A HYDROLOGICAL ANALYSIS OF THE PARADISE POND WATERSHED

PREPARED FOR

CITY OF RENO

PREPARED BY

SUMMIT

ENGINEERING CORP.

JULY 1985

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City of Reno, Washoe County, Nevada

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The City of Reno
Engineering Department

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HYDROLOGICAL ANALYSIS OF THE PARADISE POND WATERSHED CITY OF RENO, WASHOE COUNTY, NEVADA

ABSTRACT

The purpose of this hydrological analysis of the Paradise Pond watershed is to provide the City of Reno Engineering Department with: (1) Background information on how the Paradise Pond watershed is arranged and functions with different storm durations; (2) the analysis methodology of developing the hydrographs and attenuation of the peak discharges; (3) comparisons of the different improvement conditions set forth by the City of Reno Engineering Department, and analyze for the best approach to fixing the inefficiencies within the Paradise Pond watershed; and (4) recommendations of the improvements needed for the Paradise Pond watershed in order to alleviate major flood damage to existing facilities placed in a proposed order of construction priorities with pertaining estimated construction costs.

THE BACKGROUND

The Paradise Pond watershed is located in the northeastern portion of Reno, Washoe County, Nevada. The watershed borders Sparks and Sun Valley to the east, and Panther Valley to the north. The watershed covers 5.3 square miles (3400 acres) in Sections 23 through 27, 34 through 36, of Township 20 North, Range 19 East; Sections 1 and 2 of Township 19

North, Range 19 East; Sections 30 and 31 of Township 20 North, Range 20 East; Section 6 of Township 19 North, Range 20 East, M.D.B. & M. (Reference Figure 1 for an outline of the watershed's boundary).

The Paradise Pond with the surrounding area became a City of Reno Park on September 5, 1964. The pond, which originally was a gravel pit, was owned prior to the City of Reno, by the Teglia family, who operated a private fishing resort on the property. The idea set forth by the Reno Councilmen, on "why to purchase the Paradise Pond area for a park", was to use the pond to help solve the City's drainage problem in that area along with the planned storm water drain, that was to be constructed from the Silverada area to the Truckee River.

The watershed measures 3.9 miles in length and 1.9 miles in width. The highest ridge within the watershed stands at an elevation of 5,460 feet. The Paradise Pond has a water surface elevation of approximately 4,438 feet. The slope of the watershed varies anywhere from 50 percent for the hillsides to 0.1 percent in the Paradise Pond area.

The climate in the Reno area varies considerably. More than half of the annual precipitation falls as mixed rain and snow during the winter season, while the summer precipitation falls as brief thunderstorms in the middle and late afternoons. The temperature swing usually exceeds 45 degrees from morning to evening. During the winter there are very

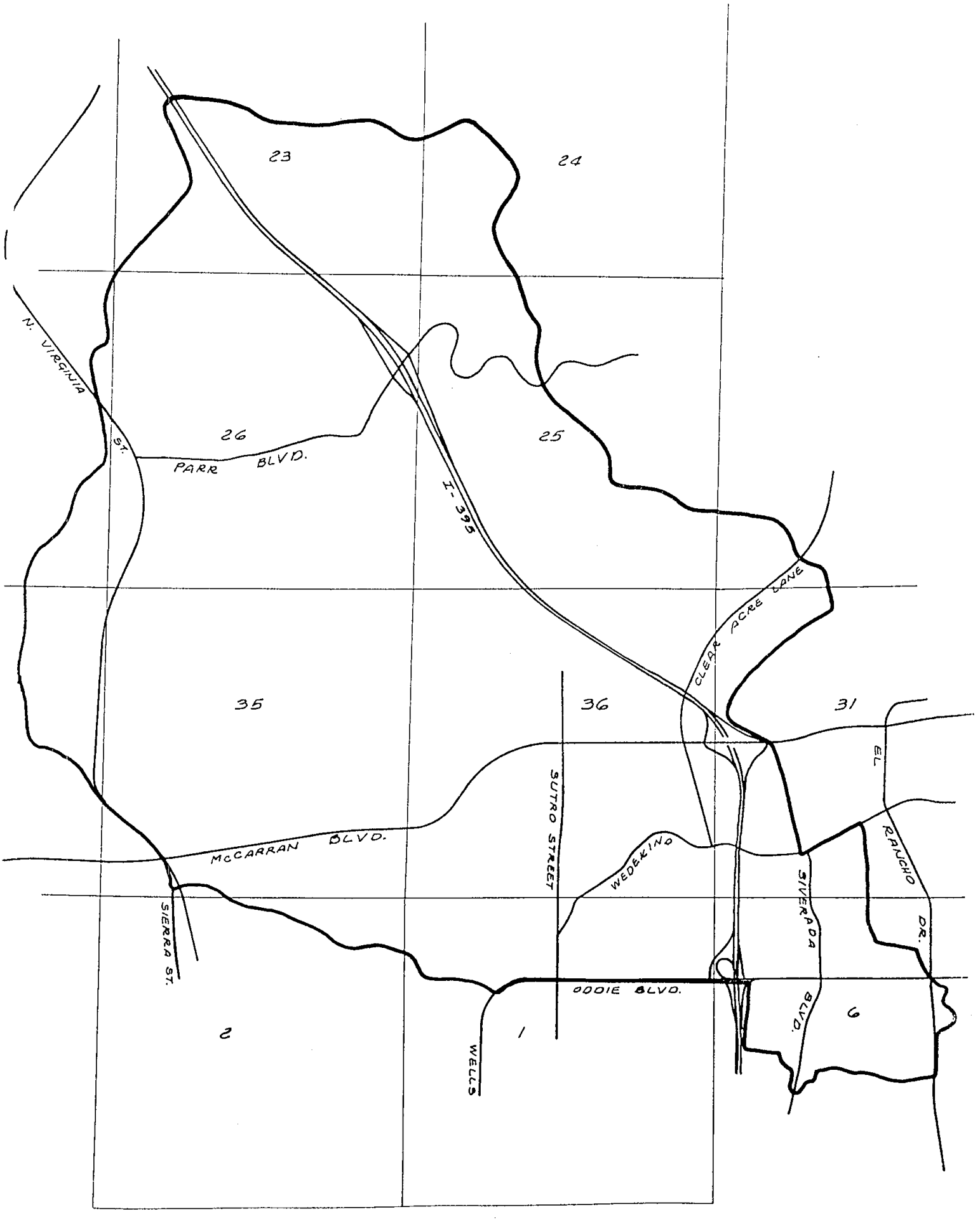

FIGURE 1 - PARADISE POND WATERSHED BOUNDARY

few days that the temperature does not exceed freezing. The average annual precipitation for Reno is approximately seven inches.

The majority of the different soil types within this watershed contain a high percentage of clay. Clayey soils are considered by the Soil Conservation Service as in Hydrologic Soil Group "D". Hydrologic Soil Group "D" indicates that the soil has a very low permeability to water and a high runoff rate.

The Paradise Pond has had only one report in which the pond actually overflowed its banks and caused flooding downstream. This happened a couple of years ago with only a minor storm. This analysis will show how the present situation works and functions if the storm drain culverts are cleared and cleaned throughout the watershed.

THE METHODOLOGY

The Paradise Pond watershed is divided into three natural drainage basins. Each drainage basin was then further divided up into smaller subareas to analyze the different effects occuring within each drainage basin (Reference Figure 2 for a guide of the subareas and drainage basins). The Soil Conservation Service (SCS) method for analyzing urban hydrology was used to establish the hydrograph data for each subarea.

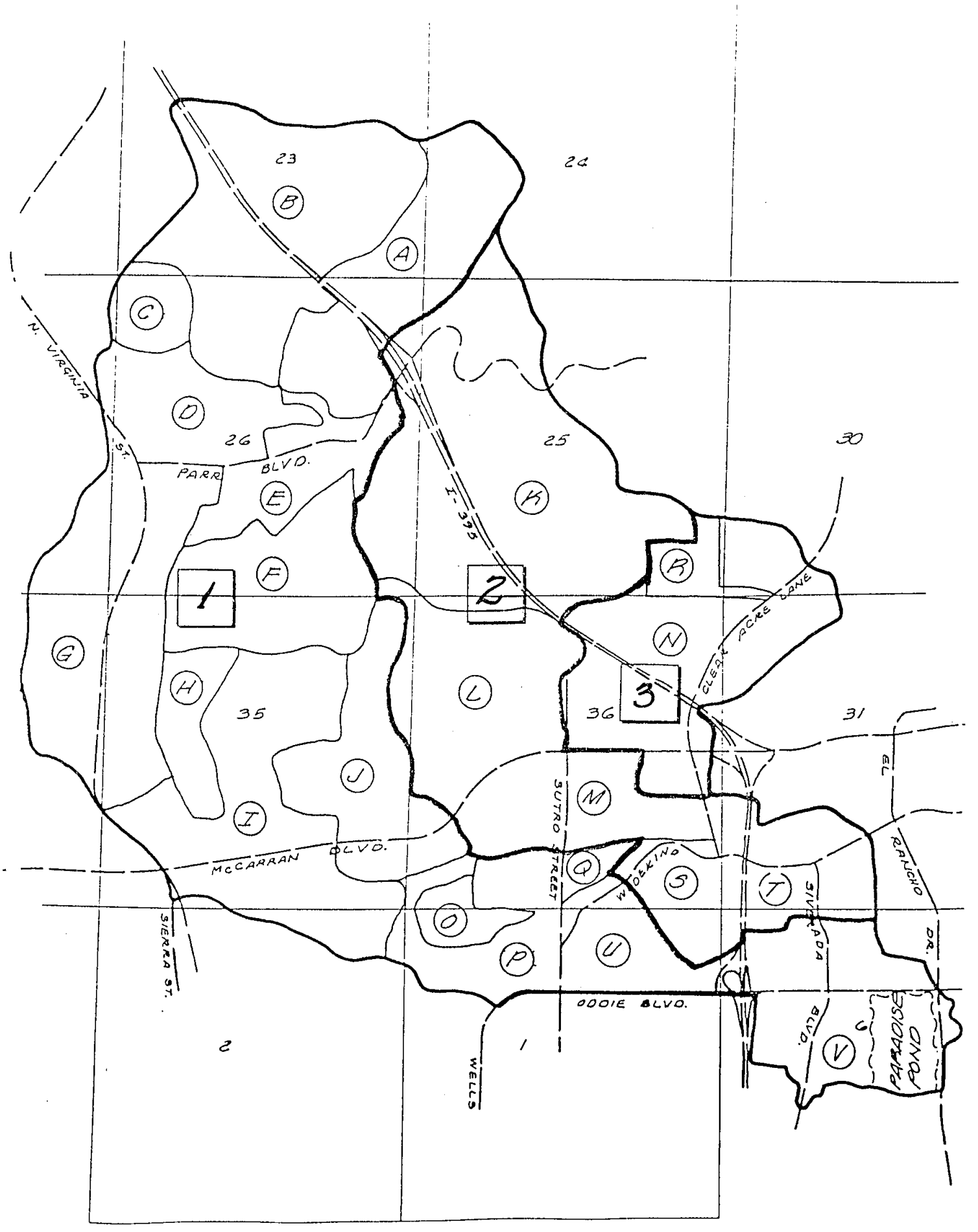

FIGURE 2 - PARADISE POND DRAINAGE BASINS & SUBAREAS

The SCS method for analyzing urban hydrology, uses the "unit hydrograph concept". This concept uses two major assumptions: (1) For a given basin similar types of storms will produce runoff hydrographs of similar shapes, and (2) that the hydrologic system described by the unit hydrograph is a linear system. These assumptions imply that by knowing the ordinates for a unit hydrograph, (a storm which produces one inch of runoff), a hydrograph for a storm which produces two inches can be determined by multiplying all the known ordinates by two. The definition of the unit hydrograph, is a hydrograph representing one unit (one inch) of direct runoff from a rainfall excess of some unit duration and specific area distribution. (13:7) The SCS has developed a typical unit hydrograph for the Reno area for use with a 3-, 6-, and 24-hour duration storm. This SCS unit hydrograph also pertains to a rainfall that falls over the entire watershed; not parts of it, but over the whole area. These were incorporated into the data for the Paradise Pond watershed.

Also, to be able to attenuate the flows from one subarea to and through another subarea, a flood routing process is performed with the hydrograph. The Muskingum routing method was used for channel routing and the Modified Puls routing method was used for the storage or detention routing. These flood routing procedures define a process of tracing, by calculation, the course and character of a flood wave as it

progresses through a channel reach or storage pond. This attenuation of the flood wave actually produces a longer and lower flood wave as it moves downstream. (13:1)

The SCS method requires three calculated items for analyzing each subarea: (1) The total area of the subarea; (2) the weighted curve number of the subarea, and (3) the lag time derived from the channel lengths velocity.

The subarea areas were calculated from a 1" = 400' scale orthographic map having a topographic interval of five or ten feet by using a digital planimeter and a digitizer. (Reference Appendix "A" for the orthographic maps). Additional topographic maps were required for the Paradise Pond including the surrounding area and the Evans detention basin.

The subarea weighted curve numbers were derived from combining the various improved and unimproved areas within each subarea pertaining to the different soil types as established by the SCS Soil Survey of Washoe County, Nevada, South Part, and calculating the average of the different condition curve numbers.

The subarea lag time was calculated two ways: The hydrograph method and the modified curve number method. The hydrograph method reflected a greater change in lag time between the improved and unimproved channel sections. Therefore, the hydrograph method was used in determining the lag times for

TABLE 1

THE SUBAREA ANALYSIS DATA

SUBAREA	AREA (S.M.)	WEIGHTED CURVE NUMBER	LAG TIME IN HOURS
A	0.340	84	0.25
B	0.436	84	0.45
C	0.068	81	0.07
D	0.237	89	0.17
E	0.163	91	0.62
F	0.325	85	0.07
G	0.342	84	0.98
H	0.079	82	0.06
I	0.433	86	0.34
J	0.248	87	0.13
K	0.714	83	0.48
L	0.280	88	0.22
M	0.160	91	0.195
N	0.388	90	0.09
O	0.068	89	0.05
P	0.223	88	0.47
Q	0.031	89	0.08
R	0.060	92	0.08
S	0.121	86	0.11
T	0.159	88	0.28
U	0.265	87	0.32
V	0.195	65	0.26

Total area = 5.335 square miles
= 3414.4 acres

the subareas. (Reference Table 1 for the subarea analysis information).

The precipitation values for the Paradise Pond watershed are available from three different sources: (1) The City of Reno Rainfall Curves developed by the Kennedy Engineers in 1957; (2) Winzler and Kelly Engineers in 1984; and (3) The National Oceanic and Atmospheric Administration (NOAA) Atlas II Isopluvials, dated 1973. (Reference Table 2 for comparison of precipitation values). The precipitation values developed by Winzler and Kelly Engineers were used for this analysis because they reflect the most recent rainfall data from the Reno area.

The channel routing process and the reservoir routing process were calculated by using the Muskingum method and the Modified Puls method, respectively. The Muskingum method requires a storage constant (k), and an inflow, outflow constant (x) for each channel reach. The Modified Puls method requires the storage-discharge curve data for each reservoir (detention pond).

THE COMPARISONS OF THE DIFFERENT CONDITIONS

The City of Reno Engineering Department recommended that a hydrological analysis be presented for various conditions with a 5-, 25-, 50-, and 100-year storms, and each storm will have a 3-, 6-, and 24-hour duration. The 24-hour duration

TABLE 2

THE PRECIPITATION VALUES FOR RAINFALL

24-Hour	Winzler & Kelly	NOAA Maps	Kennedy
100-Year	2.88"	2.70"	2.76"
50-Year	2.62"	2.50"	2.40"
25-Year	2.11"	2.10"	2.11"
5-Year	1.39"	1.50"	1.56"
6-Hour Duration			
100-Year	1.62"	1.70"	1.50"
50-Year	1.27"	1.50"	1.38"
25-Year	1.09"	1.35"	1.20"
5-Year	0.78"	0.95"	0.84"
3-Hour Duration			
100-Year	1.25"	1.45"	1.32"
50-Year	1.04"	1.28"	1.12"
25-Year	0.87"	1.13"	0.99"
5-Year	0.60"	0.79"	0.67"

storms were used predominately over the 3- and 6-hour duration storms, because it reflects a slow-moving frontal storm traversing across the watershed. The 24-hour duration storms develop a higher peak discharge, than either the 3-hour and 6-hour duration storms. The 3- and 6-hour duration storms simulate either a short or a long thundershower. Each condition will have an appendix for its corresponding hydrograph and data, that has been compiled for each storm. The hydrographs developed for this analysis were calculated for the 24-hour duration storms only. The 3- and 6-hour duration storm hydrographs were so small and with such sharp peaks, that the results were just tabulated. These tables show how the peak flows were added together as they travel down the drainage basin. One can also estimate how another condition may work within the watershed by using a similar set of hydrographs within the appendices, and combining or subtracting flows or conditions as needed.

Condition No. 1

Condition No. 1 uses the present condition of the watershed, and adds additional detention capacity at the Paradise Pond, and a 60-inch diameter pipe from the Paradise Pond to the Truckee River. The additional detention storage, for the Paradise Pond and the drainage channel to the river were included in this condition and most of the conditions, because the peak discharges entering the pond have such a

wide variation that the increased detention tends to level off the sharp peaks and thereby increases the efficiency of a smaller channel. The channel to the river or the improved channel to the North Truckee Drain is basically a must improvement. The flows that run into the Paradise Pond need some escape route, and the existing 12-inch diameter outlet with a slope of approximately 0.30 percent does not come close to providing enough capacity, even for a minor event at the present condition stated within the study.

The present condition of the watershed refers to the existing condition of the watershed and adding all the tentative subdivisions and parcels, approved for the area, to the existing condition. So actually, the present condition of the watershed is sometime in the immediate future. (Reference the othrographic base maps in Appendix "A" for the additional areas considered as developed).

The additional detention storage at Paradise Pond will be provided by constructing a dike along the southeastern corner of the pond. The dike will have a maximum height of five feet from the existing ground. The proposed dike will have a crest elevation of 4445.0 feet, while the average surface elevation of the pond is at an elevation of 4438.3 feet. This dike would provide the Paradise Pond with a storage of 4.7 vertical feet. (Reference Table 3 for the detention storage of the Paradise Pond with the dike in place). A 30-foot wide spillway was constructed in the proposed dike

TABLE 3

THE DETENTION STORAGE OF THE PROPOSED PARADISE POND

Elevation	Acre Feet of Storage	Description
4438.3	0	Water Surface - Begin Storage
4439.0	16.59	0.7 ft. depth
4440.0	43.09	1.7 ft. depth
4441.0	72.29	2.7 ft. depth
4442.0	104.99	3.7 ft. depth
4443.0	139.69	4.7 ft. depth Begin spillway flow
4443.33	151.66	Spillway 0.33 ft. depth
4443.66	163.63	Spillway 0.66 ft. depth
4444.0	175.60	Spillway 1.00 ft. depth
4444.5	193.56	Spillway 1.50 ft. depth

with a flow-line elevation of 4443.0. This is two feet below the crest of the dike.

With Condition No. 1, the present condition of the watershed, the additional Paradise Pond detention storage, and with one 60-inch diameter channel running to the Truckee River, storm water runoff would not overflow the spillway at Paradise Pond during any storm (all frequencies and durations). (Reference Appendix "B" for the hydrographs and the data compiled for Condition No. 1).

The major problems foreseen with Condition No. 1 are threefold:

1. The railroad acting detention at Manogue High School will overflow during the 50- and a 100-year 24-hour duration storms, letting as much as 16.5 cfs travel through the existing Evans Avenue area.

2. The Clearacre area (Subareas R and N) which flows into the Orr Ditch, will cause the Orr Ditch to overflow its banks, whether in the City of Reno Corporate City Limits, or the City of Sparks Corporate City Limits; thus, creating a liability for the City of Reno.

3. Subarea S and Subarea T will have standing flood waters. This is because of the possibility that

the Clearacre area will overflow the Orr Ditch and spill out into Subarea S; however, flooding will mainly be caused by the channeling of storm runoff of Subareas K, L, and M into Subarea S. There are no structures built within Subarea S or Subarea T that are able to carry this runoff. (Reference Appendix "A" for the existing improvements within Subareas S and T). Therefore, the water will run overland, some draining into Subarea T through the I-580 and Wedekind Street overpass, and the rest draining down to the low point at Clearacre Lane and Fife Drive. The runoff water will stand there until the pipes downstream have capacity to carry this additional load, approximately 1600 minutes (27 hours) from the beginning of the storm.

Condition No. 2

Condition No. 2 uses the present condition of the watershed and adds the additional detention capacity to the Paradise Pond with an improved storm drainage channel from the Paradise Pond to the North Truckee Drain. The improved storm drainage channel consists of using the existing North Truckee Drain system and replacing two lengths of pipe; the existing 12-inch diameter pipe from the Paradise Pond to "D" Street (approximately 1625 linear feet) with a 30-inch pipe, and the

existing 24- and 30-inch diameter pipes from Prater Way to "A" Street (approximately 955 linear feet) with a 42-inch pipe.

The conclusions drawn from Condition No. 2 represent that, with the present condition of the watershed, the additional Paradise Pond detention storage and with the improved North Truckee Drain channel, all but three storms prevented any storm water runoff from overflowing the spillway at the Paradise Pond. The storms that did not work were the 25-year 24-hour storm, the 50-year 24-hour storm, and the 100-year 24-hour storm. (Reference Appendix "C" for the hydrographs and data compiled for this Condition No. 2).

The major problems foreseen with Condition No. 2 are twofold:

1. All the problems presented within Condition No. 1 still apply; the railroad acting detention at Manogue overflowing, the Orr Ditch overloading, and the flooding in Subareas S and T.

2. The Paradise Pond will now overflow if the watershed is hit by one of the three different storms previously mentioned. This will flow first down El Rancho Drive and pond at its many low points, and then flow eastwardly down "D" Street into Sparks following the natural slope of the land.

Condition No. 3

Condition No. 3 represents the present condition of the watershed with a few additions: (1) The Clearacre area (Subareas R and N) is added to the watershed by providing a channel from the Orr Ditch to the Paradise Pond; (2) a split box to divert the flows from upstream at Wells Avenue into the freeway's (I-80) storm drainage system; (3) the additional detention storage at the Paradise Pond, and (4) a channel from the Paradise Pond to the outlet, whether the Truckee River or the North Truckee Drain.

The split box is a structure placed west of the Reno Rendering Plant on Wells Avenue, which takes the first 50 cfs from the storm runoff coming from the railroad acting detention pond at Manogue High School and diverts it down Wells Avenue to the freeway's (I-80) storm drain system, which is located on the south side of the freeway's right-of-way. The remaining flow, if any, at the split box will be routed its normal path to the Paradise Pond through the storm drainage pipe underneath Oddie Boulevard. The quanity of 50 cfs was used for the split box, because that is about the full capacity of the freeway's existing 54-inch diameter storm drainge pipe. The 54-inch diameter pipe is where the diverted runoff water will tie into the freeway's storm drainage system.

The Clearacre area (Subareas R and N) in the present state,

flows into the Orr Ditch. The Orr Ditch then flows into the City of Sparks, which has the next in-line flood releasing gate for the Orr Ditch. Therefore, all the water runoff from the Clearacre area will be contributing to the flooding of Sparks when the flood gate releases. This is the reason why the Clearacre area was routed into the Paradise Pond watershed and directed towards Paradise Pond. A 48-inch enlarging to a 54-inch diameter storm drain pipe from the Orr Ditch to the Paradise Pond will carry the storm runoff for the present condition for all the storms, except for the 25-year 24 hour, 50-year 24-hour, and the 100-year 24-hour storms. These three storms will require much larger diameter channels.

The conclusions drawn from Condition No. 3 show that with the present condition of the watershed, adding Subareas R and N, the split box for diverting flow, the additional storage in the Paradise Pond, and the channel from the Paradise Pond to the outlet, a variety of pipe sizes for the outlet channel were required. For all the storms, except the 25-year 24-hour, 50-year 24-hour, and the 100-year 24-hour storms, the 30-inch improved channel to the North Truckee Drain prevented any storm water runoff from overflowing the spillway at the Paradise Pone. For the 25-year 24-hour storm, the channel to the river would have to be a 60-inch pipe. For the 50-year 24-hour storm, the channel to the Truckee River would have to be two 60-inch pipes. And, for

the 100-year 24-hour storm, two 66-inch pipes from the Paradise Pond to the Truckee River would prevent any overflowing of the Paradise Pond. (Reference Appendix "D" for the hydrographs and the data compiled for Condition No. 3).

The major problem foreseen with this condition is the railroad acting detention at Manogue High School, which overflows during a 50-year 24-hour and a 100-year 24-hour storm. This overflow will run down the Evans Avenue area. Of course, there is minor flooding all over the watershed, because the catch basins and minor storm drainage lines are only built to carry a 5-year flow. (Reference Condition No. 1 for the railroad acting detention problem).

Condition No. 4.

Condition No. 4 uses the present condition of the watershed, and adds one additional item to the items stated within Condition No. 3: a detention structure and pond in the area just west of the proposed Evans Avenue extention instead of the railroad acting detention pond.

The detention structure was calculated to contain a 100-year 24-hour storm, and leave at least two feet of freeboard under the lowest point of the new Evans Avenue profile, which is at the southern end of the pond. (Reference Table 4 for the detention storage of the proposed Evans Avenue detention pond).

TABLE 4

THE DETENTION STORAGE OF THE PROPOSED EVANS AVENUE DETENTION POND

Elevation	Acre Feet of Storage	Capacity of Outlet	Description
4560.0	0	0	Begin Storage
4562.0	0.32	13	2 ft. depth
4564.0	1.60	36	4 ft. depth
4566.0	4.07	65	6 ft. depth
4568.0	7.76	100	8 ft. depth
4570.0	12.92	139	10 ft. depth
4772.0	19.70	183	12 ft. depth
4773.0	23.92	183	13 ft. depth Top of Detention Structure - Begin Overflow
4574.0	28.15	231	14 ft. depth
4576.0	38.41	395	16 ft. depth
4578.0	50.43	407	18 ft. depth
4580.4			Lowest elevation of Evans Avenue

To carry a 100-year 24-hour storm within the limits of the pond area available, the structure would need to be attached to a 66-inch diameter pipe, which would run from the structure to the existing Valley Road 72-inch pipe. This is approximately 1250 feet in length.

The conclusions drawn from Condition No. 4 show that with the present condition of the watershed, the Evans Avenue detention pond, the Clearacre area, the split box, and the additional detention of Paradise Pond, the channel sizes to the Truckee River from the Paradise Pond need to be large, to prevent the Paradise Pond from overflowing. The 100-year 24-hour storm required four 66-inch diameter pipes, the 50-year 24-hour storm required three 66-inch diameter pipes, the 25-year 24-hour storm required two 60-inch diameter pipes, and all other storms only required one 30-inch diameter pipe to the North Truckee Drain. The reasons these channels are so big, is because of the decreased area of detention at the Evans Avenue detention pond. It has a little less than one-half the capacity of the railroad acting detention. To make the Evans Avenue detention pond capable of holding a 100-year 24-hour storm without overflow required releasing more water downstream. One possibility for the Evans Avenue detention pond to increase its detention capacity is to design both sides of the Evans Avenue roadway fill to hold detention water. (Reference Appendix "E" for the hydrographs and the data compiled for Condition No. 4).

The major problem foreseen with Condition No. 4 is that the existing storm drainage system that runs along Oddie Boulevard does not have the capacity to carry a 25-year 24-hour, 50-year 24-hour, or a 100-year 24-hour storm. With one improvement the system would be capable of carrying the 25-year 24-hour storm. This improvement would be extending the 42-inch diameter pipe, that stops at the corner of Sutro Street and Oddie Boulevard, on to the agricultural field just west of the Reno Rendering Plant (approximately 1350 feet) and construct a small detention pond at the mouth of the pipe.

Condition No. 5

Condition No. 5 uses the present condition of the watershed and adds two items to those stated in Condition No. 3. These being (1) the Evans Avenue detention pond replacing the railroad acting detention, and (2) a detention pond at the bottom of Subarea K, which is on the north side of I-580 near the future Sutro Street overpass at the existing 72-inch diameter pipe storm drain. There is a natural detention basin at this point. To induce the detention pond, a 24-inch diameter pipe was used at the outlet which would flow into the 72-inch diameter pipe under I-580. This detention would allow the storm drainage channel system beneath Hug High School and Sierra Garden mobile home subdivison to still hold only a 5-year 24-hour storm event, because the peak discharge

of Subarea L becomes higher and quicker than the peak discharge of Subarea K after being channel routed to the bottom of Subarea L even without the detention pond being developed. This is assuming that there is no means of detention within Subarea L with all its present development. Remember, this is present condition, not existing condition. Once detention is developed in this area, presumably the SunVilla Estates mobile home park will detain its own storm drainage runoff, this peak discharge for Subarea L will reduce and Subarea K will become the determining peak discharge to head downstream. This detention within subarea L will cause the proposed detention pond at I-580 and the future Sutro Street overpass to help decrease some of the peaking dicharges for the channels downstream. (Reference Table 5 for the detention storage of the proposed I-580 and future Sutro Street overpass detention pond).

The conclusions drawn from Condition No. 5 show that with the present condition of the watershed, the Evans Avenue detention pond, the I-580 and the future Sutro Street overpass detention pond, the Clearacre area, the split box, and the additional detention of the Paradise Pond, the channel sizes to the Truckee River from the Paradise Pond would again, have to be large to prevent the overflowing of the Paradise Pond. They turn out to be the same as Condition No. 4. The 100-year 24-hour storm required four 66-inch pipes, the 50-year 24-hour storm required three 66-inch

TABLE 5

THE DETENTION STORAGE OF THE PROPOSED I-580 AND FUTURE SUTRO STREET OVERPASS DETENTION POND

Elevation	Acre Feet of Storage	Capacity of Outlet	Description
4690.0	0	0	Begin Storage
4700.0	15	30	10 ft. depth
4710.0	52	43	20 ft. depth
4720.0	147	80	30 ft. depth

diameter pipes, the 25-year 24-hour storm required two 60-inch diameter pipes, and all the other storms required only the one 30-inch diameter pipe to the North Truckee Drain.

This is because the detention pond at I-580 and the Sutro Street extension (Subarea K) had very little effect on the storm water runoff over the entire watershed, which feeds the Paradise Pond. If the area in Subarea K ever develops in the future, then the detention pond will have an increasing effect on the overall watershed runoff characteristics, especially at Hug High School, where the storm drainage channel is only a 30-inch diameter pipe. (Reference Appendix "F" for the hydrographs and data compiled for Condition No. 5).

The major problems foreseen with Condition No. 5 are the same as those stated within Condition No. 4: The undersizing of the pipes downstreams of the Evans detention pond and the pipes below Subarea L are also undersized, but an overflow channel has been developed to channel overflow to Subarea S where the overflow channel stops. (Reference Appendix "A" the orthographic base map, to see the pipe sizes and topographic features).

Condition No. 6

Condition No. 6 uses the present condition of the watershed

and adds three items to those stated in Condition No. 3. The three items being (1) the Evans Avenue detention pond replacing the railroad acting detention, (2) a detention pond at the bottom of Subarea K (I-580 and the future Sutro Street overpass), and (3) a detention pond at the bottom of Subarea S, which is at I-580 and Fife Drive, between Oddie Boulevard and Wedekind Road. There is a natural low point at this I-580 and Fife Drive proposed detention pond location, but the area is completely built up with homes. For the pond to be constructed, the homes would have to be condemned and removed since most of the detention pond will be built above the existing ground with a dike surrounding the pond. (Reference Table 6 for the detention storage of the proposed I-580 and Fife Drive detention pond).

A 48-inch diameter pipe was used at the outlet of the detention pond. Also, a 54-inch diameter pipe was run to the Paradise Pond by using the existing 48-inch diameter pipe under I-580 then following I-580 on the east side, south to Oddie Boulevard and out to the Paradise Pond. This detention has the ability to greatly decrease the peak flows coming from the Clearacre area (Subarea R and N), and Subareas K, L, and M, and create flows entering Paradise Pond acceptable. Subareas R and N have such a high, steep peaking discharge because of all the improvement with no storm water detention capabilities.

The conclusions drawn from Condition No. 6 show that with the

TABLE 6

THE DETENTION STORAGE OF THE PROPOSED I-580 AND FIFE DRIVE DETENTION POND

Elevation	Acre Feet of Storage	Capacity of Outlet	Description
0	0	0	Begin Storage
1	10	6.8	1 ft. depth
2	20	24	2 ft. depth
3	30	47	3 ft. depth
4	40	72	4 ft. depth
5	50	95	5 ft. depth
6	60	80	6 ft. depth
7	70	86	7 ft. depth
8	80	92	8 ft. depth
9	90	97	9 ft. depth
10	100	102	10 ft. depth

present condition of the watershed, the Evans Avenue detention, the I-580 and the future Sutro Street overpass detention, the I-580 and Fife Drive detention, the Clearacre area, the split box, and the additional detention of the Paradise Pond, the channel sizes to the Truckee River from the Paradise Pond to prevent the overflowing of the Paradise Pond are smaller than the previous two conditions. The 100-year 24-hour storm required three 66-inch diameter pipes, the 50-year 24-hour storm required three 60-inch diameter pipes. The 25-year 24-hour storm required one 60-inch diameter pipe, and all the other storms required only one 30-inch diameter pipe to the North Truckee Drain.

These storm drainage channels are smaller than either Condition No. 4 or Condition No. 5, because the detention at I-580 and Fife Drive dropped the peak discharges and detented some of the storm runoff water coming from Subara M and N, so effectively, that the Paradise Pond outlet channel could be reduced in size and still prevent any overflow of the Paradise Pond. (Reference Appendix "G" for the hydrographs and the data compiled for Condition No. 6).

The major problem foreseen with Condition No. 6, besides the undersizing of the pipes downstream of the Evans detention pond, is the cost required to construct the detention pond at I-580 and Fife Drive. This would be condemning homes and removing them over a site area of at least 10 acres.

The Recommended Improvements

The recommended improvements for the Paradise Pond watershed are based on how the watershed functions with and without the improvements; the economics of constructing and maintaining the improvements; the decreased amount of flood damage resulting from the improvements; and how the improvements will fit into the future planning of the watershed.

Of all the improvements looked at within this report, the recommended improvements are: constructing the additional detention storage at the Paradise Pond, and constructing a 60-inch diameter storm drainage channel from the Paradise Pond to the Truckee River through El Rancho Drive and Kietzke Lane. These improvments will make the Paradise Pond capable of withstanding a 25-year 24-hour storm without any storm water overflowing through the spillway if Subareas R and N are added in. (If Subareas R and N are not added into the pond, the one 60-inch diameter channel would contain all the storm water runoff within the Paradise Pond for all the storms, as shown in Condition No. 1). In Condition No. 4, during a 50-year 24-hour storm the Paradise Pond may overflow through the spillway, with a maximum peak discharge of 143 cfs. Condition No. 5 had an overflow peak discharge of 105 cfs, and the only other condition in which an overflow occured, was Condition No. 6, which was 62 cfs. During a 100-year 24-hour storm, the Paradise Pond may overflow through the spillway with a maximum peak discharge of 184 cfs

in Condition No. 4. Condition No. 5 had an overflow peak discharge of 184 cfs. Condition No. 6 had an overflow peak discharge of 106 cfs, and the last condition to have an overflow discharge is Condition No. 3, with an overflow peak discharge of 52 cfs. The storm water runoff overflowing the Paradise Pond does develop a large peak, but the duration of the overflow is quite short, with an average duration of about 4 hours. The overflow water will flow down El Rancho Drive to "D" Street, where it will turn and head east, depositing water into all the detention pockets along the way. These detention pockets will drain once the storm drainage system in its area has the capability of holding this additional storm water.

A larger diameter pipe, or the addition of another adjoining pipe to the channel from Paradise Pond to the river would help the channel's efficiency; but, the cost of the channel would increase sharply, approximately 1.7 times the original cost for constructing another adjoining pipe. The original cost for the 60-inch diameter pipe is approximately 1.25 million dollars. The centerline profile of El Rancho Drive and of Kietzke Lane limits the maximum pipe diameter to be 60- or 66-inch maximum. Anything over that size of pipe will lead to installing a longer length of channel to reach the Truckee River at a lower water surface elevation.

There will still be occasional flooding with the 60-inch diameter storm drain pipe to the river, but not as often as

with the existing 12-inch pipe, or with the improved 30-inch pipe. These pipes have far less capacity than the 60-inch pipe. The 12-inch pipe has a maximum capacity of 2 cfs, the 30-inch pipe has a maximum capacity of 21.5 cfs with the additional storage of the Paradise Pond, and the 60-inch pipe has a maximum capacity of 90.5 cfs with the additional storage of the Paradise Pond. The channel to the Truckee River fits in very well with the system. Even as far back as 1964, a channel was to be built to the Truckee River to drain the storm water runoff coming through the Paradise Pond watershed.

The construction of a dike around the southeast corner of Paradise Pond to provide additional detention storage is an inexpensive item, when compared to building a channel to the Truckee River, and yet it greatly effects how efficiently the channel will carry the overflow water. The construction of the dike will cost approximately $50,000 and the dike would hardly affect the function or the aesthetics of this recreational park.

The next improvement would be to extend the 42-inch diameter pipe from Sutro Street and Oddie Boulevard to the split box location and construct the split box with its diversion channel to the freeway's storm drainage system. This optional improvement would cost approximately $800,000 to construct. This would give the Paradise Pond watershed two outlets to the Truckee River, thereby not directing all the

storm water runoff into the Paradise Pond.

The I-580 and the future Sutro Street overpass detention pond should be considered as development begins in that area. The Evans Avenue detention pond should be planned in conjunction with the proposed Evans Avenue extension. There is definitely a need for a detention pond in this area, and once the roadway fill for Evans Avenue is constructed within the present railroad acting detention pond, the detention area for the railroad pond would be reduced greatly. Therefore, an increased amount of storm water would pass into the existing Evans Avenue area. The I-580 and Fife Drive detention pond would greatly decrease the amount of flooding that would occur in that area, and help the Paradise Pond's capacity to contain a 50- or 100-year storm water runoff. But, the cost of removing 10 acres of residentially developed land is very high. Additionally, building another park detention pond would add a lot of maintenance costs.

The other improvement of channeling the Clearacre area (Subareas R and N) into the Paradise Pond should also be a top priority. This would greatly improve the existing condition of Subareas S and T by channeling the storm water runoff from Subareas N and M through an underground storm drainage system into the Paradise Pond. This is something Subareas S and T now lack. All the flow from Subarea M, and some of Subarea N when it overflows the Orr Ditch, now flows overland through a series of small capacity open ditches and

small diameter closed storm drainage pipes. The approximate cost of constructing this improvement would be in the neighborhood of 1.0 million dollars.

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12) "City of Reno, Public Works Design Manual", City of Reno Engineering Department, May 1983.

13) "HEC-1, Flood Hydrograph Package", Corps of Engineers and The University of California at Davis, 1985.

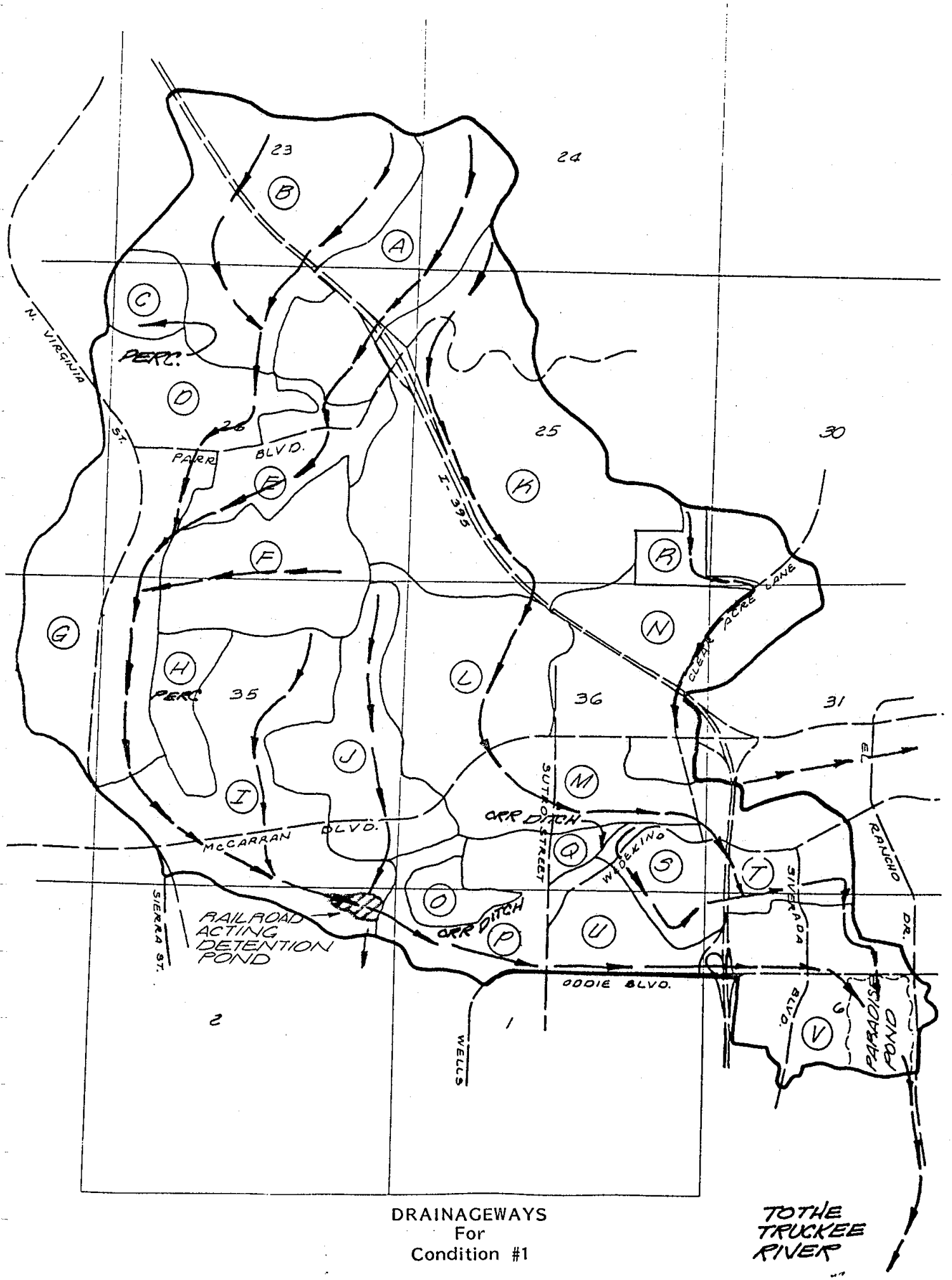
14) An Interview with the Corps of Engineers, Sacramento District, Mr. Alan Otto and Ms. Susan Hurst., April 1985.

APPENDICES

Appendices B through G contain hydrographs for the 5-, 25-, 50-, and 100-year 24-hour duration storms. They are arranged from upstream (Subarea A) to downstream (Paradise Pond). The hydrographs are read by following the horizontal axis to the desired time; the rate of runoff, in cubic feet per second, is then read from the vertical axis. The area under each curve represents the volume of runoff. In general, a hydrograph is plotted for each separate subarea. That hydrograph is then routed to the next subarea downstream to give a total hydrograph for the downstream subarea. This process is repeated until eventually the runoff has been routed to Paradise Pond. For the 3- and 6-hour duration storms, peak runoff values and corresponding times to peak are given in tables.

APPENDIX "A"

APPENDIX "B"



DRAINAGEWAYS
For
Condition #1

TABLE 7

CONDITION NO. 1 WITH 3-HOUR DURATION STORM

Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
A	2.75 cfs @ 110 min.	11.20 cfs @ 80 min.	19.68 cfs @ 60 min.	33.80 cfs @ 60 min.
B	3.30 cfs @ 130 min.	13.47 cfs @ 105 min.	22.97 cfs @ 90 min.	38.01 cfs @ 75 min.
C	0.23 cfs @ 155 min.	1.48 cfs @ 75 min.	2.76 cfs @ 55 min.	5.15 cfs @ 50 min.
D	7.82 cfs @ 105 min.	26.45 cfs @ 80 min.	43.31 cfs @ 80 min.	68.04 cfs @ 75 min.
E	14.37 cfs @ 130 min.	47.14 cfs @ 105 min.	75.56 cfs @ 100 min.	116.72 cfs @ 95 min.
F	3.80 cfs @ 95 min.	14.40 cfs @ 50 min.	24.88 cfs @ 45 min.	44.08 cfs @ 35 min.
G	18.44 cfs @ 215 min.	60.21 cfs @ 200 min.	95.82 cfs @ 195 min.	147.56 cfs @ 190 min.
H	0.38 cfs @ 125 min.	2.03 cfs @ 75 min.	3.76 cfs @ 50 min.	6.72 cfs @ 50 min.
I	18.26 cfs @ 260 min.	59.53 cfs @ 245 min.	23.88 cfs @ 235 min.	145.96 cfs @ 230 min.
J	4.32 cfs @ 75 min.	14.74 cfs @ 50 min.	24.47 cfs @ 40 min.	40.34 cfs @ 40 min.
R.R.	4.50 cfs @ 260 min.	14.88 cfs @ 245 min.	23.60 cfs @ 235 min.	31.99 cfs @ 230 min.
K	4.02 cfs @ 150 min.	18.67 cfs @ 110 min.	32.43 cfs @ 95 min.	54.50 cfs @ 85 min.
L	7.17 cfs @ 160 min.	27.61 cfs @ 135 min.	46.47 cfs @ 120 min.	75.60 cfs @ 110 min.
M	11.36 cfs @ 80 min.	33.88 cfs @ 135 min.	55.63 cfs @ 130 min.	88.03 cfs @ 125 min.
N	16.55 cfs @ 55 min.	45.86 cfs @ 35 min.	71.60 cfs @ 35 min.	106.18 cfs @ 35 min.

TABLE 7 - (con't)

Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
O	2.00 cfs @ 50 min.	6.40 cfs @ 30 min.	10.77 cfs @ 30 min.	16.86 cfs @ 30 min.
P	4.65 cfs @ 115 min.	14.85 cfs @ 395 min.	23.56 cfs @ 390 min.	32.08 cfs @ 70 min.
Q	0.91 cfs @ 55 min.	2.85 cfs @ 35 min.	4.64 cfs @ 35 min.	7.19 cfs @ 30 min.
R	2.88 cfs @ 35 min.	6.41 cfs @ 30 min.	8.37 cfs @ 30 min.	10.95 cfs @ 30 min.
S	1.67 cfs @ 95 min.	6.12 cfs @ 55 min.	10.32 cfs @ 45 min.	17.40 cfs @ 35 min.
T	15.88 cfs @ 105 min.	45.28 cfs @ 90 min.	69.93 cfs @ 85 min.	104.60 cfs @ 85 min.
U	24.61 cfs @ 110 min.	71.13 cfs @ 95 min.	110.03 cfs @ 90 min.	165.73 cfs @ 85 min.
V	24.61 cfs @ 110 min.	71.13 cfs @ 95 min.	110.03 cfs @ 90 min.	165.73 cfs @ 85 min.
One 60-inch pipe outlet:				
	1.24 cfs @ 110 min. w/5 ac.ft.	5.52 cfs @ 95 min. w/23 ac.ft.	10.44 cfs @ 90 min. w/33 ac.ft.	18.25 cfs @ 85 min. w/47 ac.ft.

TABLE 7 - (con't)

CONDITION NO. 1 WITH 6-HOUR DURATION STORM

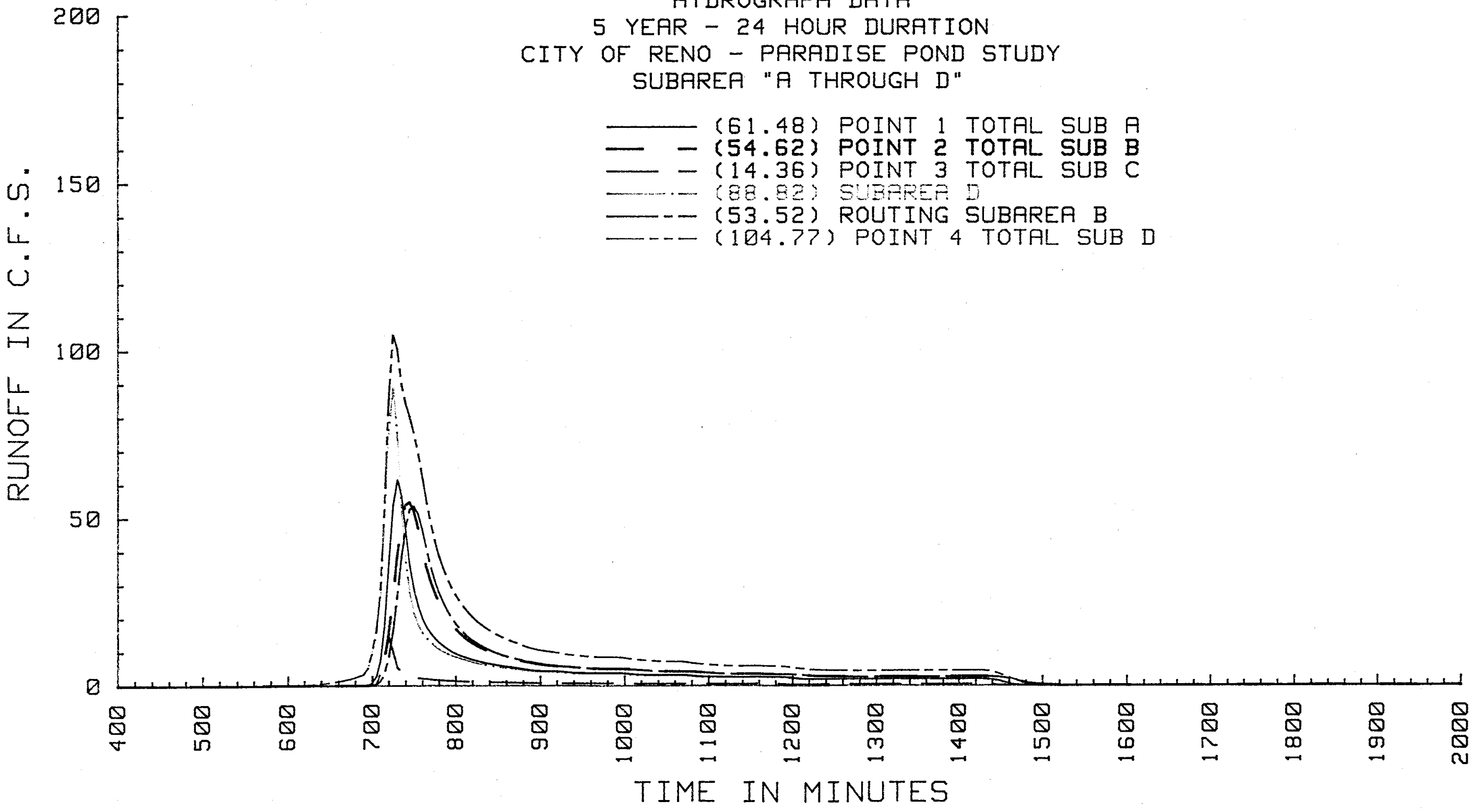
Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
A	4.44 cfs @ 215 min.	19.78 cfs @ 165 min.	32.51 cfs @ 165 min.	64.51 cfs @ 160 min.
B	5.58 cfs @ 235 min.	20.28 cfs @ 180 min.	33.25 cfs @ 180 min.	64.91 cfs @ 175 min.
C	0.53 cfs @ 360 min.	2.70 cfs @ 155 min.	5.56 cfs @ 150 min.	12.52 cfs @ 150 min.
D	14.25 cfs @ 160 min.	40.17 cfs @ 160 min.	60.64 cfs @ 160 min.	109.27 cfs @ 160 min.
E	22.64 cfs @ 215 min.	62.85 cfs @ 200 min.	93.42 cfs @ 200 min.	164.25 cfs @ 195 min.
F	7.48 cfs @ 155 min.	32.16 cfs @ 150 min.	50.44 cfs @ 150 min.	90.93 cfs @ 150 min.
G	30.85 cfs @ 320 min.	81.25 cfs @ 300 min.	118.63 cfs @ 295 min.	203.76 cfs @ 290 min.
H	0.72 cfs @ 245 min.	4.25 cfs @ 150 min.	7.88 cfs @ 150 min.	16.24 cfs @ 150 min.
I	40.22 cfs @ 360 min.	99.19 cfs @ 345 min.	141.93 cfs @ 340 min.	237.75 cfs @ 335 min.
J	9.55 cfs @ 155 min.	29.24 cfs @ 155 min.	42.94 cfs @ 150 min.	75.31 cfs @ 150 min.
R.R.	10.41 cfs @ 360 min.	25.11 cfs @ 345 min.	31.94 cfs @ 340 min.	34.20 cfs @ 335 min.
K	7.61 cfs @ 265 min.	26.83 cfs @ 185 min.	45.40 cfs @ 180 min.	91.94 cfs @ 180 min.
L	12.91 cfs @ 270 min.	38.44 cfs @ 225 min.	60.12 cfs @ 220 min.	112.34 cfs @ 215 min.
M	20.12 cfs @ 170 min.	50.82 cfs @ 170 min.	72.54 cfs @ 165 min.	126.19 cfs @ 230 min.
N	36.35 cfs @ 150 min.	82.24 cfs @ 150 min.	111.54 cfs @ 150 min.	174.64 cfs @ 150 min.

TABLE 7 - (con't)

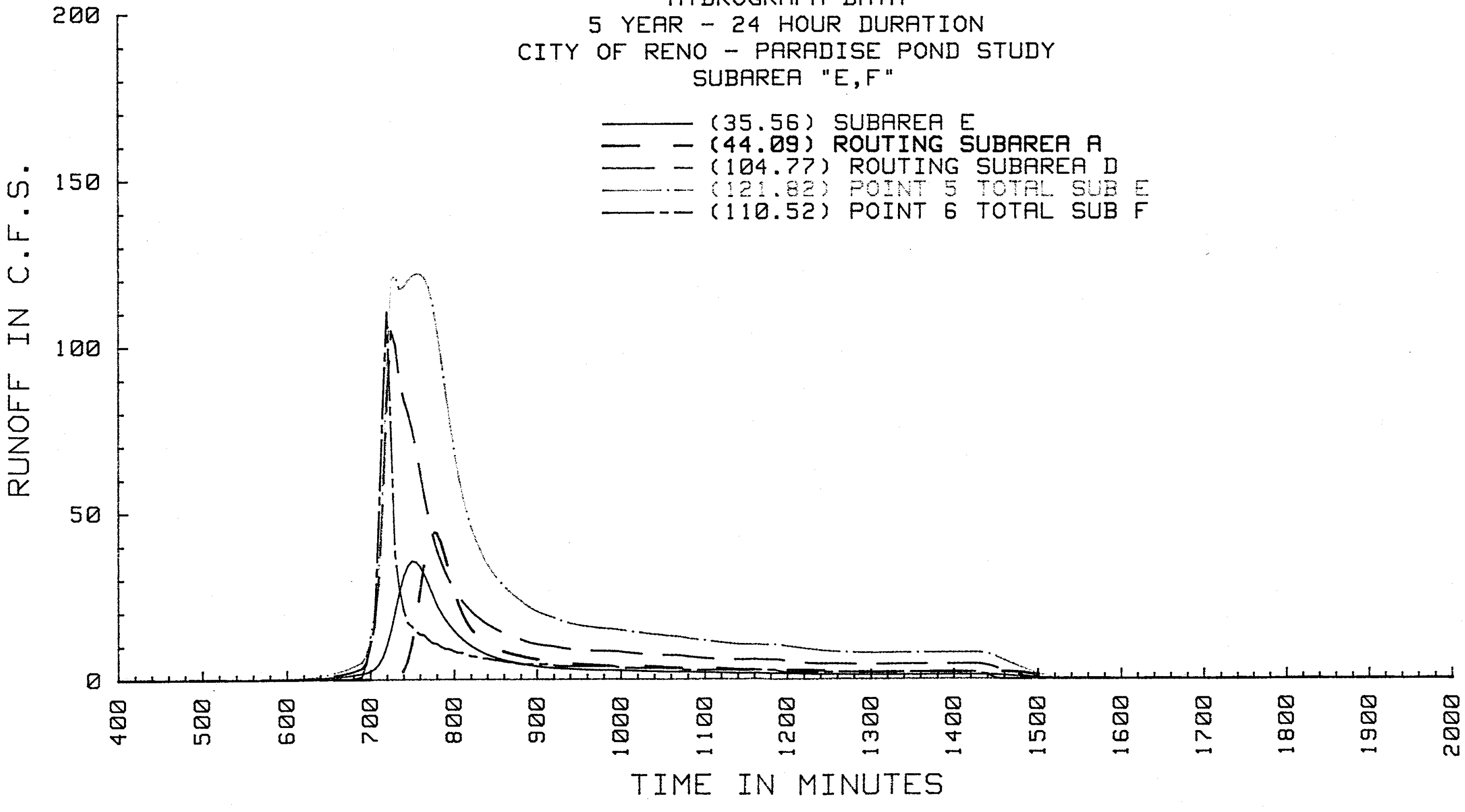
Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
O	5.15 cfs @ 150 min.	12.08 cfs @ 150 min.	16.96 cfs @ 145 min.	27.45 cfs @ 145 min.
P	10.39 cfs @ 570 min.	25.08 cfs @ 560 min.	31.94 cfs @ 560 min.	50.56 cfs @ 175 min.
Q	2.23 cfs @ 150 min.	5.48 cfs @ 150 min.	7.63 cfs @ 150 min.	12.16 cfs @ 150 min.
R	5.13 cfs @ 150 min.	8.44 cfs @ 150 min.	10.90 cfs @ 150 min.	31.06 cfs @ 145 min.
S	3.58 cfs @ 155 min.	12.34 cfs @ 150 min.	19.23 cfs @ 150 min.	34.51 cfs @ 150 min.
T	25.76 cfs @ 195 min.	63.72 cfs @ 190 min.	90.43 cfs @ 190 min.	149.37 cfs @ 185 min.
U	39.04 cfs @ 200 min.	98.93 cfs @ 190 min.	141.74 cfs @ 185 min.	237.80 cfs @ 185 min.
V	39.04 cfs @ 200 min.	98.93 cfs @ 190 min.	141.74 cfs @ 185 min.	238.00 cfs @ 185 min.
One 60-inch pipe outlet:				
	3.15 cfs @ 200 min. w/17.5 ac.ft.	12.04 cfs @ 190 min. w/36 ac.ft.	19.27 cfs @ 185 min. w/48.5 ac.ft.	31.75 cfs @ 185 min. w/65 ac.ft.

HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "A THROUGH D"

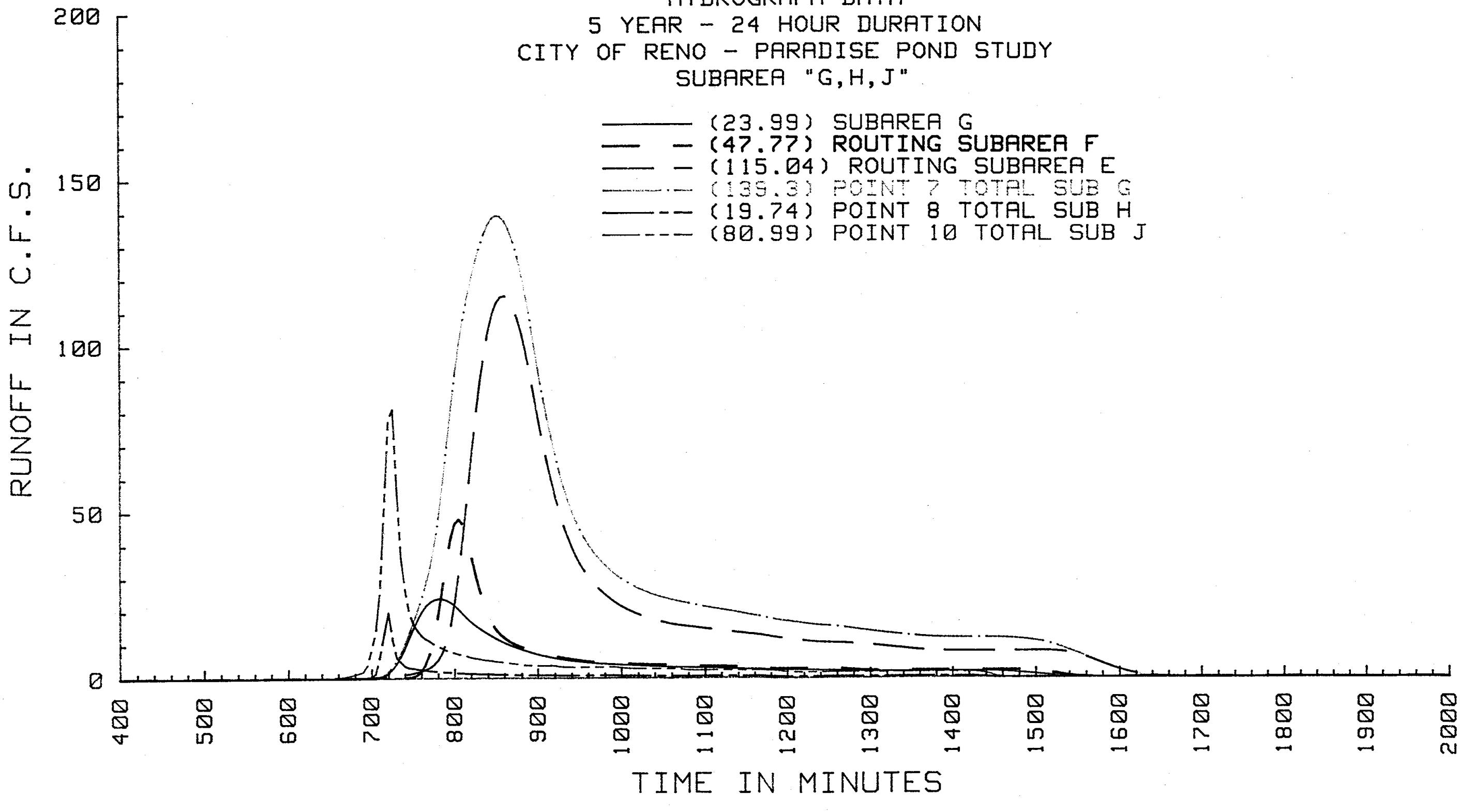
——— (61.48) POINT 1 TOTAL SUB A
— — (54.62) POINT 2 TOTAL SUB B
—— — (14.36) POINT 3 TOTAL SUB C
——·— (88.82) SUBAREA D
——-- (53.52) ROUTING SUBAREA B
——--- (104.77) POINT 4 TOTAL SUB D



HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "E,F"

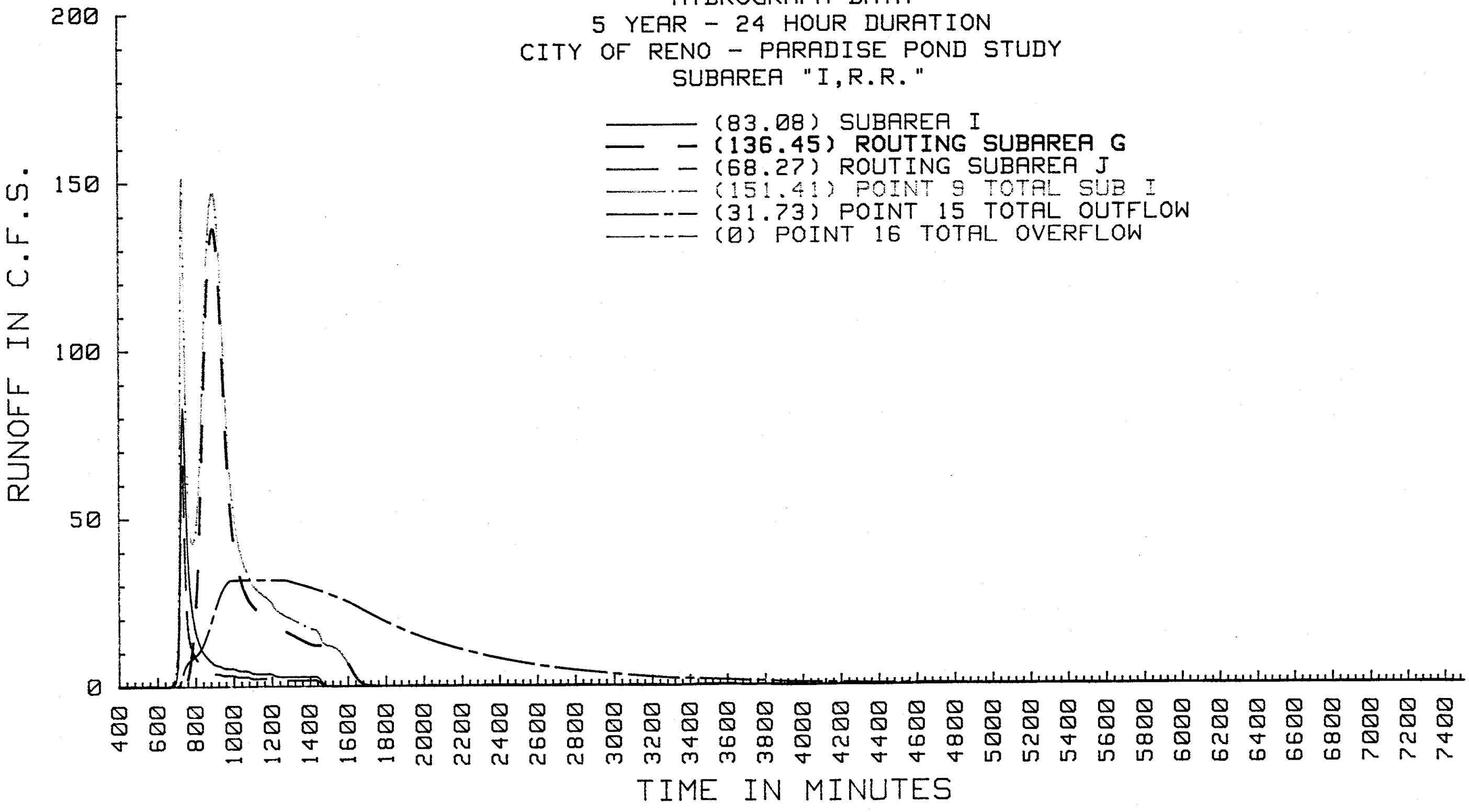


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "G,H,J"



HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,R.R."

——— (83.08) SUBAREA I
—— — (136.45) ROUTING SUBAREA G
—— — (68.27) ROUTING SUBAREA J
——·— (151.41) POINT 9 TOTAL SUB I
——-- (31.73) POINT 15 TOTAL OUTFLOW
——--- (0) POINT 16 TOTAL OVERFLOW



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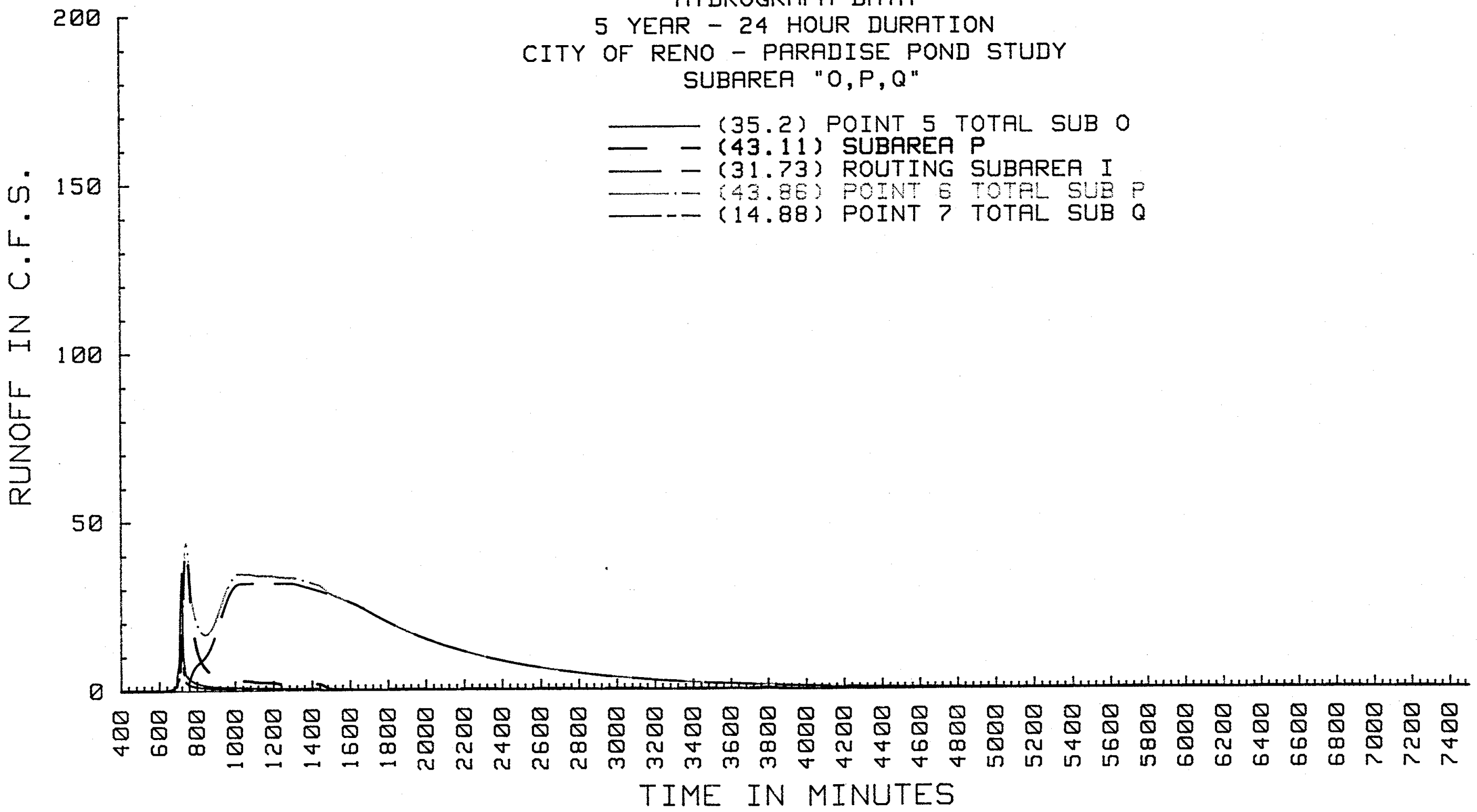
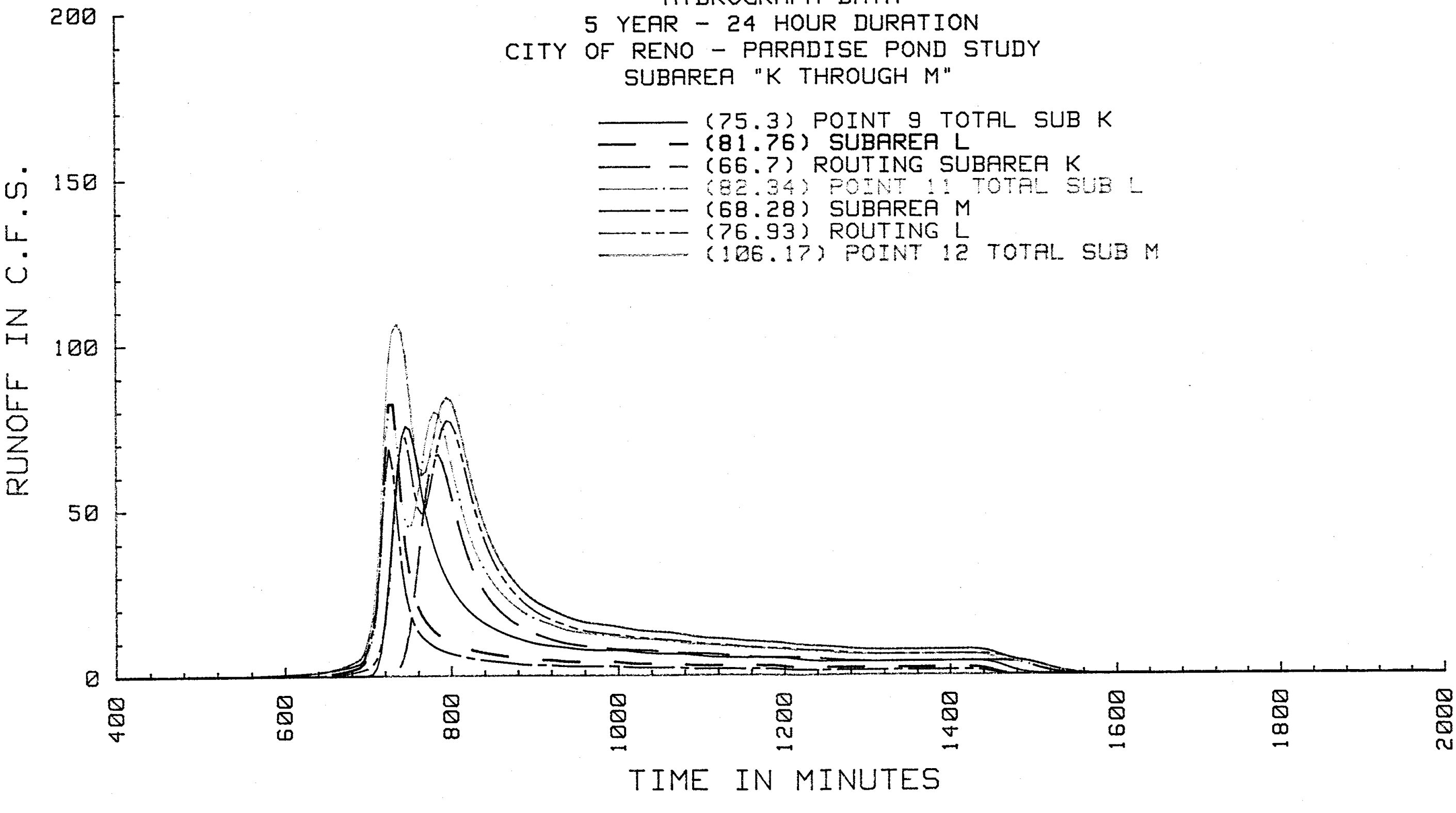
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

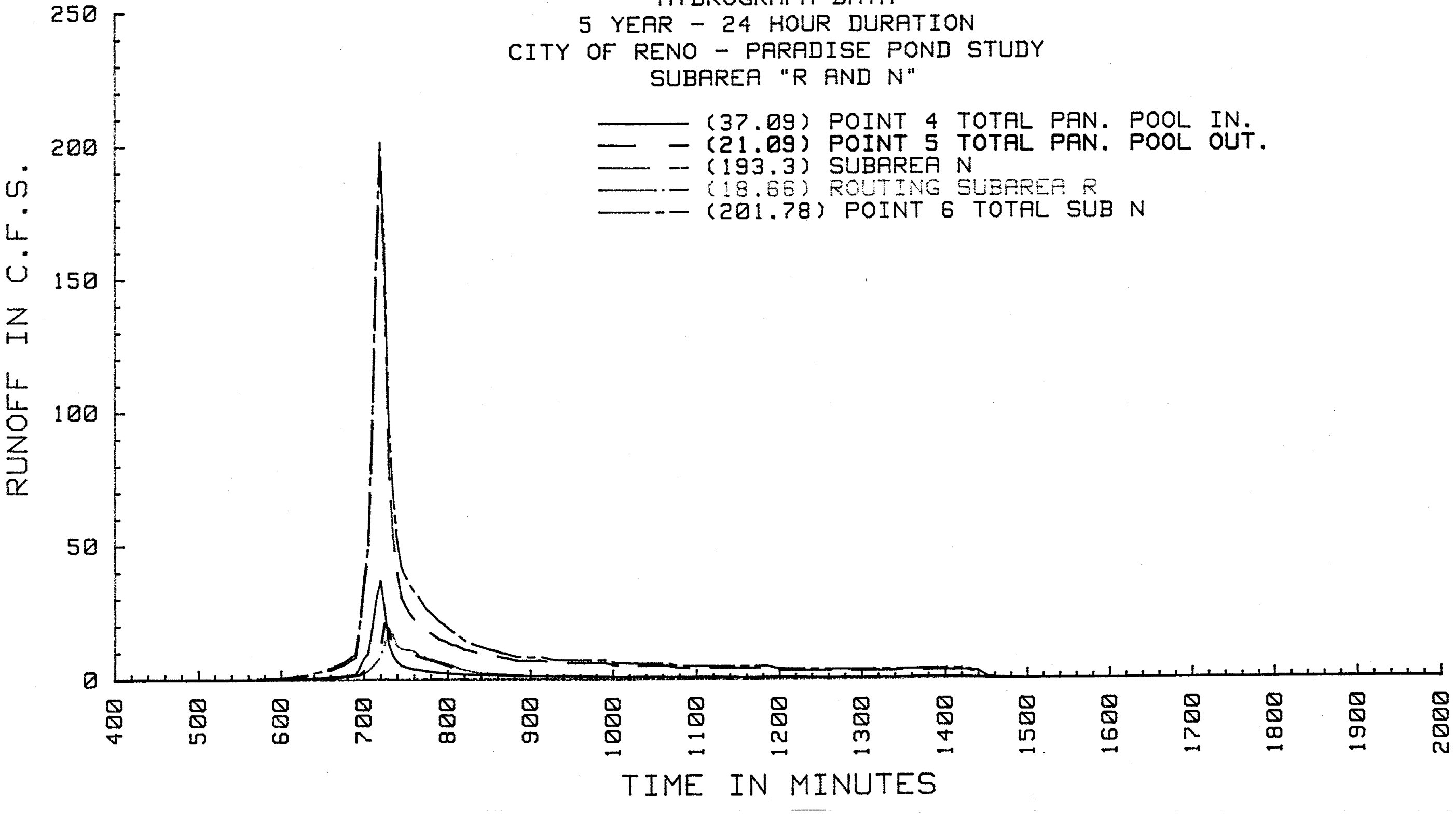


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M"

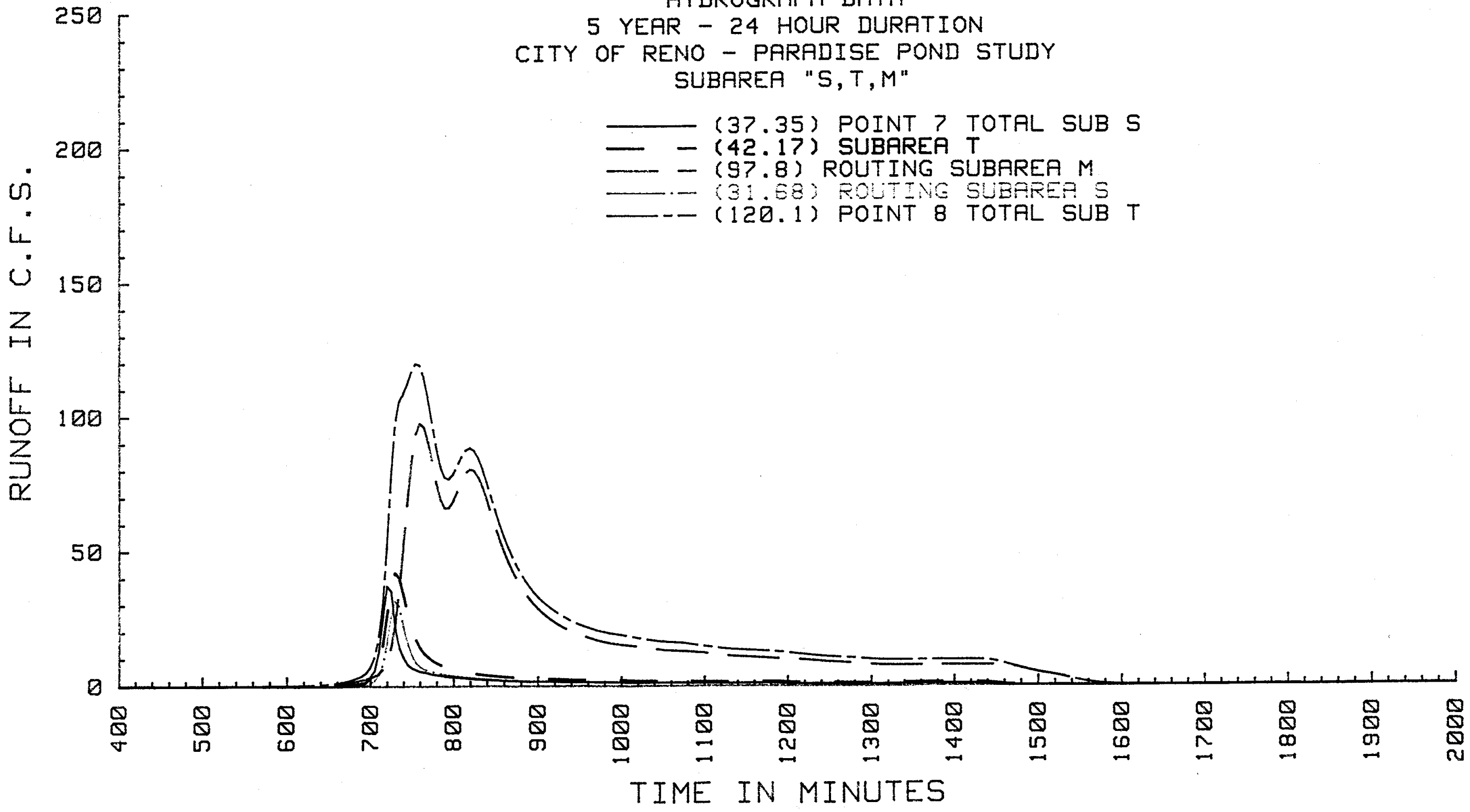


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "R AND N"

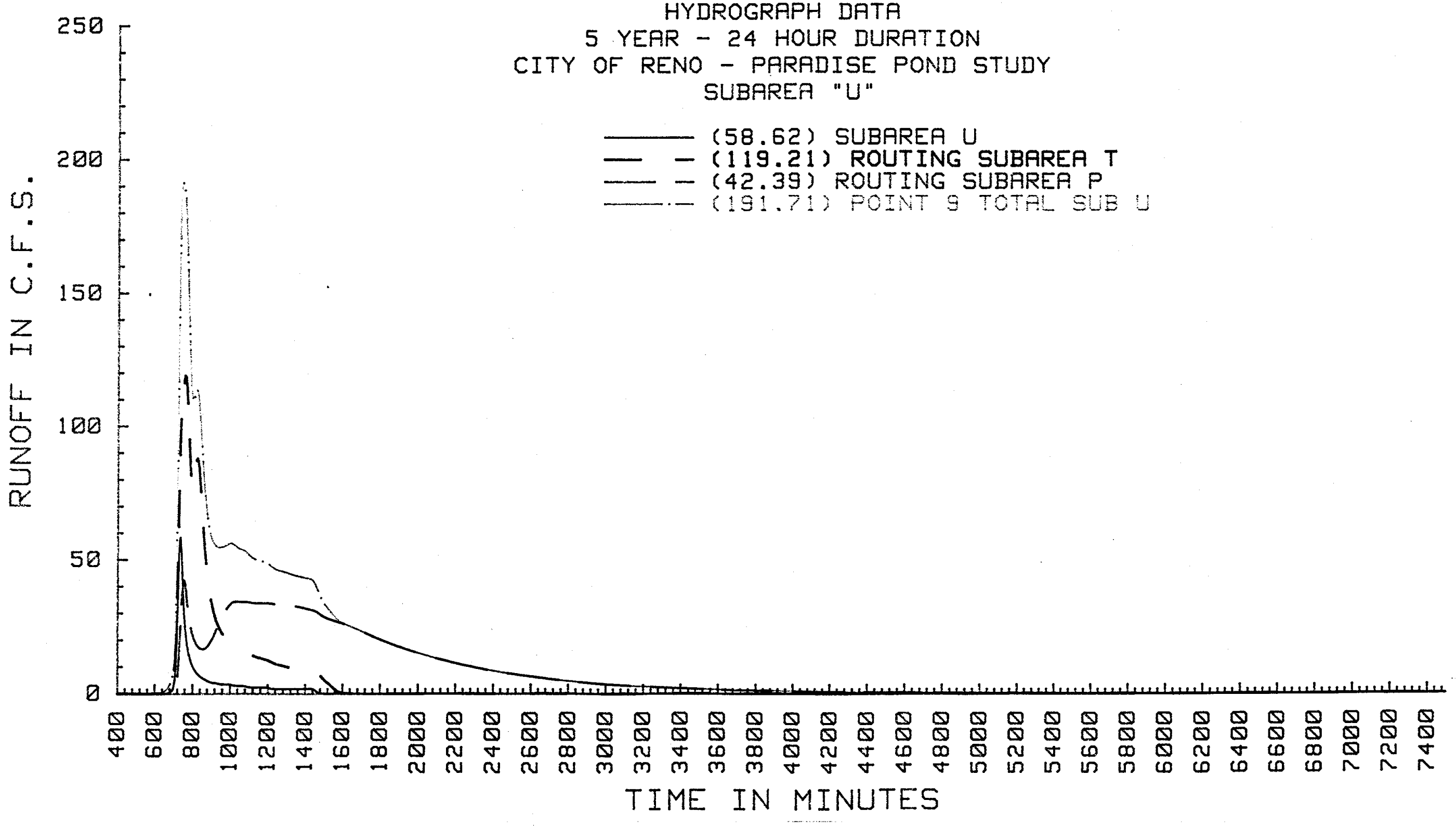
——— (37.09) POINT 4 TOTAL PAN. POOL IN.
— — (21.09) POINT 5 TOTAL PAN. POOL OUT.
—— — (193.3) SUBAREA N
——·— (18.66) ROUTING SUBAREA R
——-— (201.78) POINT 6 TOTAL SUB N



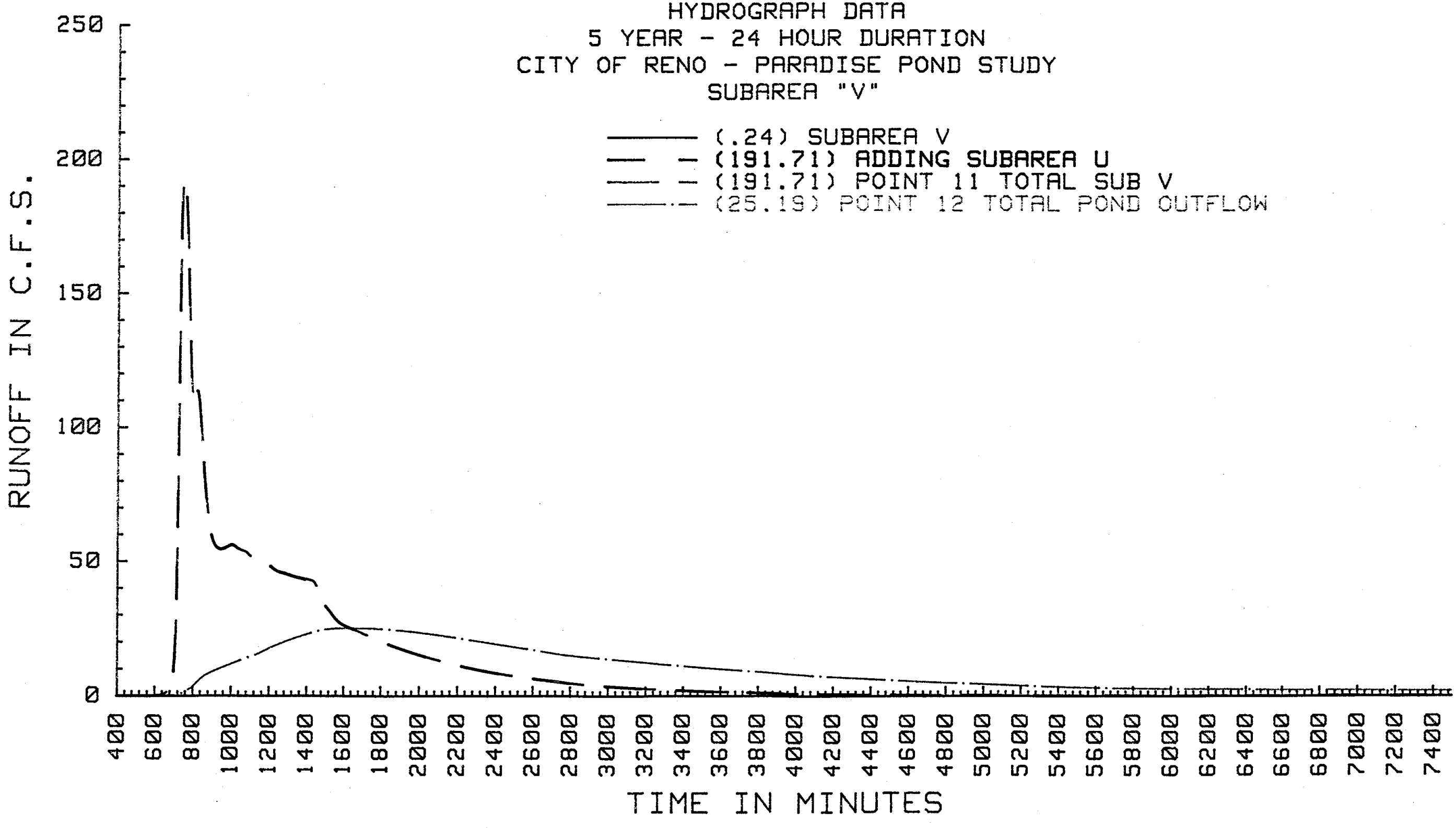
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



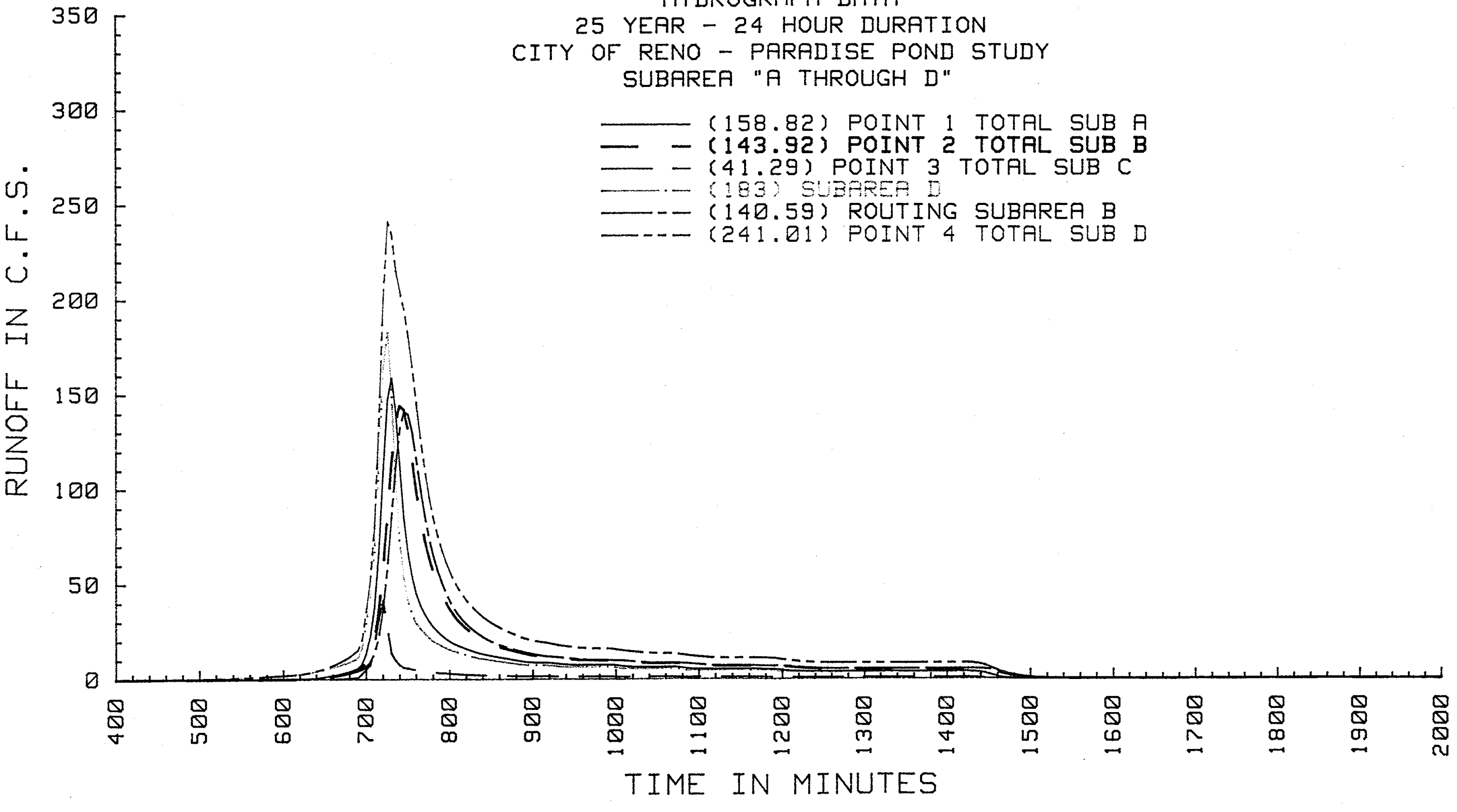
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



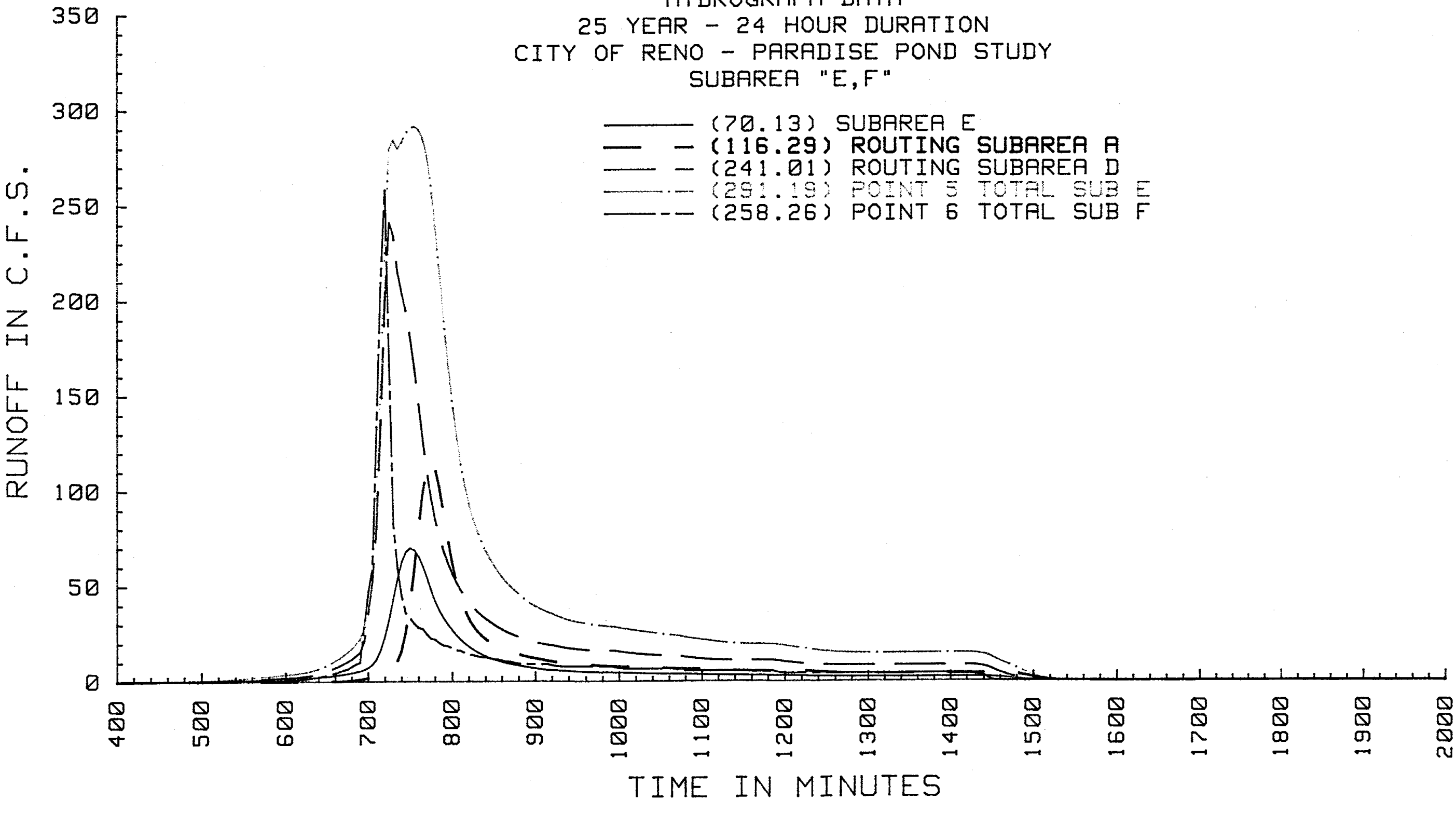
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "A THROUGH D"

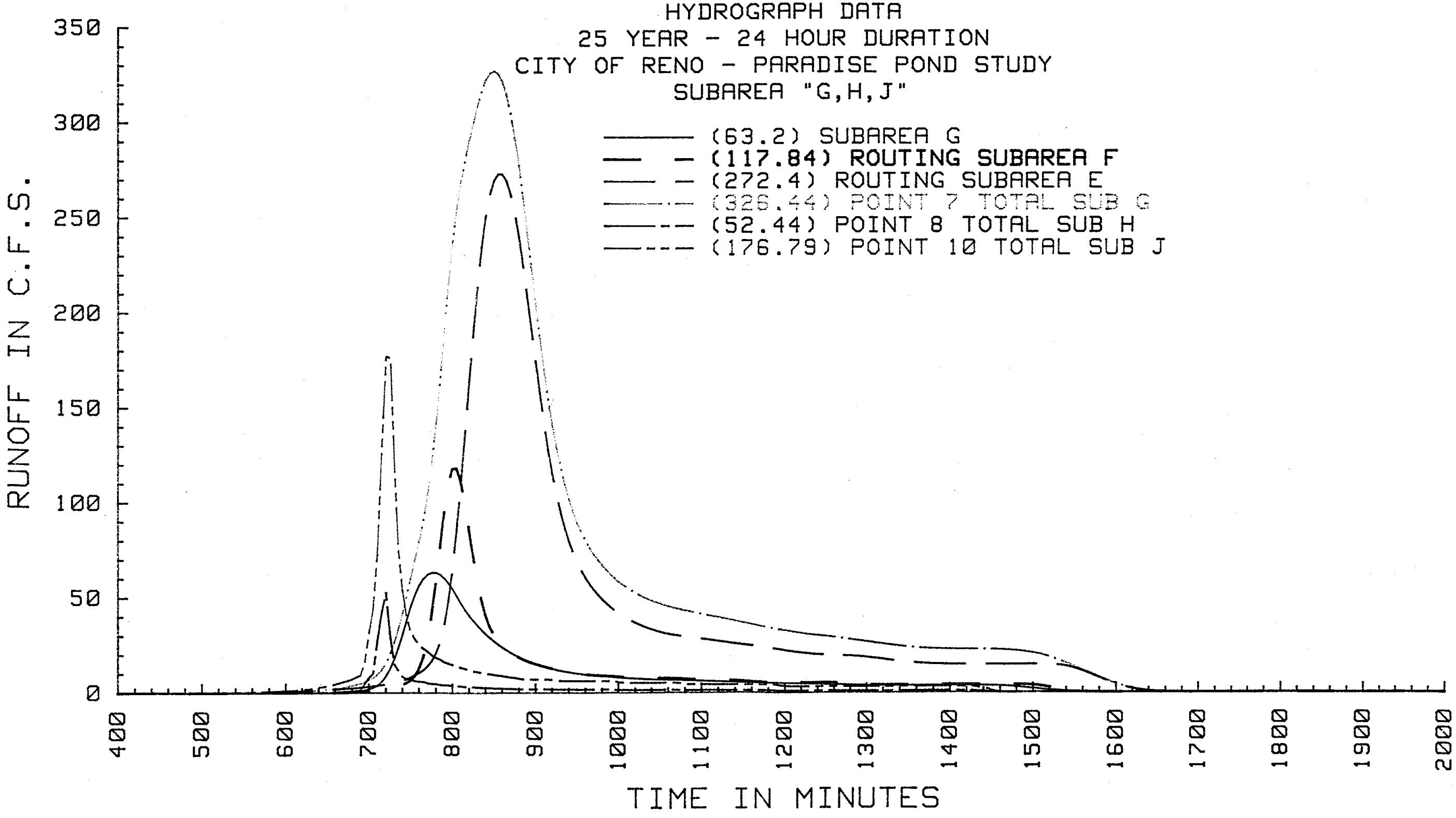


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "E,F"

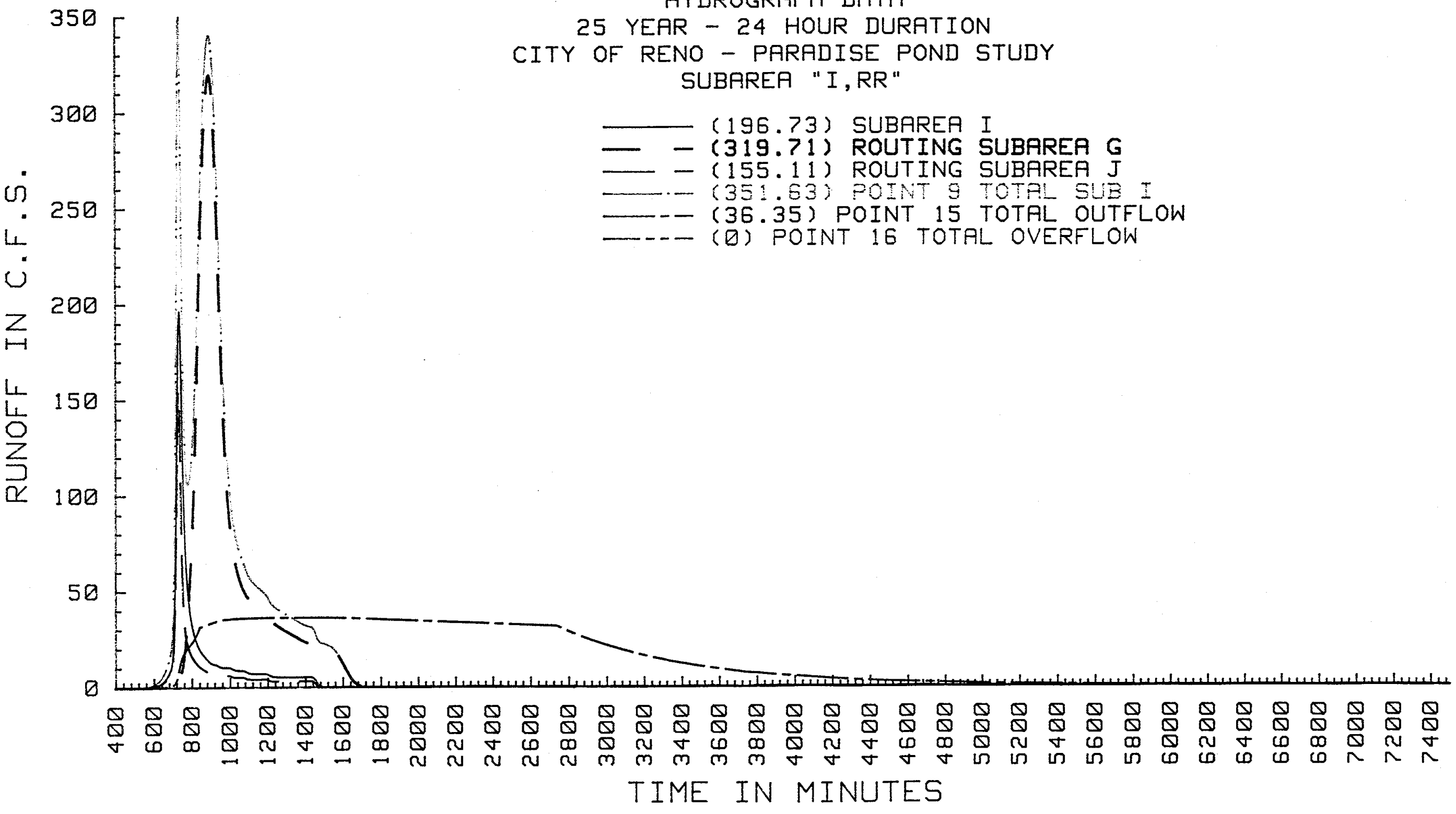


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "G,H,J"

——— (63.2) SUBAREA G
— — (117.84) ROUTING SUBAREA F
—— — (272.4) ROUTING SUBAREA E
——·— (326.44) POINT 7 TOTAL SUB G
——-- (52.44) POINT 8 TOTAL SUB H
——·-- (176.79) POINT 10 TOTAL SUB J

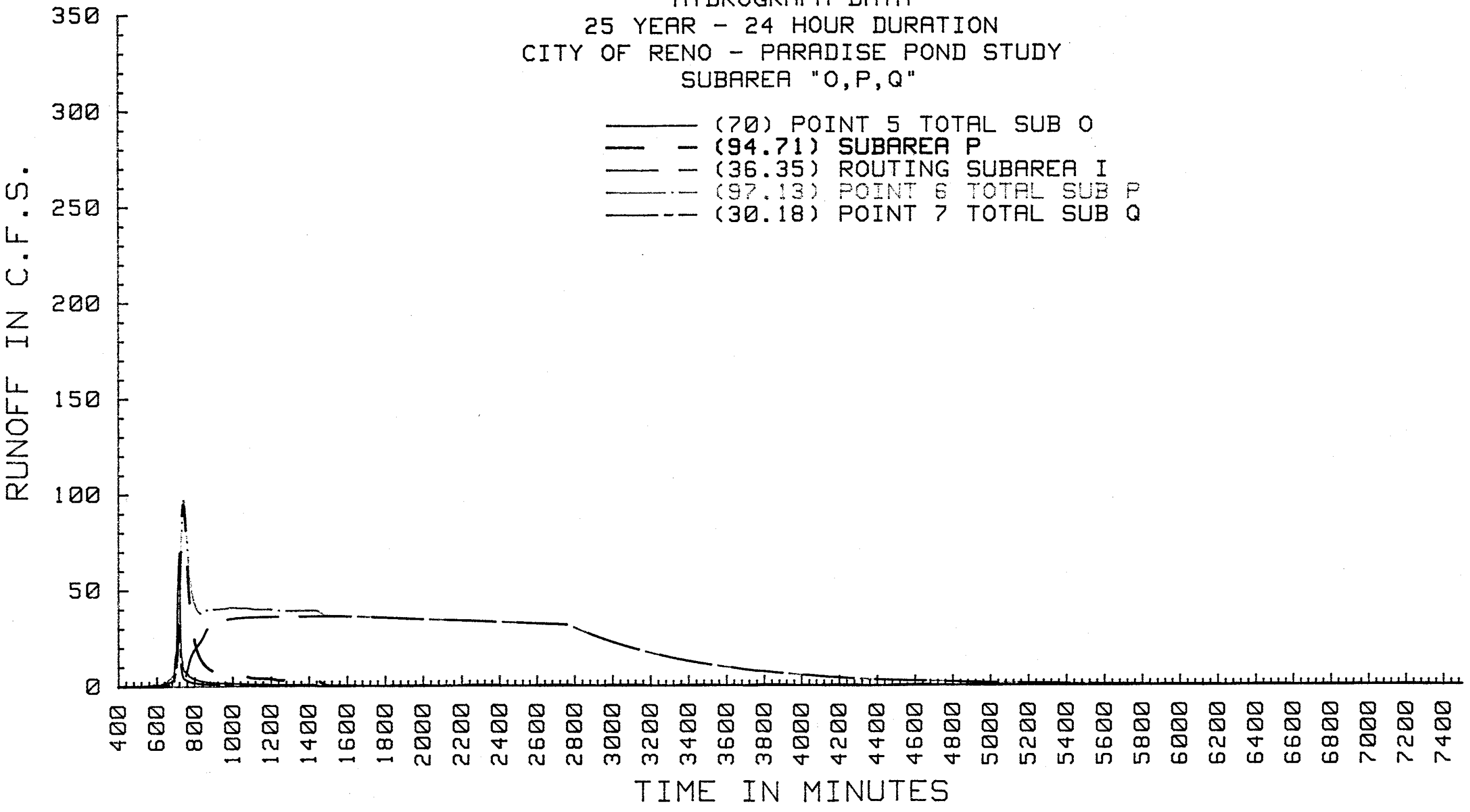


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,RR"

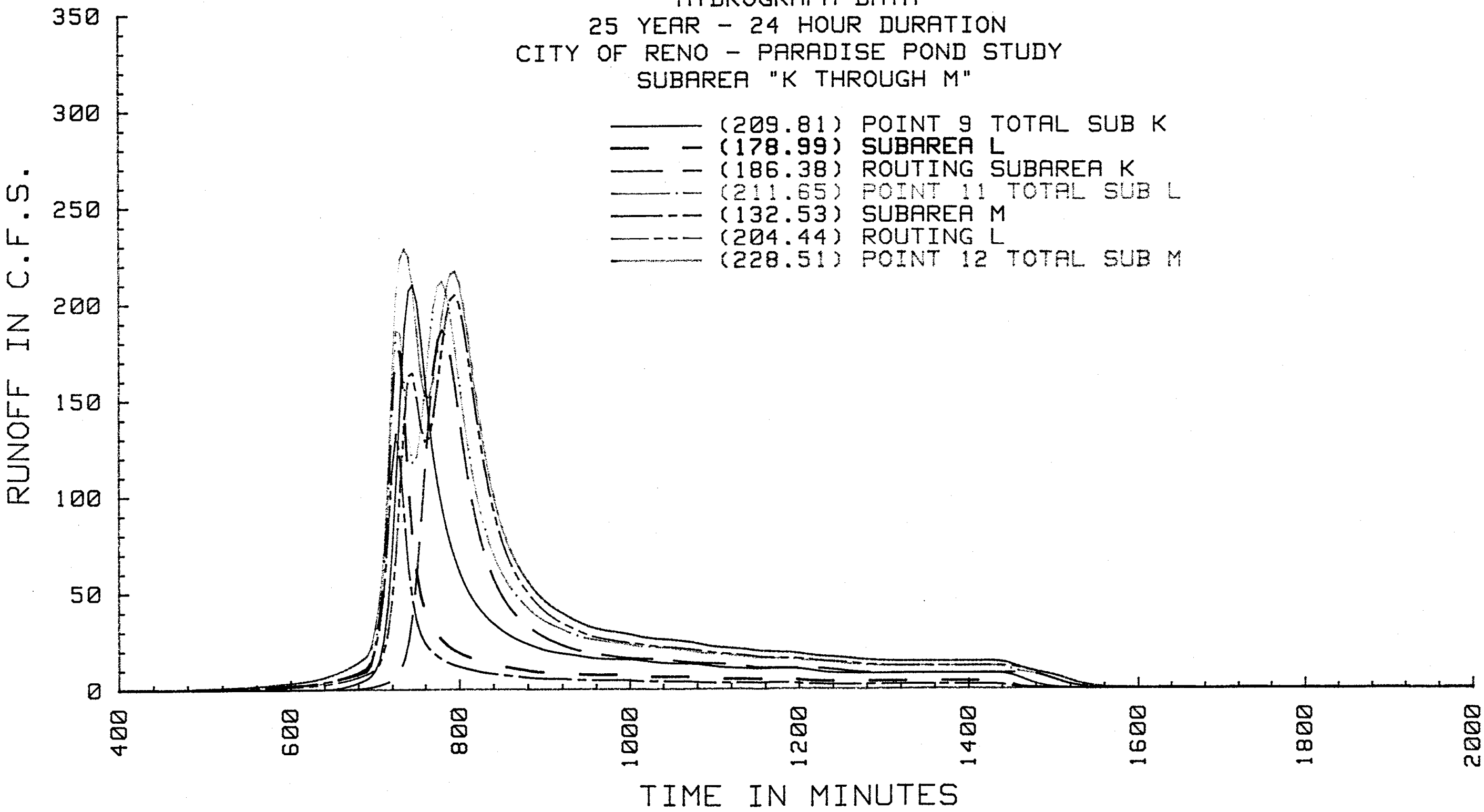


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

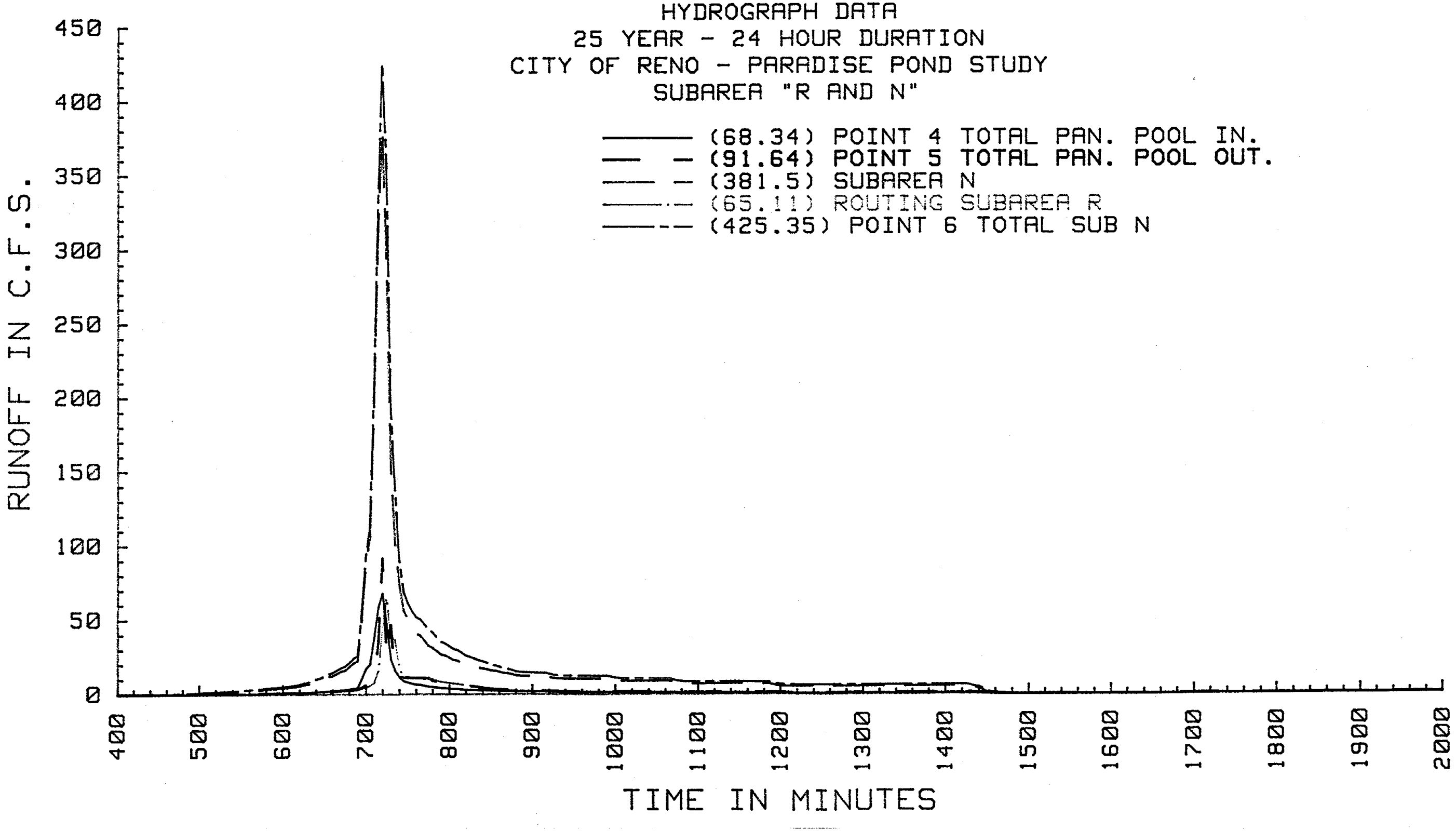
——— (70) POINT 5 TOTAL SUB O
— — (94.71) SUBAREA P
—— — (36.35) ROUTING SUBAREA I
——·— (97.13) POINT 6 TOTAL SUB P
——-- (30.18) POINT 7 TOTAL SUB Q



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M"



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "R AND N"



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

——— (87.07) POINT 7 TOTAL SUB S
— — (91.89) SUBAREA T
—— — (211.43) ROUTING SUBAREA M
——·— (74.23) ROUTING SUBAREA S
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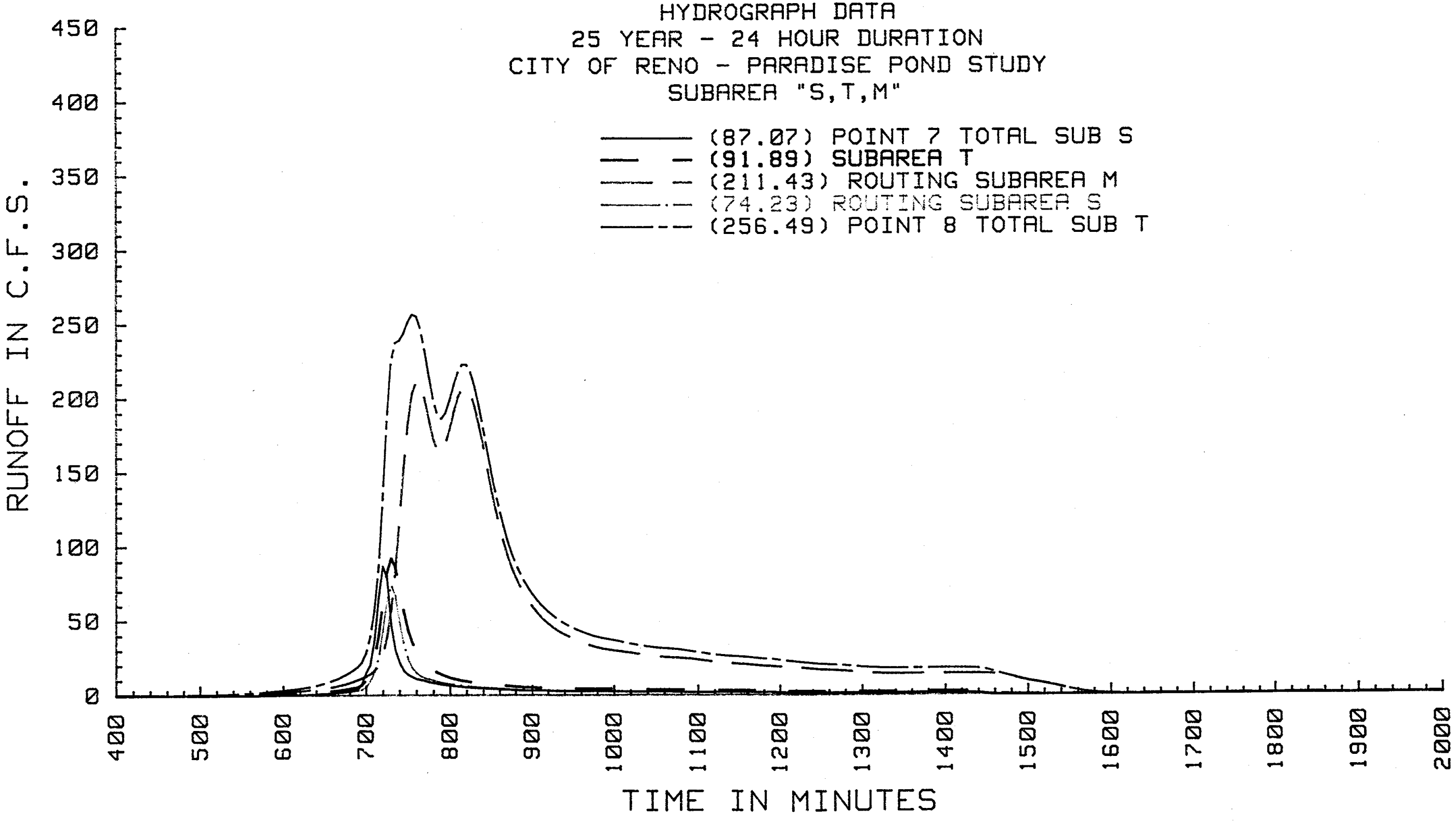
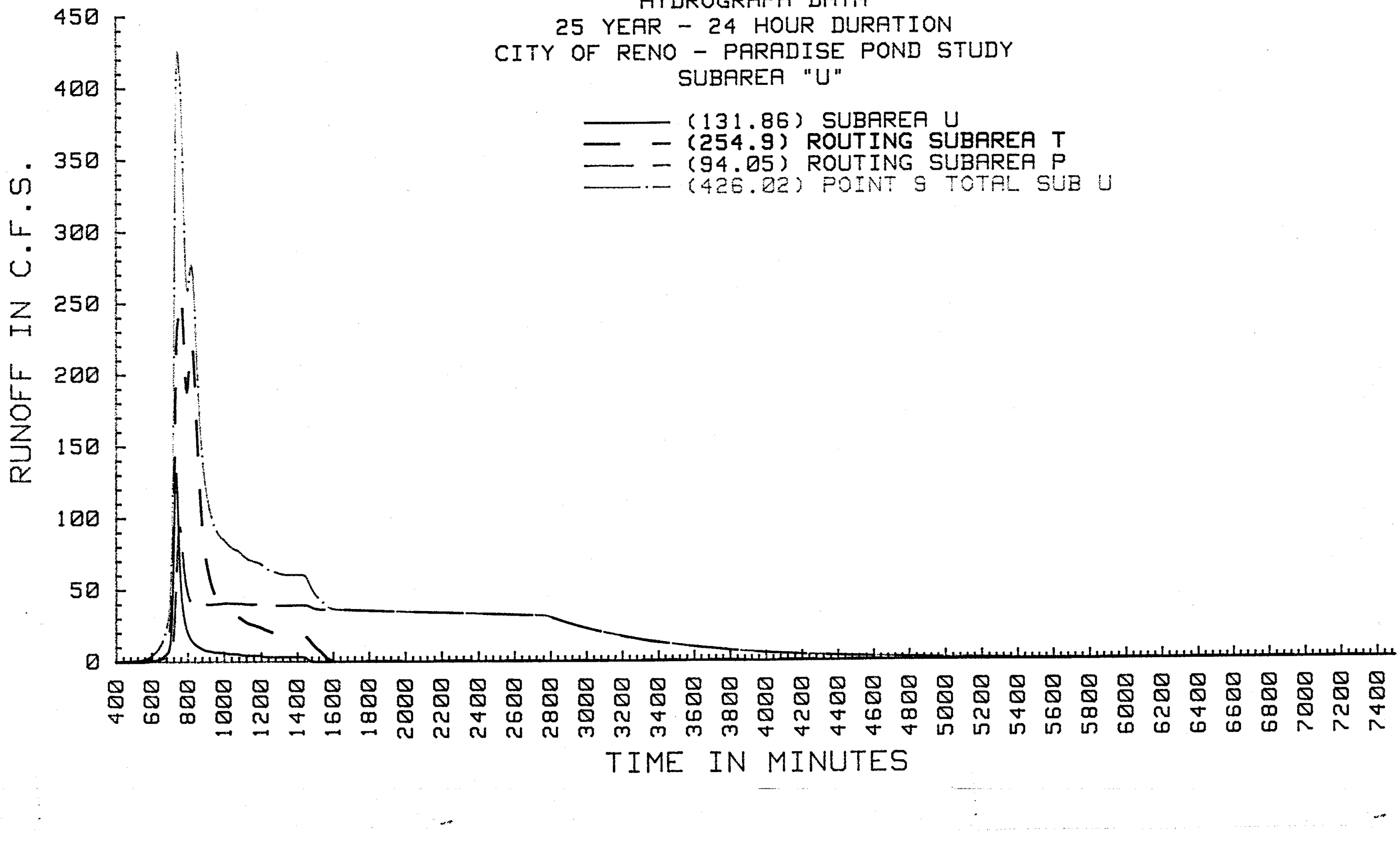
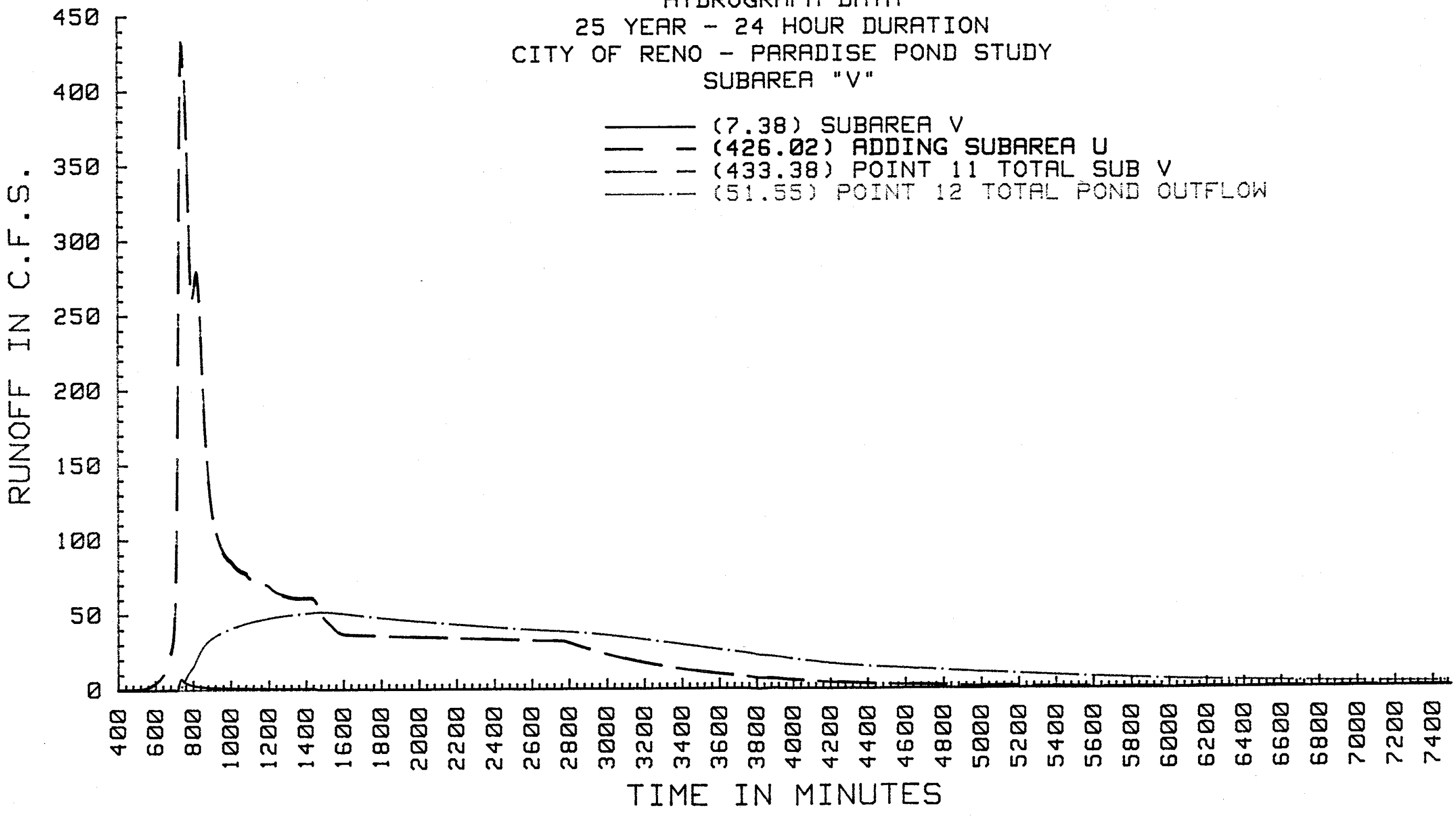


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"

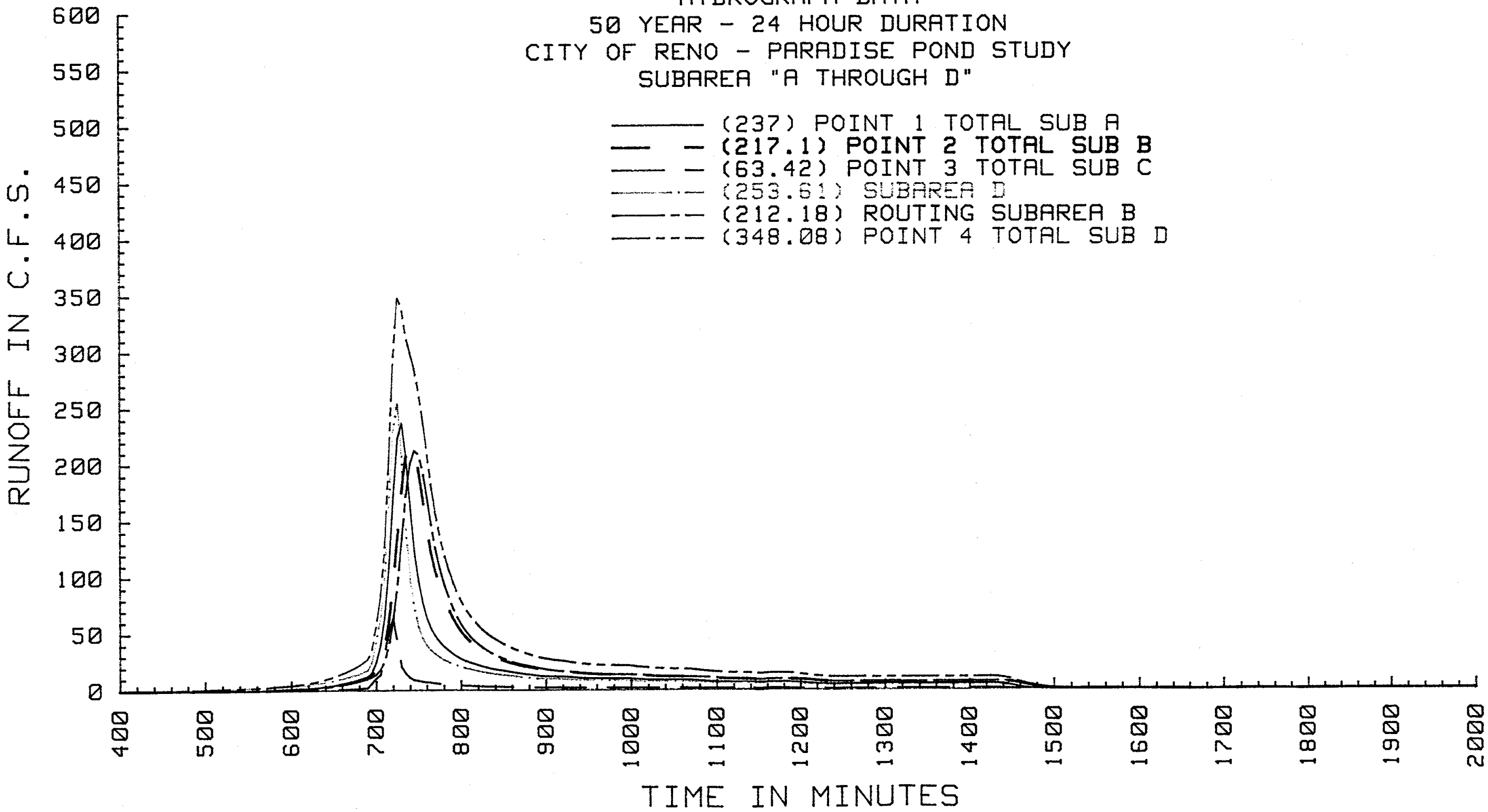


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

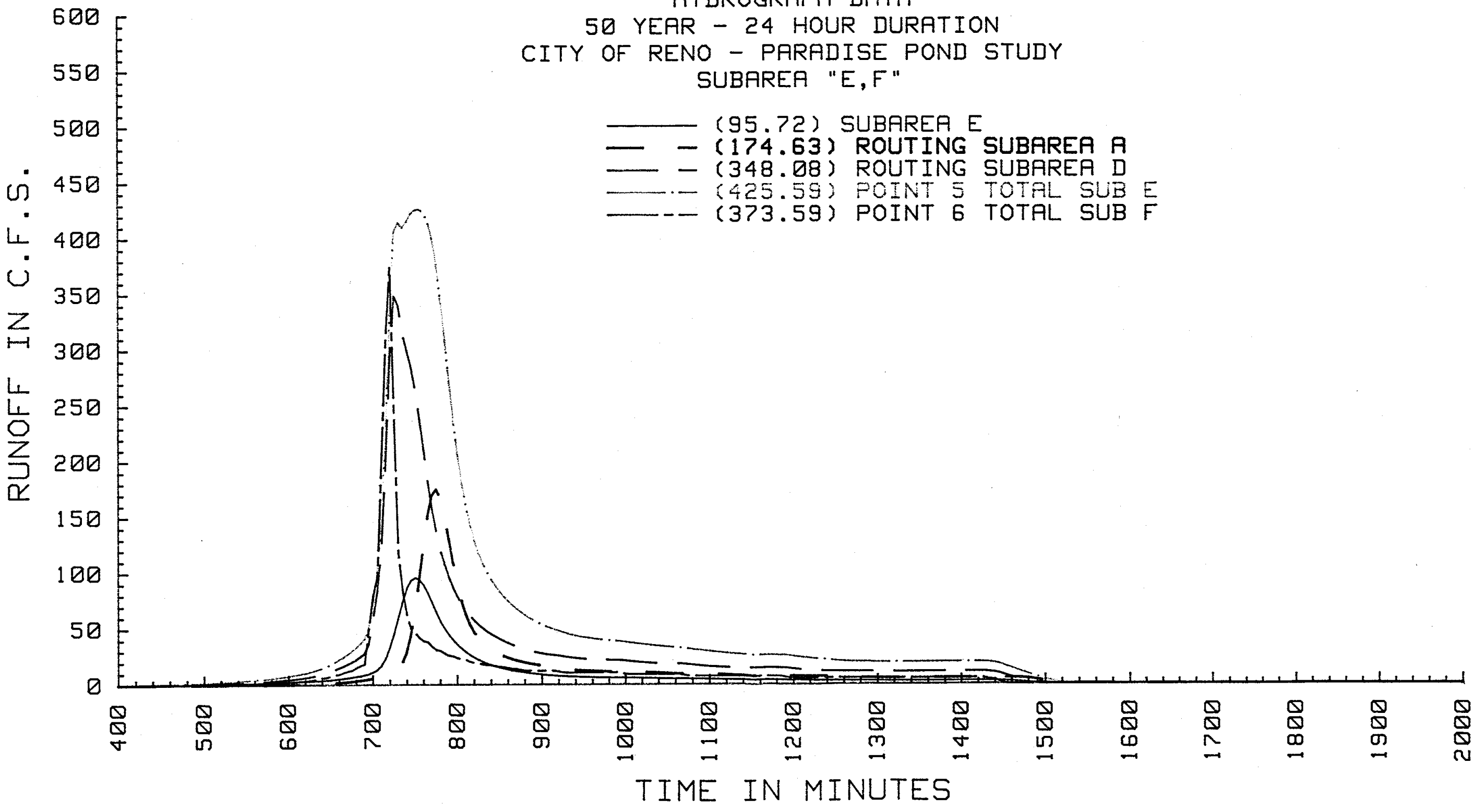
——— (7.38) SUBAREA V
— — (426.02) ADDING SUBAREA U
—— — (433.38) POINT 11 TOTAL SUB V
——·— (51.55) POINT 12 TOTAL POND OUTFLOW



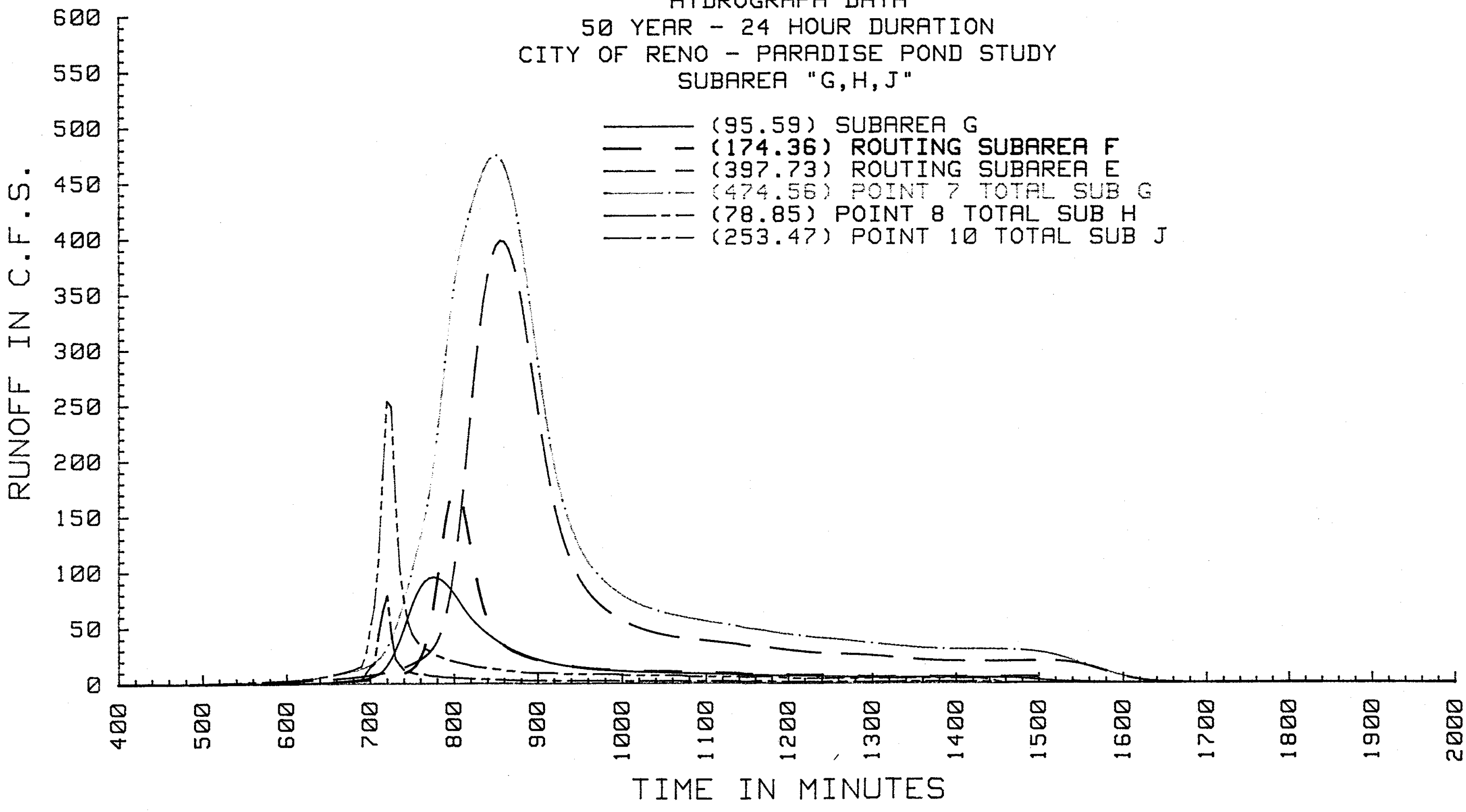
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "A THROUGH D"



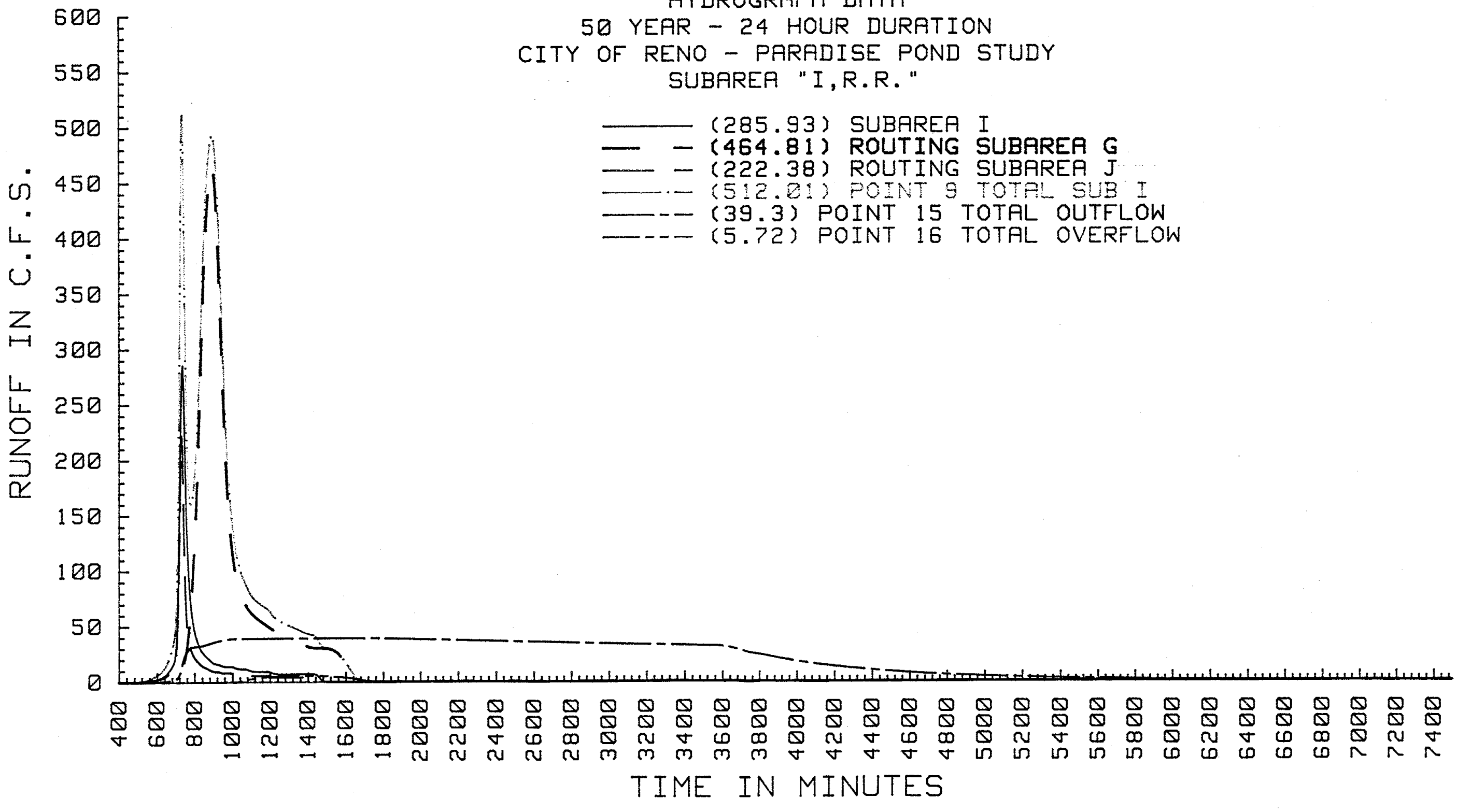
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "E,F"



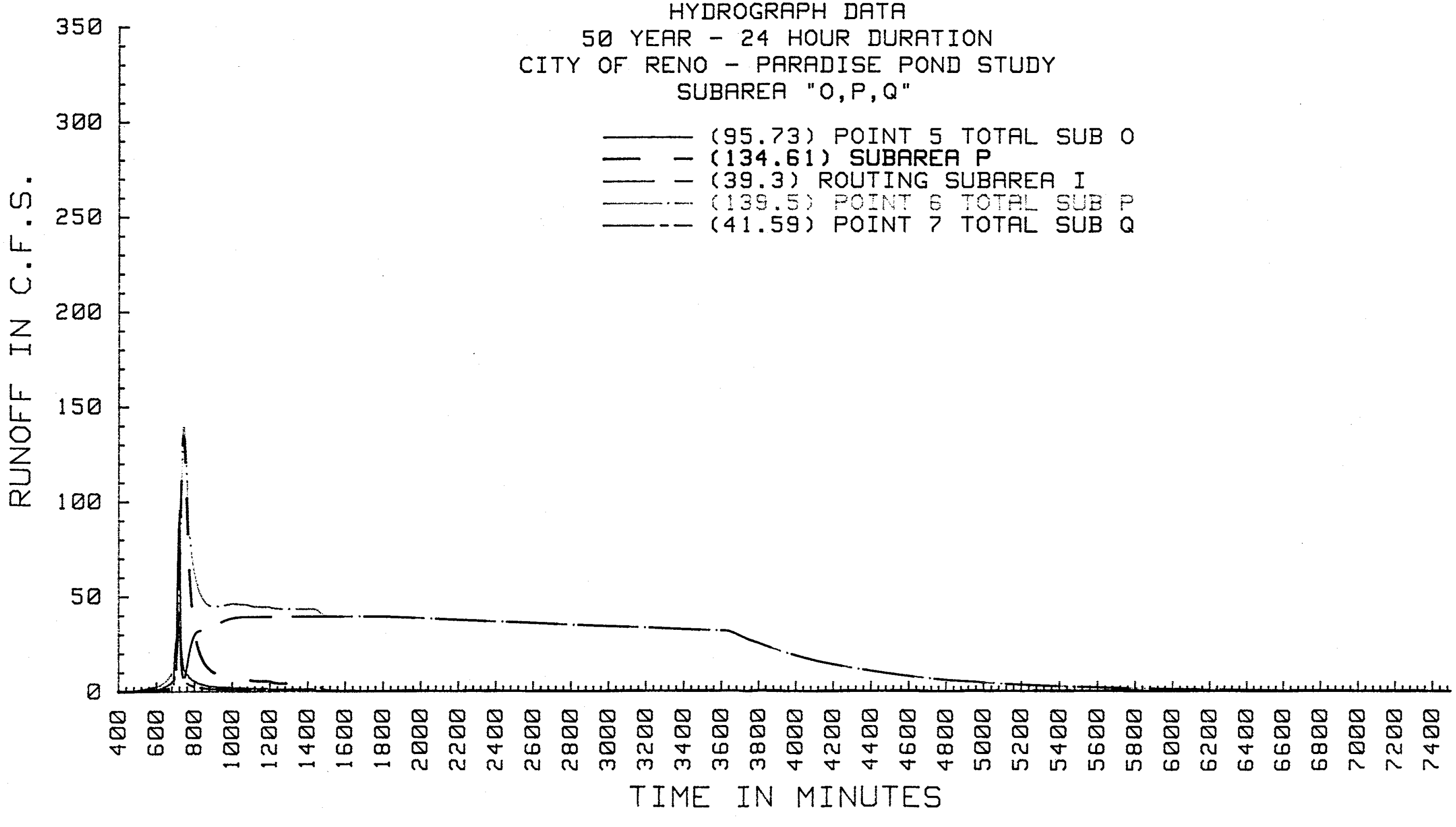
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "G,H,J"



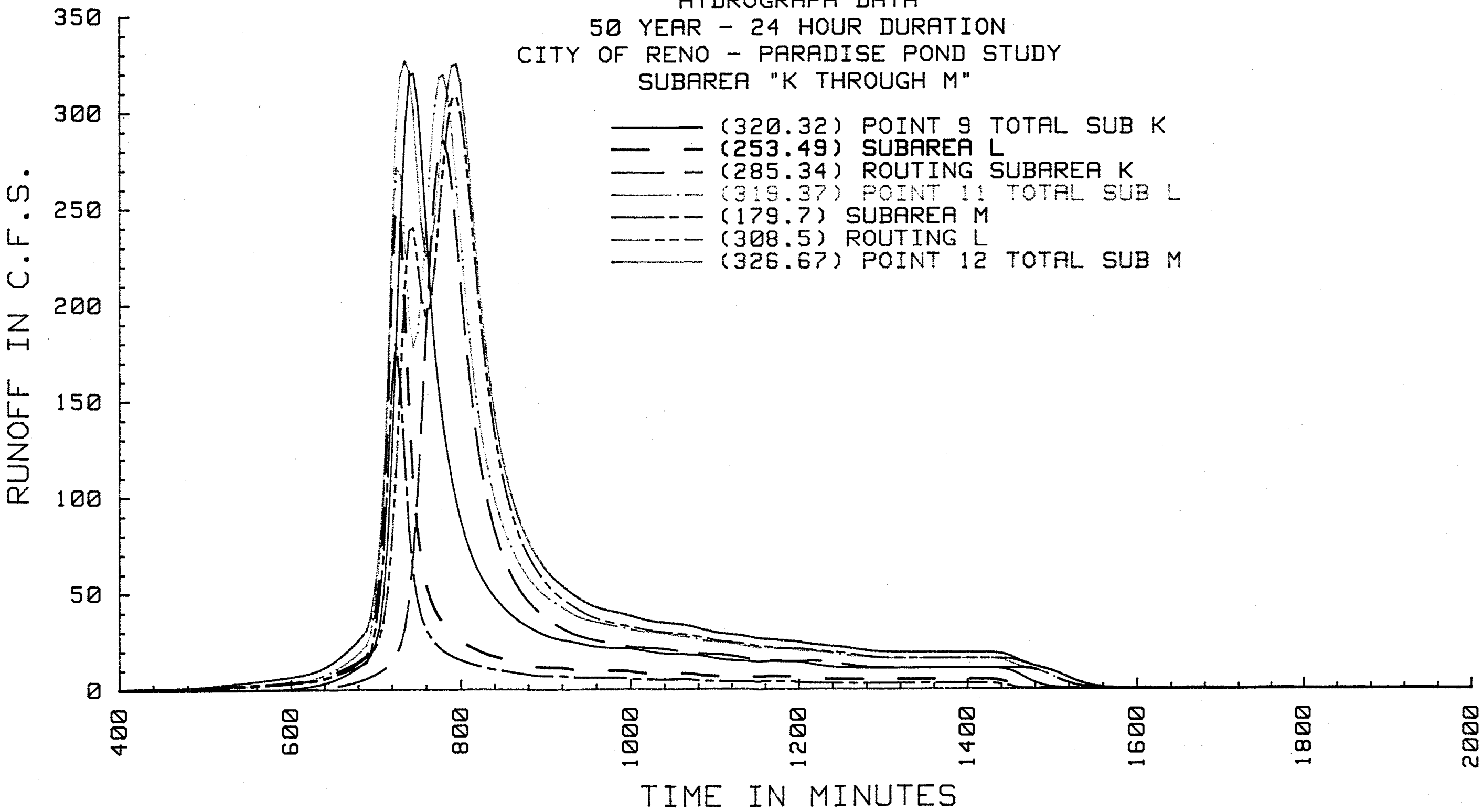
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,R.R."



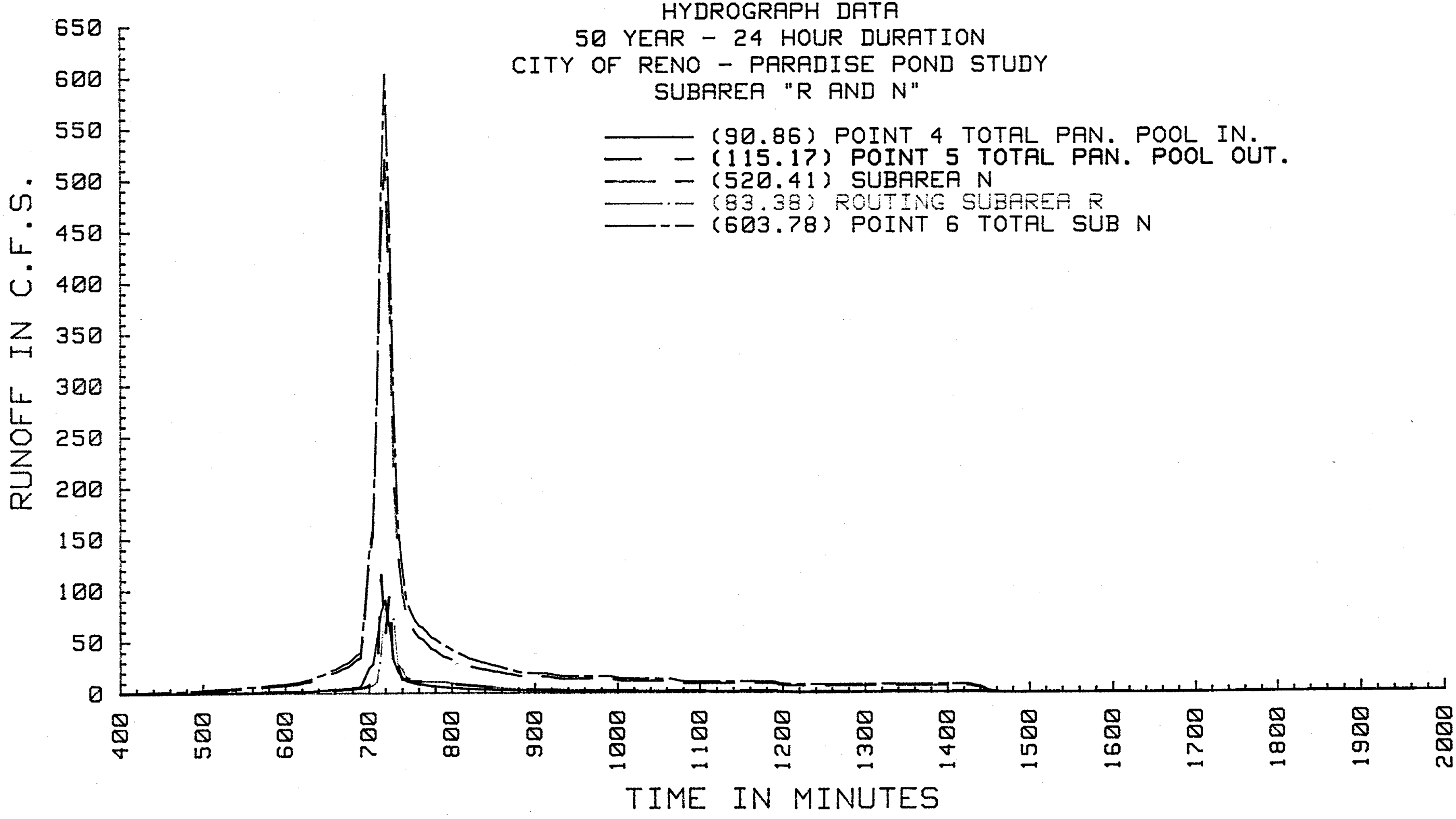
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M"

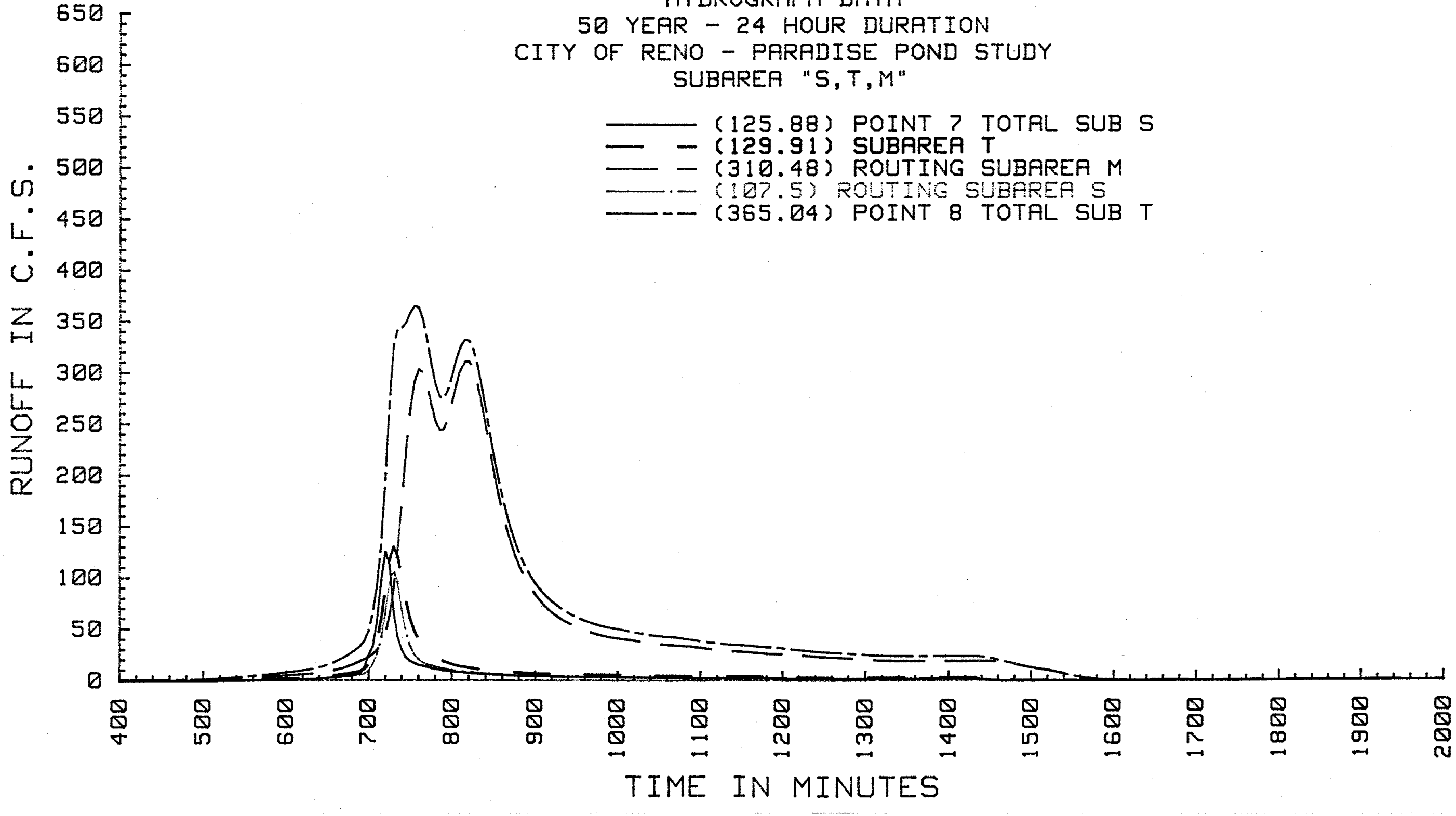


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "R AND N"

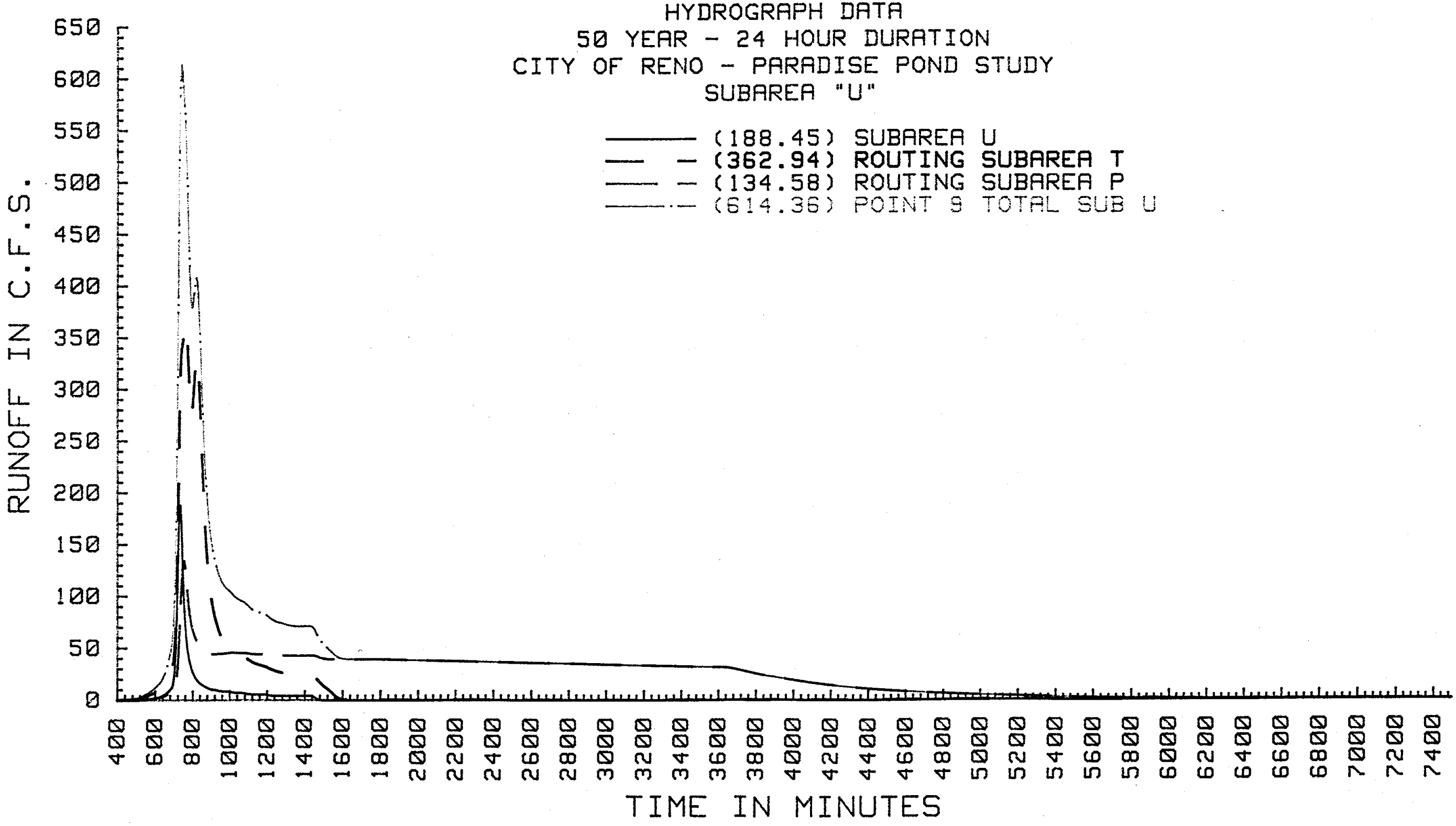


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

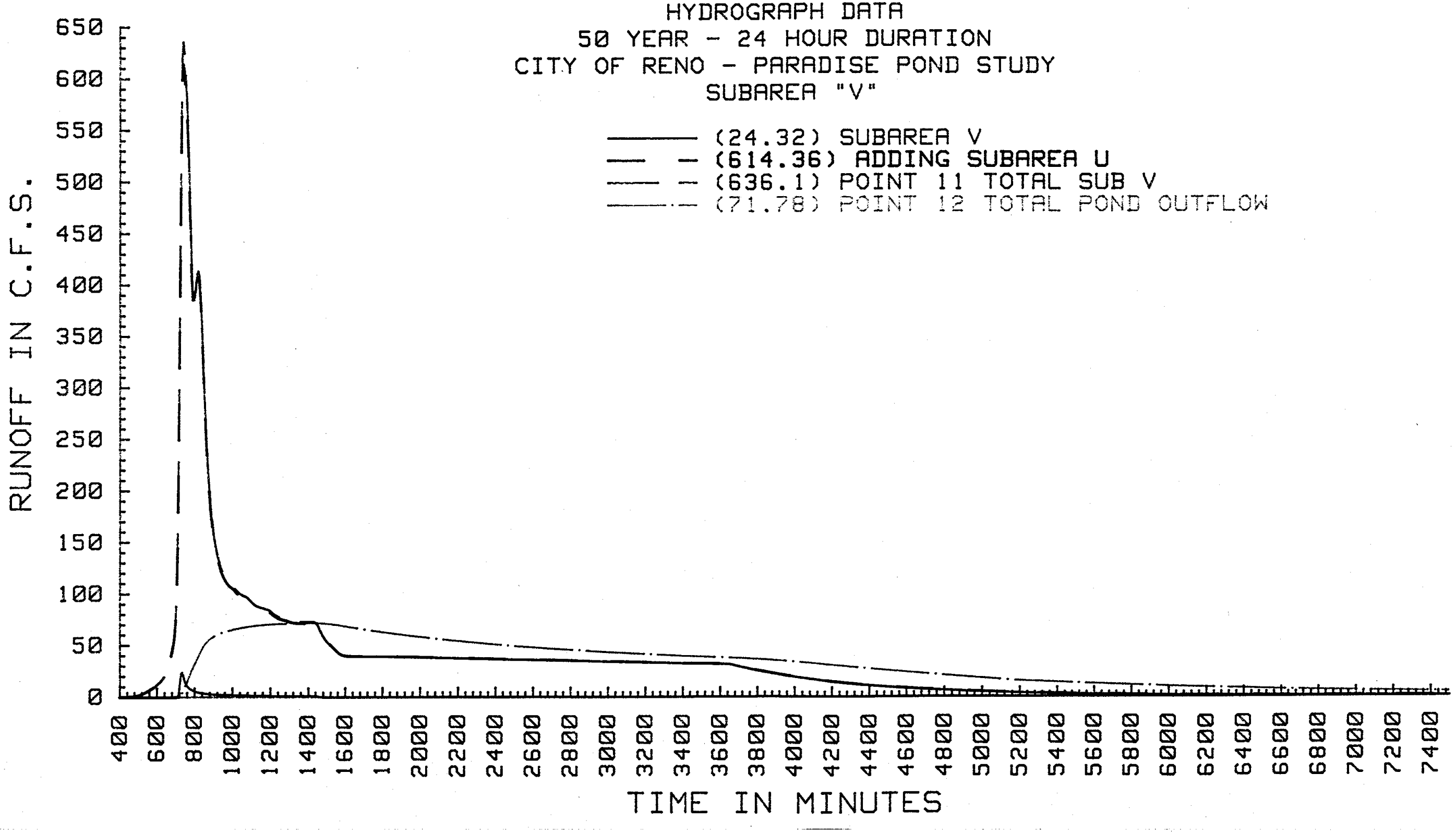
——— (125.88) POINT 7 TOTAL SUB S
— — (129.91) SUBAREA T
— — (310.48) ROUTING SUBAREA M
—·— (107.5) ROUTING SUBAREA S
—·— (365.04) POINT 8 TOTAL SUB T



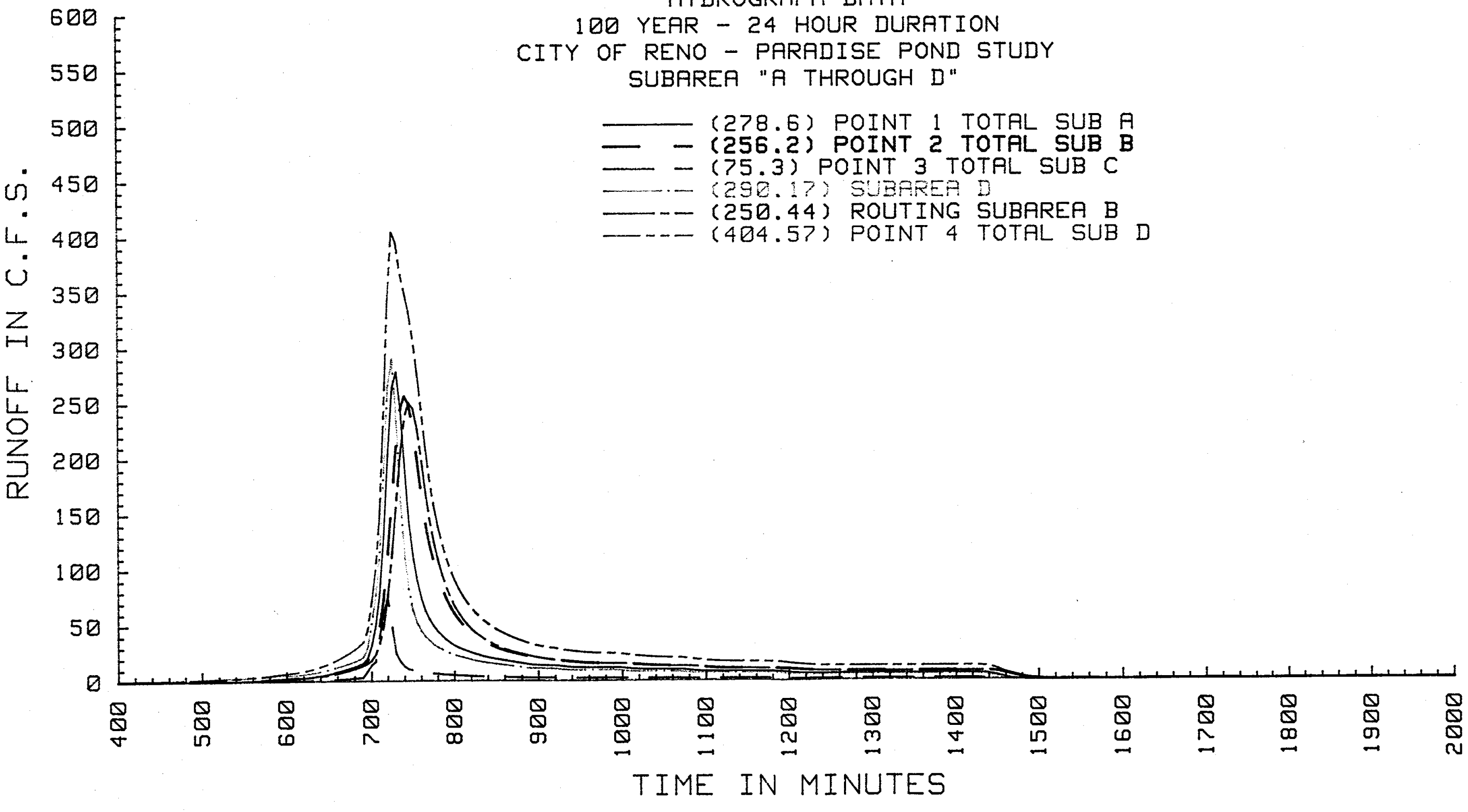
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



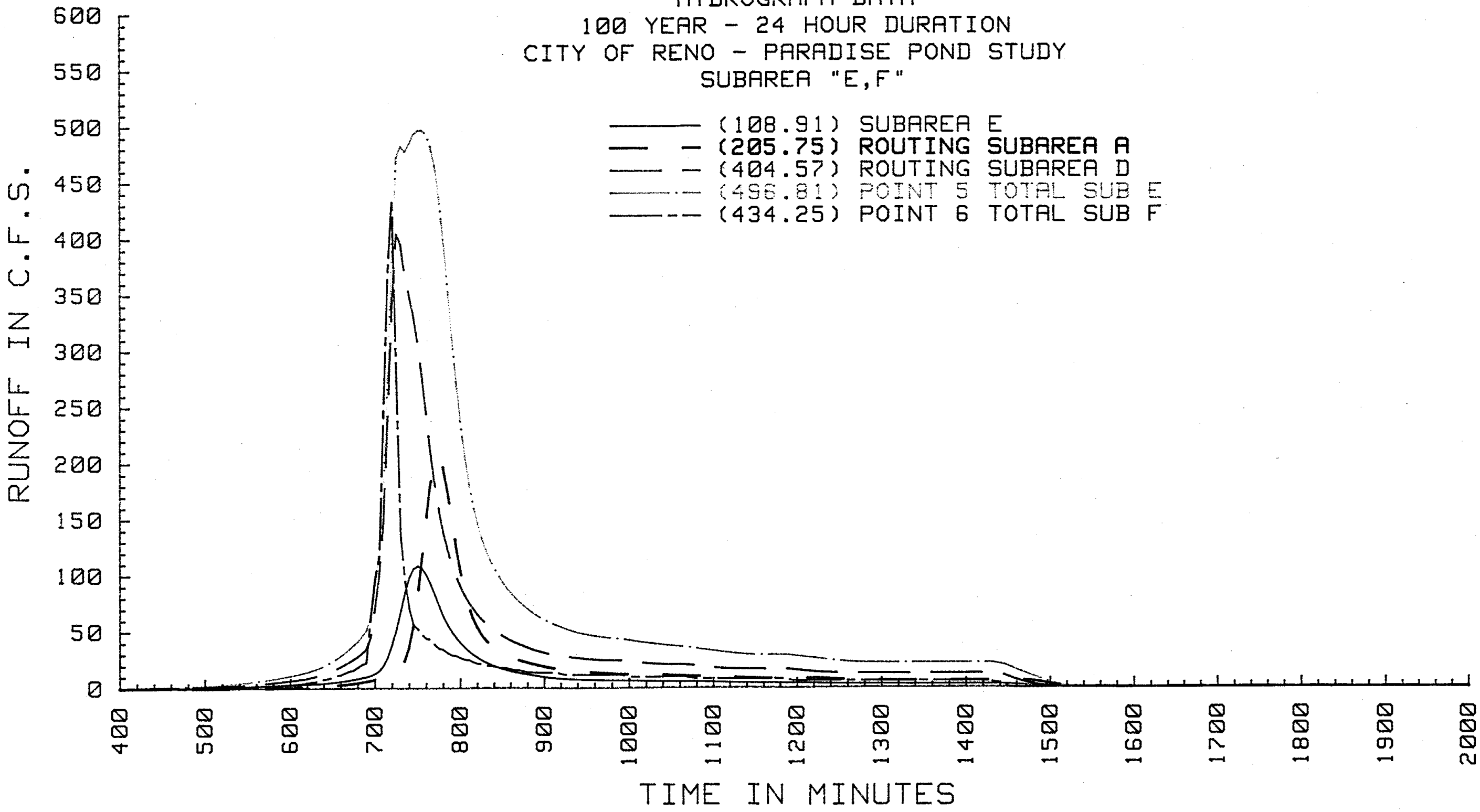
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



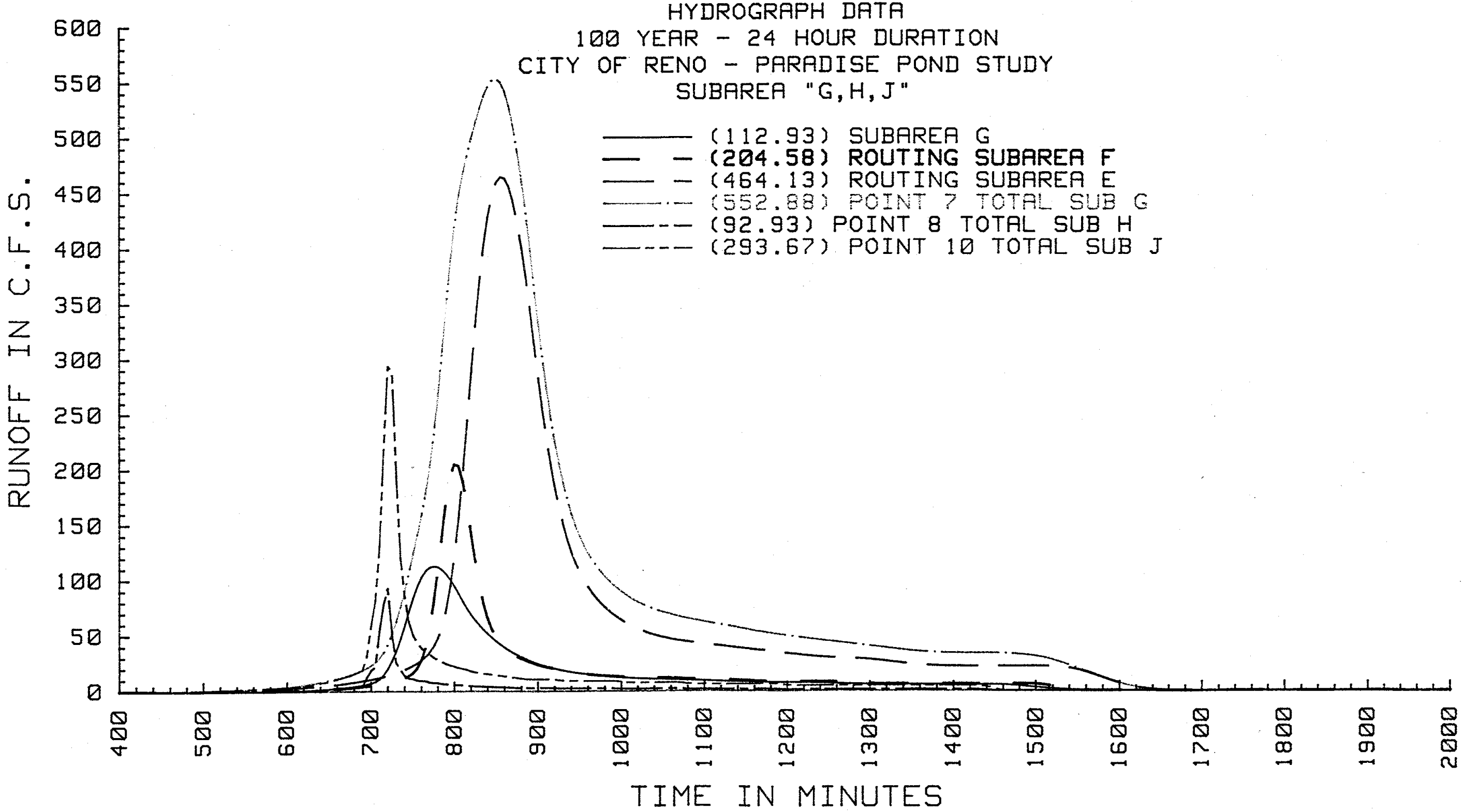
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "A THROUGH D"



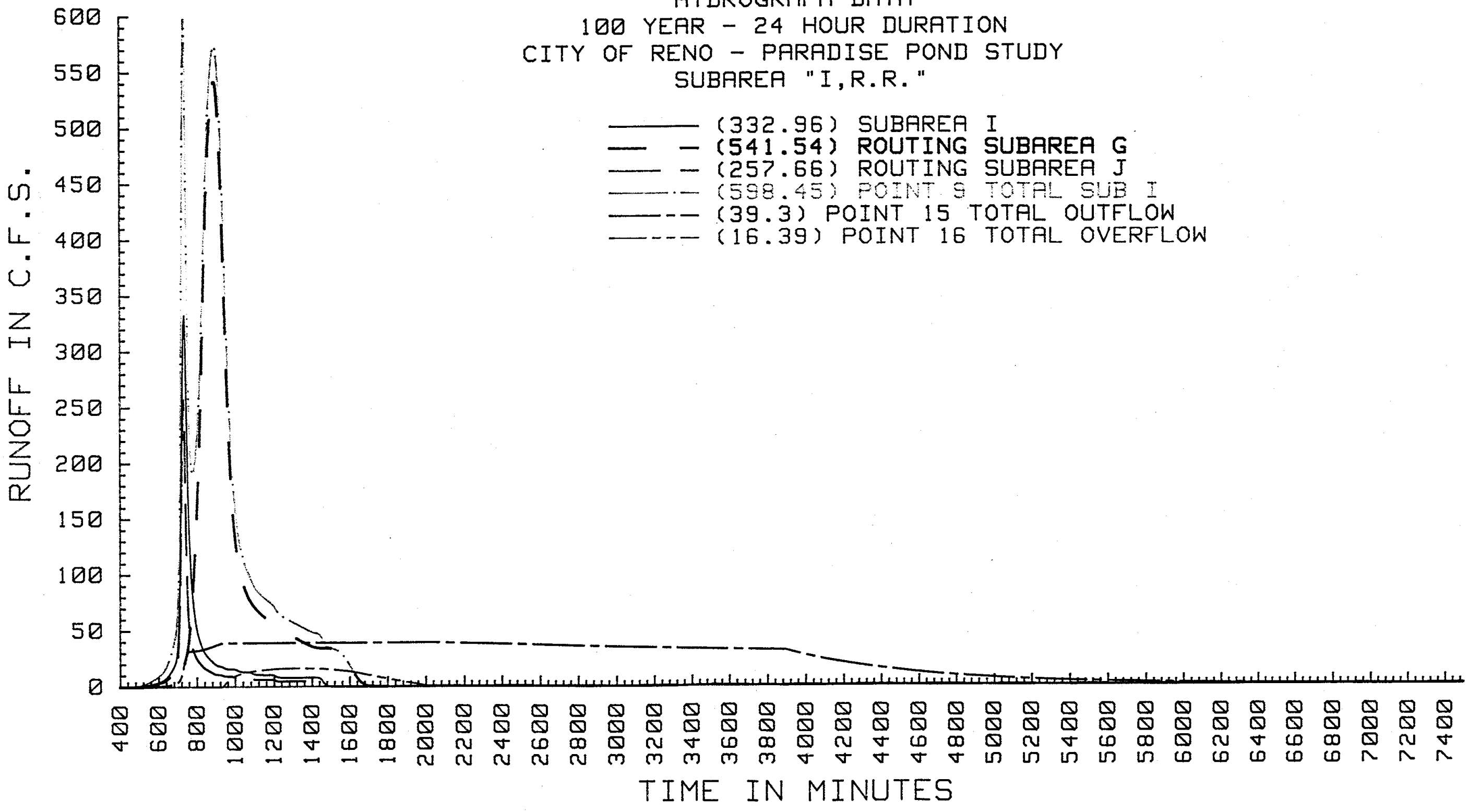
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "E,F"



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "G,H,J"

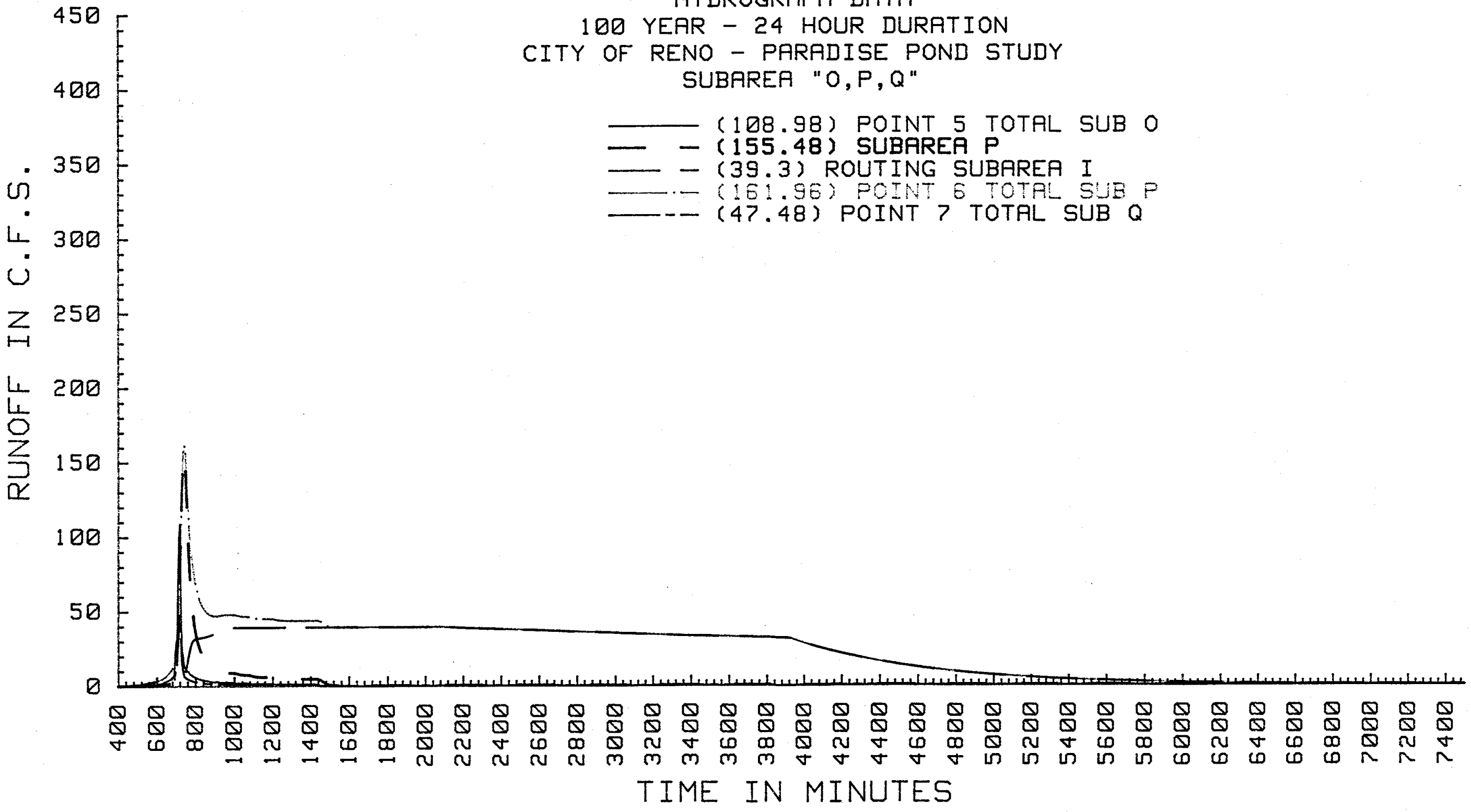


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,R.R."

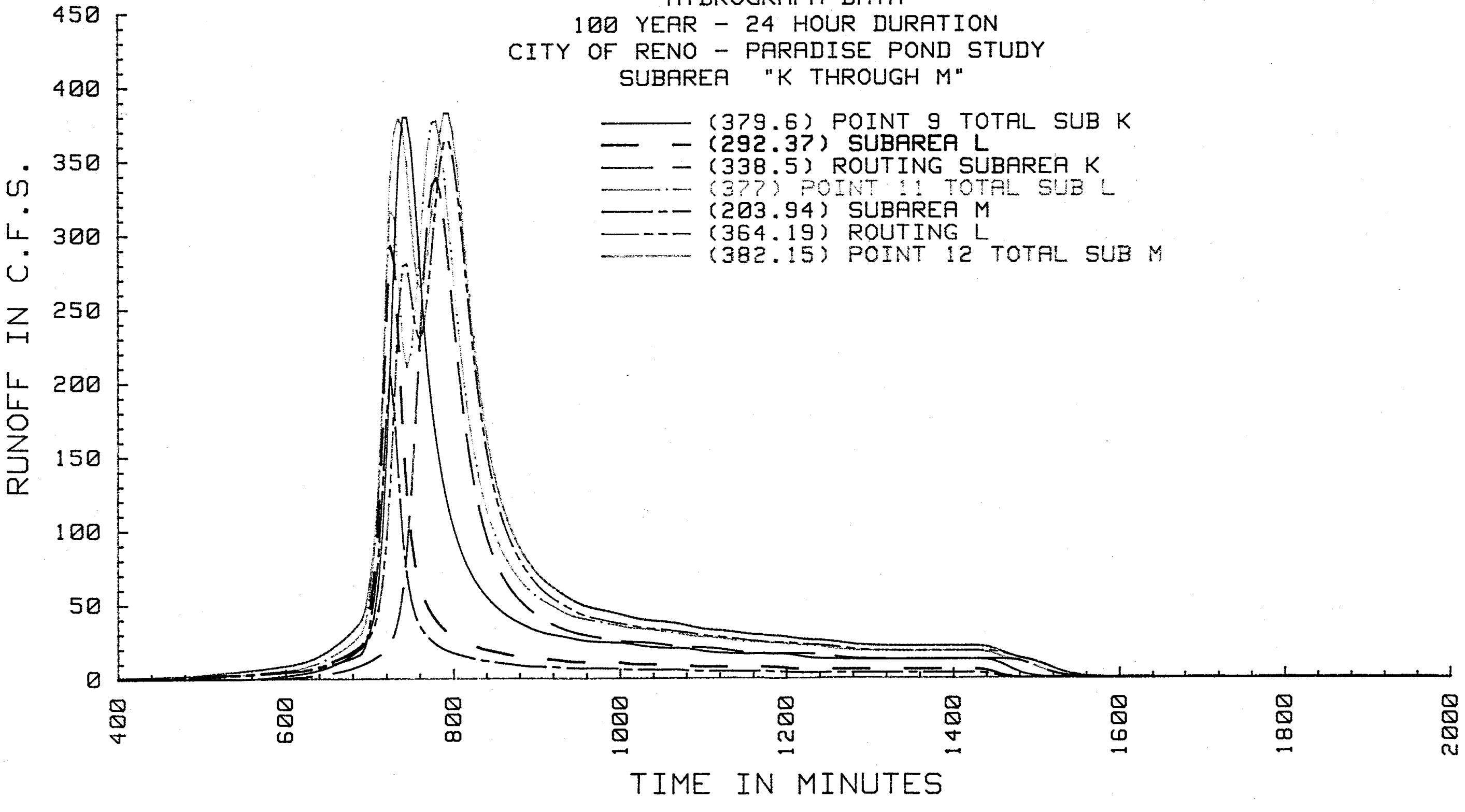


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

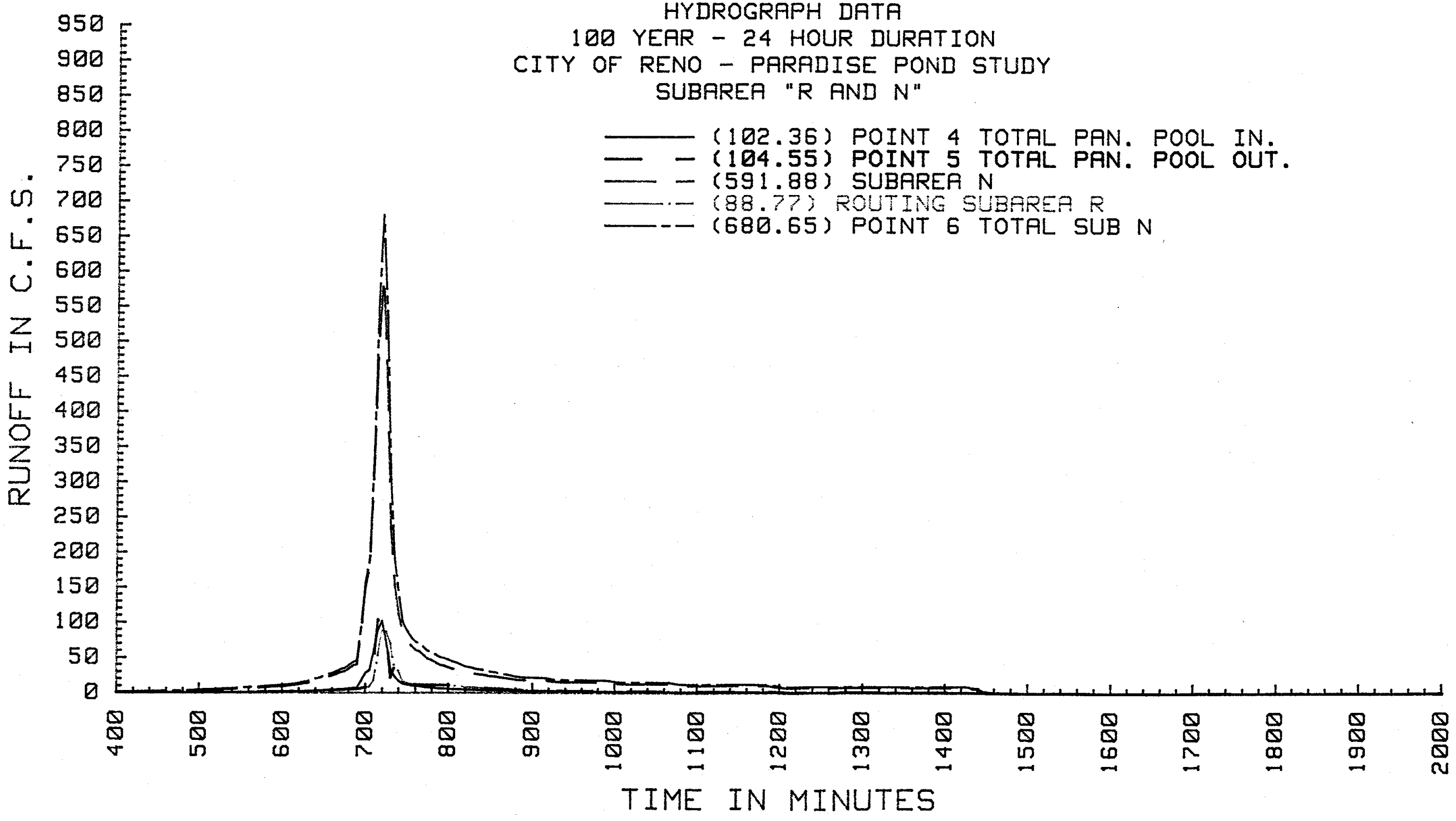
——— (108.98) POINT 5 TOTAL SUB O
— — (155.48) SUBAREA P
— — (39.3) ROUTING SUBAREA I
—·— (161.96) POINT 6 TOTAL SUB P
—-- (47.48) POINT 7 TOTAL SUB Q



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M"

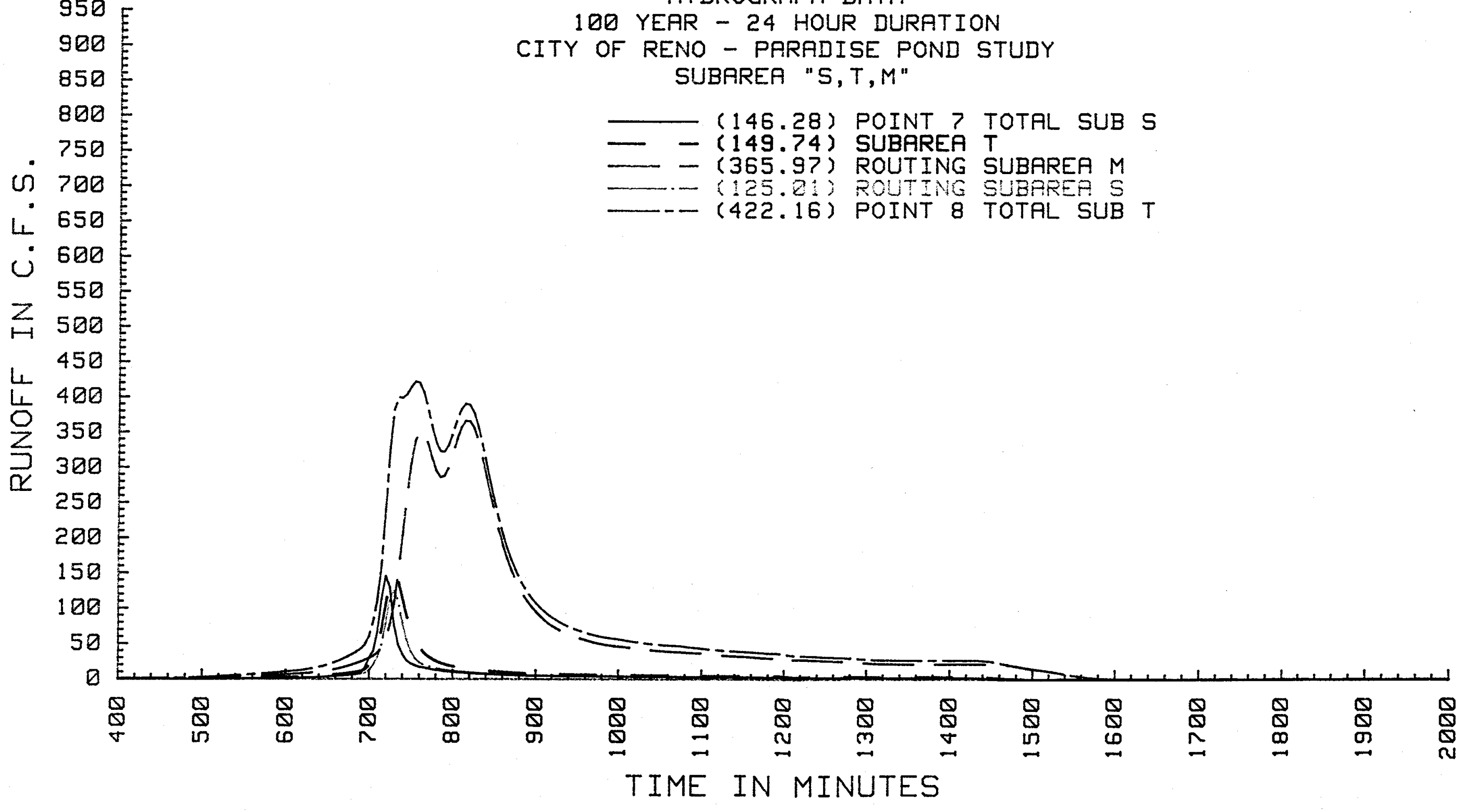


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "R AND N"



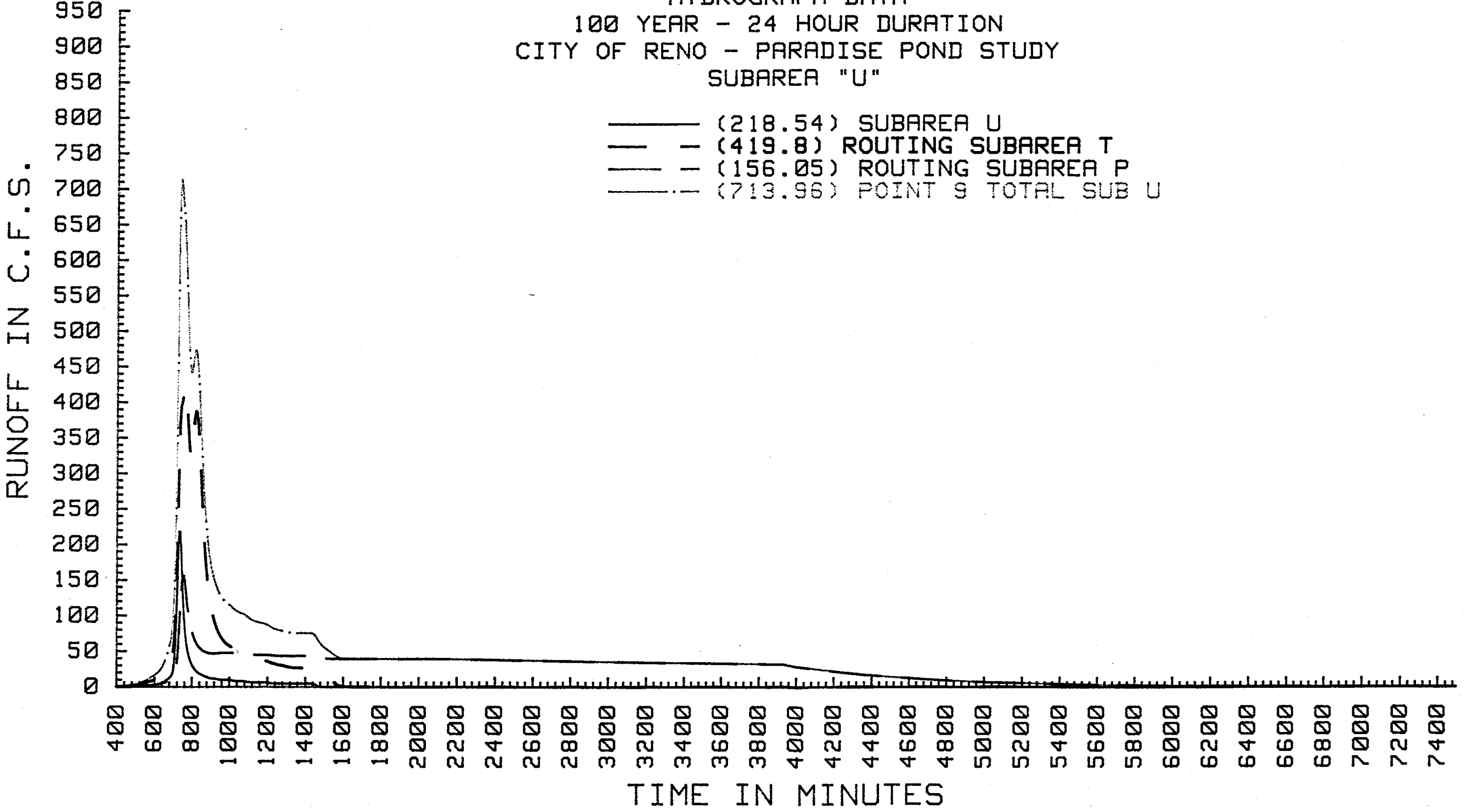
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

——— (146.28) POINT 7 TOTAL SUB S
— — (149.74) SUBAREA T
—— — (365.97) ROUTING SUBAREA M
——·— (125.21) ROUTING SUBAREA S
——-- (422.16) POINT 8 TOTAL SUB T



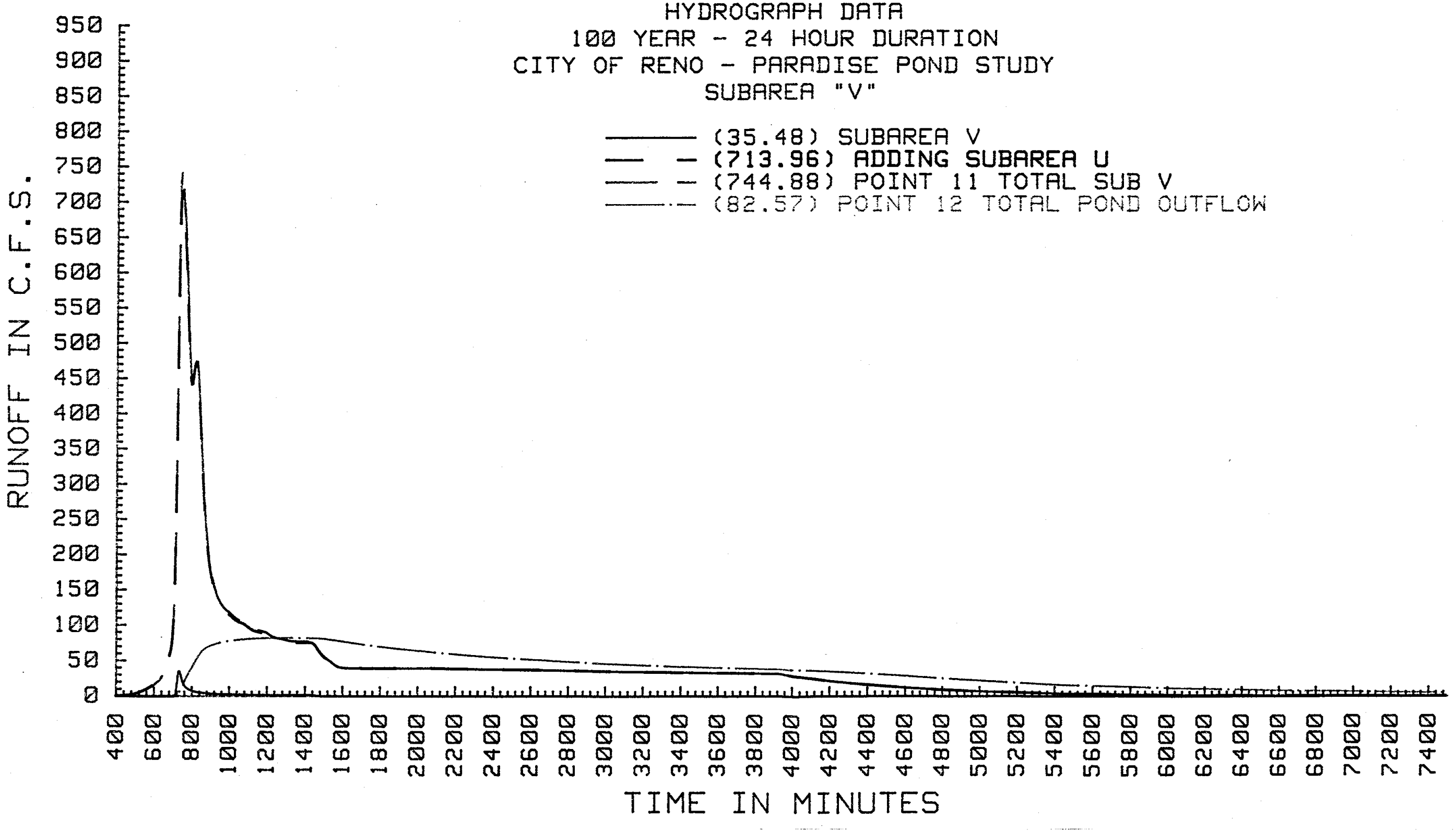
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"

——— (218.54) SUBAREA U
— — (419.8) ROUTING SUBAREA T
— — (156.05) ROUTING SUBAREA P
——·— (713.96) POINT 9 TOTAL SUB U

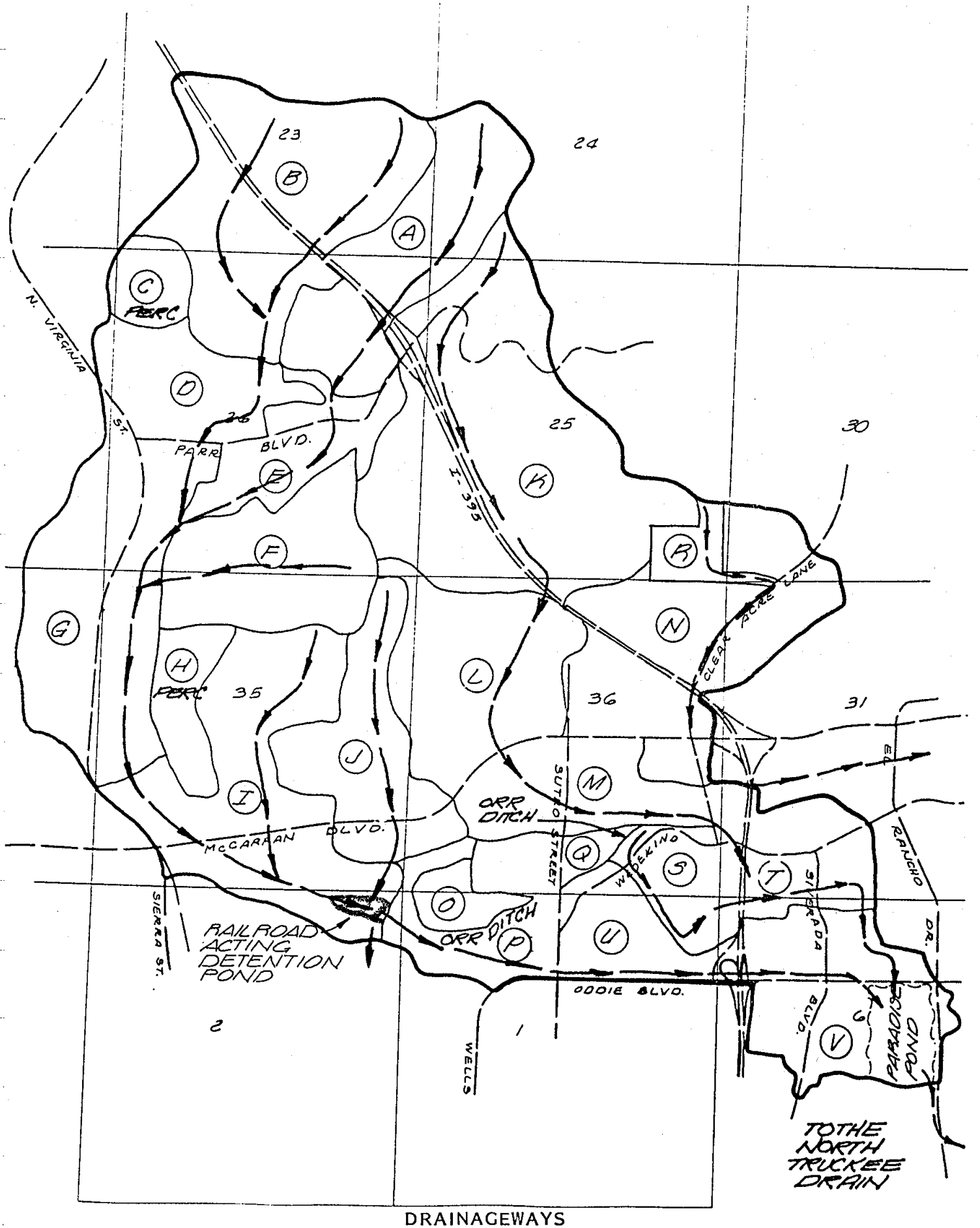


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (35.48) SUBAREA V
— — (713.96) ADDING SUBAREA U
— — (744.88) POINT 11 TOTAL SUB V
—·— (82.57) POINT 12 TOTAL POND OUTFLOW



APPENDIX "C"



DRAINAGEWAYS
For
Condition #2

NOTE:

For Subareas A through T reference tables and graphs in Appendix "B".

TABLE 8

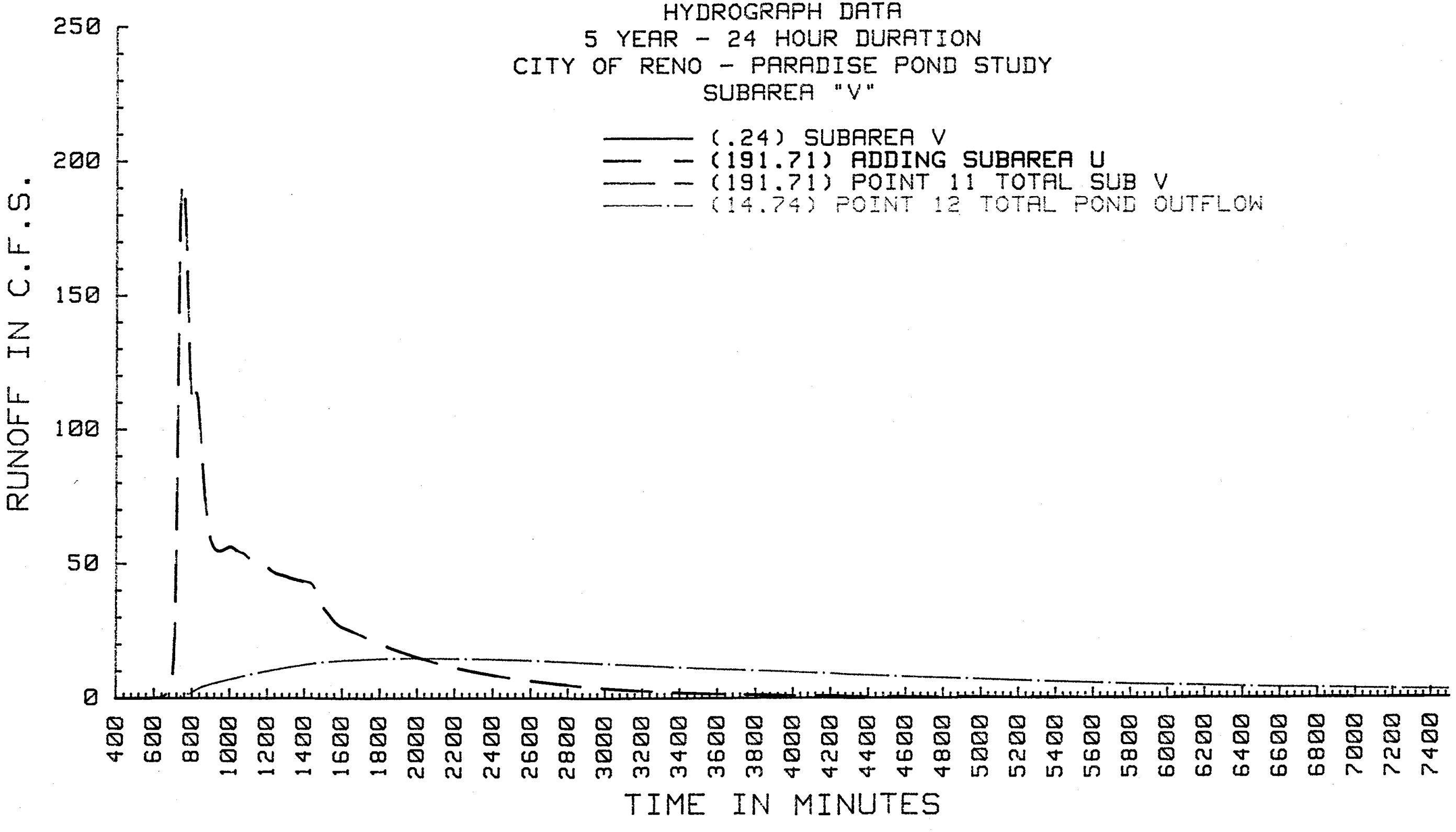
CONDITION NO. 2 WITH 3- and 6-HOUR DURATION STORMS

Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
U	24.61 cfs @ 110 min.	71.13 cfs @ 95 min.	110.03 cfs @ 90 min.	165.73 cfs @ 85 min.
V	24.61 cfs @ 110 min.	71.13 cfs @ 95 min.	110.03 cfs @ 90 min.	165 cfs @ 85 min.
Pond Outflow	0.81 cfs w/8 ac.ft.	3.80 cfs w/25 ac.ft.	7.06 cfs w/37 ac.ft.	11.54 cfs w/55 ac.ft.
Pond Overflow	0	0	0	0
W	0	1.45 cfs @ 160 min.	3.31 cfs @ 135 min.	6.57 cfs @ 120 min.
X	0.81 cfs @ 1640 min.	3.80 cfs @ 1390 min.	7.06 cfs @ 1280 min.	11.54 cfs @ 1245 min.
North Truckee Ditch	0.81 cfs @ 1640 min.	3.80 cfs @ 1400 min.	7.06 cfs @ 1290 min.	11.54 cfs @ 1255 min.

Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
U	39.04 cfs @ 200 min.	98.93 cfs @ 190 min.	141.74 cfs @ 185 min.	237.80 cfs @ 185 min.
V	39.04 cfs @ 200 min.	98.93 cfs @ 190 min.	141.74 cfs @ 185 min.	238.00 cfs @ 185 min.
Pond Outflow	2.28 cfs w/19 ac.ft.	8.11 cfs w/41 ac.ft.	12.00 cfs w/56.5 ac.ft.	17.24 cfs w/89 ac.ft.
Pond Overflow	0	0	0	0
W	0.62 cfs @ 370 min.	2.48 cfs @ 285 min.	4.22 cfs @ 245 min.	10.25 cfs @ 195 min.
X	2.28 cfs @ 1680 min.	8.11 cfs @ 1400 min.	12.00 cfs @ 1385 min.	18.66 cfs @ 365 min.
North Truckee Ditch	2.28 cfs @ 1690 min.	8.11 cfs @ 1410 min.	12.00 cfs @ 1395 min.	18.56 cfs @ 375 min.

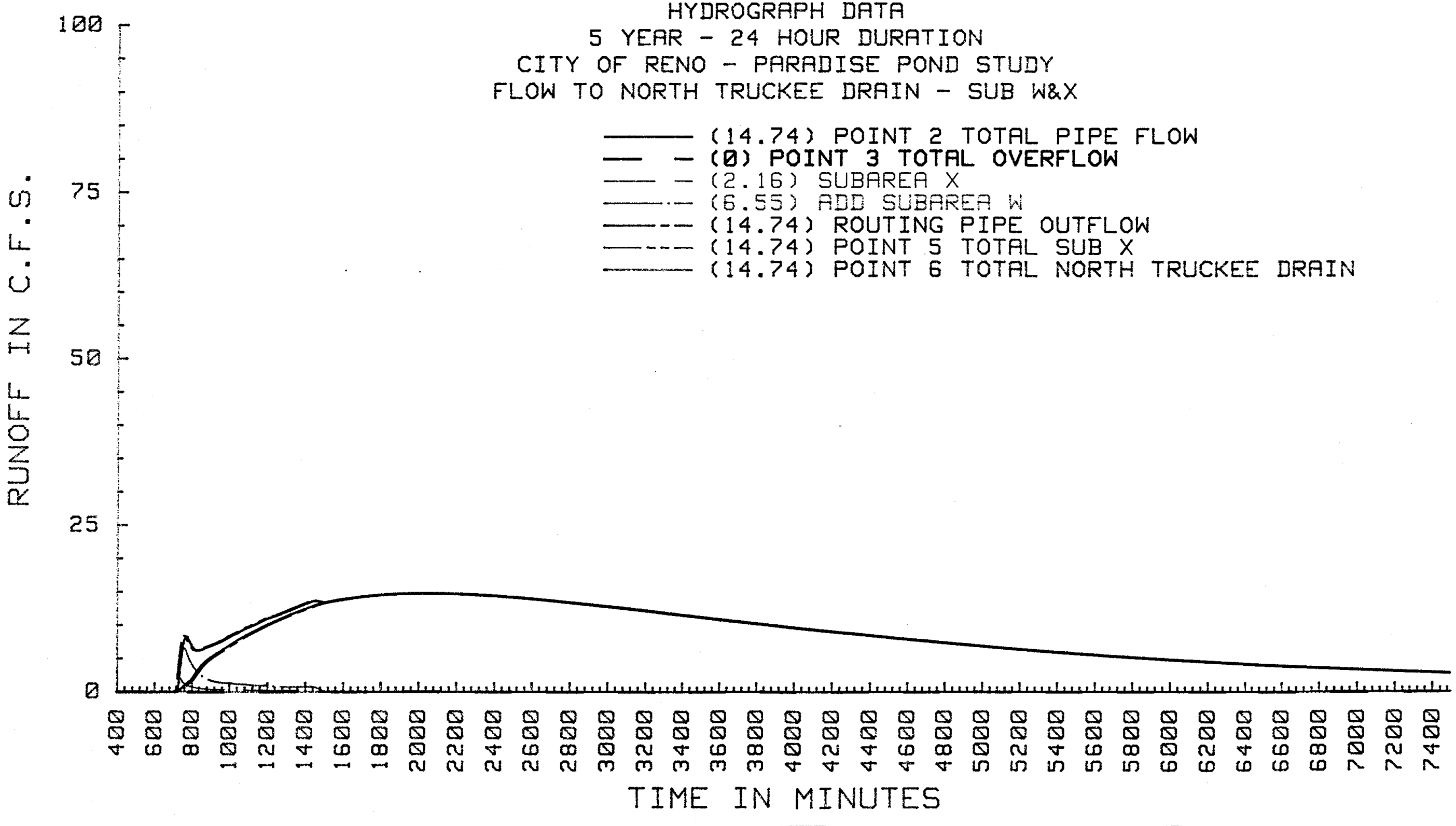
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (.24) SUBAREA V
— — (191.71) ADDING SUBAREA U
— — (191.71) POINT 11 TOTAL SUB V
—·— (14.74) POINT 12 TOTAL POND OUTFLOW



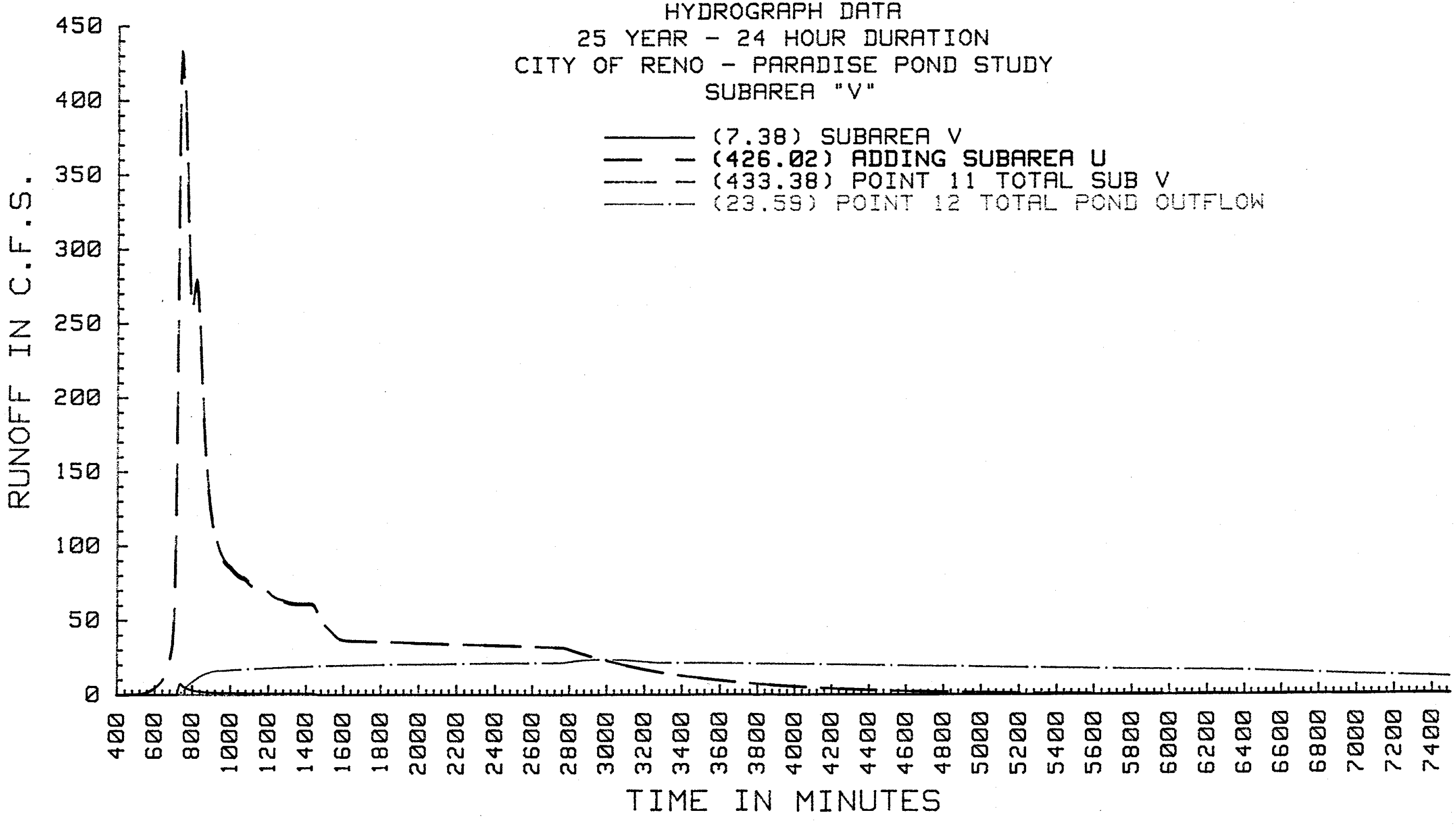
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FLOW TO NORTH TRUCKEE DRAIN - SUB W&X

——— (14.74) POINT 2 TOTAL PIPE FLOW
— — (0) POINT 3 TOTAL OVERFLOW
—— — (2.16) SUBAREA X
——·— (6.55) ADD SUBAREA W
——-- (14.74) ROUTING PIPE OUTFLOW
——--- (14.74) POINT 5 TOTAL SUB X
——— (14.74) POINT 6 TOTAL NORTH TRUCKEE DRAIN

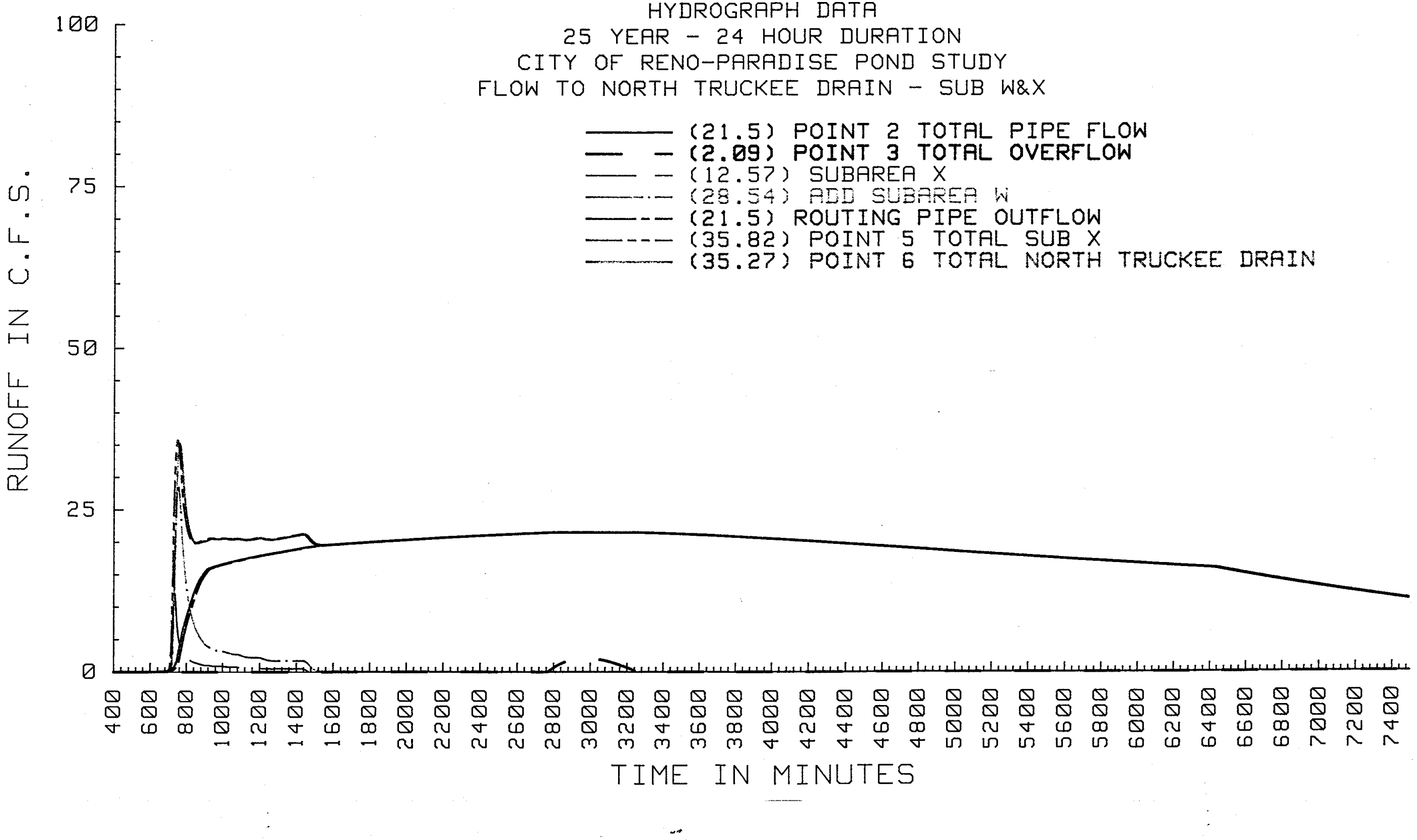


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (7.38) SUBAREA V
— — **(426.02) ADDING SUBAREA U**
— — (433.38) POINT 11 TOTAL SUB V
—·— (23.59) POINT 12 TOTAL POND OUTFLOW

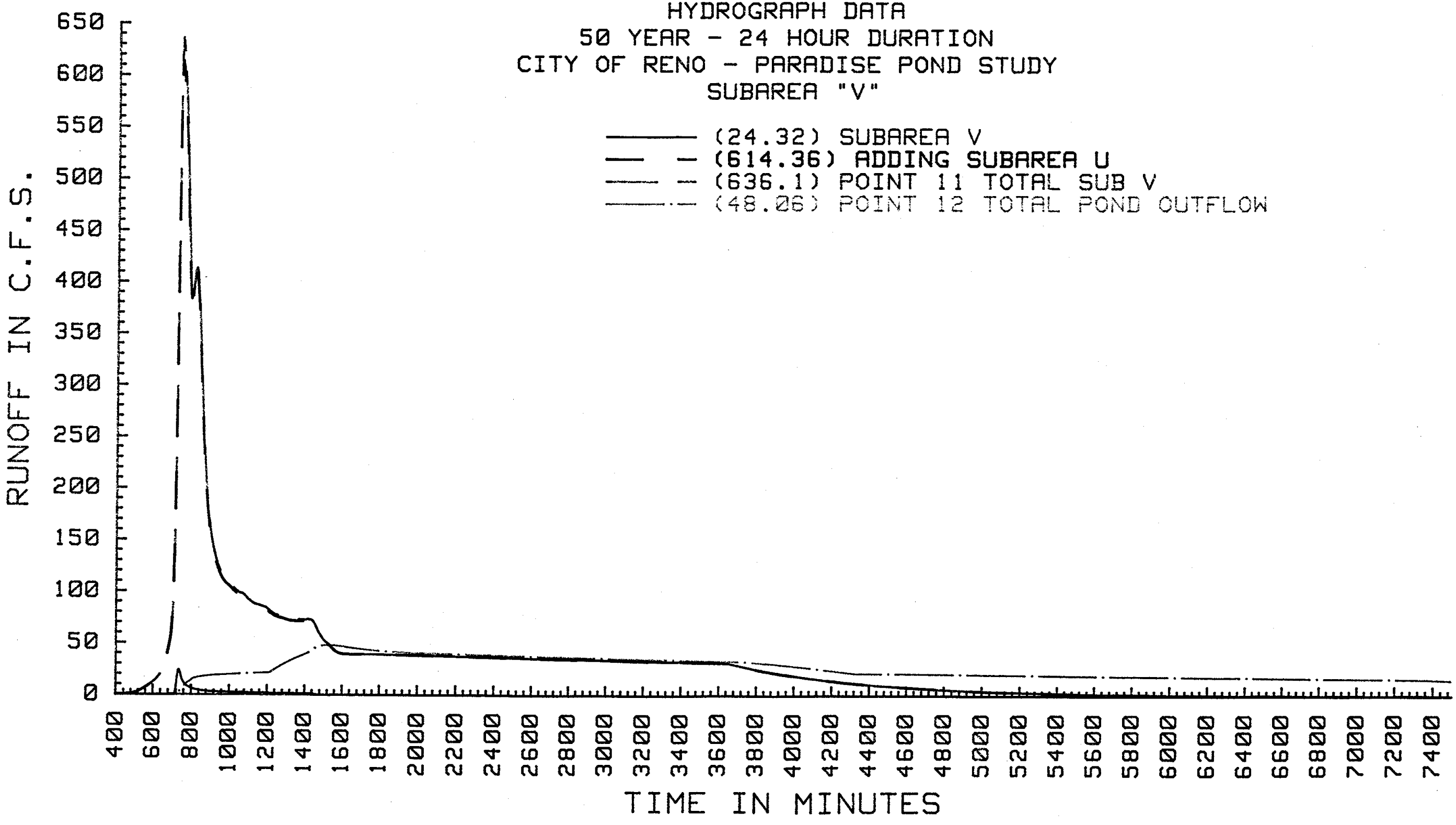


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO-PARADISE POND STUDY
FLOW TO NORTH TRUCKEE DRAIN - SUB W&X

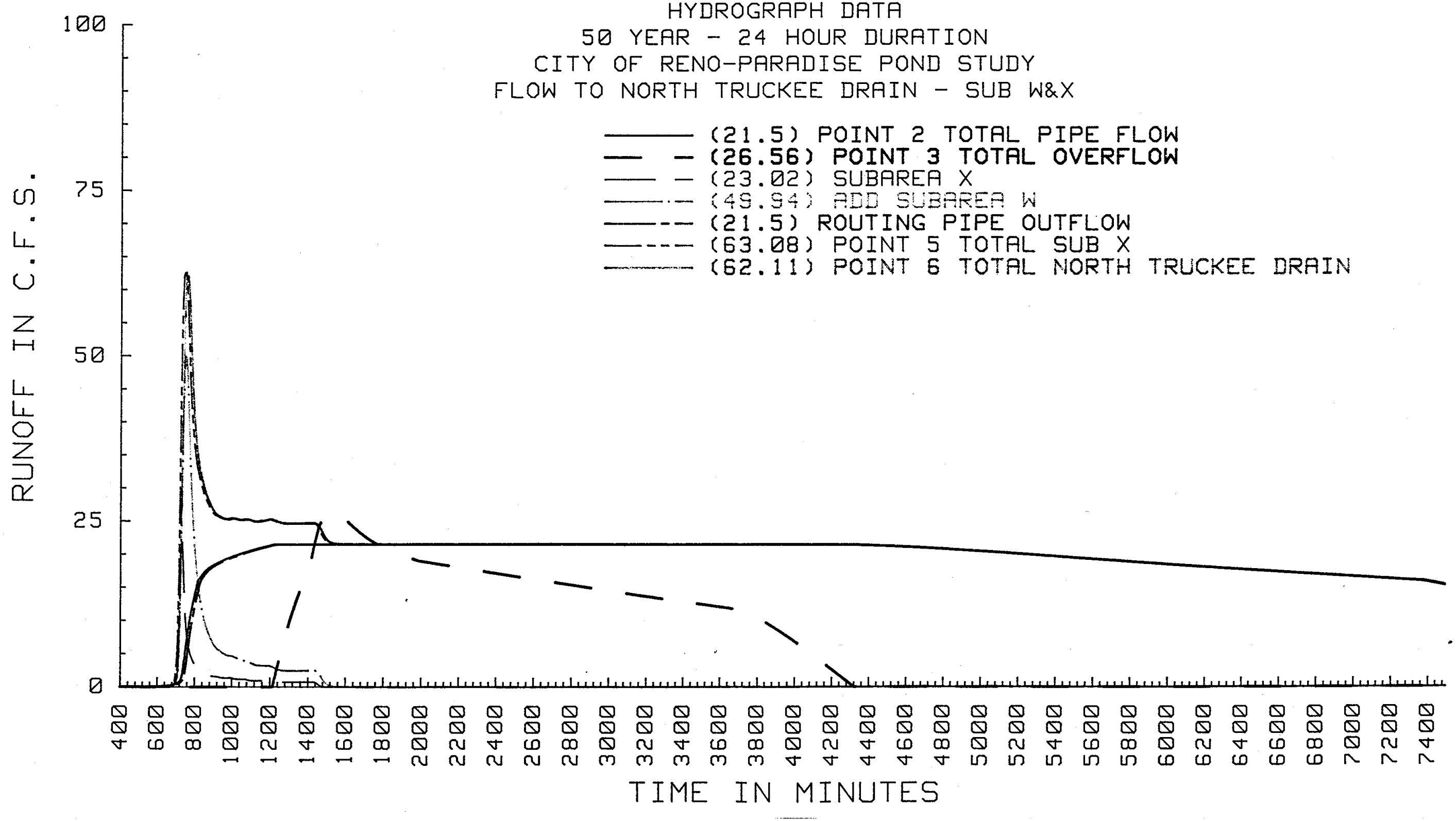


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (24.32) SUBAREA V
— — (614.36) ADDING SUBAREA U
— — (636.1) POINT 11 TOTAL SUB V
———·— (48.06) POINT 12 TOTAL POND OUTFLOW

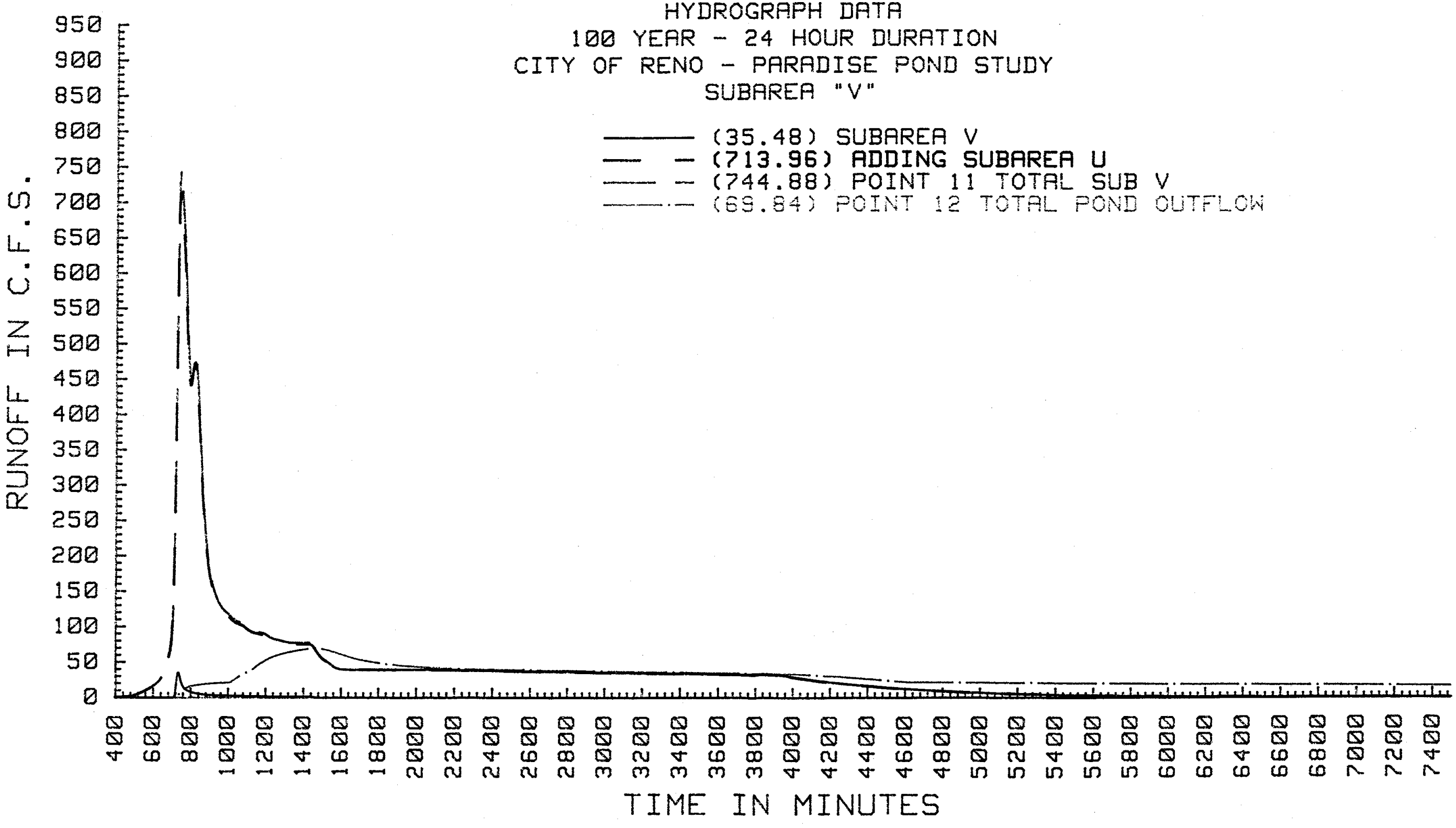


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO-PARADISE POND STUDY
FLOW TO NORTH TRUCKEE DRAIN - SUB W&X



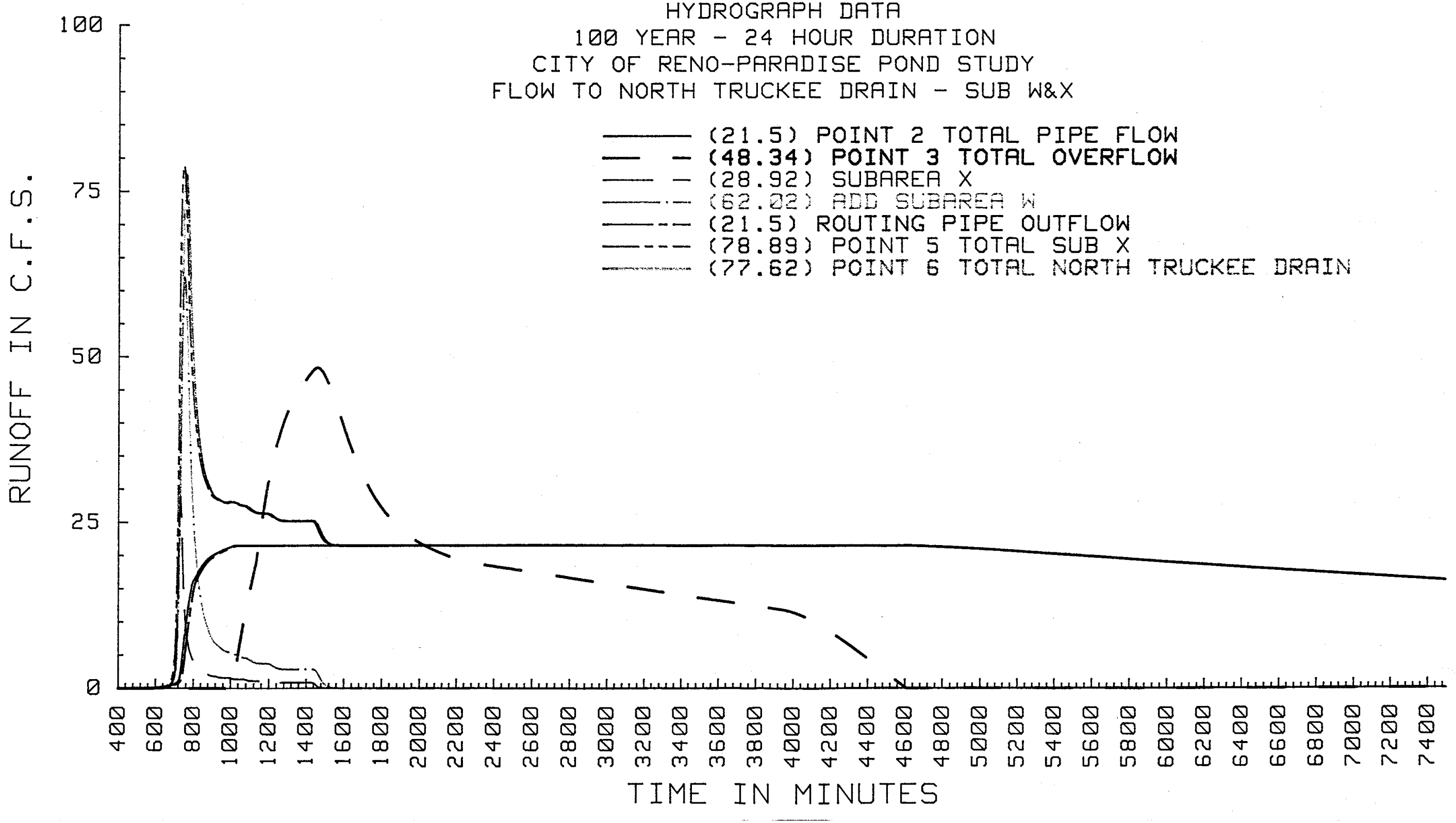
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (35.48) SUBAREA V
— — (713.96) ADDING SUBAREA U
—— — (744.88) POINT 11 TOTAL SUB V
——·— (69.84) POINT 12 TOTAL POND OUTFLOW

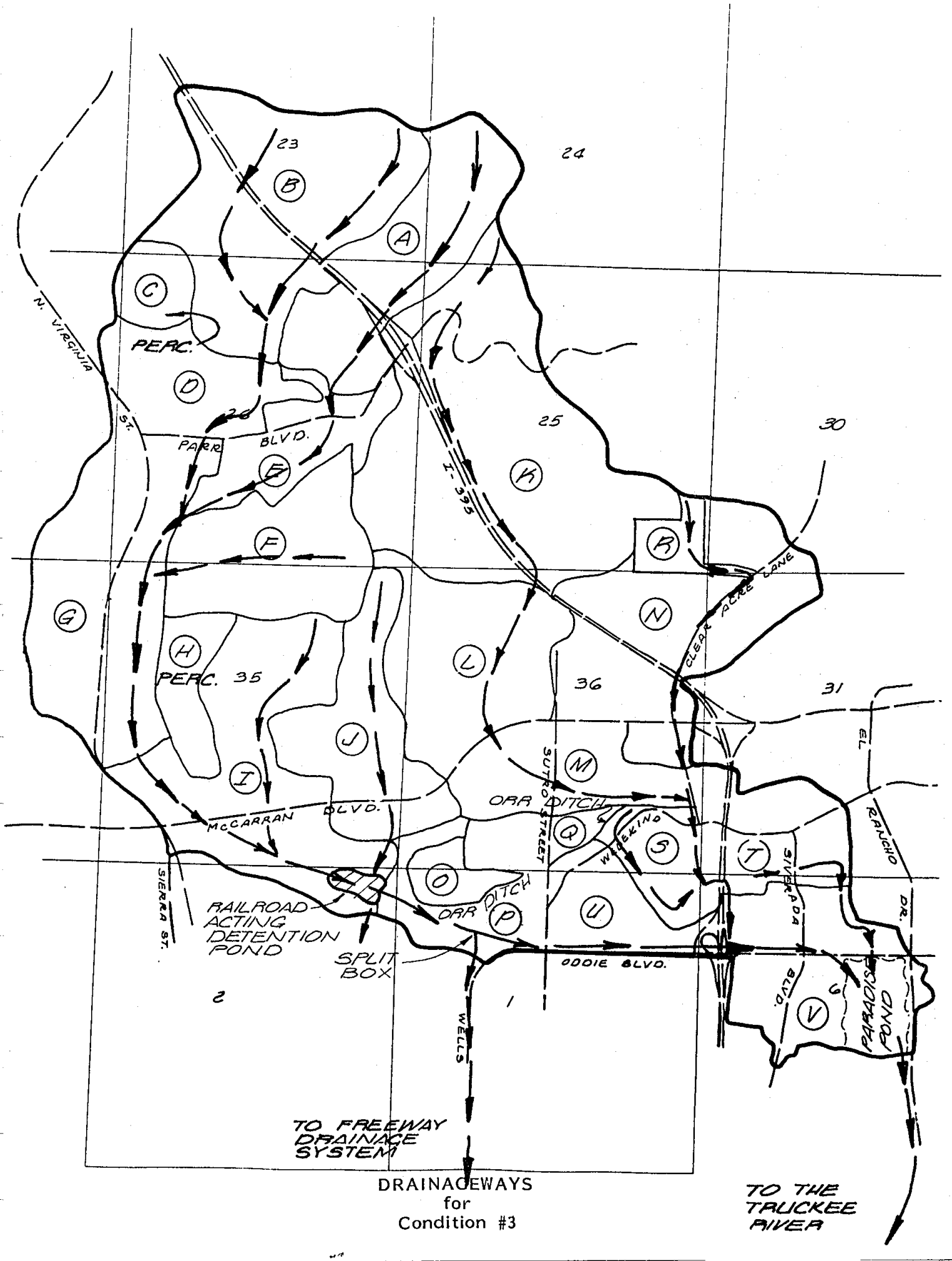


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO-PARADISE POND STUDY
FLOW TO NORTH TRUCKEE DRAIN - SUB W&X

——— (21.5) POINT 2 TOTAL PIPE FLOW
— — (48.34) POINT 3 TOTAL OVERFLOW
— — (28.92) SUBAREA X
—·— (62.02) ADD SUBAREA W
—-- (21.5) ROUTING PIPE OUTFLOW
—--- (78.89) POINT 5 TOTAL SUB X
——— (77.62) POINT 6 TOTAL NORTH TRUCKEE DRAIN



APPENDIX "D"



DRAINAGEWAYS
for
Condition #3

NOTE:

For Subareas A through J, K through N, and R reference tables and graphs in Appendix "B".

TABLE 9

CONDITION NO. 3 WITH 3- AND 6-HOUR DURATION STORMS

Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
Split Box	4.49 cfs @ 405 min.	14.85 cfs @ 395 min.	23.56 cfs @ 390 min.	31.99 cfs @ 390 min.
Freeway	4.49 cfs @ 405 min.	14.85 cfs @ 395 min.	23.56 cfs @ 390 min.	31.99 cfs @ 390 min.
O	2.00 cfs @ 50 min.	6.40 cfs @ 30 min.	10.77 cfs @ 30 min.	16.86 cfs @ 30 min.
P	4.36 cfs @ 105 min.	12.81 cfs @ 80 min.	20.21 cfs @ 75 min.	31.16 cfs @ 70 min.
Q	0.91 cfs @ 55 min.	2.85 cfs @ 35 min.	4.64 cfs @ 35 min.	7.19 cfs @ 30 min.
S	28.05 cfs @ 75 min.	77.51 cfs @ 55 min.	116.99 cfs @ 50 min.	173.60 cfs @ 50 min.
T	3.29 cfs @ 85 min.	10.27 cfs @ 60 min.	16.47 cfs @ 55 min.	25.56 cfs @ 55 min.
U	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.11 cfs @ 60 min.	253.90 cfs @ 60 min.
V	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.11 cfs @ 60 min.	253.90 cfs @ 60 min.
One 30-inch pipe outlet:				
	0.71 cfs @ 85 min. w/7.1 ac.ft.	2.68 cfs @ 65 min. w/20.4 ac.ft.	5.47 cfs @ 60 min. w/31 ac.ft.	9.35 cfs @ 60 min. w/45.8 ac.ft.

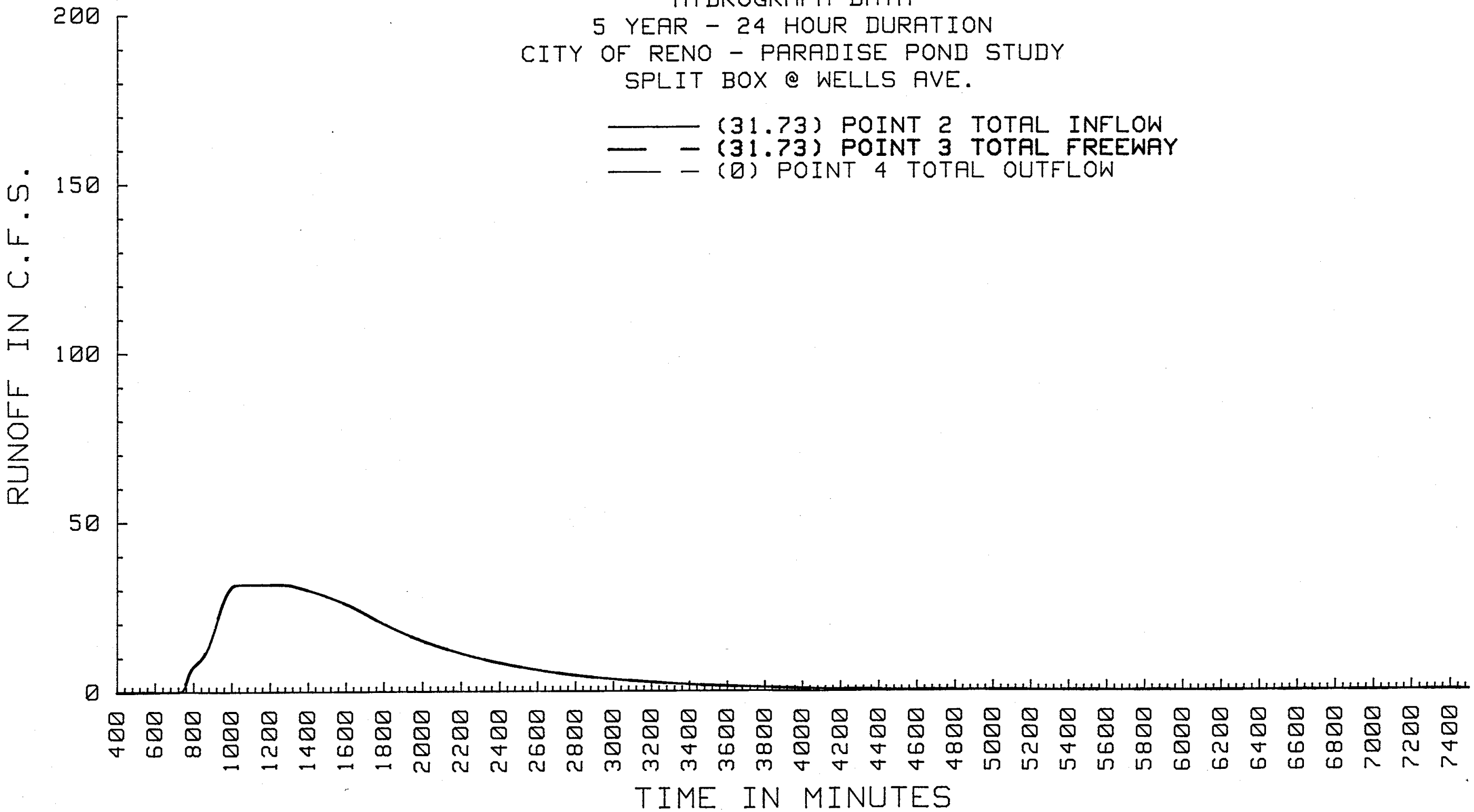
TABLE 9 - (con't)

CONDITION NO. 3 WITH 3- AND 6-HOUR DURATION STORMS

Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
Split Box	10.39 cfs @ 570 min.	25.08 cfs @ 560 min.	31.94 cfs @ 560 min.	34.20 cfs @ 580 min.
Freeway	10.39 cfs @ 570 min.	25.08 cfs @ 560 min.	31.94 cfs @ 560 min.	34.20 cfs @ 580 min.
O	5.15 cfs @ 150 min.	12.08 cfs @ 150 min.	16.96 cfs @ 145 min.	27.45 cfs @ 145 min.
P	7.28 cfs @ 185 min.	19.80 cfs @ 175 min.	29.04 cfs @ 175 min.	49.42 cfs @ 175 min.
Q	2.23 cfs @ 150 min.	5.48 cfs @ 150 min.	7.63 cfs @ 150 min.	12.16 cfs @ 150 min.
S	54.18 cfs @ 155 min.	129.91 cfs @ 150 min.	183.30 cfs @ 150 min.	301.32 cfs @ 150 min.
T	6.30 cfs @ 165 min.	17.52 cfs @ 165 min.	25.68 cfs @ 160 min.	43.91 cfs @ 160 min.
U	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.33 cfs @ 160 min.	415.65 cfs @ 160 min.
V	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.33 cfs @ 160 min.	415.65 cfs @ 160 min.
Paradise Pond Outlet One 30-inch pipe:				
	1.54 cfs @ 170 min. w/15.3ac.ft.	6.28 cfs @ 160 min. w/34.0ac.ft.	9.60 cfs @ 160 min. w/46.8ac.ft.	16.13 cfs @ 160 min. w/75.0ac.ft.

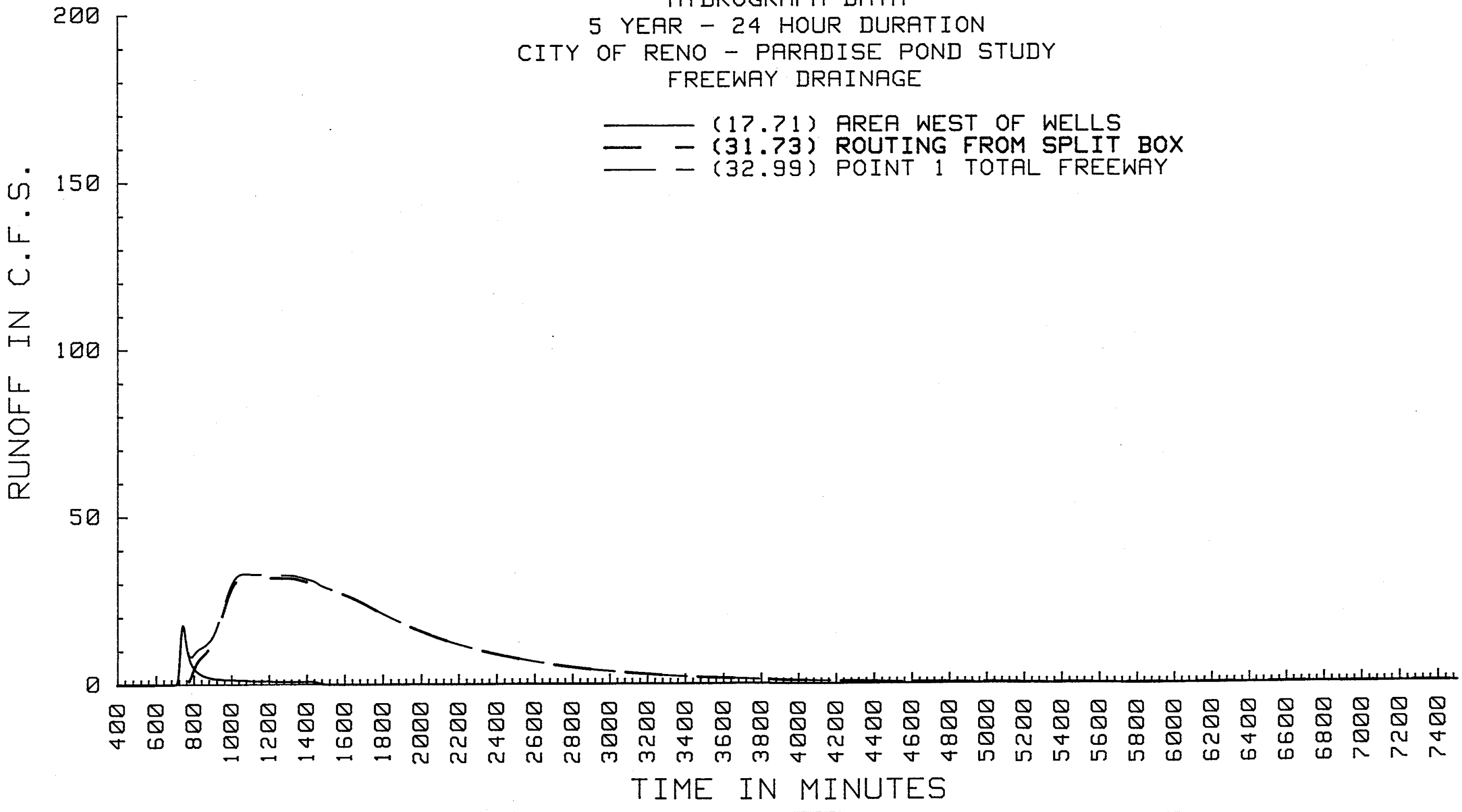
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (31.73) POINT 2 TOTAL INFLOW
— — (31.73) POINT 3 TOTAL FREEWAY
—— — (0) POINT 4 TOTAL OUTFLOW



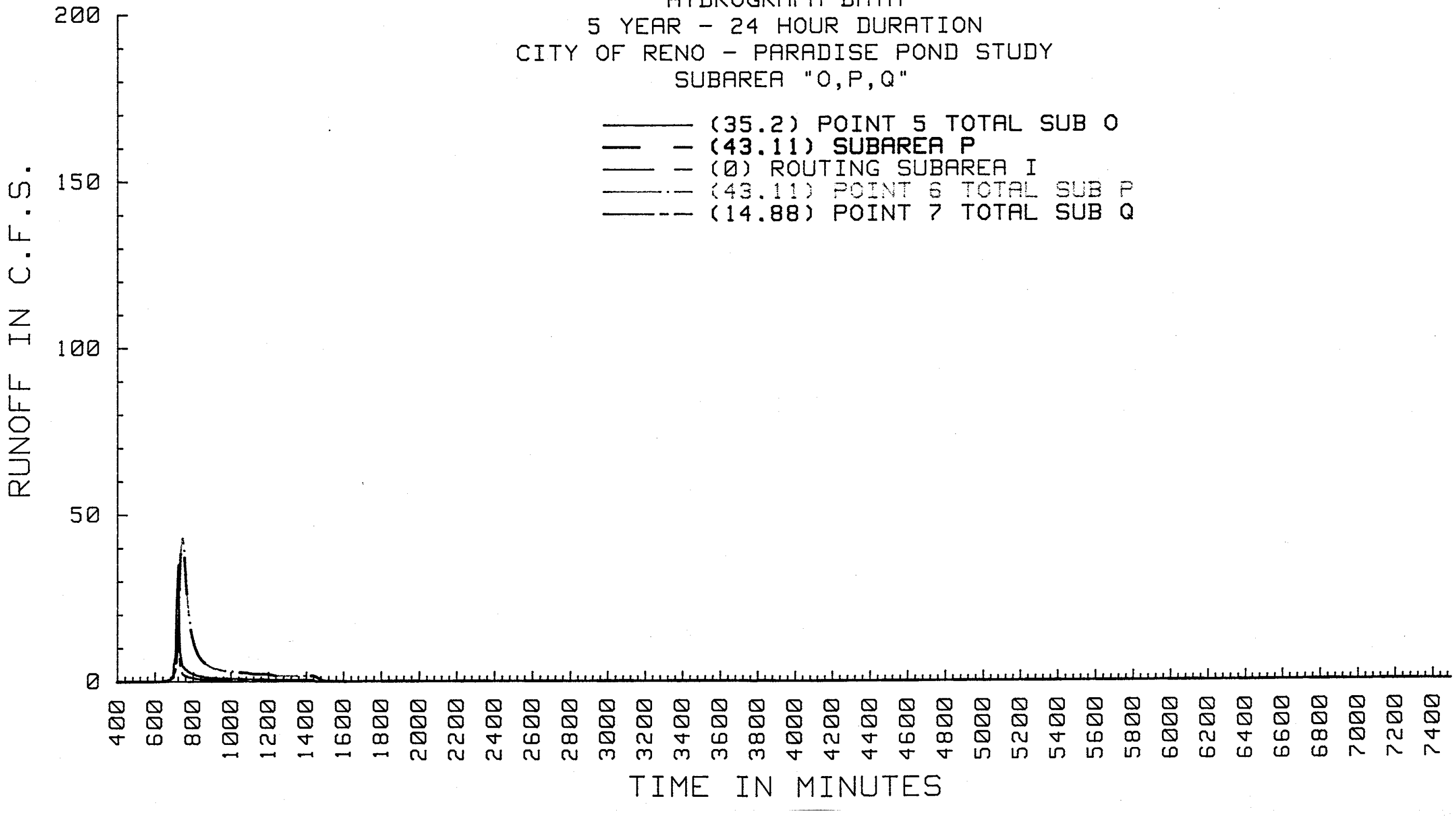
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (17.71) AREA WEST OF WELLS
— — (31.73) ROUTING FROM SPLIT BOX
—— — (32.99) POINT 1 TOTAL FREEWAY

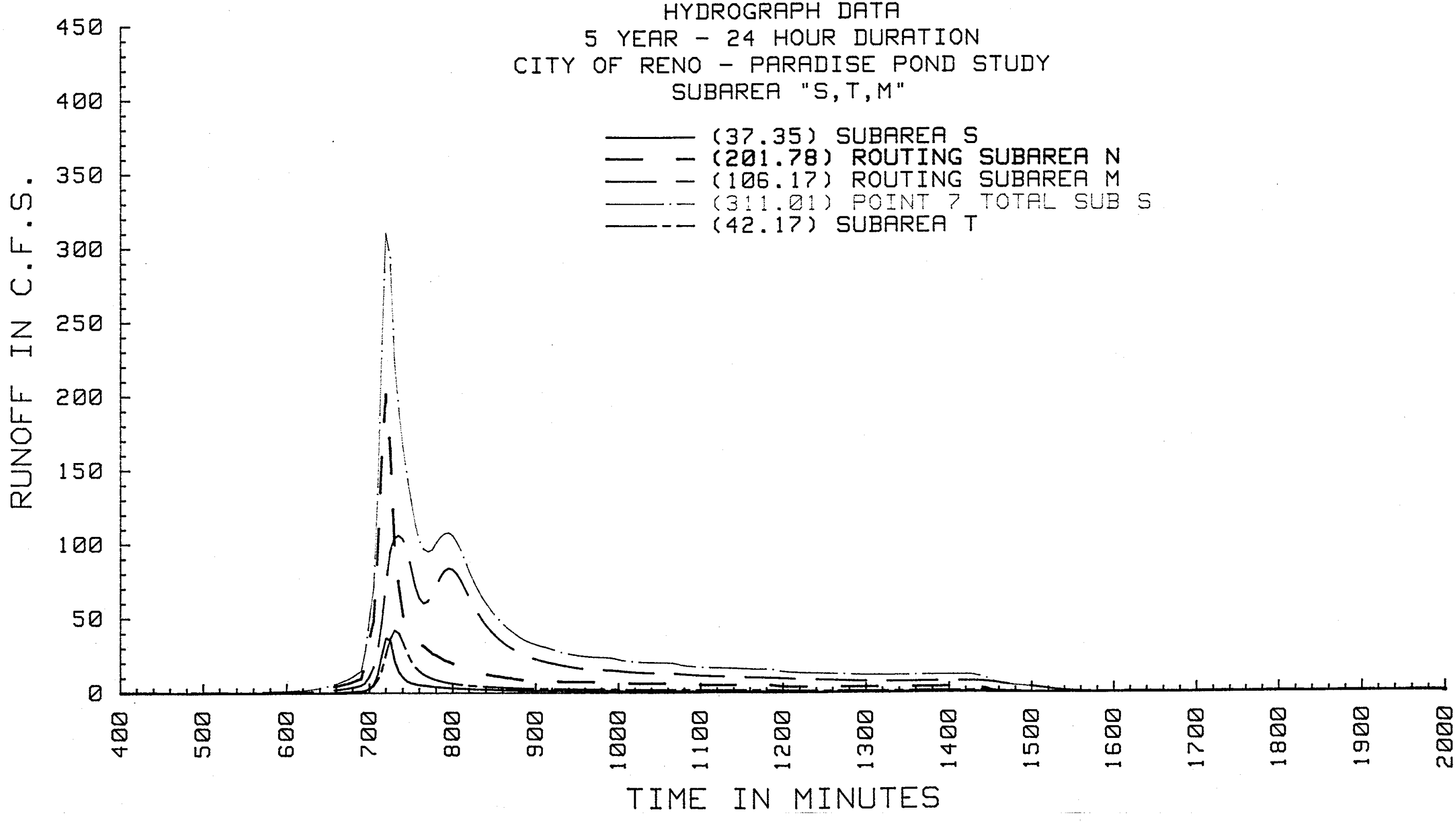


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

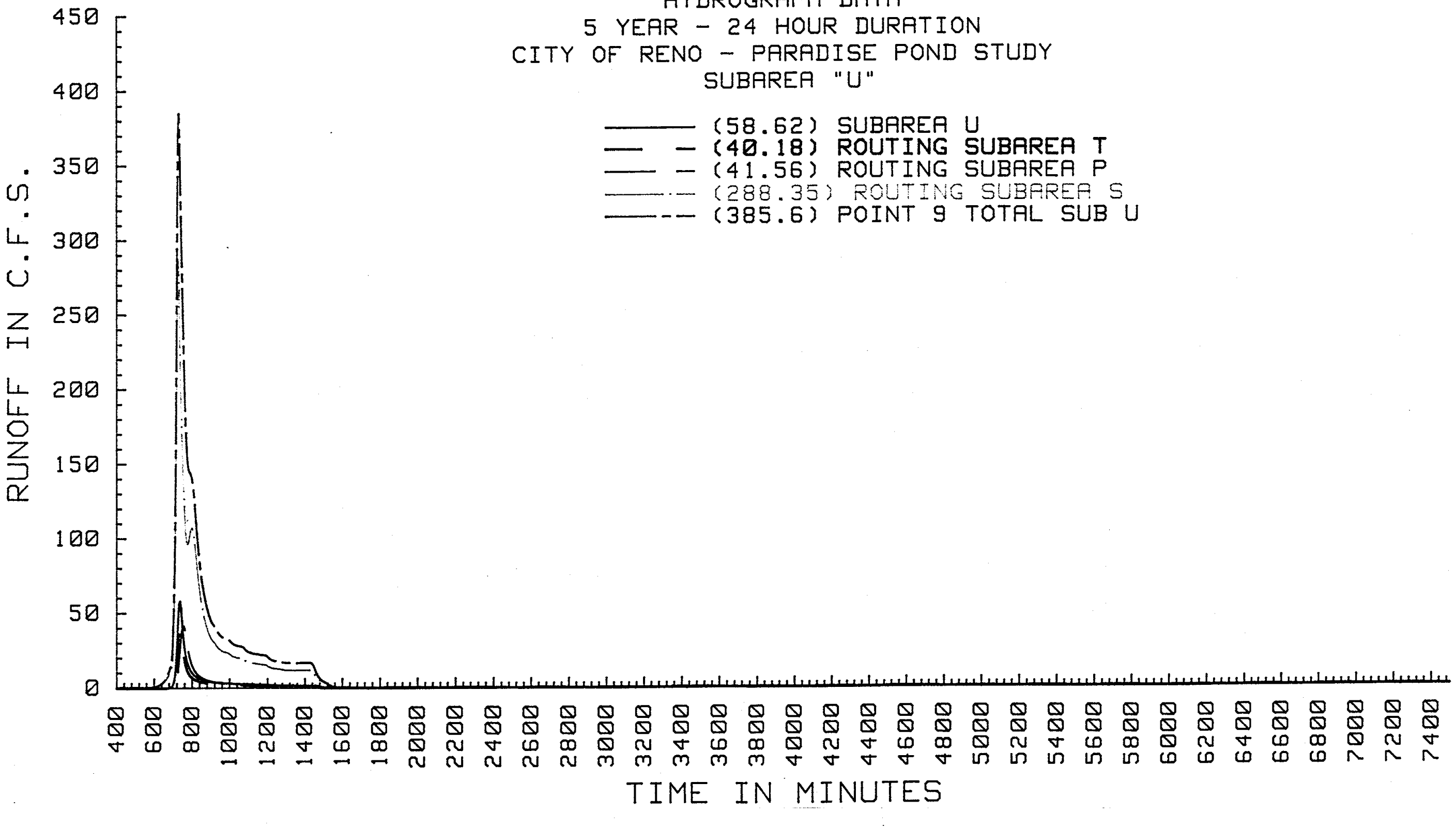
——— (35.2) POINT 5 TOTAL SUB O
— — (43.11) SUBAREA P
— — (0) ROUTING SUBAREA I
—·— (43.11) POINT 6 TOTAL SUB P
——-— (14.88) POINT 7 TOTAL SUB Q



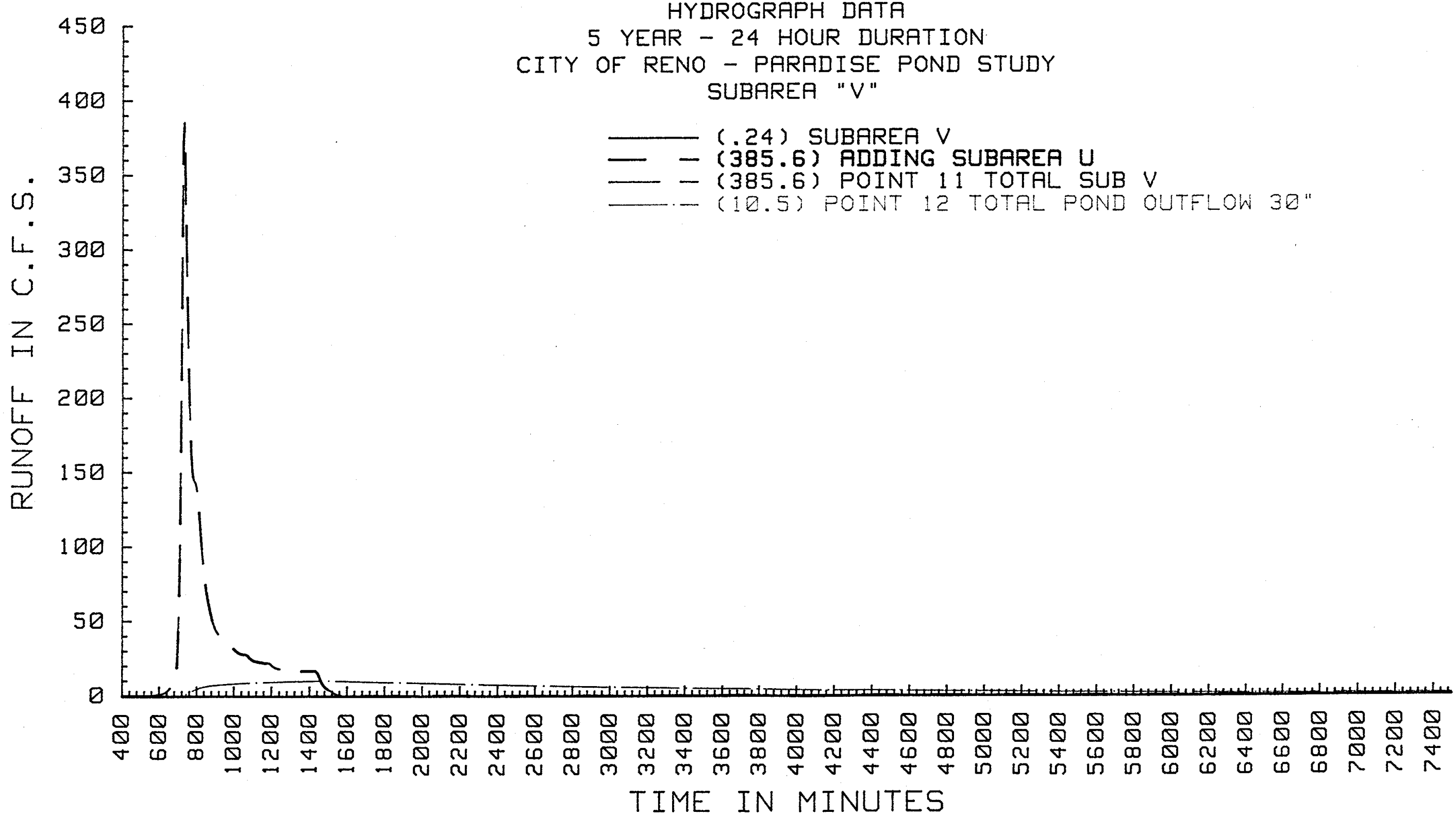
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"

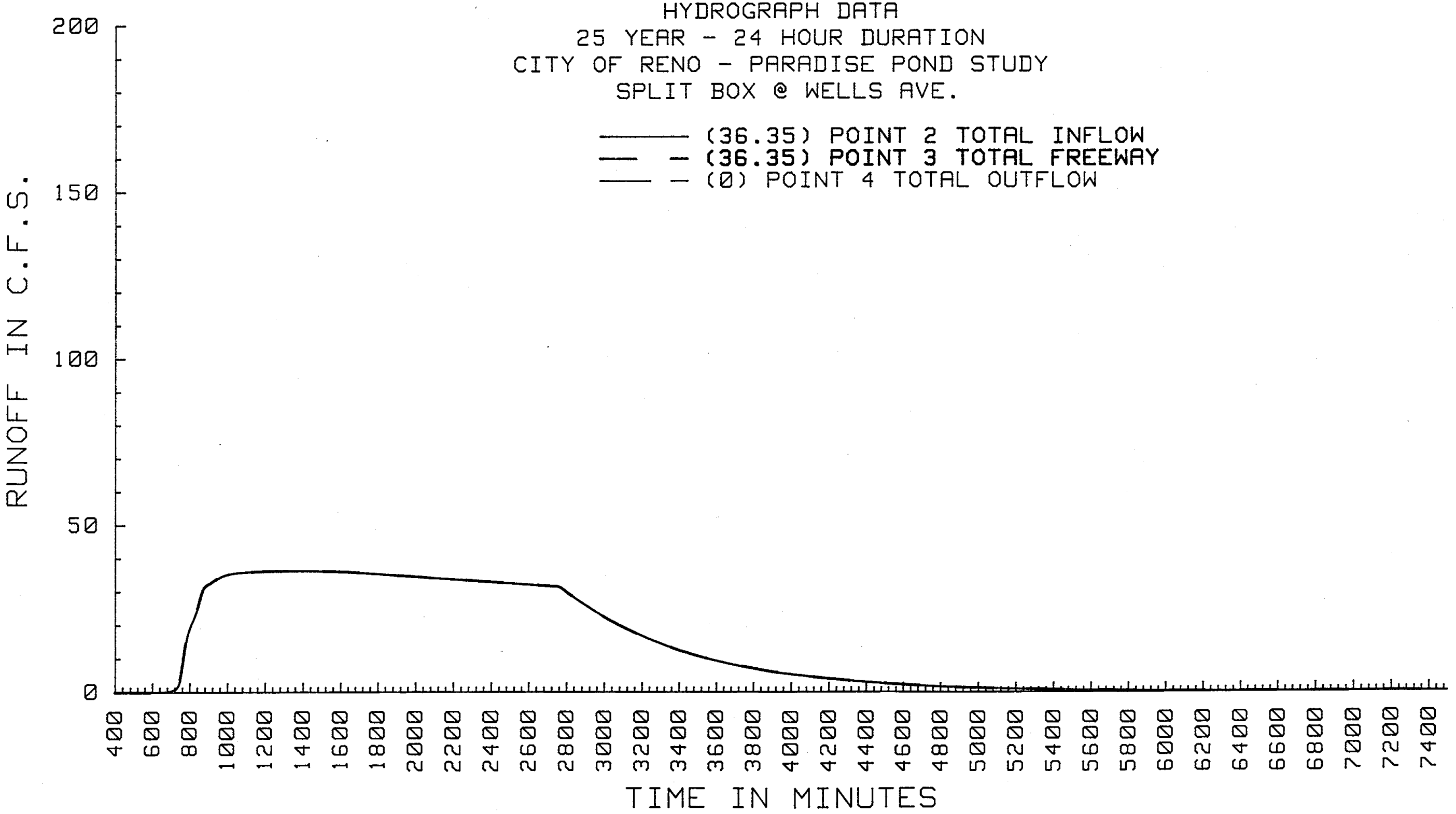


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



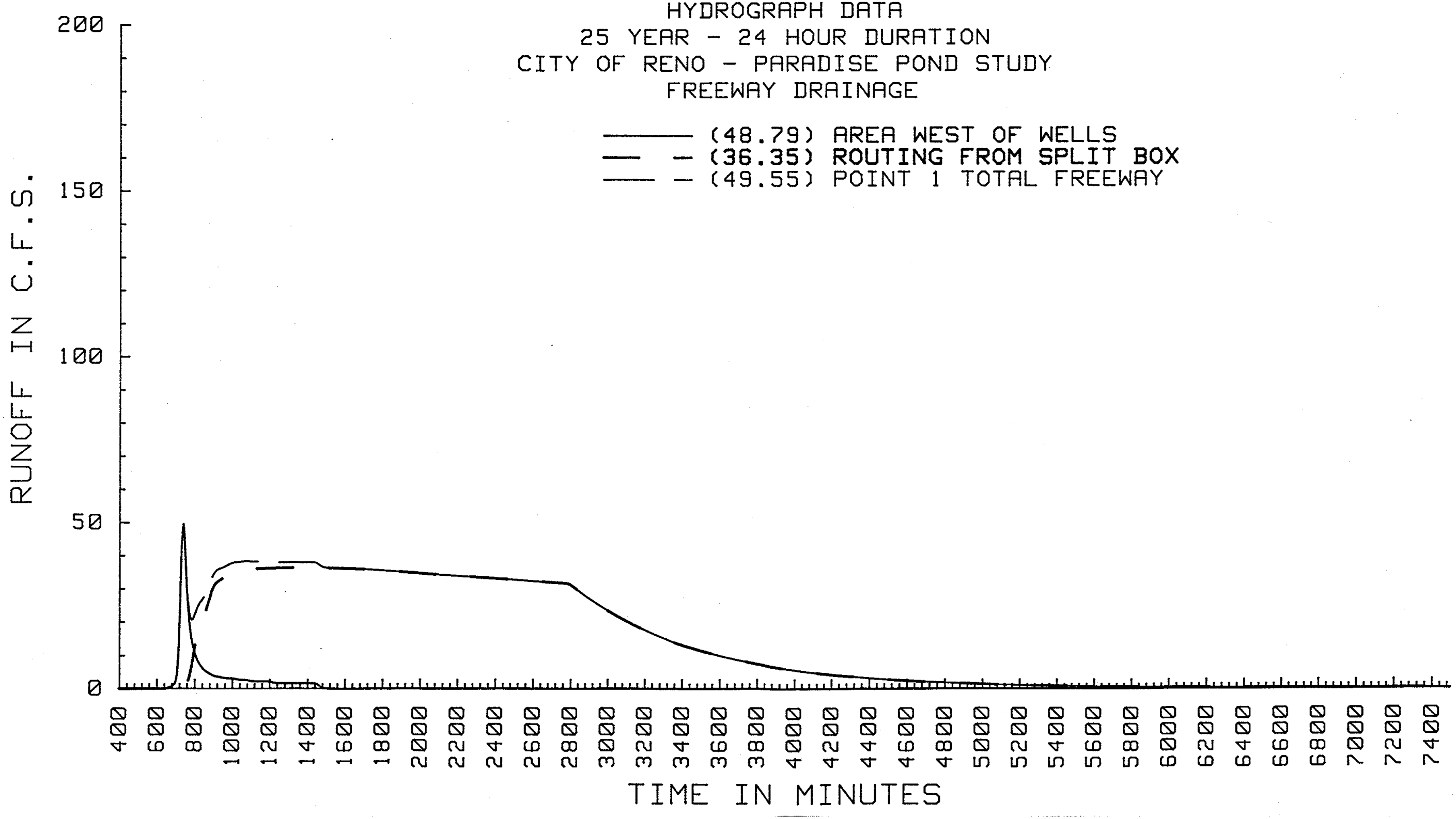
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (36.35) POINT 2 TOTAL INFLOW
— — (36.35) POINT 3 TOTAL FREEWAY
—— — (0) POINT 4 TOTAL OUTFLOW



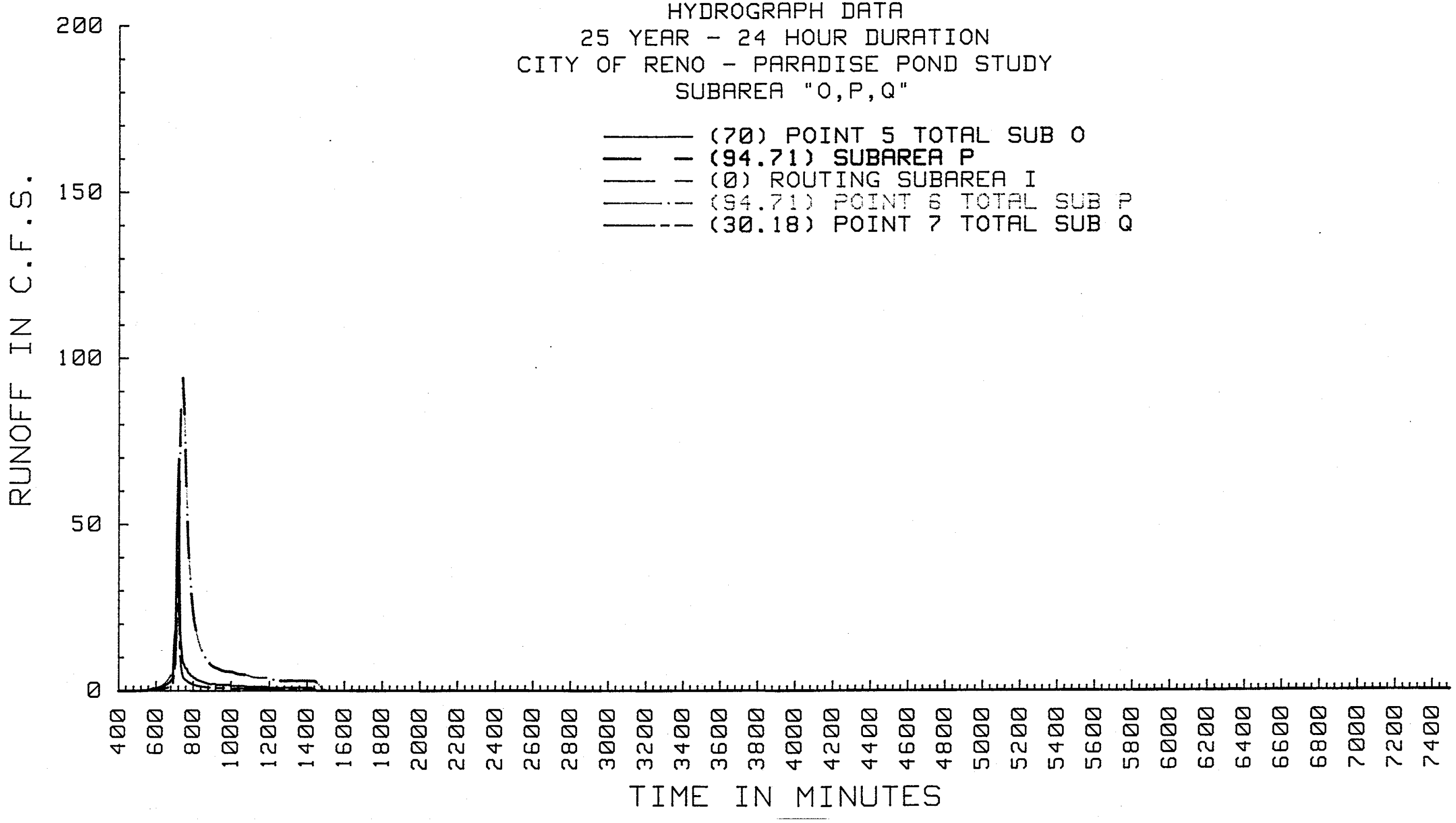
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (48.79) AREA WEST OF WELLS
— — (36.35) ROUTING FROM SPLIT BOX
—— — (49.55) POINT 1 TOTAL FREEWAY

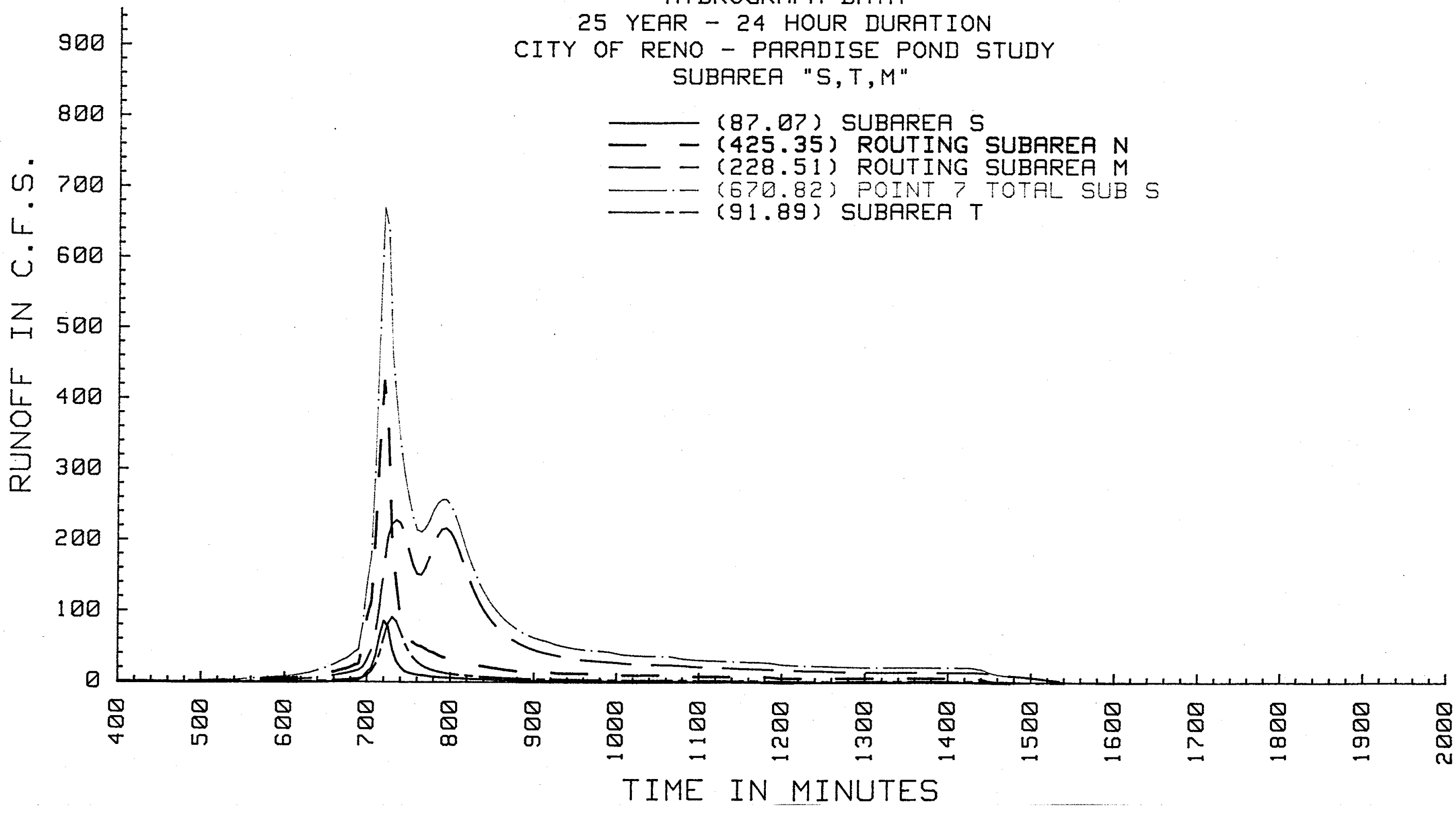


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

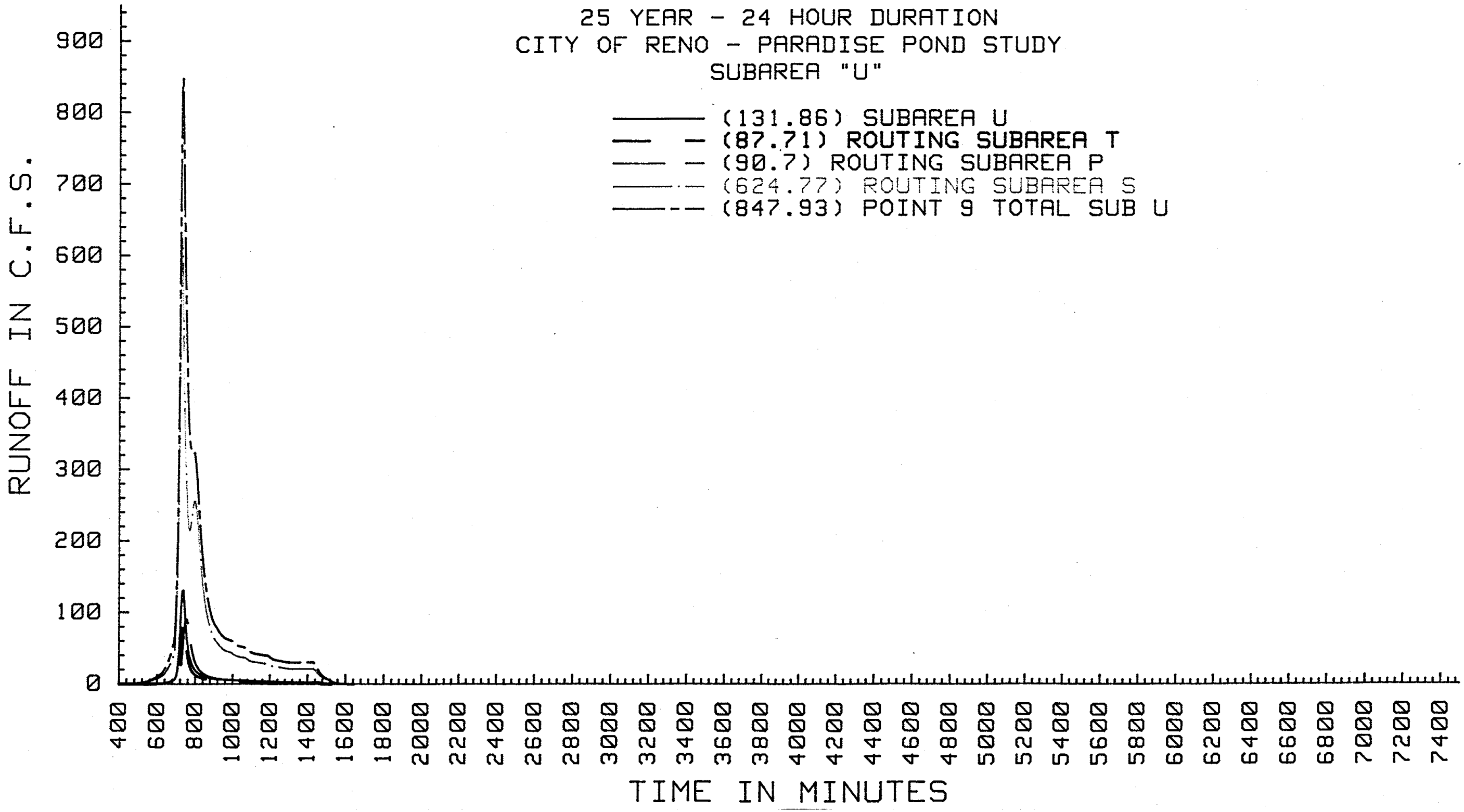
——— (70) POINT 5 TOTAL SUB O
— — (94.71) SUBAREA P
—— — (0) ROUTING SUBAREA I
——·— (94.71) POINT 6 TOTAL SUB P
——-- (30.18) POINT 7 TOTAL SUB Q



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

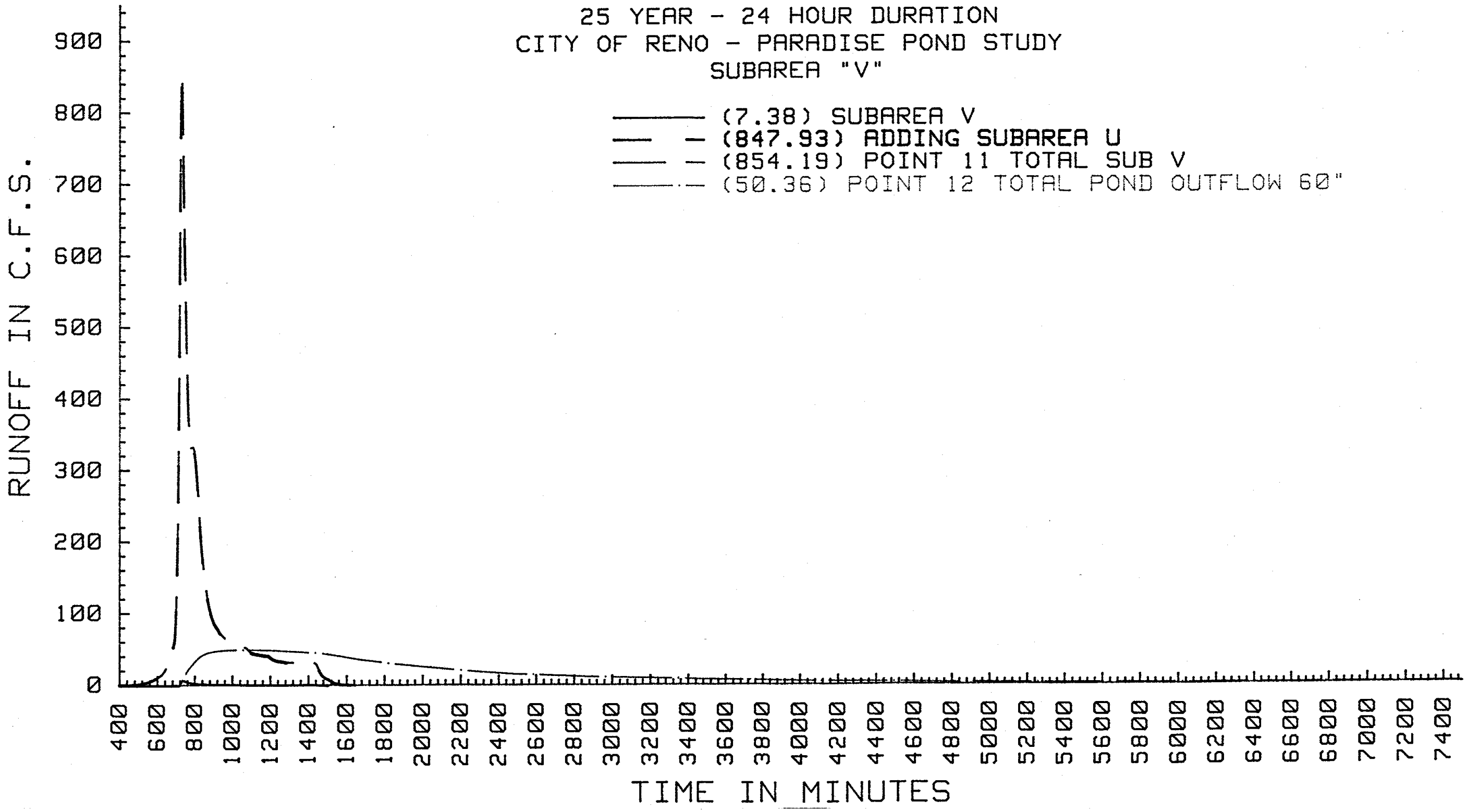


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



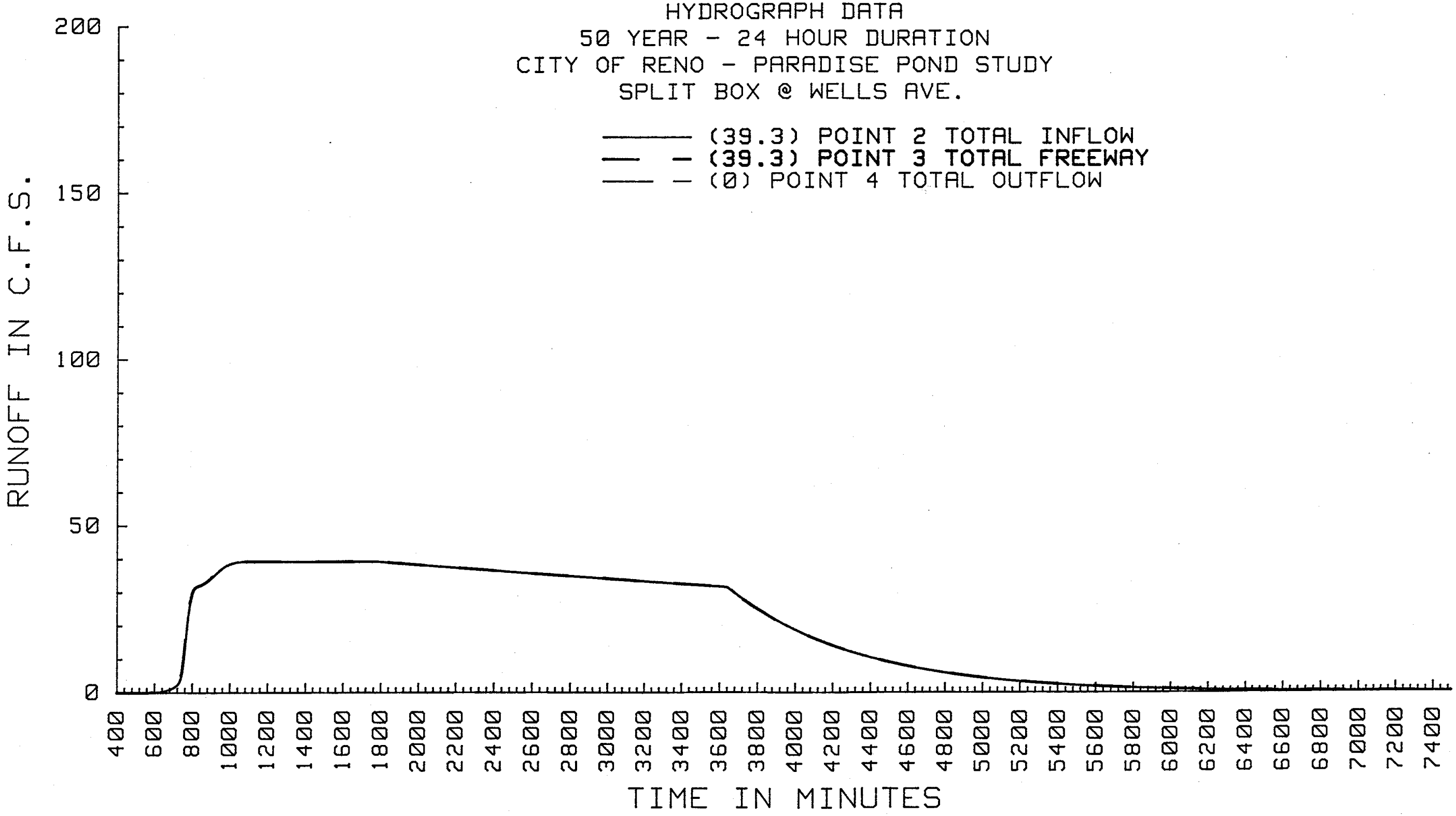
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (7.38) SUBAREA V
— — (847.93) ADDING SUBAREA U
—— — (854.19) POINT 11 TOTAL SUB V
——·— (50.36) POINT 12 TOTAL POND OUTFLOW 60"



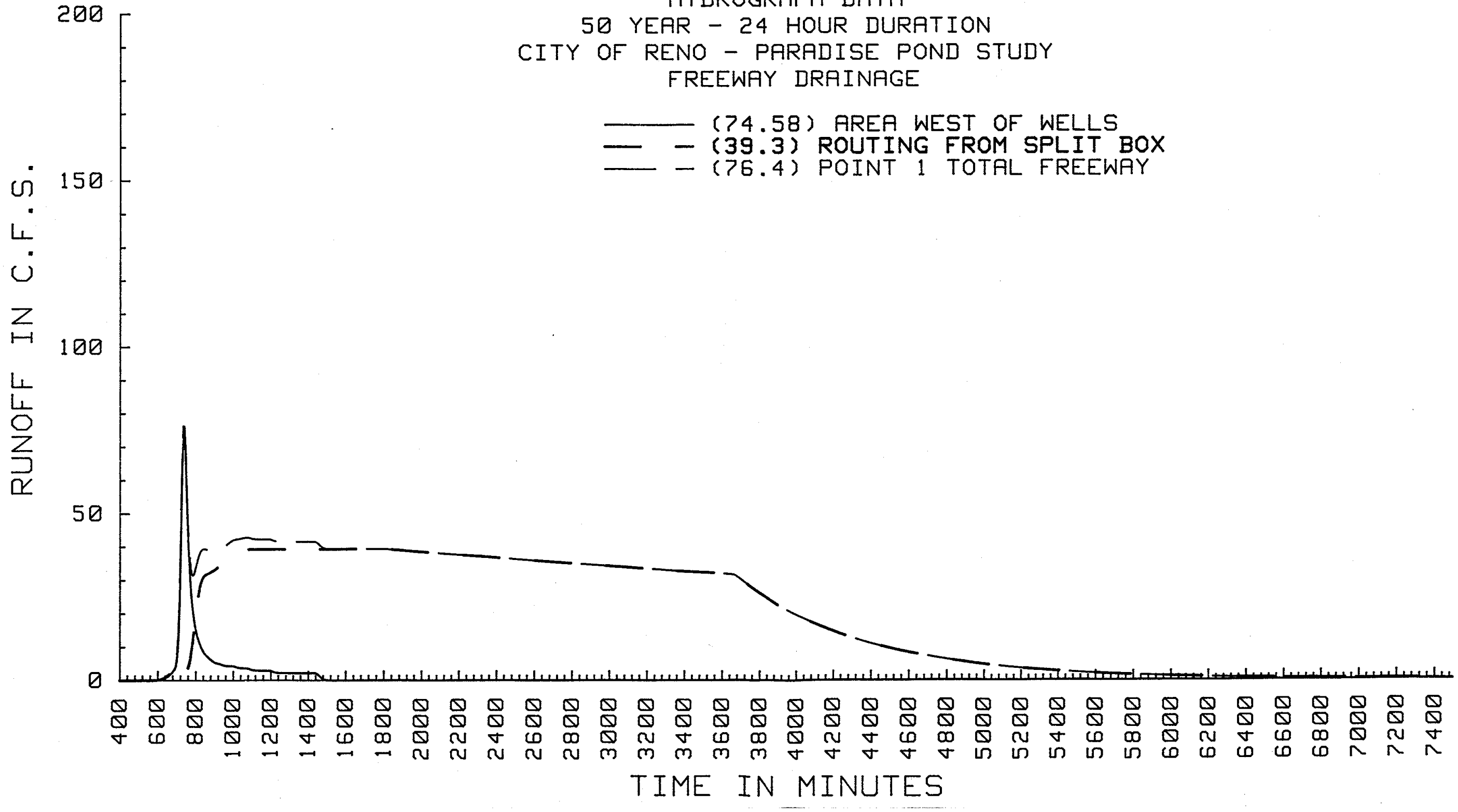
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (39.3) POINT 2 TOTAL INFLOW
— — (39.3) POINT 3 TOTAL FREEWAY
—— — (0) POINT 4 TOTAL OUTFLOW



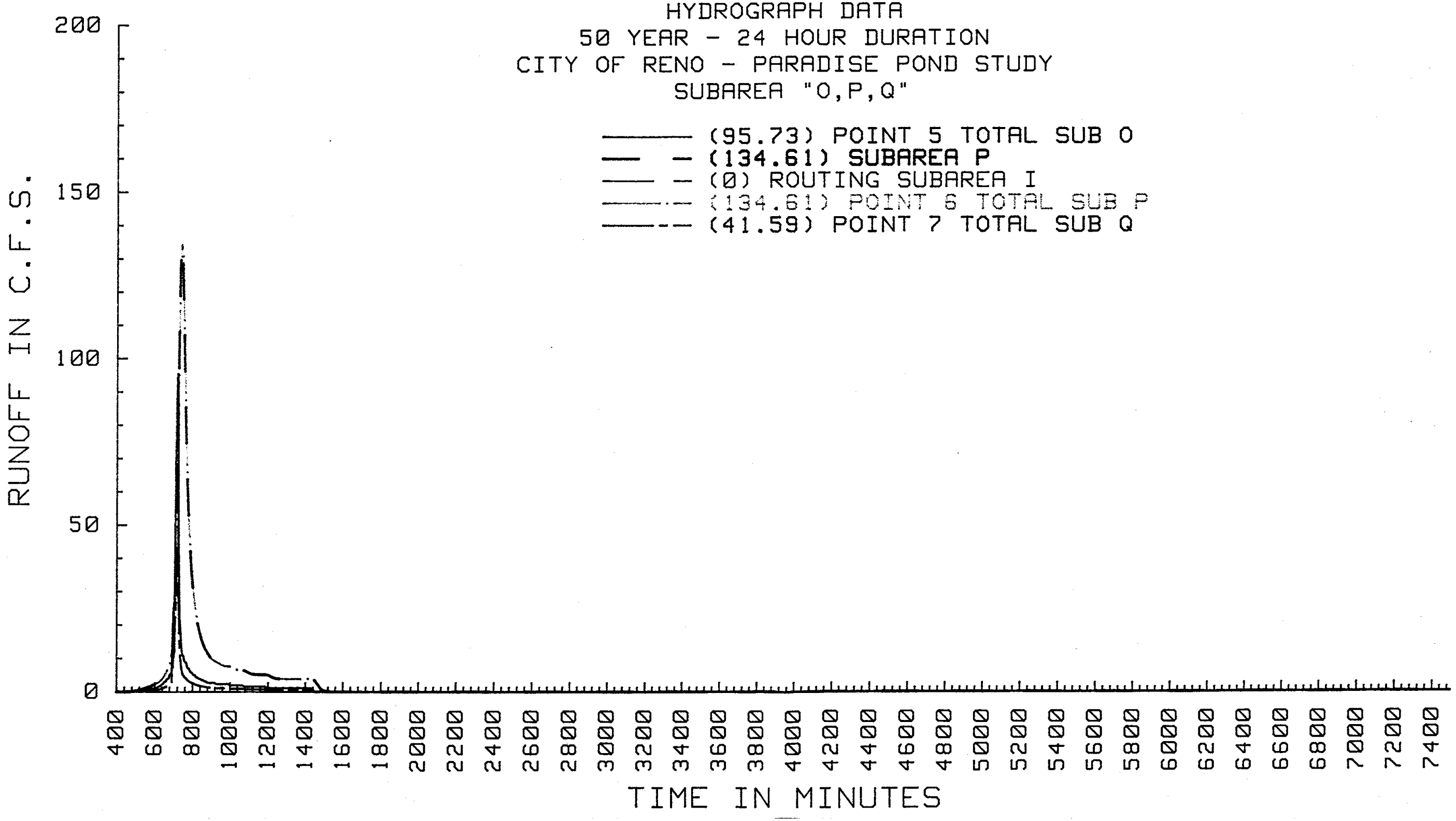
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (74.58) AREA WEST OF WELLS
— — (39.3) ROUTING FROM SPLIT BOX
—— — (76.4) POINT 1 TOTAL FREEWAY

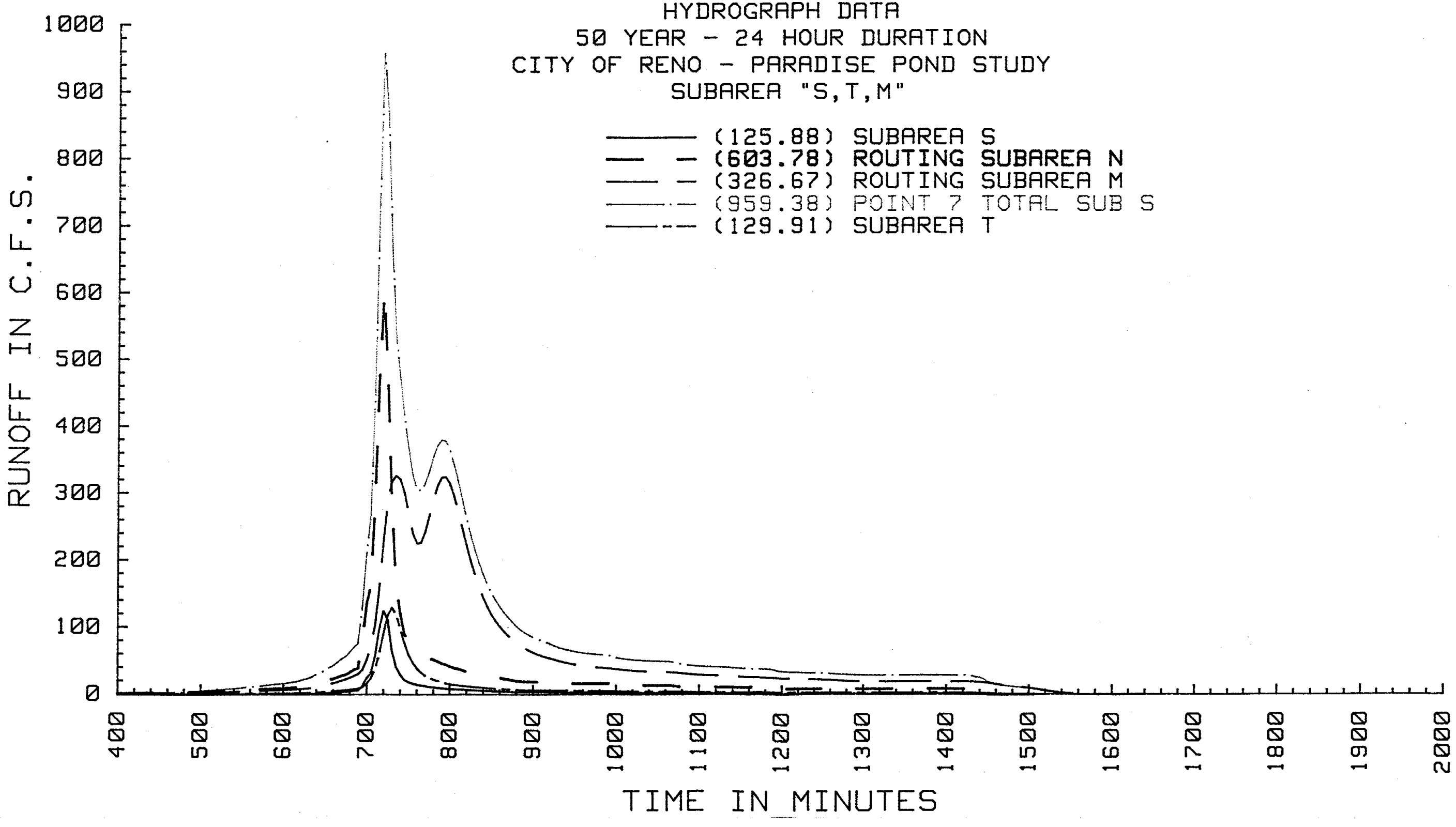


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

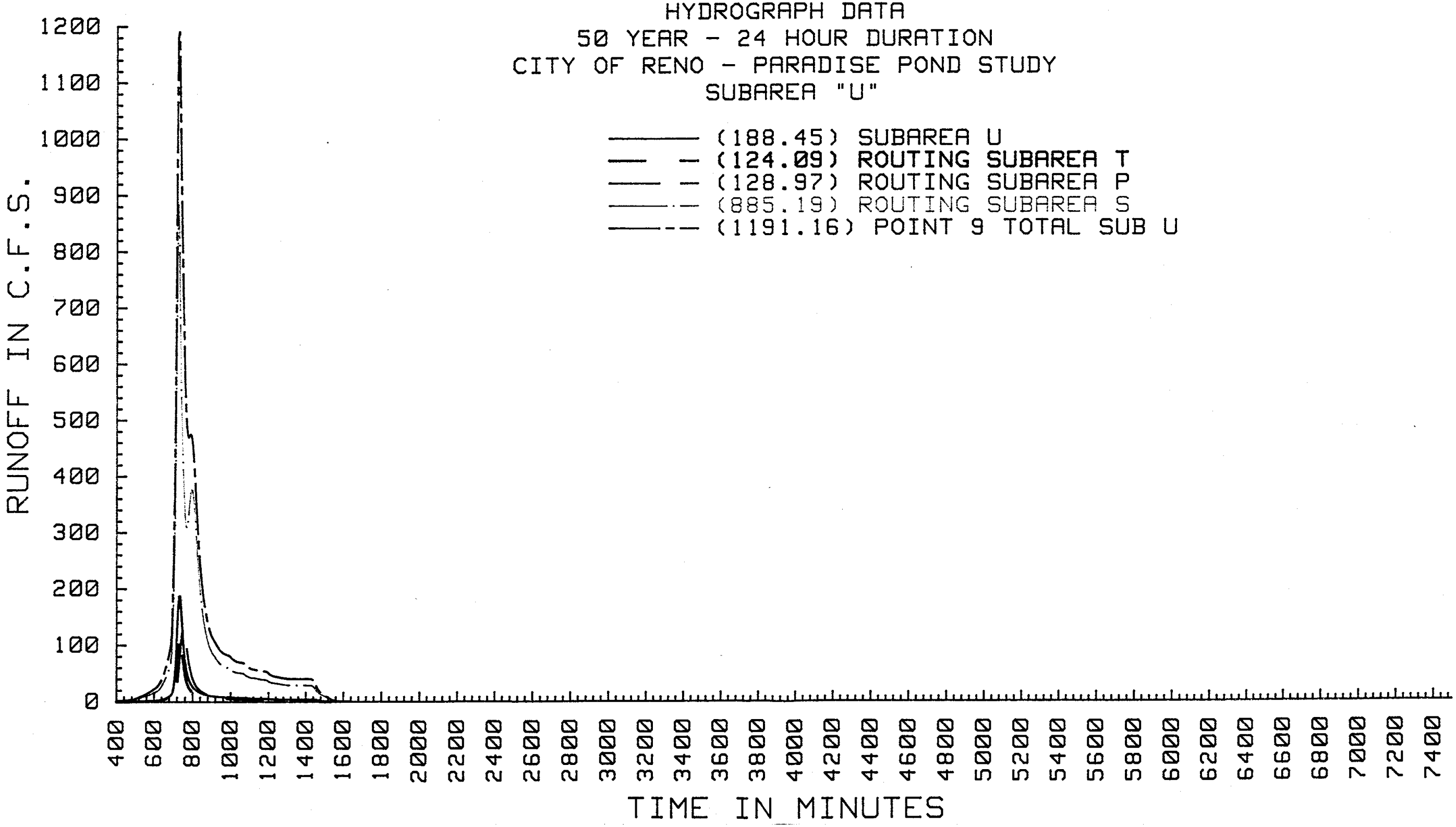
——— (95.73) POINT 5 TOTAL SUB O
— — (134.61) SUBAREA P
—— — (0) ROUTING SUBAREA I
———·— (134.61) POINT 6 TOTAL SUB P
———-- (41.59) POINT 7 TOTAL SUB Q



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

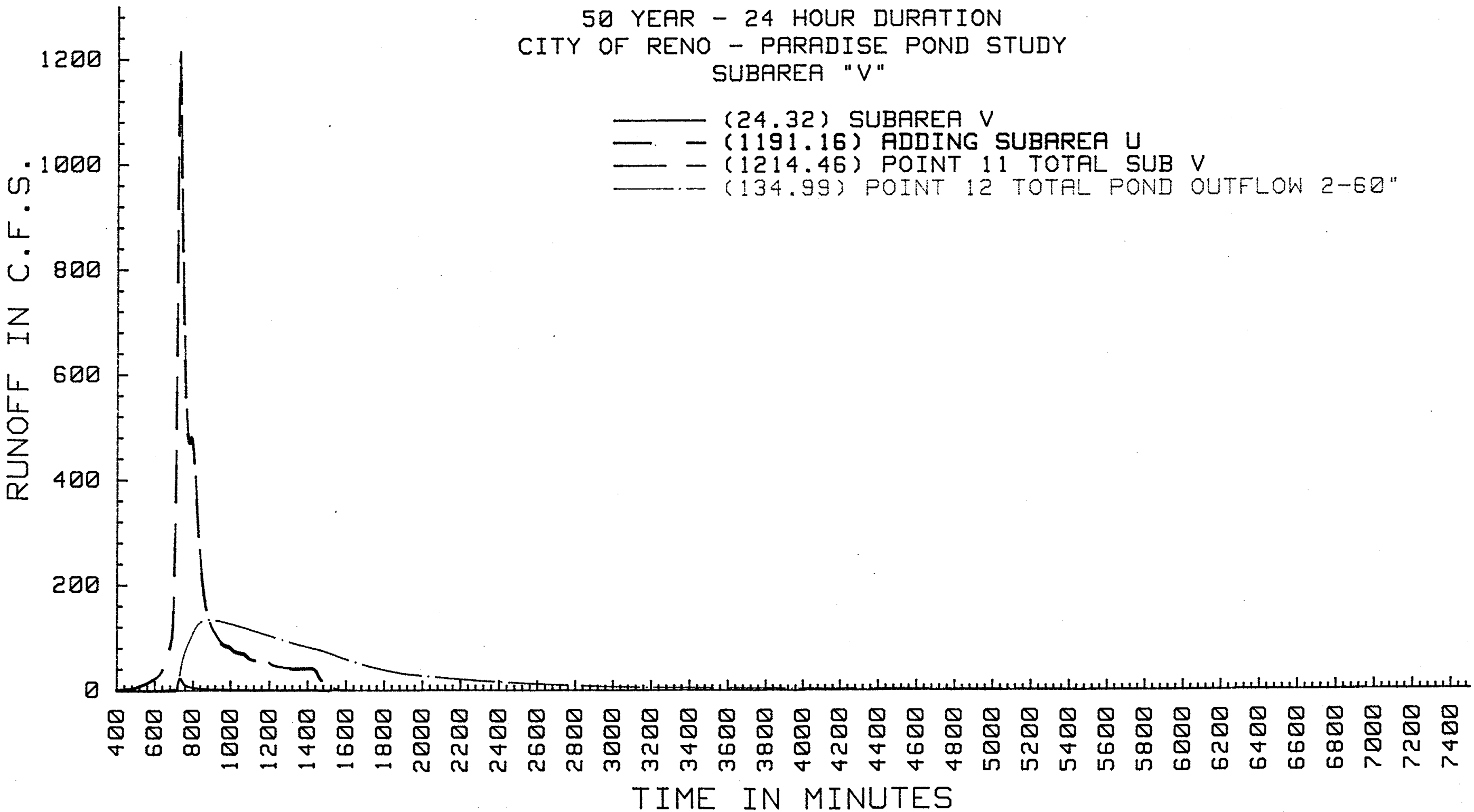


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



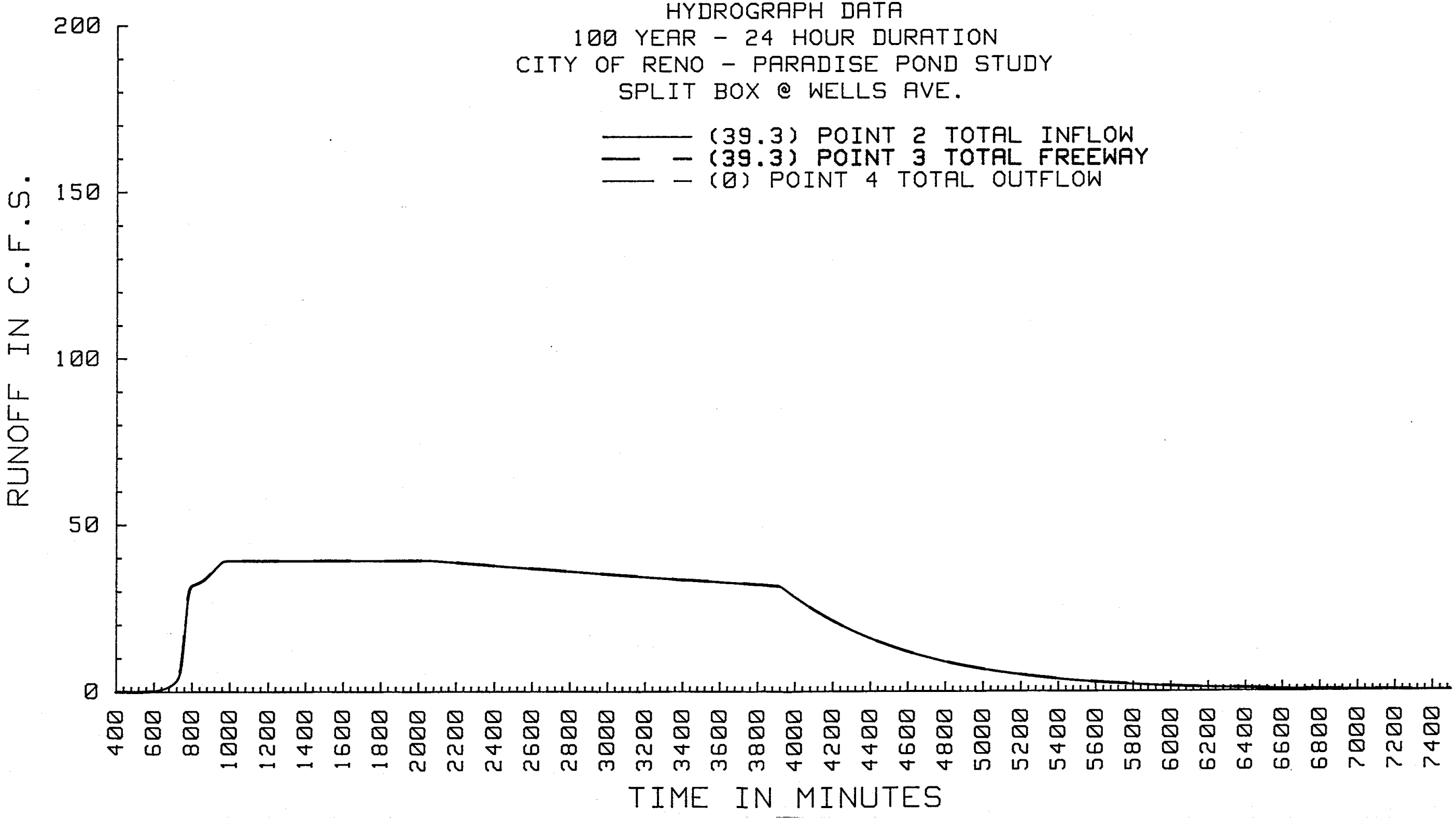
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (24.32) SUBAREA V
— — (1191.16) ADDING SUBAREA U
— — (1214.46) POINT 11 TOTAL SUB V
——·— (134.99) POINT 12 TOTAL POND OUTFLOW 2-60"



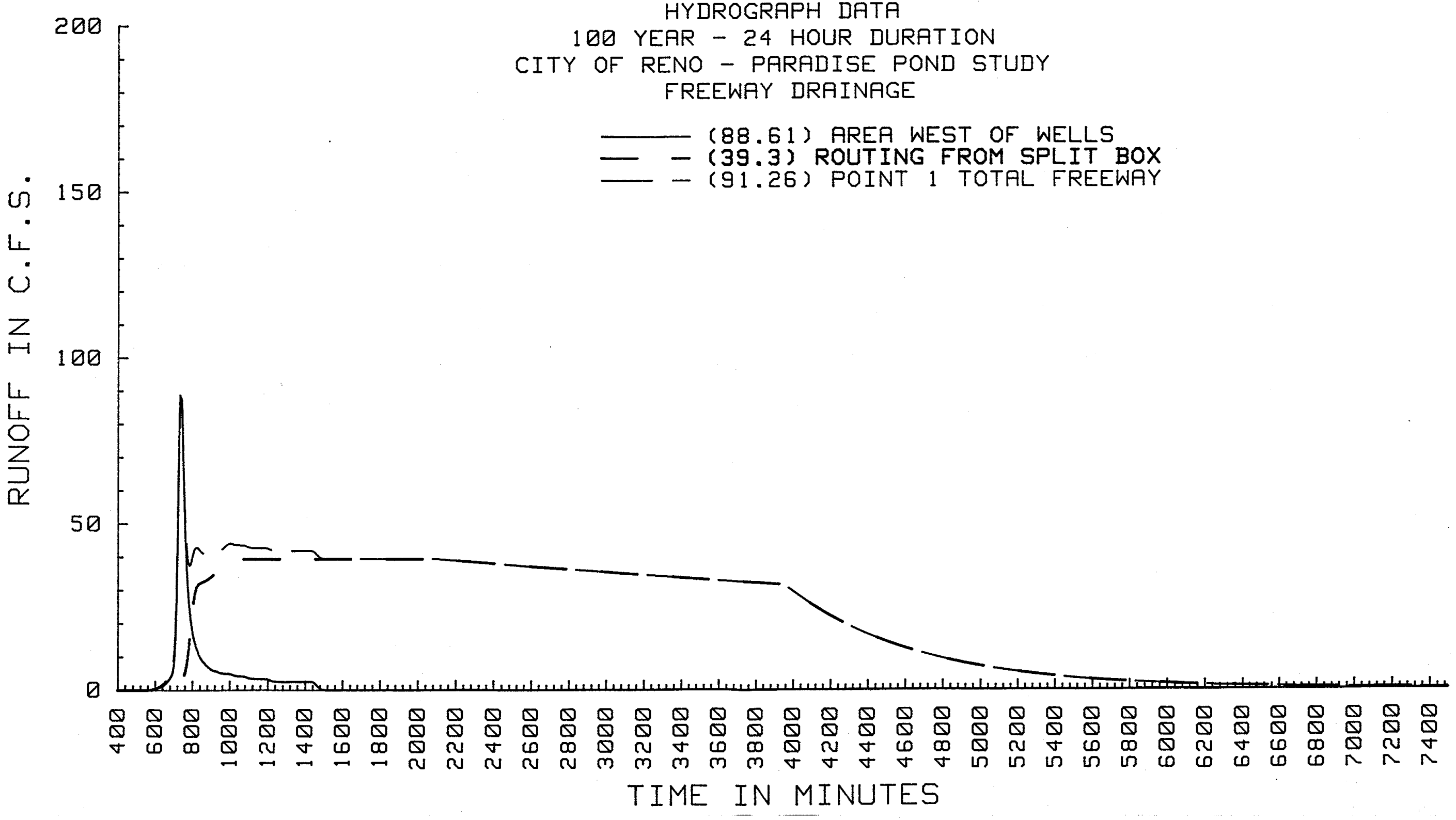
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (39.3) POINT 2 TOTAL INFLOW
— — (39.3) POINT 3 TOTAL FREEWAY
—— — (0) POINT 4 TOTAL OUTFLOW

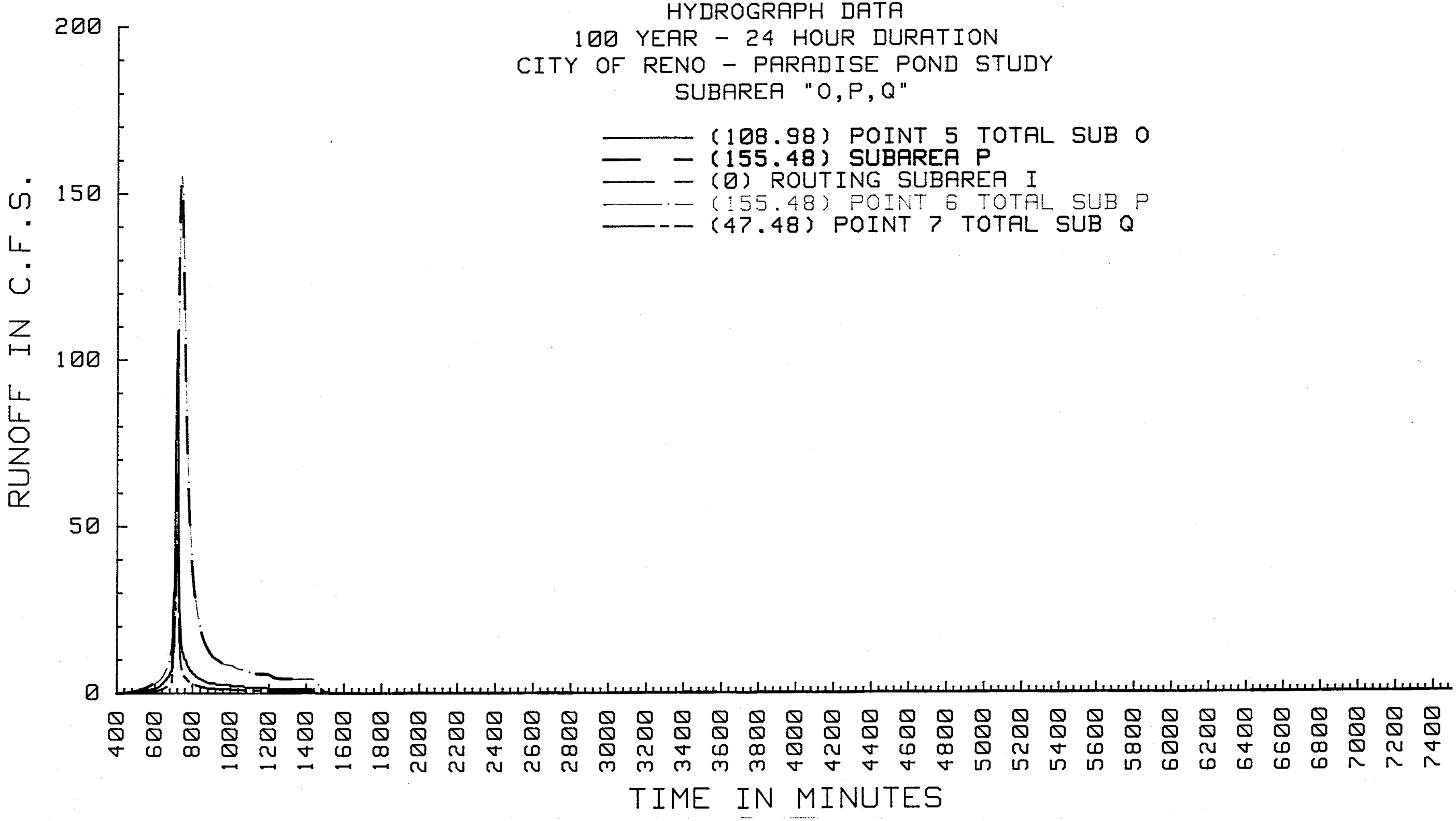


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

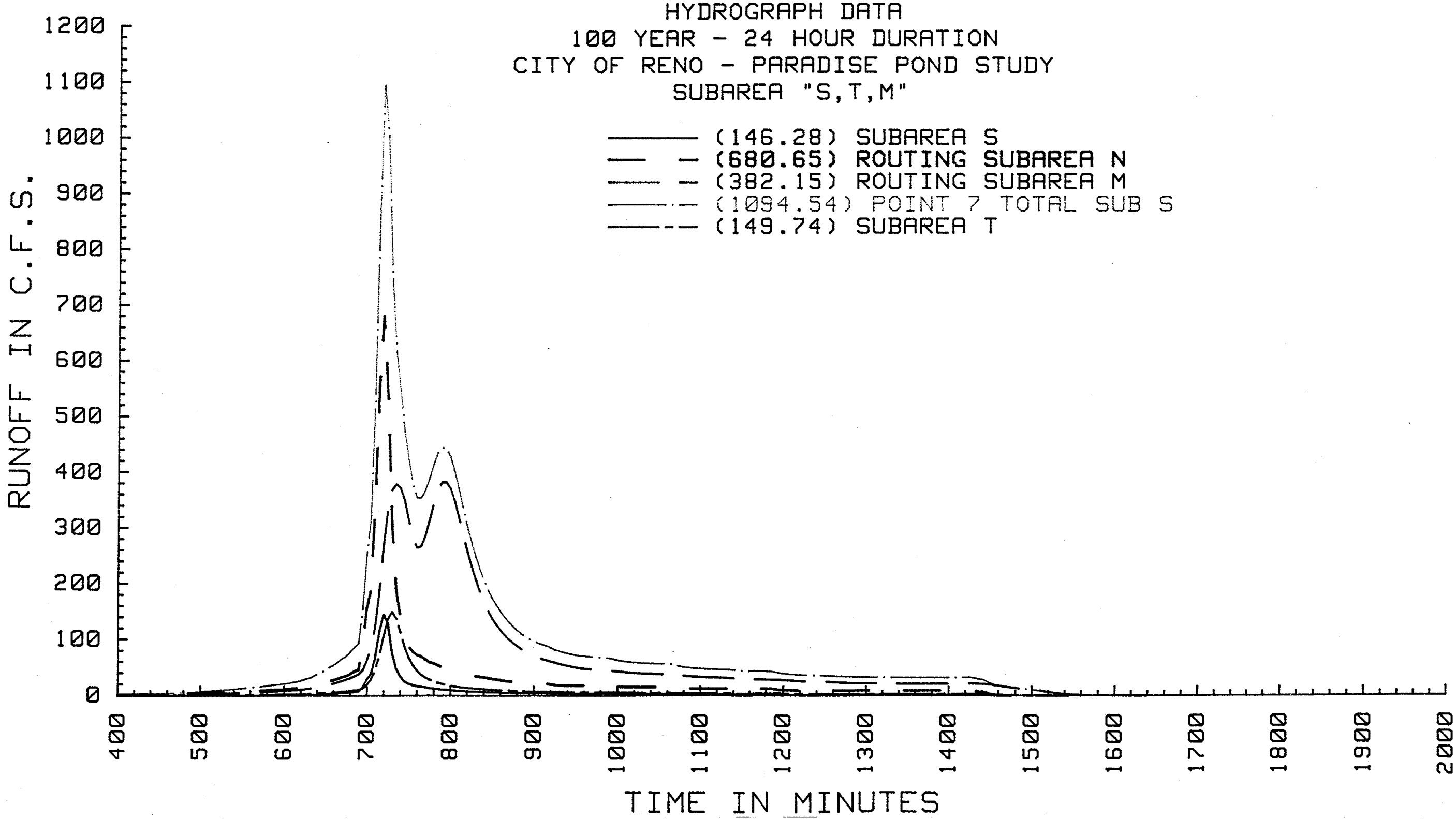
——— (88.61) AREA WEST OF WELLS
— — (39.3) ROUTING FROM SPLIT BOX
—— — (91.26) POINT 1 TOTAL FREEWAY



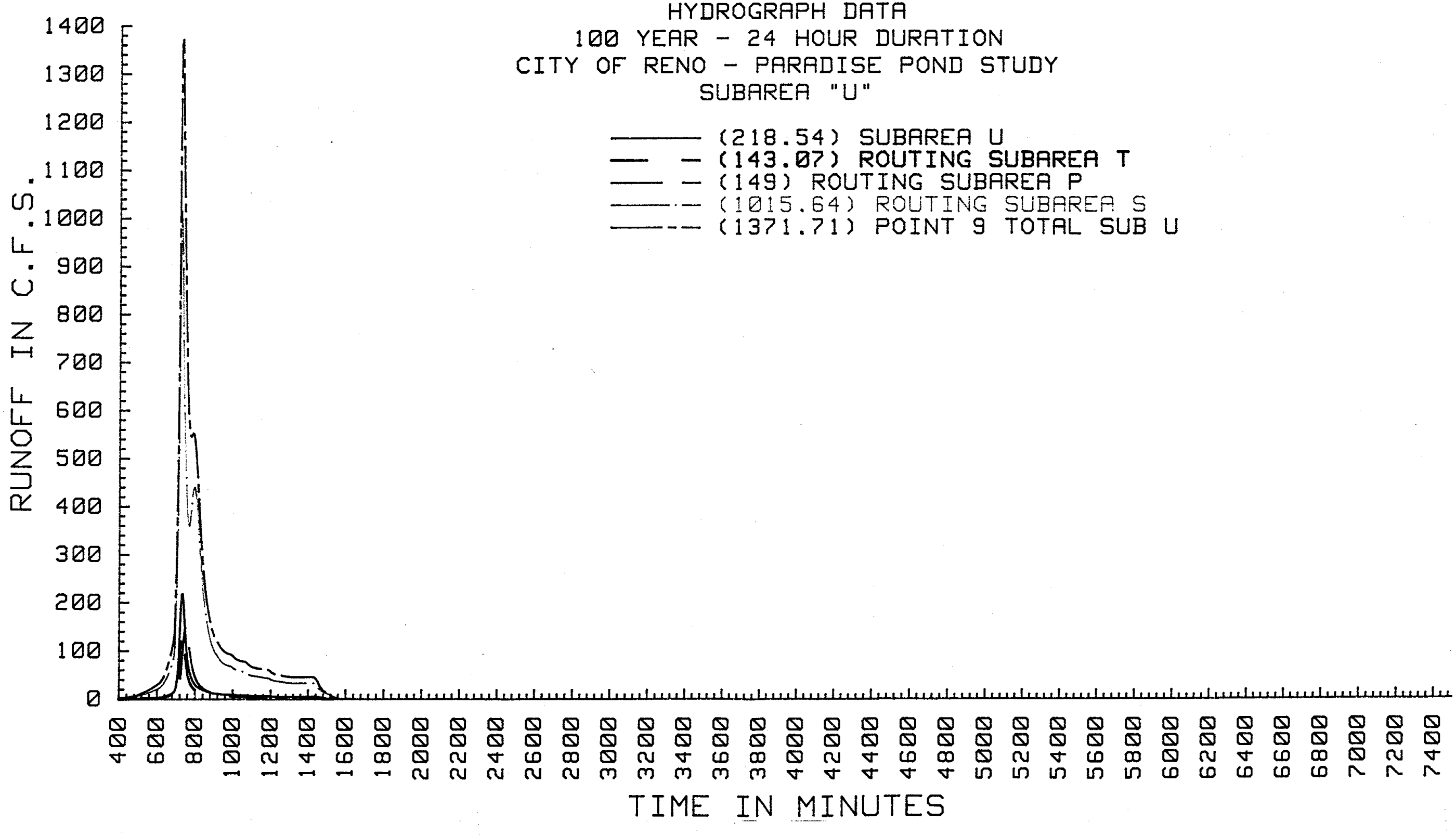
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



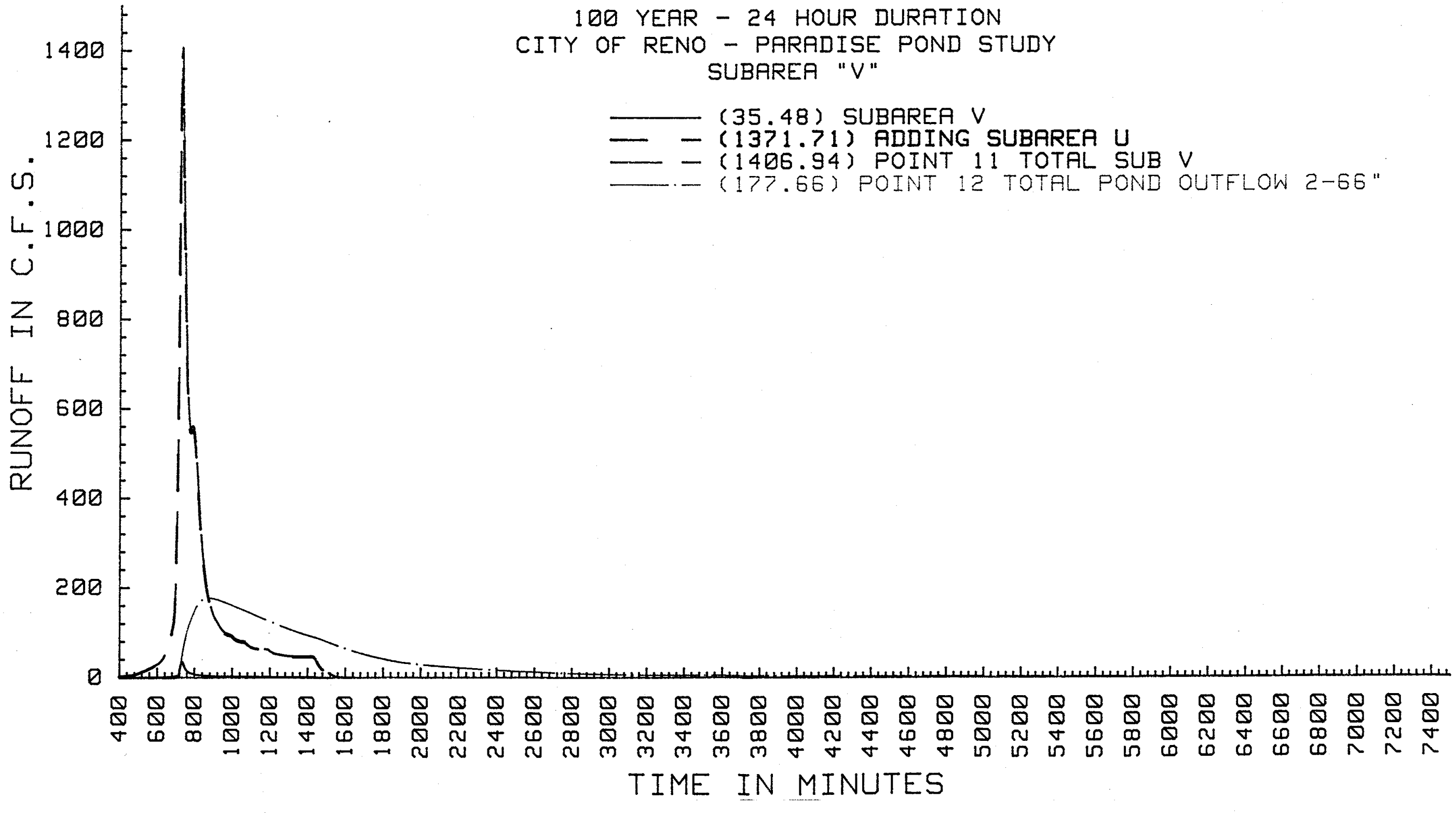
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



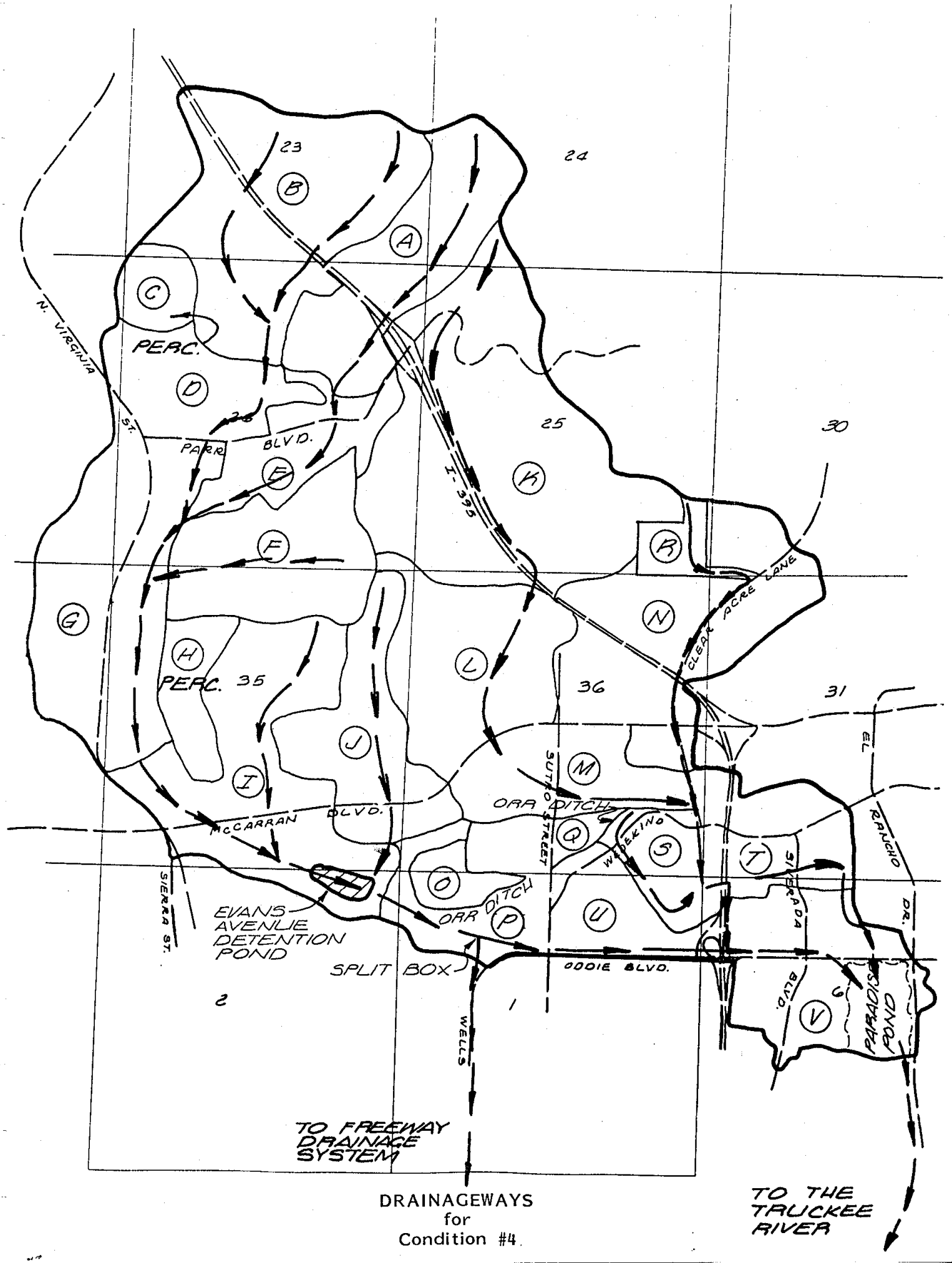
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



APPENDIX "E"



DRAINAGEWAYS
for
Condition #4.

NOTE:

For Subareas A through J, K through N, and R reference tables and graphs in Appendix "B".

TABLE 10

CONDITION NO. 4 WITH 3- AND 6-HOUR DURATION STORMS

Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
Evans	16.97 cfs @ 0.5 ac.ft.	52.15 cfs @ 3.0 ac.ft.	79.85 cfs @ 5.6 ac.ft.	117.59 cfs @ 10.1 ac.ft.
Split Box	16.88 cfs @ 320 min.	51.89 cfs @ 310 min.	79.49 cfs @ 310 min.	117.11 cfs @ 310 min.
Freeway	16.88 cfs @ 320 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.
O	2.00 cfs @ 50 min.	6.40 cfs @ 30 min.	10.77 cfs @ 30 min.	16.86 cfs @ 30 min.
P	4.36 cfs @ 105 min.	12.81 cfs @ 80 min.	29.50 cfs @ 310 min.	67.12 cfs @ 310 min.
Q	0.91 cfs @ 55 min.	2.85 cfs @ 35 min.	4.64 cfs @ 35 min.	7.19 cfs @ 30 min.
S	28.05 cfs @ 75 min.	77.51 cfs @ 55 min.	116.99 cfs @ 50 min.	173.60 cfs @ 50 min.
T	3.29 cfs @ 85 min.	10.27 cfs @ 60 min.	16.47 cfs @ 55 min.	25.56 cfs @ 55 min.
U	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.11 cfs @ 60 min.	253.90 cfs @ 60 min.
V	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.11 cfs @ 60 min.	253.90 cfs @ 60 min.
Paradise Pond Outlet One 30-inch pipe:	0.71 cfs @ 85 min. w/7.1 ac.ft.	2.68 cfs @ 65 min. w/20.4 ac.ft.	6.56 cfs @ 60 min. w/35 ac.ft.	12.79 cfs @ 60 min. w/59.7 ac.ft.

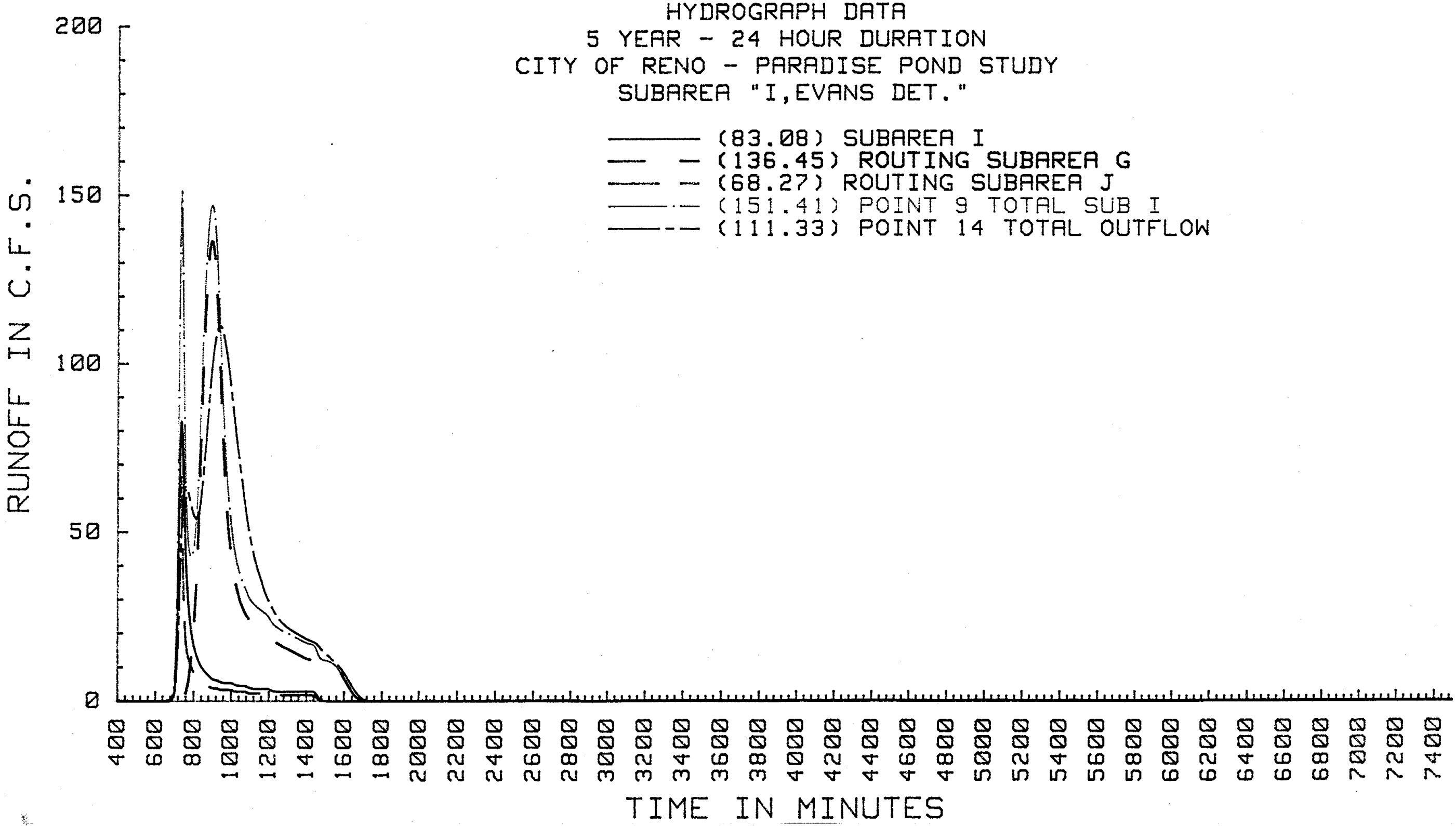
TABLE 10 - (con't)

CONDITION NO. 4 WITH 3- AND 6-HOUR DURATION STORMS

Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
Evans	35.98 cfs @ 1.6 ac.ft.	80.69 cfs @ 5.7 ac.ft.	111.20 cfs @ 9.2 ac.ft.	173.98 cfs @ 18.3 ac.ft.
Split Box	35.63 cfs @ 410 min.	80.18 cfs @ 415 min.	110.59 cfs @ 415 min.	173.09 cfs @ 415 min.
Freeway	35.63 cfs @ 410 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.
O	5.15 cfs @ 150 min.	12.08 cfs @ 150 min.	16.96 cfs @ 145 min.	27.45 cfs @ 145 min.
P	7.28 cfs @ 185 min.	31.53 cfs @ 405 min.	62.31 cfs @ 405 min.	125.32 cfs @ 410 min.
Q	2.23 cfs @ 150 min.	5.48 cfs @ 150 min.	7.63 cfs @ 150 min.	12.16 cfs @ 150 min.
S	54.18 cfs @ 155 min.	129.91 cfs @ 150 min.	183.30 cfs @ 150 min.	301.32 cfs @ 150 min.
T	6.30 cfs @ 165 min.	17.52 cfs @ 165 min.	25.68 cfs @ 160 min.	43.91 cfs @ 160 min.
U	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.33 cfs @ 160 min.	415.65 cfs @ 160 min.
V	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.33 cfs @ 160 min.	415.65 cfs @ 160 min.
Paradise Pond Outlet One 30-inch pipe:				
	1.54 cfs @ 170 min. w/15.3ac.ft.	7.56 cfs @ 160 min. w/38.9ac.ft.	12.80 cfs @ 160 min. w/59.7ac.ft.	19.08 cfs @ 160 min. w/111.6ac.ft.

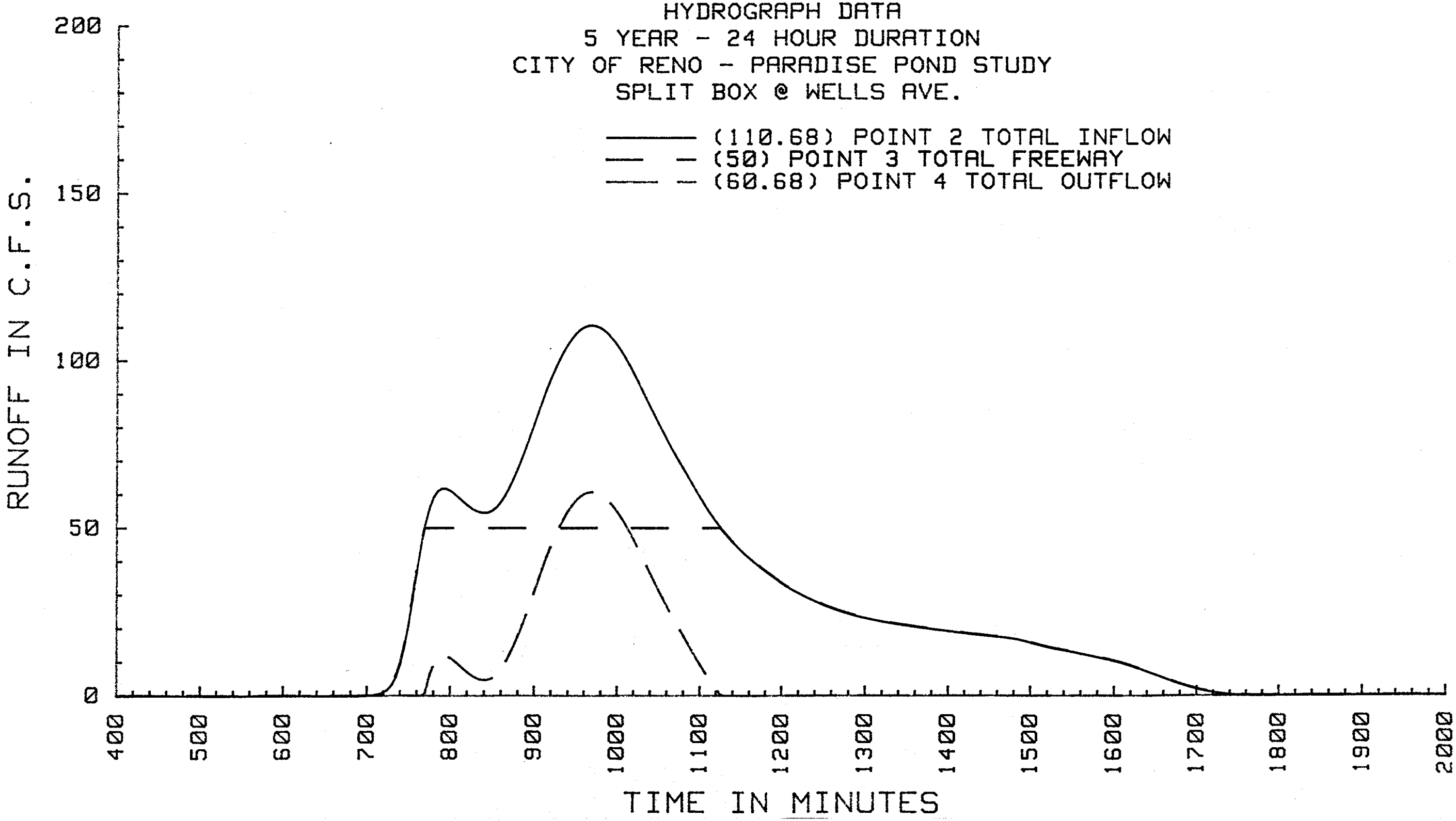
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

——— (83.08) SUBAREA I
— — (136.45) ROUTING SUBAREA G
—— — (68.27) ROUTING SUBAREA J
———·— (151.41) POINT 9 TOTAL SUB I
———-- (111.33) POINT 14 TOTAL OUTFLOW



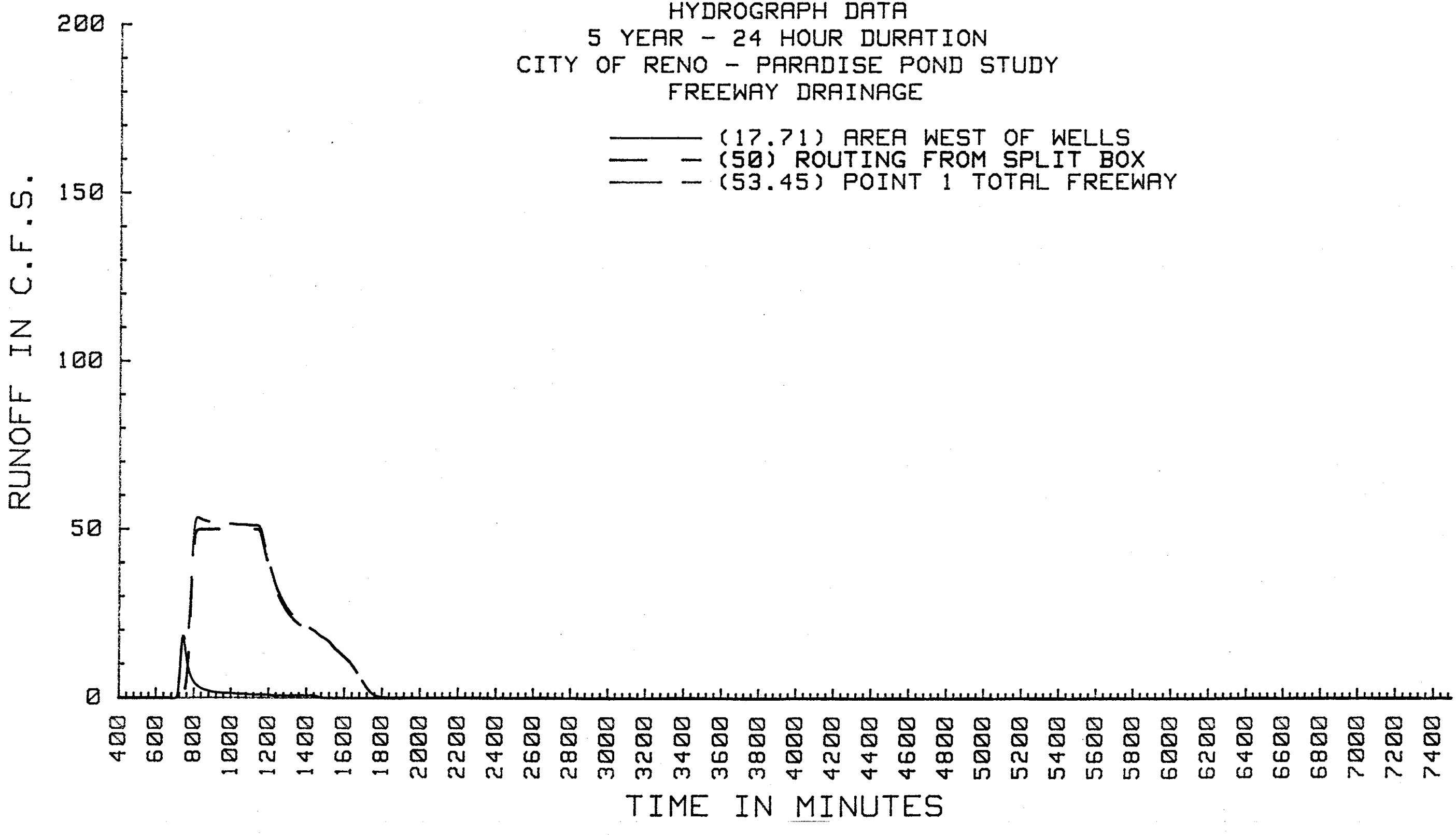
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (110.68) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (60.68) POINT 4 TOTAL OUTFLOW



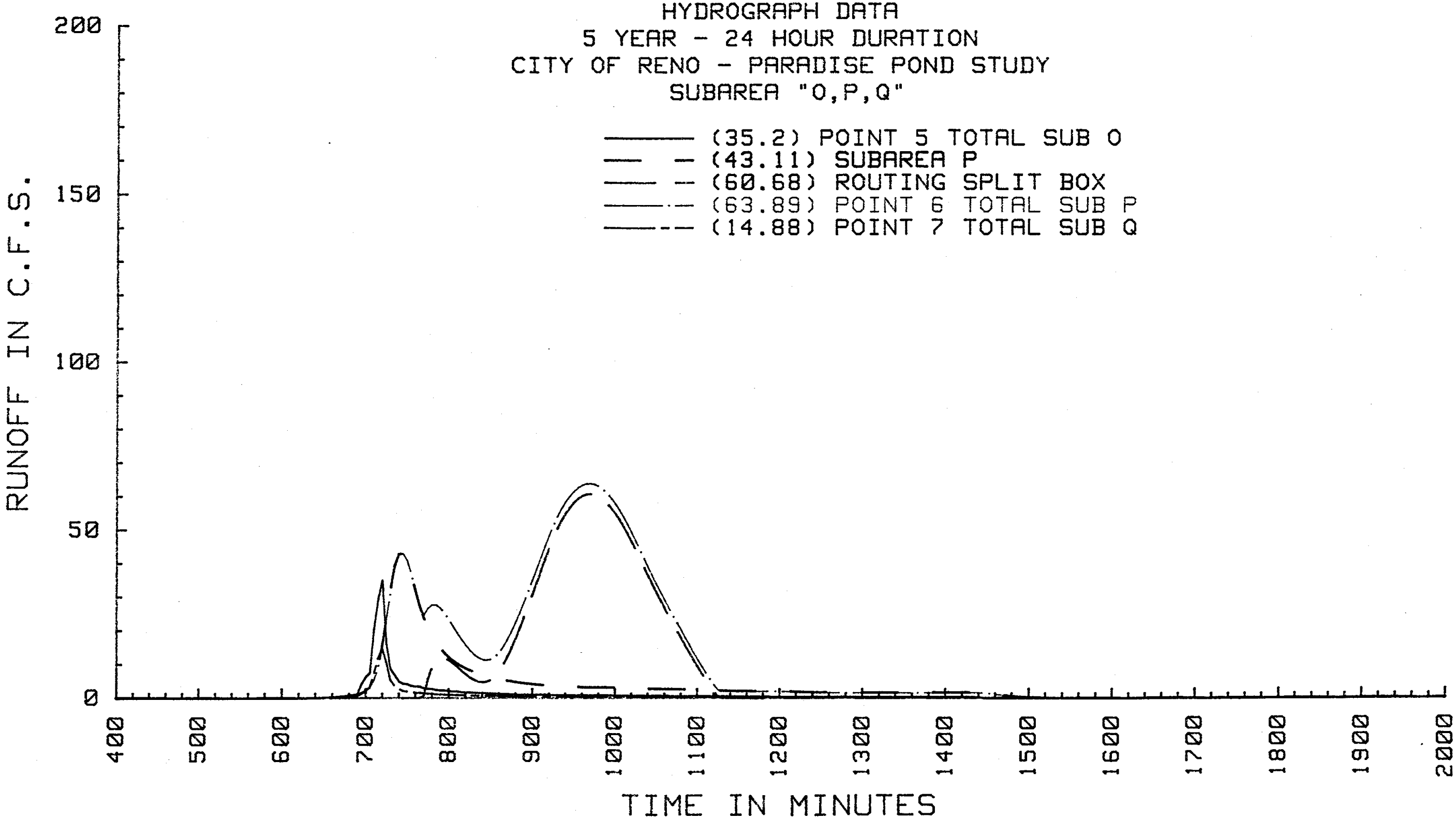
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (17.71) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (53.45) POINT 1 TOTAL FREEWAY

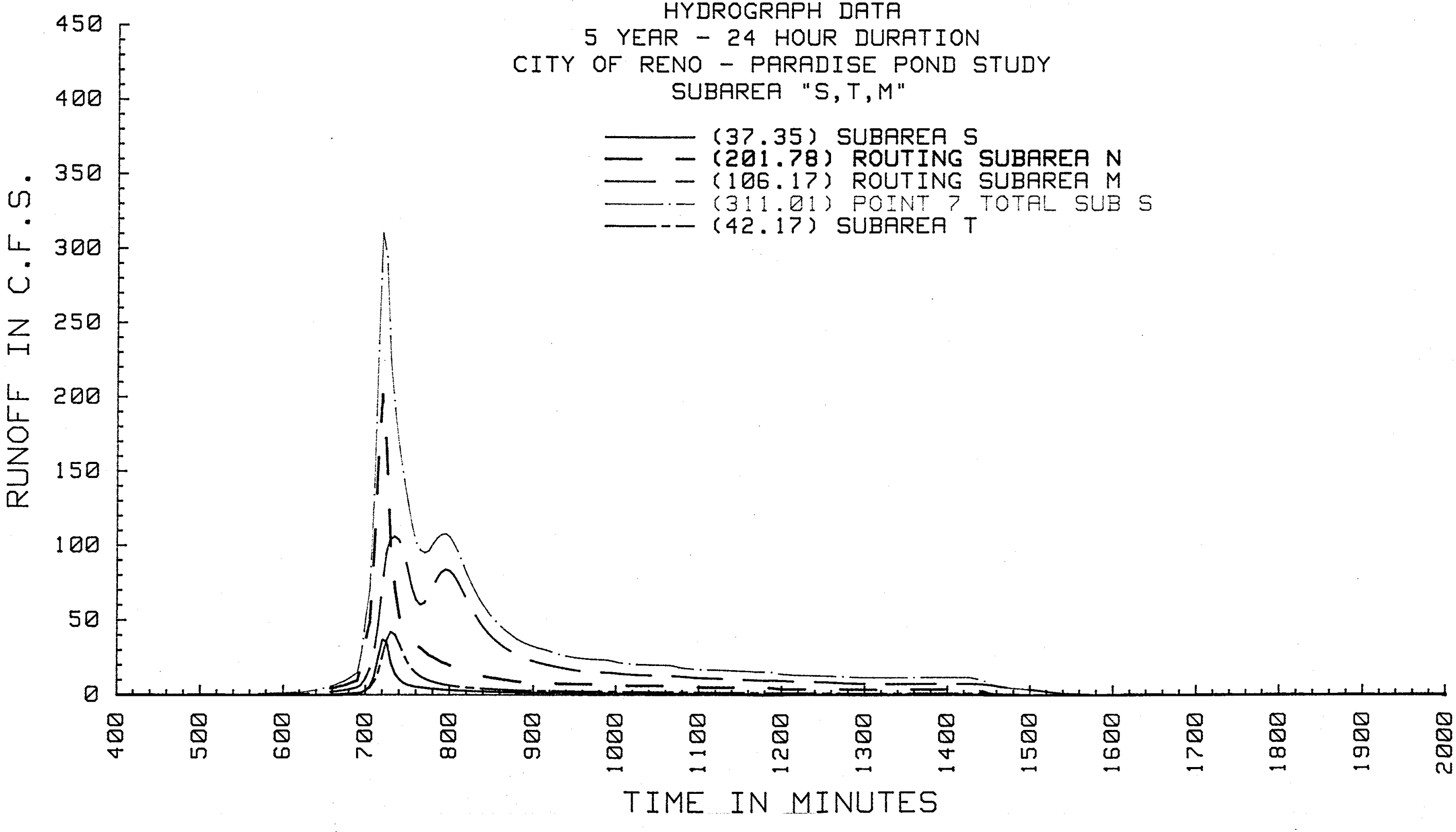


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

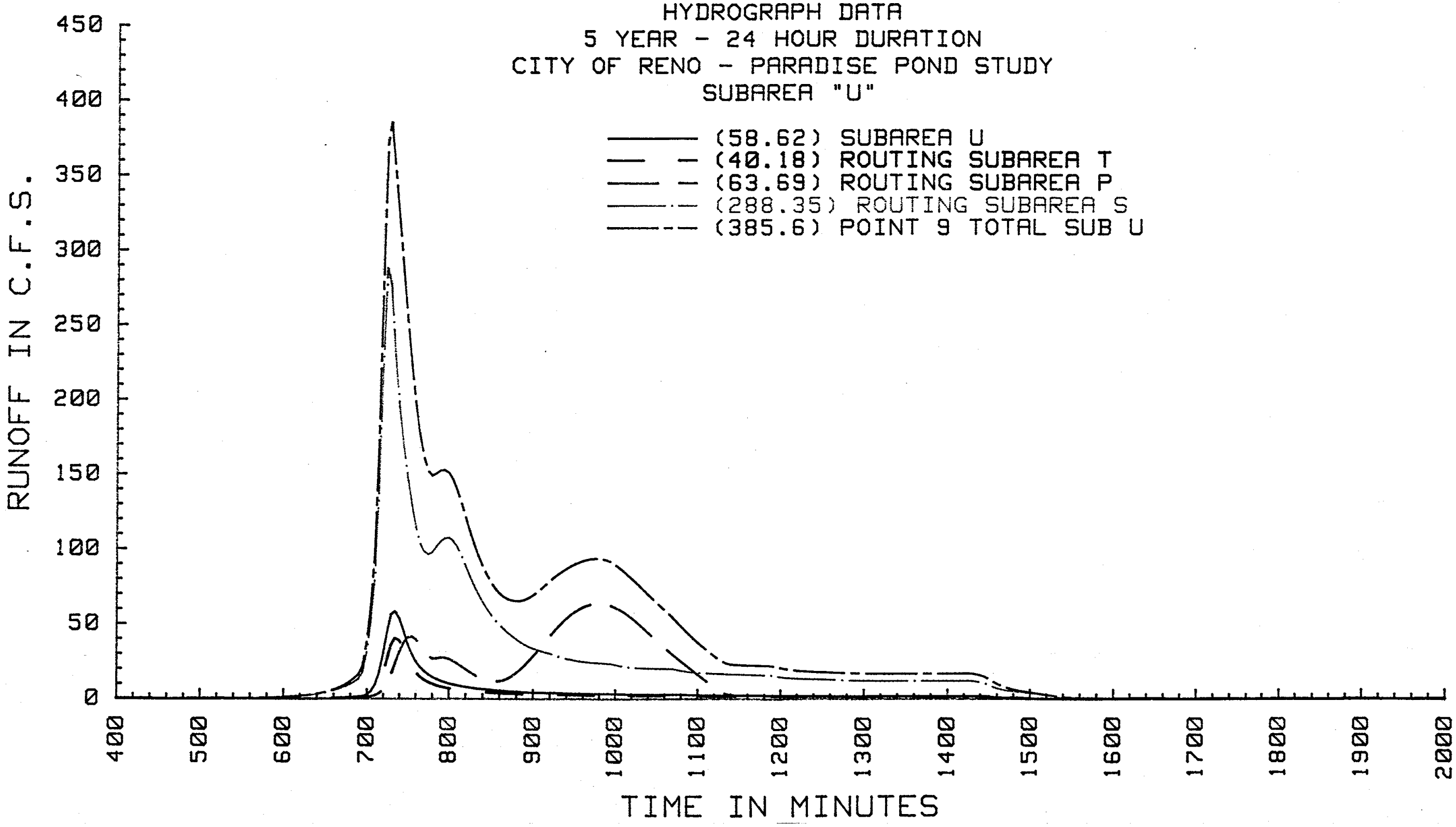
——— (35.2) POINT 5 TOTAL SUB O
— — (43.11) SUBAREA P
—— — (60.68) ROUTING SPLIT BOX
——·— (63.89) POINT 6 TOTAL SUB P
——-- (14.88) POINT 7 TOTAL SUB Q



HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

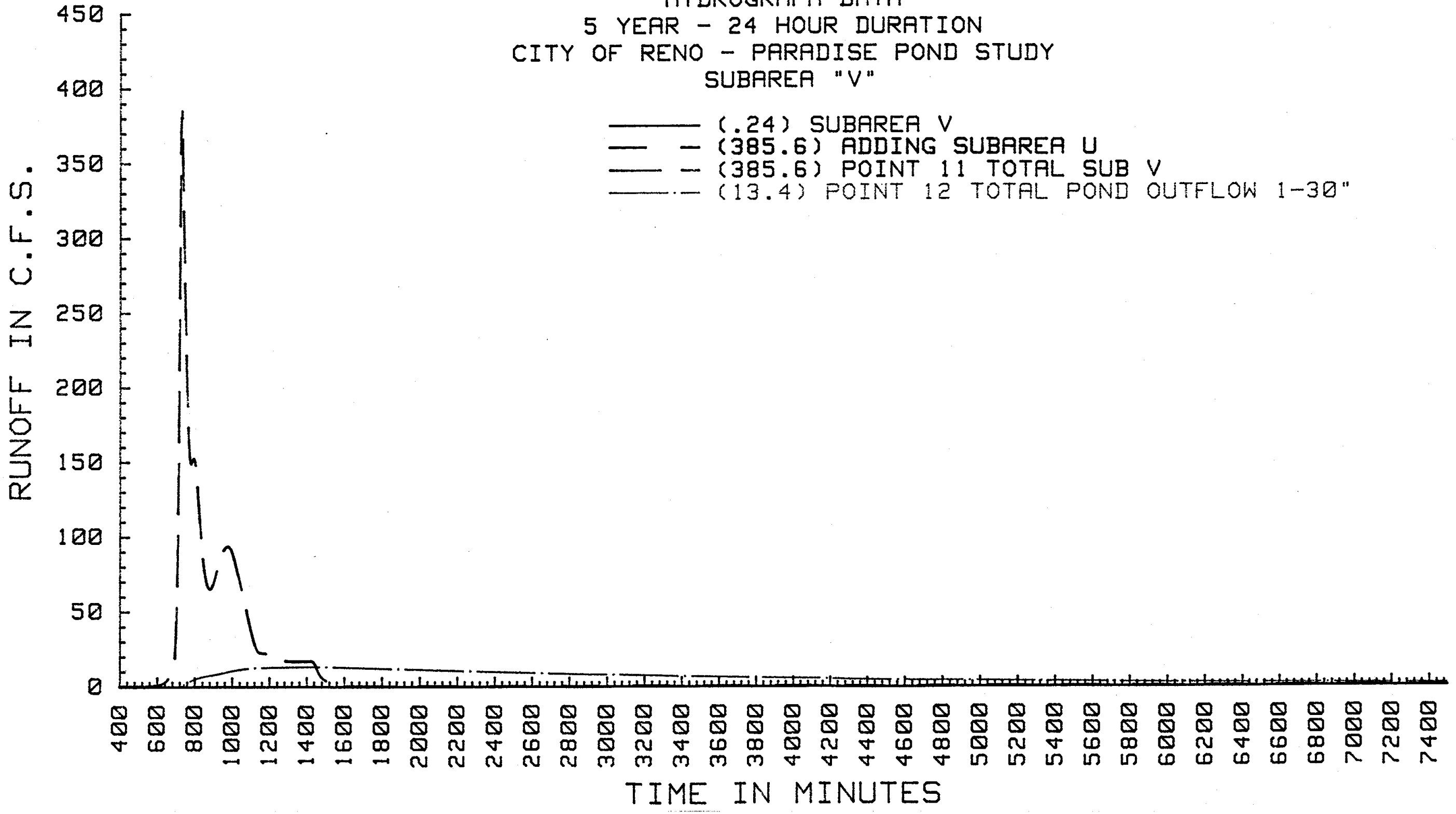


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



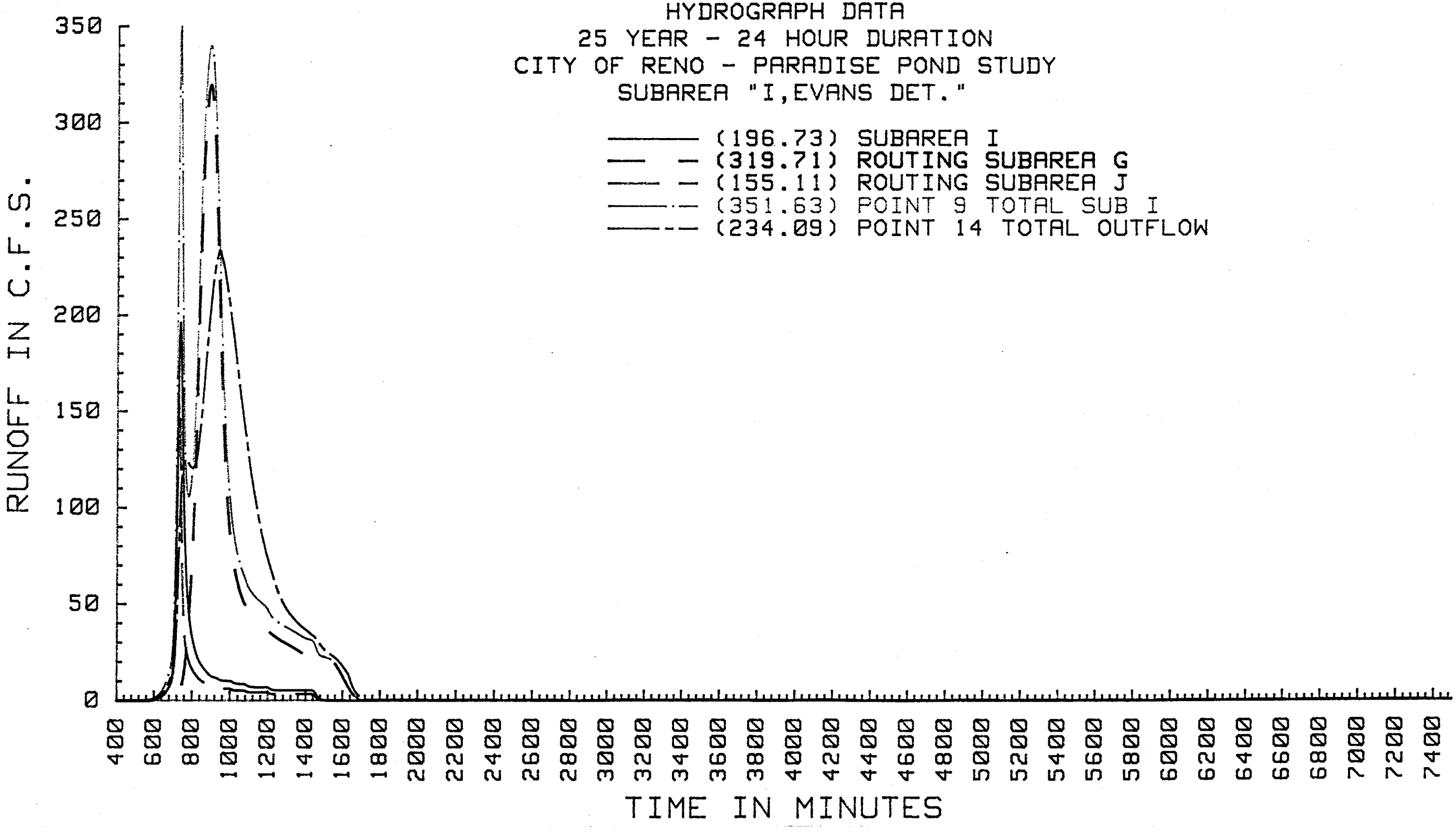
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (.24) SUBAREA V
— — (385.6) ADDING SUBAREA U
— — (385.6) POINT 11 TOTAL SUB V
—·— (13.4) POINT 12 TOTAL POND OUTFLOW 1-30"



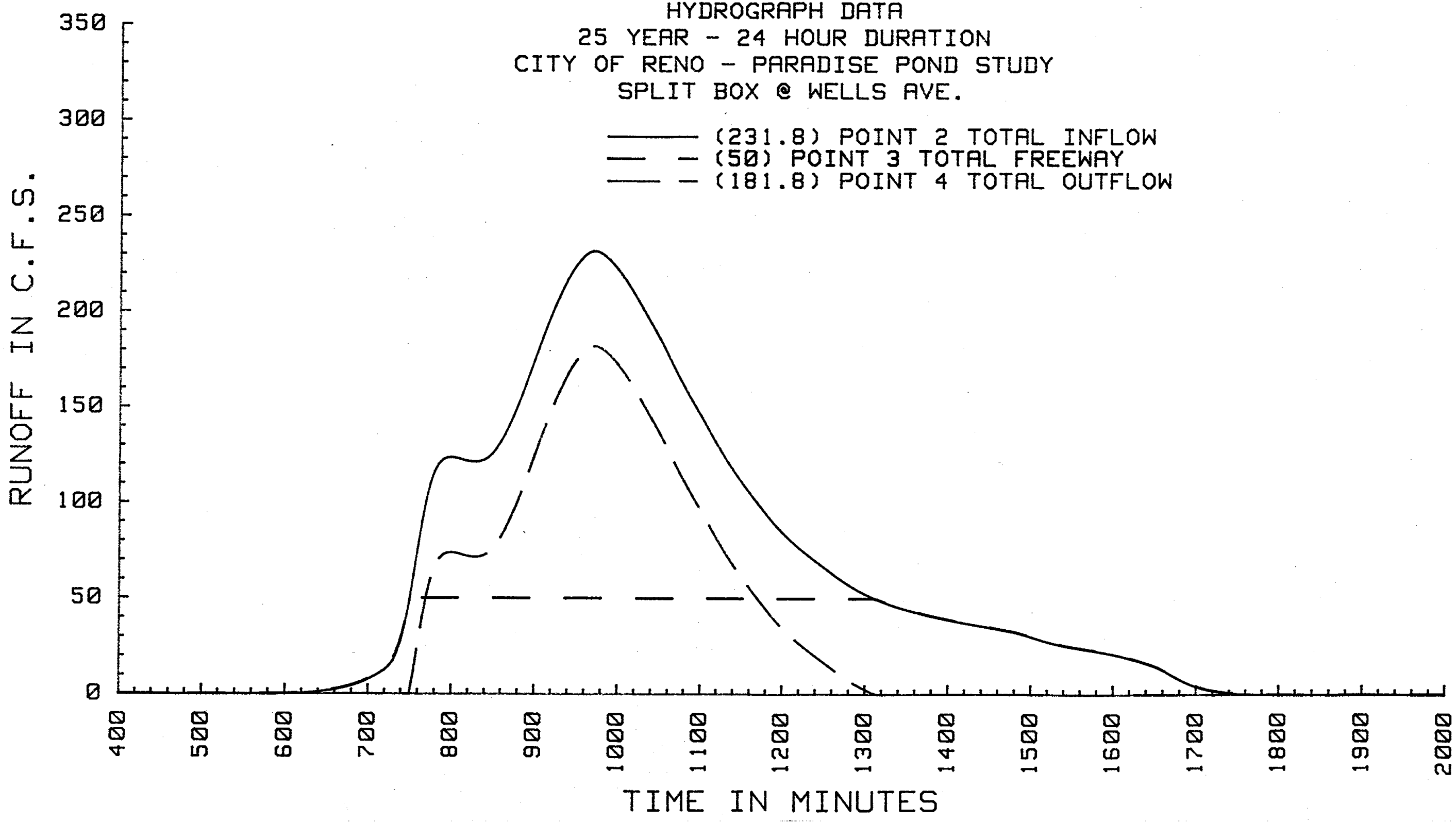
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

——— (196.73) SUBAREA I
— — (319.71) ROUTING SUBAREA G
— — (155.11) ROUTING SUBAREA J
———·— (351.63) POINT 9 TOTAL SUB I
———-— (234.09) POINT 14 TOTAL OUTFLOW



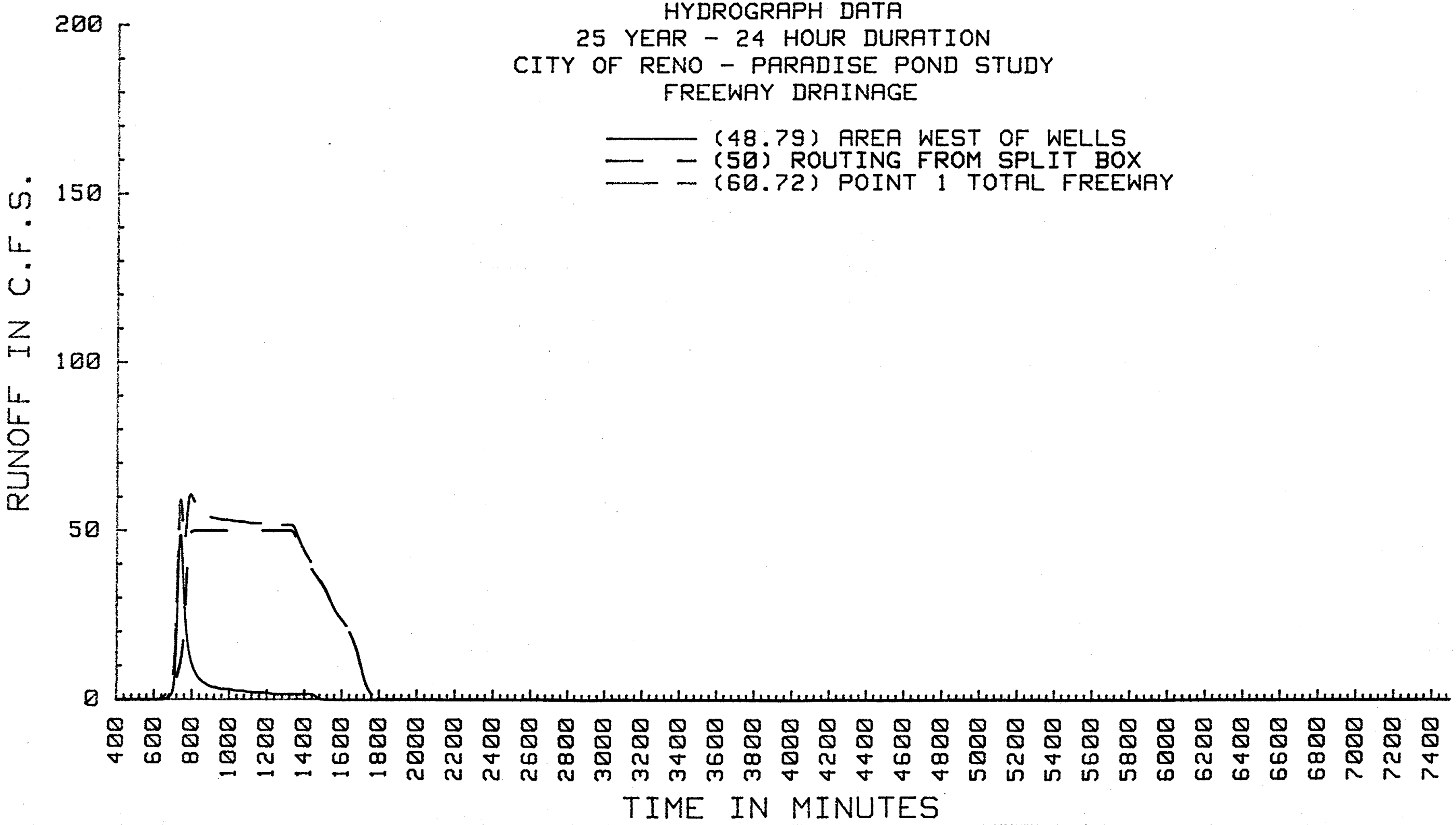
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (231.8) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (181.8) POINT 4 TOTAL OUTFLOW

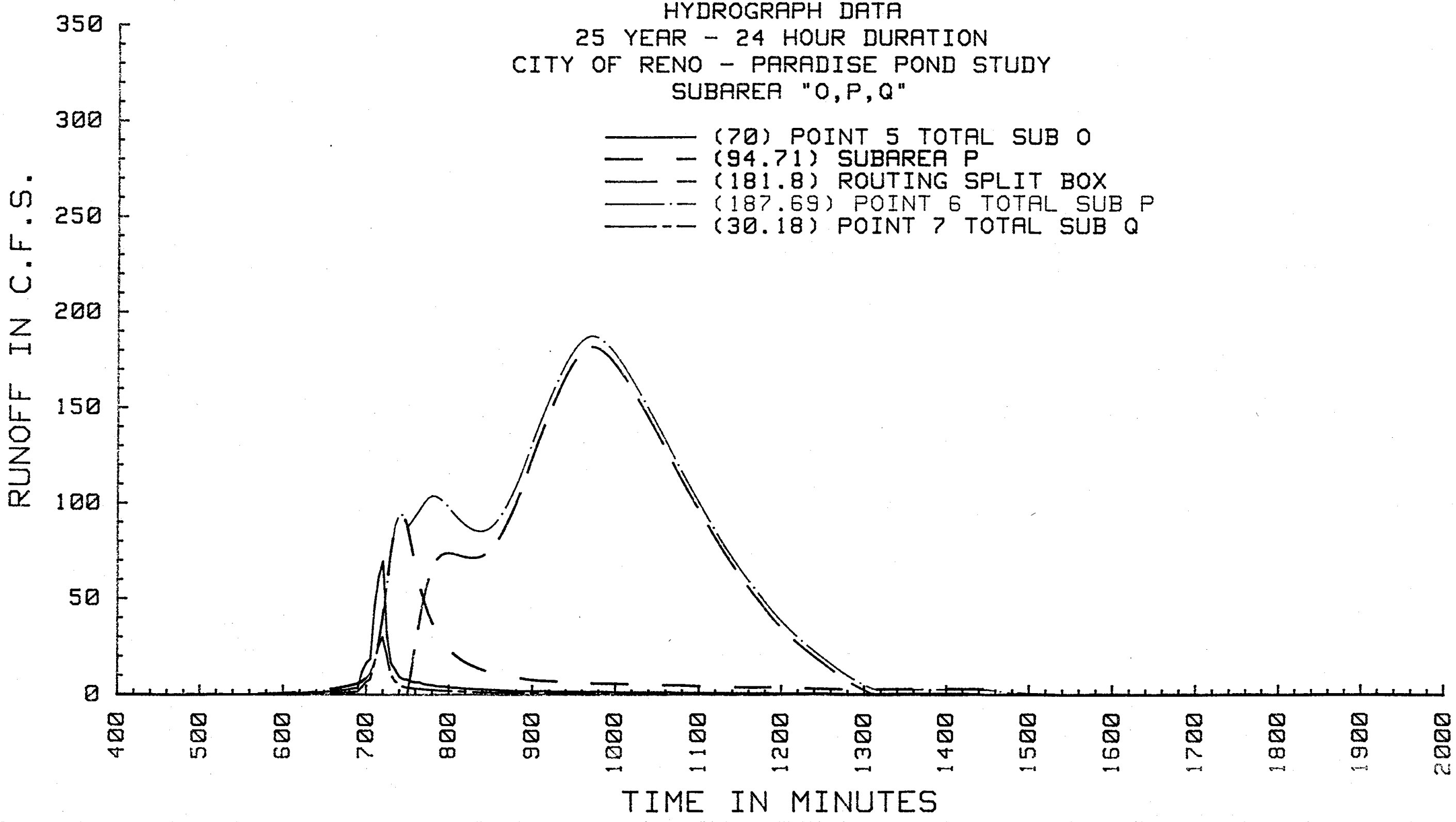


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (48.79) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (60.72) POINT 1 TOTAL FREEWAY

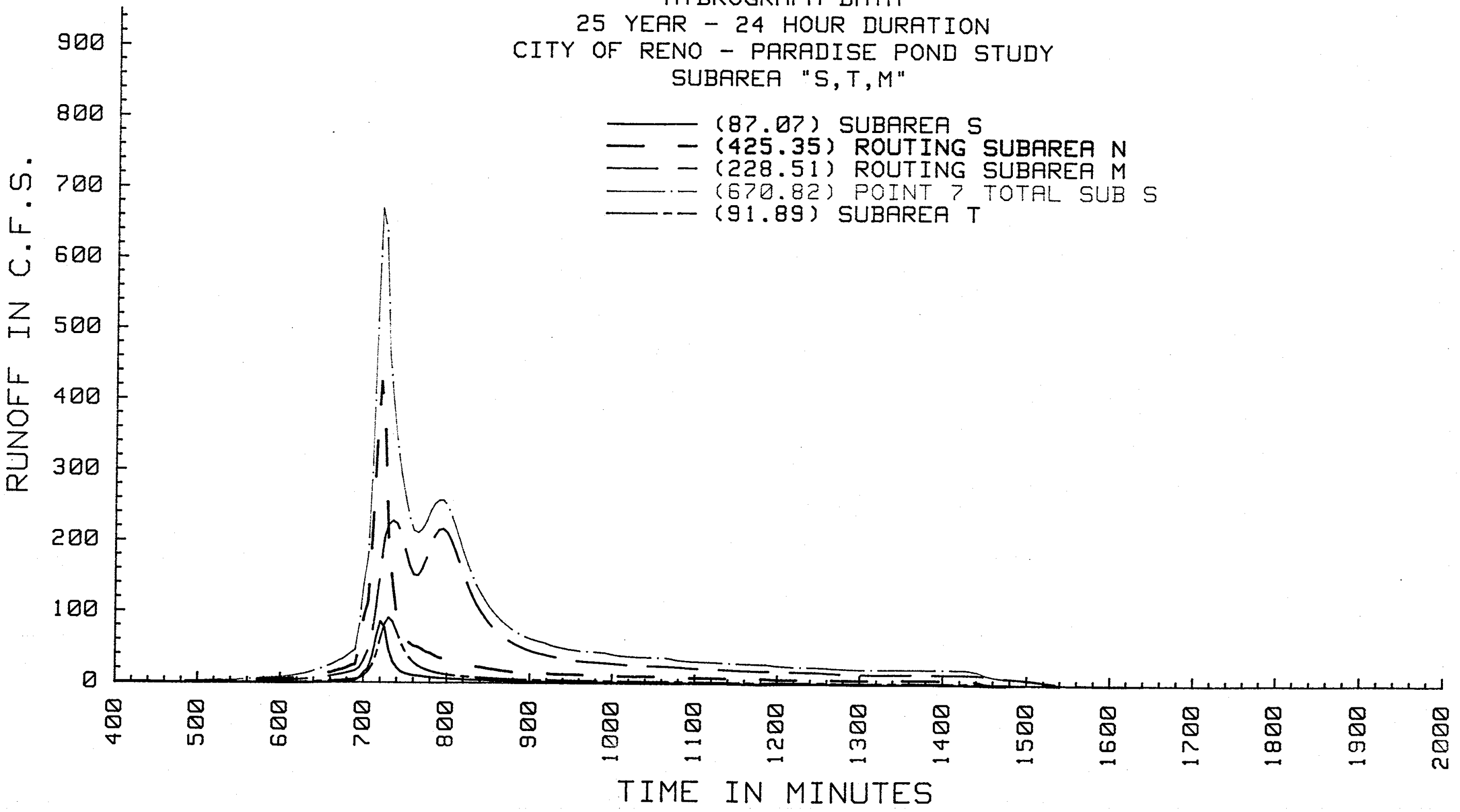


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

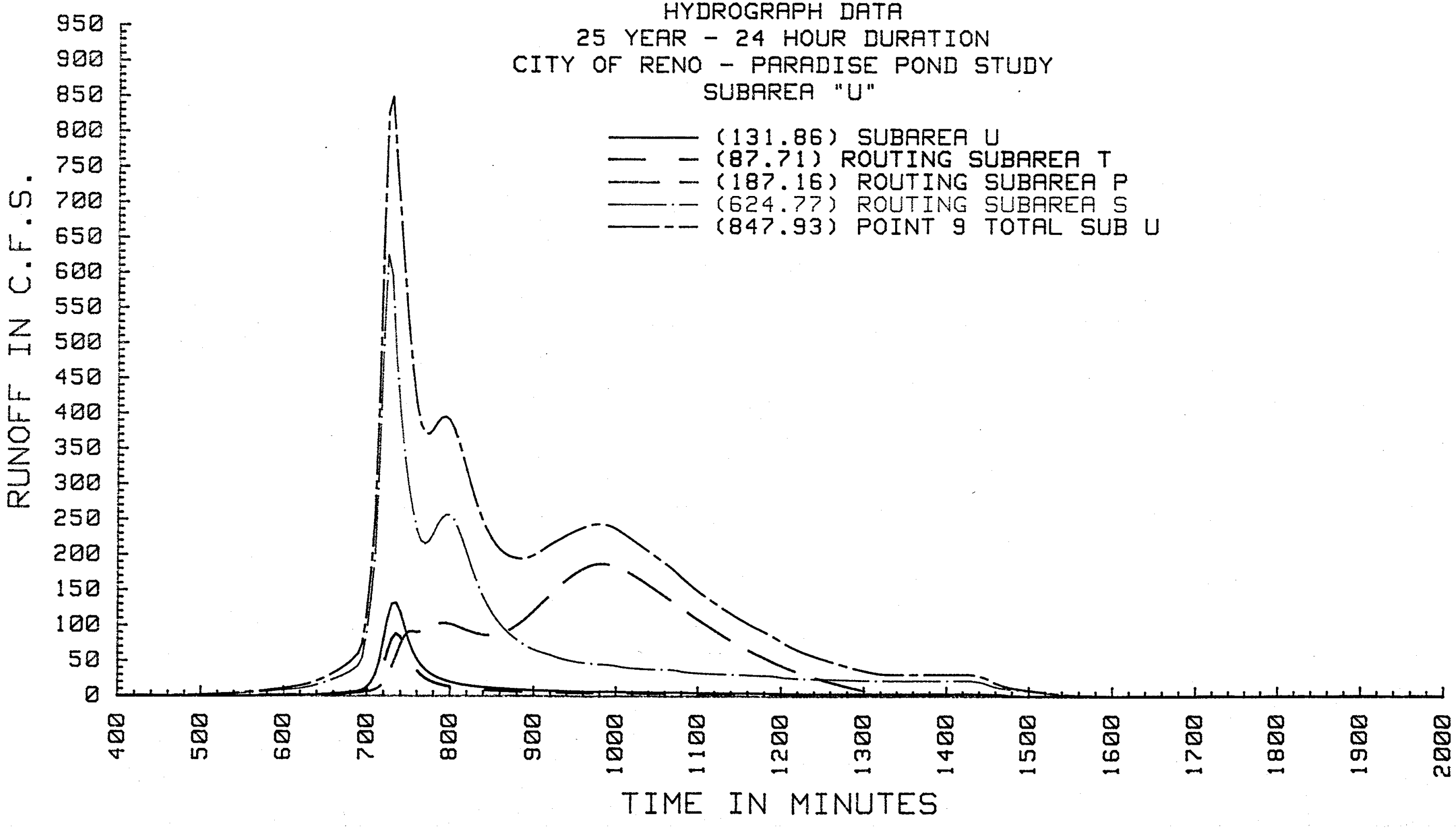


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

——— (87.07) SUBAREA S
— — (425.35) ROUTING SUBAREA N
— — (228.51) ROUTING SUBAREA M
——·— (670.82) POINT 7 TOTAL SUB S
——·· (91.89) SUBAREA T

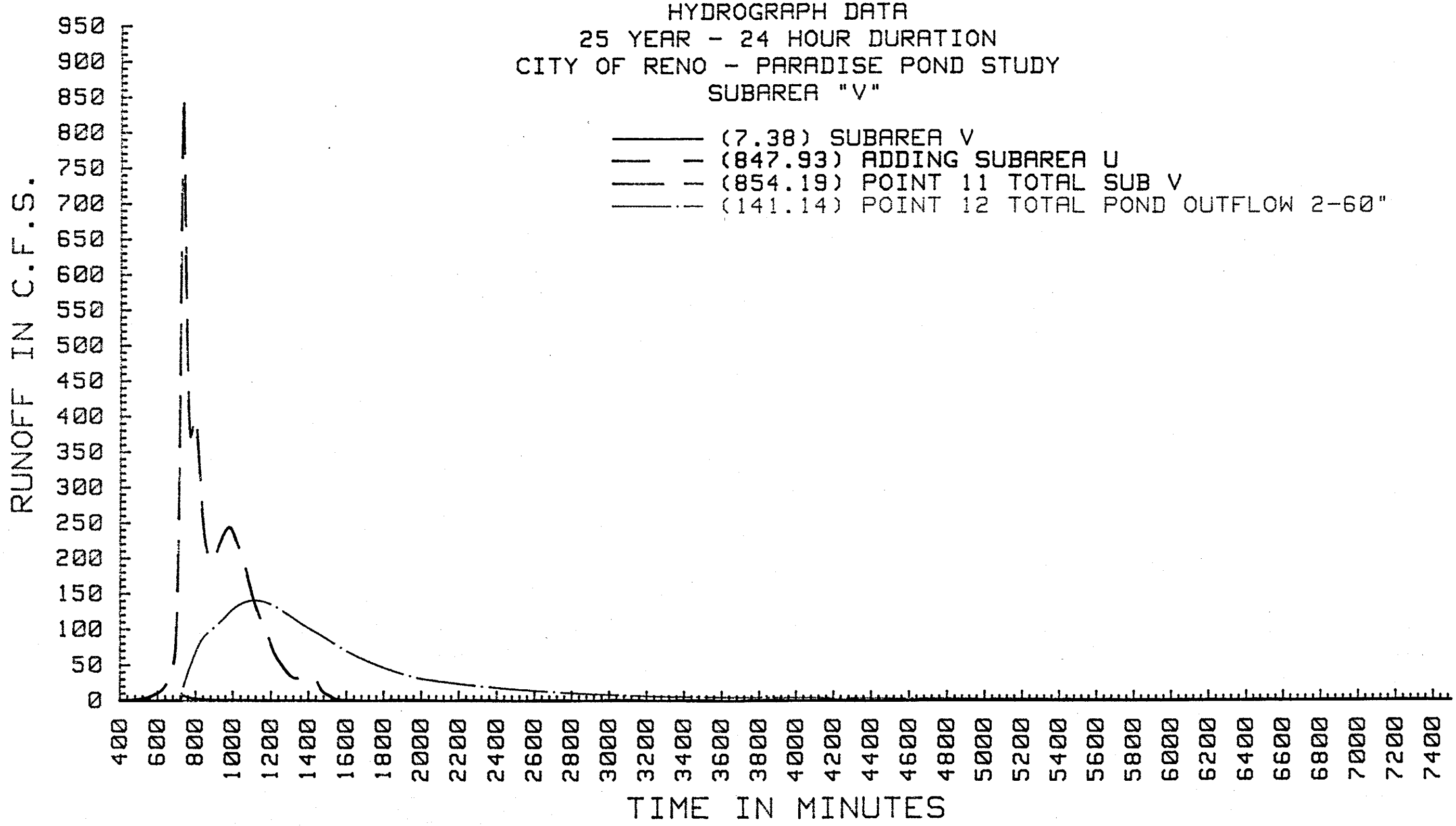


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"

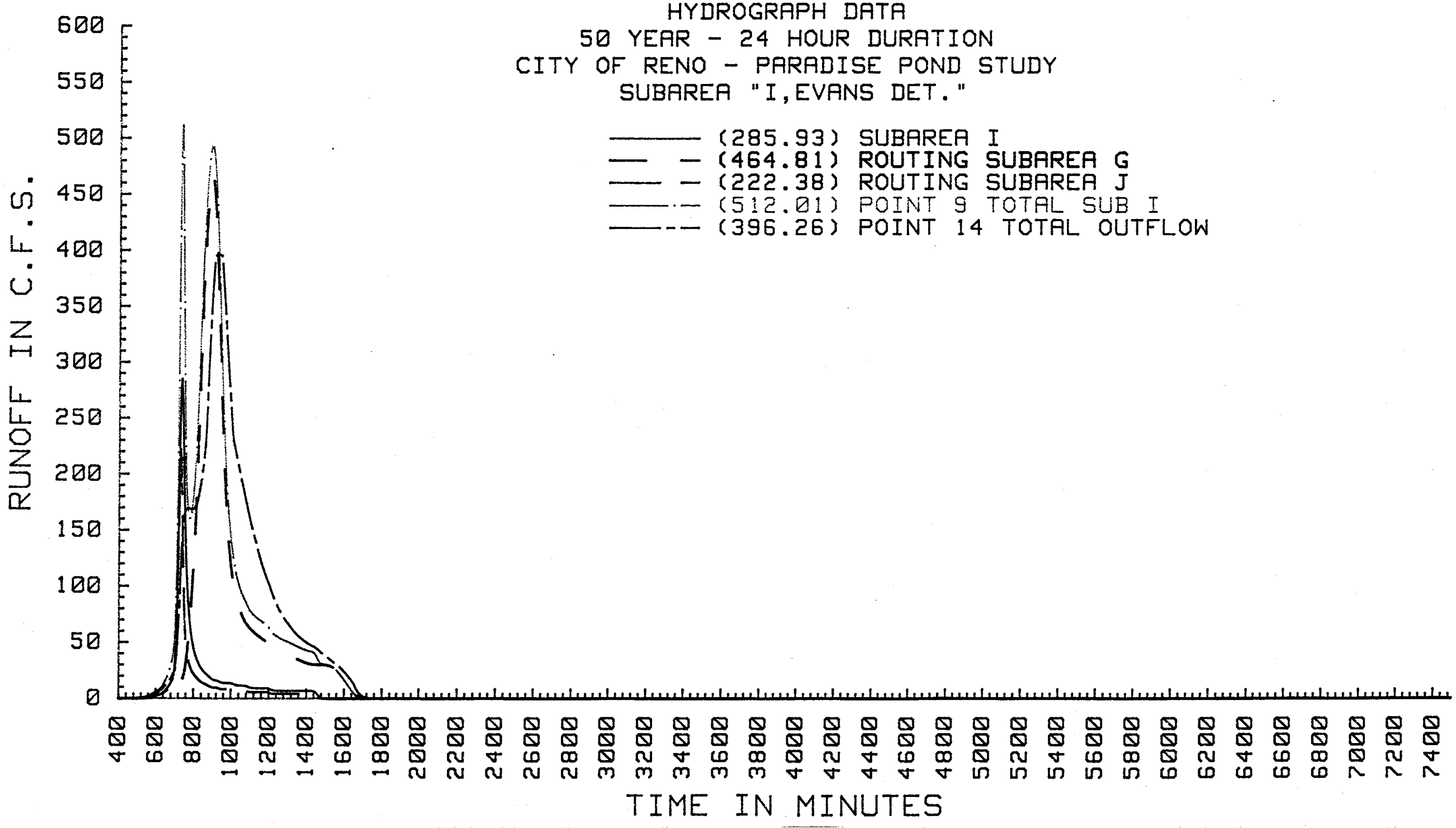


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

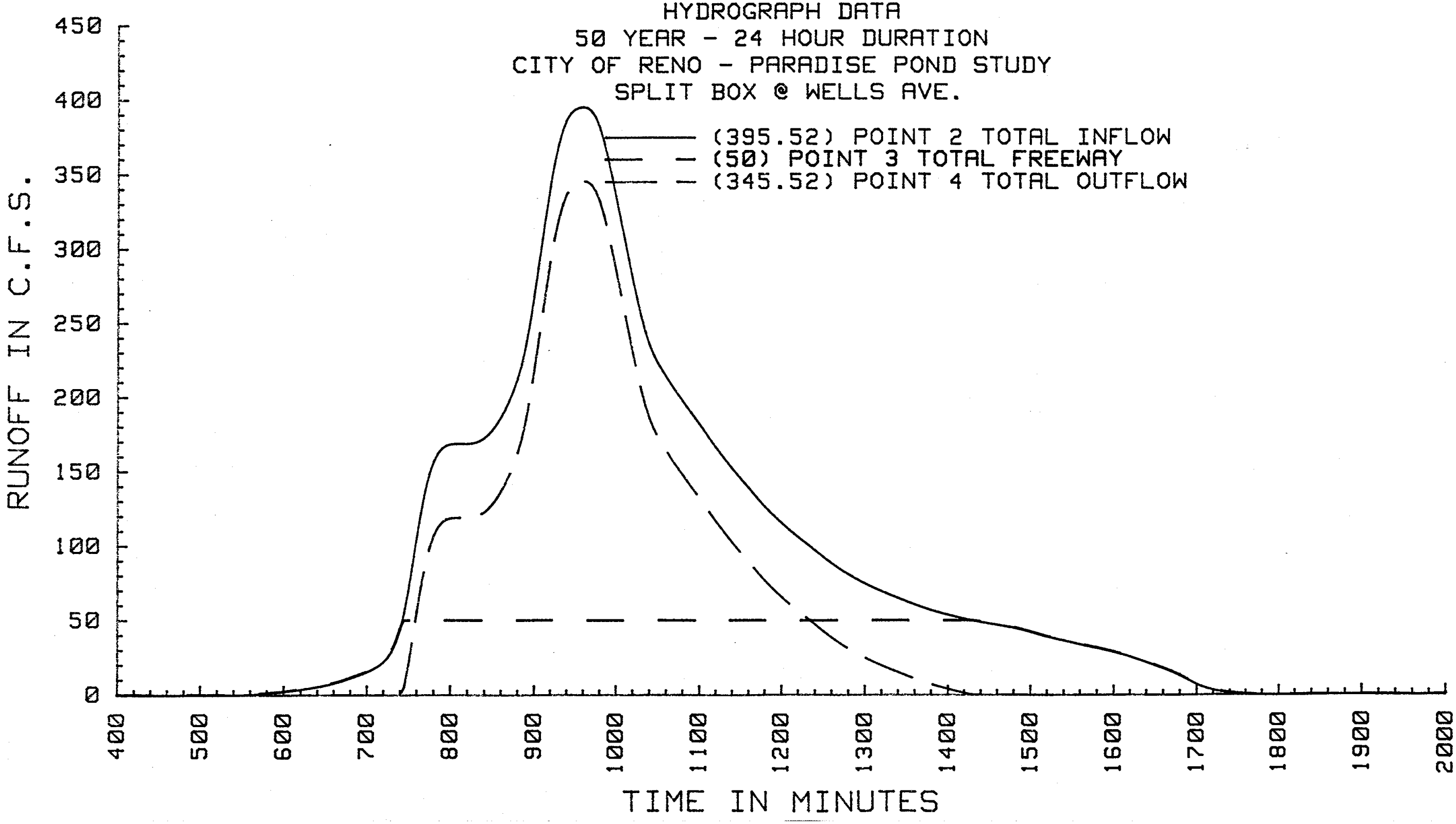
——— (7.38) SUBAREA V
— — (847.93) ADDING SUBAREA U
— — (854.19) POINT 11 TOTAL SUB V
—·— (141.14) POINT 12 TOTAL POND OUTFLOW 2-60"



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

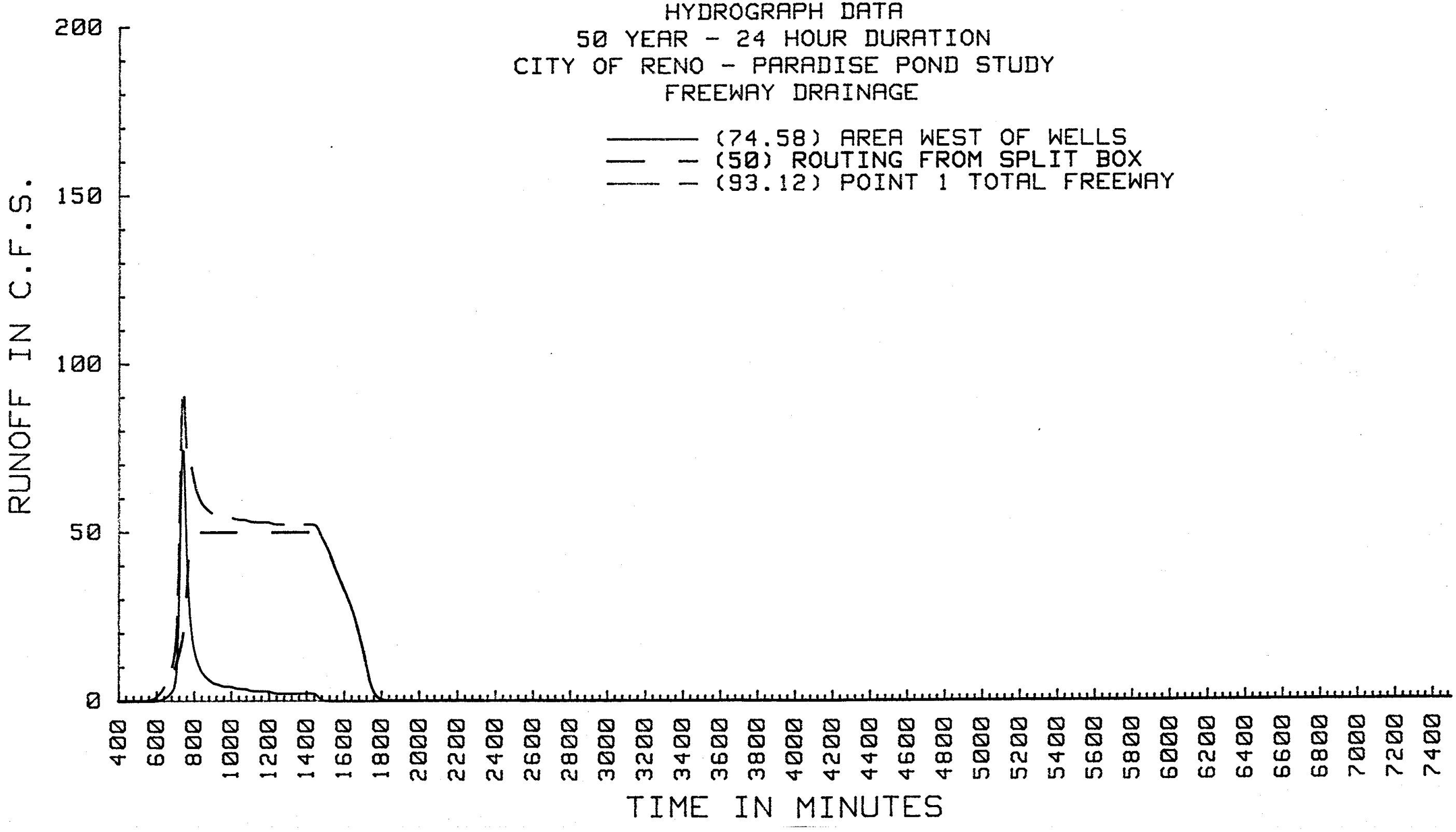


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

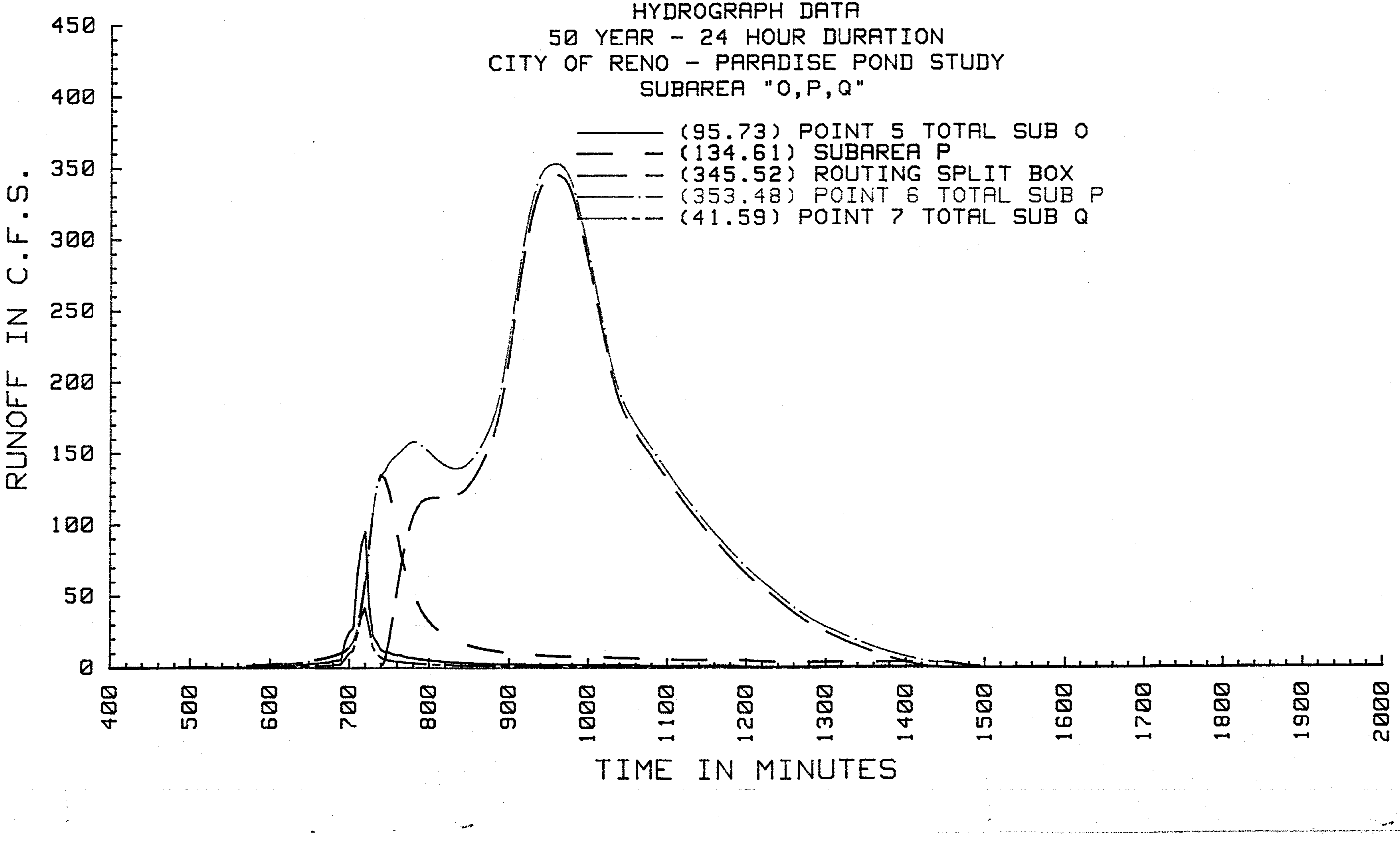


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

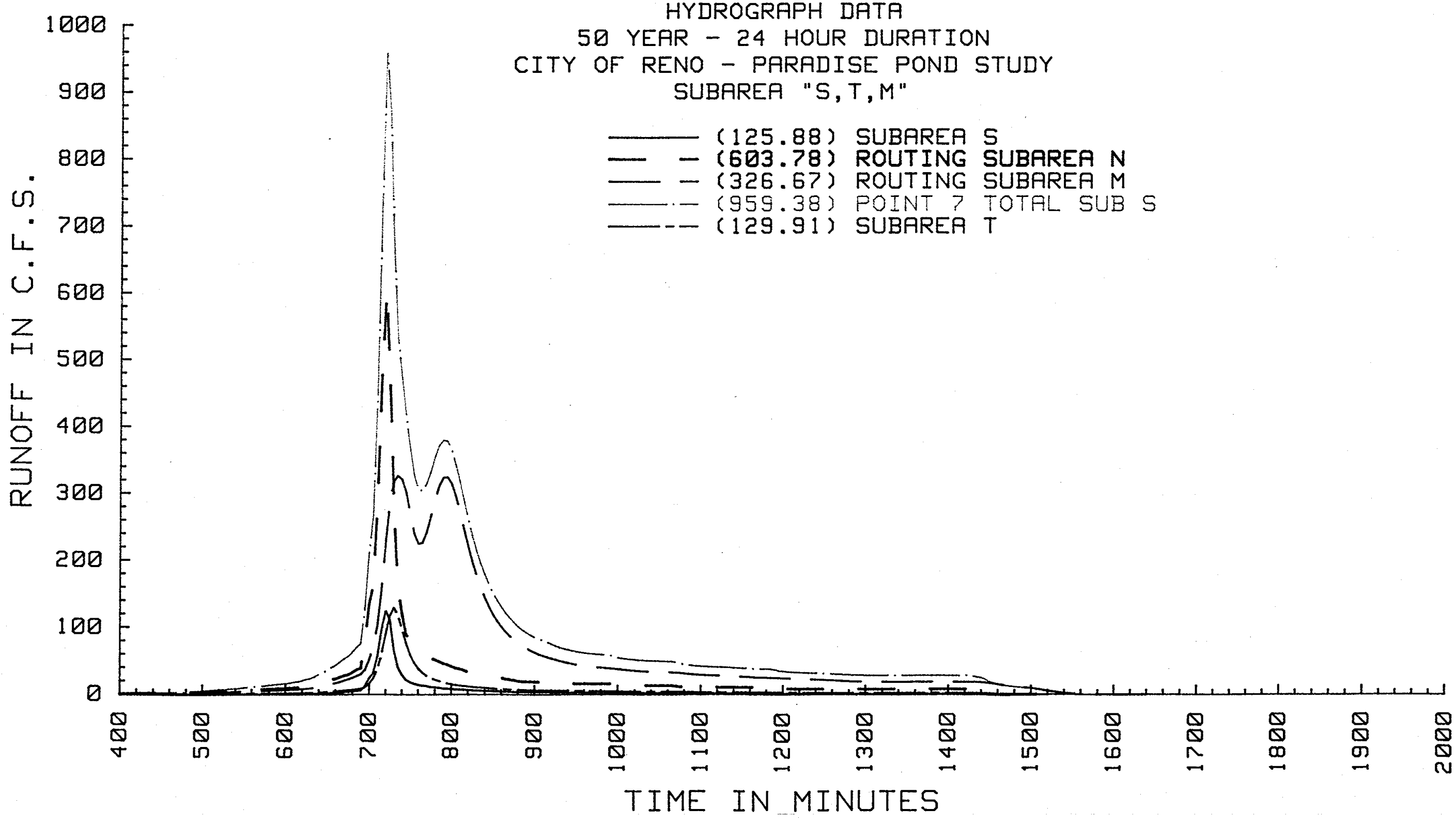
——— (74.58) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (93.12) POINT 1 TOTAL FREEWAY



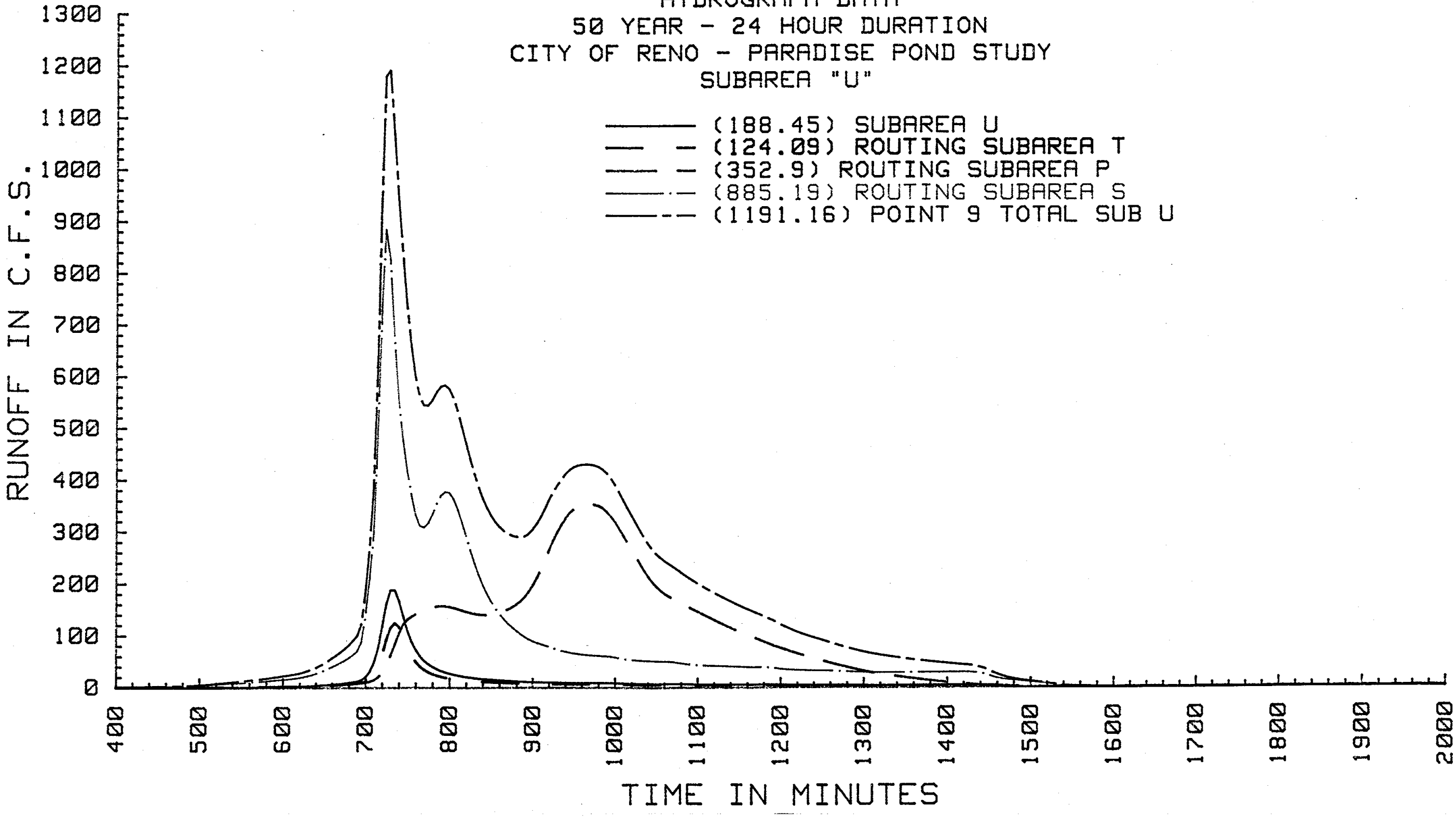
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

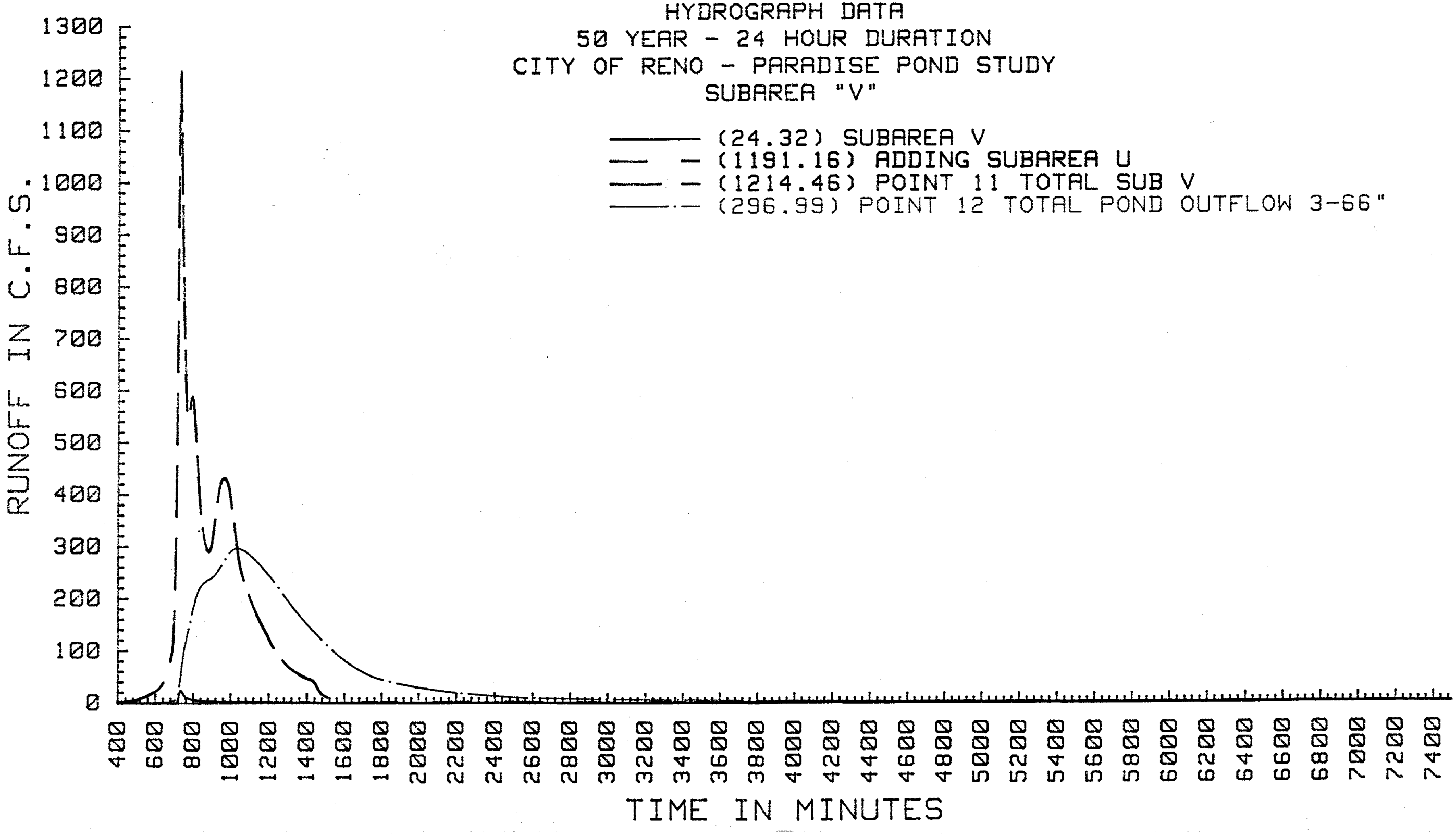


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"

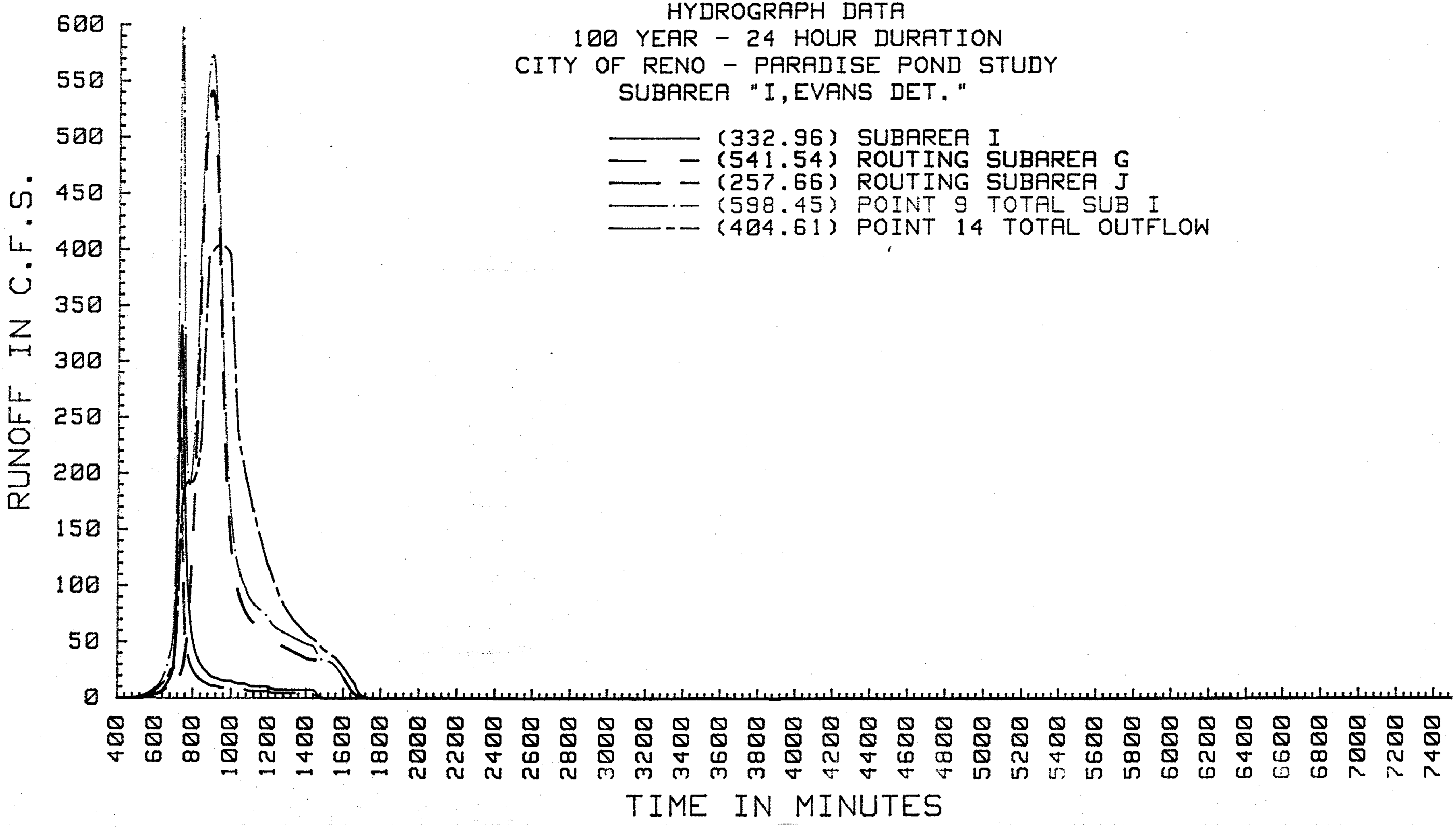


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

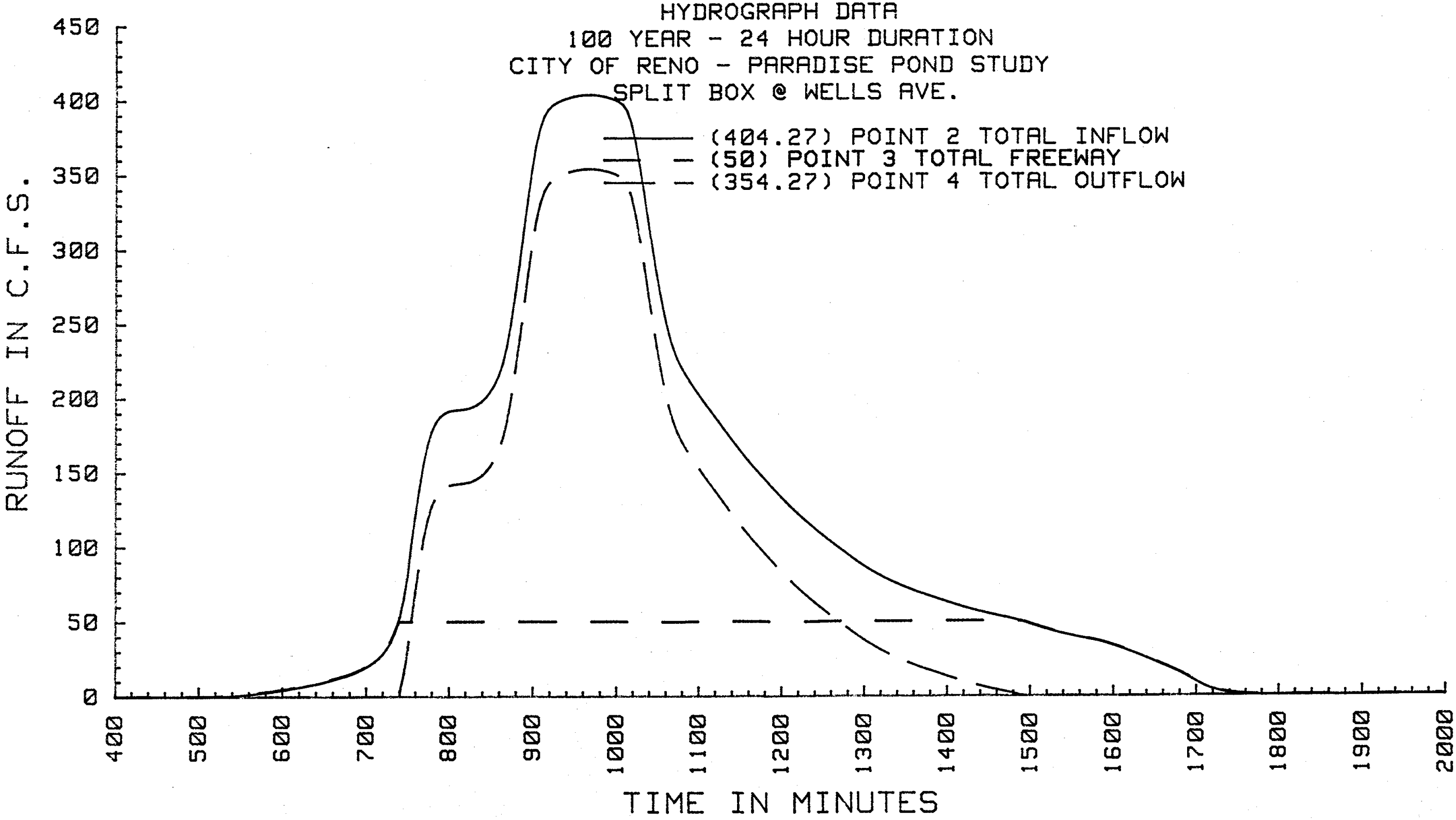
——— (24.32) SUBAREA V
— — (1191.16) ADDING SUBAREA U
——— — (1214.46) POINT 11 TOTAL SUB V
———·— (296.99) POINT 12 TOTAL POND OUTFLOW 3-66"



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

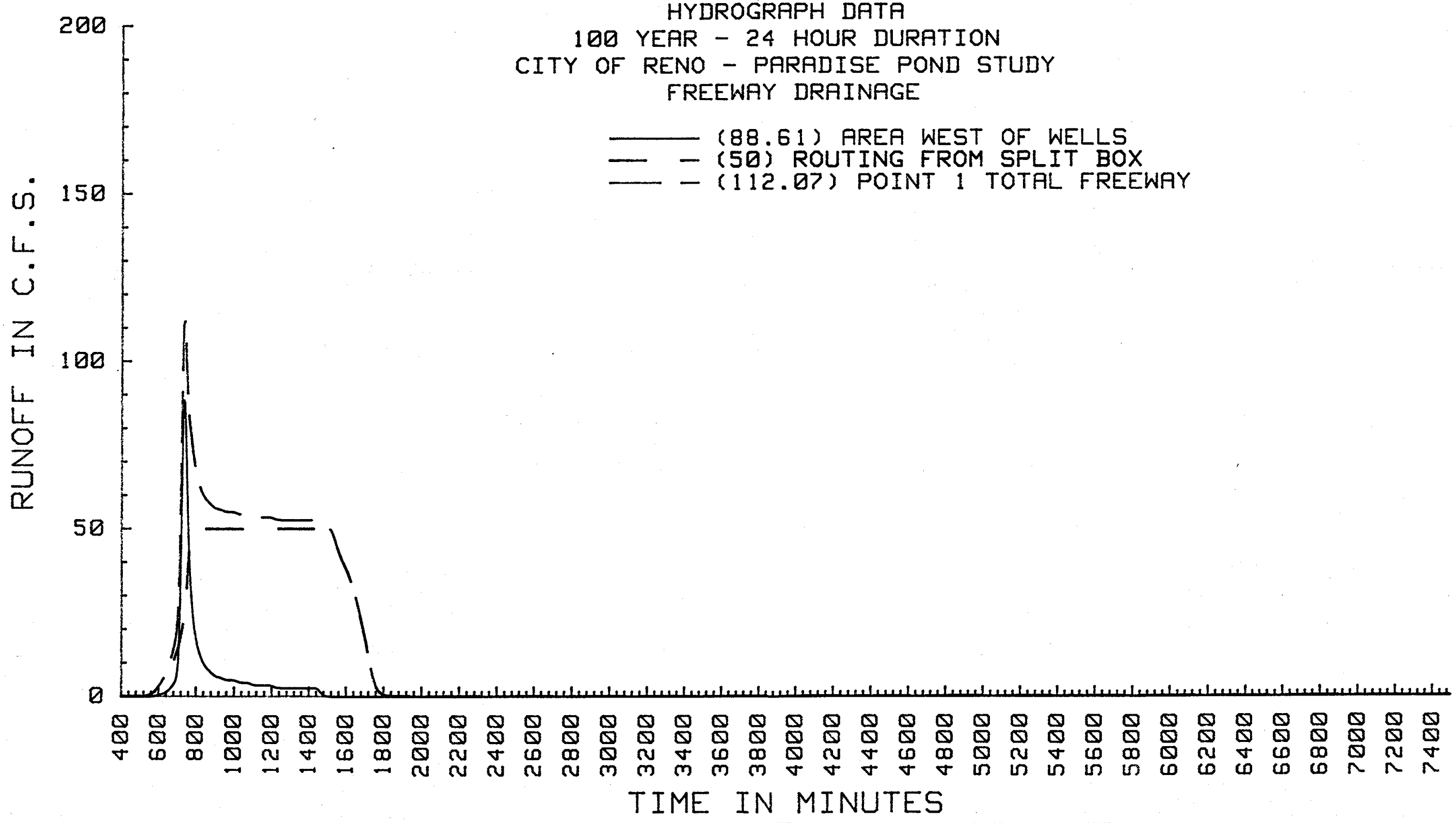


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

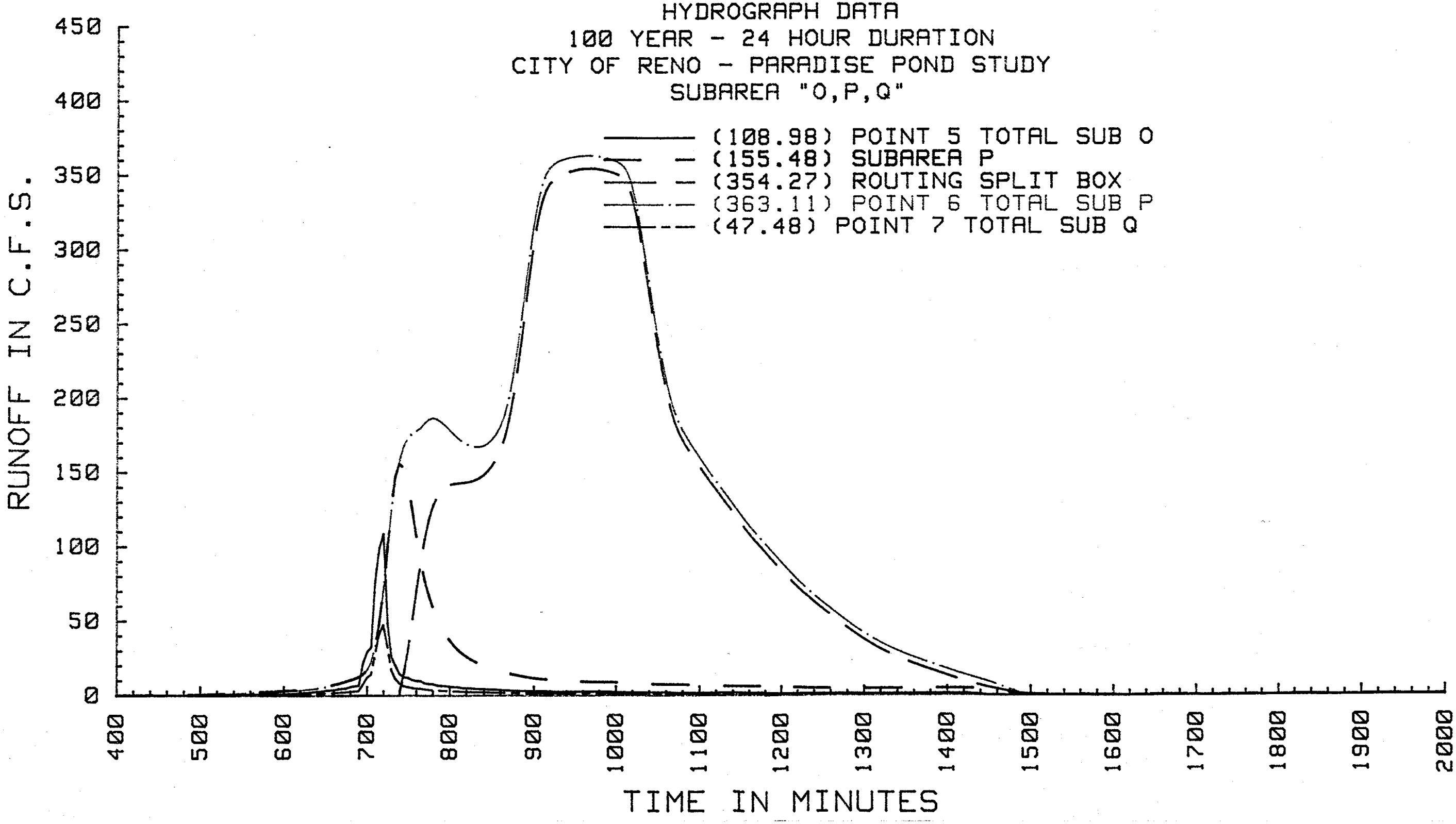


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

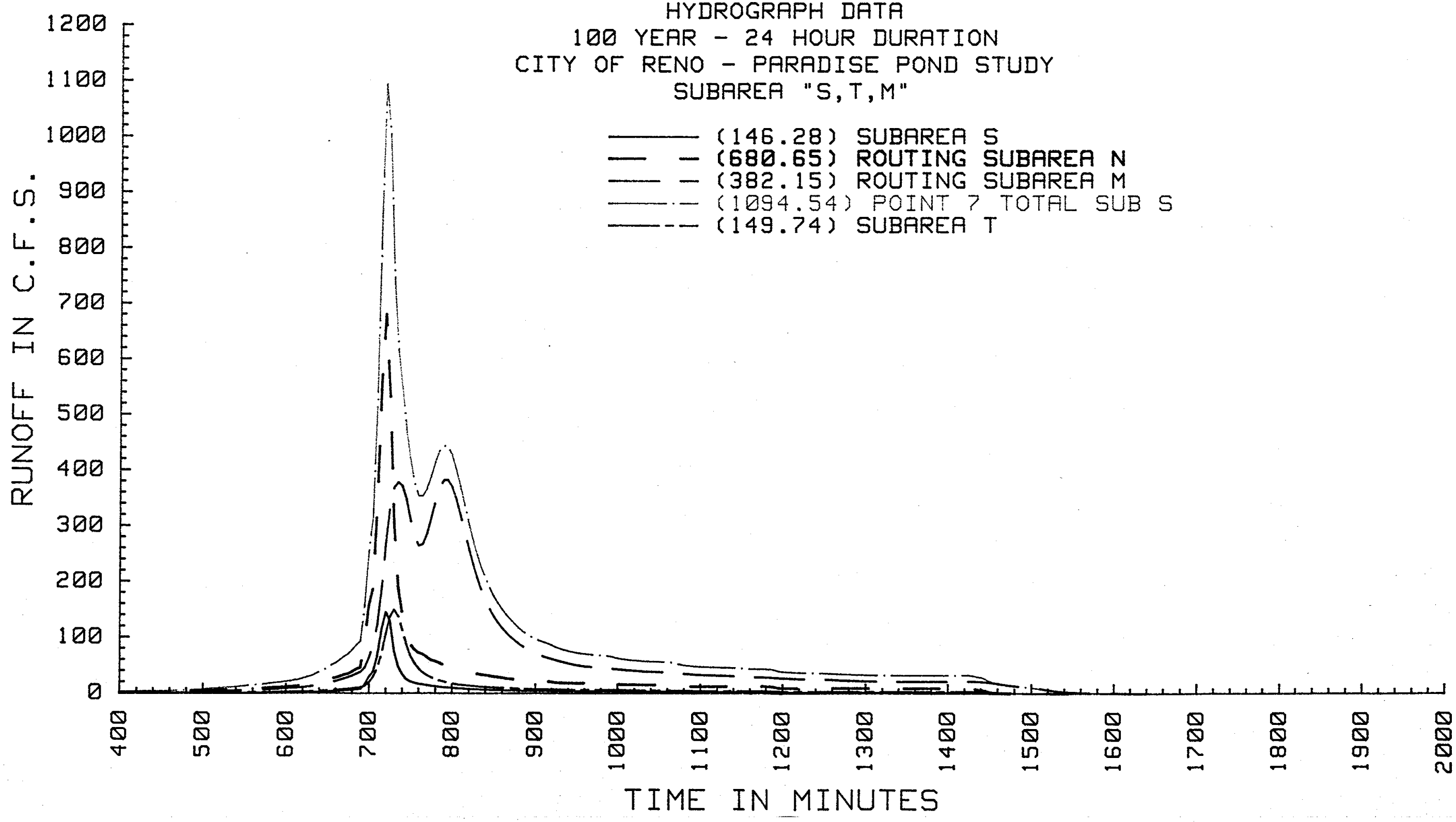
——— (88.61) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (112.07) POINT 1 TOTAL FREEWAY



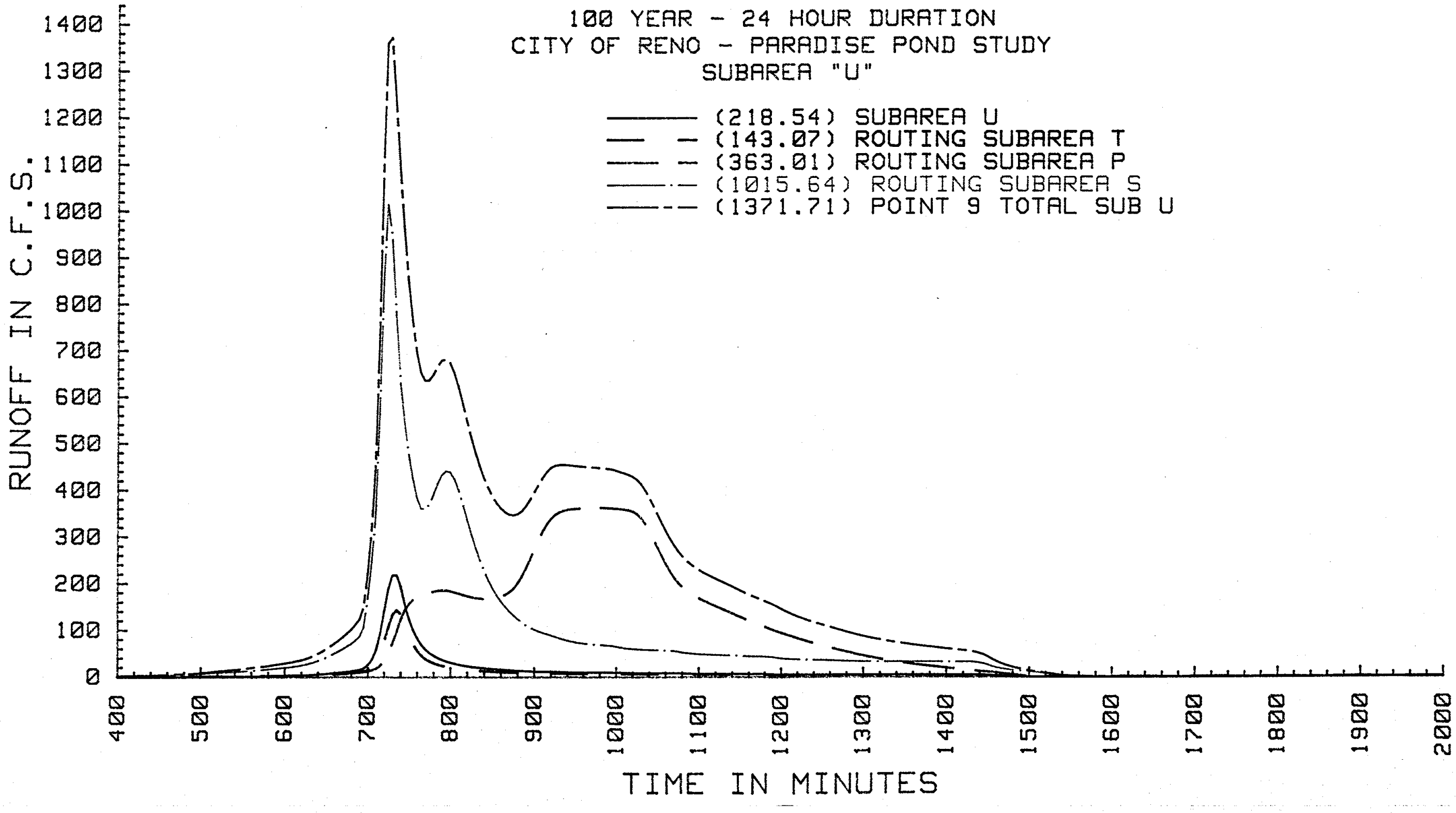
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



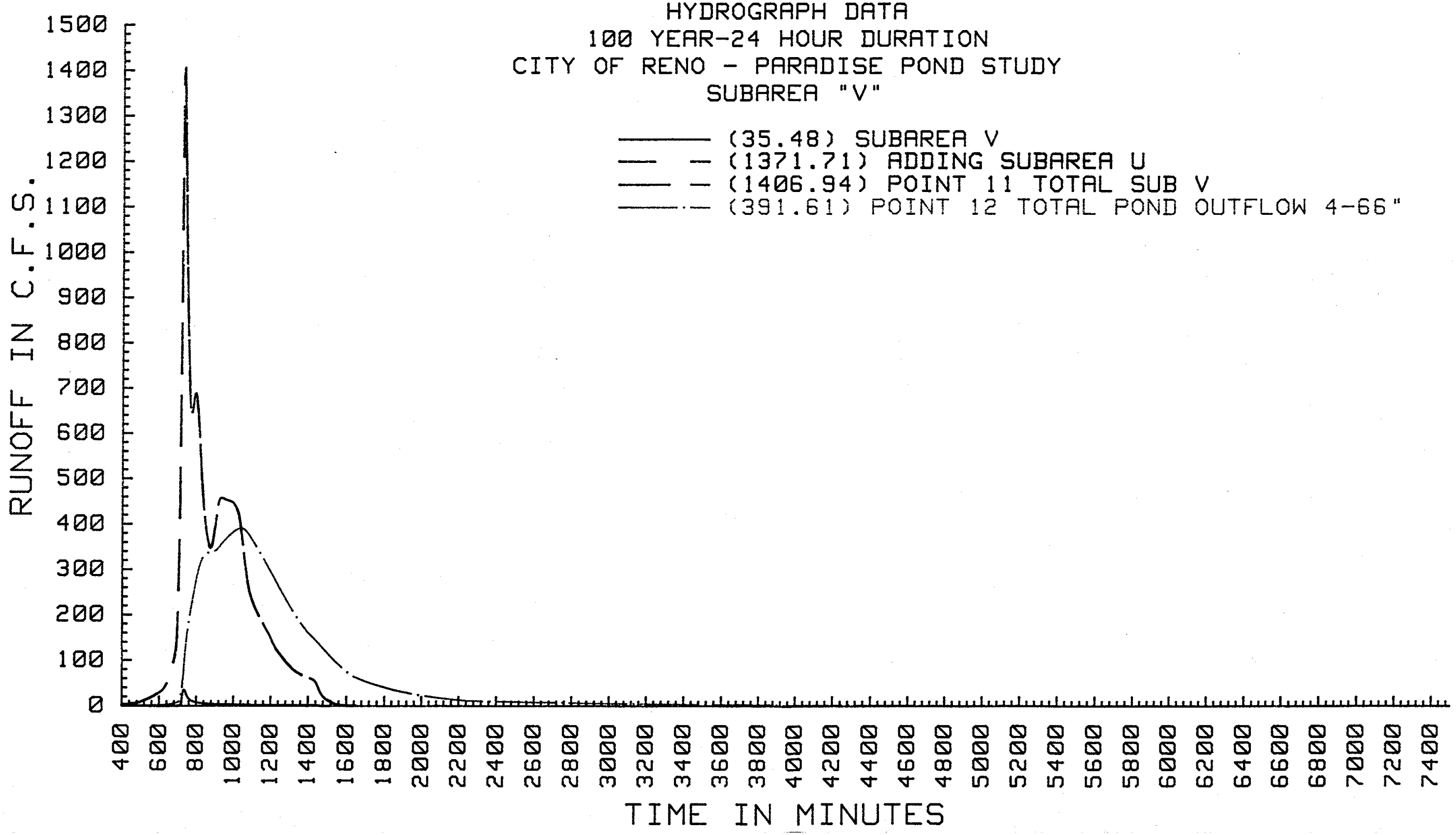
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



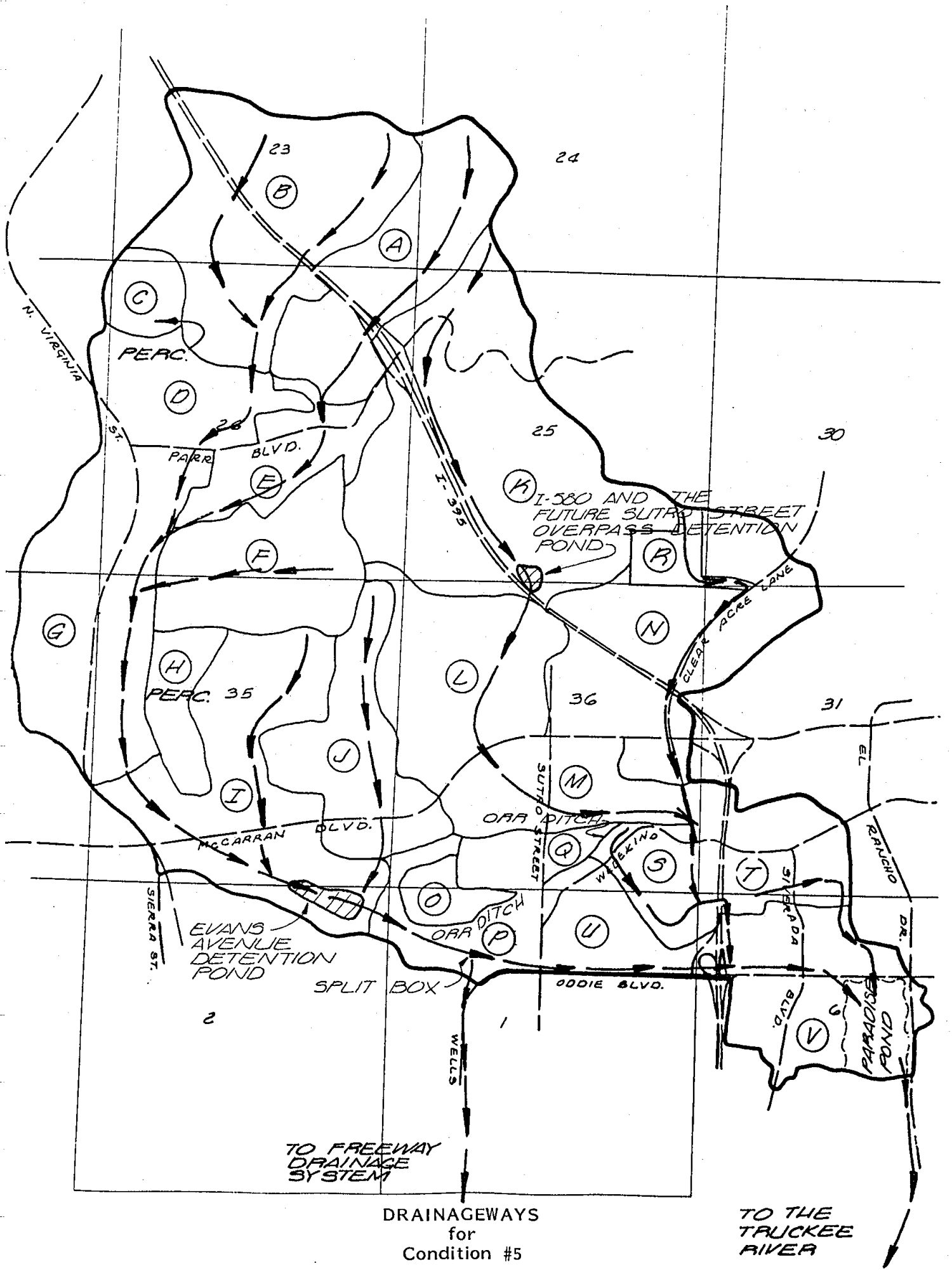
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



HYDROGRAPH DATA
100 YEAR-24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



APPENDIX "F"



DRAINAGEWAYS
for
Condition #5

NOTE:

For Subareas A through J, N and R reference tables and graphs in Appendix "B".

TABLE 11

CONDITION NO. 5 WITH 3- AND 6-HOUR DURATION STORMS

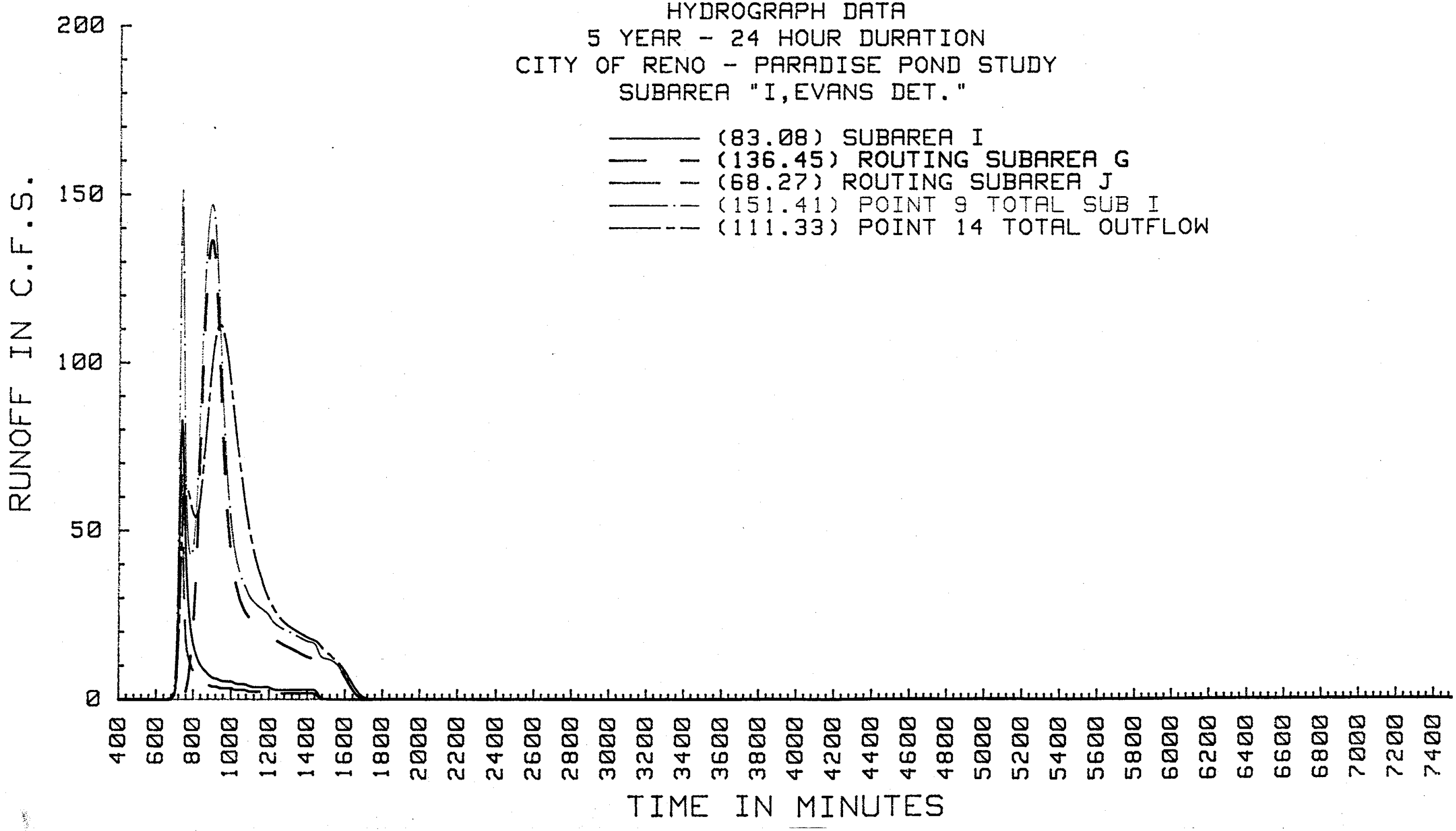
Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
Evans	16.97 cfs @ 0.5 ac.ft.	52.15 cfs @ 3.0 ac.ft.	79.85 cfs @ 5.6 ac.ft.	117.59 cfs @ 10.1 ac.ft.
Split Box	16.88 cfs @ 320 min.	51.89 cfs @ 310 min.	79.49 cfs @ 310 min.	117.11 cfs @ 310 min.
Freeway	16.88 cfs @ 320 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.
K	0.98 cfs @ 150 min. w/0.5 ac.ft.	4.92 cfs @ 110 min. w/2.5 ac.ft.	8.54 cfs @ 95 min. w/4.3 ac.ft.	13.94 cfs @ 85 min. w/7.0 ac.ft.
L	5.92 cfs @ 80 min.	18.82 cfs @ 55 min.	30.24 cfs @ 50 min.	47.44 cfs @ 45 min.
M	11.36 cfs @ 80 min.	32.36 cfs @ 65 min.	50.74 cfs @ 60 min.	76.61 cfs @ 60 min.
O	2.00 cfs @ 50 min.	6.40 cfs @ 30 min.	10.77 cfs @ 30 min.	16.86 cfs @ 30 min.
P	4.36 cfs @ 105 min.	12.81 cfs @ 80 min.	29.50 cfs @ 310 min.	67.12 cfs @ 310 min.
Q	0.91 cfs @ 55 min.	2.85 cfs @ 35 min.	4.64 cfs @ 35 min.	7.19 cfs @ 30 min.
S	28.05 cfs @ 75 min.	77.51 cfs @ 55 min.	116.99 cfs @ 50 min.	173.57 cfs @ 50 min.
T	3.29 cfs @ 85 min.	10.27 cfs @ 60 min.	16.47 cfs @ 55 min.	25.56 cfs @ 55 min.
U	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.07 cfs @ 60 min.	253.75 cfs @ 60 min.
V	37.96 cfs @ 85 min.	107.36 cfs @ 65 min.	168.07 cfs @ 60 min.	253.75 cfs @ 60 min.
Paradise Pond Outlet One 30-inch pipe:				
	0.67 cfs @ 85 min. w/6.6ac.ft.	2.22 cfs @ 65 min. w/18.7ac.ft.	5.83 cfs @ 60 min. w/32.3ac.ft.	11.80 cfs @ 60 min. w/55.7ac.ft.

TABLE 11 - (con't)

CONDITION NO. 5 WITH 3- AND 6-HOUR DURATION STORMS

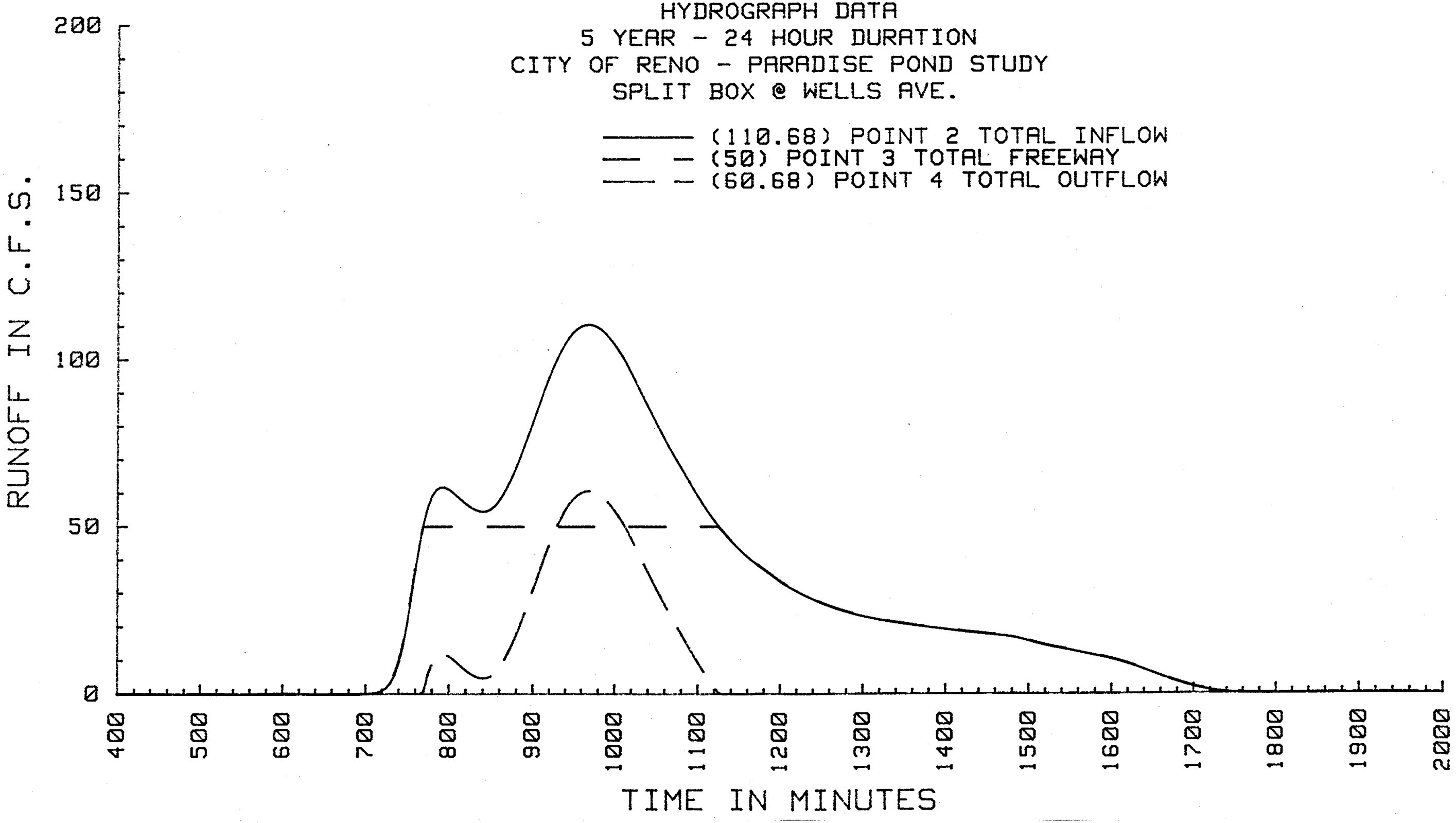
Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
Evans	35.98 cfs @ 1.6 ac.ft.	80.69 cfs @ 5.7 ac.ft.	111.20 cfs @ 9.2 ac.ft.	173.98 cfs @ 18.3 ac.ft.
Split Box	35.63 cfs @ 410 min.	80.18 cfs @ 415 min.	110.59 cfs @ 415 min.	173.09 cfs @ 415 min.
Freeway	35.63 cfs @ 410 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.
K	3.10 cfs @ 265 min. w/1.6 ac.ft.	8.87 cfs @ 185 min. w/4.4 ac.ft.	13.12 cfs @ 180 min. w/6.6 ac.ft.	22.77 cfs @ 180 min. w/11.4 ac.ft.
L	11.97 cfs @ 160 min.	33.58 cfs @ 160 min.	48.55 cfs @ 160 min.	83.21 cfs @ 155 min.
M	20.12 cfs @ 170 min.	50.76 cfs @ 170 min.	72.47 cfs @ 165 min.	120.22 cfs @ 165 min.
O	5.15 cfs @ 150 min.	12.08 cfs @ 150 min.	16.96 cfs @ 145 min.	27.45 cfs @ 145 min.
P	7.28 cfs @ 185 min.	31.53 cfs @ 405 min.	62.31 cfs @ 405 min.	125.32 cfs @ 410 min.
Q	2.23 cfs @ 150 min.	5.48 cfs @ 150 min.	7.63 cfs @ 150 min.	12.16 cfs @ 150 min.
S	54.18 cfs @ 155 min.	129.91 cfs @ 150 min.	183.30 cfs @ 150 min.	301.32 cfs @ 150 min.
T	6.30 cfs @ 165 min.	17.52 cfs @ 165 min.	25.68 cfs @ 160 min.	43.91 cfs @ 160 min.
U	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.32 cfs @ 160 min.	415.60 cfs @ 160 min.
V	65.57 cfs @ 170 min.	168.55 cfs @ 160 min.	243.32 cfs @ 160 min.	415.60 cfs @ 160 min.
Paradise Pond Outlet One 30-inch pipe:				
	1.42 cfs @ 170 min. w/14.2ac.ft.	6.73 cfs @ 160 min. w/35.7ac.ft.	11.79 cfs @ 160 min. w/55.6ac.ft.	18.52 cfs @ 160 min. w/105.2ac.ft.

HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."



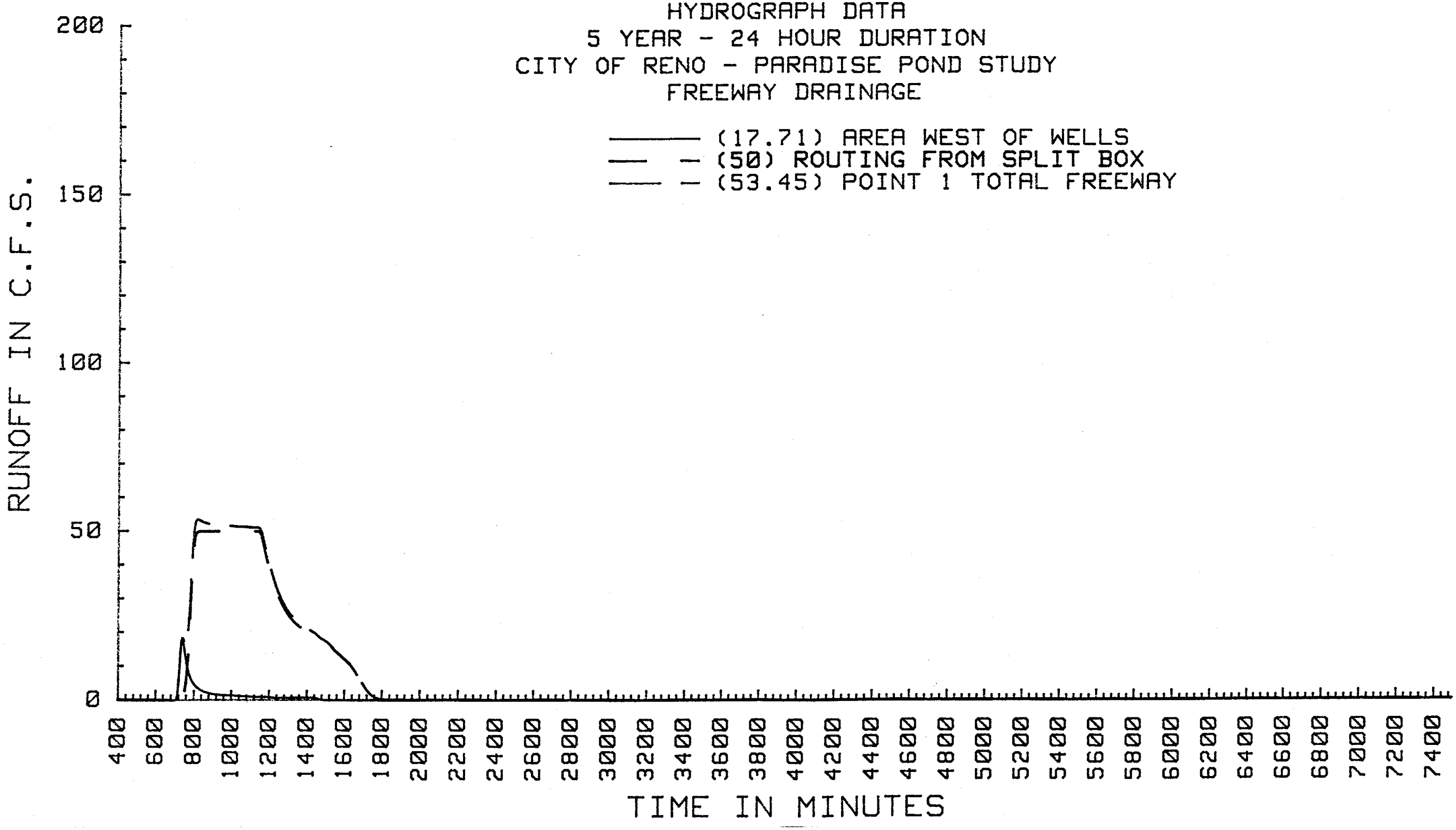
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (110.68) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (60.68) POINT 4 TOTAL OUTFLOW

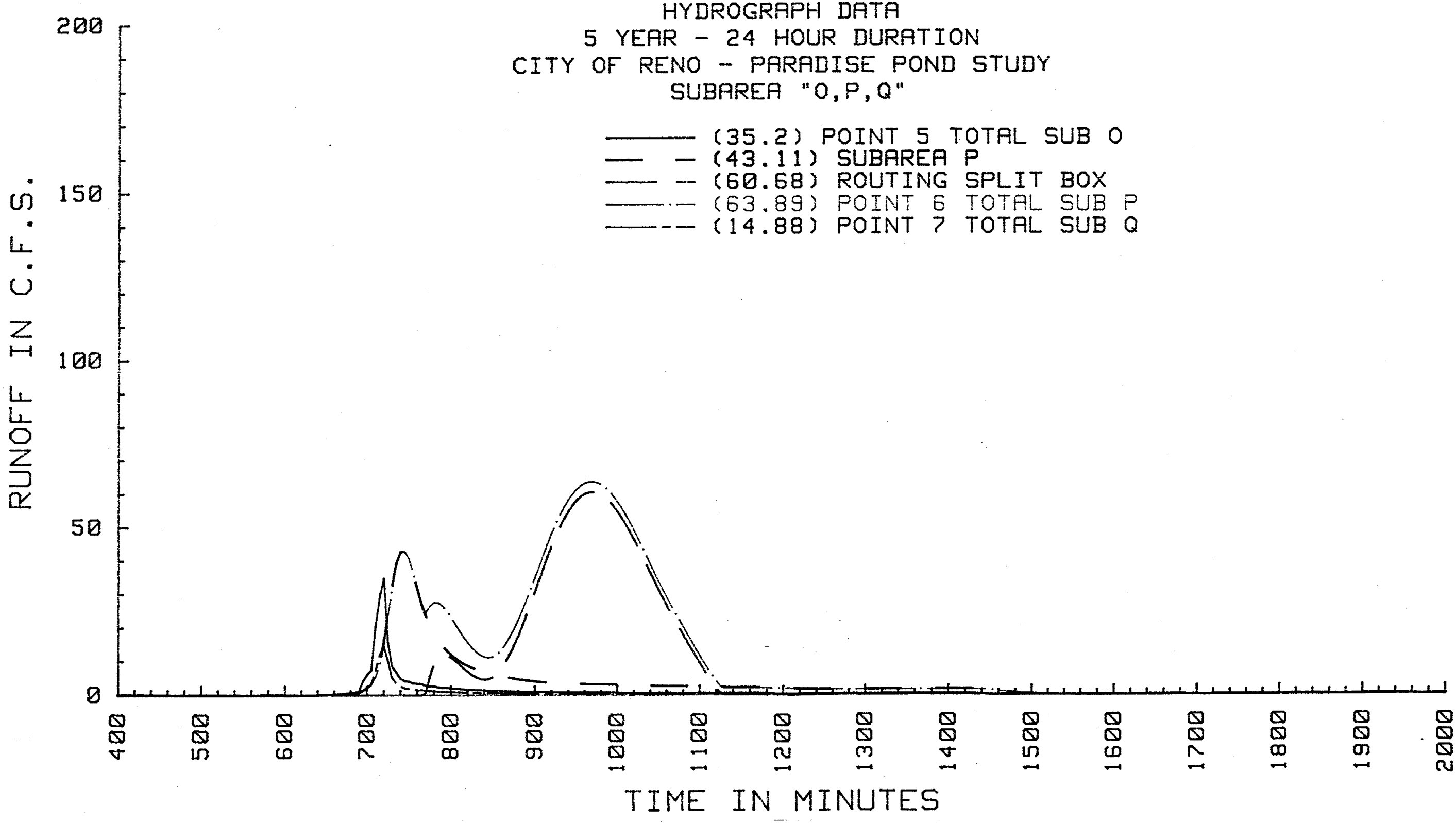


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

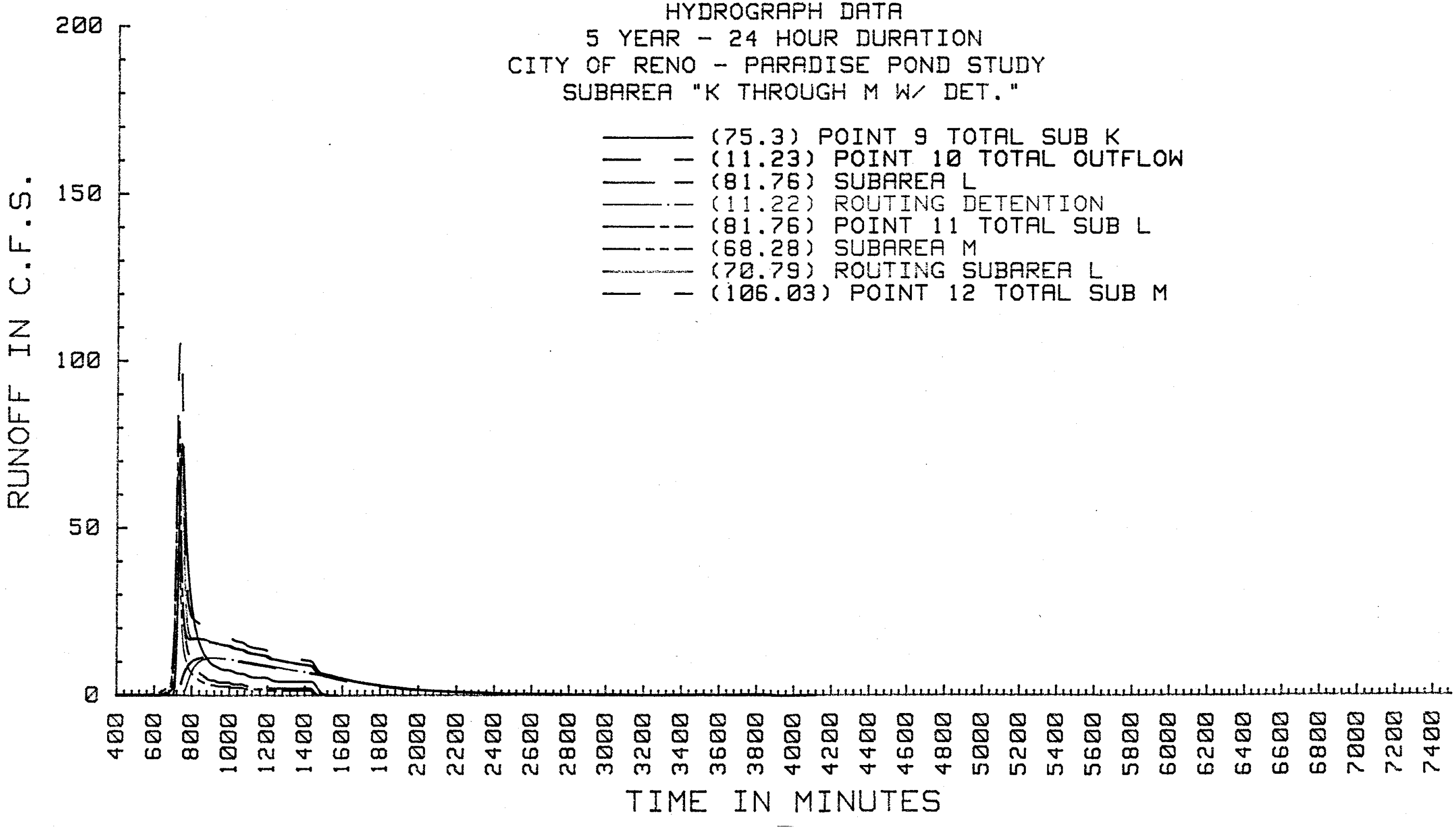
——— (17.71) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (53.45) POINT 1 TOTAL FREEWAY



HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

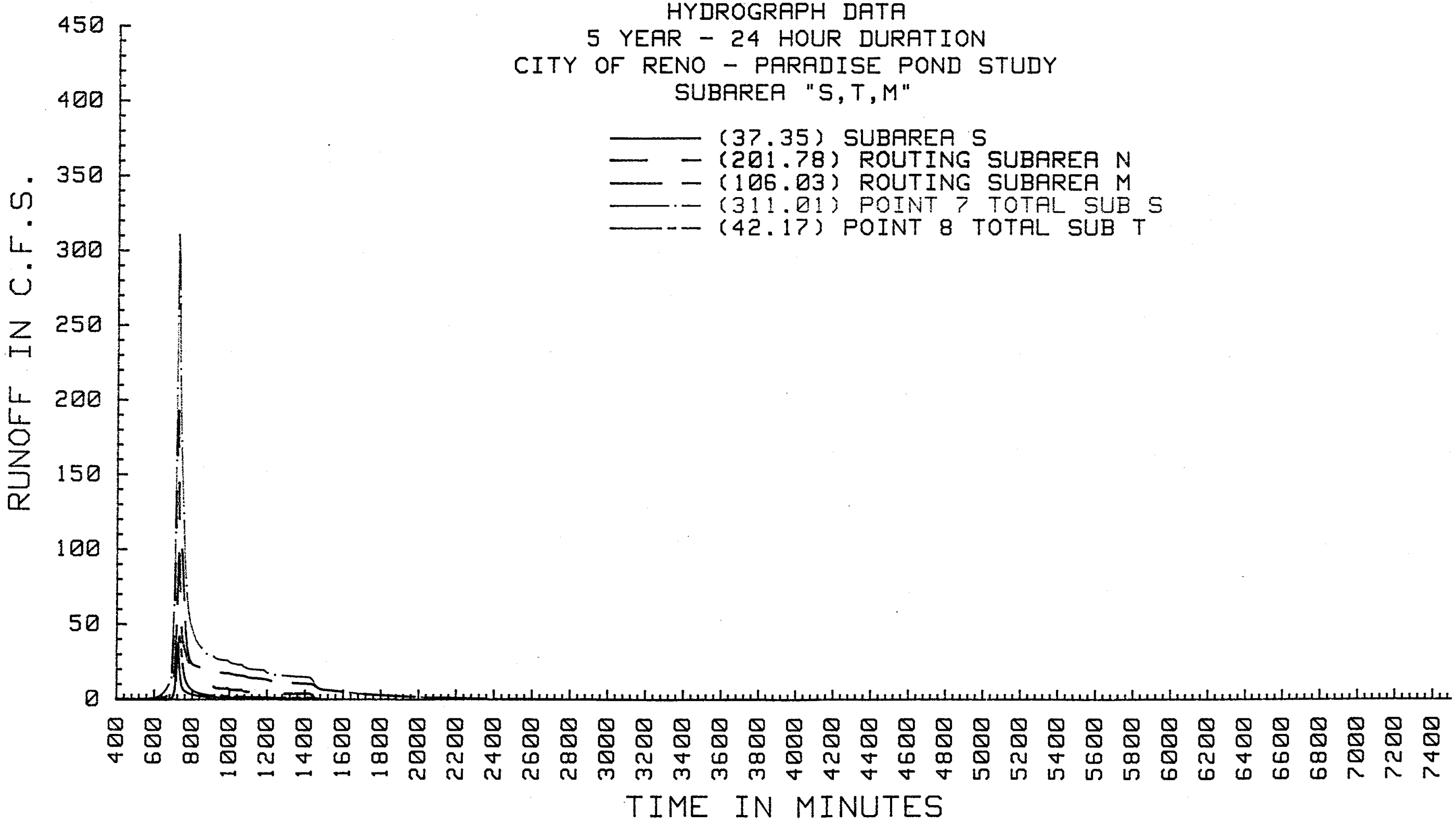


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

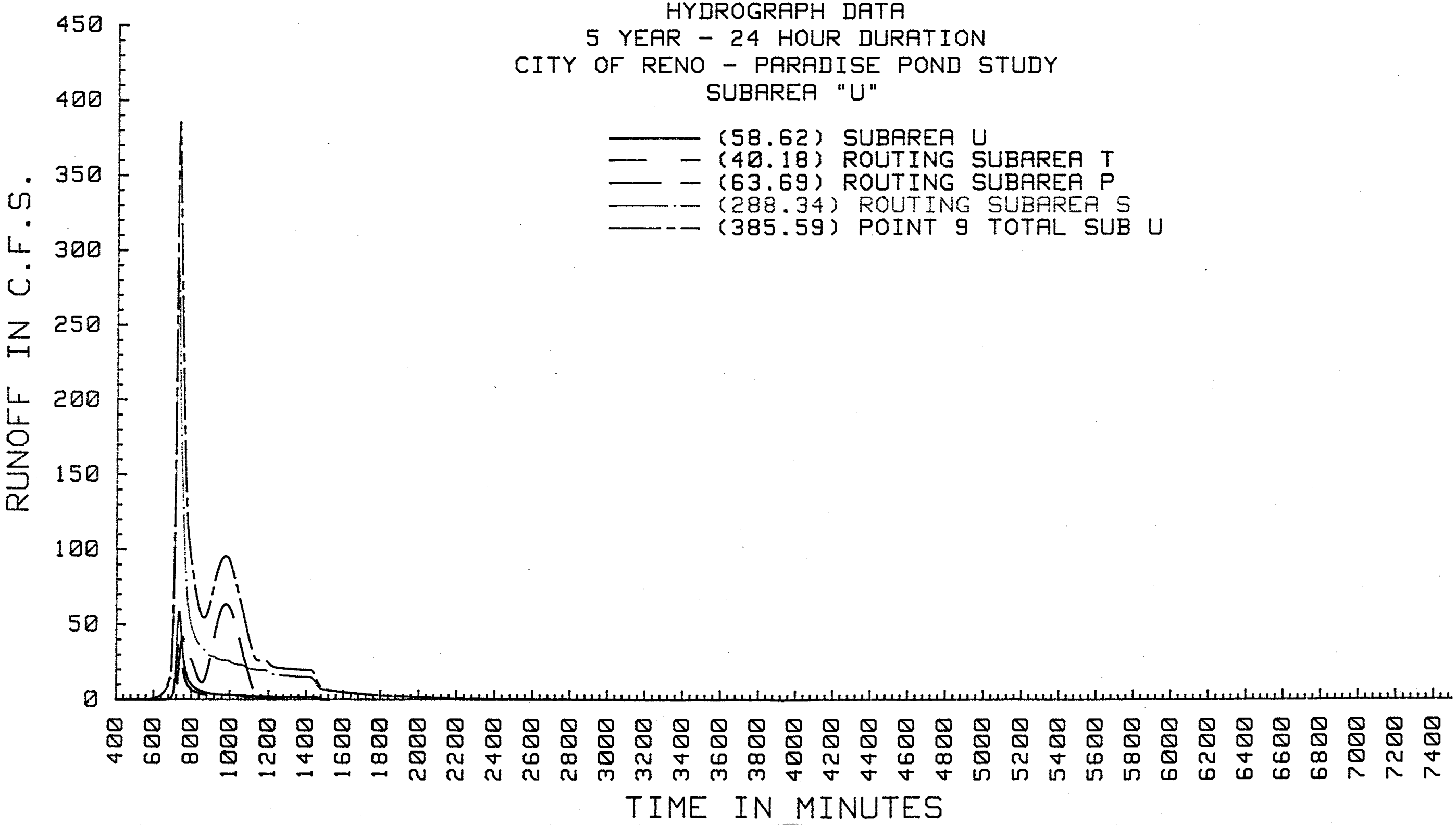


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

——— (37.35) SUBAREA S
— — (201.78) ROUTING SUBAREA N
— — (106.03) ROUTING SUBAREA M
———·— (311.01) POINT 7 TOTAL SUB S
———·· (42.17) POINT 8 TOTAL SUB T

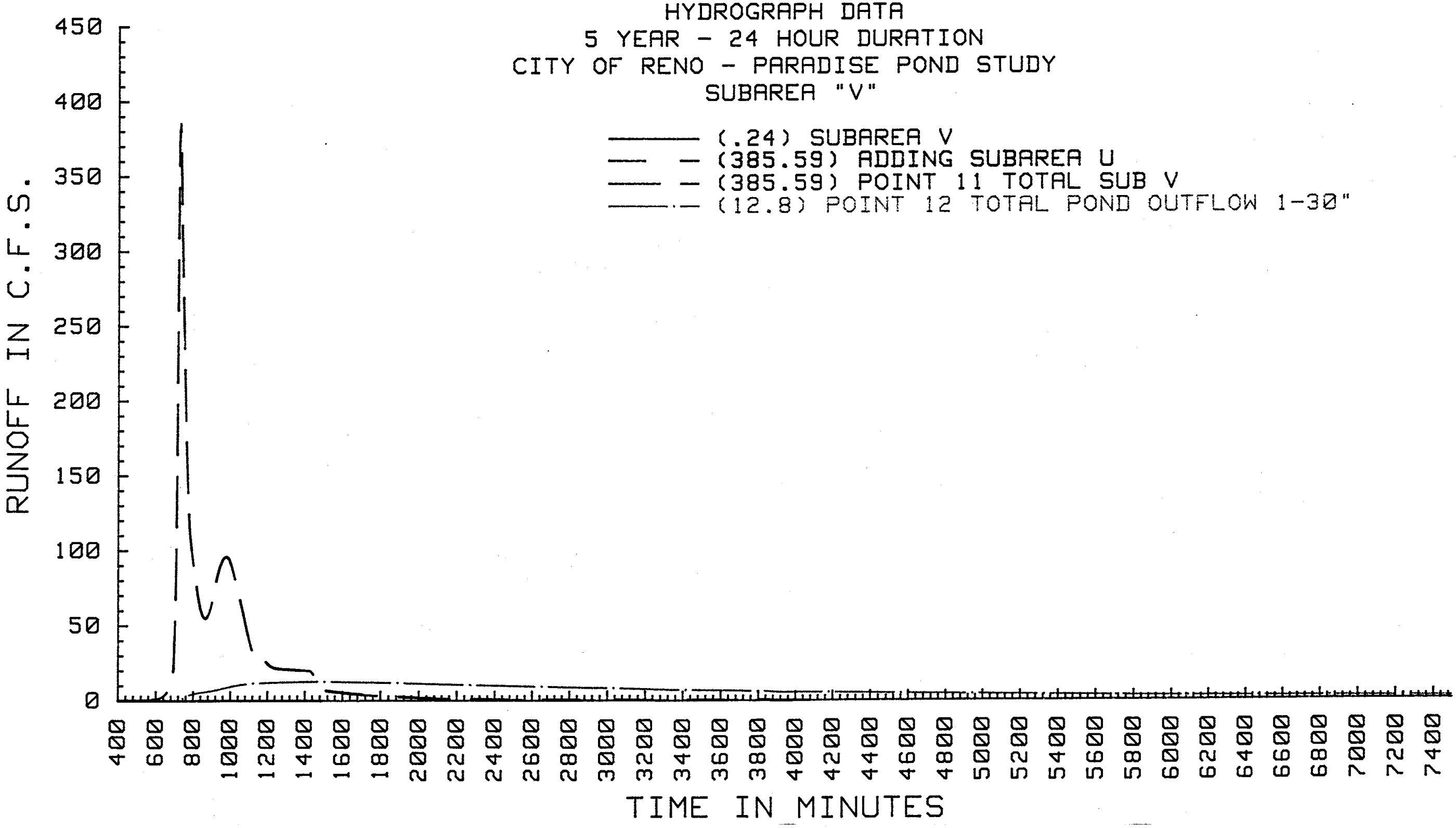


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



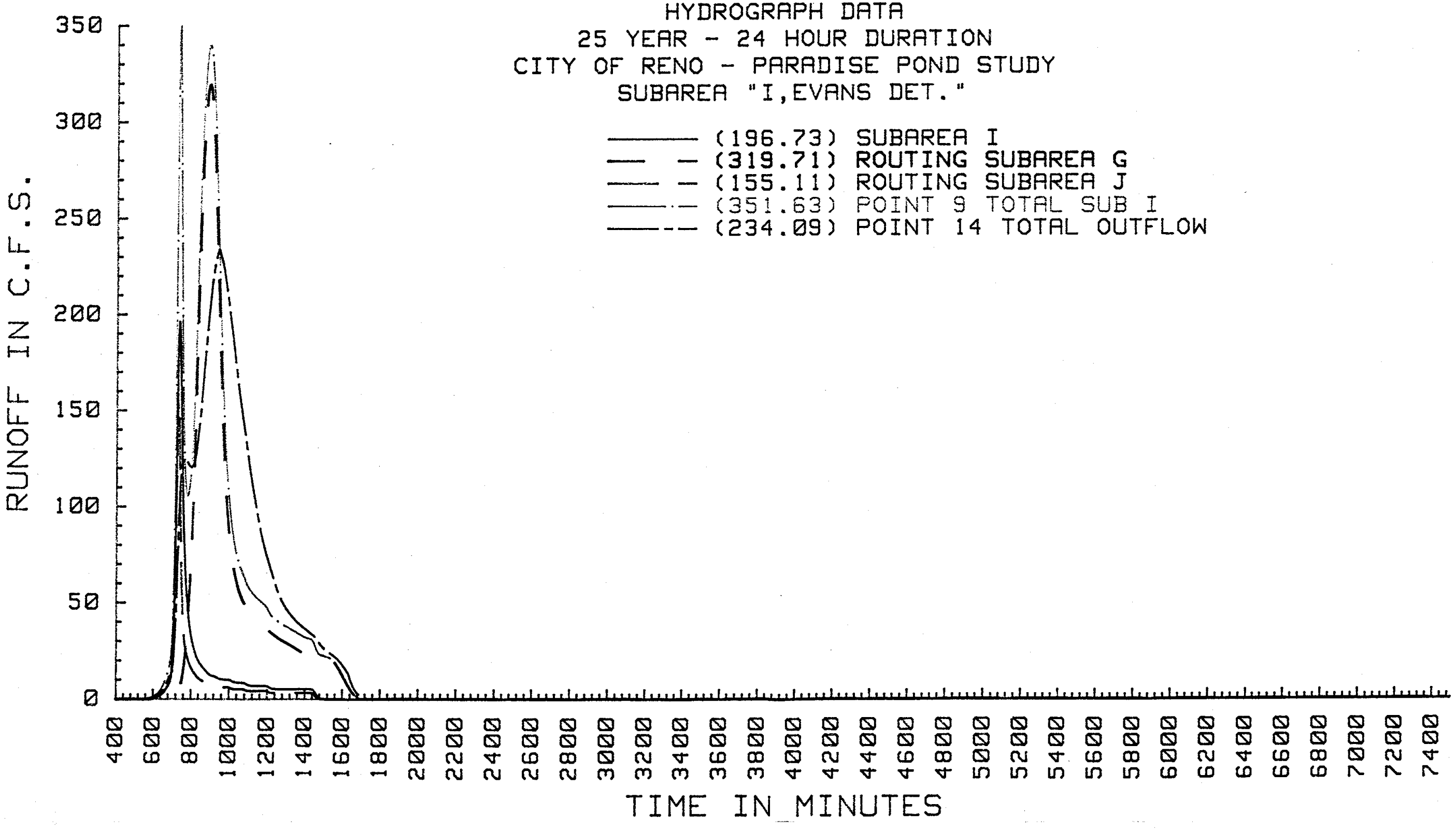
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (.24) SUBAREA V
— — (385.59) ADDING SUBAREA U
— — (385.59) POINT 11 TOTAL SUB V
—·— (12.8) POINT 12 TOTAL POND OUTFLOW 1-30"



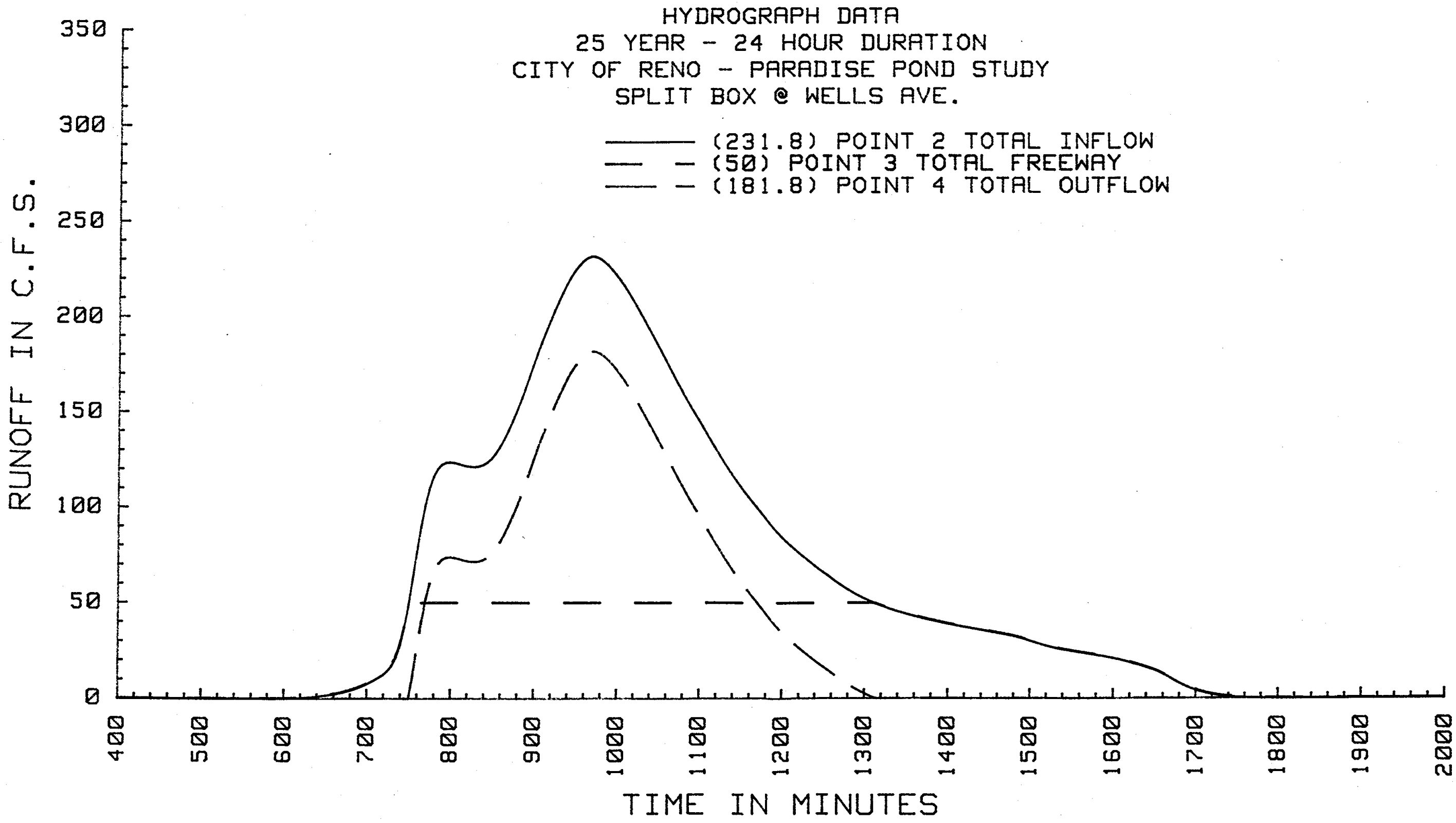
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

——— (196.73) SUBAREA I
— — (319.71) ROUTING SUBAREA G
— — (155.11) ROUTING SUBAREA J
——·— (351.63) POINT 9 TOTAL SUB I
——·· (234.09) POINT 14 TOTAL OUTFLOW



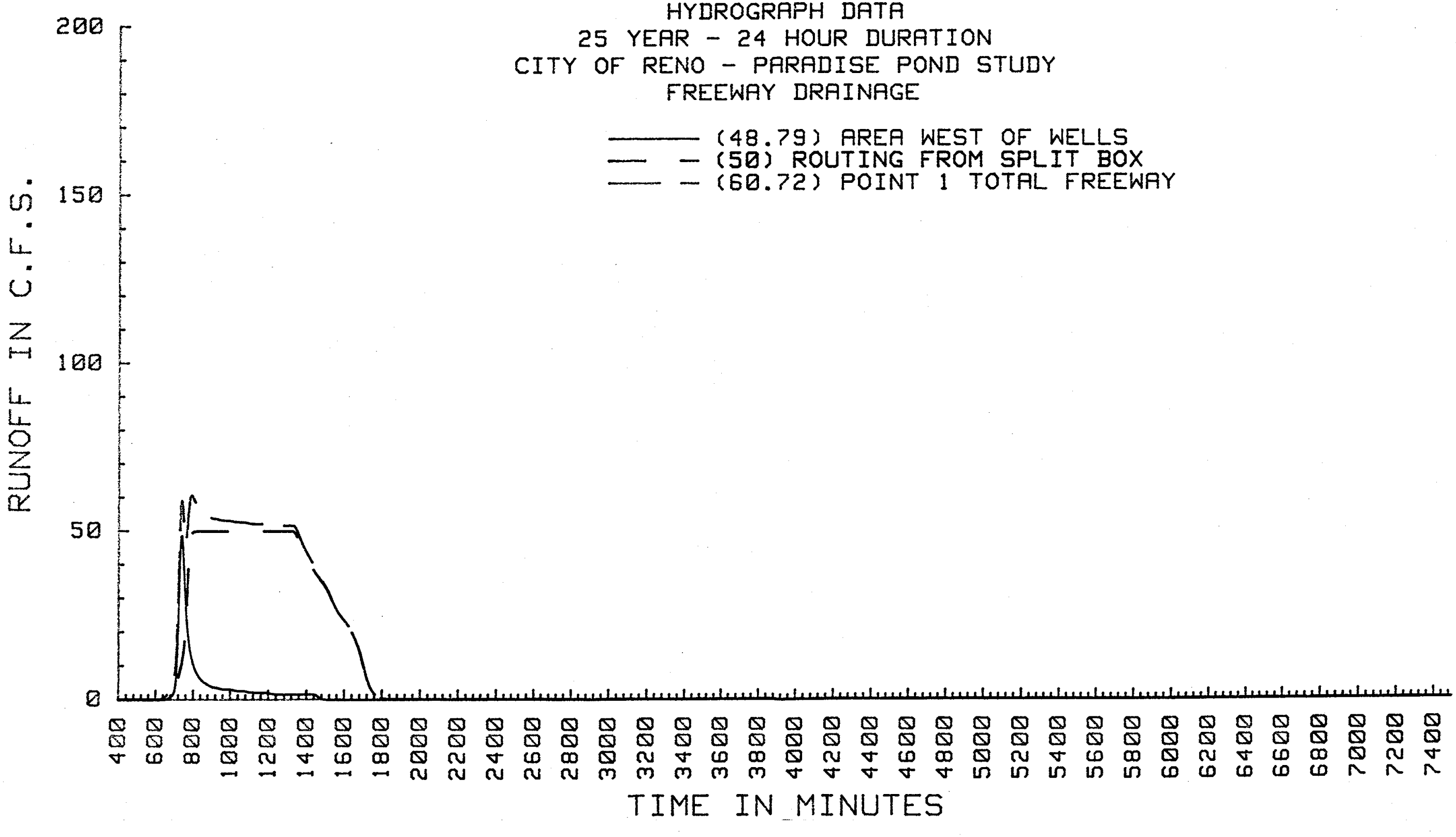
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (231.8) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (181.8) POINT 4 TOTAL OUTFLOW



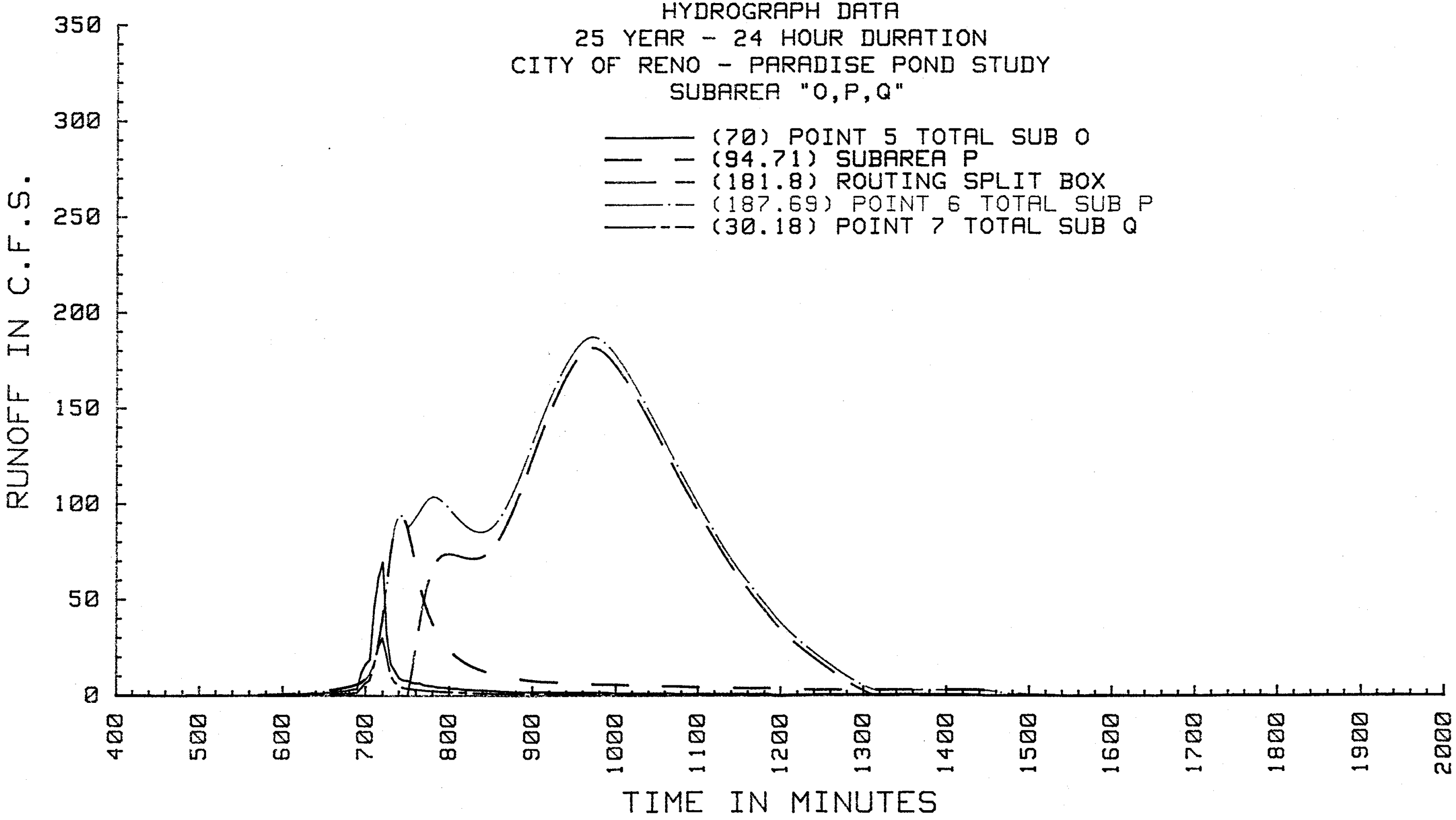
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (48.79) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (60.72) POINT 1 TOTAL FREEWAY

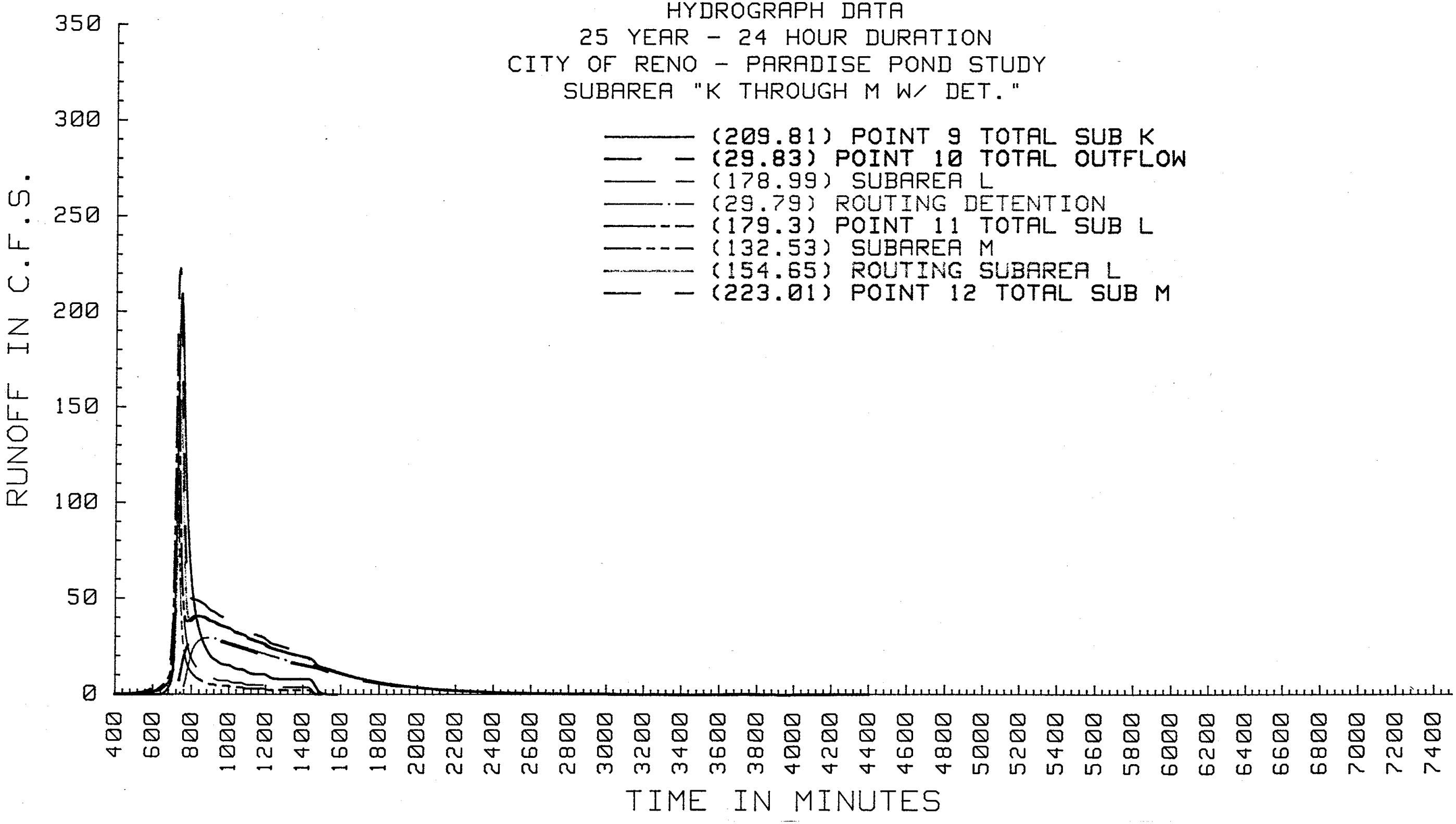


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

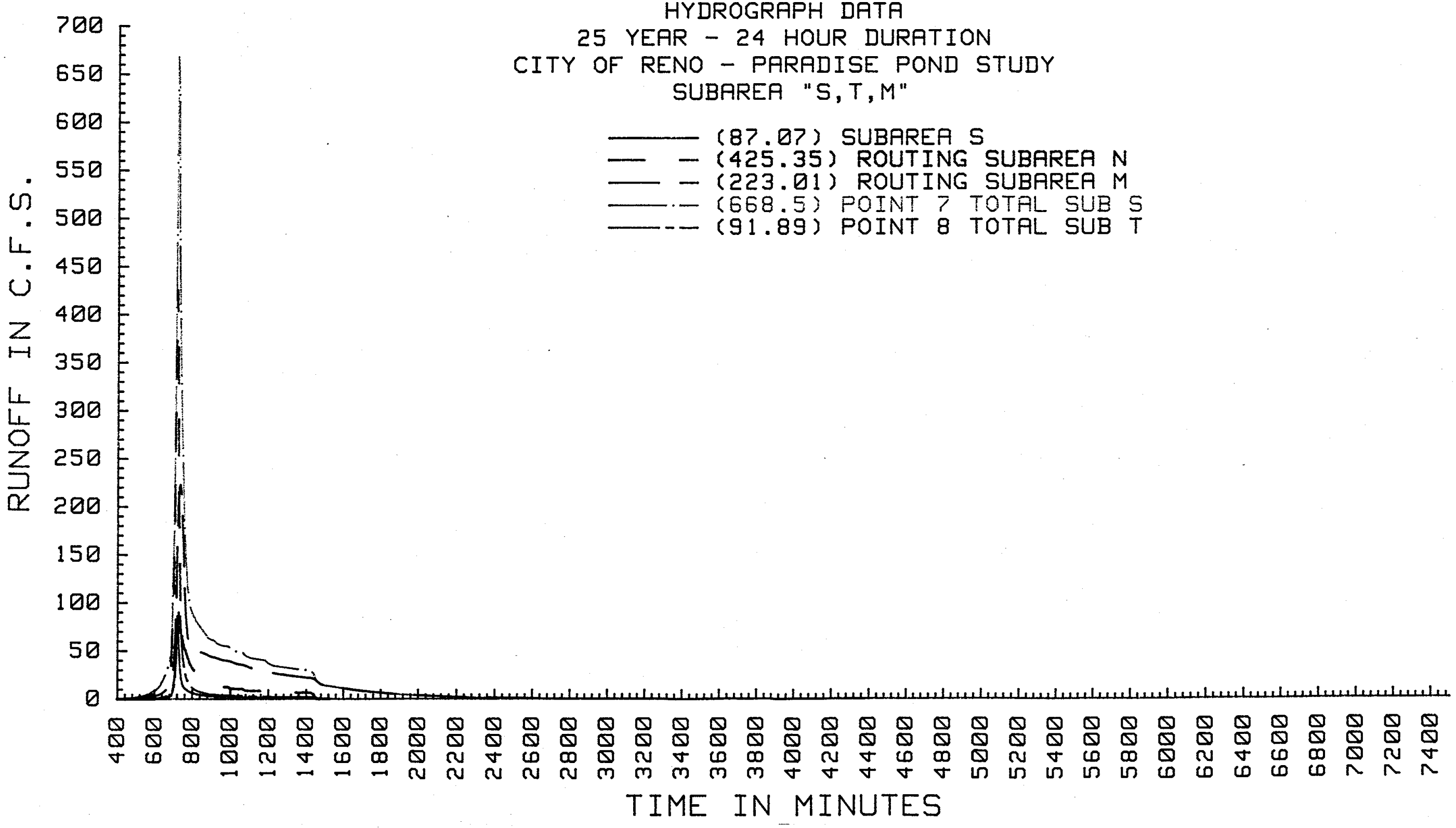
——— (70) POINT 5 TOTAL SUB O
— — (94.71) SUBAREA P
— — (181.8) ROUTING SPLIT BOX
—·— (187.69) POINT 6 TOTAL SUB P
—-— (30.18) POINT 7 TOTAL SUB Q



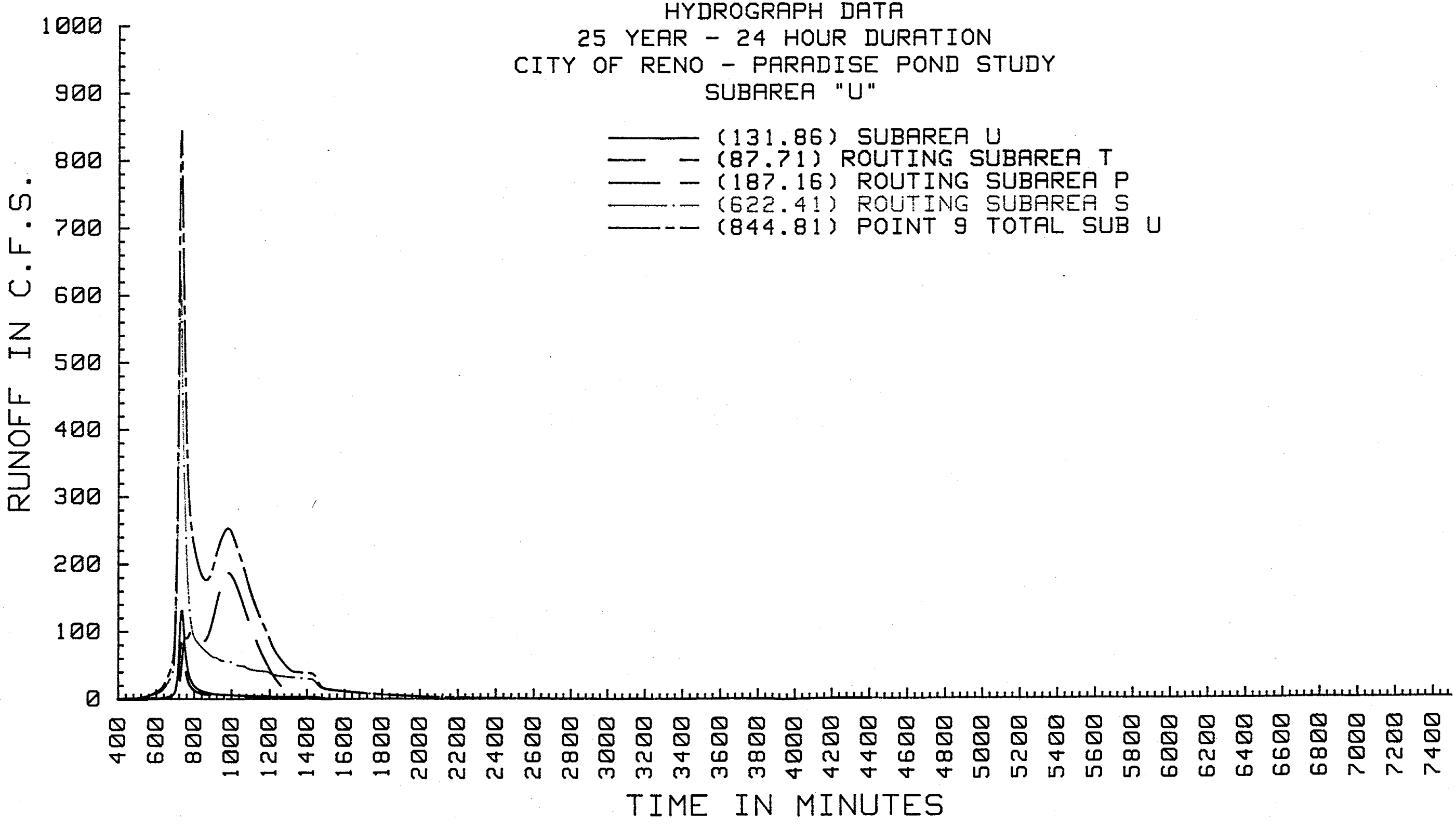
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."



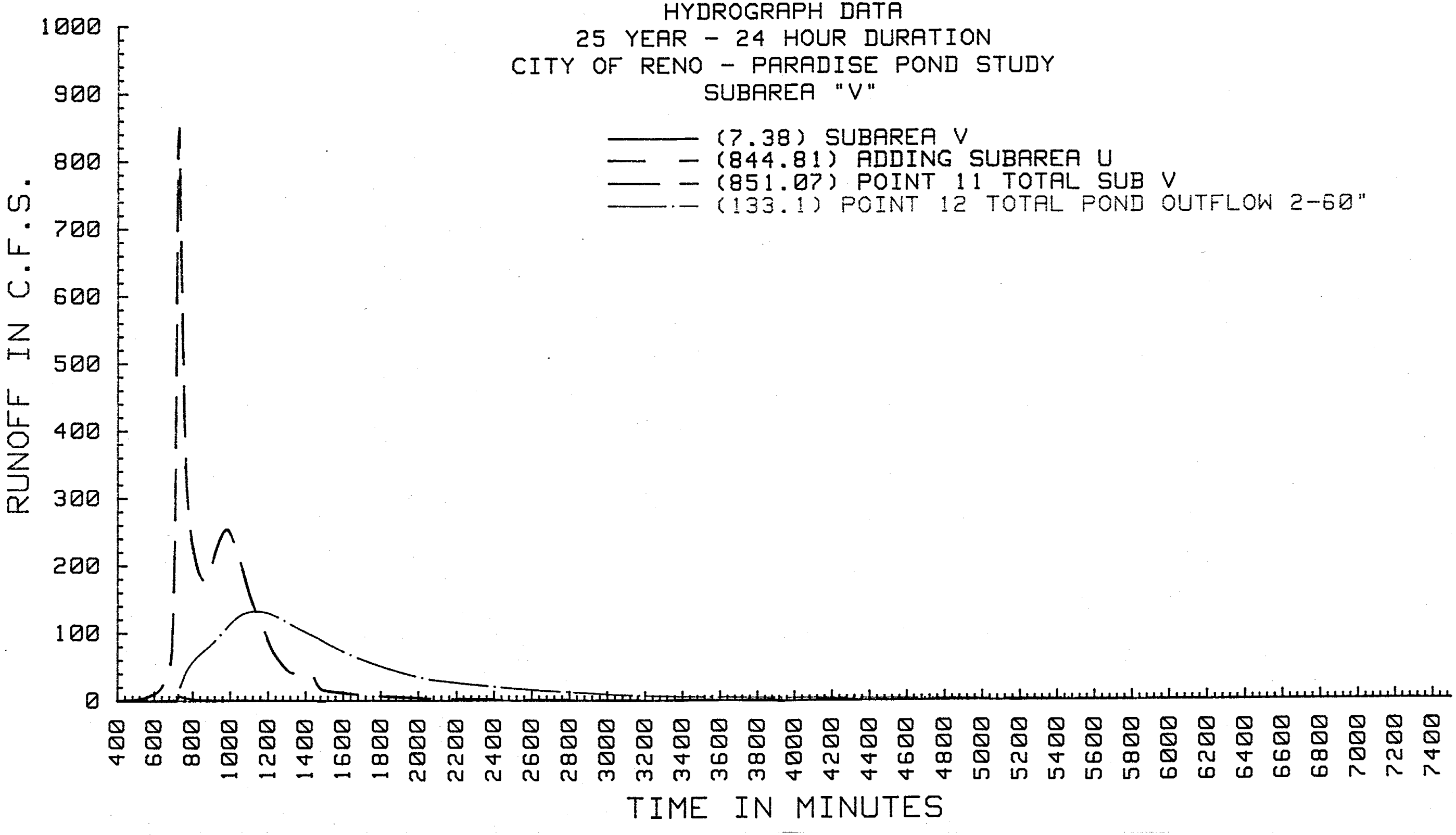
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



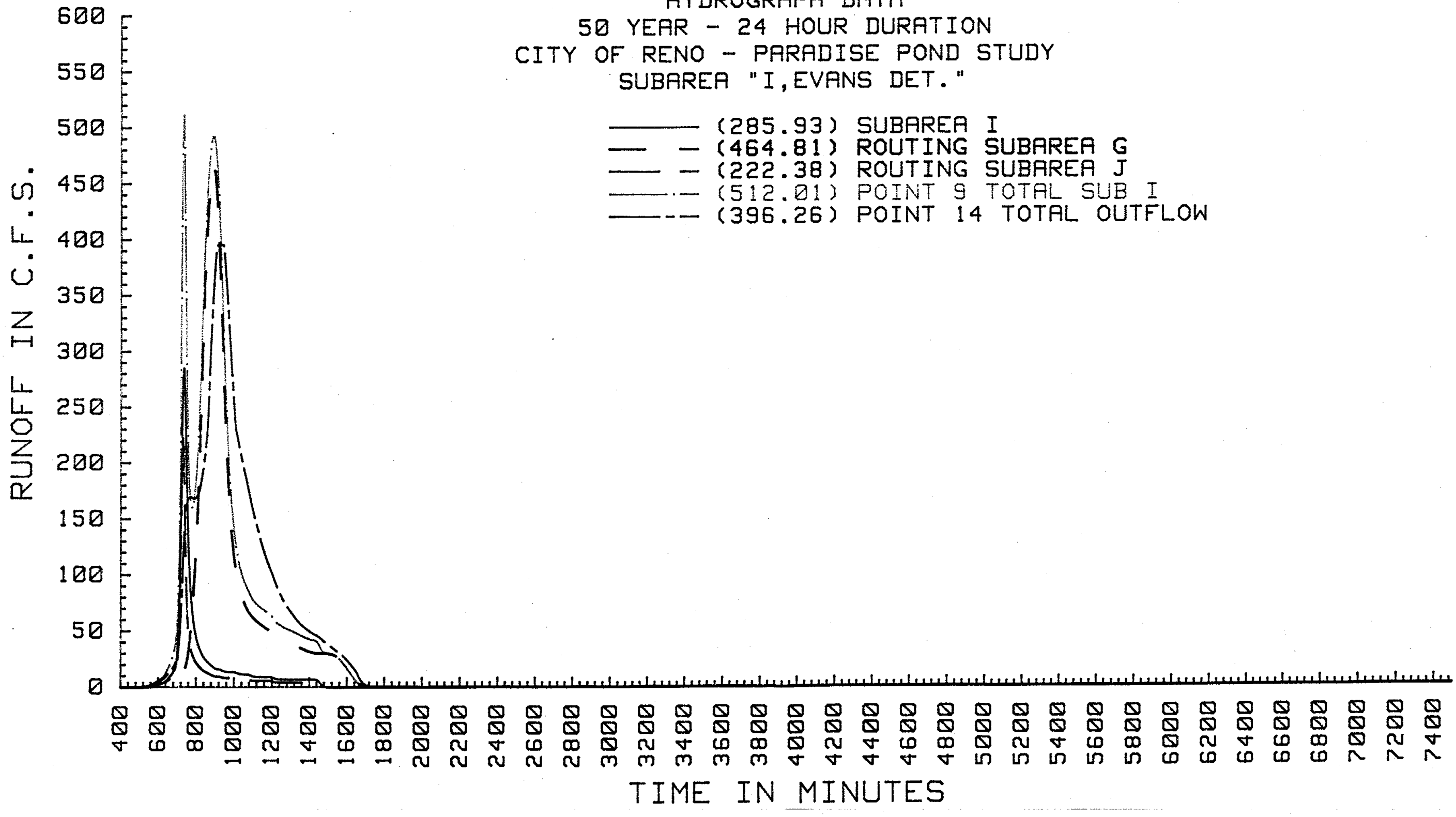
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



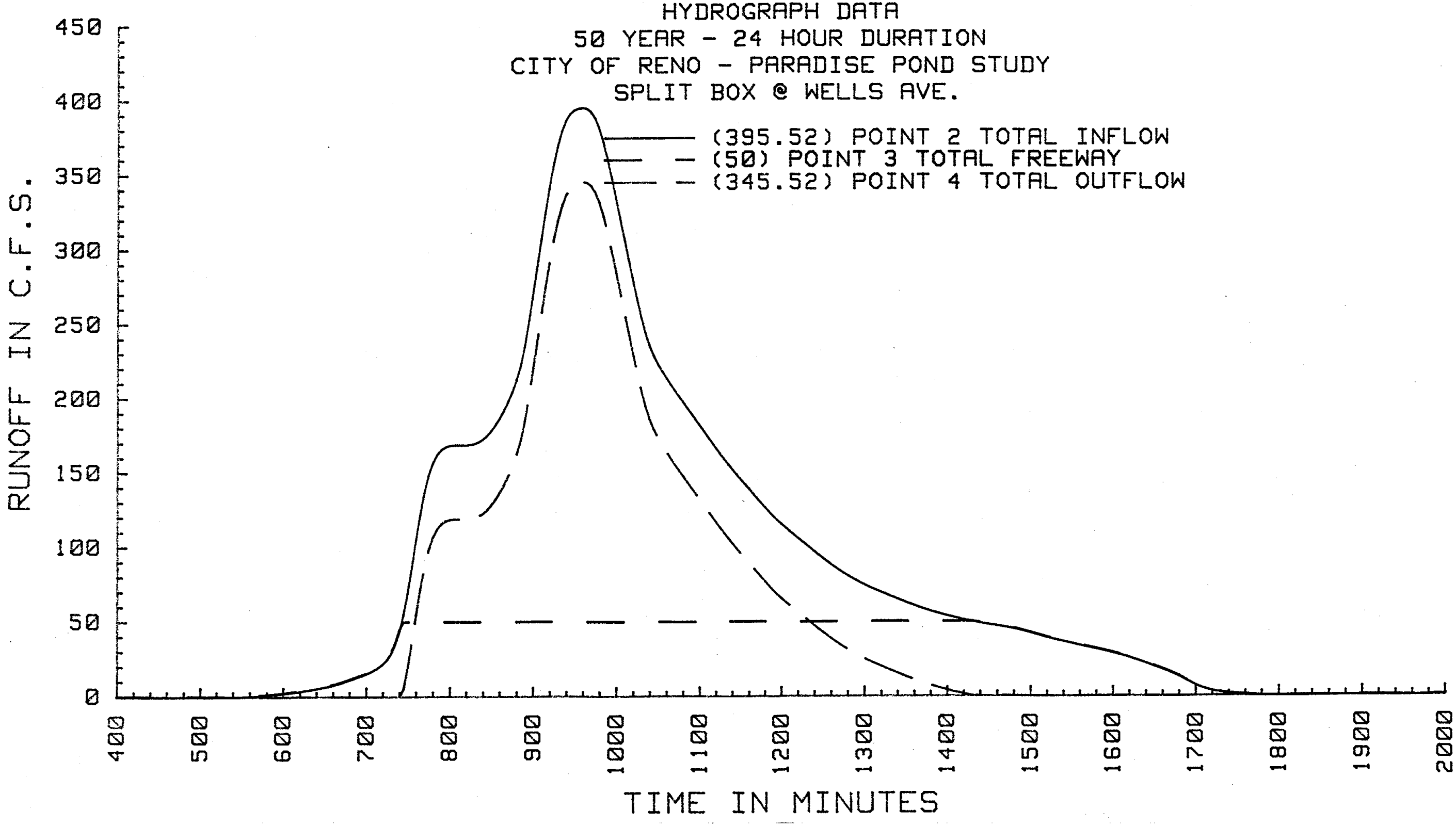
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

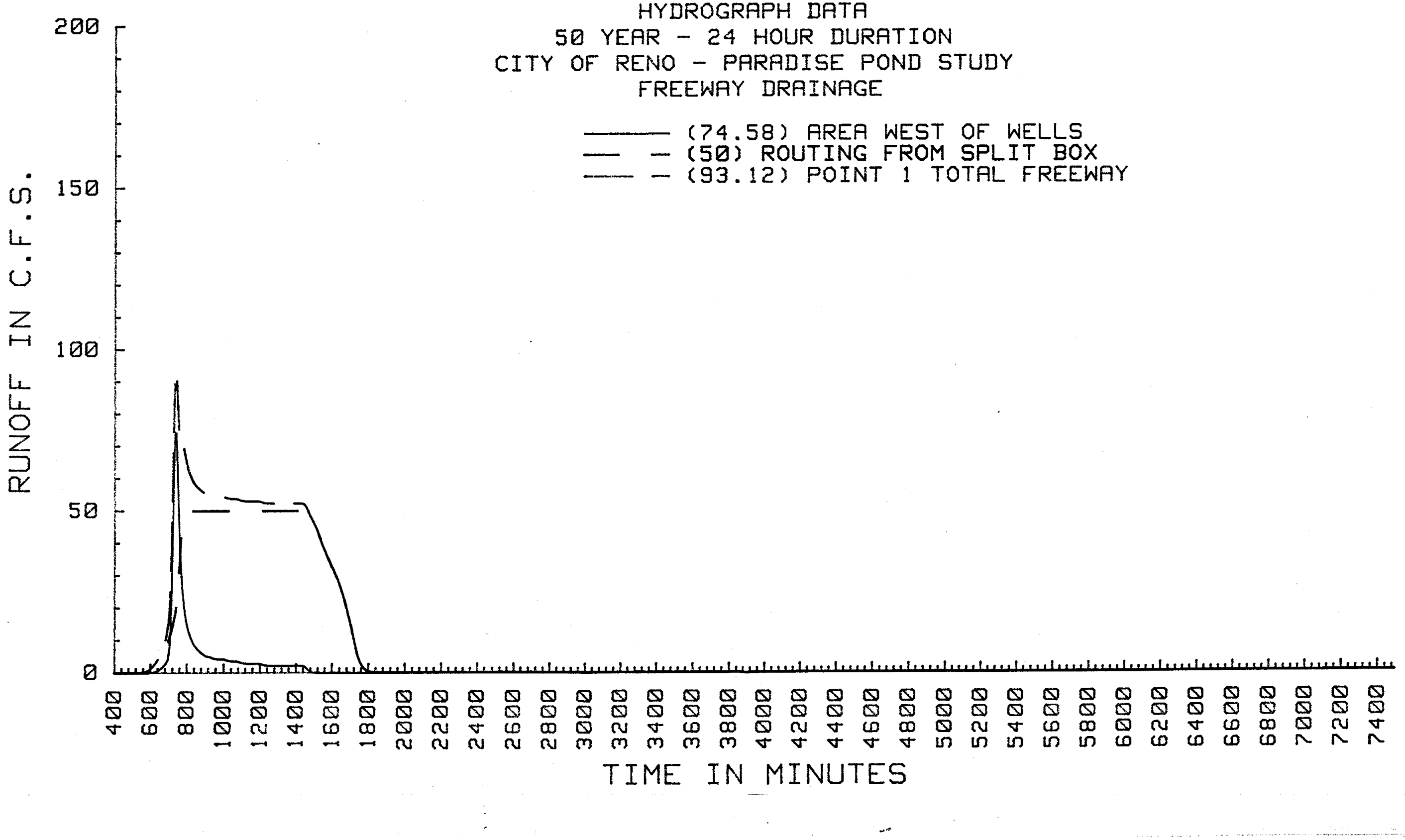


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

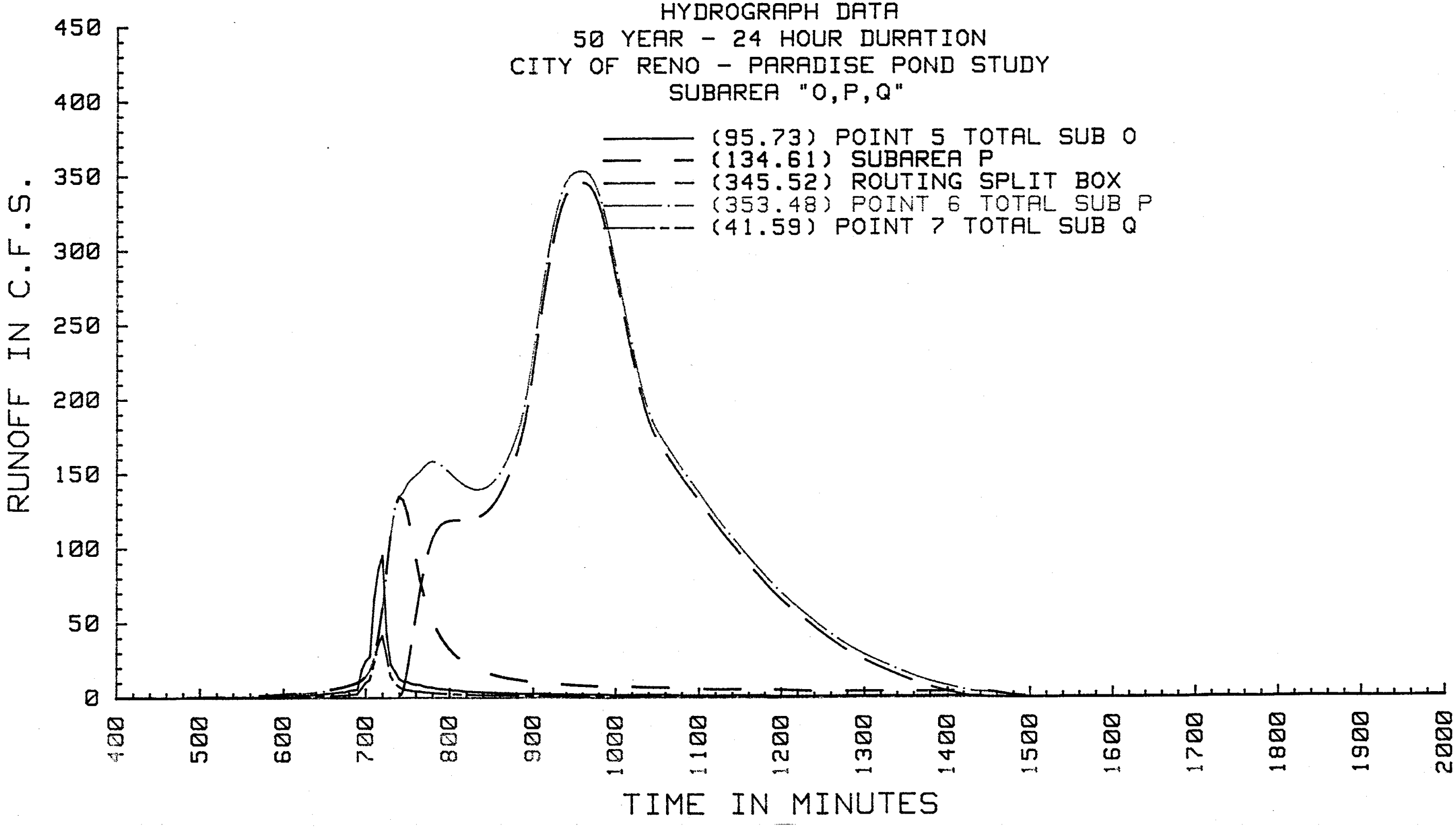


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (74.58) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (93.12) POINT 1 TOTAL FREEWAY

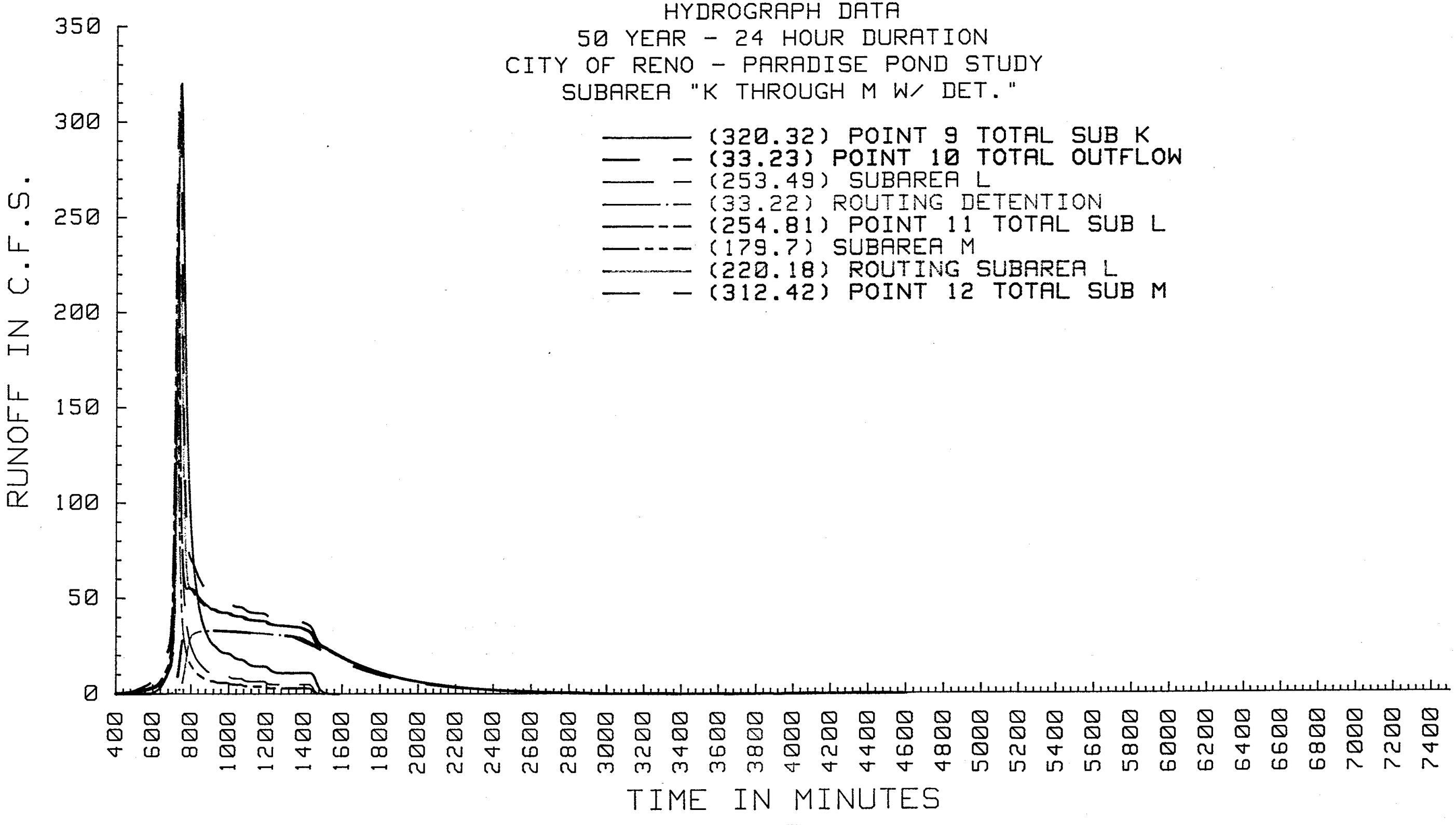


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

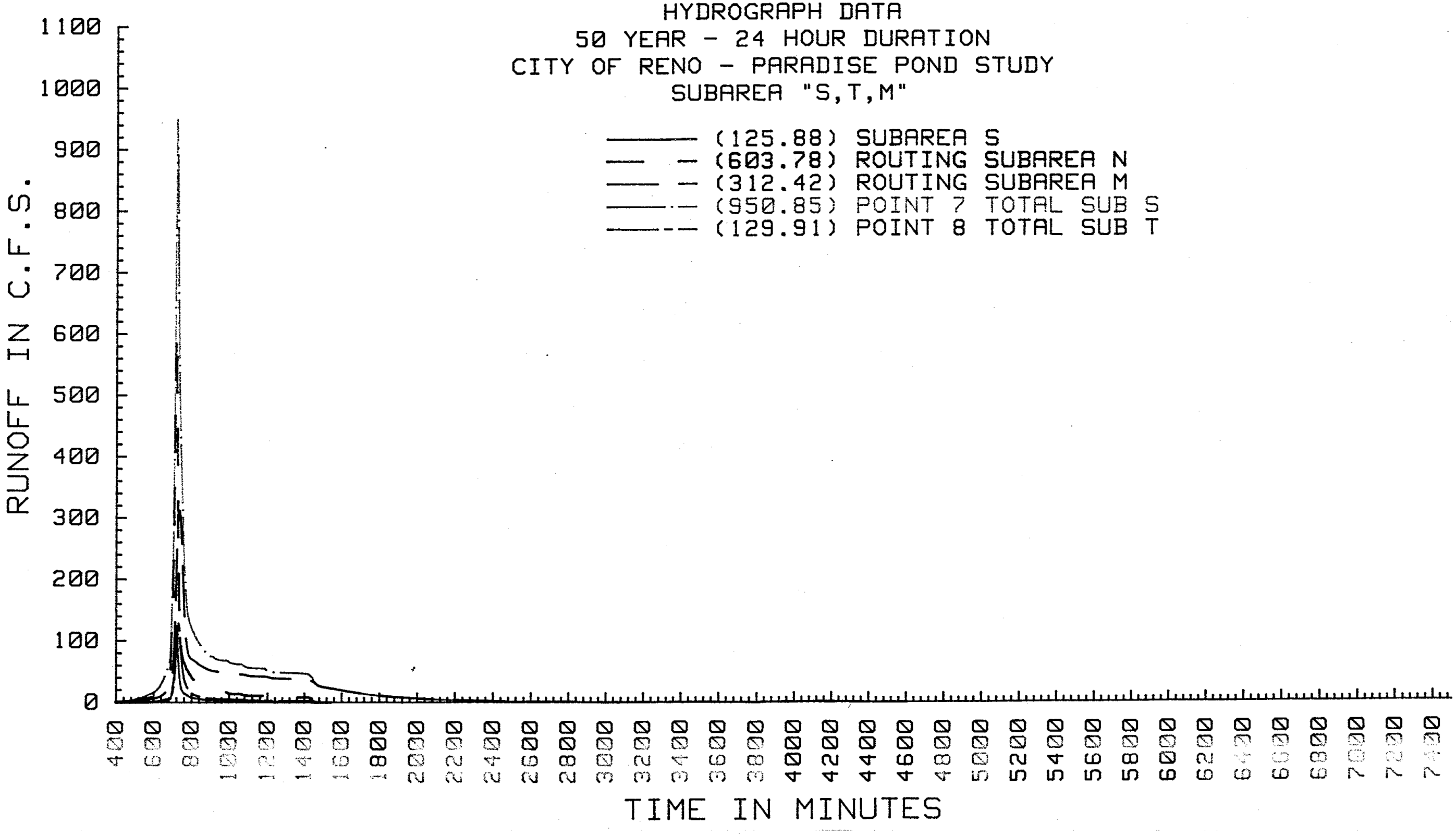


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

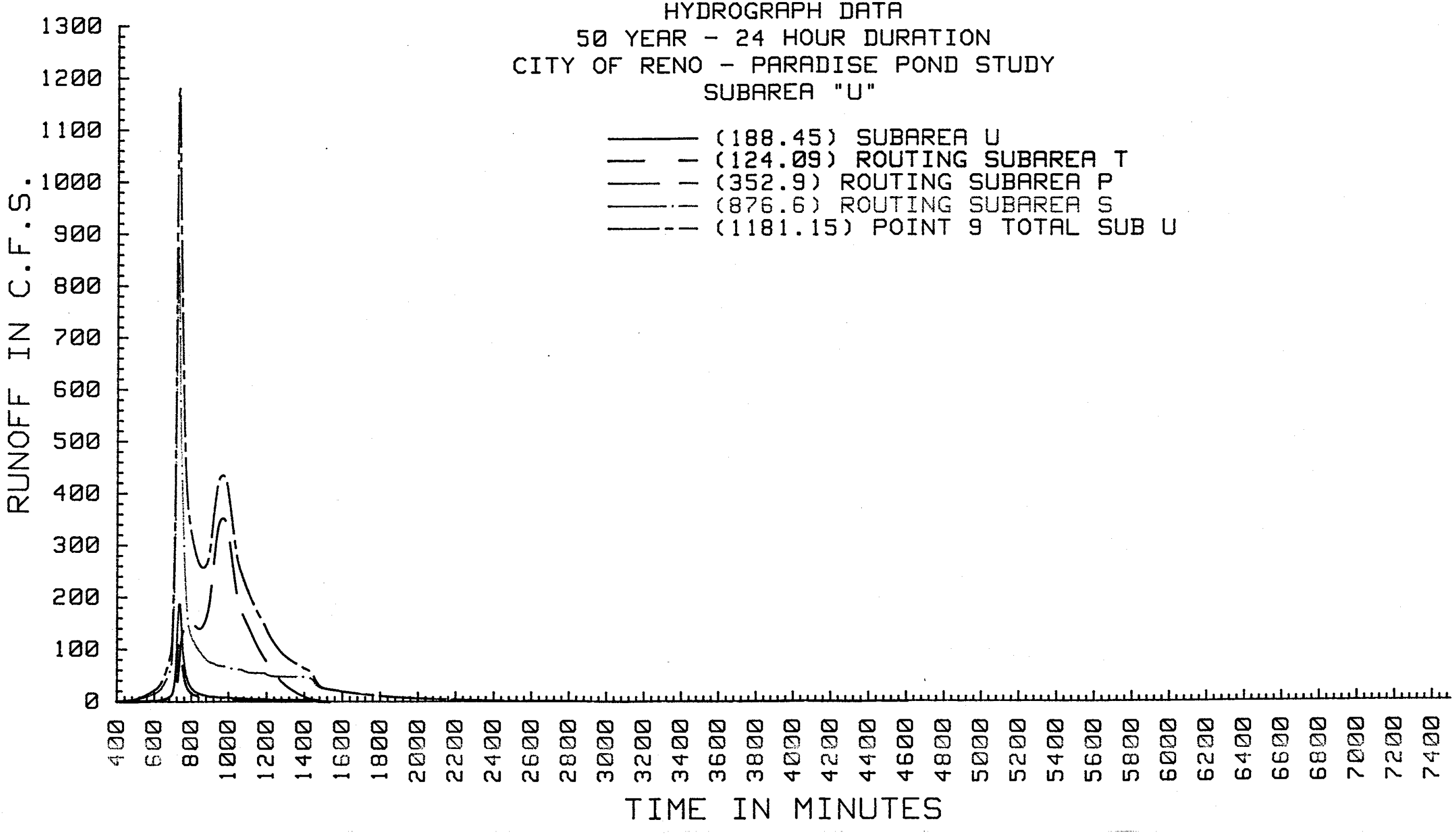
——— (320.32) POINT 9 TOTAL SUB K
—— — (33.23) POINT 10 TOTAL OUTFLOW
—— — (253.49) SUBAREA L
——·— (33.22) ROUTING DETENTION
——-- (254.81) POINT 11 TOTAL SUB L
—--- (179.7) SUBAREA M
———— (220.18) ROUTING SUBAREA L
—— — (312.42) POINT 12 TOTAL SUB M



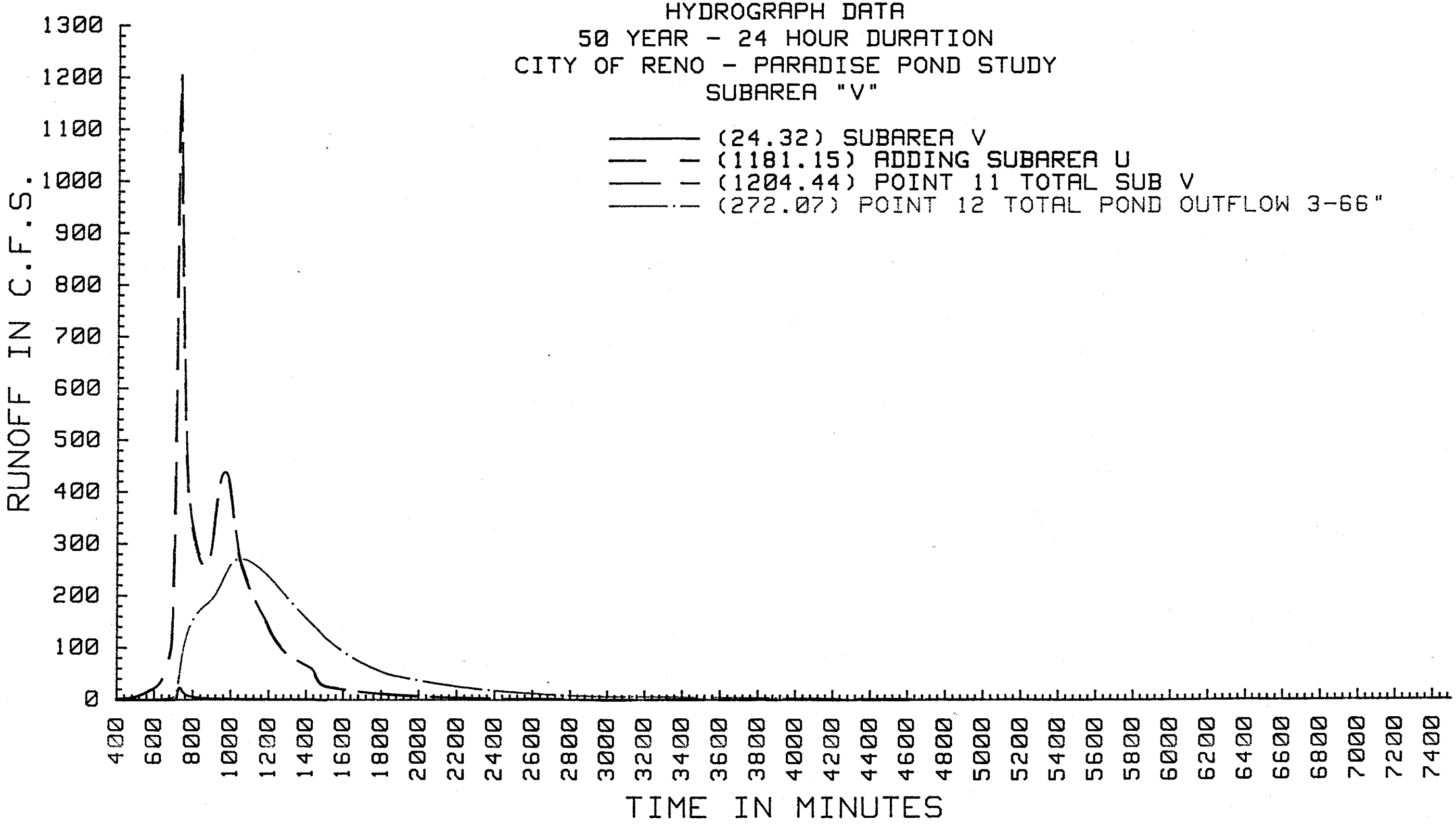
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"



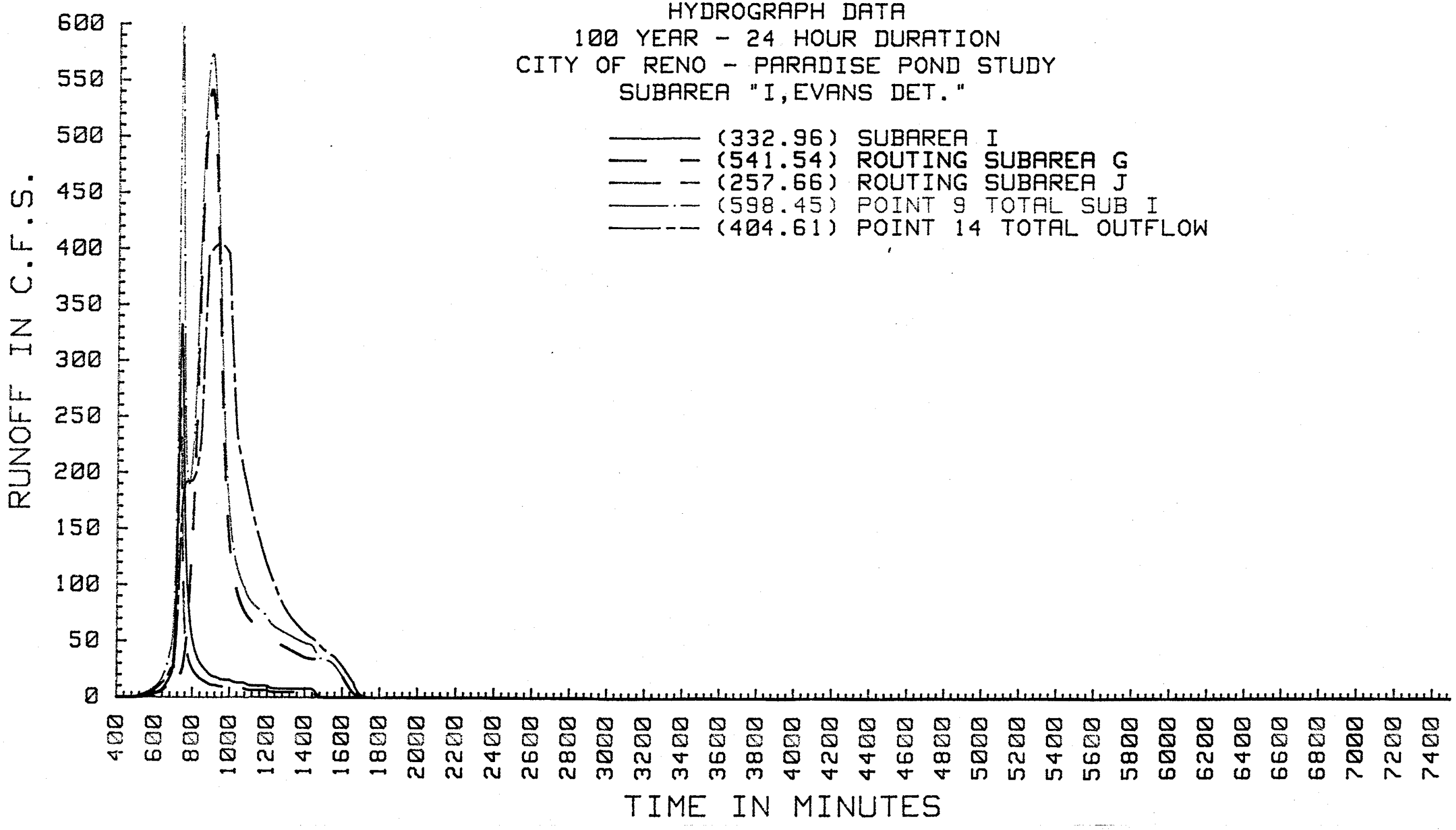
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



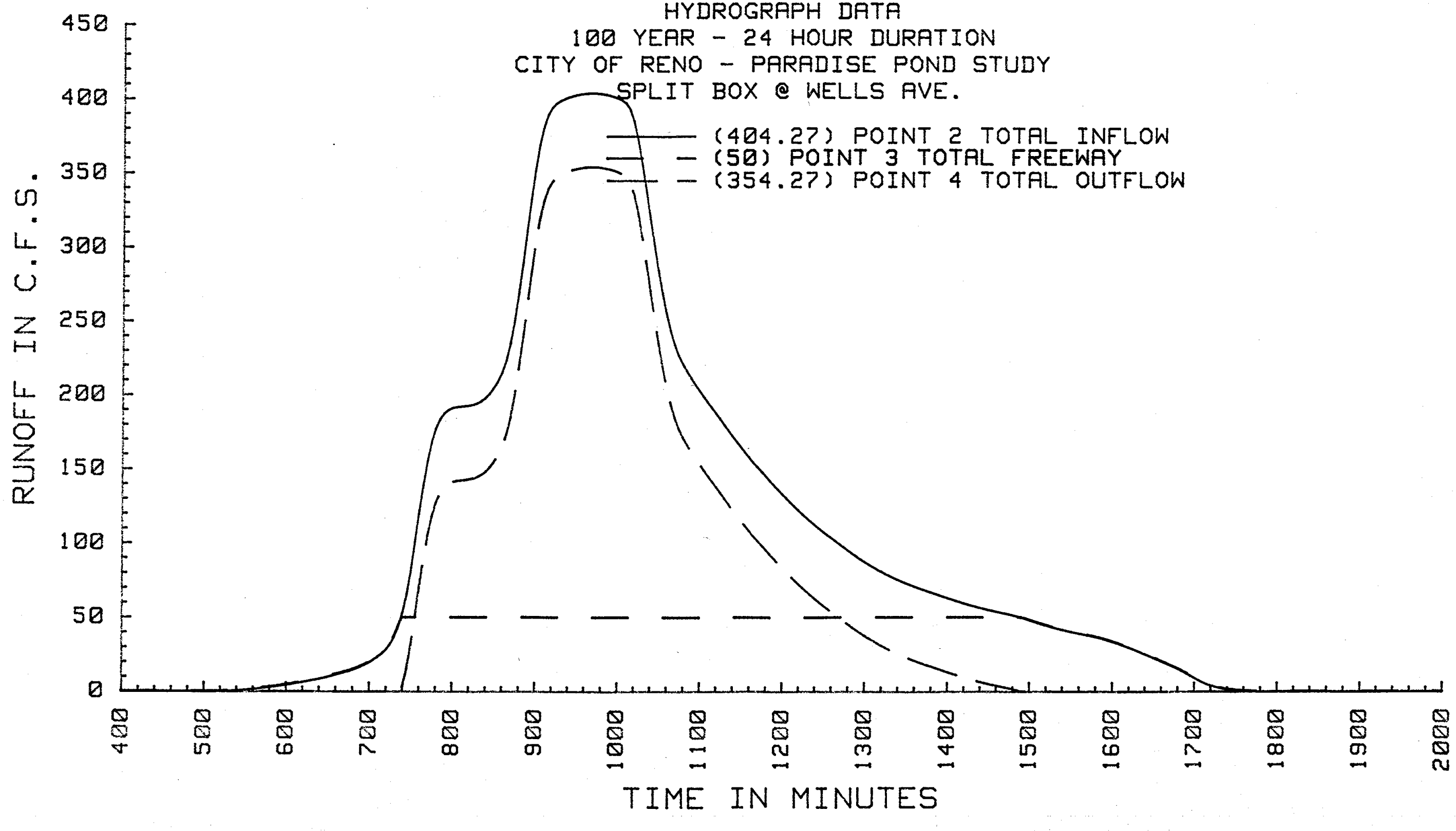
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

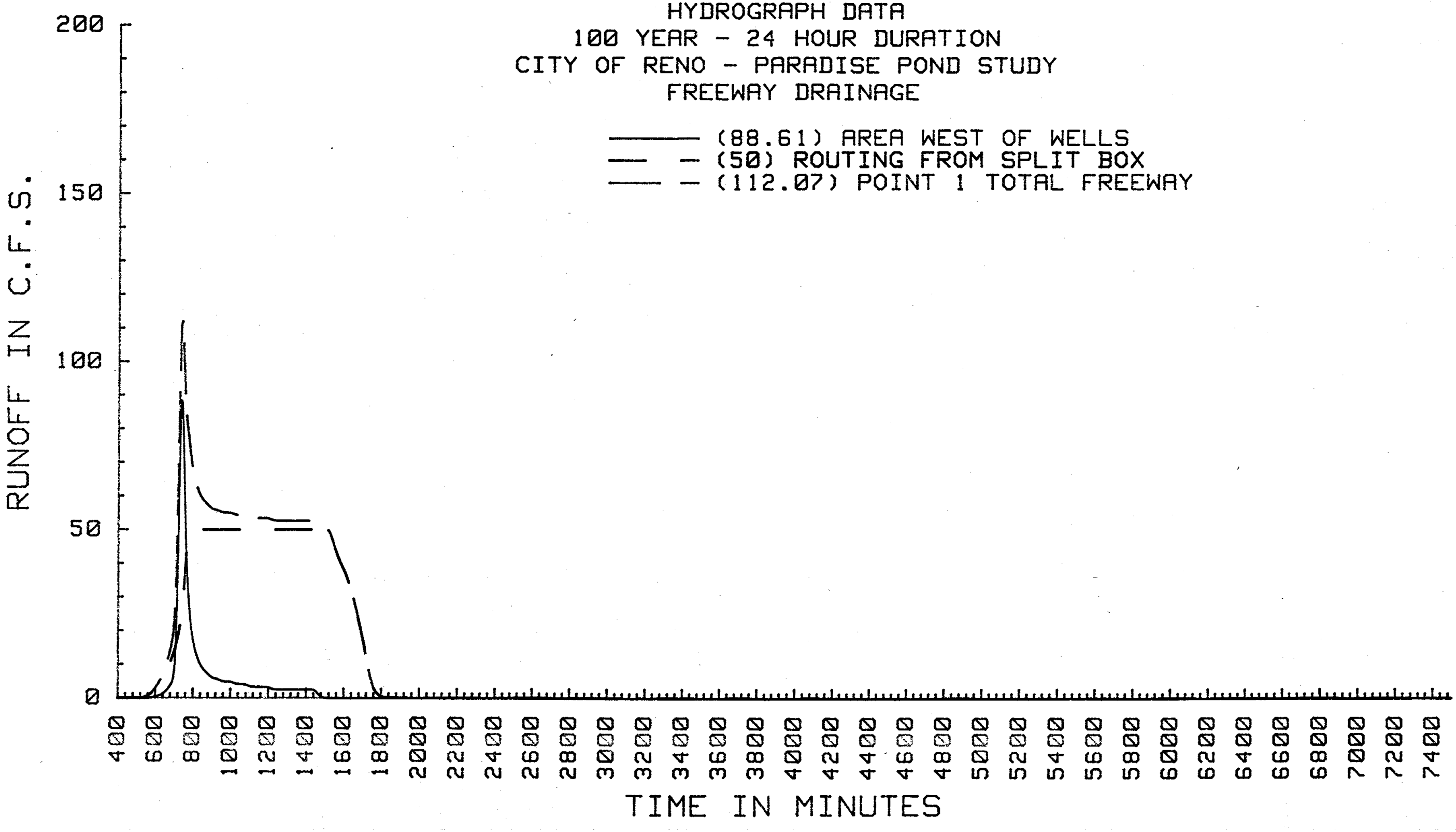


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

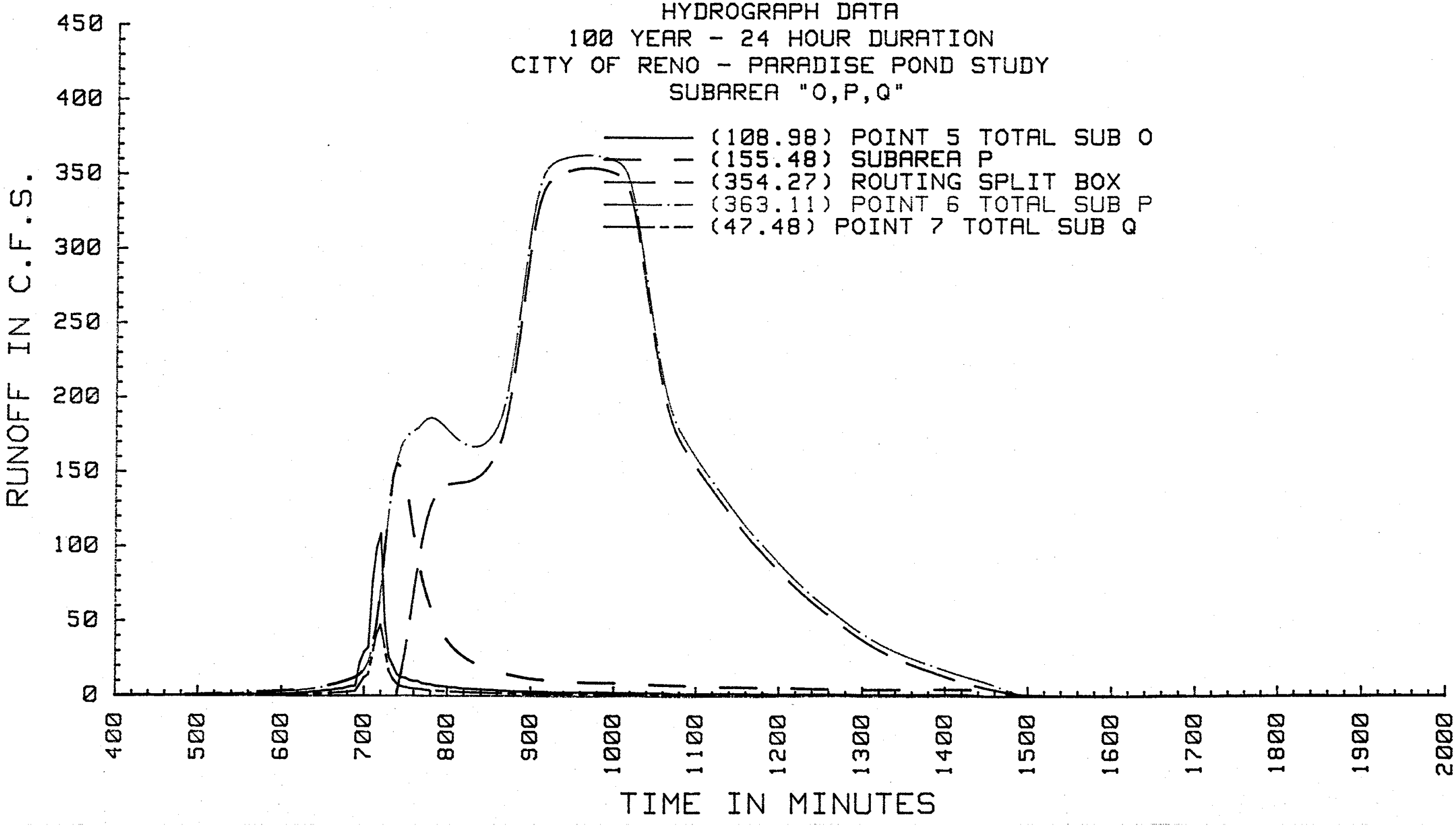


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

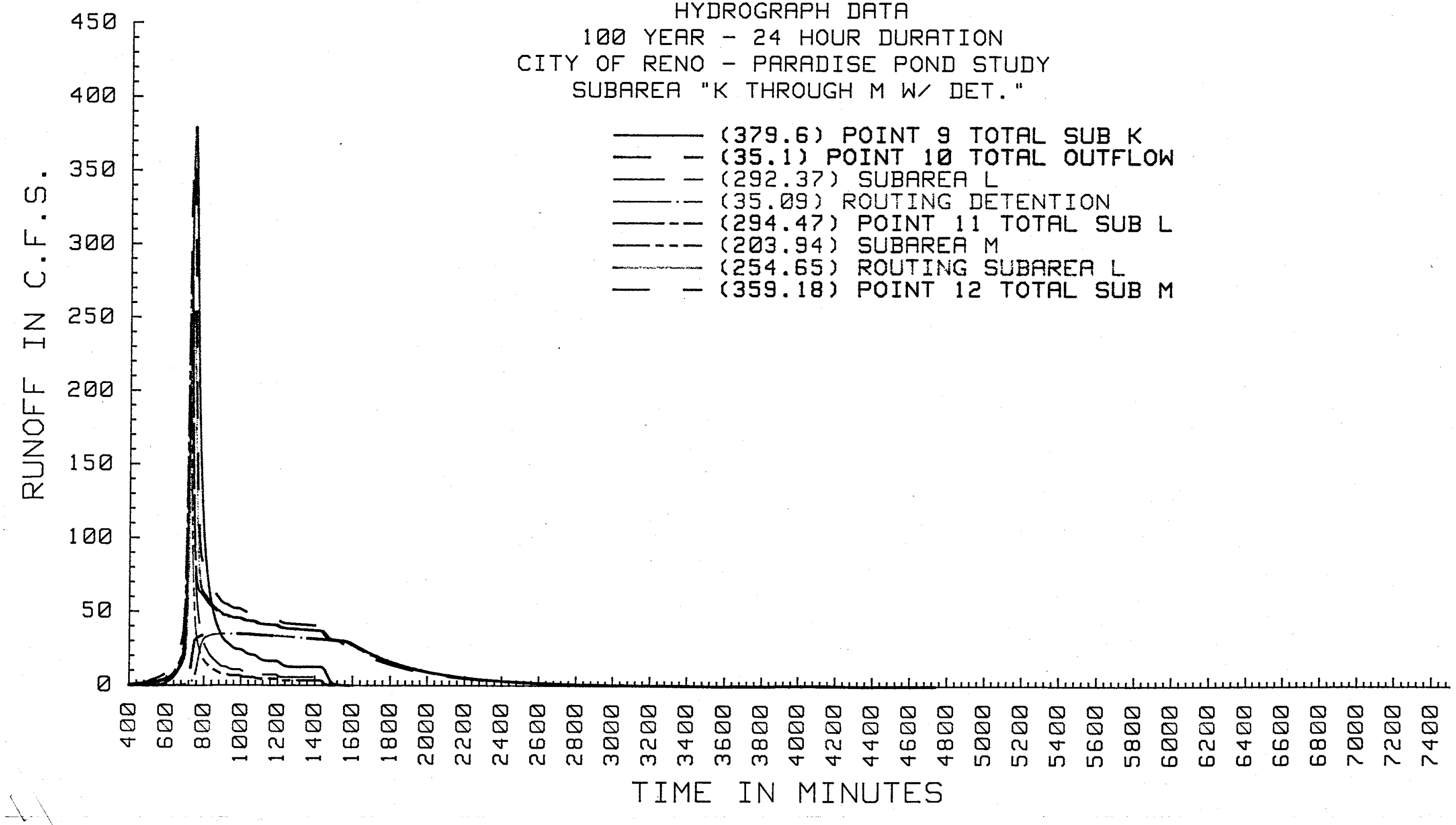
——— (88.61) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (112.07) POINT 1 TOTAL FREEWAY



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

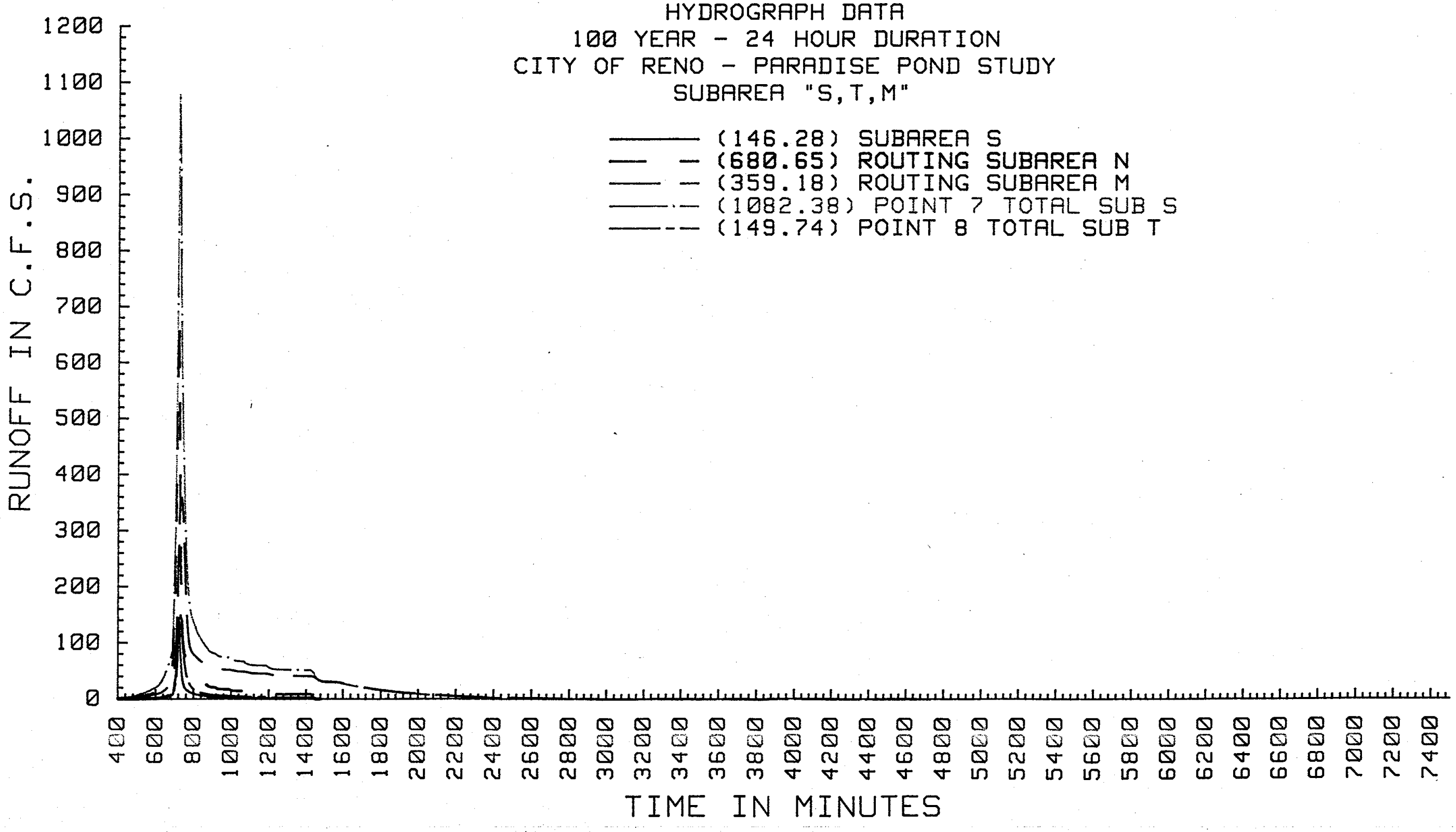


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

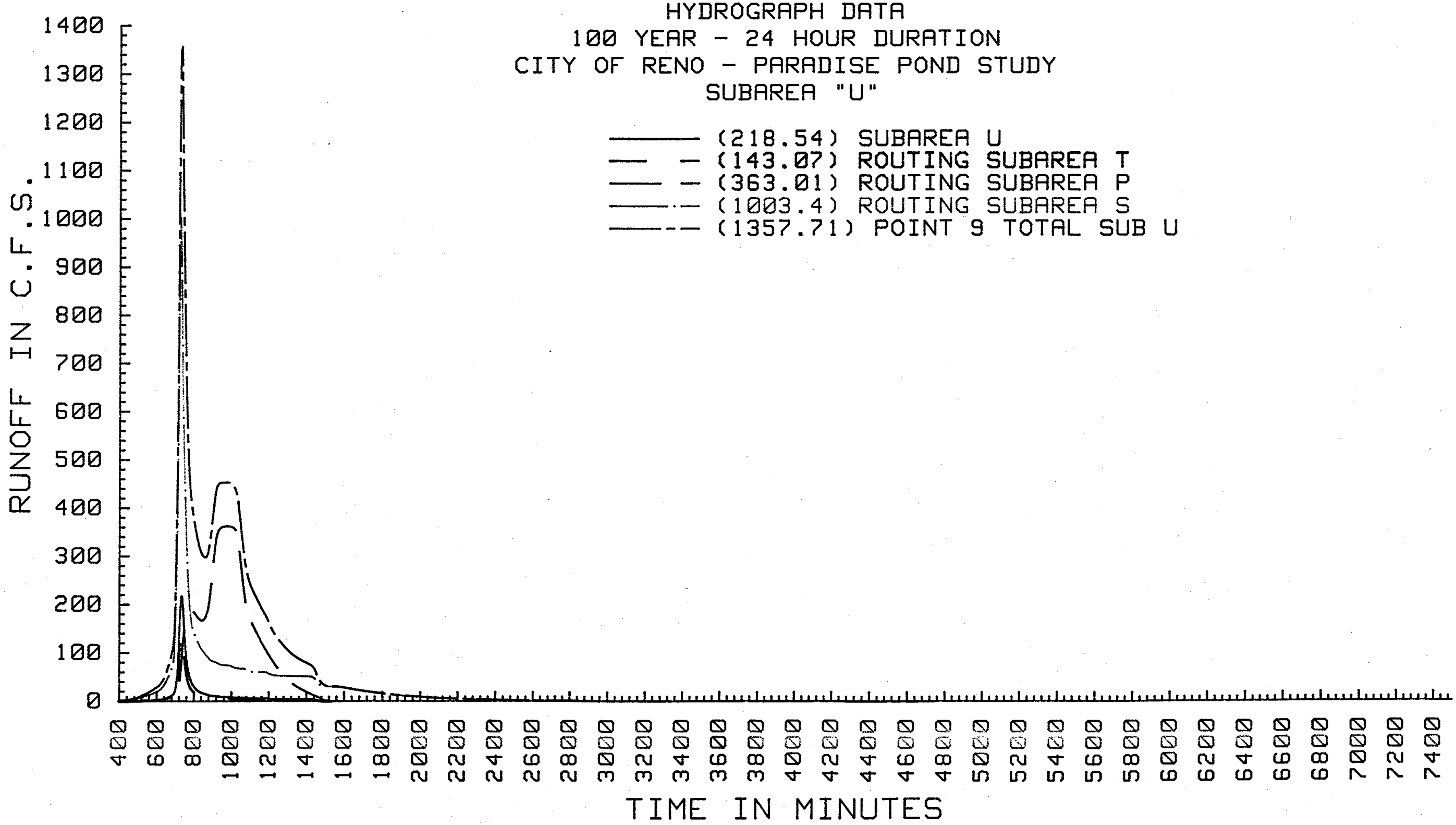


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M"

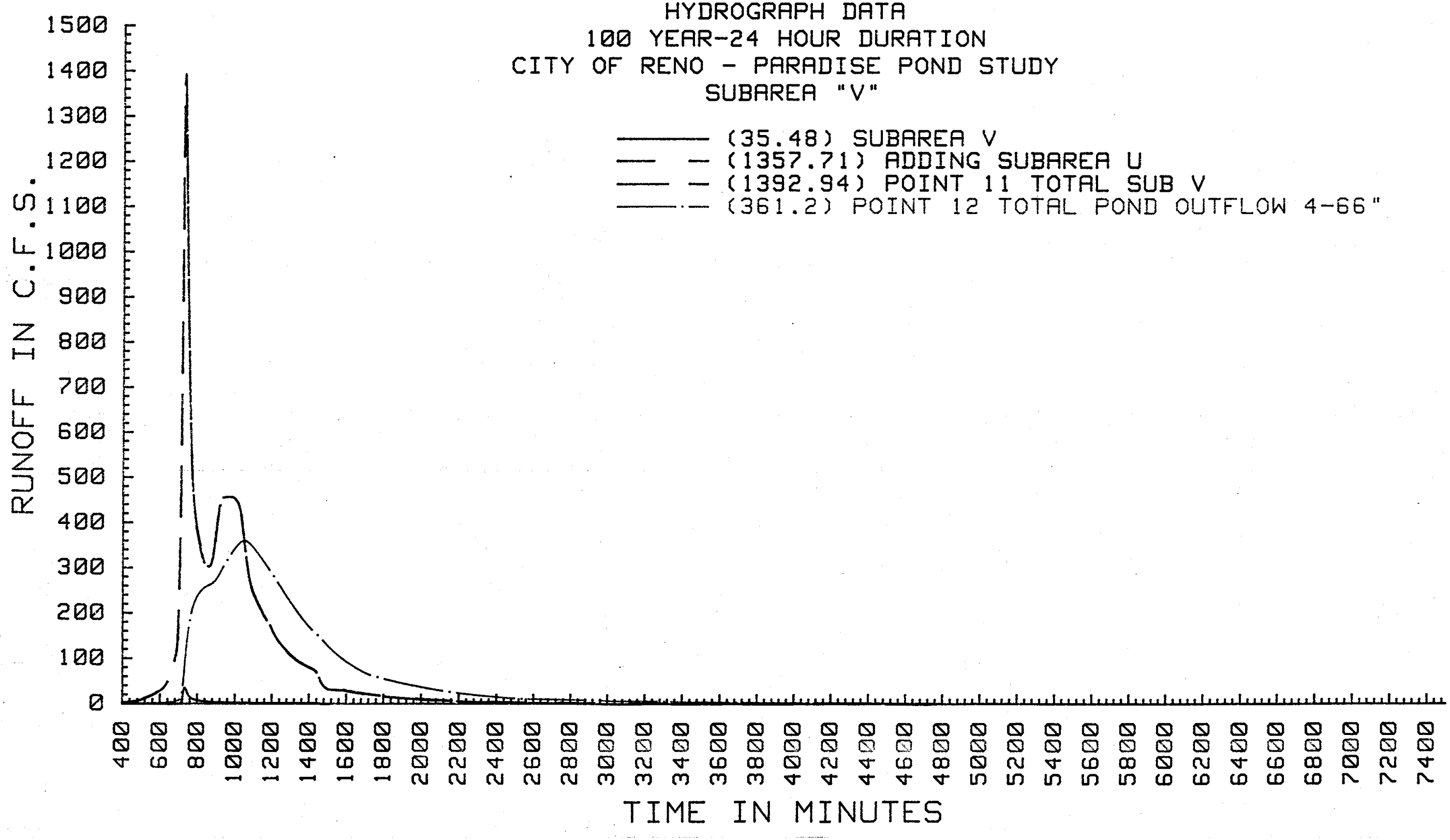
——— (146.28) SUBAREA S
— — (680.65) ROUTING SUBAREA N
— — (359.18) ROUTING SUBAREA M
——·— (1082.38) POINT 7 TOTAL SUB S
——·— (149.74) POINT 8 TOTAL SUB T



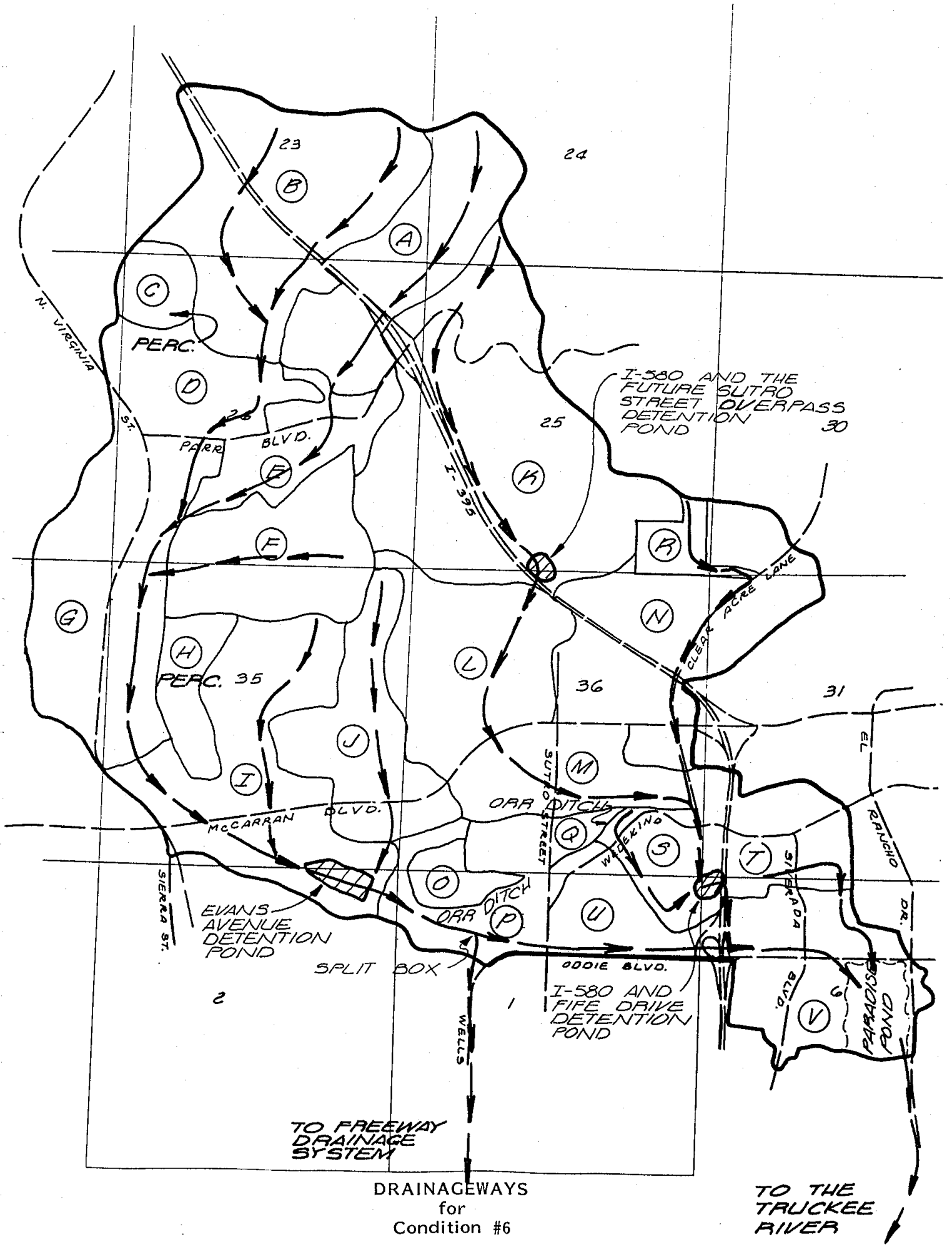
HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



HYDROGRAPH DATA
100 YEAR-24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



APPENDIX "G"



DRAINAGEWAYS
for
Condition #6

NOTE:

For Subareas A through J, N and R reference tables and graphs in Appendix "B".

TABLE 12

CONDITION NO. 6 WITH 3- AND 6-HOUR DURATION STORMS

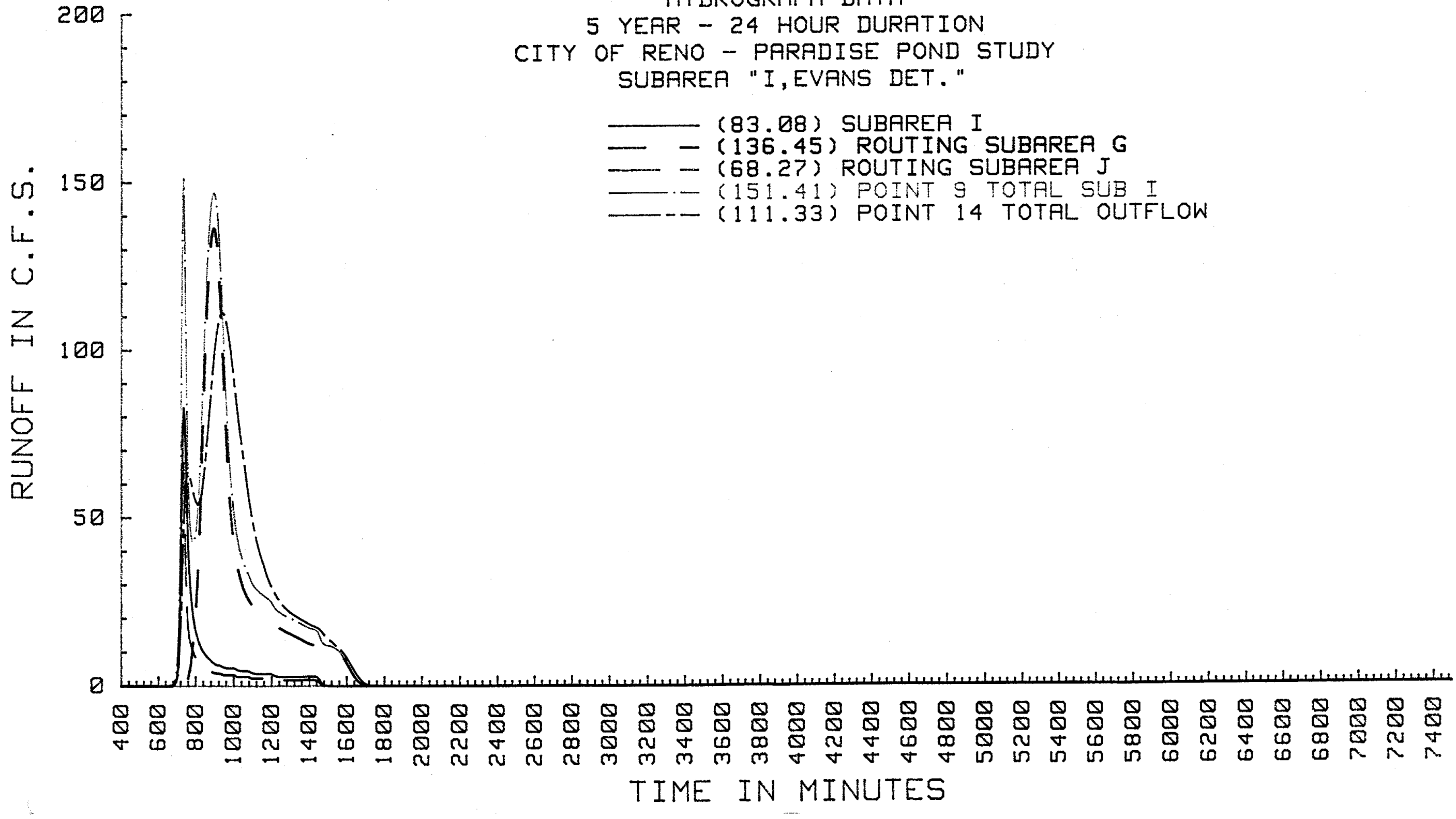
Subarea Totals	5-Year 3-Hour	25-Year 3-Hour	50-Year 3-Hour	100-Year 3-Hour
Evans	16.97 cfs @ 0.5 ac.ft.	52.15 cfs @ 3.0 ac.ft.	79.85 cfs @ 5.6 ac.ft.	117.59 cfs @ 10.1 ac.ft.
Split Box	16.88 cfs @ 320 min.	51.89 cfs @ 310 min.	79.49 cfs @ 310 min.	117.11 cfs @ 310 min.
Freeway	16.88 cfs @ 320 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.	50.00 cfs @ 310 min.
K	0.98 cfs @ 150 min. w/0.5 ac.ft.	4.92 cfs @ 110 min. w/2.5 ac.ft.	8.54 cfs @ 95 min. w/4.3 ac.ft.	13.94 cfs @ 85 min. w/7.0 ac.ft.
L	5.92 cfs @ 80 min.	18.82 cfs @ 55 min.	30.24 cfs @ 50 min.	47.44 cfs @ 45 min.
M	11.36 cfs @ 80 min.	32.36 cfs @ 65 min.	50.74 cfs @ 60 min.	76.61 cfs @ 60 min.
O	2.00 cfs @ 50 min.	6.40 cfs @ 30 min.	10.77 cfs @ 30 min.	16.86 cfs @ 30 min.
P	4.36 cfs @ 105 min.	12.81 cfs @ 80 min.	29.50 cfs @ 310 min.	67.12 cfs @ 310 min.
Q	0.91 cfs @ 55 min.	2.85 cfs @ 35 min.	4.64 cfs @ 35 min.	7.19 cfs @ 30 min.
S	28.05 cfs @ 75 min.	77.51 cfs @ 55 min.	116.99 cfs @ 50 min.	173.57 cfs @ 50 min.
T	3.29 cfs @ 85 min.	10.27 cfs @ 60 min.	16.47 cfs @ 55 min.	25.56 cfs @ 55 min.
U	13.47 cfs @ 110 min.	38.90 cfs @ 85 min.	60.70 cfs @ 75 min.	93.42 cfs @ 70 min.
V	13.47 cfs @ 110 min.	38.90 cfs @ 85 min.	60.70 cfs @ 75 min.	93.42 cfs @ 70 min.
Paradise Pond Outlet One 30-inch pipe:				
	0.53 cfs @ 110 min. w/5.2ac.ft.	1.53 cfs @ 85 min. w/15.2ac.ft.	3.96 cfs @ 75 min. w/25.2ac.ft.	8.92 cfs @ 70 min. w/44.0ac.ft.

TABLE 12 - (con't)

CONDITION NO. 6 WITH 3- AND 6-HOUR DURATION STORMS

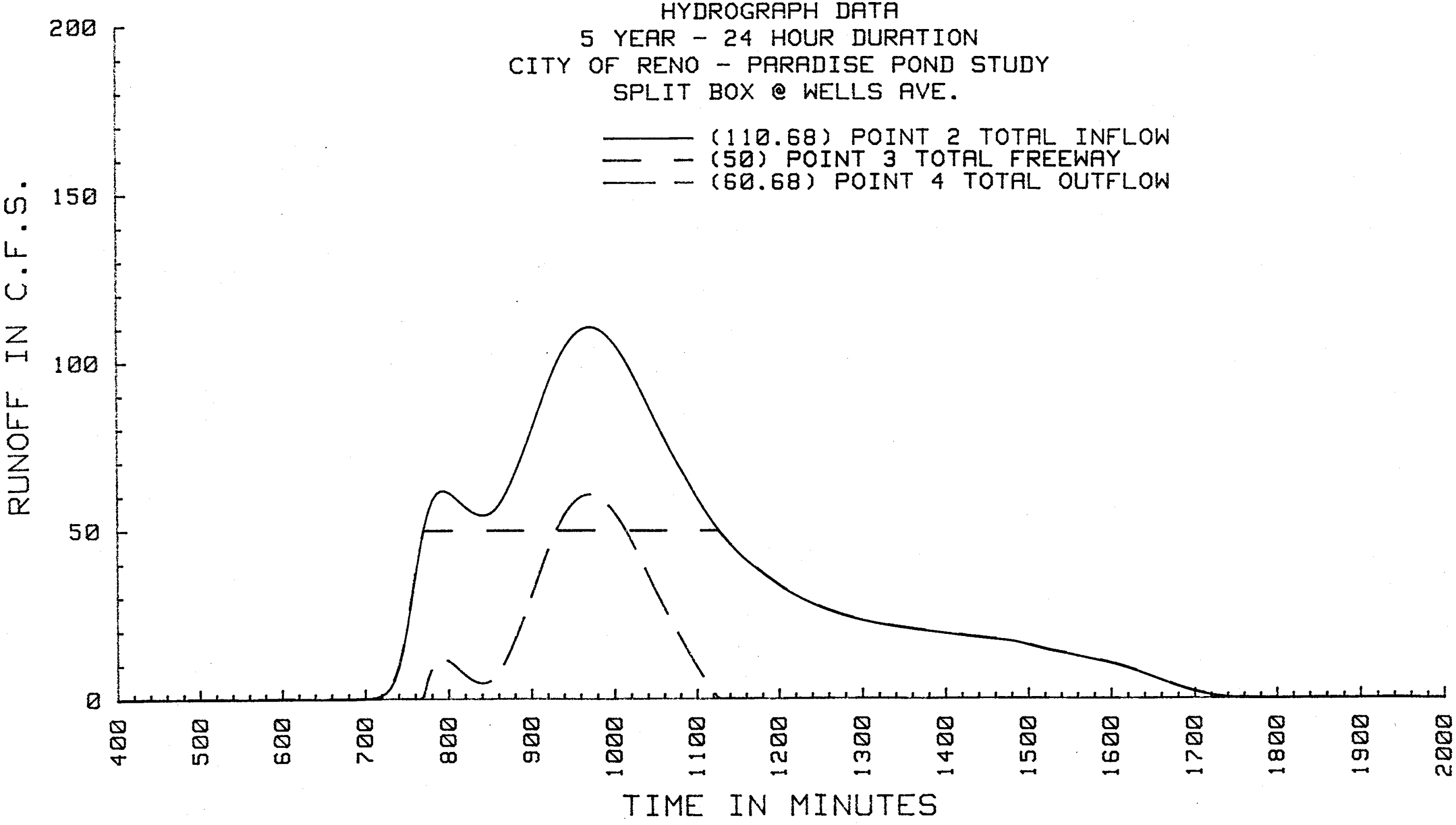
Subarea Totals	5-Year 6-Hour	25-Year 6-Hour	50-Year 6-Hour	100-Year 6-Hour
Evans	35.98 cfs @ 1.6 ac.ft.	80.69 cfs @ 5.7 ac.ft.	111.20 cfs @ 9.2 ac.ft.	173.98 cfs @ 18.3 ac.ft.
Split Box	35.63 cfs @ 410 min.	80.18 cfs @ 415 min.	110.59 cfs @ 415 min.	173.09 cfs @ 415 min.
Freeway	35.63 cfs @ 410 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.	50.00 cfs @ 415 min.
K	3.10 cfs @ 265 min. w/1.6 ac.ft.	8.87 cfs @ 185 min. w/4.4 ac.ft.	13.12 cfs @ 180 min. w/6.6 ac.ft.	22.77 cfs @ 180 min. w/11.4 ac.ft.
L	11.97 cfs @ 160 min.	33.58 cfs @ 160 min.	48.55 cfs @ 160 min.	83.21 cfs @ 155 min.
M	20.12 cfs @ 170 min.	50.76 cfs @ 170 min.	72.47 cfs @ 165 min.	120.22 cfs @ 165 min.
O	5.15 cfs @ 150 min.	12.08 cfs @ 150 min.	16.96 cfs @ 145 min.	27.45 cfs @ 145 min.
P	7.28 cfs @ 185 min.	31.53 cfs @ 405 min.	62.31 cfs @ 405 min.	125.32 cfs @ 410 min.
Q	2.23 cfs @ 150 min.	5.48 cfs @ 150 min.	7.63 cfs @ 150 min.	12.16 cfs @ 150 min.
S	54.18 cfs @ 155 min.	129.91 cfs @ 150 min.	183.30 cfs @ 150 min.	301.32 cfs @ 150 min.
T	6.30 cfs @ 165 min.	17.52 cfs @ 165 min.	25.68 cfs @ 160 min.	43.91 cfs @ 160 min.
U	20.93 cfs @ 185 min.	58.37 cfs @ 175 min.	94.67 cfs @ 375 min.	182.41 cfs @ 375 min.
V	20.93 cfs @ 185 min.	58.37 cfs @ 175 min.	95.13 cfs @ 375 min.	183.99 cfs @ 375 min.
Paradise Pond Outlet One 30-inch pipe:				
	1.14 cfs @ 185 min. w/11.4ac.ft.	4.63 cfs @ 175 min. w/27.8ac.ft.	8.92 cfs @ 375 min. w/44.1ac.ft.	17.15 cfs @ 375 min. w/87.8ac.ft.

HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."



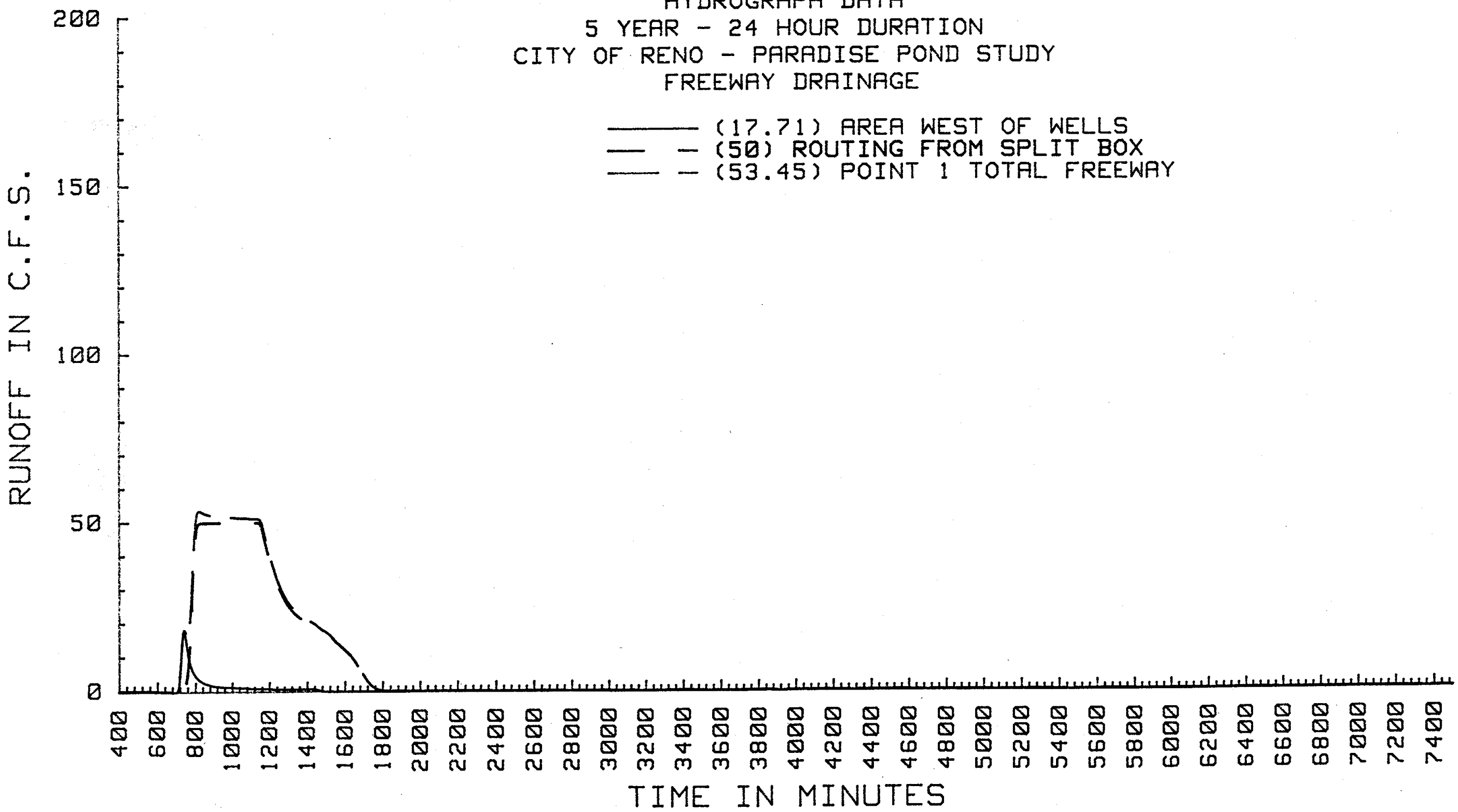
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (110.68) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (60.68) POINT 4 TOTAL OUTFLOW

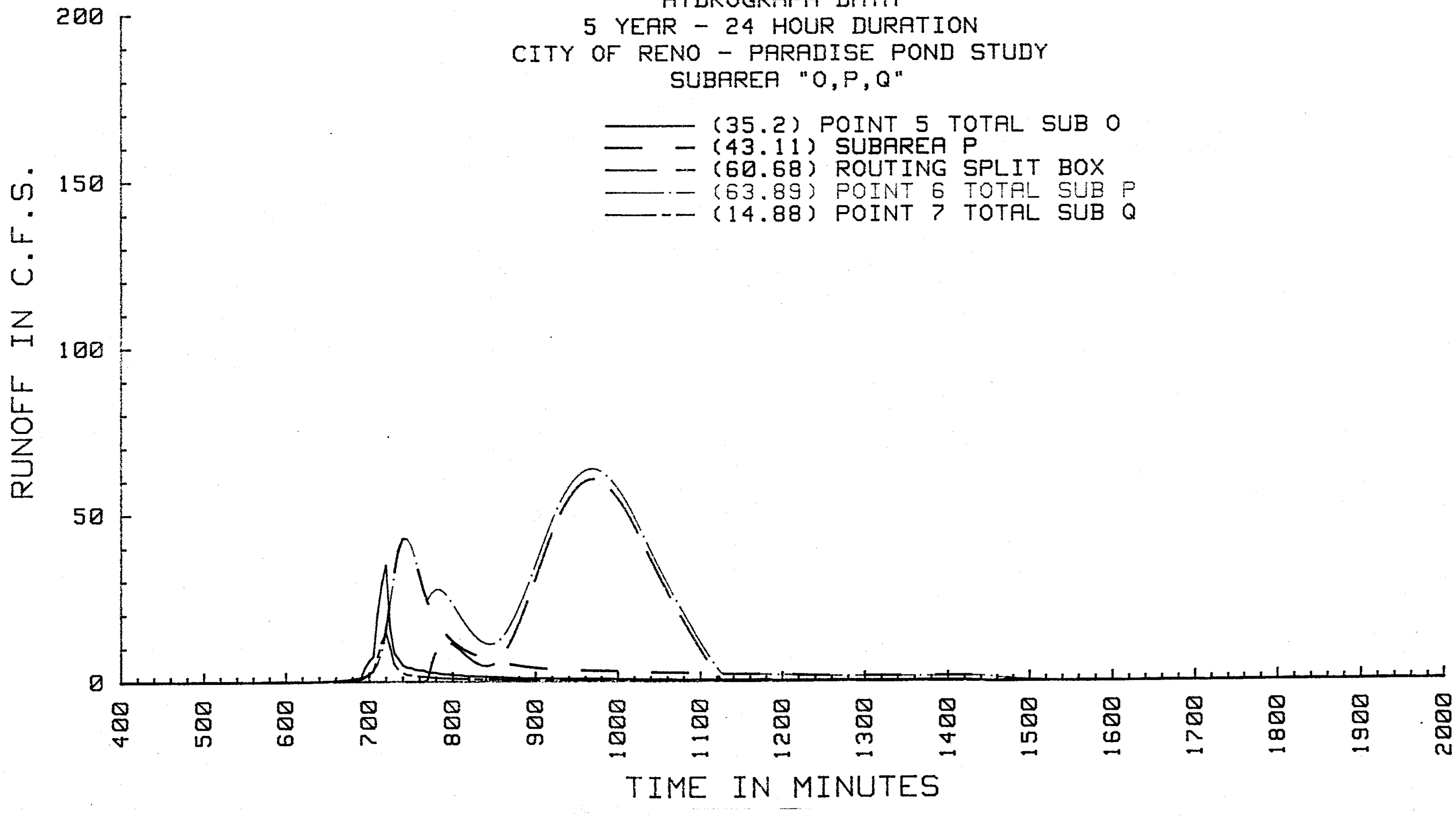


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (17.71) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (53.45) POINT 1 TOTAL FREEWAY

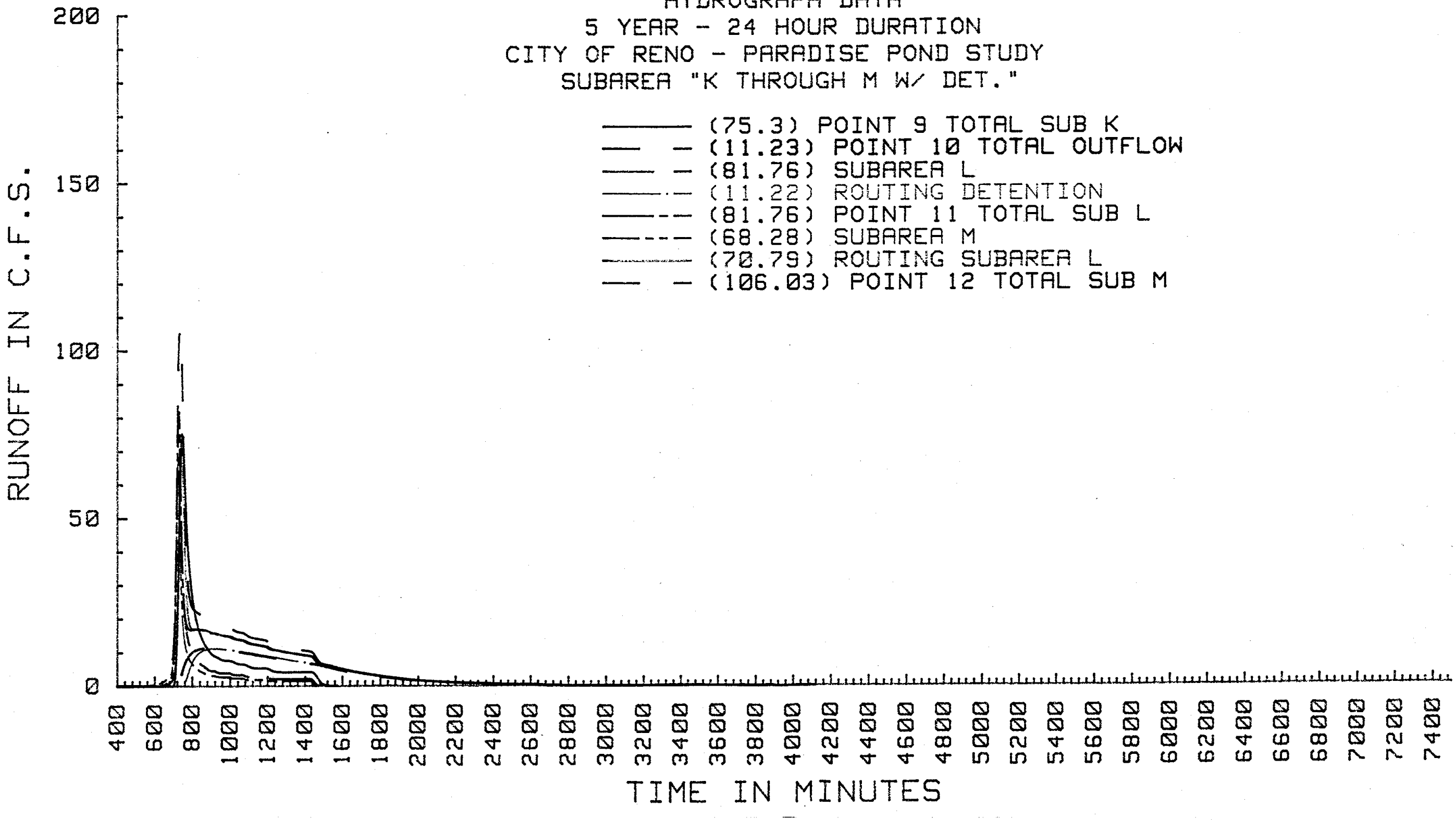


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



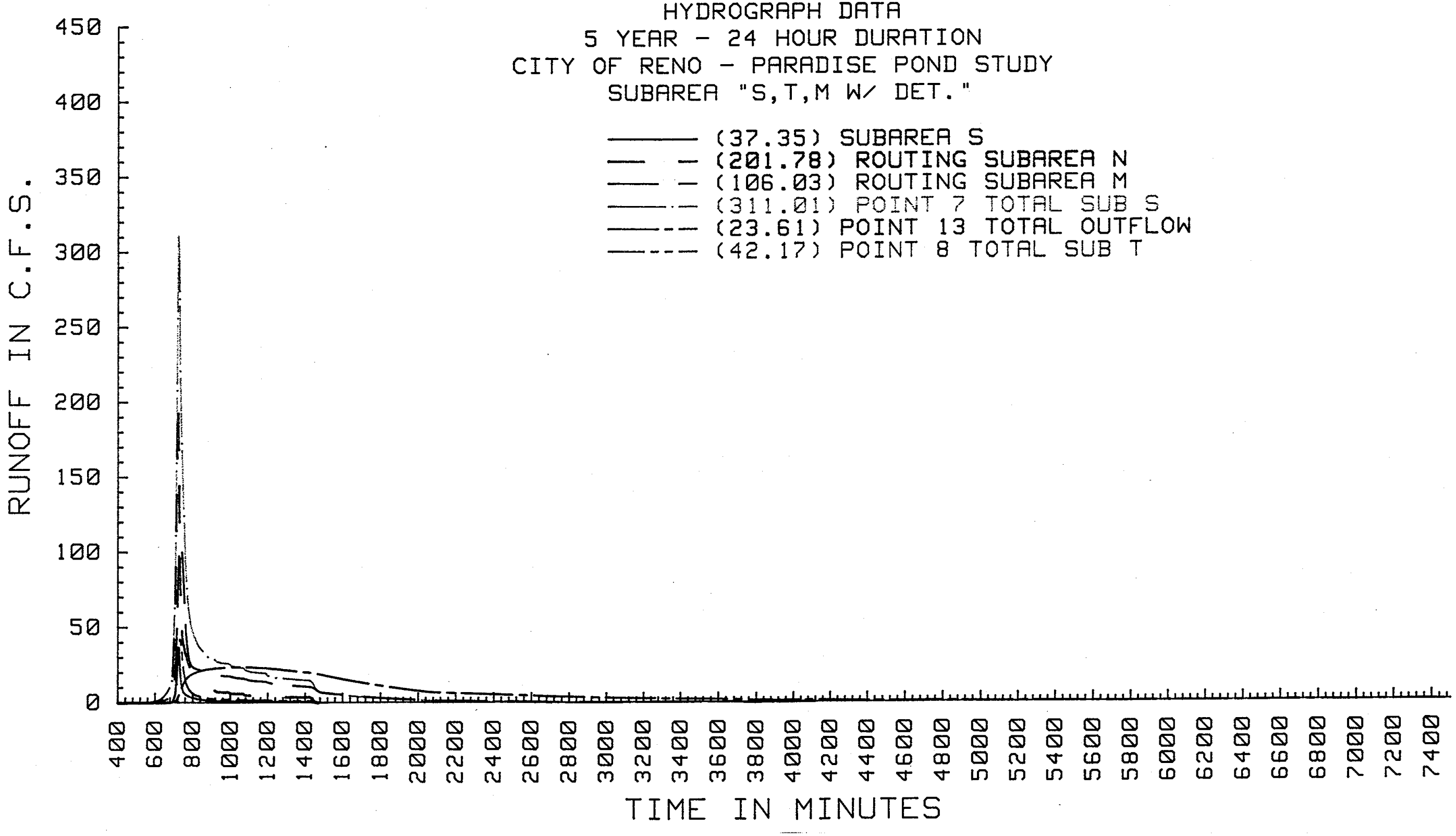
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

——— (75.3) POINT 9 TOTAL SUB K
—— — (11.23) POINT 10 TOTAL OUTFLOW
—— — (81.76) SUBAREA L
——·— (11.22) ROUTING DETENTION
——-- (81.76) POINT 11 TOTAL SUB L
——--- (68.28) SUBAREA M
——— (70.79) ROUTING SUBAREA L
—— — (106.03) POINT 12 TOTAL SUB M

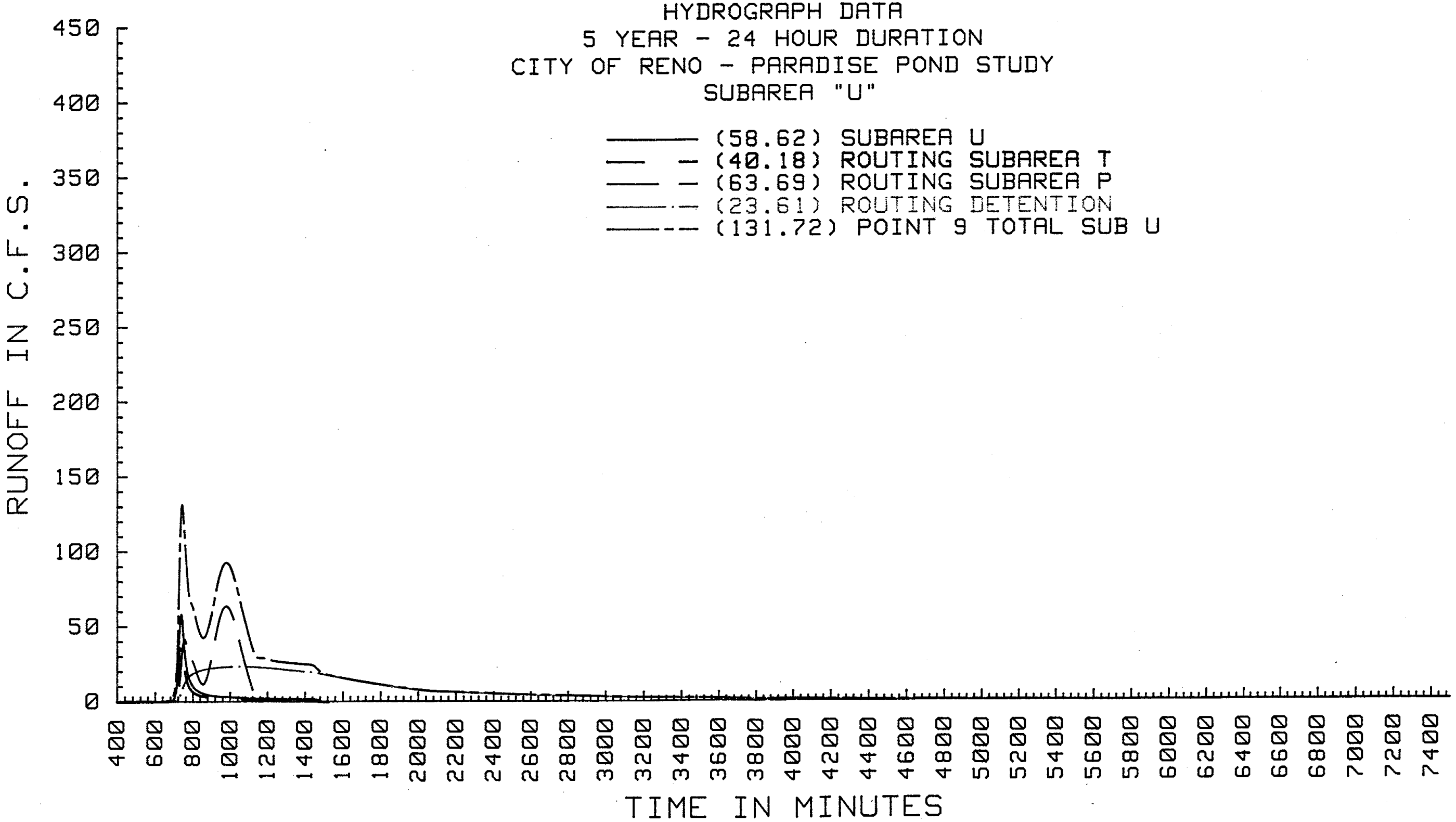


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M W/ DET."

——— (37.35) SUBAREA S
— — (201.78) ROUTING SUBAREA N
— — (106.03) ROUTING SUBAREA M
—·— (311.01) POINT 7 TOTAL SUB S
—-- (23.61) POINT 13 TOTAL OUTFLOW
—--- (42.17) POINT 8 TOTAL SUB T

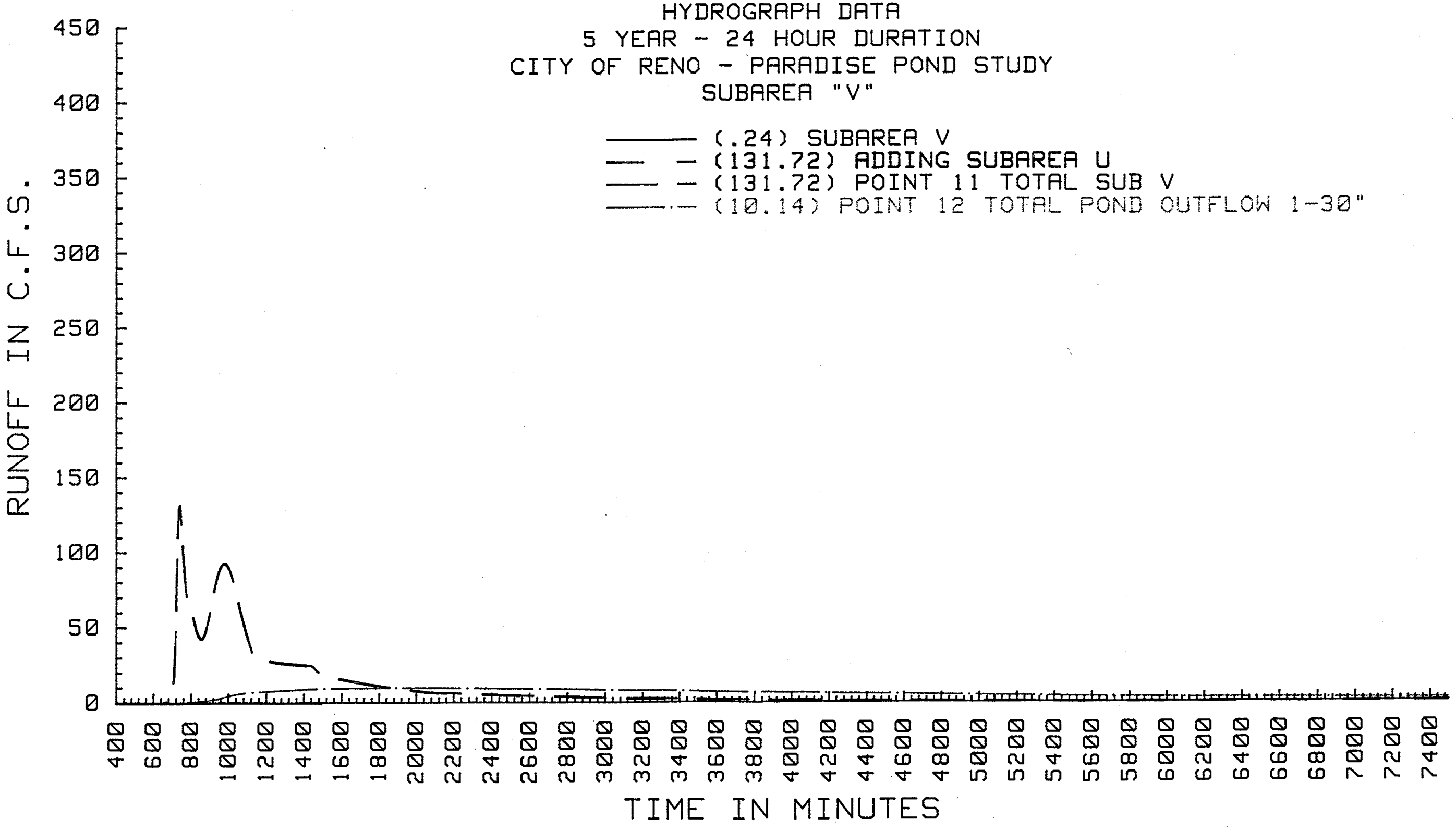


HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



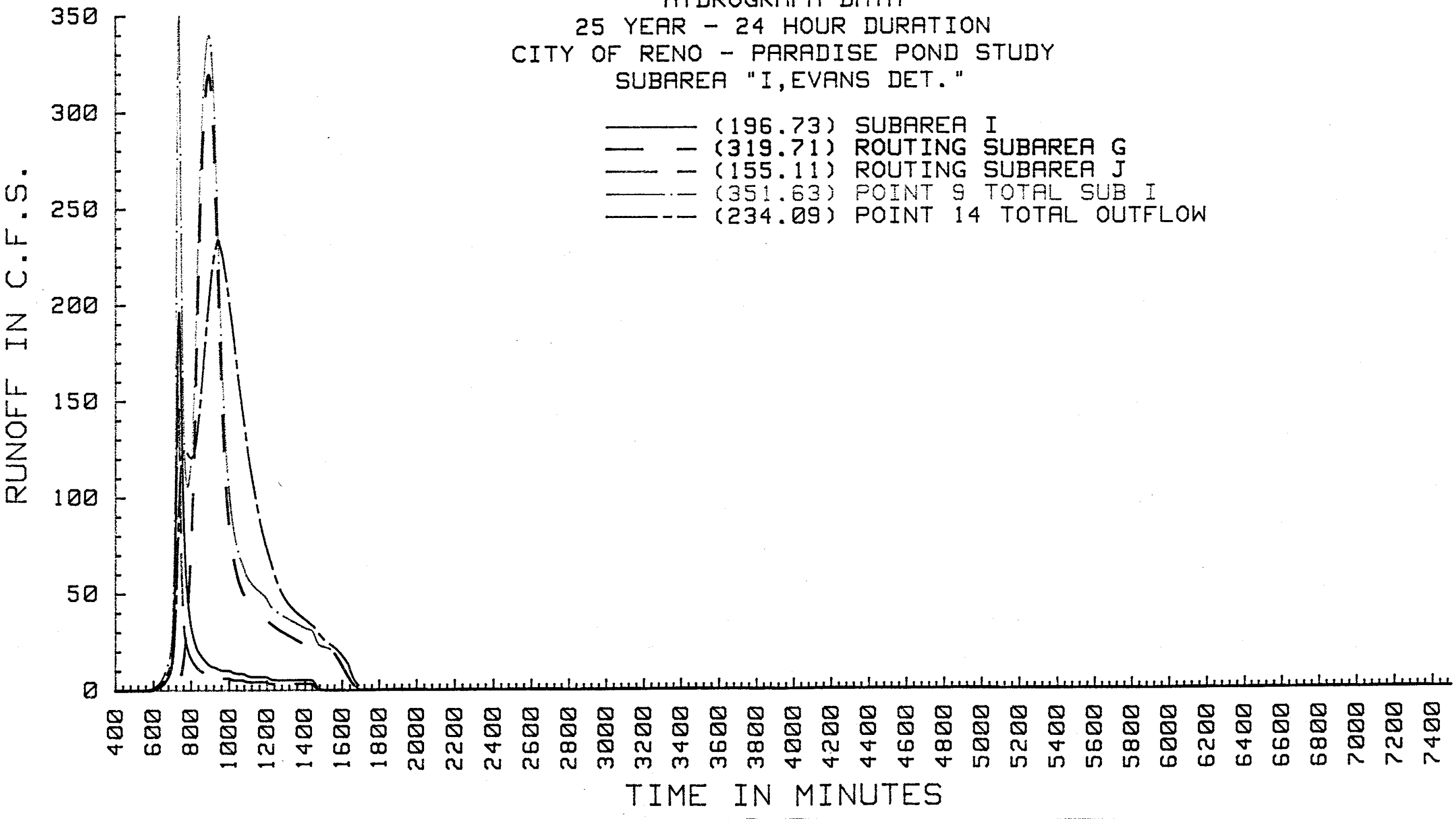
HYDROGRAPH DATA
5 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (.24) SUBAREA V
— — (131.72) ADDING SUBAREA U
— — (131.72) POINT 11 TOTAL SUB V
—·— (10.14) POINT 12 TOTAL POND OUTFLOW 1-30"



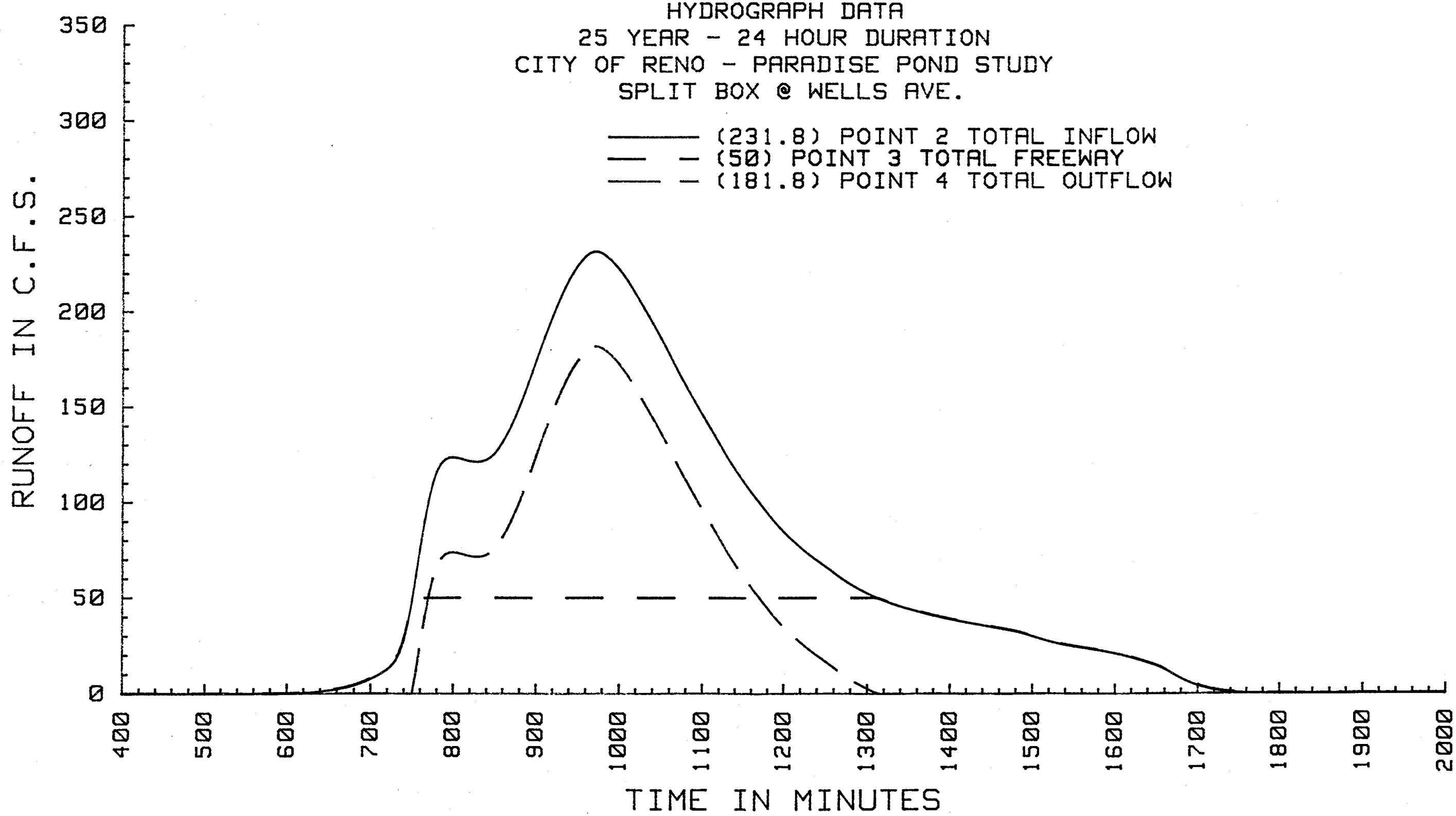
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

——— (196.73) SUBAREA I
— — (319.71) ROUTING SUBAREA G
— — (155.11) ROUTING SUBAREA J
———·— (351.63) POINT 9 TOTAL SUB I
———-- (234.09) POINT 14 TOTAL OUTFLOW



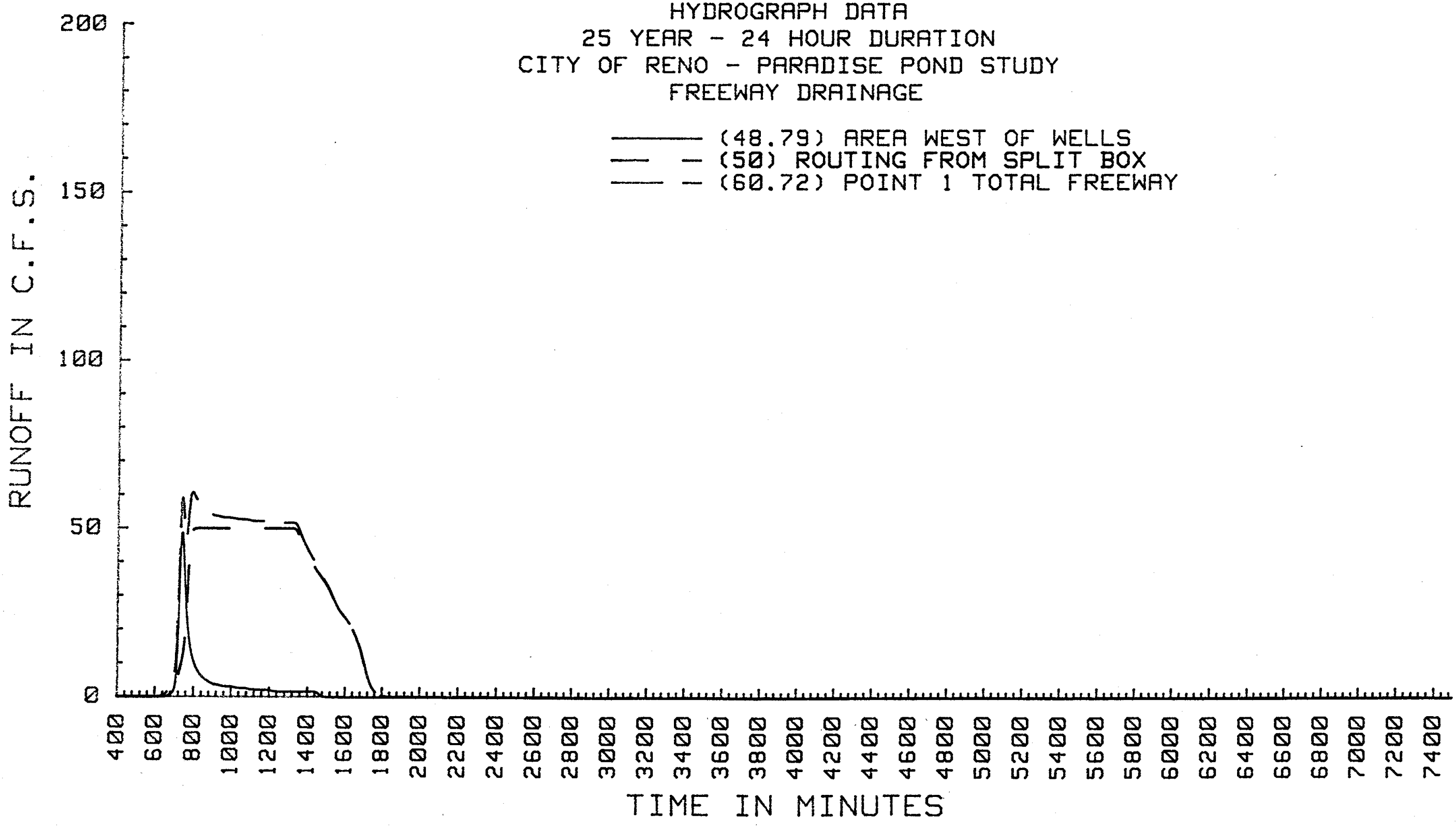
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

——— (231.8) POINT 2 TOTAL INFLOW
— — (50) POINT 3 TOTAL FREEWAY
—— — (181.8) POINT 4 TOTAL OUTFLOW

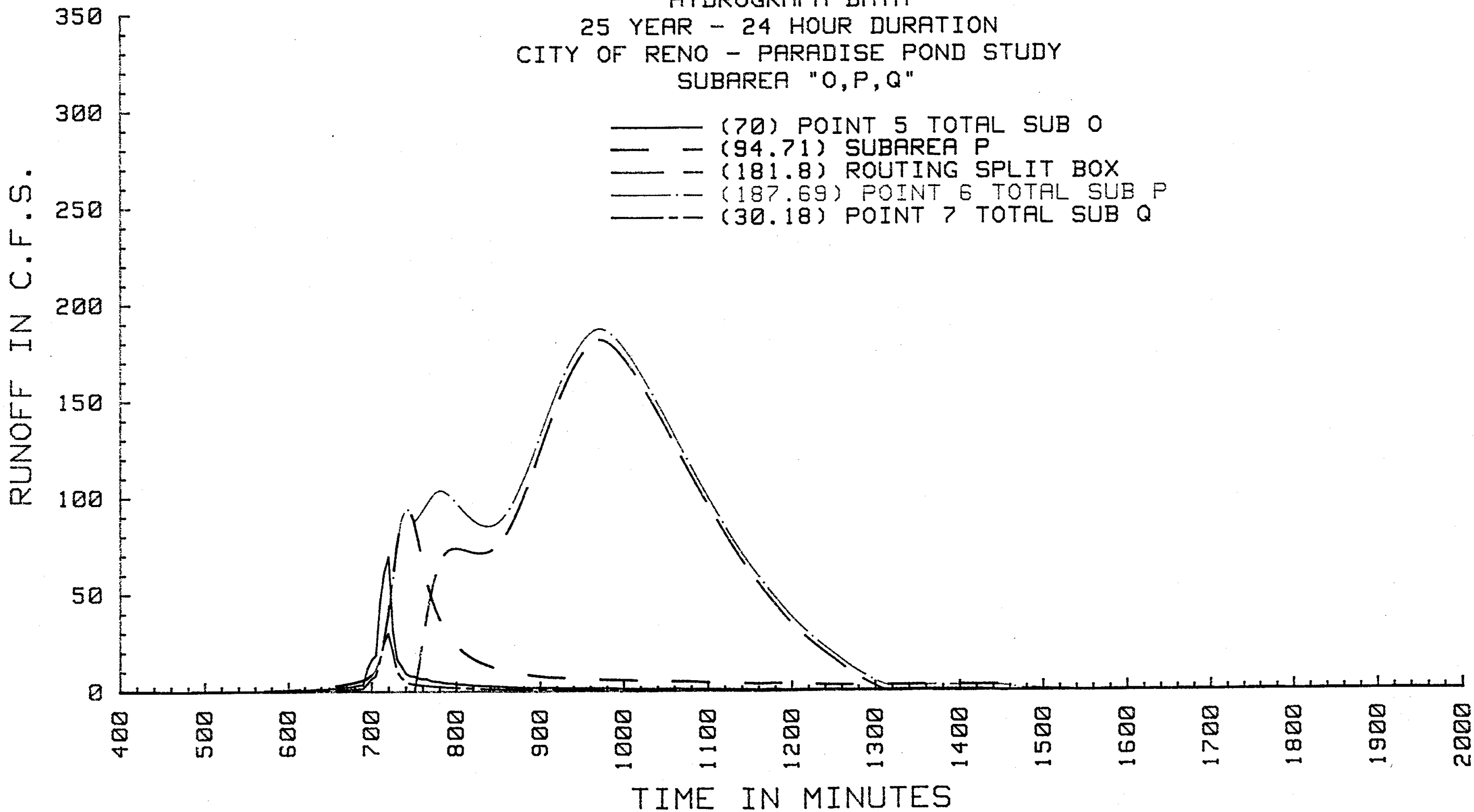


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

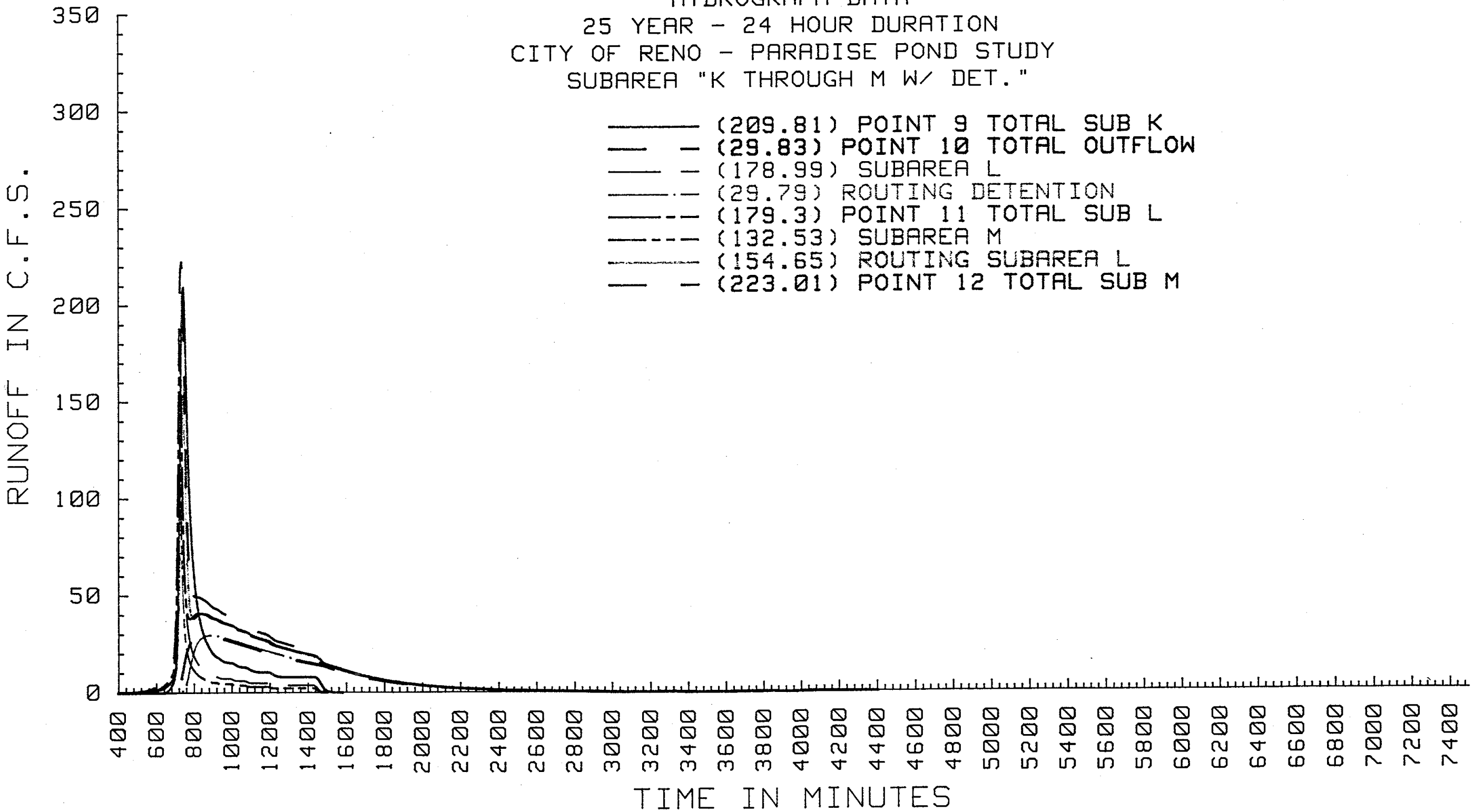
——— (48.79) AREA WEST OF WELLS
— — (50) ROUTING FROM SPLIT BOX
—— — (60.72) POINT 1 TOTAL FREEWAY



HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

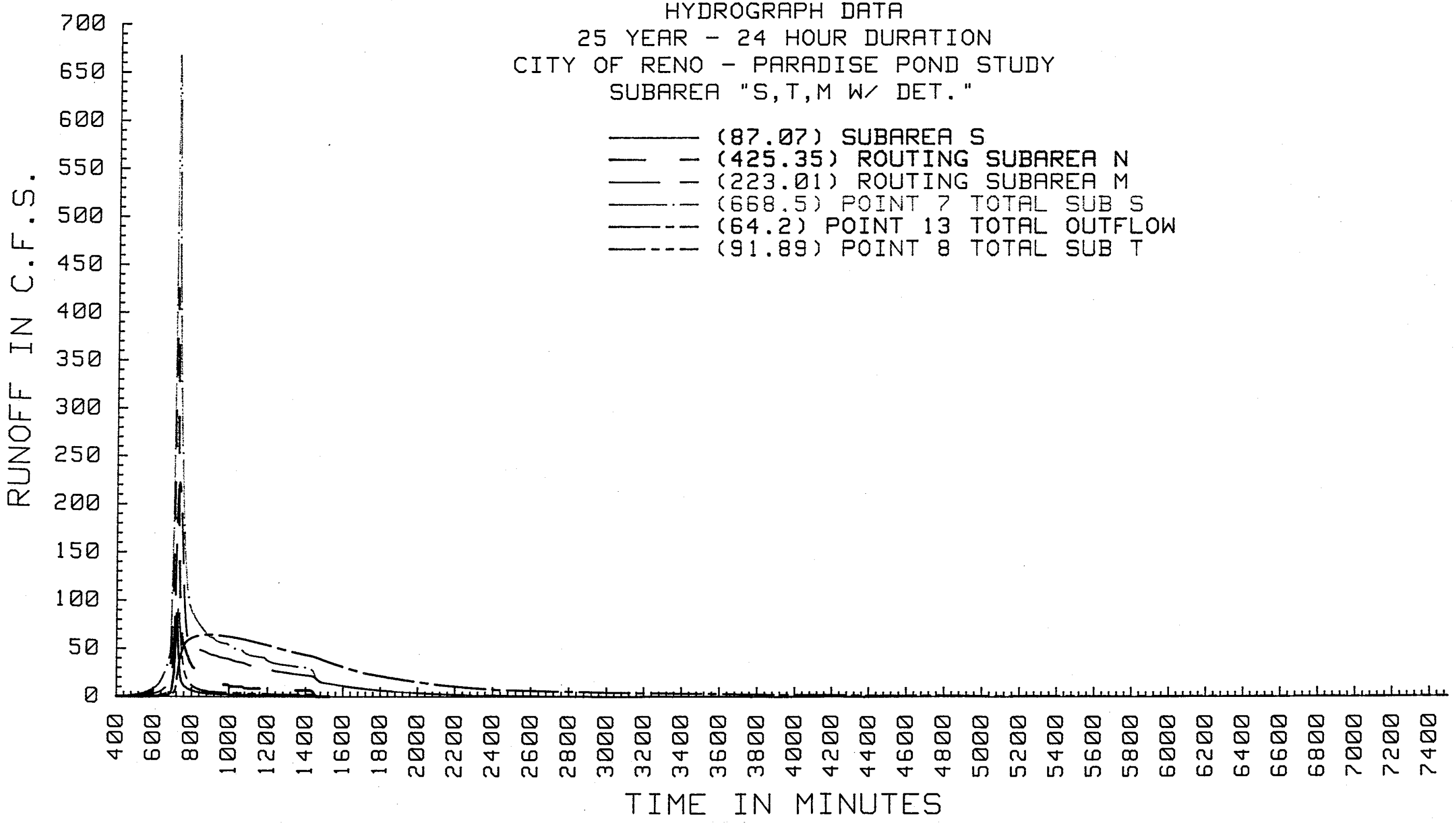


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

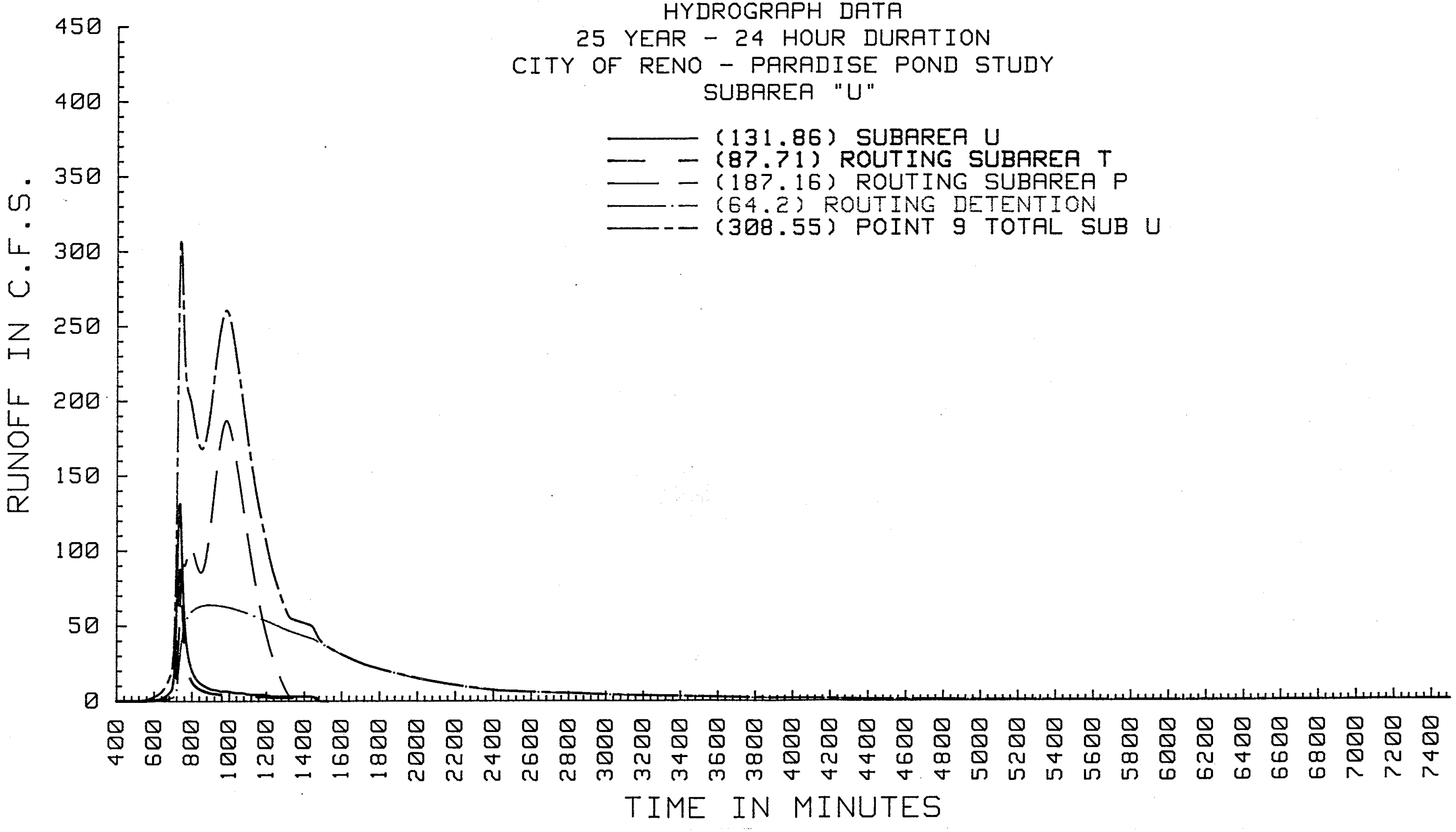


HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M W/ DET."

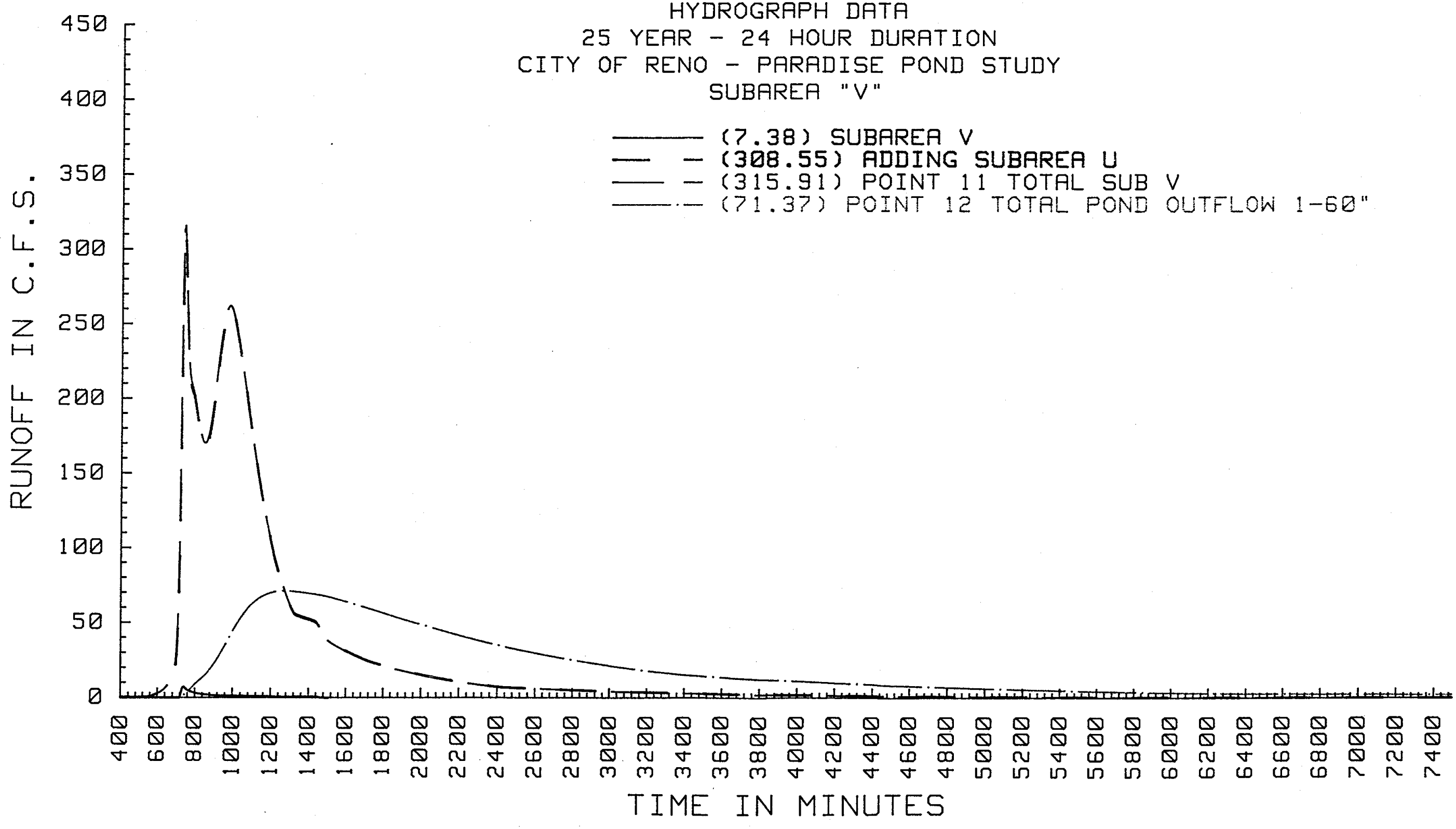
——— (87.07) SUBAREA S
— — (425.35) ROUTING SUBAREA N
— — (223.01) ROUTING SUBAREA M
—·— (668.5) POINT 7 TOTAL SUB S
—·-· (64.2) POINT 13 TOTAL OUTFLOW
—·-·- (91.89) POINT 8 TOTAL SUB T



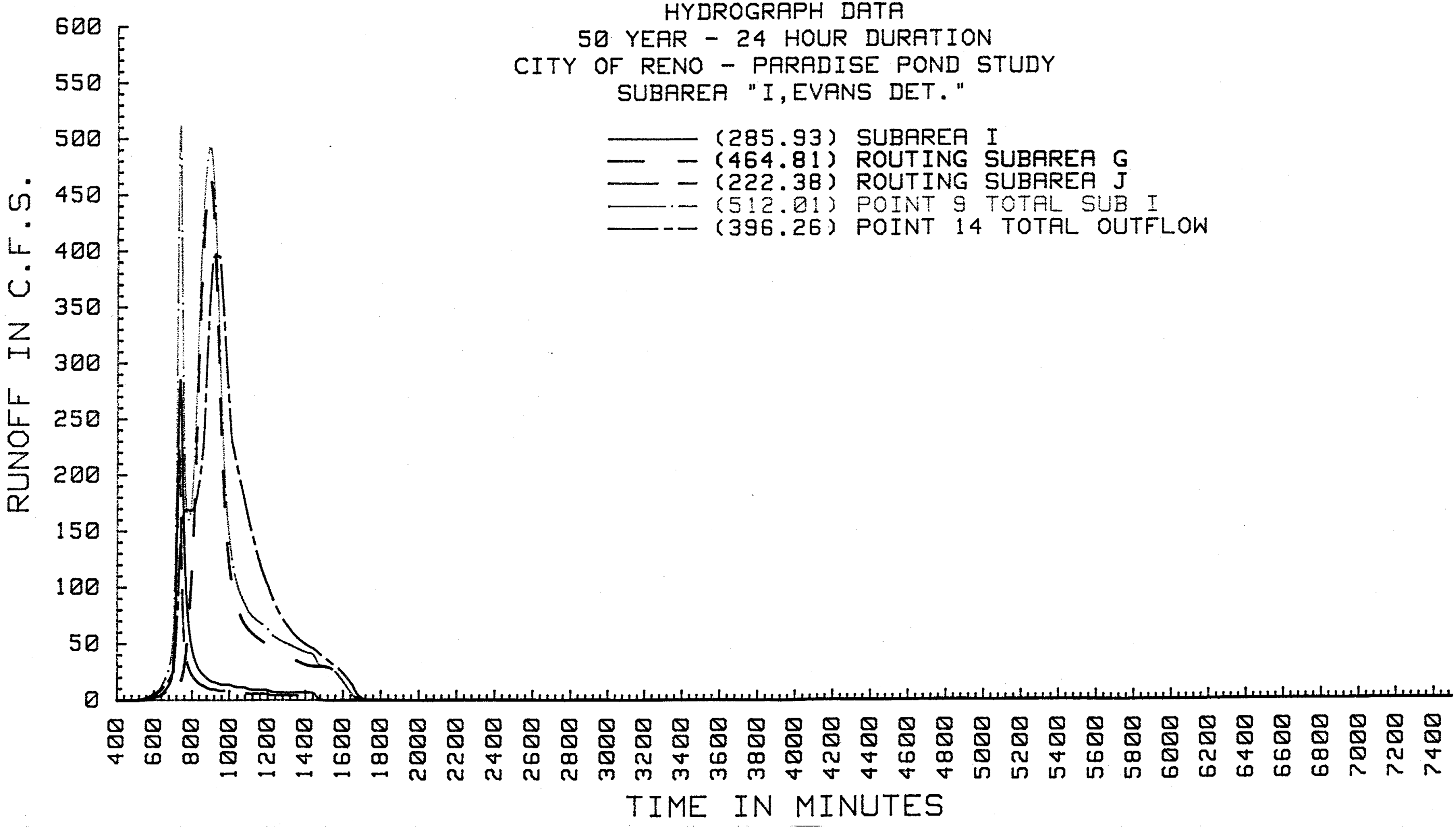
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



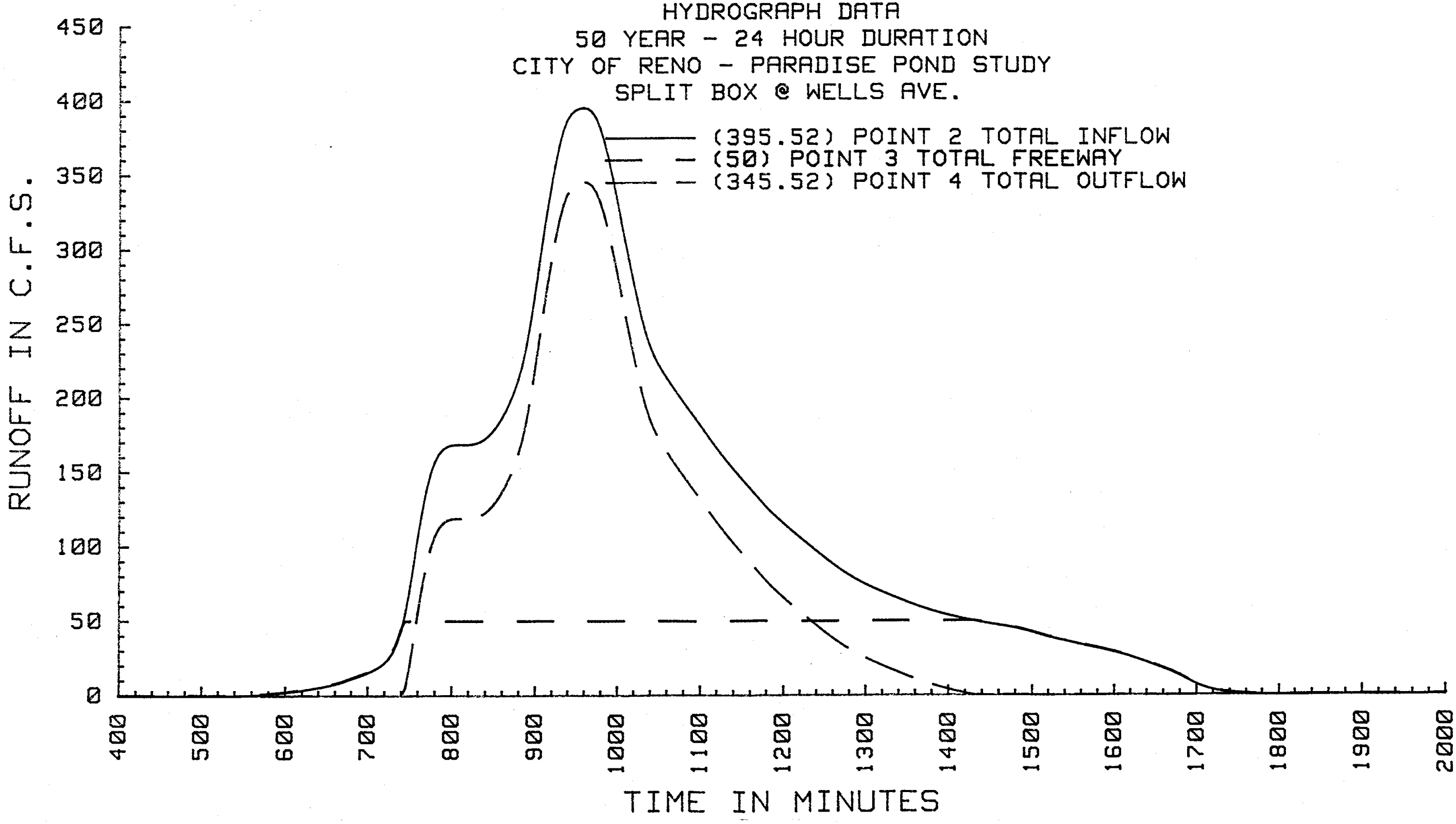
HYDROGRAPH DATA
25 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"



HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

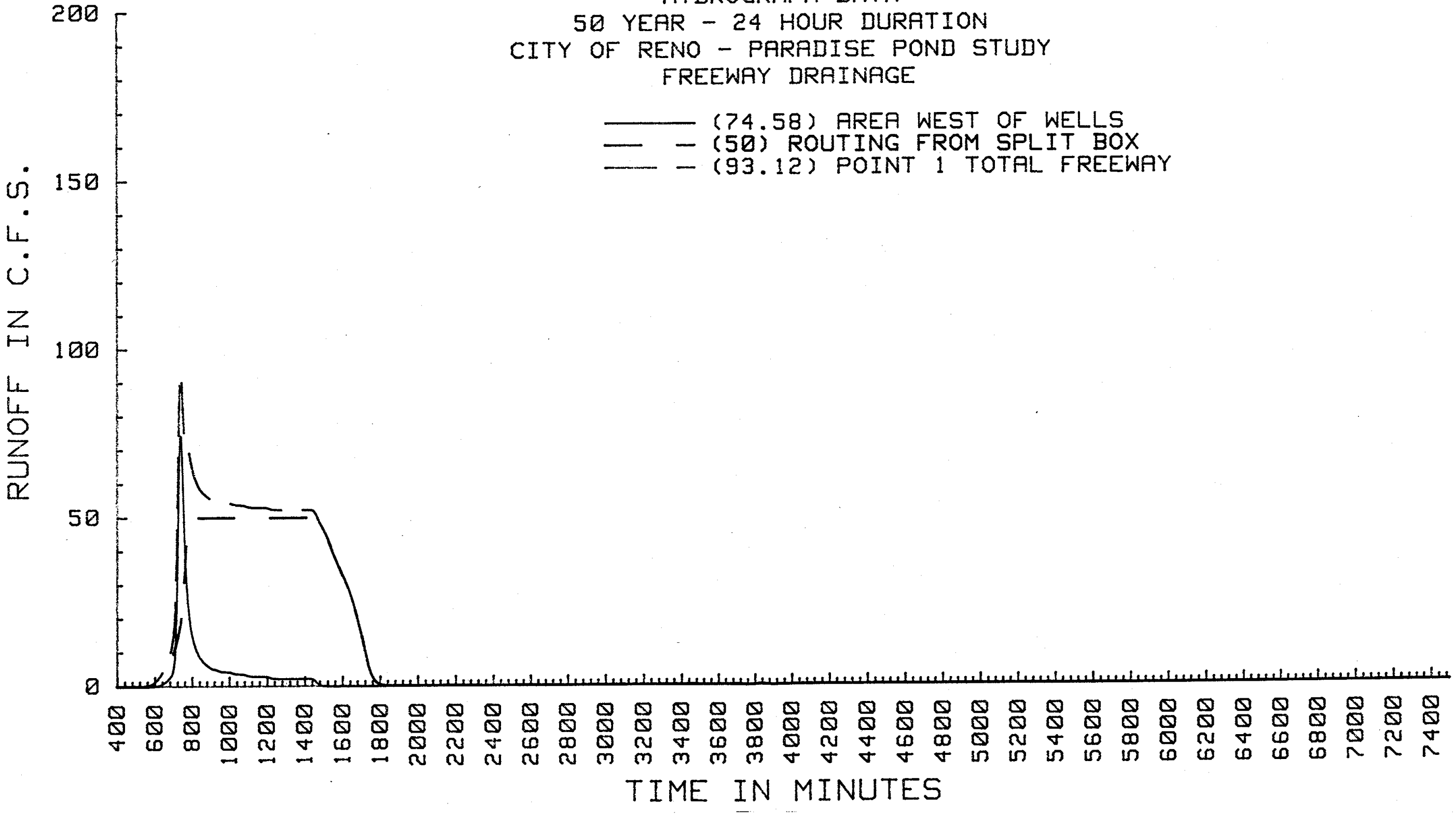


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

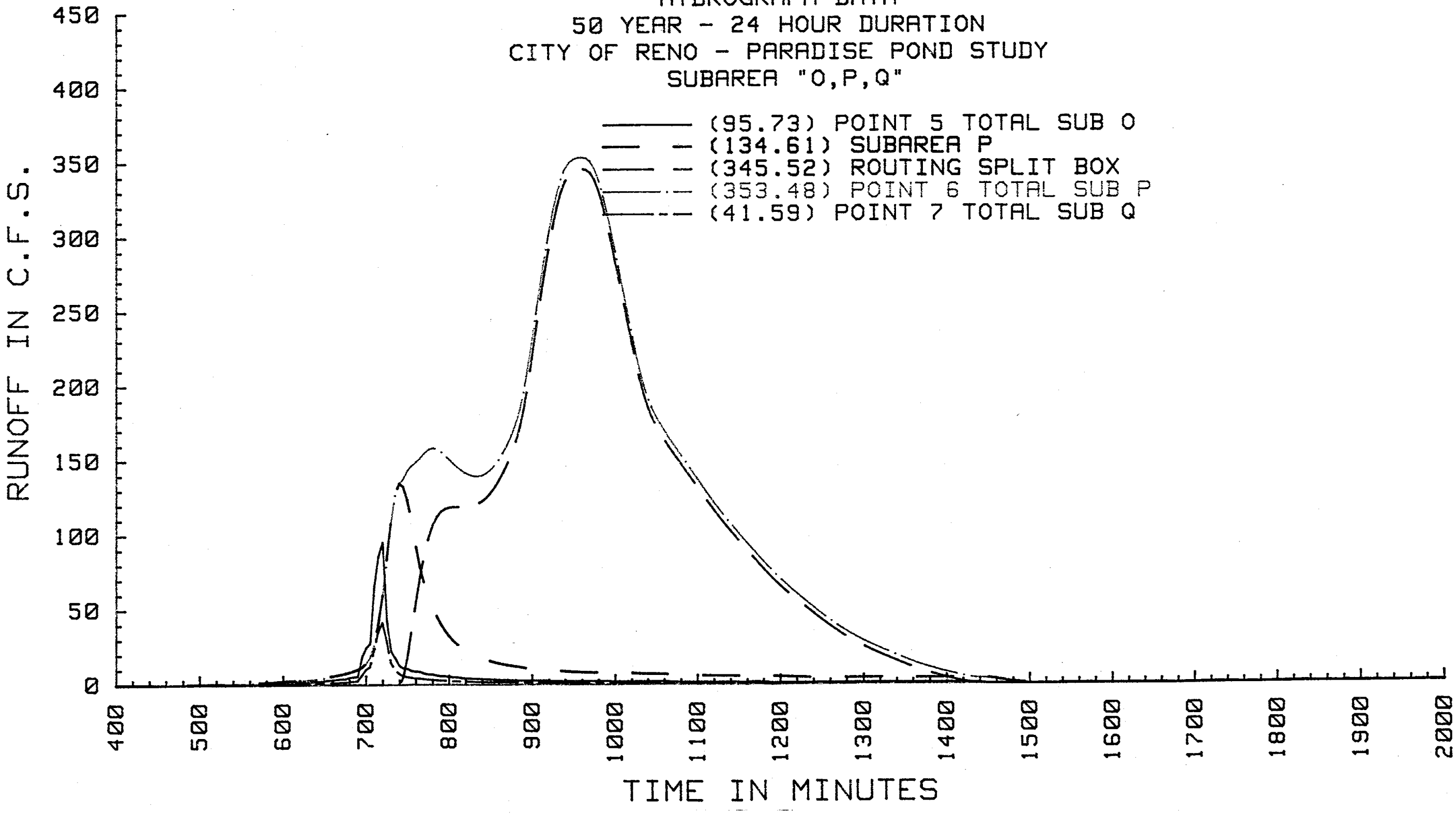


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

——— (74.58) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (93.12) POINT 1 TOTAL FREEWAY

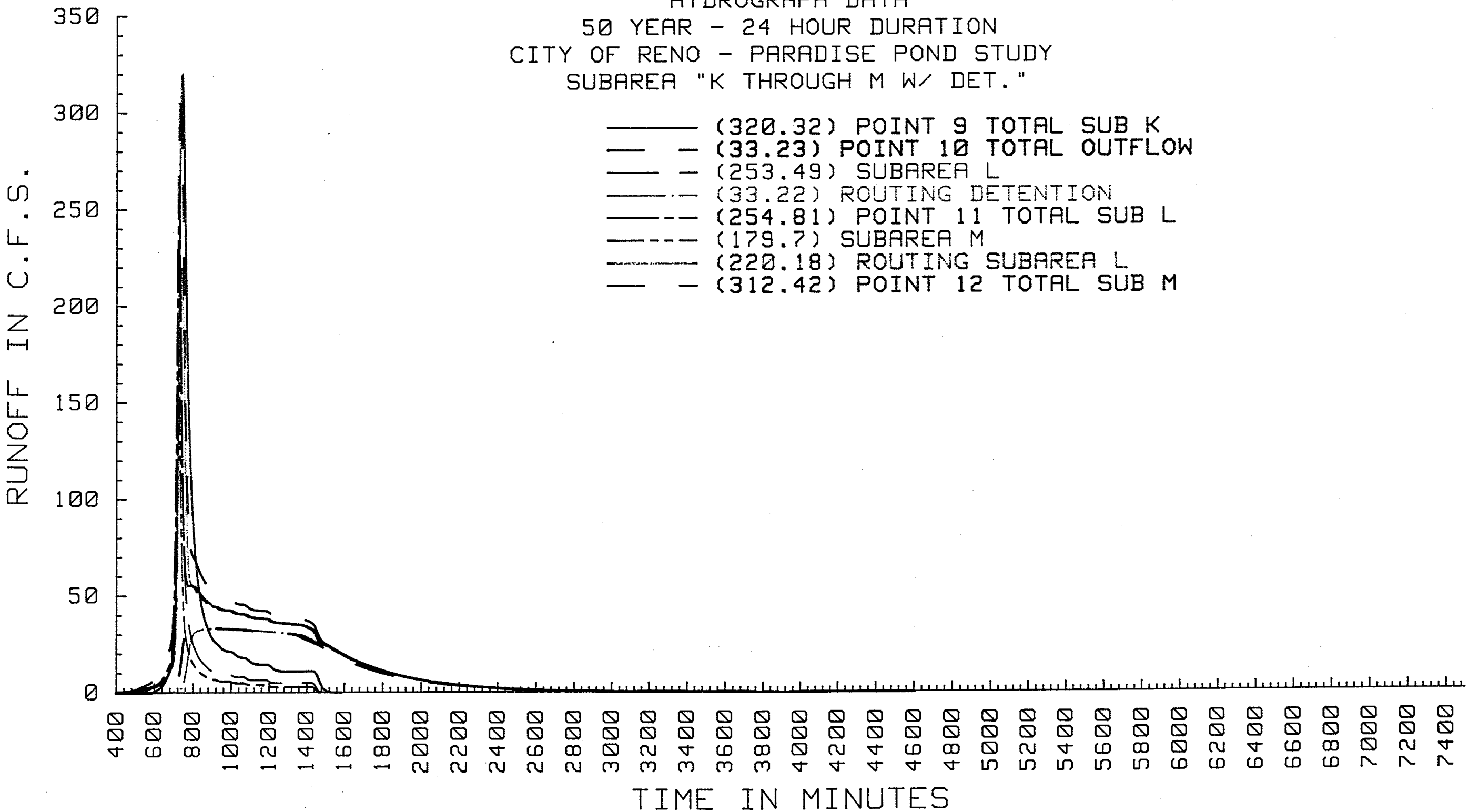


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"



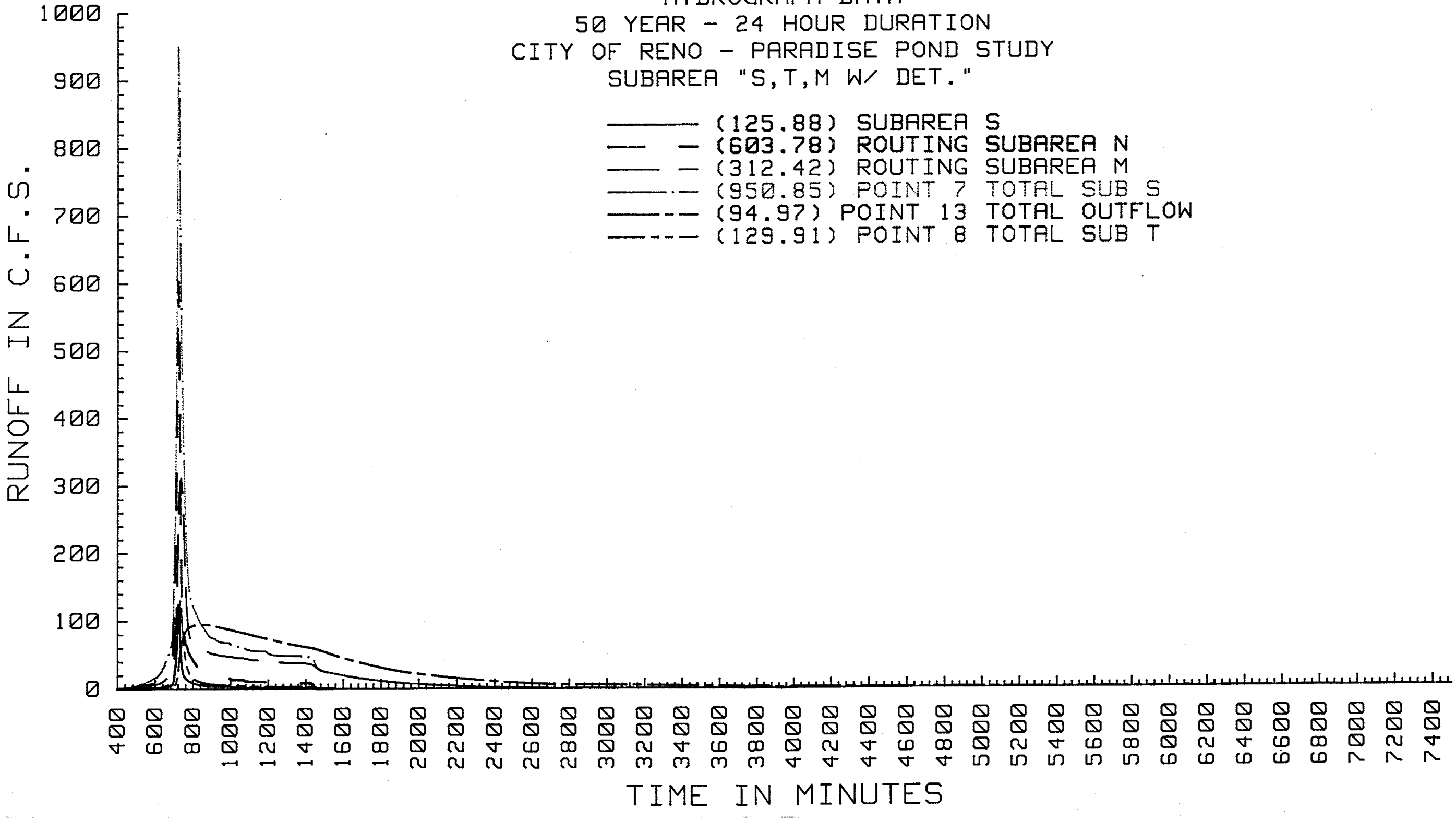
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

——— (320.32) POINT 9 TOTAL SUB K
— — (33.23) POINT 10 TOTAL OUTFLOW
—— — (253.49) SUBAREA L
——·— (33.22) ROUTING DETENTION
——-- (254.81) POINT 11 TOTAL SUB L
—--- (179.7) SUBAREA M
——— (220.18) ROUTING SUBAREA L
— — (312.42) POINT 12 TOTAL SUB M

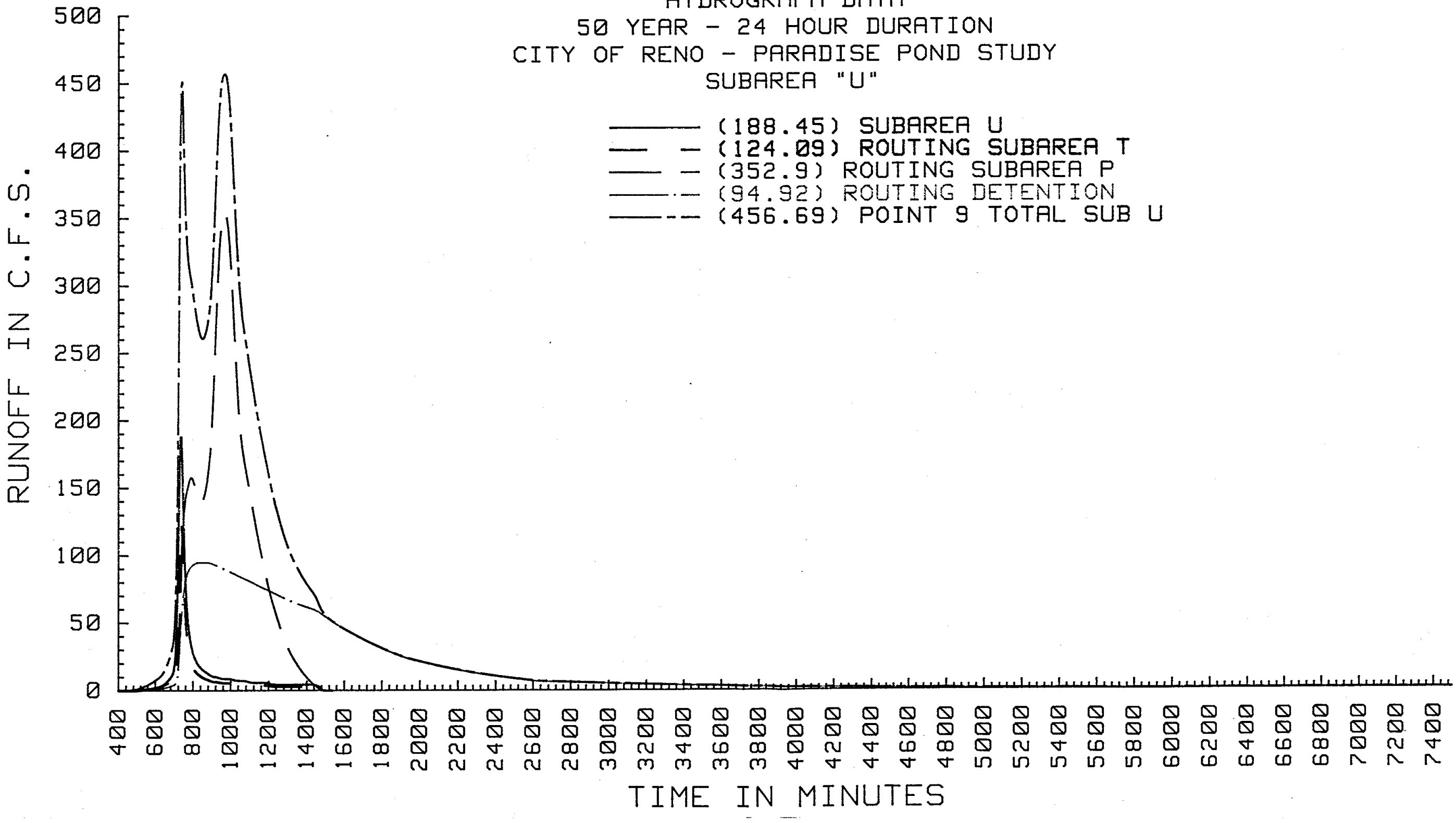


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M W/ DET."

——— (125.88) SUBAREA S
— — (603.78) ROUTING SUBAREA N
—— — (312.42) ROUTING SUBAREA M
———·— (950.85) POINT 7 TOTAL SUB S
———-- (94.97) POINT 13 TOTAL OUTFLOW
———--- (129.91) POINT 8 TOTAL SUB T

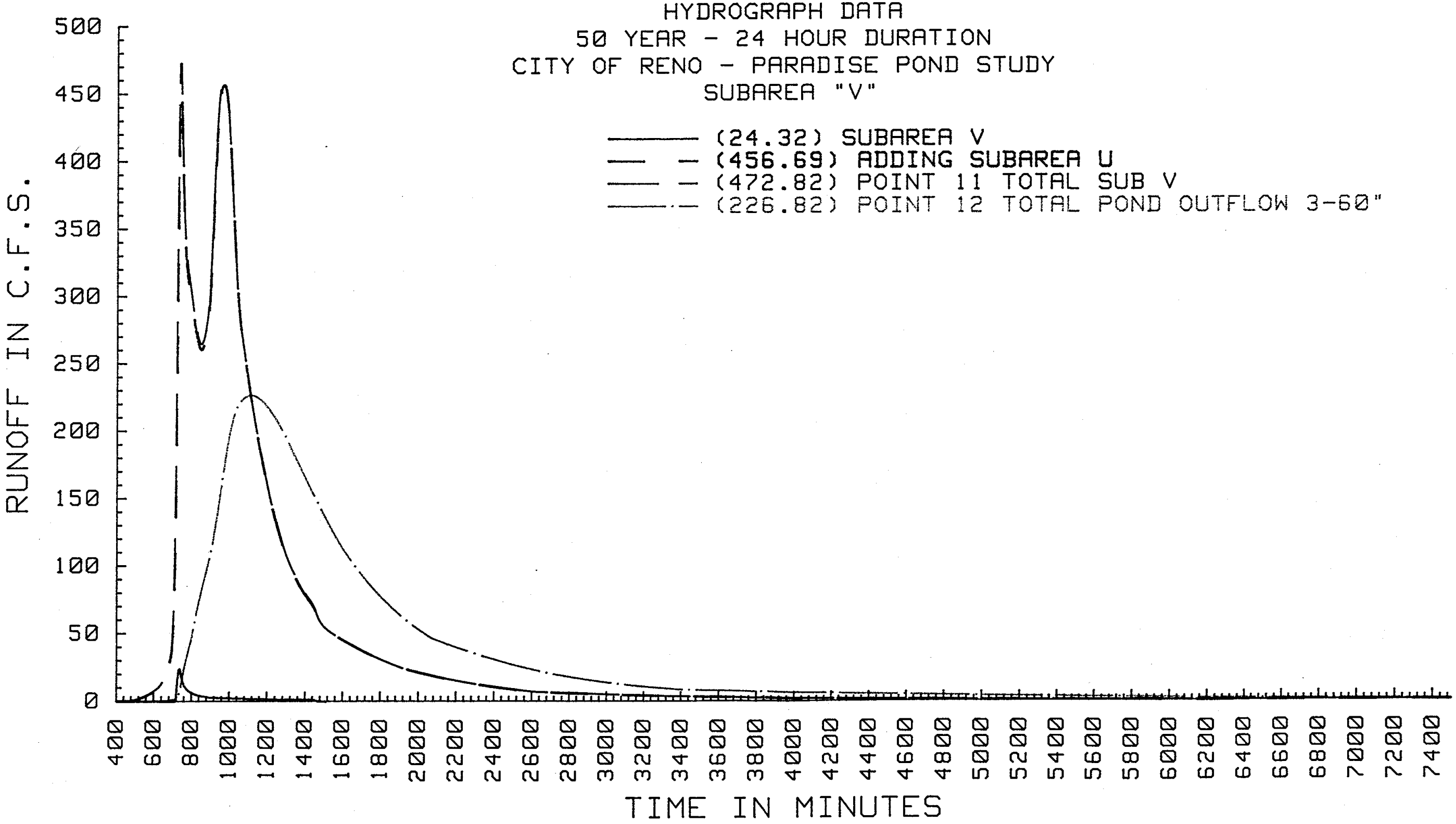


HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



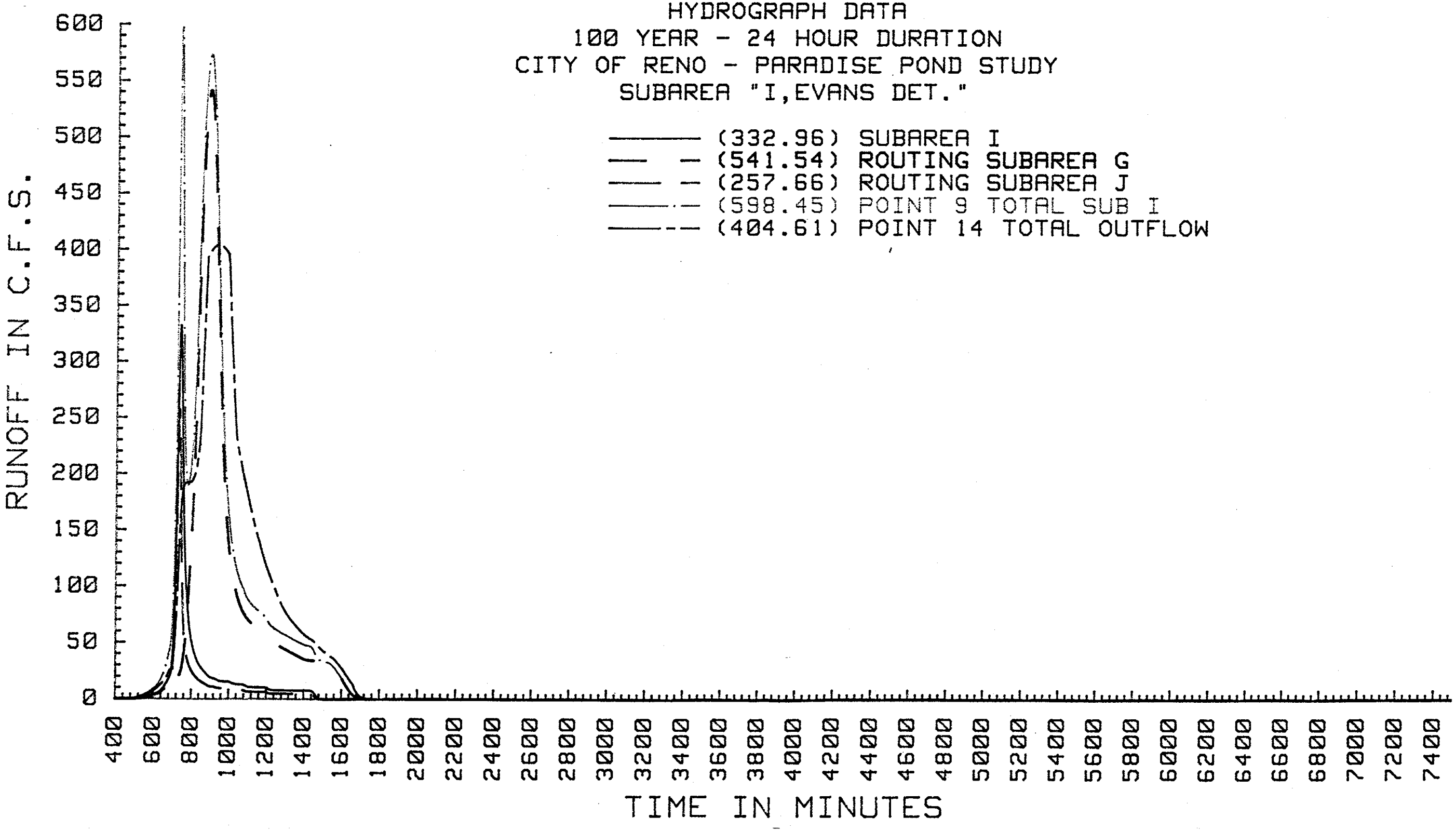
HYDROGRAPH DATA
50 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"

——— (24.32) SUBAREA V
— — (456.69) ADDING SUBAREA U
—— — (472.82) POINT 11 TOTAL SUB V
——·— (226.82) POINT 12 TOTAL POND OUTFLOW 3-60"

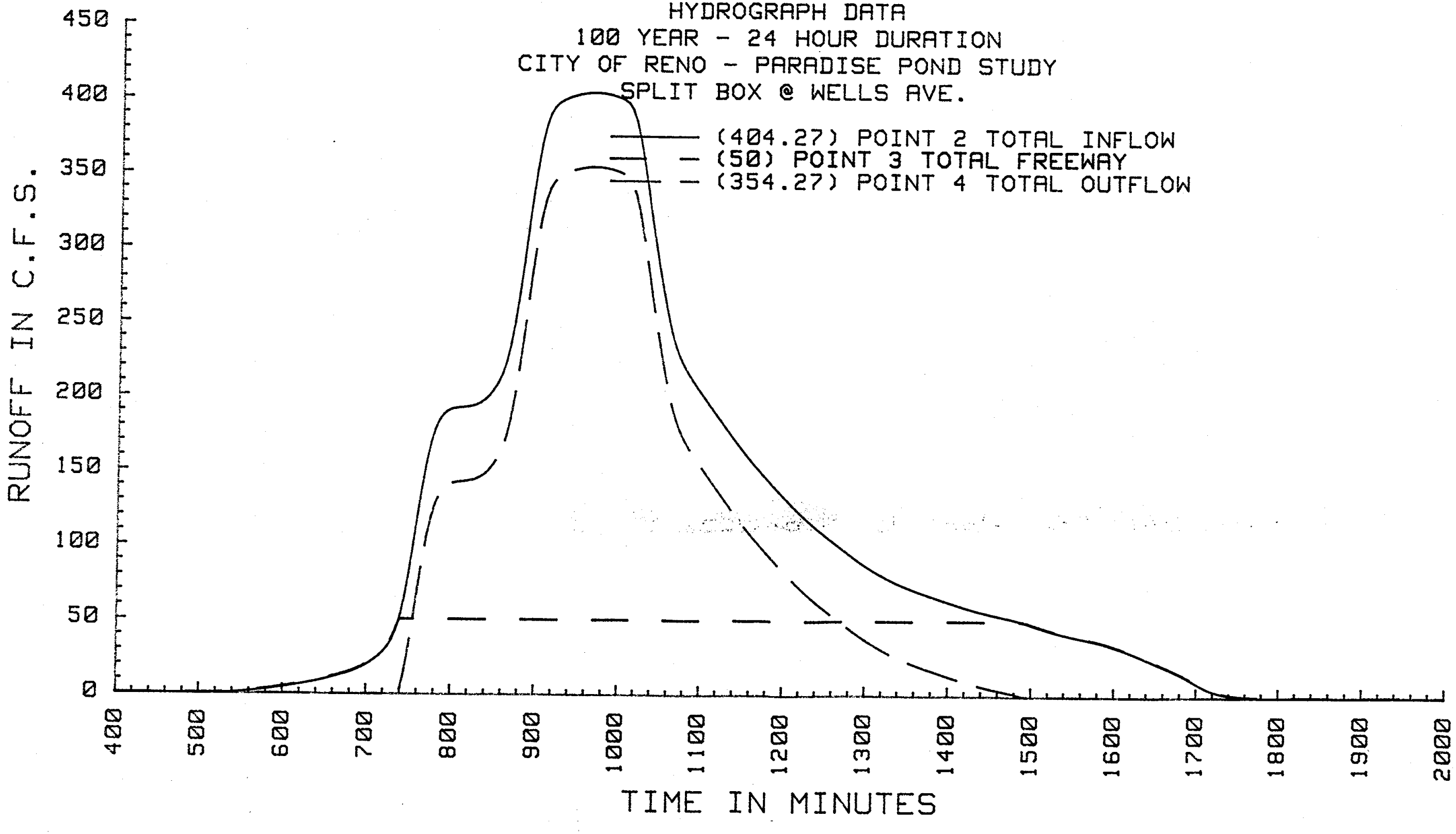


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "I,EVANS DET."

——— (332.96) SUBAREA I
— — (541.54) ROUTING SUBAREA G
— — (257.66) ROUTING SUBAREA J
—·— (598.45) POINT 9 TOTAL SUB I
—··— (404.61) POINT 14 TOTAL OUTFLOW

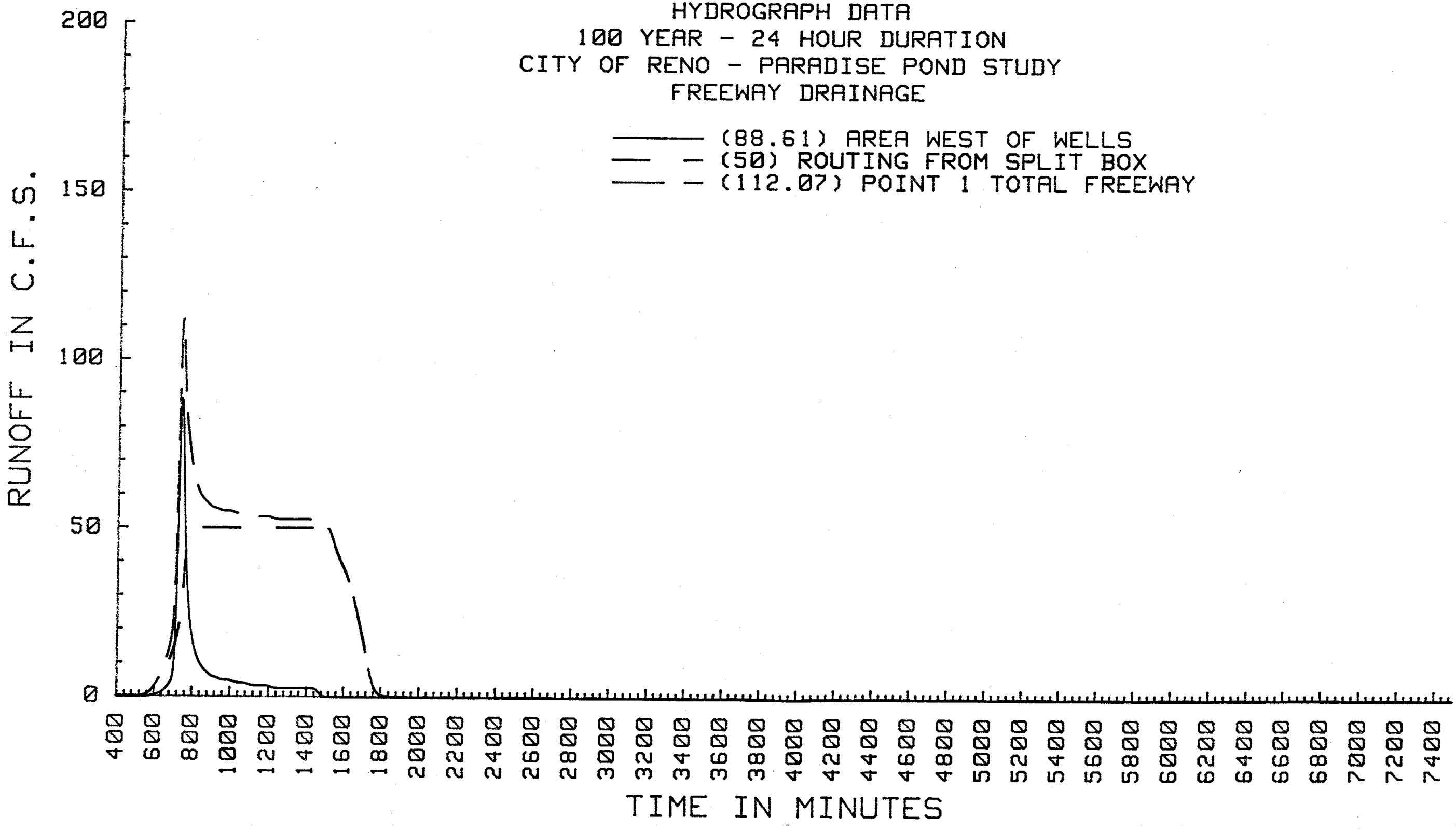


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SPLIT BOX @ WELLS AVE.

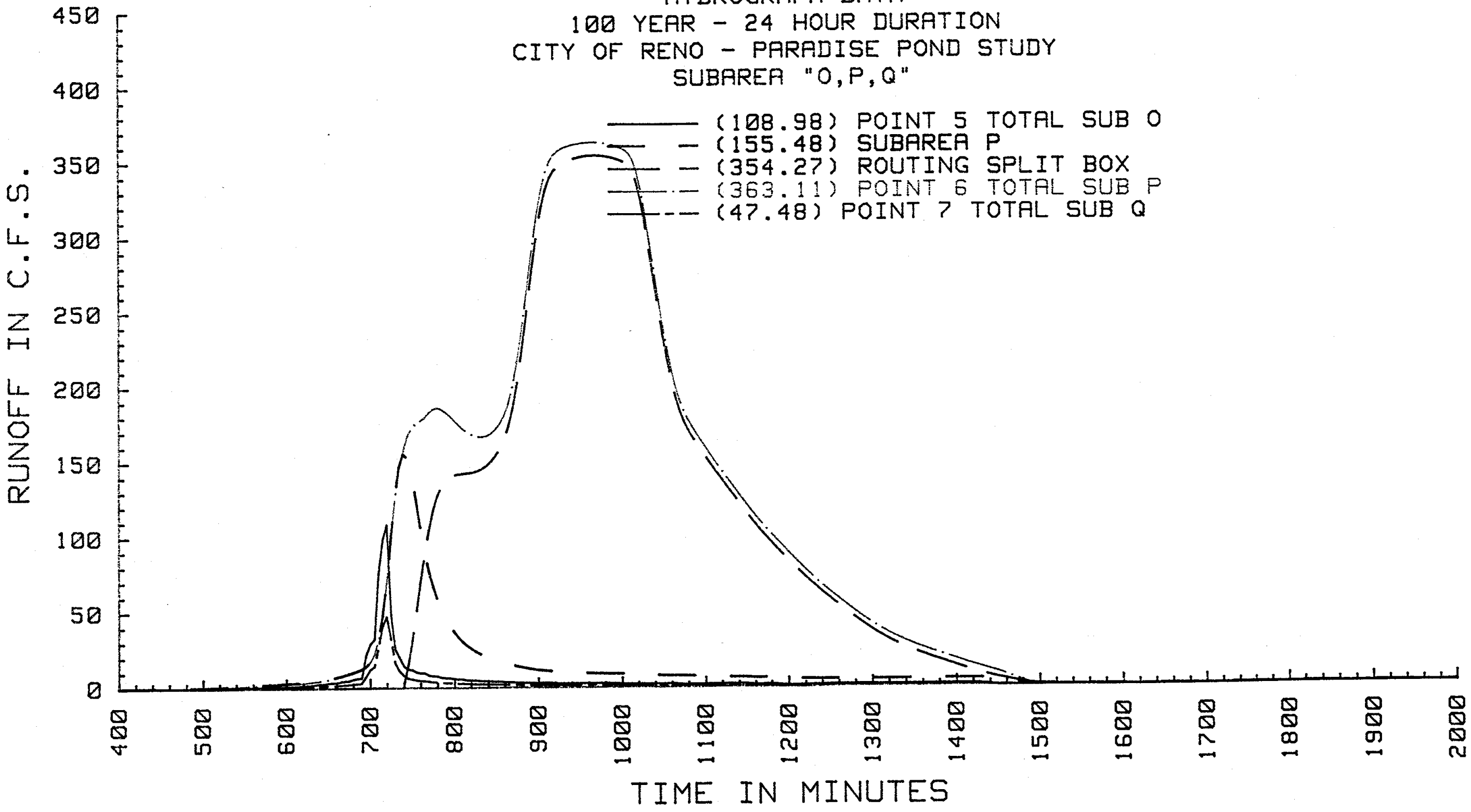


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
FREEWAY DRAINAGE

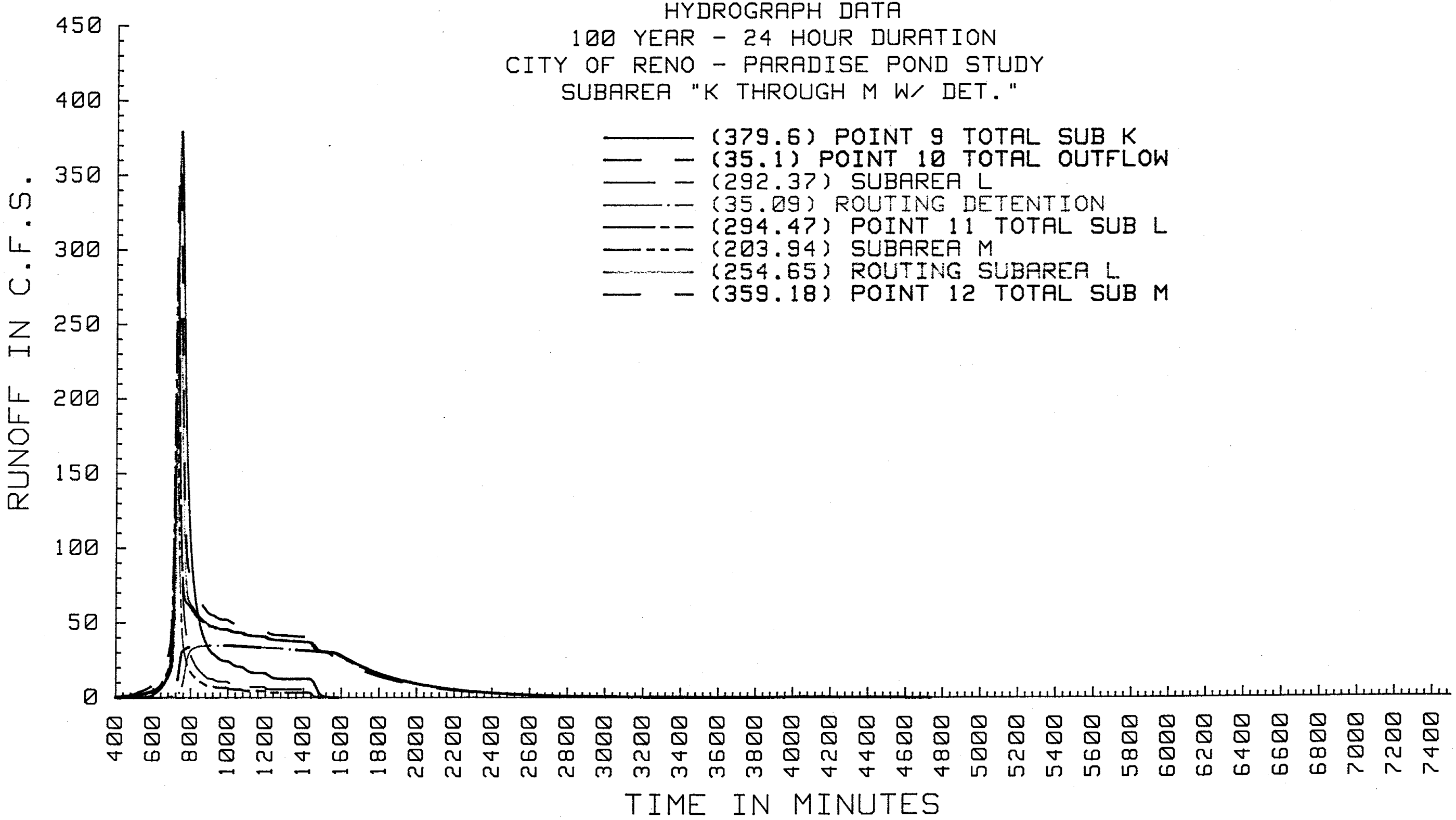
——— (88.61) AREA WEST OF WELLS
—— — (50) ROUTING FROM SPLIT BOX
—— — (112.07) POINT 1 TOTAL FREEWAY



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "O,P,Q"

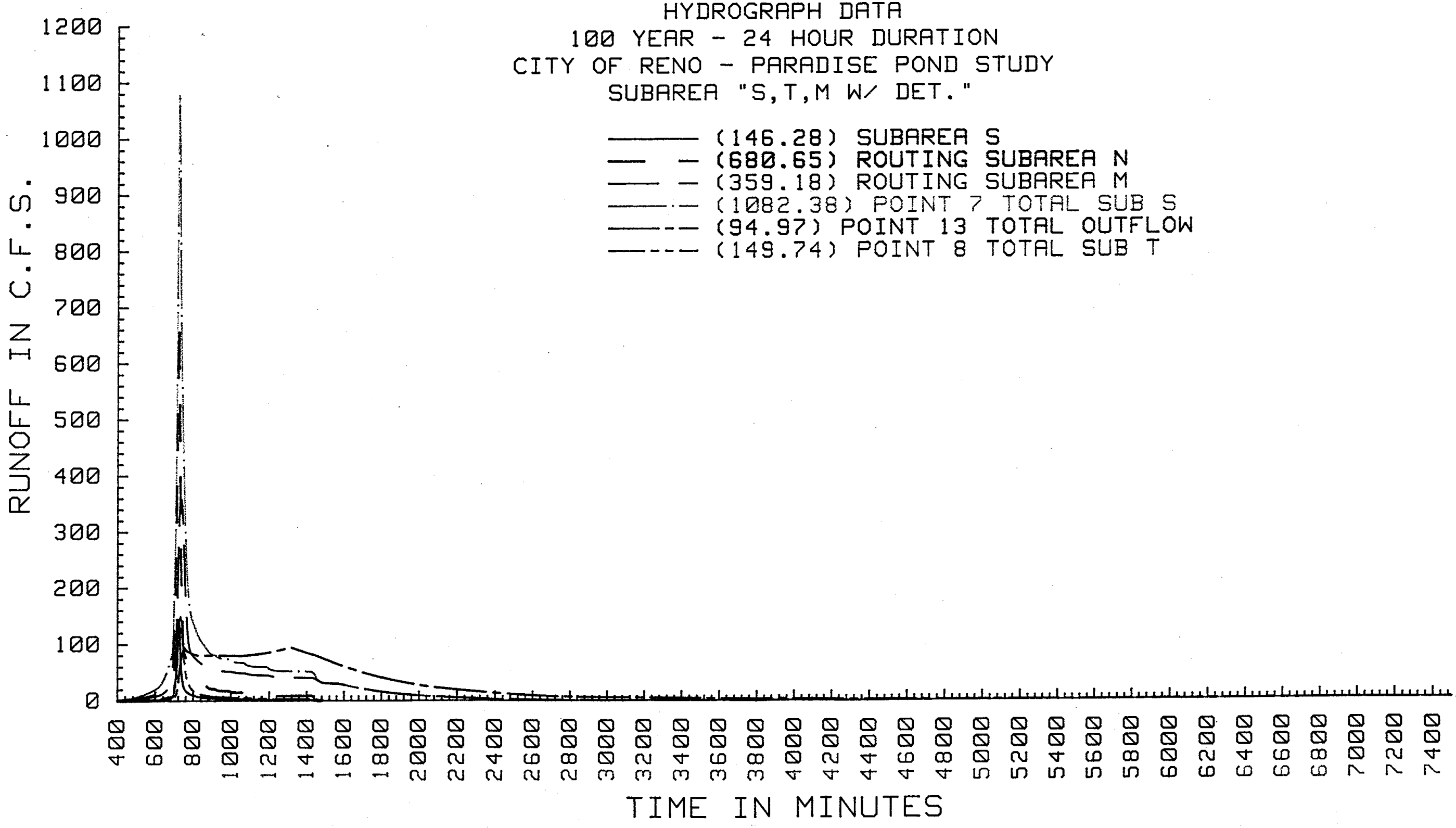


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "K THROUGH M W/ DET."

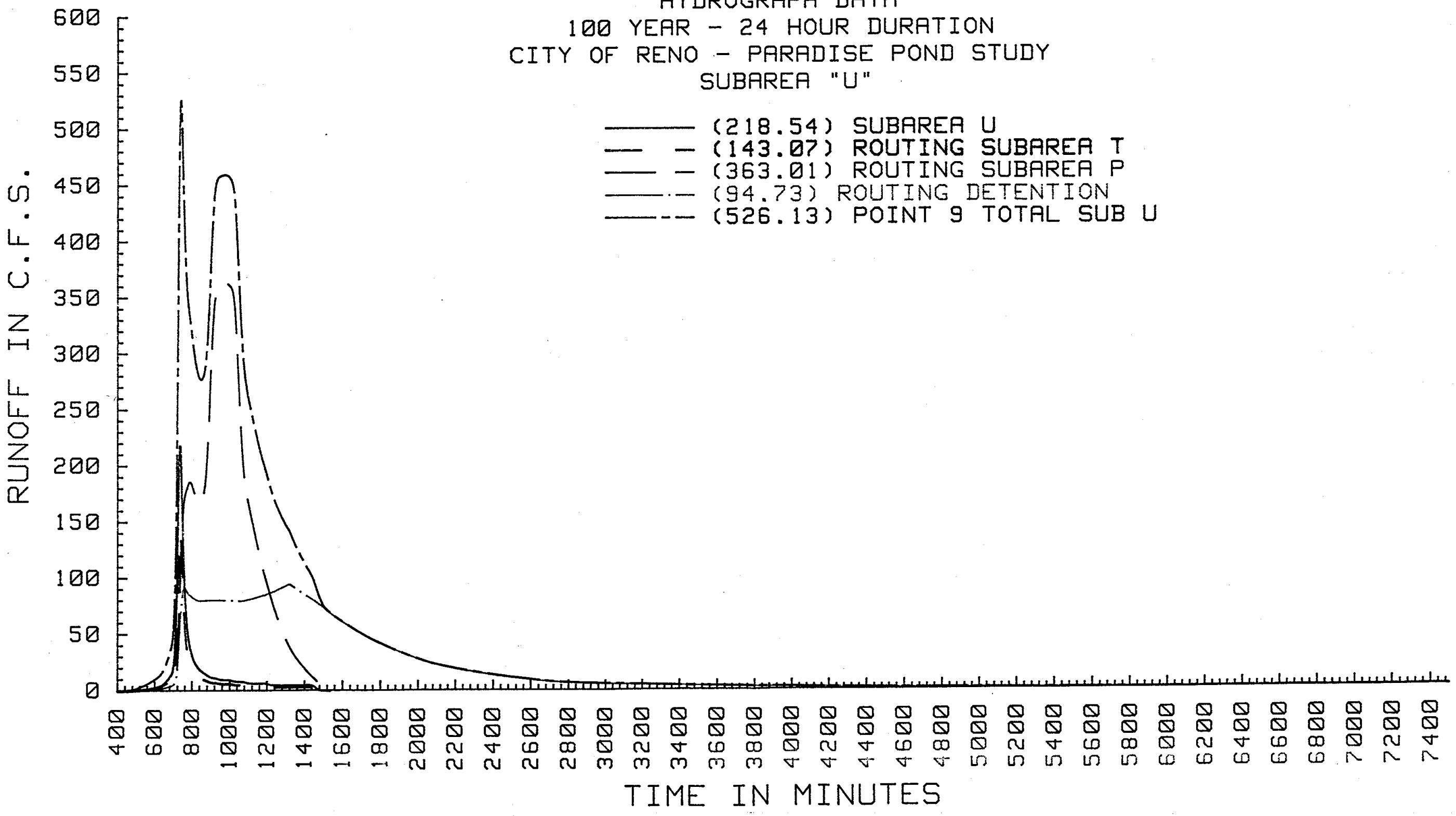


HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "S,T,M W/ DET."

——— (146.28) SUBAREA S
— — (680.65) ROUTING SUBAREA N
—— — (359.18) ROUTING SUBAREA M
———·— (1082.38) POINT 7 TOTAL SUB S
———-- (94.97) POINT 13 TOTAL OUTFLOW
——·-·— (149.74) POINT 8 TOTAL SUB T



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "U"



HYDROGRAPH DATA
100 YEAR - 24 HOUR DURATION
CITY OF RENO - PARADISE POND STUDY
SUBAREA "V"