.000(Ft.)
Downstream point elevation =   561.000(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  =    2.000(Ft.)
Flow(q) thru subarea =      0.510(CFS)
Depth of flow =   0.065(Ft.), Average velocity =   3.704(Ft/s)
Channel flow top width =    2.259(Ft.)
Flow Velocity =    3.70(Ft/s)
Travel time  =    0.80 min.
Time of concentration =   19.70 min.
Critical depth =      0.121(Ft.)


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Process from Point/Station      222.000 to Point/Station      223.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   561.000(Ft.)
Downstream point elevation =   558.000(Ft.)
Channel length thru subarea  =   370.000(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 =   1.110(CFS)
Manning's 'N'   = 0.040
Maximum depth of channel =   2.000(Ft.)
Flow(q) thru subarea =   1.110(CFS)
Depth of flow =   0.306(Ft.), Average velocity =   1.244(Ft/s)
Channel flow top width =   3.835(Ft.)
Flow Velocity =   1.24(Ft/s)
Travel time =   4.96 min.
Time of concentration =   24.66 min.
Critical depth =   0.191(Ft.)
Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =   1.489(In/Hr) for a   25.0 year storm
Subarea runoff =   1.035(CFS) for   6.950(Ac.)
Total runoff =   1.546(CFS)   Total area =   9.910(Ac.)

++
Process from Point/Station   222.000 to Point/Station   223.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 3
Stream flow area =   9.910(Ac.)
Runoff from this stream =   1.546(CFS)
Time of concentration =   24.66 min.
Rainfall intensity =   1.489(In/Hr)

Total of 3 streams to confluence:
Flow rates before confluence point:
4.484   1.701   1.546
Area of streams before confluence:
36.950   9.660   9.910
Results of confluence:
Total flow rate =   7.731(CFS)
Time of concentration =   47.279 min.
Effective stream area after confluence =   56.520(Ac.)

++
Process from Point/Station   223.000 to Point/Station   223.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =   56.520(Ac.)
Runoff from this stream =   7.731(CFS)
Time of concentration =   47.28 min.
Rainfall intensity =   1.043(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 =   758.000(Ft.)
Top (of initial area) elevation =  1015.000(Ft.)
Bottom (of initial area) elevation =   900.000(Ft.)
Difference in elevation =   115.000(Ft.)
Slope =    0.15172  s(%)=      15.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.700 min.
Rainfall intensity =      2.110(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.196(CFS)
Total initial stream area =        0.930(Ac.)


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Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   815.000(Ft.)
Channel length thru subarea  =   578.000(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 =      0.413(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      0.413(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   2.399(Ft/s)
Channel flow top width =    2.462(Ft.)
Flow Velocity =    2.40(Ft/s)
Travel time  =    4.01 min.
Time of concentration =   16.71 min.
Critical depth =      0.104(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.814(In/Hr) for a    25.0 year storm
Subarea runoff =      0.372(CFS) for      2.050(Ac.)
Total runoff =      0.568(CFS)      Total area =       2.980(Ac.)


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Process from Point/Station      301.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.980(Ac.)
Runoff from this stream =      0.568(CFS)
Time of concentration =   16.71 min.
Rainfall intensity =     1.814(In/Hr)
Program is now starting with Main Stream No. 4


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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 =   938.000(Ft.)
Top (of initial area) elevation =   815.000(Ft.)
Bottom (of initial area) elevation =   700.000(Ft.)
Difference in elevation =   115.000(Ft.)
Slope =    0.12260  s(%)=      12.26
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.400 min.
Rainfall intensity =      2.041(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.398(CFS)
Total initial stream area =        1.950(Ac.)


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Process from Point/Station      400.000 to Point/Station      401.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      1.950(Ac.)
Runoff from this stream =      0.398(CFS)
Time of concentration =   13.40 min.
Rainfall intensity =     2.041(In/Hr)


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Process from Point/Station      402.000 to Point/Station      403.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   631.000(Ft.)
Top (of initial area) elevation =   705.000(Ft.)
Bottom (of initial area) elevation =   686.000(Ft.)
Difference in elevation =    19.000(Ft.)
Slope =    0.03011  s(%)=       3.01
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 =      0.248(CFS)
Total initial stream area =        1.270(Ac.)


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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 2
Stream flow area =      1.270(Ac.)
Runoff from this stream =      0.248(CFS)
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Time of concentration =   14.30 min.
Rainfall intensity =     1.953(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.398       0.248
Area of streams before confluence:
        1.950        1.270
Results of confluence:
Total flow rate =      0.646(CFS)
Time of concentration =    13.400 min.
Effective stream area after confluence =      3.220(Ac.)


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Process from Point/Station      403.000 to Point/Station      403.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      3.220(Ac.)
Runoff from this stream =      0.646(CFS)
Time of concentration =   13.40 min.
Rainfall intensity =     2.041(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      11.446       7.731       0.568       0.646
Area of streams before confluence:
       60.080       56.520        2.980        3.220


Results of confluence:
Total flow rate =     20.391(CFS)
Time of concentration =    24.356 min.
Effective stream area after confluence  =    122.800(Ac.)
End of computations, total study area =         122.800 (Ac.)
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            UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989- 2005 Version 7.1
      Rational Hydrology Study        Date: 03/23/09
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EMSA
Proposed Conditions
100-Year Flow Rate
County of Santa Clara Rational Method

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

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Program License Serial Number 4028

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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 =   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.)


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Process from Point/Station      101.000 to Point/Station      102.000
**** 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.)


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Process from Point/Station      102.000 to Point/Station      103.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   920.000(Ft.)
Downstream point elevation =   860.000(Ft.)
Channel length thru subarea  =   812.000(Ft.)
Channel base width      =   10.000(Ft.)
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Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      7.729(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      7.729(CFS)
Depth of flow =   0.166(Ft.), Average velocity =   3.502(Ft/s)
Channel flow top width =   16.630(Ft.)
Flow Velocity =    3.50(Ft/s)
Travel time  =    3.86 min.
Time of concentration =   19.39 min.
Critical depth =      0.227(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Rainfall intensity =      2.077(In/Hr) for a   100.0 year storm
Subarea runoff =      6.915(CFS) for     27.750(Ac.)
Total runoff =     11.347(CFS)      Total area =      46.400(Ac.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   860.000(Ft.)
Downstream point elevation =   694.000(Ft.)
Channel length thru subarea  =  1577.000(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 =     12.795(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     12.795(CFS)
Depth of flow =   0.559(Ft.), Average velocity =   6.226(Ft/s)
Channel flow top width =    5.353(Ft.)
Flow Velocity =    6.23(Ft/s)
Travel time  =    4.22 min.
Time of concentration =   23.61 min.
Critical depth =      0.754(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.864(In/Hr) for a   100.0 year storm
Subarea runoff =      2.207(CFS) for     11.840(Ac.)
Total runoff =     13.554(CFS)      Total area =      58.240(Ac.)


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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 =     58.240(Ac.)
Runoff from this stream =     13.554(CFS)
Time of concentration =   23.61 min.
Rainfall intensity =     1.864(In/Hr)
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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 =   140.000(Ft.)
Top (of initial area) elevation =   777.000(Ft.)
Bottom (of initial area) elevation =   725.000(Ft.)
Difference in elevation =    52.000(Ft.)
Slope =    0.37143  s(%)=      37.14
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 =      0.515(CFS)
Total initial stream area =        1.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.840(Ac.)
Runoff from this stream =      0.515(CFS)
Time of concentration =   10.50 min.
Rainfall intensity =     2.801(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
      13.554       0.515
Area of streams before confluence:
       58.240        1.840
Results of confluence:
Total flow rate =     14.069(CFS)
Time of concentration =    23.614 min.
Effective stream area after confluence =     60.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     60.080(Ac.)
Runoff from this stream =     14.069(CFS)
Time of concentration =   23.61 min.
Rainfall intensity =     1.864(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 ****
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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 =   904.000(Ft.)
Difference in elevation =   170.000(Ft.)
Slope =    0.29260  s(%)=      29.26
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   11.700 min.
Rainfall intensity =      2.667(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.696(CFS)
Total initial stream area =        2.610(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   904.000(Ft.)
Downstream point elevation =   895.000(Ft.)
Channel length thru subarea  =   850.000(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 =      2.146(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.146(CFS)
Depth of flow =   0.147(Ft.), Average velocity =   0.841(Ft/s)
Channel flow top width =   24.700(Ft.)
Flow Velocity =    0.84(Ft/s)
Travel time  =   16.84 min.
Time of concentration =   28.54 min.
Critical depth =      0.096(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.616(In/Hr) for a   100.0 year storm
Subarea runoff =      1.756(CFS) for     10.870(Ac.)
Total runoff =      2.452(CFS)      Total area =      13.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   895.000(Ft.)
Downstream point elevation =   820.000(Ft.)
Channel length thru subarea  =   228.000(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  =    2.000(Ft.)
Flow(q) thru subarea =      2.452(CFS)
```

```
Depth of flow =   0.175(Ft.), Average velocity =   5.958(Ft/s)
Channel flow top width =    2.700(Ft.)
Flow Velocity =    5.96(Ft/s)
Travel time  =    0.64 min.
Time of concentration =   29.18 min.
Critical depth =      0.320(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   820.000(Ft.)
Downstream point elevation =   803.000(Ft.)
Channel length thru subarea  =  1356.000(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 =      3.194(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.194(CFS)
Depth of flow =   0.475(Ft.), Average velocity =   1.966(Ft/s)
Channel flow top width =    4.847(Ft.)
Flow Velocity =    1.97(Ft/s)
Travel time  =   11.50 min.
Time of concentration =   40.67 min.
Critical depth =      0.355(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.367(In/Hr) for a   100.0 year storm
Subarea runoff =      1.114(CFS) for      8.150(Ac.)
Total runoff =      3.566(CFS)      Total area =      21.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   803.000(Ft.)
Downstream point elevation =   620.000(Ft.)
Channel length thru subarea  =  1102.000(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
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.566(CFS)
Depth of flow =   0.254(Ft.), Average velocity =   5.083(Ft/s)
Channel flow top width =    3.524(Ft.)
Flow Velocity =    5.08(Ft/s)
Travel time  =    3.61 min.
Time of concentration =   44.29 min.
Critical depth =      0.379(Ft.)


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Process from Point/Station      205.000 to Point/Station      206.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   620.000(Ft.)
Downstream point elevation =   552.000(Ft.)
Channel length thru subarea  =   356.000(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 =      4.829(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      4.829(CFS)
Depth of flow =   0.288(Ft.), Average velocity =   5.846(Ft/s)
Channel flow top width =    3.730(Ft.)
Flow Velocity =    5.85(Ft/s)
Travel time  =    1.01 min.
Time of concentration =   45.30 min.
Critical depth =      0.449(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.291(In/Hr) for a   100.0 year storm
Subarea runoff =      1.977(CFS) for     15.320(Ac.)
Total runoff =      5.543(CFS)      Total area =      36.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     36.950(Ac.)
Runoff from this stream =      5.543(CFS)
Time of concentration =   45.30 min.
Rainfall intensity =     1.291(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 =   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 =      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.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** 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 =      0.530(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      0.530(CFS)
Depth of flow =   0.066(Ft.), Average velocity =   3.741(Ft/s)
Channel flow top width =    2.266(Ft.)
Flow Velocity =    3.74(Ft/s)
Travel time  =    1.39 min.
Time of concentration =   16.39 min.
Critical depth =      0.124(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.228(In/Hr) for a   100.0 year storm
Subarea runoff =      0.813(CFS) for      3.650(Ac.)
Total runoff =      0.924(CFS)      Total area =       4.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** 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 =      1.542(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.542(CFS)
Depth of flow =   0.150(Ft.), Average velocity =   4.477(Ft/s)
Channel flow top width =    2.599(Ft.)
Flow Velocity =    4.48(Ft/s)
Travel time  =    2.61 min.
Time of concentration =   18.99 min.
Critical depth =      0.242(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.097(In/Hr) for a   100.0 year storm
Subarea runoff =      1.160(CFS) for      5.530(Ac.)
Total runoff =      2.083(CFS)      Total area =       9.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      9.660(Ac.)
Runoff from this stream =      2.083(CFS)
Time of concentration =   18.99 min.
Rainfall intensity =     2.097(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 =   919.000(Ft.)
Top (of initial area) elevation =   645.000(Ft.)
Bottom (of initial area) elevation =   636.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.00979  s(%)=       0.98
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   18.900 min.
Rainfall intensity =      2.101(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 =        2.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      222.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =   636.000(Ft.)
Downstream point elevation =   561.000(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  =    2.000(Ft.)
Flow(q) thru subarea =      0.622(CFS)
Depth of flow =   0.073(Ft.), Average velocity =   3.984(Ft/s)
Channel flow top width =    2.291(Ft.)
Flow Velocity =    3.98(Ft/s)
Travel time  =    0.74 min.
Time of concentration =   19.64 min.
Critical depth =      0.137(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =   561.000(Ft.)
Downstream point elevation =   558.000(Ft.)
Channel length thru subarea  =   370.000(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 =      1.352(CFS)
Manning's 'N'    = 0.040
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      1.352(CFS)
Depth of flow =   0.340(Ft.), Average velocity =   1.318(Ft/s)
Channel flow top width =    4.039(Ft.)
Flow Velocity =    1.32(Ft/s)
Travel time  =    4.68 min.
Time of concentration =   24.32 min.
Critical depth =      0.215(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      1.828(In/Hr) for a   100.0 year storm
Subarea runoff =      1.271(CFS) for      6.950(Ac.)
Total runoff =      1.893(CFS)      Total area =       9.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      9.910(Ac.)
Runoff from this stream =      1.893(CFS)
Time of concentration =   24.32 min.
Rainfall intensity =     1.828(In/Hr)

Total of 3 streams to confluence:
Flow rates before confluence point:
       5.543       2.083       1.893
Area of streams before confluence:
       36.950        9.660        9.910
Results of confluence:
Total flow rate =      9.519(CFS)
Time of concentration =    45.303 min.
Effective stream area after confluence =     56.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      223.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     56.520(Ac.)
Runoff from this stream =      9.519(CFS)
Time of concentration =   45.30 min.
Rainfall intensity =     1.291(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 =   758.000(Ft.)
Top (of initial area) elevation =  1015.000(Ft.)
Bottom (of initial area) elevation =   900.000(Ft.)
Difference in elevation =   115.000(Ft.)
Slope =    0.15172  s(%)=      15.17
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   12.700 min.
Rainfall intensity =      2.555(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.238(CFS)
Total initial stream area =       0.930(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   900.000(Ft.)
Downstream point elevation =   815.000(Ft.)
Channel length thru subarea  =   578.000(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  =    2.000(Ft.)
Flow(q) thru subarea =      0.500(CFS)
Depth of flow =   0.086(Ft.), Average velocity =   2.567(Ft/s)
Channel flow top width =    2.517(Ft.)
Flow Velocity =    2.57(Ft/s)
Travel time  =    3.75 min.
Time of concentration =   16.45 min.
Critical depth =      0.117(Ft.)
 Adding area flow to channel
UNDEVELOPED (dense cover) subarea
Rainfall intensity =      2.225(In/Hr) for a   100.0 year storm
Subarea runoff =      0.456(CFS) for      2.050(Ac.)
Total runoff =      0.694(CFS)      Total area =       2.980(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.980(Ac.)
Runoff from this stream =      0.694(CFS)
Time of concentration =   16.45 min.
Rainfall intensity =     2.225(In/Hr)
Program is now starting with Main Stream No. 4


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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 =   938.000(Ft.)
Top (of initial area) elevation =   815.000(Ft.)
Bottom (of initial area) elevation =   700.000(Ft.)
Difference in elevation =   115.000(Ft.)
Slope =    0.12260  s(%)=      12.26
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   13.400 min.
Rainfall intensity =      2.477(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.100
Subarea runoff =      0.483(CFS)
Total initial stream area =        1.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 4 in normal stream number 1
Stream flow area =      1.950(Ac.)
Runoff from this stream =      0.483(CFS)
Time of concentration =   13.40 min.
Rainfall intensity =     2.477(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (dense cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =   631.000(Ft.)
Top (of initial area) elevation =   705.000(Ft.)
Bottom (of initial area) elevation =   686.000(Ft.)
Difference in elevation =    19.000(Ft.)
Slope =    0.03011  s(%)=       3.01
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 =      0.302(CFS)
Total initial stream area =        1.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      403.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 4 in normal stream number 2
Stream flow area =      1.270(Ac.)
Runoff from this stream =      0.302(CFS)
```

```
Time of concentration =   14.30 min.
Rainfall intensity =     2.376(In/Hr)

Total of 2 streams to confluence:
Flow rates before confluence point:
       0.483       0.302
Area of streams before confluence:
        1.950        1.270
Results of confluence:
Total flow rate =      0.785(CFS)
Time of concentration =    13.400 min.
Effective stream area after confluence =      3.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      403.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      3.220(Ac.)
Runoff from this stream =      0.785(CFS)
Time of concentration =   13.40 min.
Rainfall intensity =     2.477(In/Hr)

Total of 4 main streams to confluence:
Flow rates before confluence point:
      14.069       9.519       0.694       0.785
Area of streams before confluence:
       60.080       56.520        2.980        3.220


Results of confluence:
Total flow rate =     25.067(CFS)
Time of concentration =    23.614 min.
Effective stream area after confluence  =    122.800(Ac.)
End of computations, total study area =         122.800 (Ac.)
```

APPENDIX B

DESILTATION BASIN ANALYSES

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., details 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 = 58.24 acres — This is the largest area tributary to a 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} = 22 inches — See Appendix A for Figure 1

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 = 1.61

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 = 0.0781 acre-feet or 3,404 cubic feet

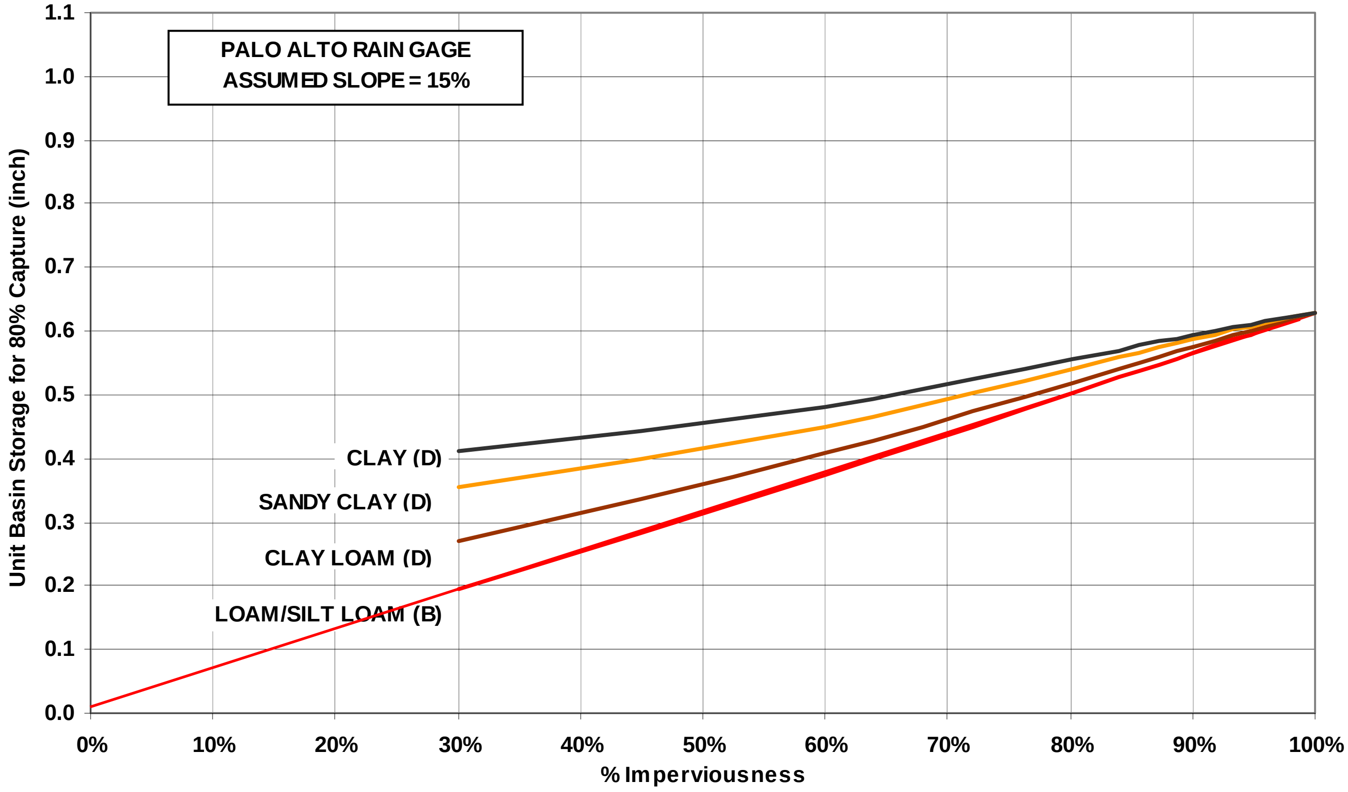
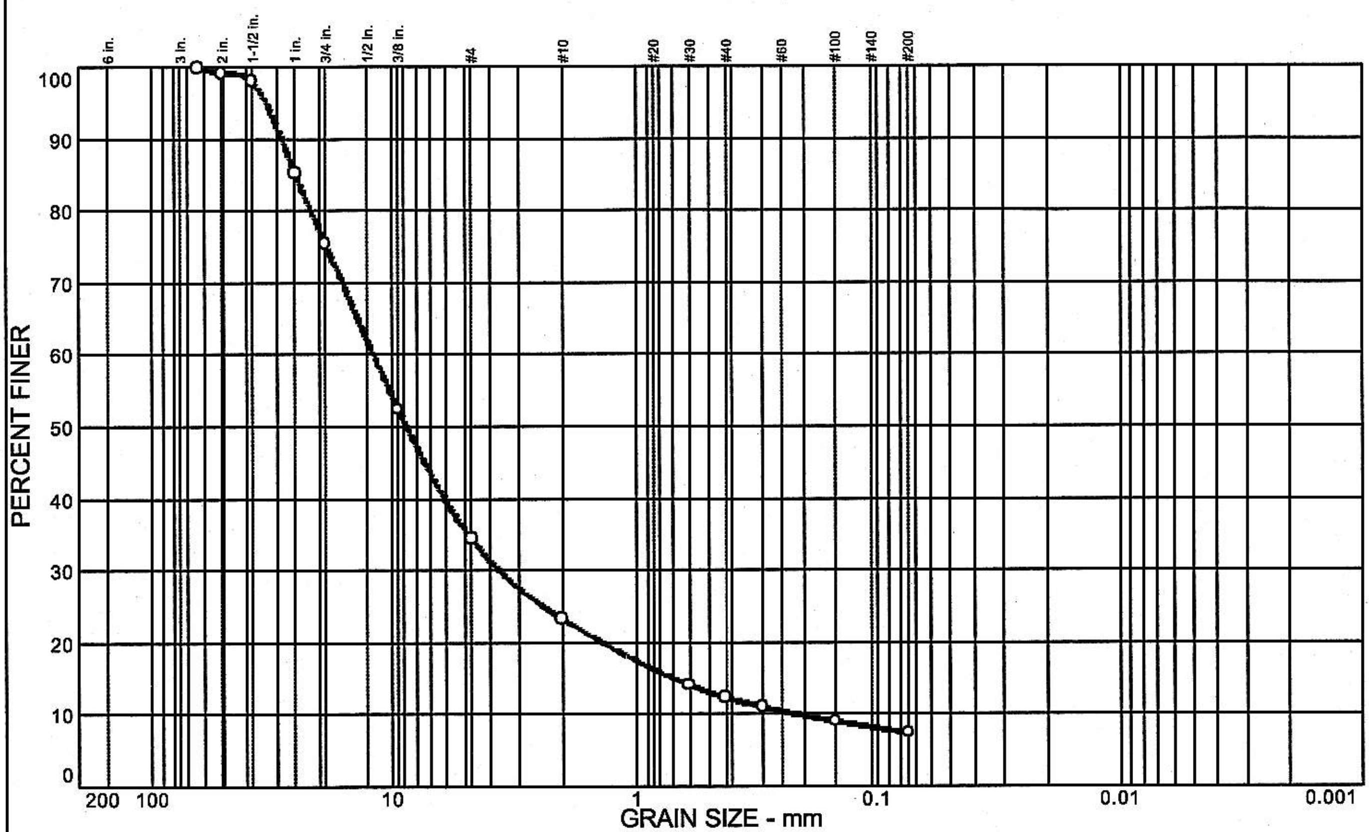


Figure 3-B Unit Basin Volume for 80% Capture - <u>Palo Alto Rain Gage</u>

EMSA - Proposed Desiltation Basin Sizing using SWRCB Equation

Proposed Condition Rational Method Node	Area, ac	Q25, cfs	As, sf	Minimum Basin Length, ft	Minimum Basin Width, ft
104	58.24	11.0	2,129	65	33
206	36.95	4.5	871	42	21
213	9.66	1.7	329	26	13
223	9.91	1.5	290	24	12
302	2.98	0.6	116	15	8
401	1.95	0.4	77	12	6
403	1.27	0.2	39	9	4

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 Weir for Risers

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	13.60	ft^3/s
Crest Elevation	100.00	ft
Weir Coefficient	3.00	US
Crest Length	6.28	ft

Results

Headwater Elevation	100.80	ft
Headwater Height Above Crest	0.80	ft
Flow Area	5.05	ft^2
Velocity	2.69	ft/s
Wetted Perimeter	7.89	ft
Top Width	6.28	ft

Worksheet for Circular Orifice for Risers

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	13.60	ft³/s
Centroid Elevation	100.00	ft
Tailwater Elevation	90.00	ft
Discharge Coefficient	0.60	
Diameter	2.00	ft

Results

Headwater Elevation	100.81	ft
Headwater Height Above Centroid	0.81	ft
Tailwater Height Above Centroid	-10.00	ft
Flow Area	3.14	ft²
Velocity	4.33	ft/s

Worksheet for Broad Crested Weir for Spillway

Project Description

Solve For	Discharge

Input Data

Headwater Elevation		100.63	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	13.67	ft³/s
Headwater Height Above Crest	0.63	ft
Tailwater Height Above Crest	-5.00	ft
Weir Coefficient	2.73	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.73	US
Flow Area	6.30	ft²
Velocity	2.17	ft/s
Wetted Perimeter	11.26	ft
Top Width	10.00	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	13.60	ft³/s

Results

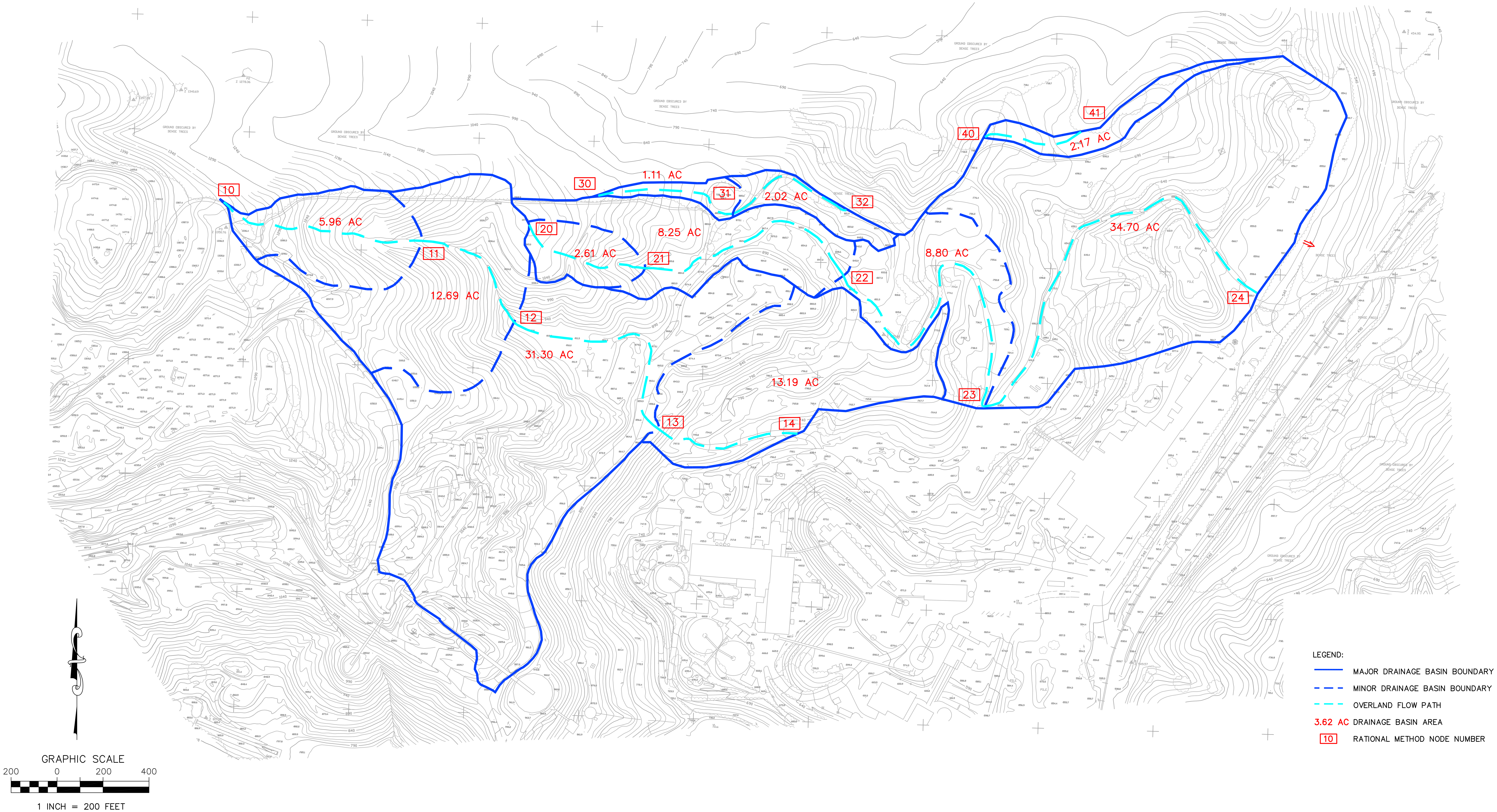
Normal Depth	1.12	ft
Flow Area	1.81	ft²
Wetted Perimeter	3.38	ft
Hydraulic Radius	0.53	ft
Top Width	1.99	ft
Critical Depth	1.33	ft
Percent Full	55.9	%
Critical Slope	0.00595	ft/ft
Velocity	7.53	ft/s
Velocity Head	0.88	ft
Specific Energy	2.00	ft
Froude Number	1.39	
Maximum Discharge	24.33	ft³/s
Discharge Full	22.62	ft³/s
Slope Full	0.00361	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

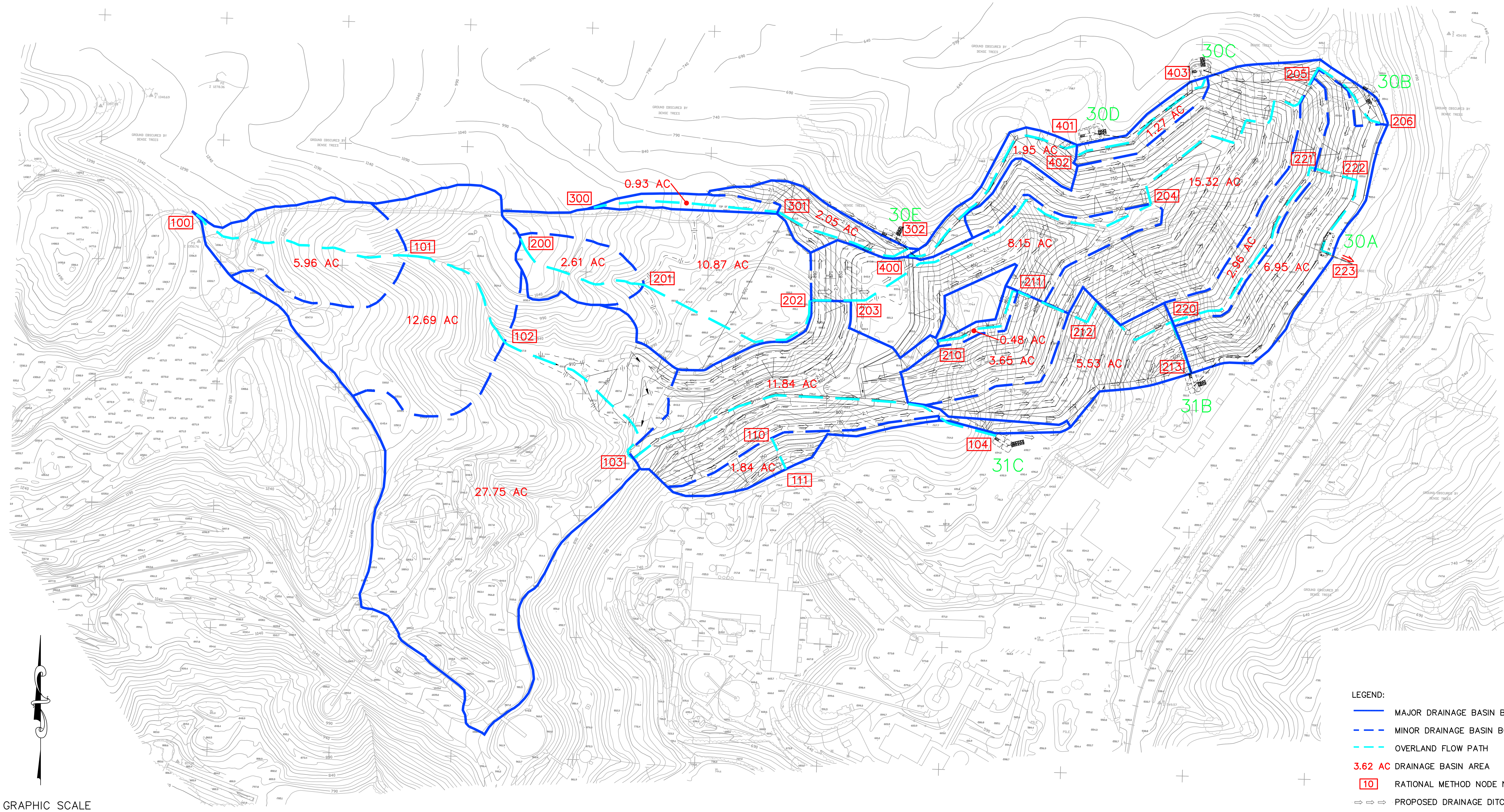
GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.90	%
Downstream Velocity	Infinity	ft/s



EXISTING 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
- 10 RATIONAL METHOD NODE NUMBER
- PROPOSED DRAINAGE DITCH
- 30A PROPOSED DESILTATION BASIN

NOTE:
THE DESILTATION BASINS ARE TEMPORARY AND WILL BE REMOVED ONCE THE VEGETATION ESTABLISHES. THE HYDROLOGIC ANALYSES WERE BASED ON THE FINAL POST-RECLAMATION CONDITIONS.

PROPOSED CONDITION

RATIONAL METHOD WORK MAP

JUNE 11, 2009