ESJ Gen-Tie Line
230kV & 500kV Alternatives
San Diego County, California

Hydrology Study

Prepared for

Energia Sierra Juarez U.S., LLC.
101 Ash St. HQ #14
San Diego, California 92101
P: 619-696-2121

June 2009

Project No. 52573

Prepared by

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, Missouri 64114
816-333-9400

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SINCE 1898

CERTIFICATION

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXCERCISEED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

6/2/09

Trang Wong, R.C.E. 69965 Date
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ESJ Gen-Tie Line
Hydrology Study

Project 52573

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Project Description

Energia Sierra Juarez U.S. Transmission LLC (ESJ U.S.) proposes to interconnect new renewable wind power in Northern Baja Mexico into the existing Southwest Power Link (SWPL) Transmission Line in the United States. ESJ U.S. requests a Major Use Permit (MUP) for the construction, operation and maintenance of a less than one mile segment of an "electric generator tie-line" within Eastern San Diego County. The proposed generator tie-line (Gen-Tie) will have the capacity to import up to 1250 MW of proposed renewable wind energy from Northern Baja California, Mexico. The proposed Gen-Tie will transmit only renewable energy.

The proposed project subject of the San Diego County Major Use Permit (MUP) application is the construction, operation and maintenance of a less than one-mile electric generator tie line from the Mexico border to a substation adjacent to the Southwest Power Link (SWPL) 500 kV transmission line in Eastern San Diego County. This project, known as Energia Sierra Juarez U.S. Gen-Tie project (ESJ Gen-Tie Project) is proposed by ESJ U.S. The proposed ESJ Gen-Tie Project consists of a single-circuit 500 kV line (Route A1) or double-circuit 230 kV lines (Route A2) supported on three to five 150-foot steel lattice towers or up to 170-foot steel monopoles. The proposed Gen-Tie will have the capacity to interconnect up to 1250 MW of future renewable energy generators located in Northern Baja California Mexico.

Either route would connect with the East County Substation (ECO Substation) to be proposed, permitted, constructed and operated by San Diego Gas and Electric (SDG&E) which in turn will connect to SWPL. The ECO Substation is located approximately 0.65 miles north of the U.S. Mexico border and approximately 3.75 miles east of Jacumba in the southeast corner of San Diego County near the Imperial County Line (see Figures 1 and 2).

The total length of the generator tie line will be approximately two miles, with approximately one mile in the United States (ESJ Gen-Tie Project) and approximately one mile from the international border to the first point of interconnection in Mexico, at the ESJ Jacume substation in Mexico. An additional overhead static ground wire running above the conductors would have a fiber optic core for communications between the ESJ Jacume Substation in Mexico and the proposed SDG&E ECO Substation.

Access to the ESJ Gen-Tie Project area is provided by Old Highway 80. The property legal access from Old Highway 80 to the site is shown in Figure 3 (Route PA). This access would require construction of a new 20 foot wide road.

A new Gen-Tie tower access road will be constructed that will parallel the proposed Gen-Tie. The Gen-Tie access road and foundations for the lattice towers or monopoles would be located entirely within the permanent right-of-way. The Gen-tie access road would be an approximately 12-foot wide graded dirt road. Roads would be maintained periodically. This maintenance would include periodic grading and minor repairs.

As noted above, the Gen-Tie will consist of either a single-circuit 500 kV or double-circuit 230 kV lines. The key features and impacts of each of these alternatives are summarized below in Table 1, below.

Table 1 – 500 kV and 230 kV Parameters

Parameter	**500 kV Interconnection**	**230 kV Interconnection**
Maximum Capacity	1250 MW	1250 MW
Number of Circuits	Single Circuit	Double Circuit
Minimum Ground Clearance	39 ft	34 ft
Permanent Right-of-Way	214 ft	130 ft
Number of Structures	3 to 5	3 to 5
Maximum Spacing Between Structures	1500 ft	1500 ft
Construction Land Disturbance at each structure[1]	150 ft x 200 ft (0.69 acre)	120 ft x 160 ft (0.44 acre)
Construction Land Disturbance for all structures[1]	3.45 acres (assuming 5 structures)	2.20 acres (assuming 5 structures)
Temporary Laydown /parking/stringing area	2.1 acres	2.1 acres
Permanent Land Disturbance at Each Structure	50 ft x 50 ft (0.06 acre)	45 ft x 45 ft (0.05 acre)
Permanent Land Disturbance for All Structures	0.30 acres (assuming 5 structures)	0.25 acre (assuming 5 structures)
Maximum Height of Lattice Towers	150 ft	150 ft
Maximum Base of Lattice Towers	34 ft x 34 ft	29 ft x 29 ft
Foundation of Lattice Tower at each corner	3 – 6 ft diameter	3 – 6 ft diameter
Maximum Height of Steel Monopoles	170 ft	150 ft
Foundation of Steel Monopoles	7-9 ft diameter	6-9 ft diameter

[1] The construction land disturbance includes temporary plus permanent impacts

Route A1 (the 500kV Gen-Tie) would be constructed within a 214-foot wide permanent right-of-way. Route A2 (the 230kV Gen-Tie) would be constructed within a 130-foot permanent right-of way. A 100-foot and 70 foot wide temporary construction easement along the right-of-way was originally proposed

for Route A1 and A2, respectively. The temporary easement has been eliminated to minimize disturbed areas.

In lieu of these 100-foot wide (7.72 acres) or 70-foot wide (5.64 acres) temporary easements, the wire stringing site proposed at the north end of the project site immediately adjacent to the property access road, and which was originally identified as having a temporary disturbance of 0.69 acres, will instead be used as a wire stringing site and as a construction laydown and parking area. This consolidated construction laydown/parking/stringing temporary disturbance area will be 2.10 acres which is a reduction in temporary impacts in comparison to the 100-foot and 70-foot easements.

The monopoles or lattice towers would be located no more than 1,500 feet apart. The precise locations may be adjusted based on final design and, if necessary, to avoid sensitive cultural resources. There will be no poles placed within 150 feet of the international border. This type of Gen-Tie rarely causes interference to radio and television signals and there are no adjacent or nearby land uses where this could possibly be an issue.

Construction impacts will include:

- Clearing, grading, and grubbing;
- Access road and pad construction;
- Digging and drilling for tower foundations;
- Pouring concrete foundations for towers;
- Overhead electrical power system construction; and
- Final grading and site clean-up

Vegetation would be cleared and grubbed along the proposed access roads. Vegetation debris will be removed offsite and disposed of consistent with applicable requirements. Limited grading would be required for the tower/pole pads and the temporary construction laydown/parking/stringing site (construction staging and wire stringing site). Top soil removed during the grading of the tower areas and construction staging area would be stockpiled in the construction staging and wire stringing site, if necessary. This topsoil will be utilized during final grading of the road and tower areas. Based on preliminary engineering design, grading would not require the import or export of soil (net zero cut and fill). Vegetation debris will be removed offsite and disposed of properly.

Gen-Tie towers/poles would be supported on excavated, reinforced concrete foundations. The foundations would be excavated using a backhoe or similar excavation equipment. The maximum area of

disturbance at each tower site would be approximately 150 feet by 200 feet, or 0.69 acre at each site, for a total of 3.45 acres of temporary impacts if 5 structures are installed. Permanent impacts at each tower site would not exceed 50 feet by 50 feet, or 0.06 acre. This disturbed acreage is based on the 500 kV Route A1; impacts associated with 230 kV Route A2 would be less. Table 2 lists the temporary and permanent disturbed areas for Route A1 and A2. Note that during construction the total area that will be disturbed is the temporary impact plus the permanent land disturbance.

Table 2 - Land Disturbance

Project Components	500 kV (Route A1) Interconnection			230 kV (Route A2) Interconnection		
	Total Area (acres)	Permanent Area (acres)	Temporary Area (acres)	Total Area (acres)	Permanent Area (acres)	Temporary Area (acres)
Construction lay-down/parking/stringing area	2.1	0.0	2.1	2.1	0.0	2.1
Property Legal Access Road	1.1	1.1	0.0	1.1	1.1	0.0
Gen-Tie Access Road	0.9	0.9	0.0	0.9	0.9	0.0
Tower Pads Temporary Impacts (5 towers)[1]	3.15	0.0	3.15	1.95	0.0	1.95
Tower Base Permanent Impacts (5 towers)[1]	0.3	0.3	0.0	0.25	0.25	0.0
Totals	7.55	2.30	5.25	6.30	2.25	4.05

[1] Depending on final design 3-5 towers would be installed. Values are approximate.

VICINITY MAP

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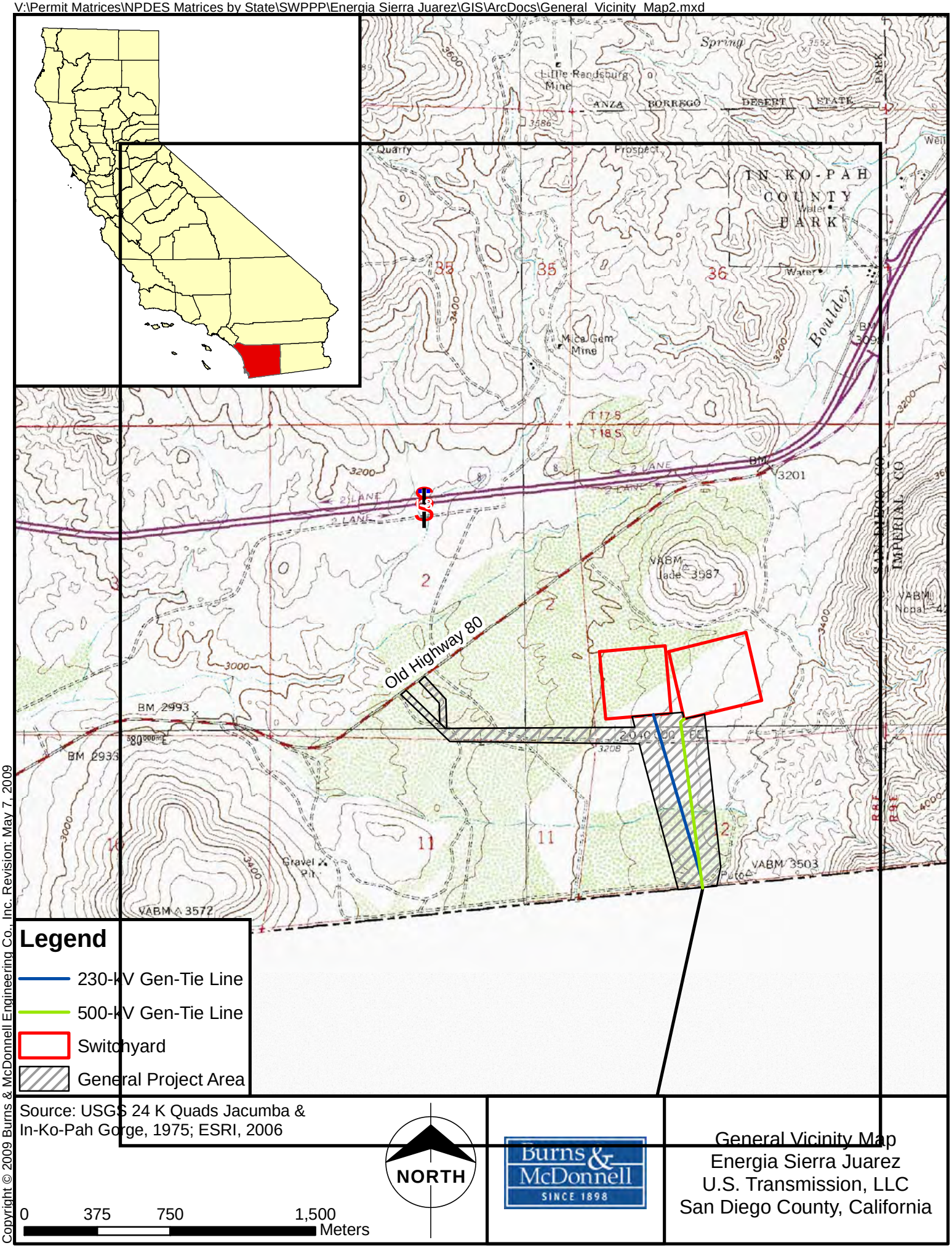

Watershed Description

The Project area is within the Jacumba Valley hydrologic sub-area of the Anza Borrego watershed. The site has minimal relief, and stormwater will primarily sheet flow to the west. A swale located within the Project area, approximately 0.3 miles north of the United States/Mexico border, was determined not to be a tributary to the intermittent stream, Carrizo Creek. Boulder Creek is located northwest of the Project area, approximately 0.4 miles from the proposed 500-kV Interconnection line. No federally jurisdictional streams or wetlands are located within the Project Area. This project work will not conflict with any stream channels, and stormwater runoff will not discharge directly into any Clean Water Act Section 303(d) water bodies.

Methodology

This Hydrology Report is prepared in accordance with specifications listed within the County of San Diego Hydrology Manual. Per that manual, the recommended design method for watershed areas less than 1 square mile in size is the Rational Method or the Modified Rational Method. Although the watershed analyzed in this report is less than 1 square mile (0.62 sq. mi.), the National Resources Conservation Service (NRCS) methodology was chosen because the end results provided greater detail and it is the preferred method of Burns & McDonnell. The analysis was performed using the Hydraflow Hydrographs Software Package. Results for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year design storm frequencies are all included. The curve numbers (CNs) were developed using Table 4-2 of the Hydrology Manual, and have been adjusted using the Precipitation Zone Numbers (PZN) in Figure C-1 of the same text. The time of concentration was calculated using the Lag method.

Calculation Summary

The following tables present a summary of the flows:

Table 1: FLOW SUMMARY

Basin	Return Freq. (YR)	Pre-Developed Basin Flow (cfs)	Post-Developed Basin Flow (cfs)	Increase in Basin Flow (cfs)
1	2	1.50	1.50	0
1	5	4.02	4.02	0
1	10	10.04	10.04	0
1	25	30.74	30.74	0
1	50	114.56	114.56	0
1	100	138.66	138.66	0

Basin	Return Freq. (YR)	Pre-Developed Flow (cfs)	Post-Developed Basin Flow (cfs)	Increase in Basin Flow (cfs)
2	2	7.97	7.97	0
2	5	21.58	21.58	0
2	10	40.03	40.03	0
2	25	84.39	84.39	0
2	50	208.54	208.54	0
2	100	244.52	244.52	0

FLOW SUMMARY (cont'd)

Basin	Return Freq. (YR)	Pre-Developed Flow (cfs)	Post-Developed Basin Flow (cfs)	Increase in Basin Flow (cfs)
3	2	9.52	9.52	0
3	5	21.03	21.03	0
3	10	34.62	34.62	0
3	25	65.95	65.95	0
3	50	145.83	145.83	0
3	100	169.13	169.13	0

Basin	Return Freq. (YR)	Pre-Developed Flow (cfs)	Post-Developed Basin Flow (cfs)	Increase in Basin Flow (cfs)
Legal Access Road	2	0.009	0.032	0.022
Legal Access Road	5	0.024	0.092	0.068
Legal Access Road	10	0.049	0.197	0.148
Legal Access Road	25	0.169	0.506	0.337
Legal Access Road	50	0.964	1.611	0.647
Legal Access Road	100	1.205	1.925	0.720

Table 2: Curve Number Summary

(Less than 35-year Return Period)

Basin	Pre-Dev. Area (ac)	Pre-Dev. Composite Curve Number	Pre-Dev. Composite Curve Number (PZN Applied)	Post-Dev. Area (ac)	Post-Dev. Composite Curve Number	Post-Dev. Composite Curve Number (PZN Applied)
Basin #1	146.01	69.0	64.3	146.01	69.0	64.3
Basin #2	159.53	77.0	72.5	159.53	77.0	72.5
Basin #3	92.27	80.0	75.8	92.27	80.0	75.8
Legal Access Road	2.06	63.0	58.0	2.06	72.0	67.3

(Greater than 35-year Return Period)

Basin	Pre-Dev. Area (ac)	Pre-Dev. Composite Curve Number	Pre-Dev. Composite Curve Number (PZN Applied)	Post-Dev. Area (ac)	Post-Dev. Composite Curve Number	Post-Dev. Composite Curve Number (PZN Applied)
Basin #1	146.01	69.0	76.5	146.01	69.0	76.5
Basin #2	159.53	77.0	83.0	159.53	77.0	83.0
Basin #3	92.27	80.0	85.5	92.27	80.0	85.5
Legal Access Road	2.06	63.0	71.5	2.06	72.0	79.0

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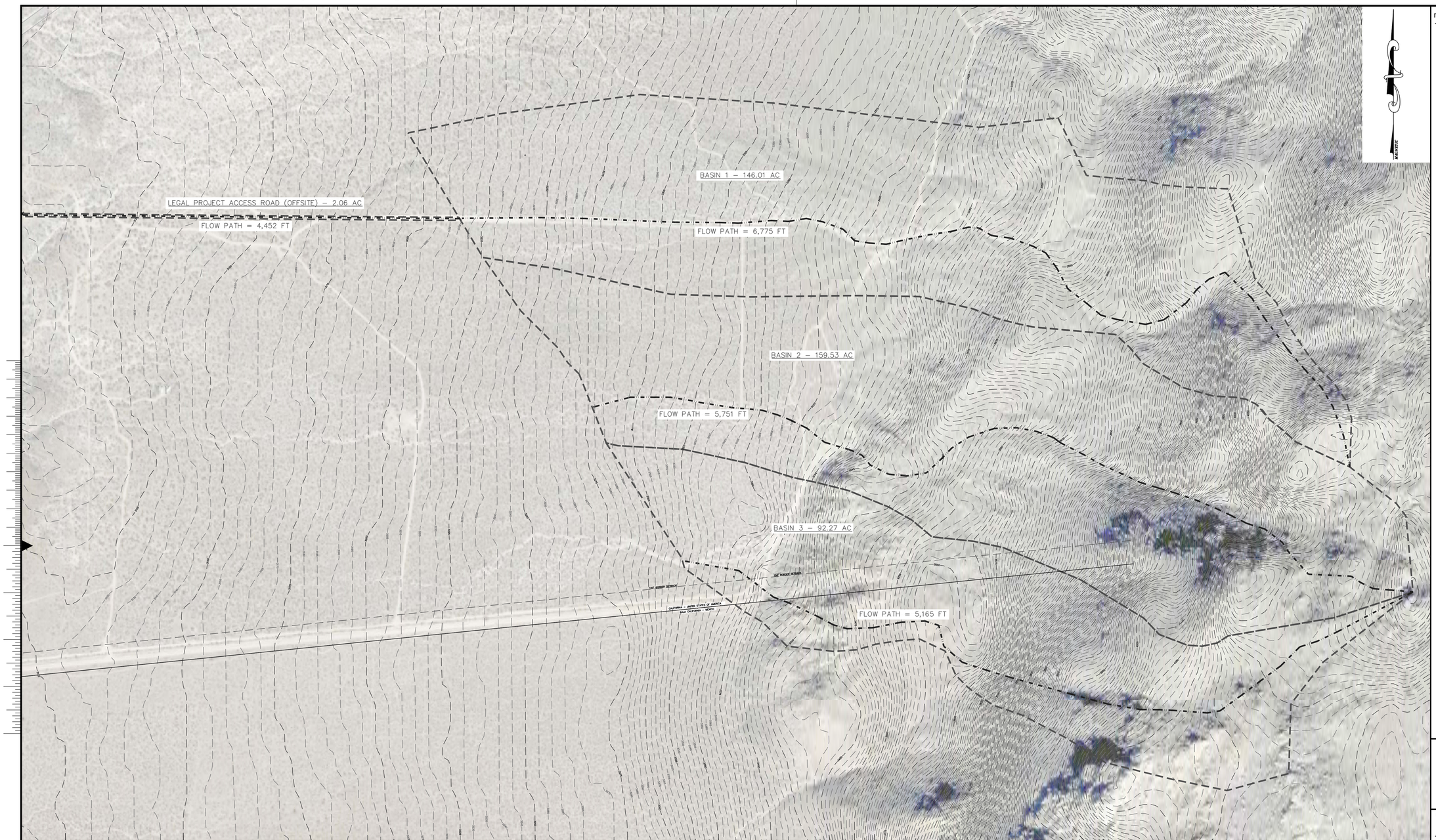
CONCLUSION

The proposed transmission line development does not increase the amount of stormwater runoff from the site. There will be a total maximum impervious area of 750 square feet added to the site by way of the structure foundations. Also, there will be dirt access roads running along the transmission line right-of way. These access roads will add areas that are less pervious than the existing vegetated soil. Despite the addition of impervious foundations and semi-pervious access roads, the composite curve numbers of the basins remain unchanged between pre- and post-developed states. The total area occupied by foundations and access roads is not large enough relative to the basin size to increase the composite curve number; therefore there is no increase in stormwater runoff. With regard to the legal project access road that will be installed to provide access from Old Highway 80, there will be a slight increase in run off. The area is currently covered with approximately 30% vegetation, and will have to be cleared and grubbed to install the road. This will increase the runoff volume, but only slightly, and even after development the runoff from this road area will remain below 2 cfs for a 100-year storm event. This small increase in stormwater runoff does not warrant installation of detention facilities.

Due to the relatively small land disturbance involved with the proposed Gen-Tie line project and the minimal long term impact of the transmission line on the landscape, significant soil loss from sedimentation should not occur. The site will be disturbed during construction, however, erosion control BMP's will be placed to deter any sediment transport from the project area. Temporary silt fence and sandbag cross barriers will be placed on the downhill side of the entire right-of-way to capture any silt during the construction phase of the project. Also, all cut/fill slopes greater than 3:1 will be stabilized using erosion control matting and temporary seeding. Following construction, the site will be re-vegetated to 70% of the pre-developed conditions per the State Water Resources Control Board Order # 99-08DWQ NPDES General Permit #CAS000002, except as may be required for fire protection. For the reasons listed above and the nature of the construction activities involved with the project, no soil loss calculations are included in this report.

WATERSHED BOUNDARY/TOPOGRAPHIC MAP



SAN DIEGO COUNTY, CA

GRAPHIC SCALE

-300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

OWNER:
ESJ U.S. TRANSMISSION LLC.
101 ASH STREET HQ #14
SAN DIEGO, CA 92101
(619) 696-2121

24-HR CONTACT: TBD

REGISTERED PROFESSIONAL ENGINEER
TRANG WONG
C-69965
EXP. 9/30/10
CIVIL
STATE OF CALIFORNIA
6/3/09

no.	date	by	ckd	description

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date	detailed
JUNE 2, 2009	J. KANITZ
designed	checked
J. KANITZ	J. STAHULAK

ESJ U.S.

WATERSHED BOUNDARY/TOPO MAP

project	contract
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Scale For Microfilming
Millimeters
Inches

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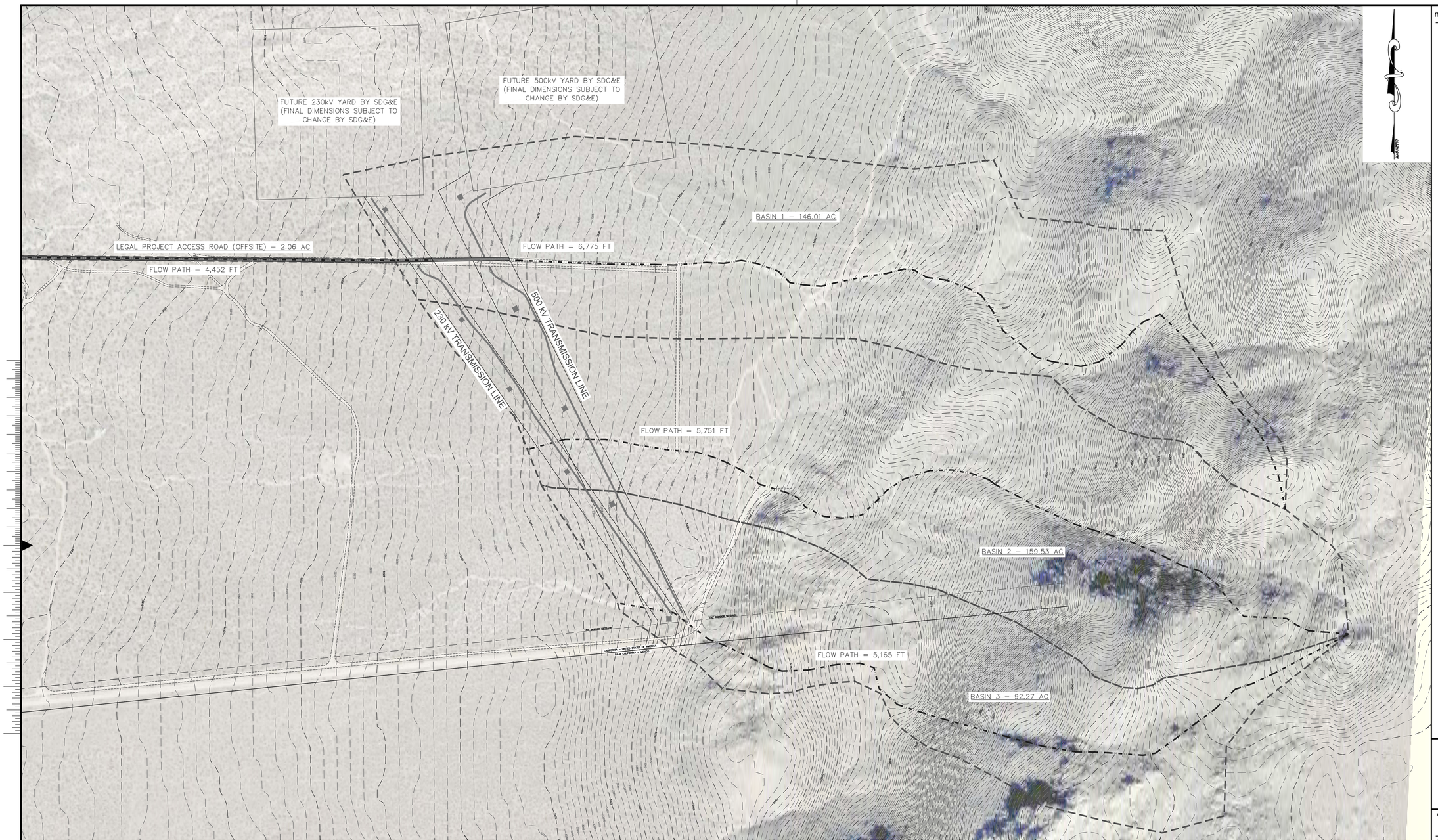
WATERSHED GEOMETRIC INFORMATION MAP



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WATERSHED GEOMETRIC INFO MAP

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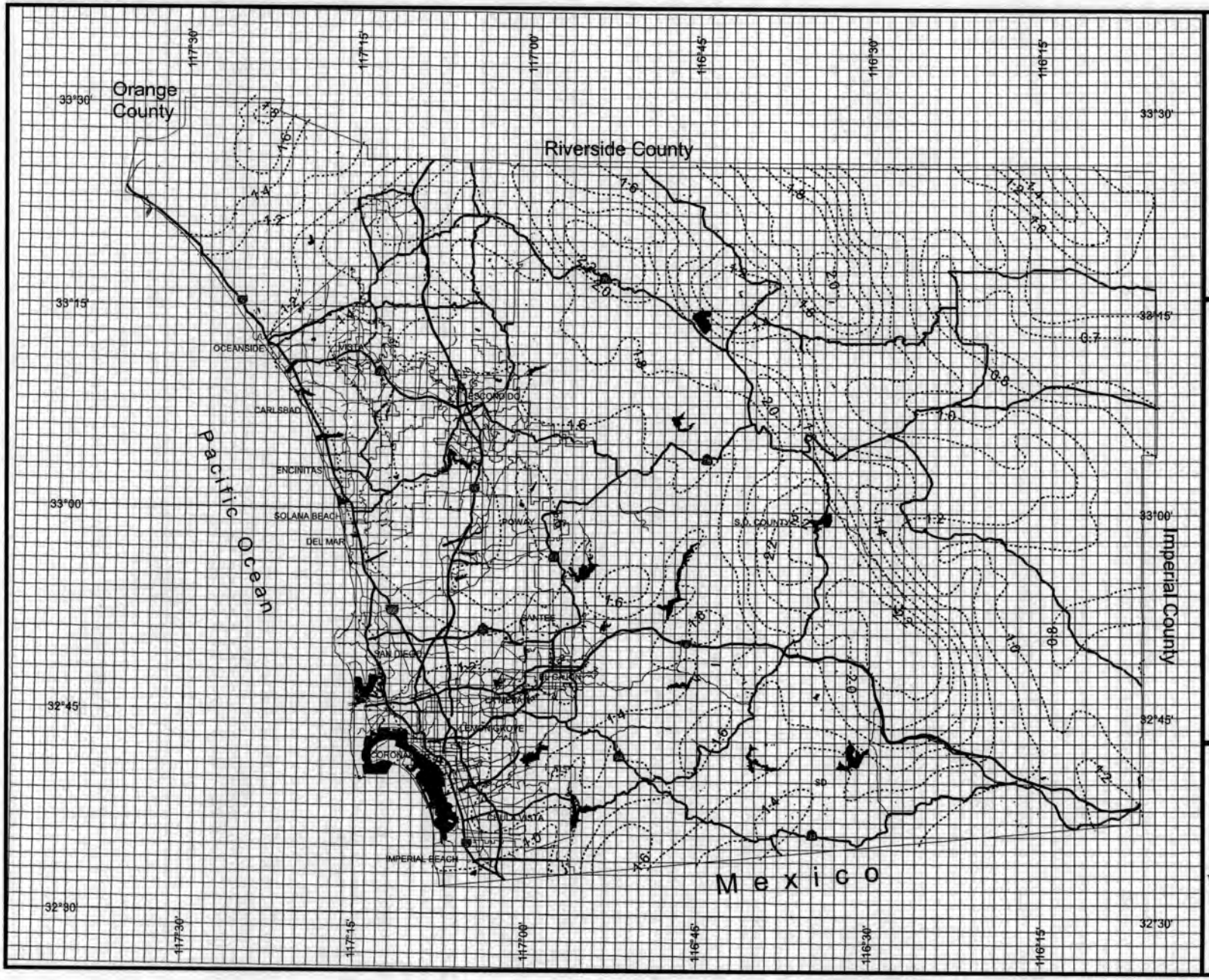
ISOPLUVIAL MAPS



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
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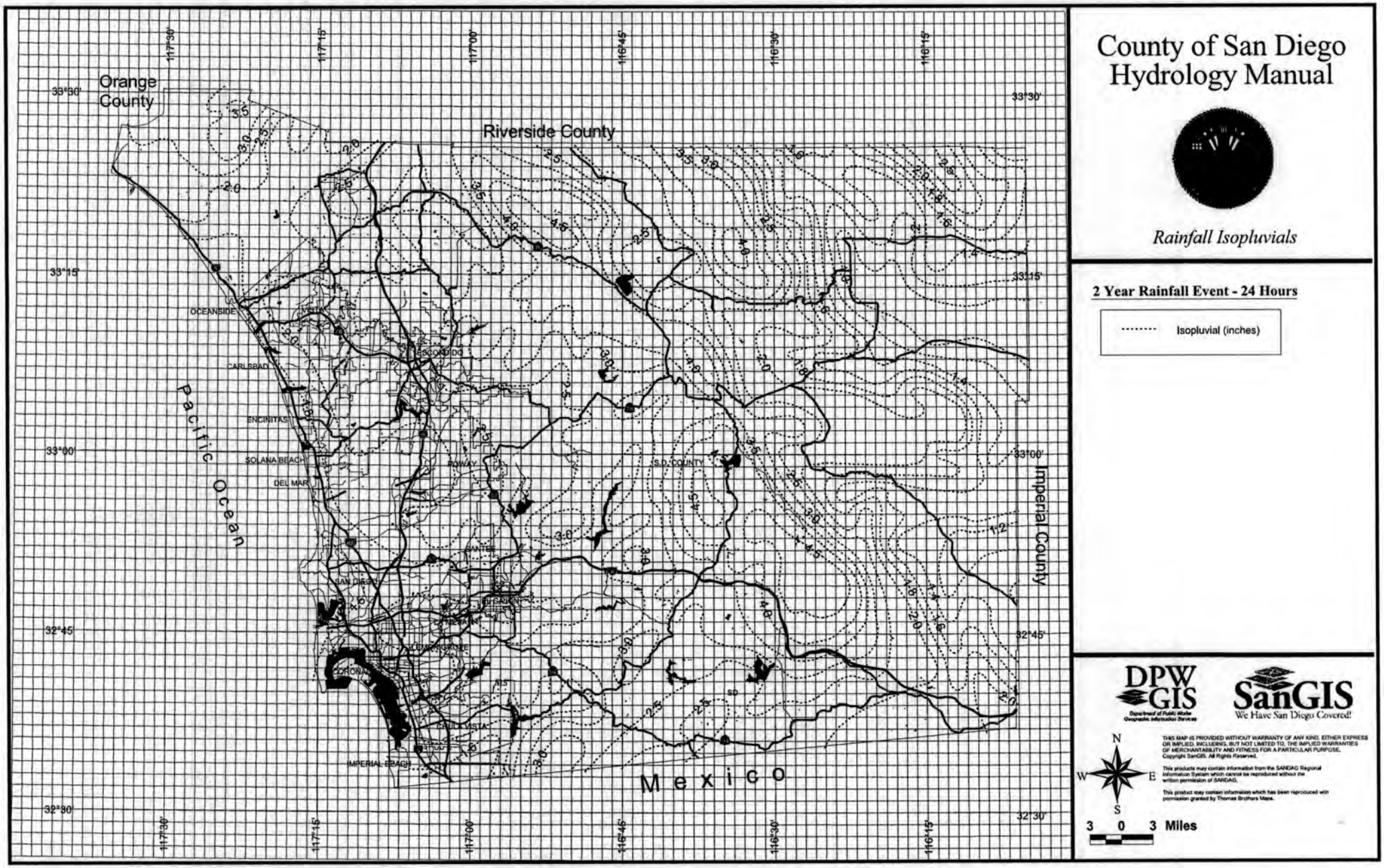

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Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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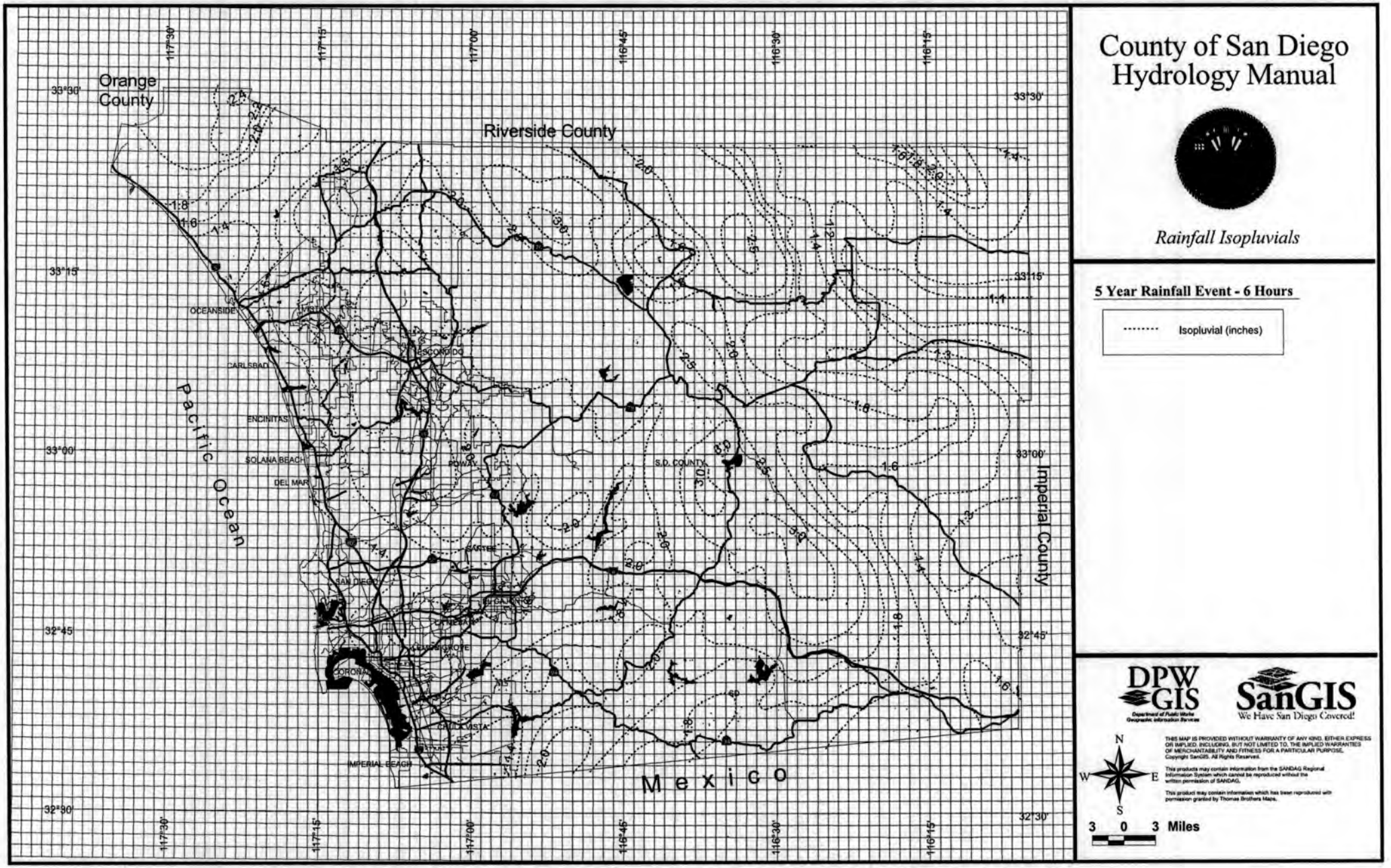

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Rainfall Isopluvials

5 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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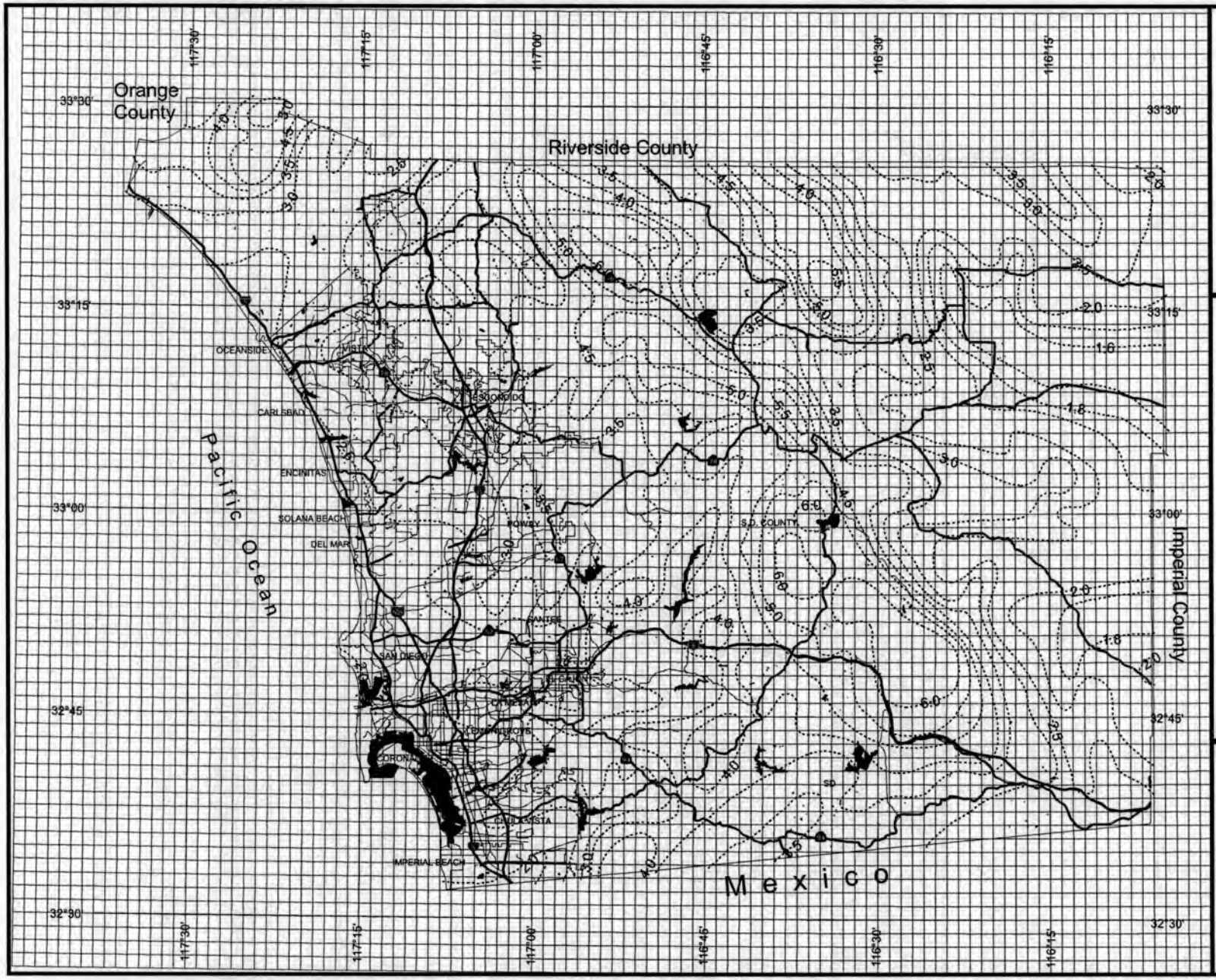

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Rainfall Isopluvials

5 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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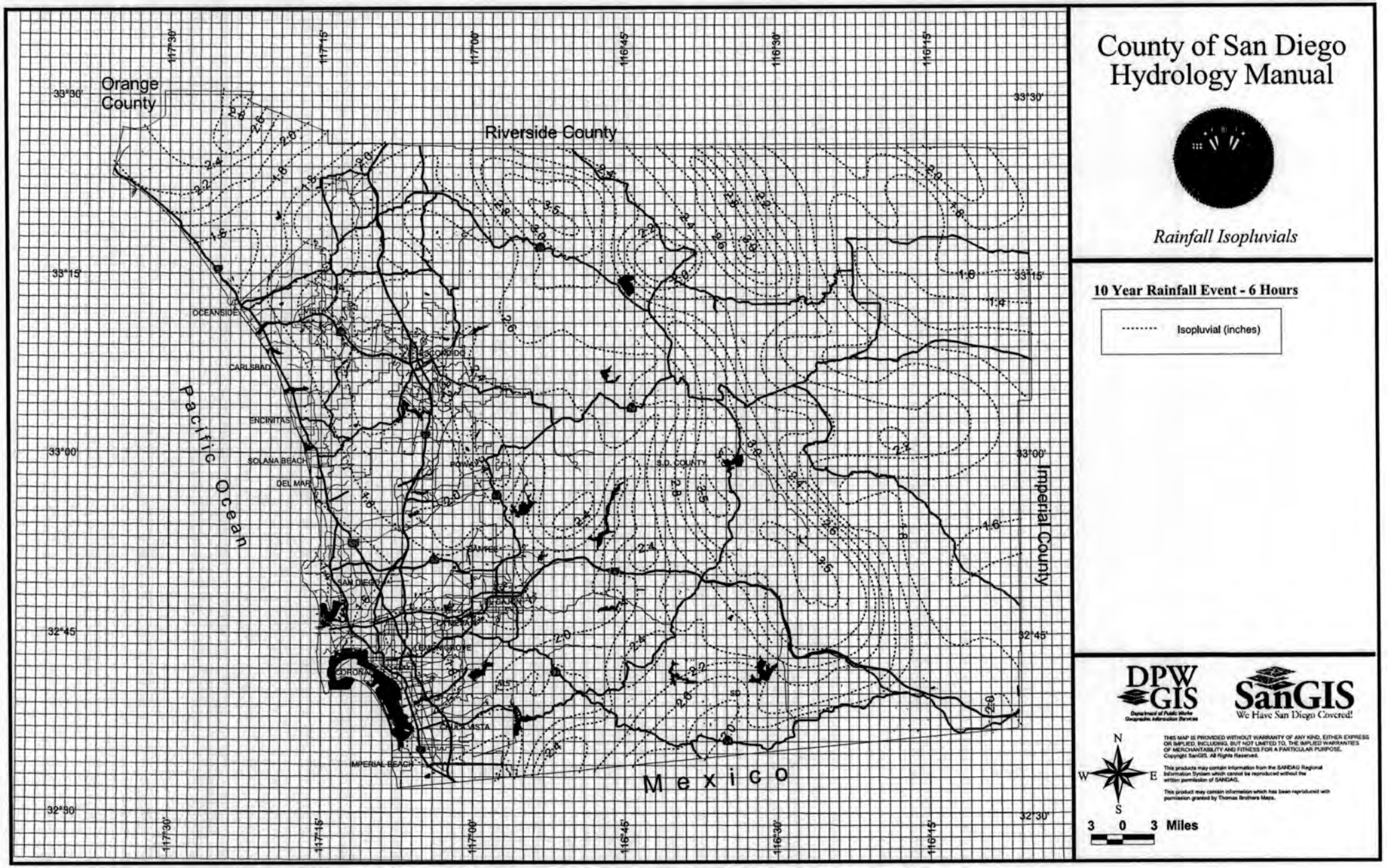

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Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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Data Used at Public Works Geographic Information Services

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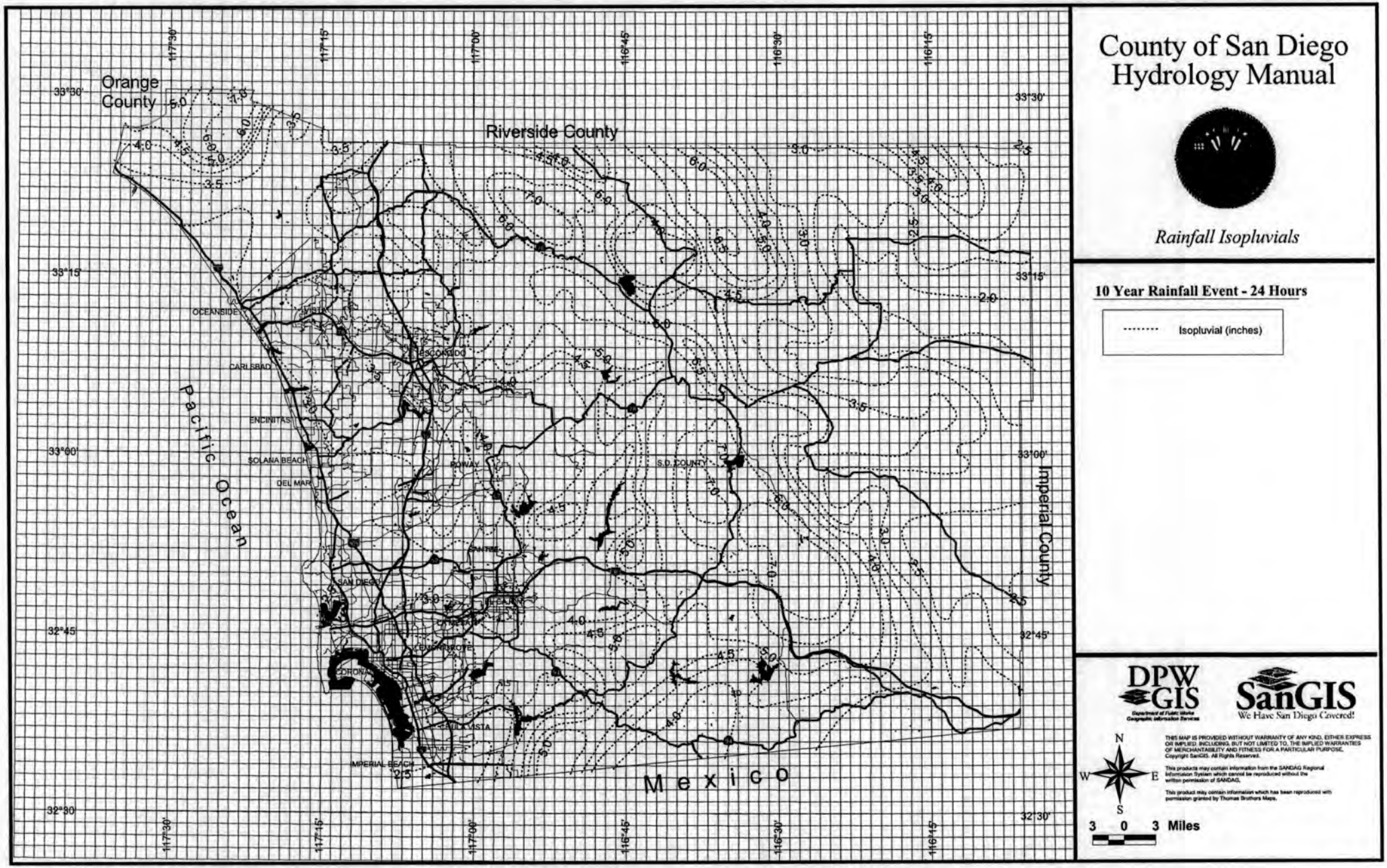

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Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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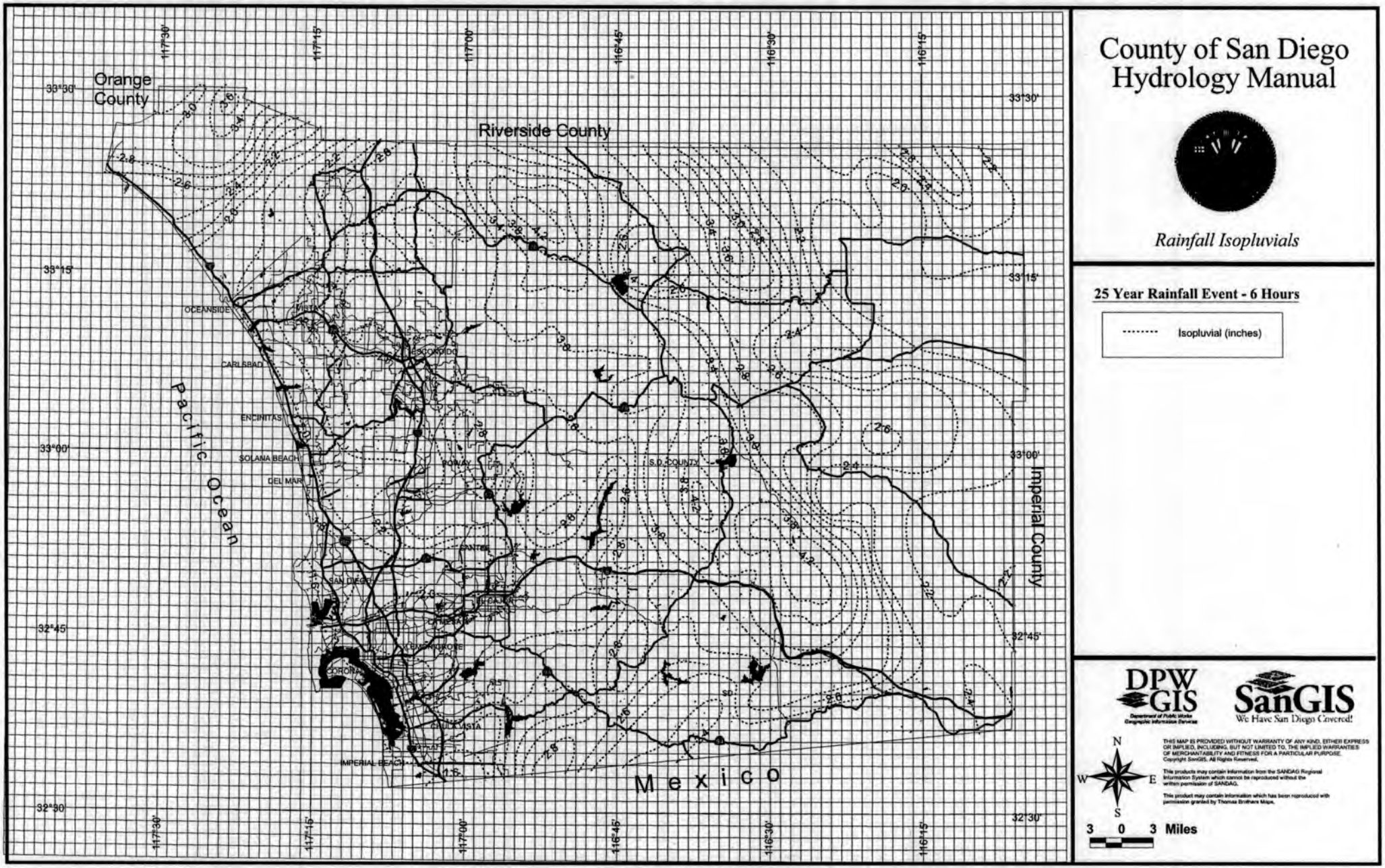

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Rainfall Isopluvials

25 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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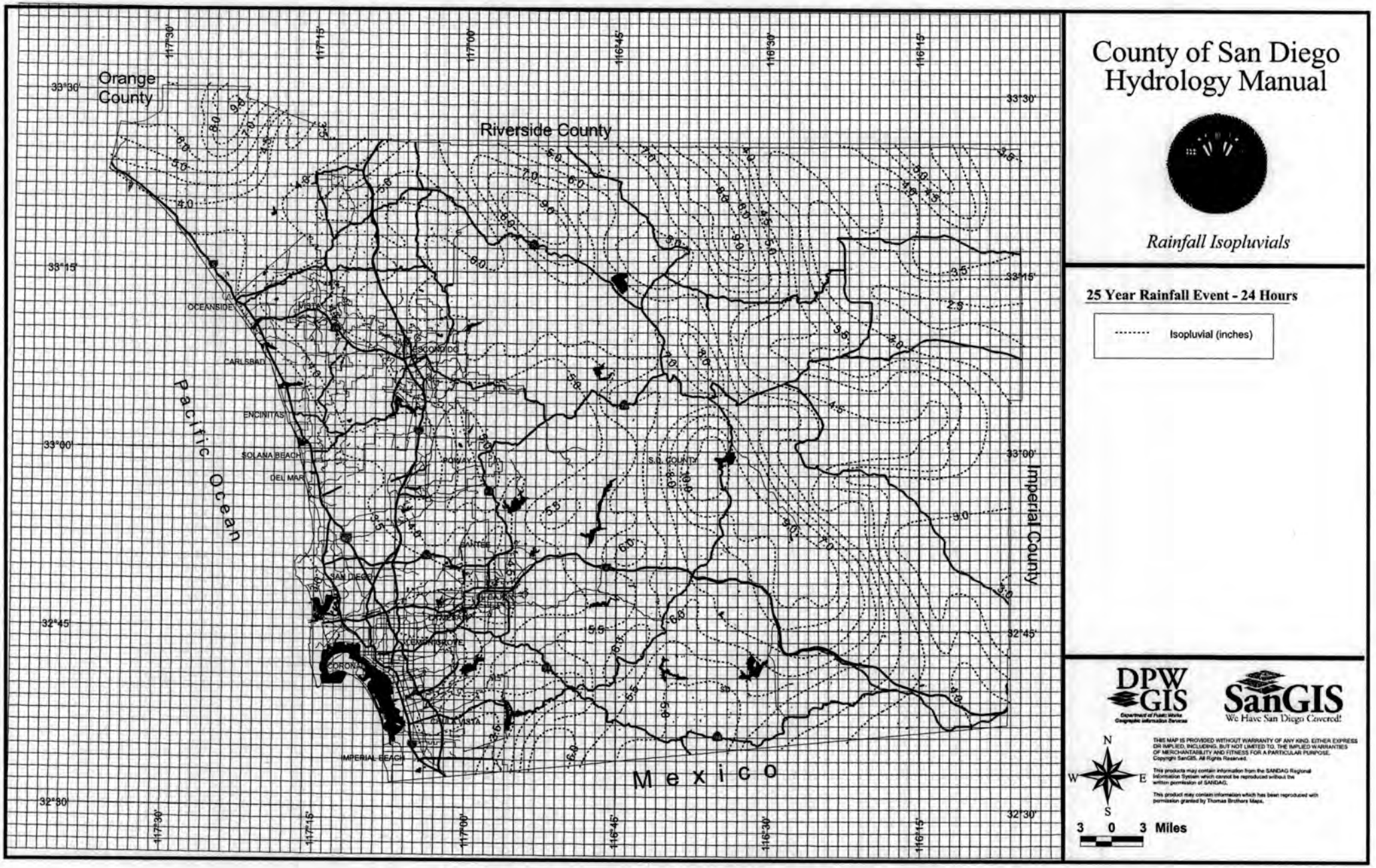

County of San Diego Hydrology Manual

Rainfall Isopluvials

25 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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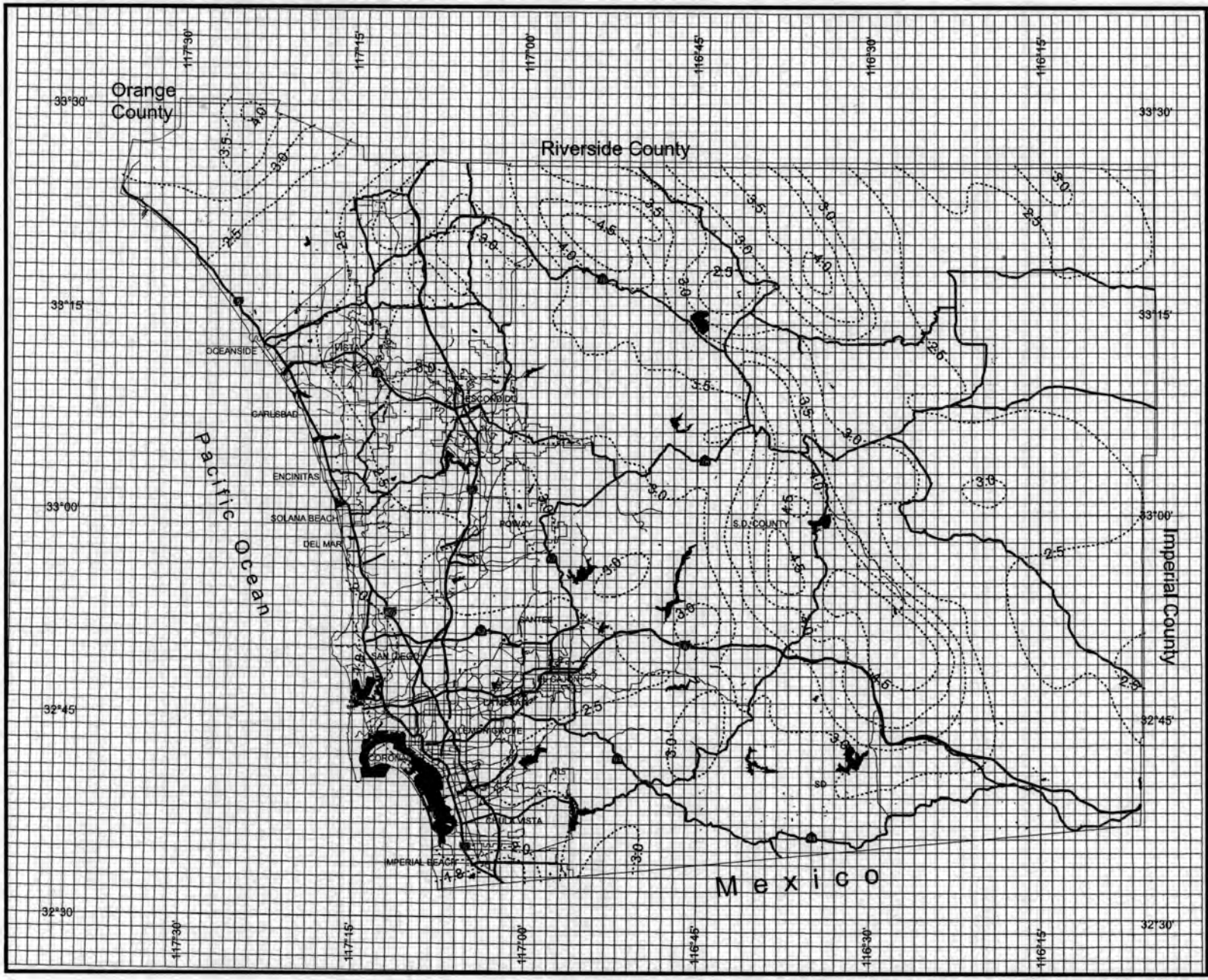

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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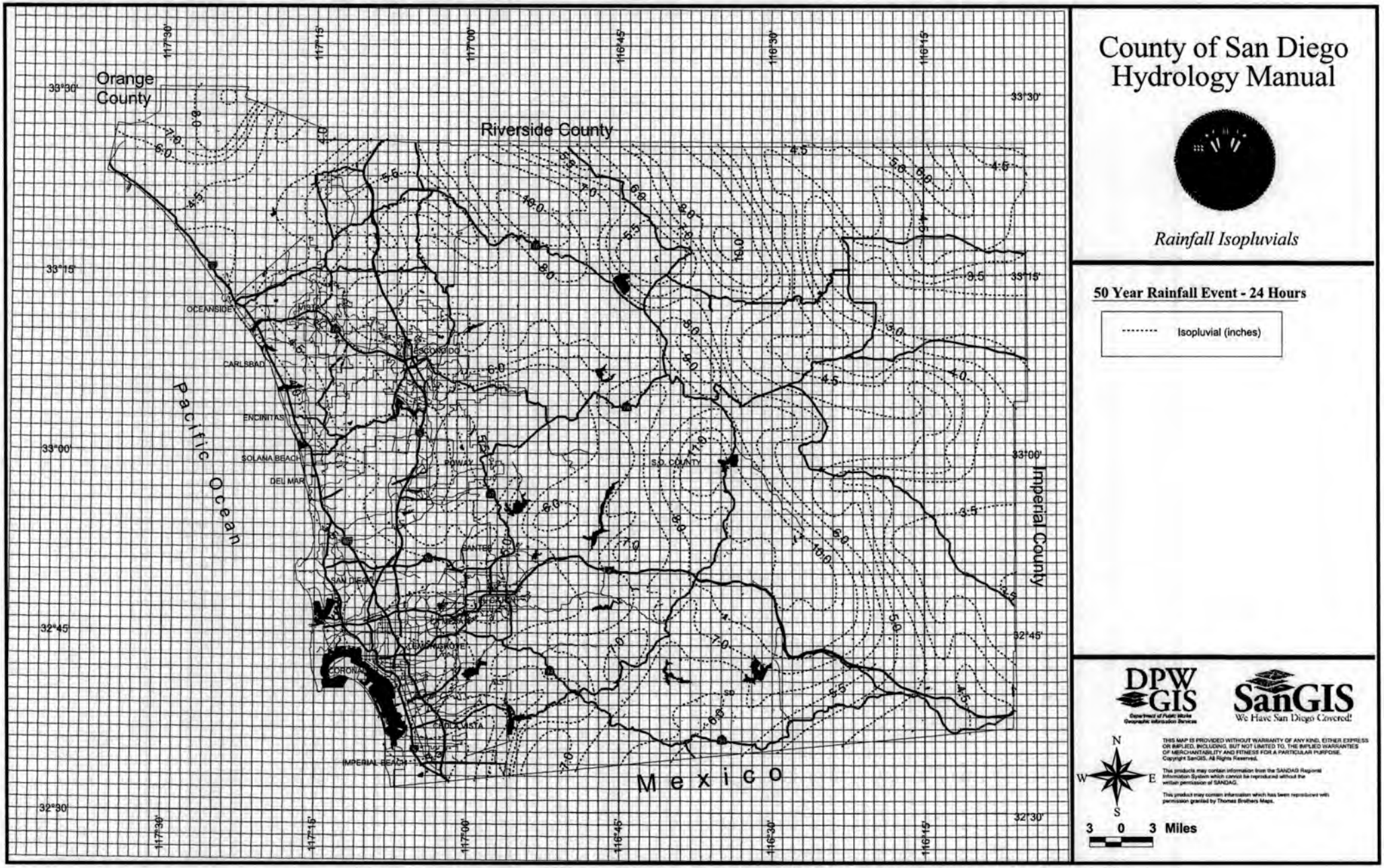

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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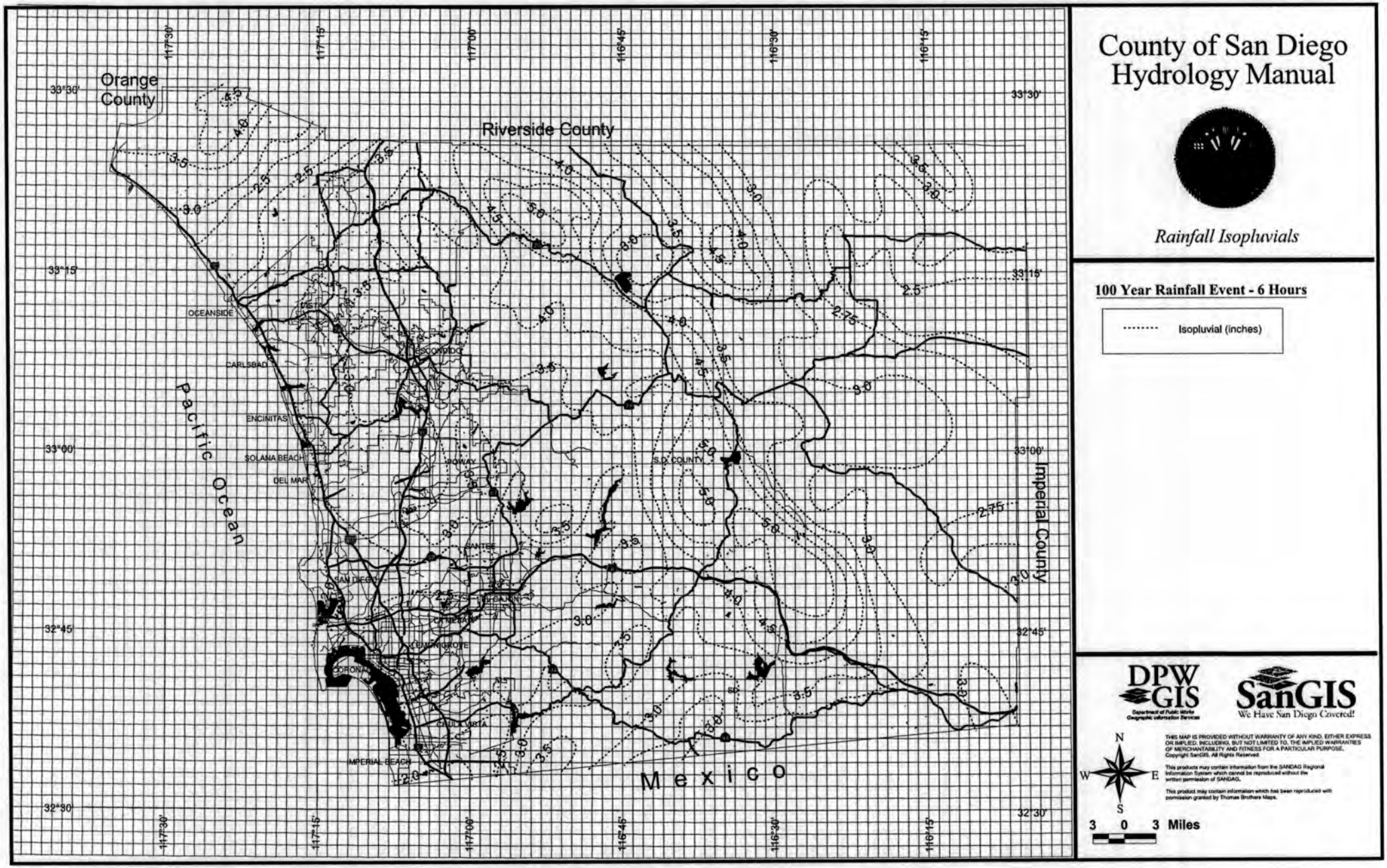

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Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

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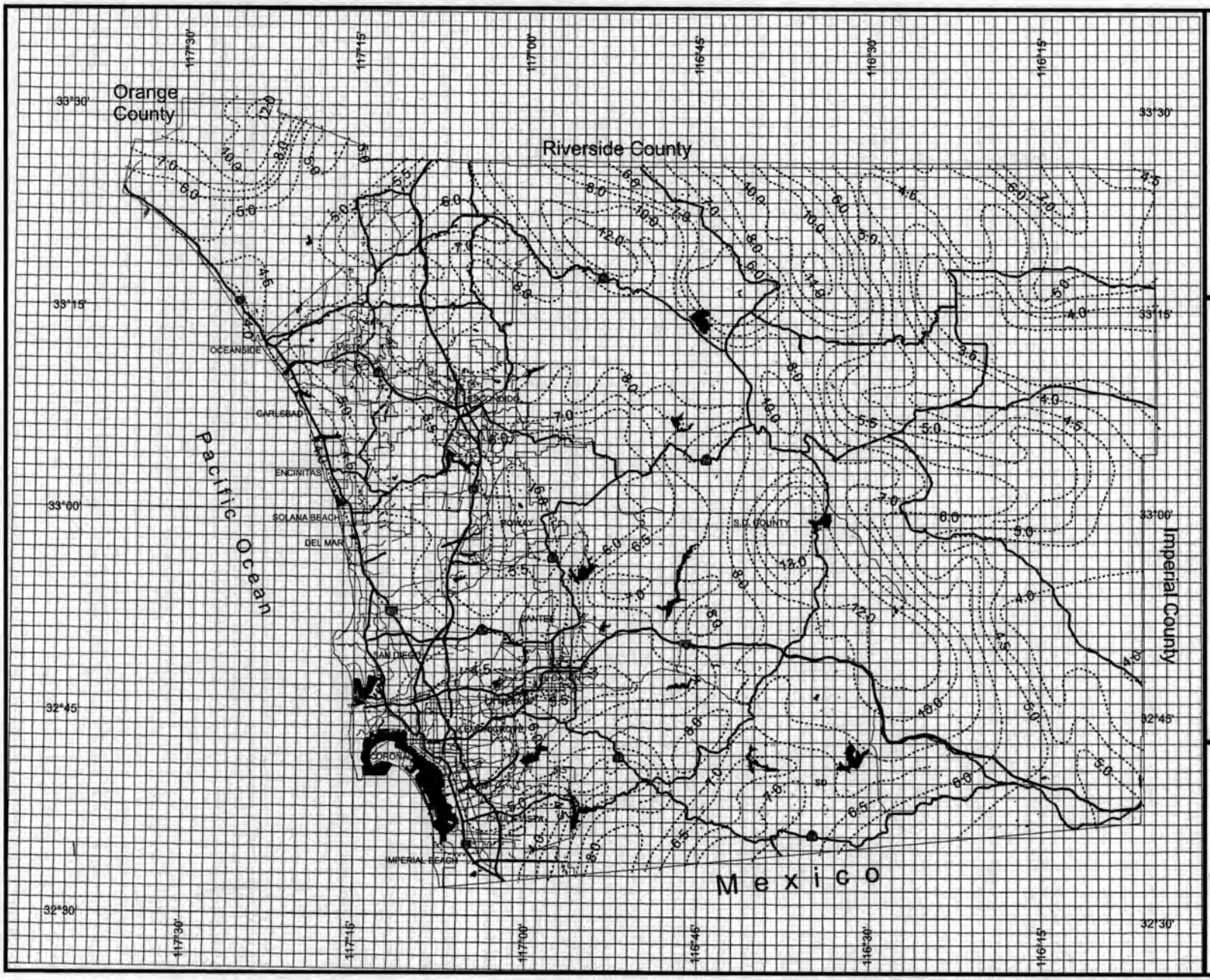


County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

PRE-DEVELOPED HYDROGRAPHS

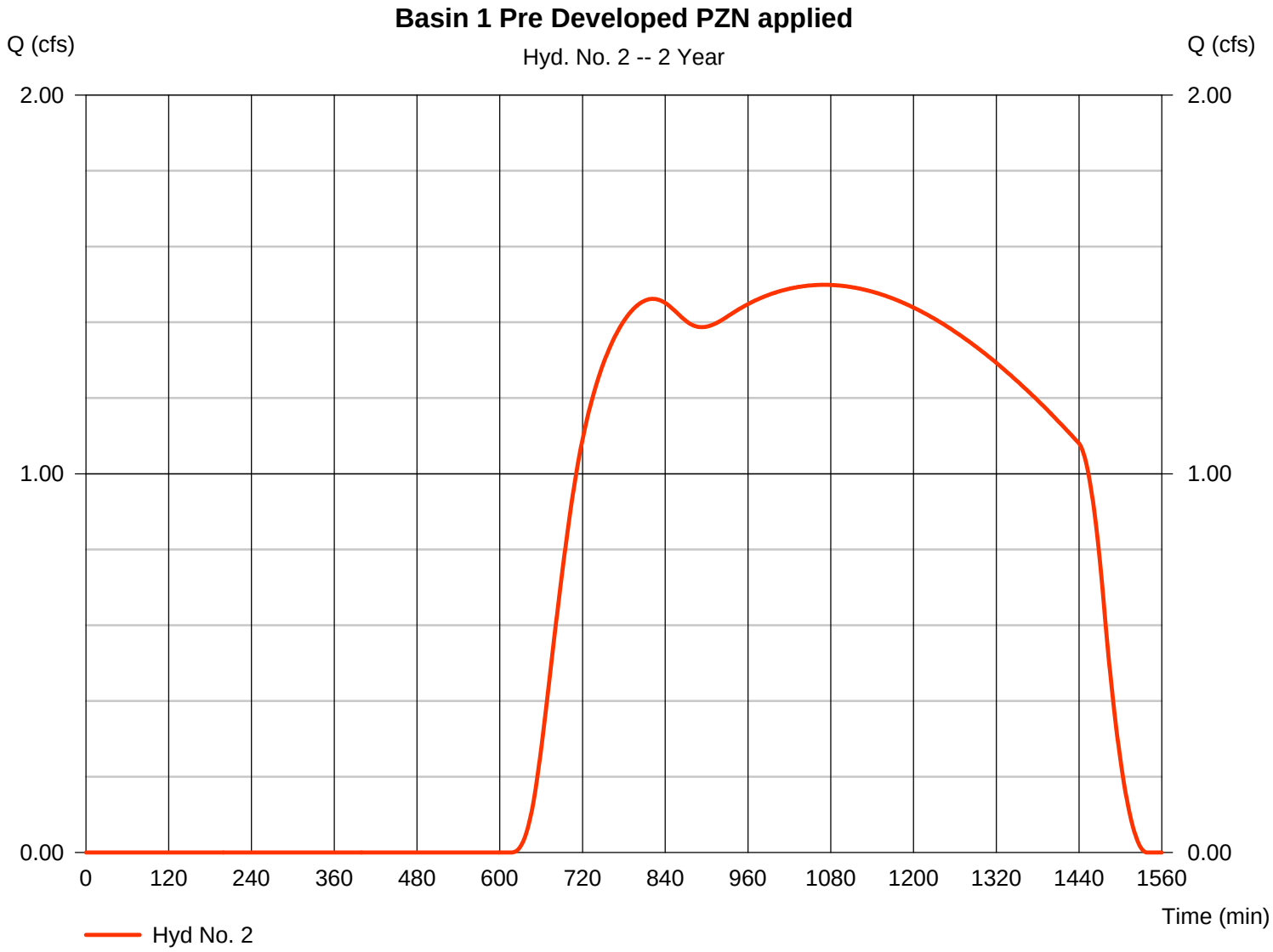
Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.499 cfs
Storm frequency	=	2 yrs	Time to peak	=	1070 min
Time interval	=	1 min	Hyd. volume	=	65,332 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010



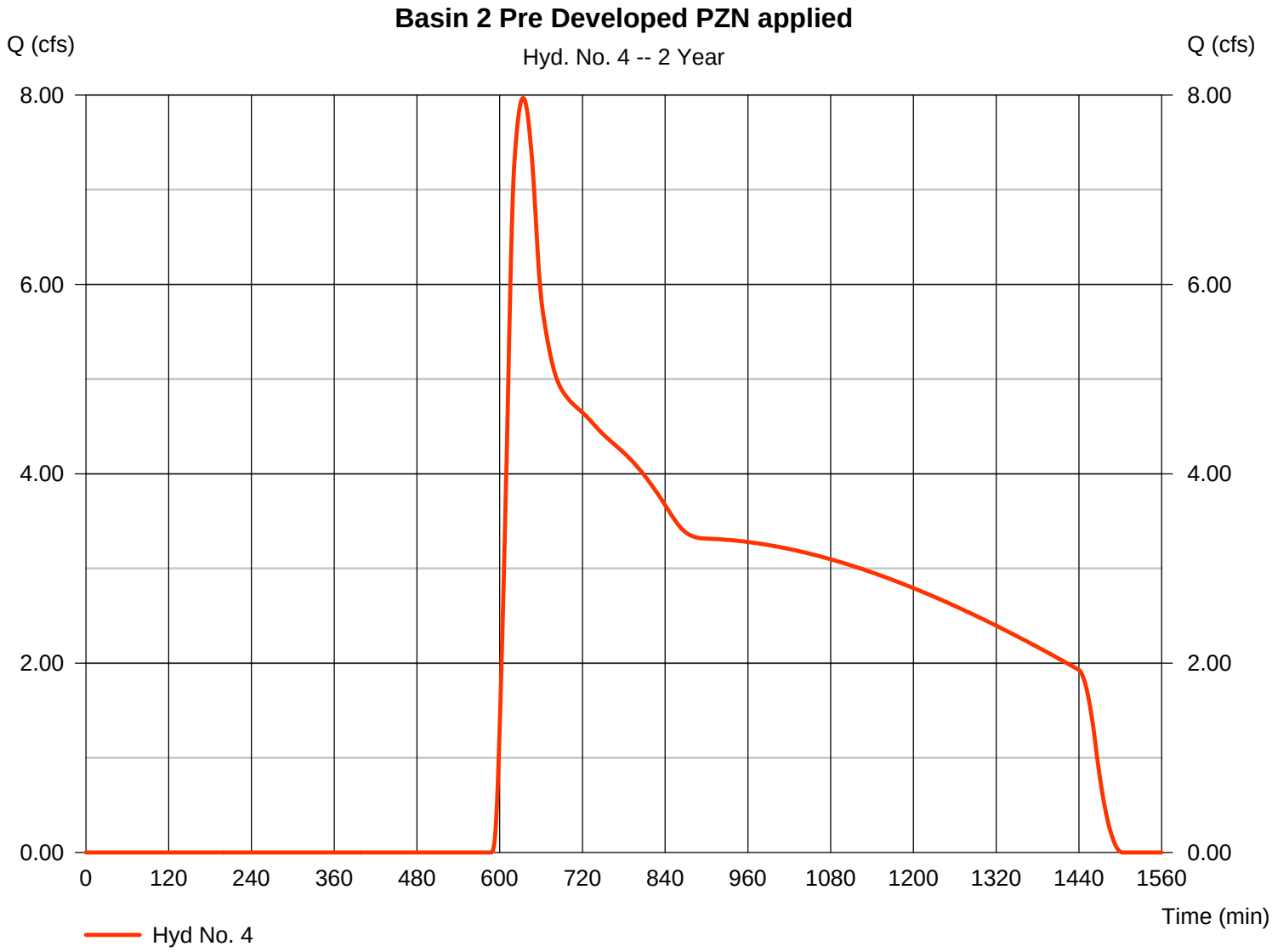
Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.969 cfs
Storm frequency	=	2 yrs	Time to peak	=	634 min
Time interval	=	1 min	Hyd. volume	=	177,256 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



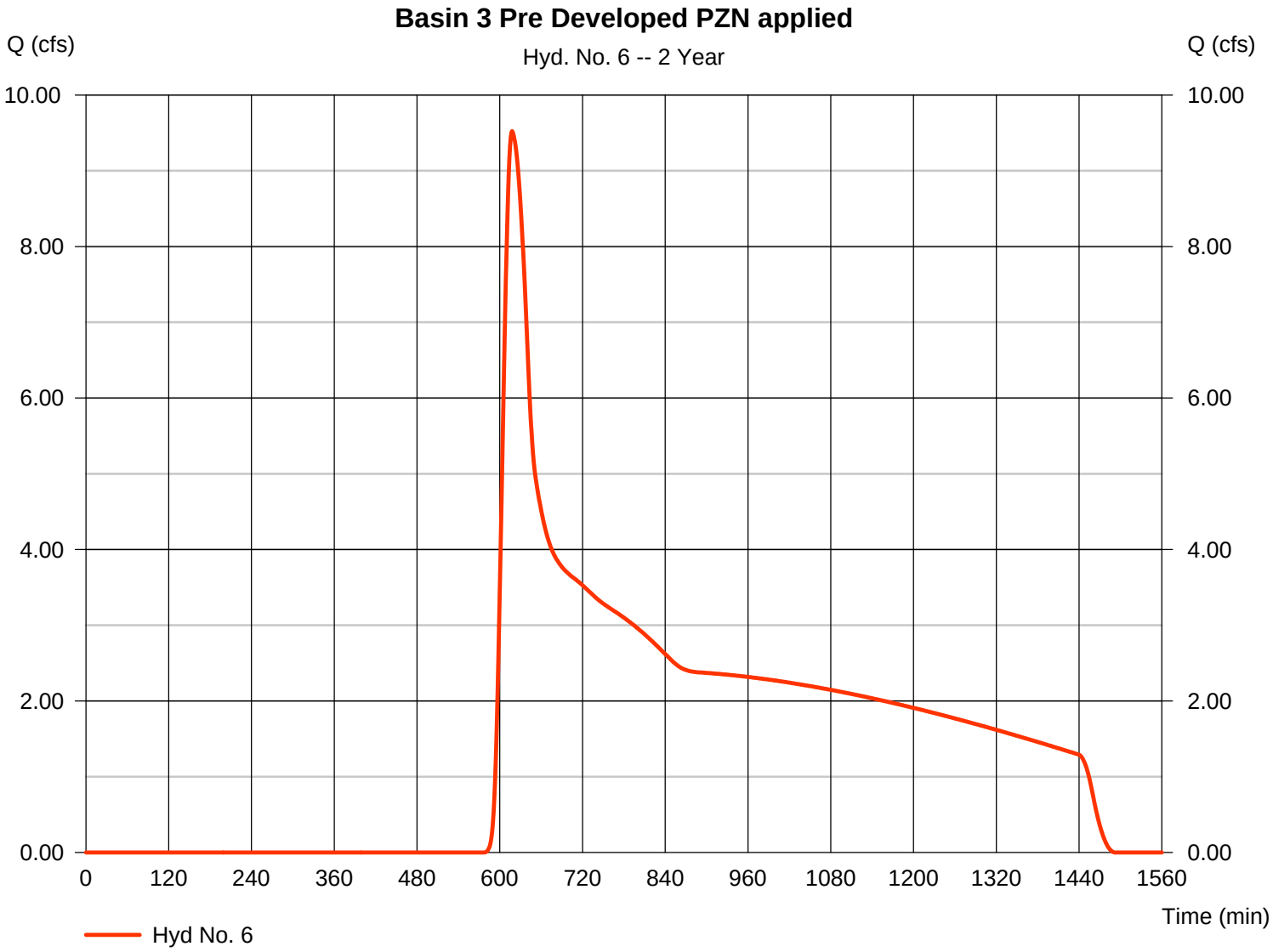
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.522 cfs
Storm frequency	=	2 yrs	Time to peak	=	618 min
Time interval	=	1 min	Hyd. volume	=	135,476 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



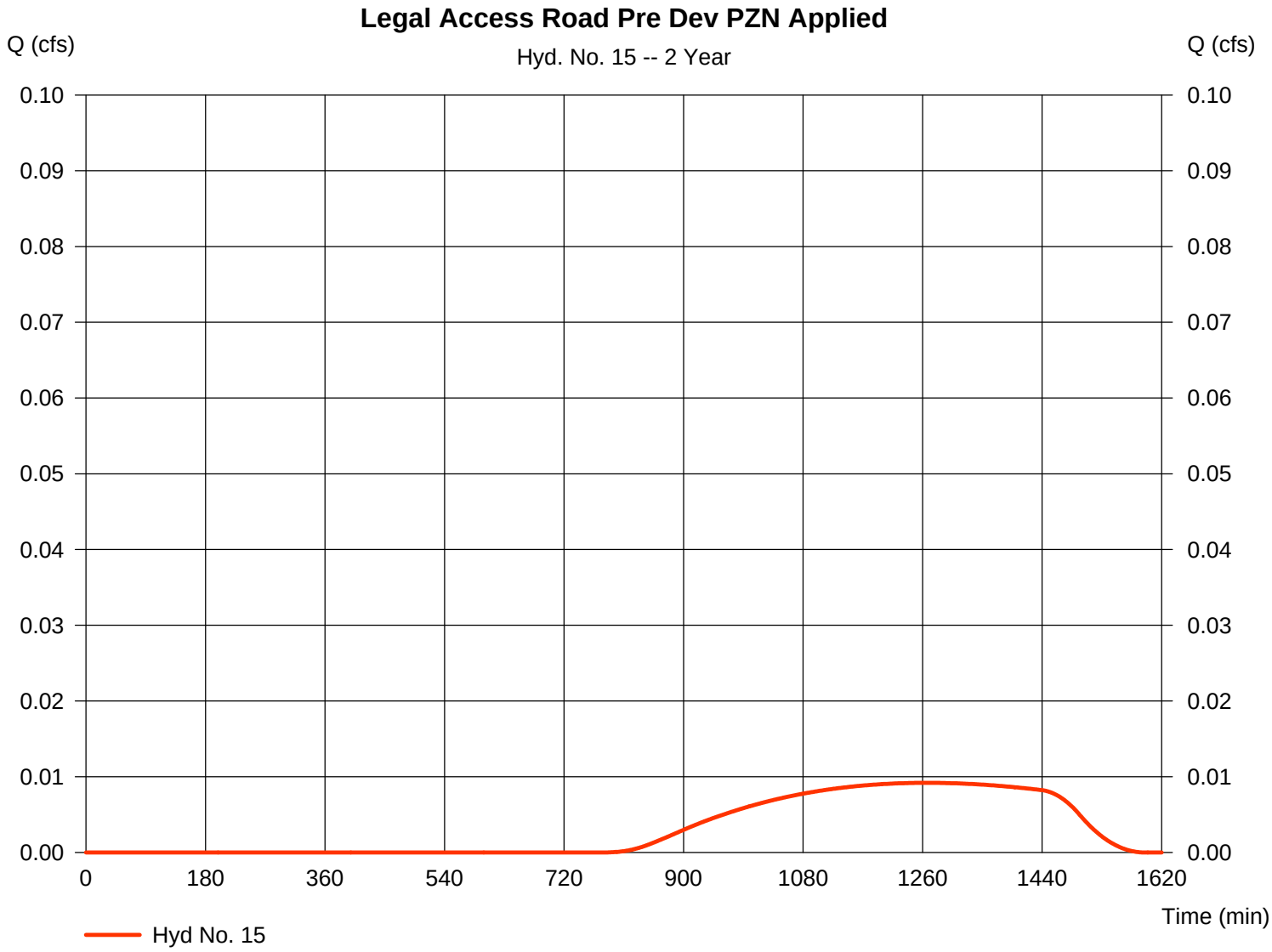
Hydrograph Report

Hyd. No. 15

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.009 cfs
Storm frequency	=	2 yrs	Time to peak	=	1267 min
Time interval	=	1 min	Hyd. volume	=	293 cuft
Drainage area	=	2.060 ac	Curve number	=	58*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	96.90 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.018 cfs
Storm frequency	=	5 yrs	Time to peak	=	680 min
Time interval	=	1 min	Hyd. volume	=	147,905 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010

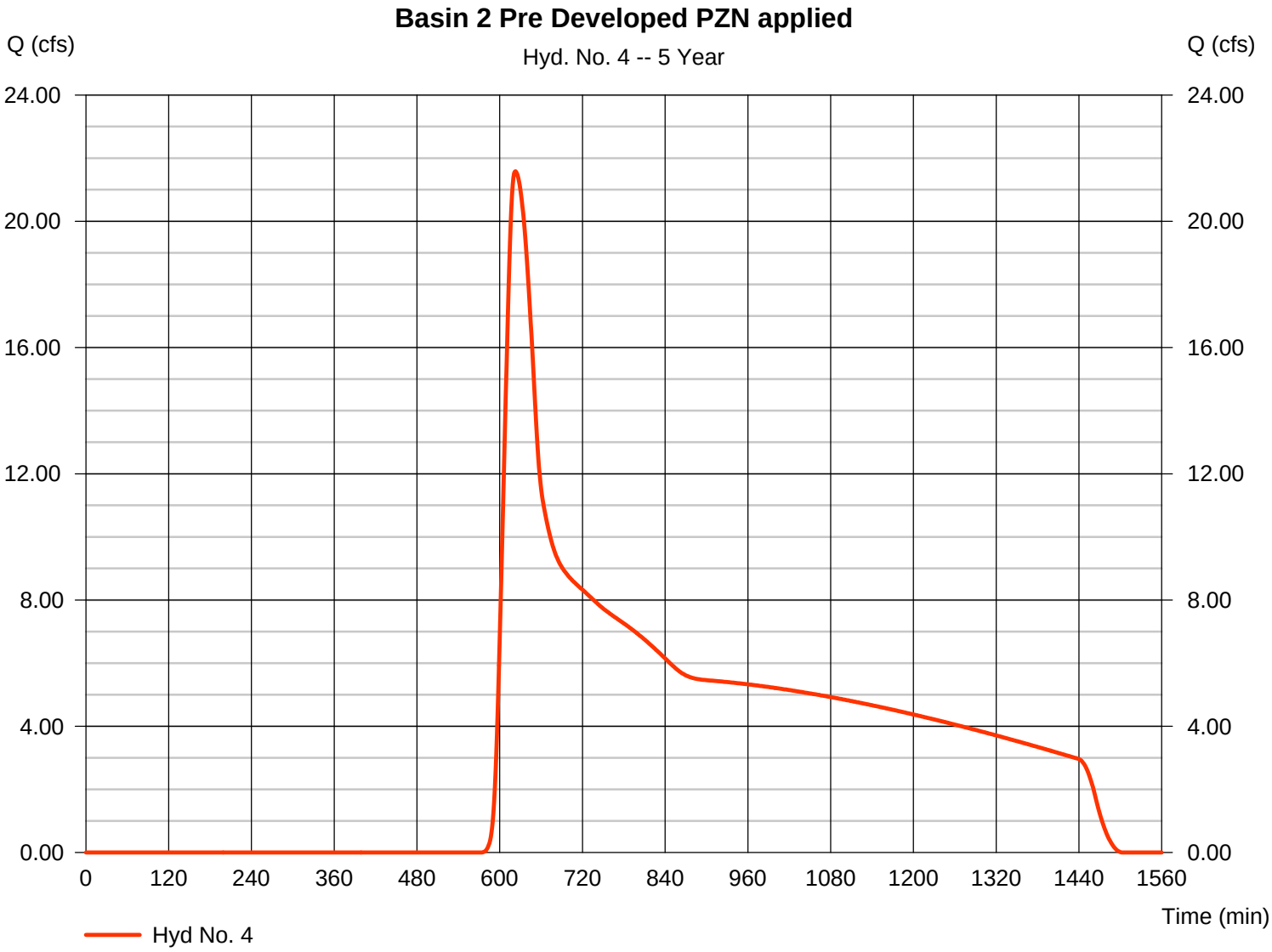
Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.58 cfs
Storm frequency	=	5 yrs	Time to peak	=	623 min
Time interval	=	1 min	Hyd. volume	=	317,292 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



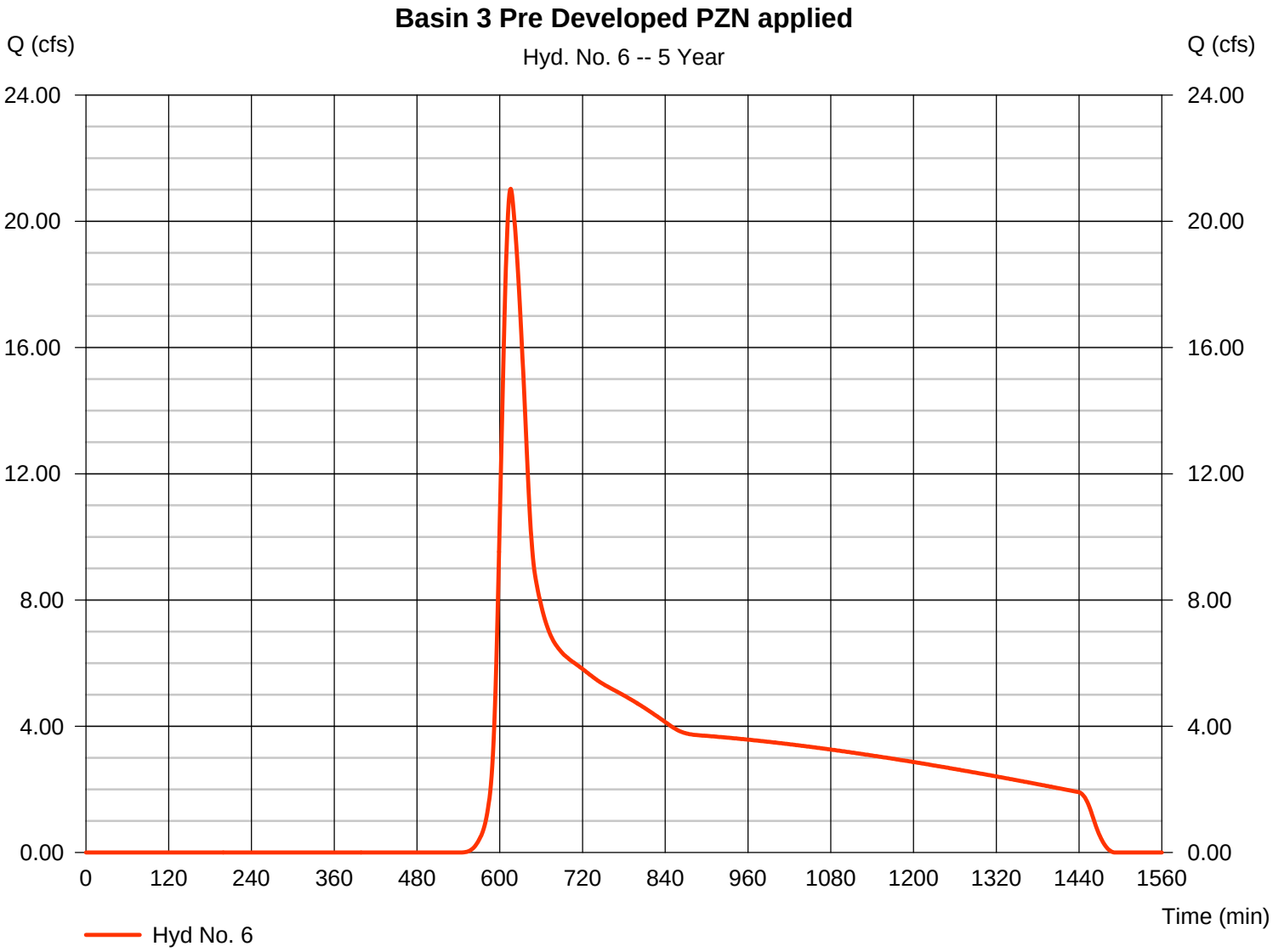
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.03 cfs
Storm frequency	=	5 yrs	Time to peak	=	616 min
Time interval	=	1 min	Hyd. volume	=	228,200 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



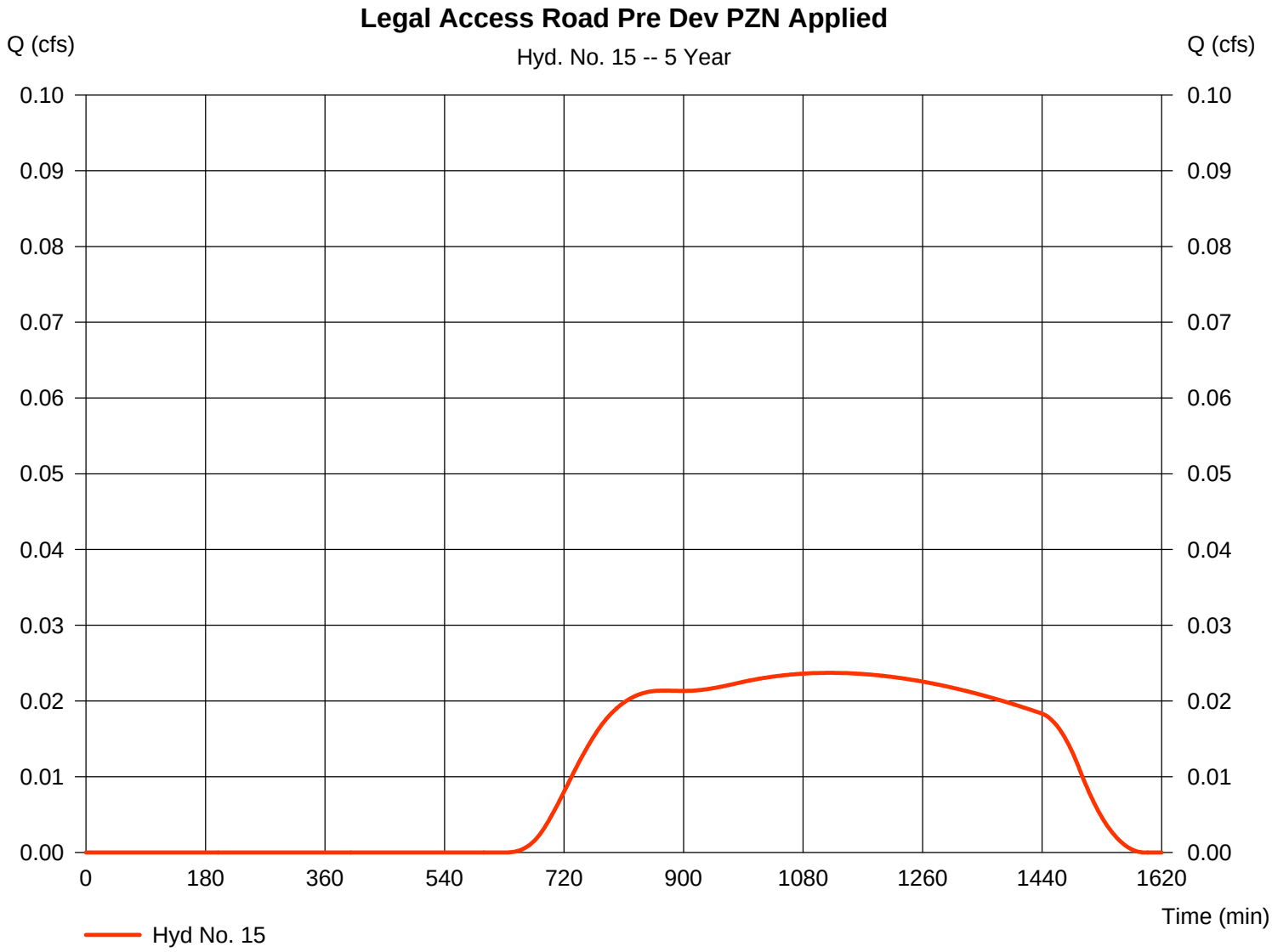
Hydrograph Report

Hyd. No. 15

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.024 cfs
Storm frequency	=	5 yrs	Time to peak	=	1120 min
Time interval	=	1 min	Hyd. volume	=	1,000 cuft
Drainage area	=	2.060 ac	Curve number	=	58*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	96.90 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



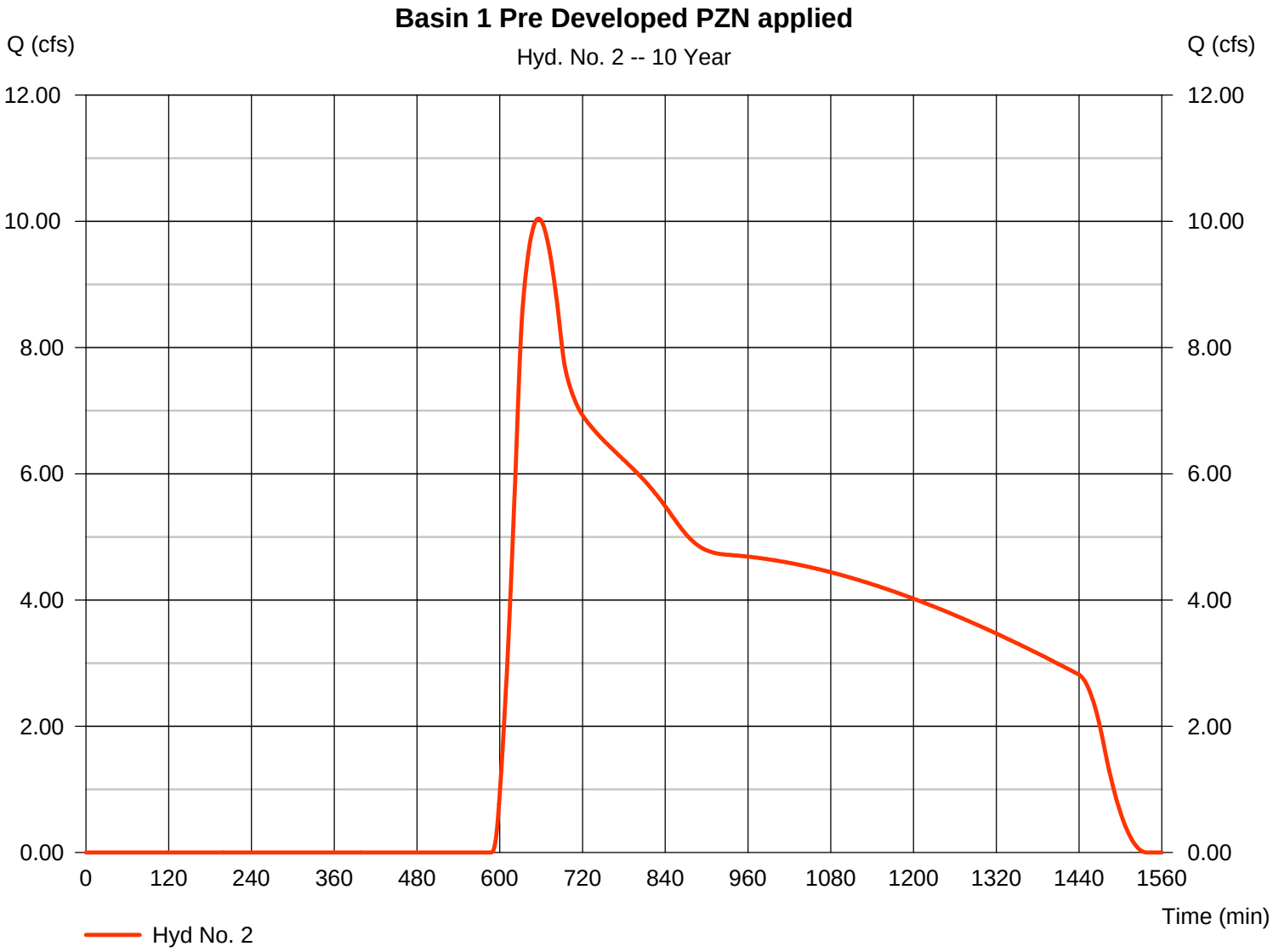
Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.04 cfs
Storm frequency	=	10 yrs	Time to peak	=	656 min
Time interval	=	1 min	Hyd. volume	=	255,160 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010



Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	40.03 cfs
Storm frequency	=	10 yrs	Time to peak	=	621 min
Time interval	=	1 min	Hyd. volume	=	482,103 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530

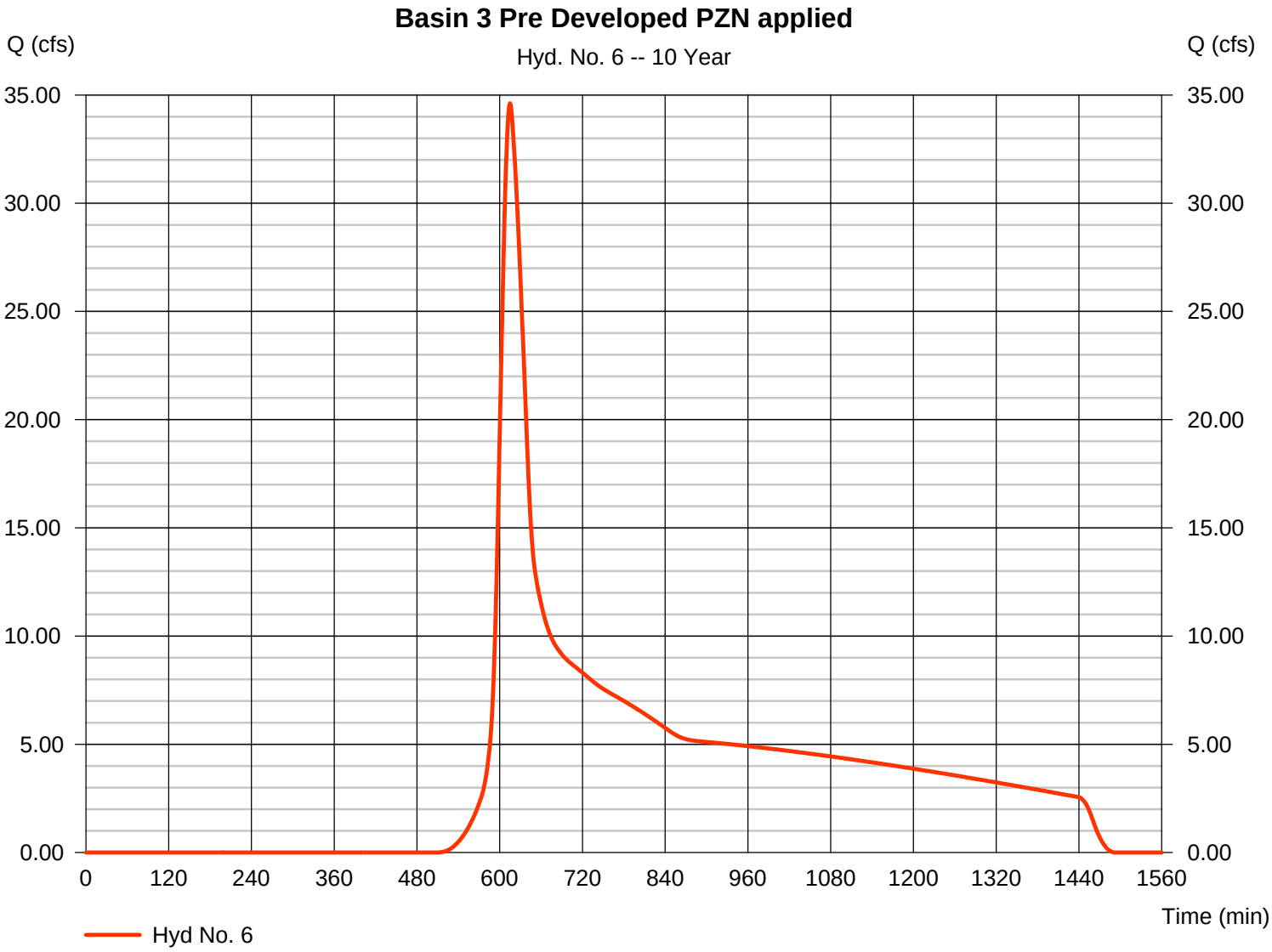
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	615 min
Time interval	=	1 min	Hyd. volume	=	334,194 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



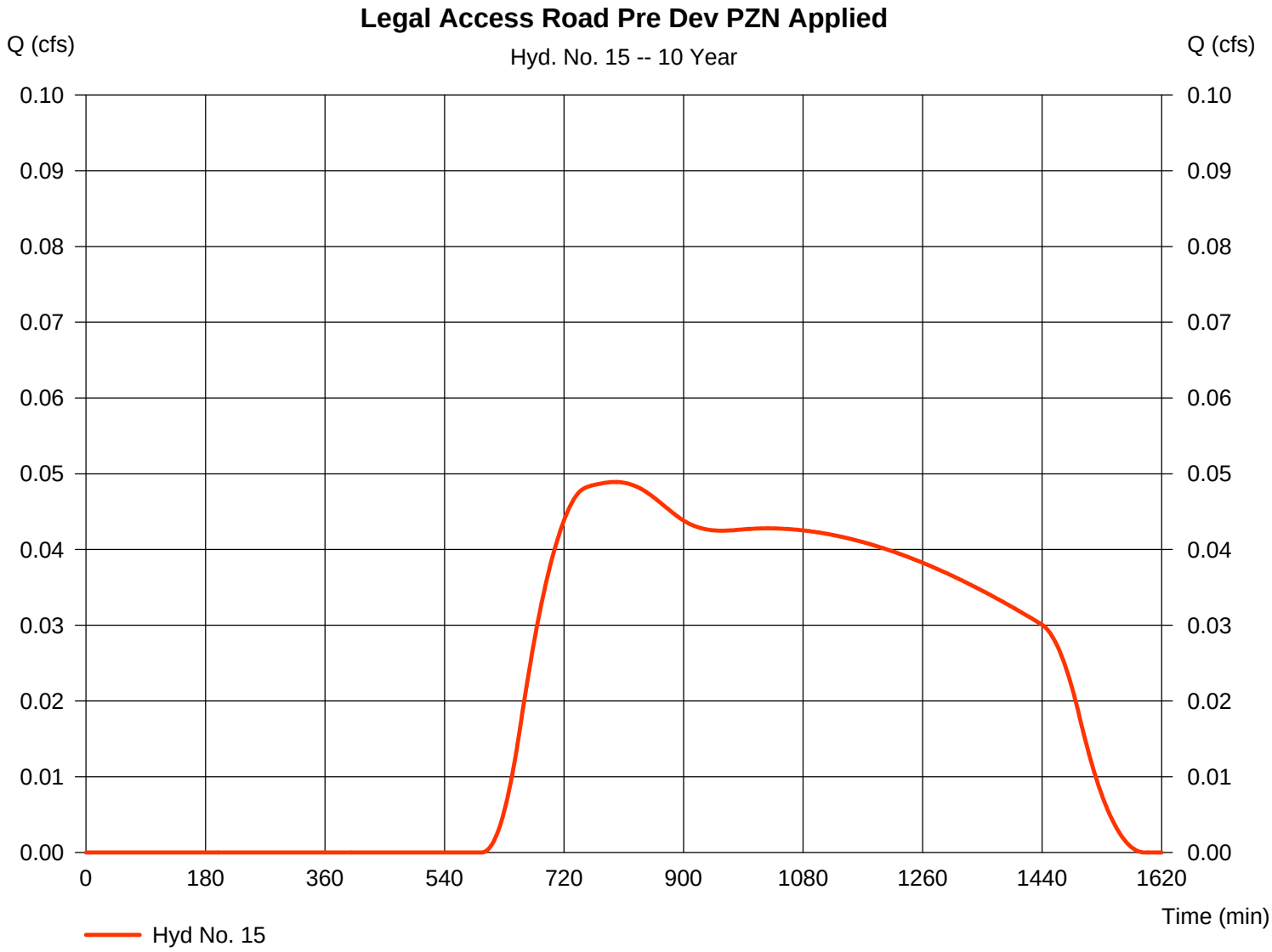
Hydrograph Report

Hyd. No. 15

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.049 cfs
Storm frequency	=	10 yrs	Time to peak	=	797 min
Time interval	=	1 min	Hyd. volume	=	2,052 cuft
Drainage area	=	2.060 ac	Curve number	=	58*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	96.90 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



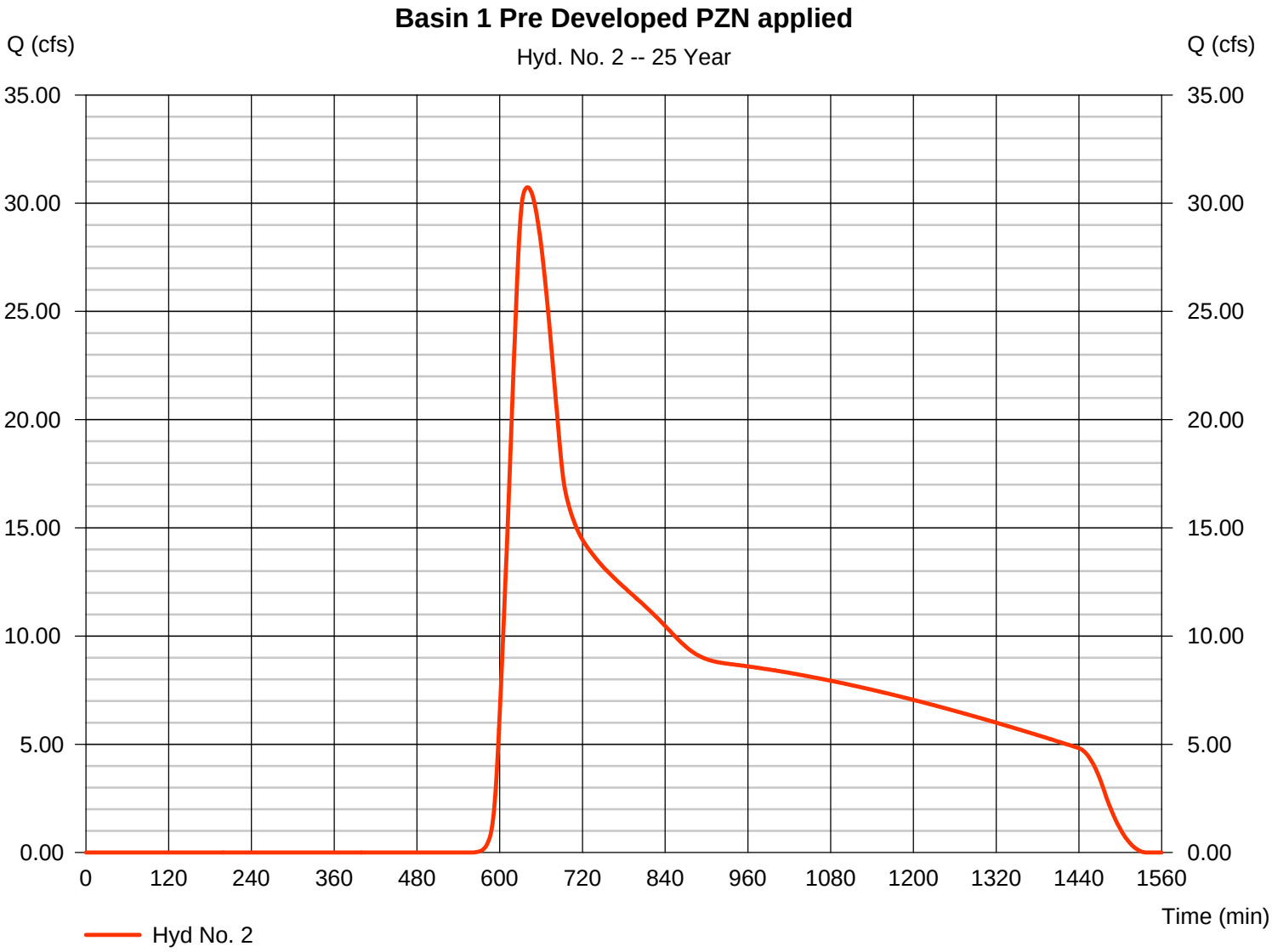
Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	30.74 cfs
Storm frequency	=	25 yrs	Time to peak	=	640 min
Time interval	=	1 min	Hyd. volume	=	526,011 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010



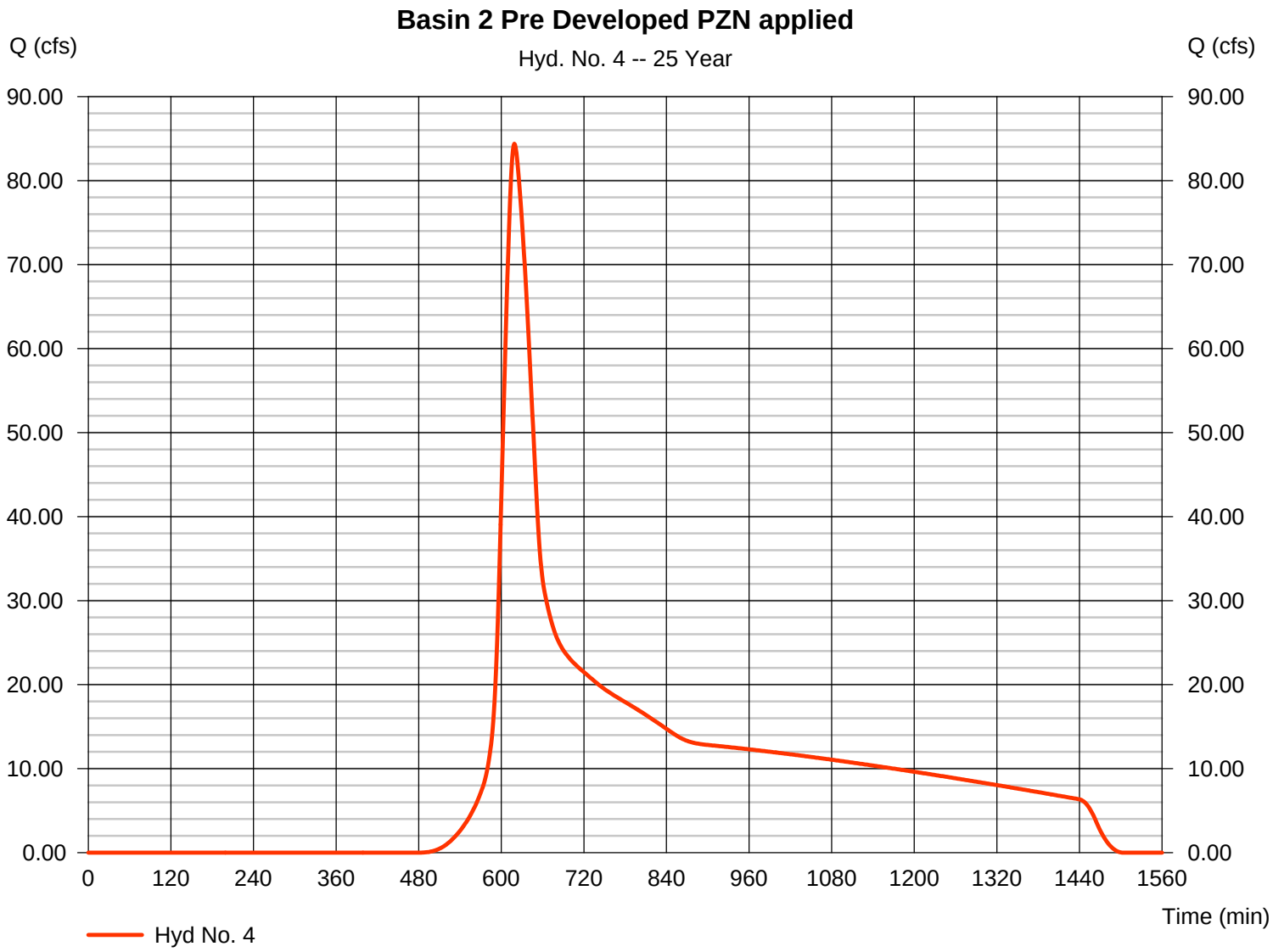
Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	84.39 cfs
Storm frequency	=	25 yrs	Time to peak	=	619 min
Time interval	=	1 min	Hyd. volume	=	864,921 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



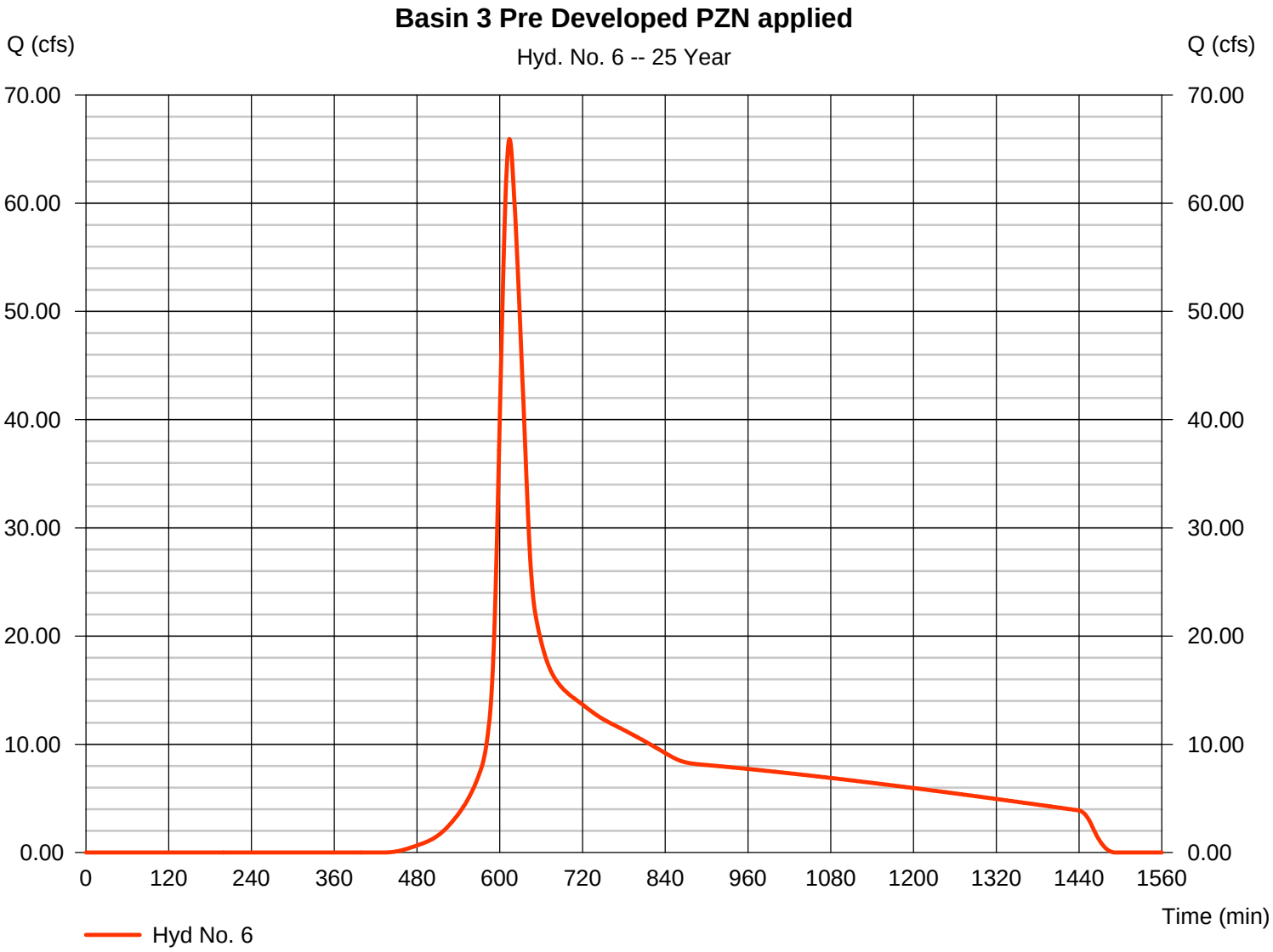
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	65.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	614 min
Time interval	=	1 min	Hyd. volume	=	573,842 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



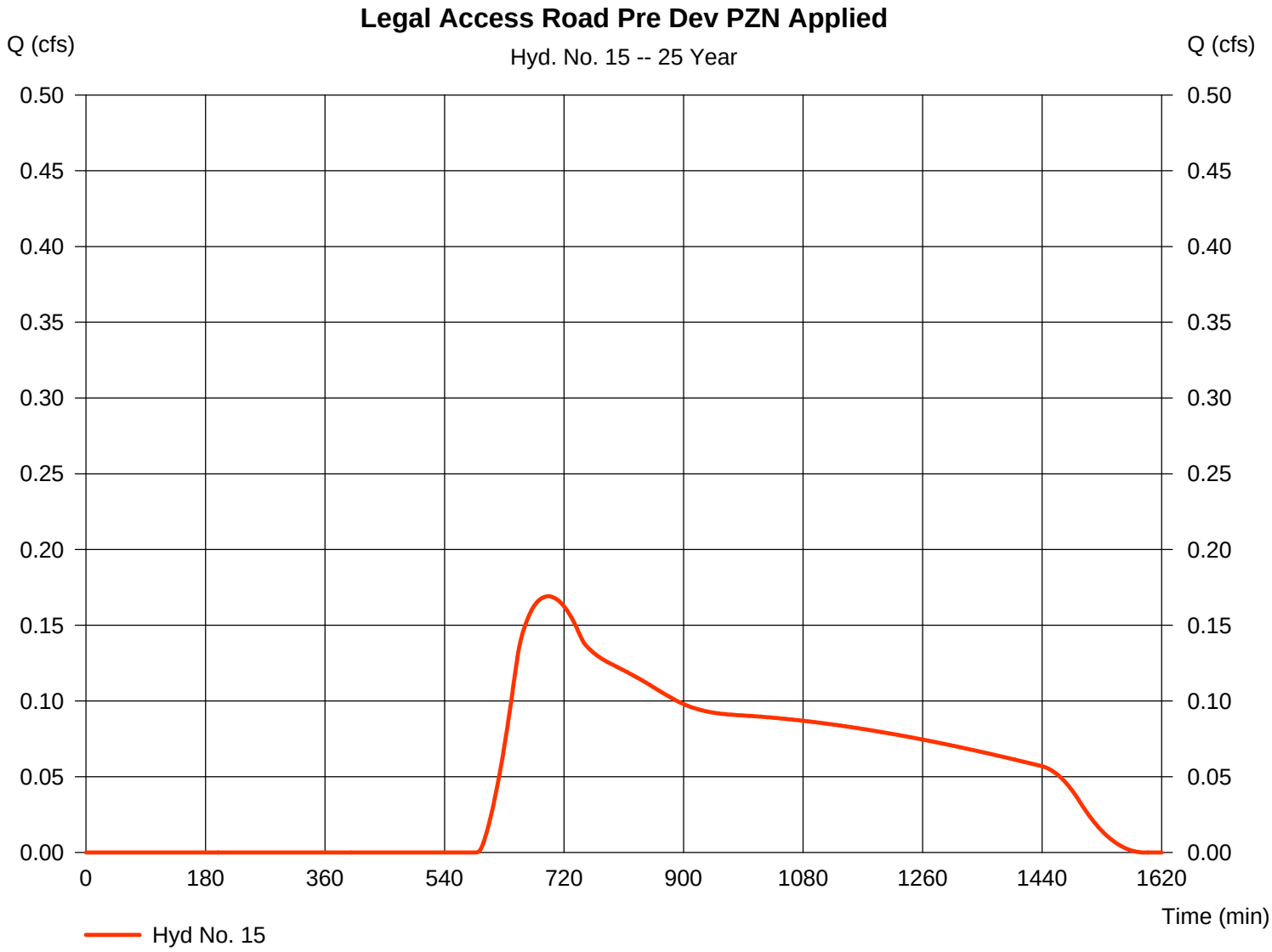
Hydrograph Report

Hyd. No. 15

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.169 cfs
Storm frequency	=	25 yrs	Time to peak	=	696 min
Time interval	=	1 min	Hyd. volume	=	4,983 cuft
Drainage area	=	2.060 ac	Curve number	=	58*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	96.90 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



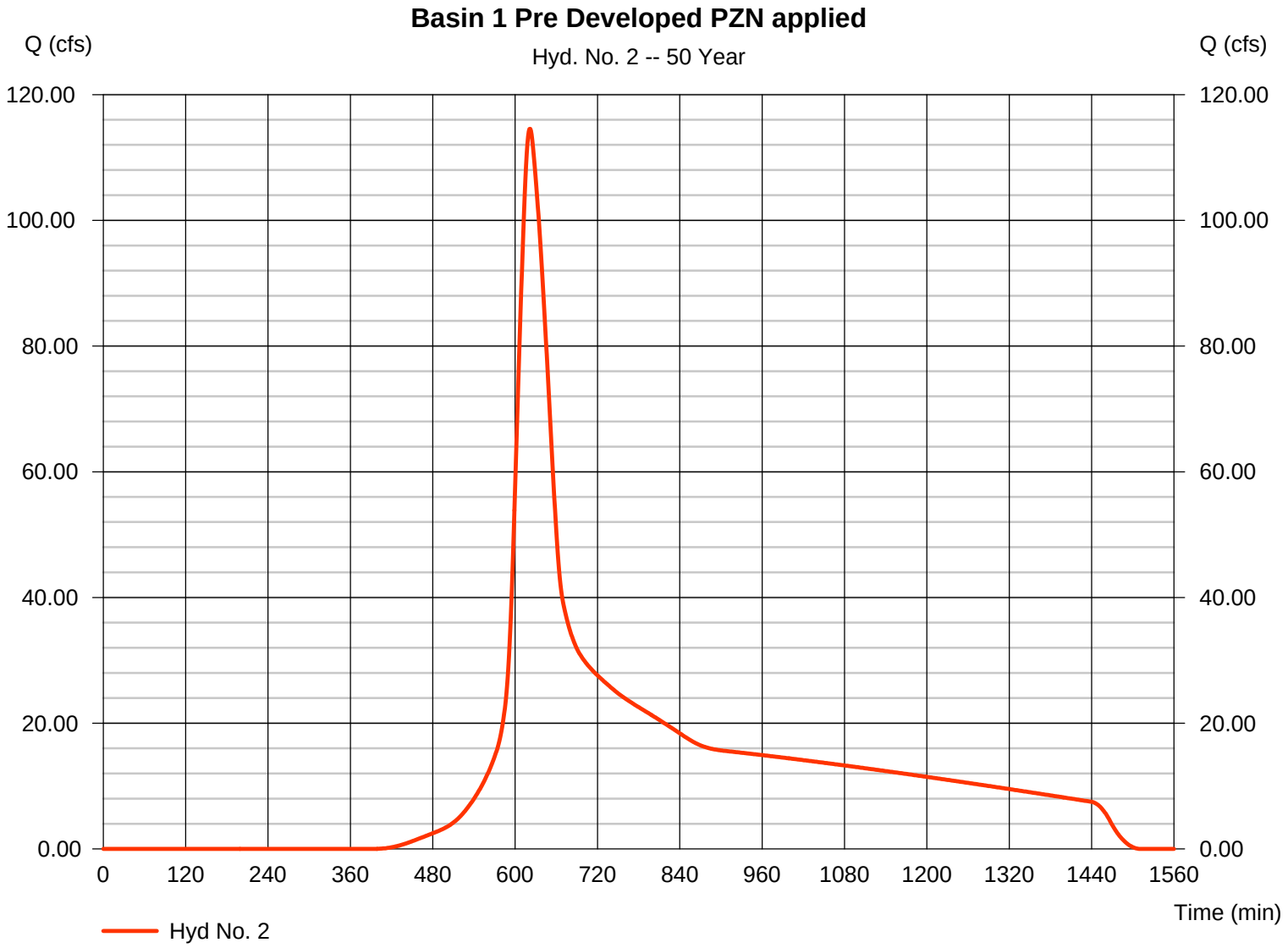
Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	114.56 cfs
Storm frequency	=	50 yrs	Time to peak	=	622 min
Time interval	=	1 min	Hyd. volume	=	1,150,154 cuft
Drainage area	=	146.010 ac	Curve number	=	76.5*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	44.20 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010



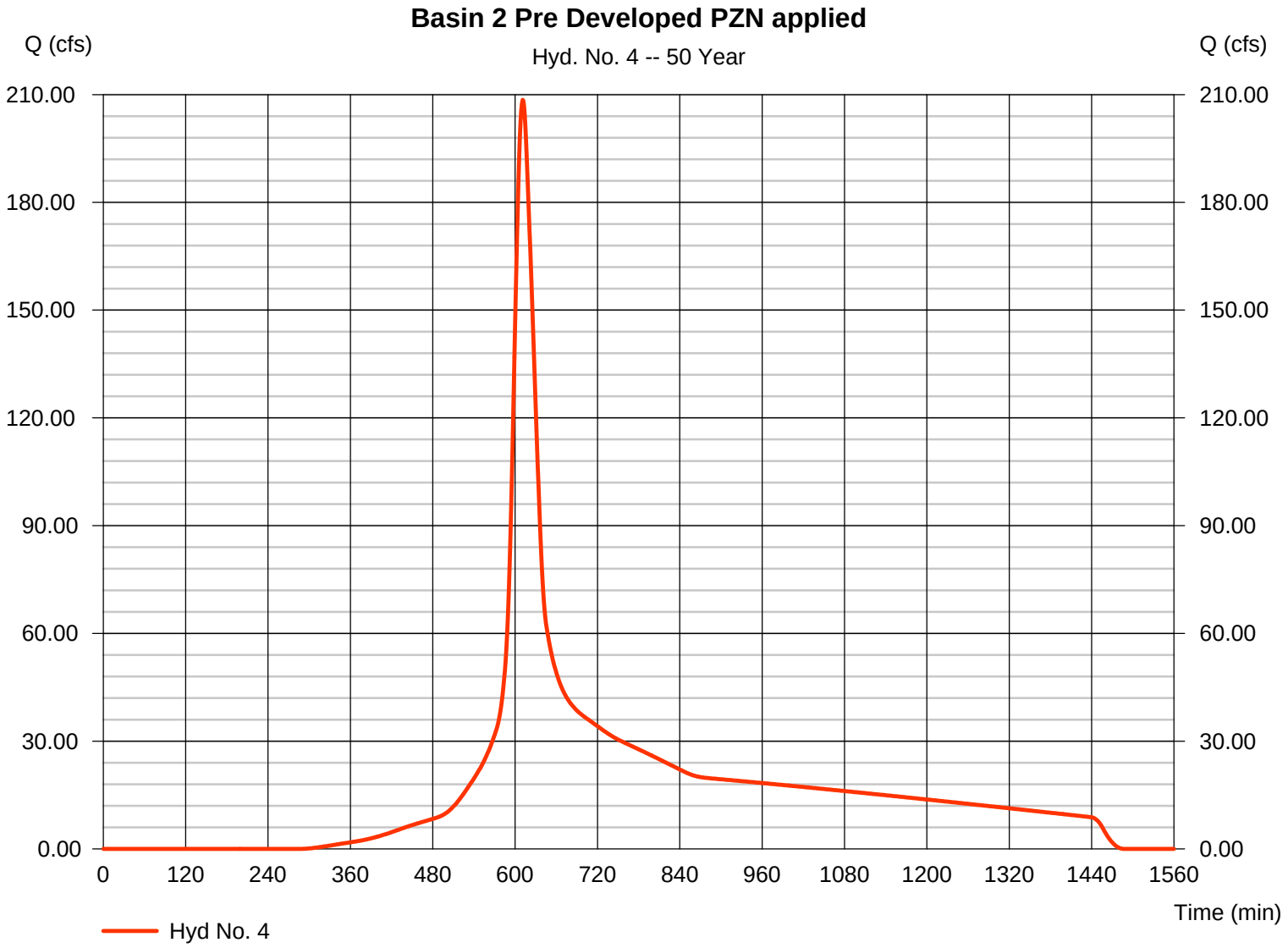
Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	208.54 cfs
Storm frequency	=	50 yrs	Time to peak	=	611 min
Time interval	=	1 min	Hyd. volume	=	1,578,362 cuft
Drainage area	=	159.530 ac	Curve number	=	83*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	29.20 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



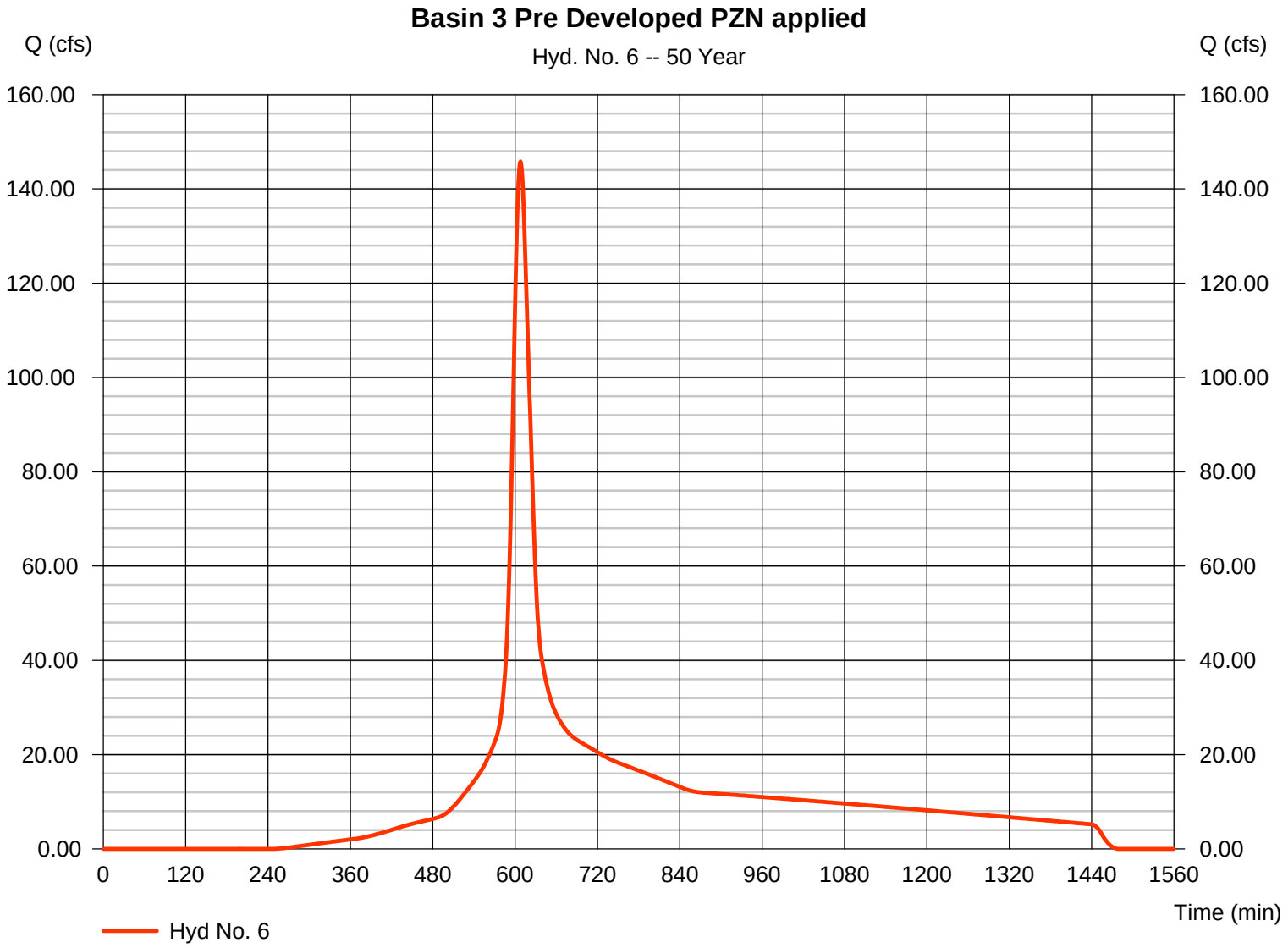
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	145.83 cfs
Storm frequency	=	50 yrs	Time to peak	=	608 min
Time interval	=	1 min	Hyd. volume	=	990,079 cuft
Drainage area	=	92.270 ac	Curve number	=	85.5*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	23.90 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



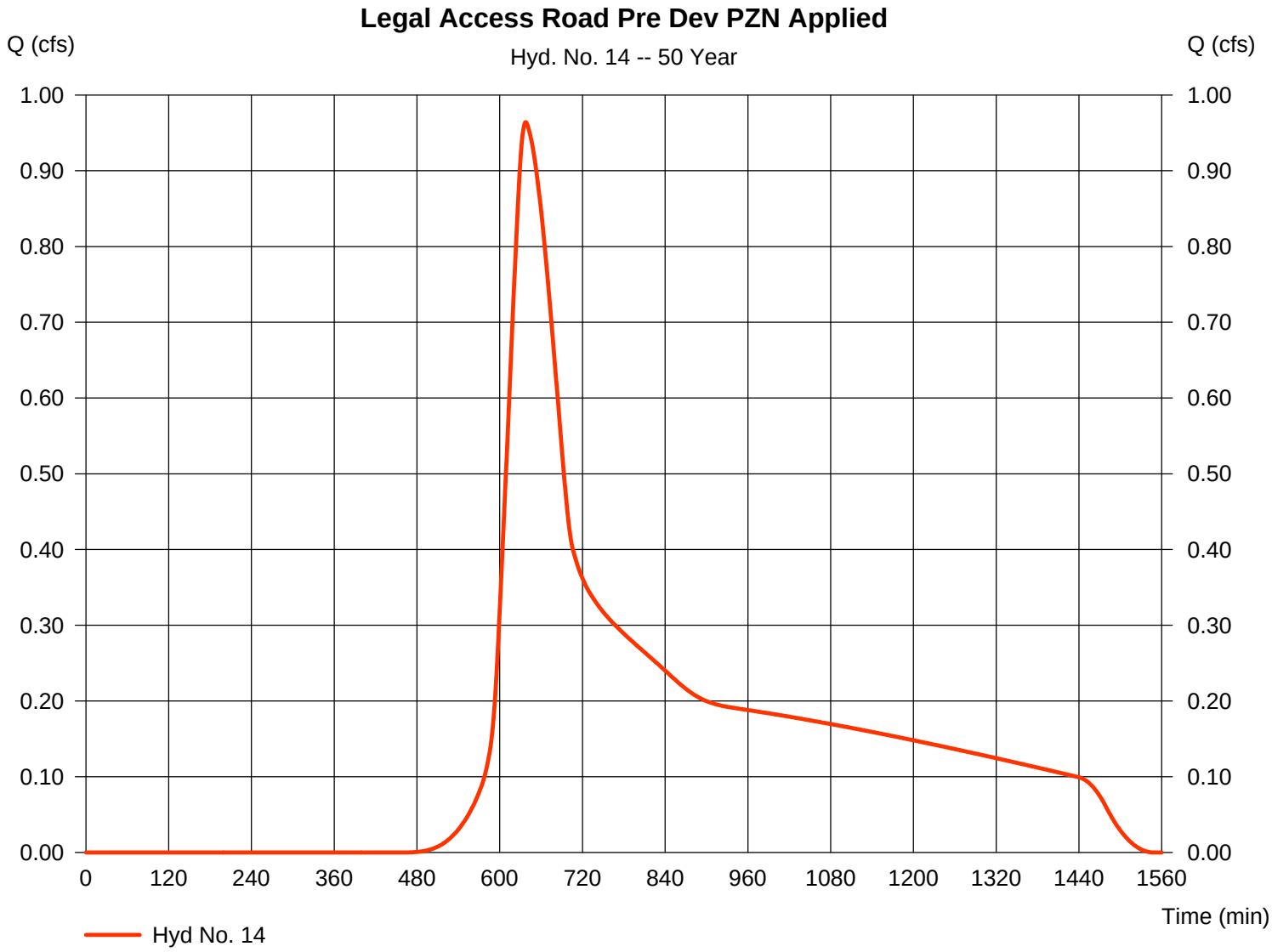
Hydrograph Report

Hyd. No. 14

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.964 cfs
Storm frequency	=	50 yrs	Time to peak	=	638 min
Time interval	=	1 min	Hyd. volume	=	13,294 cuft
Drainage area	=	2.060 ac	Curve number	=	71.5*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	68.20 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



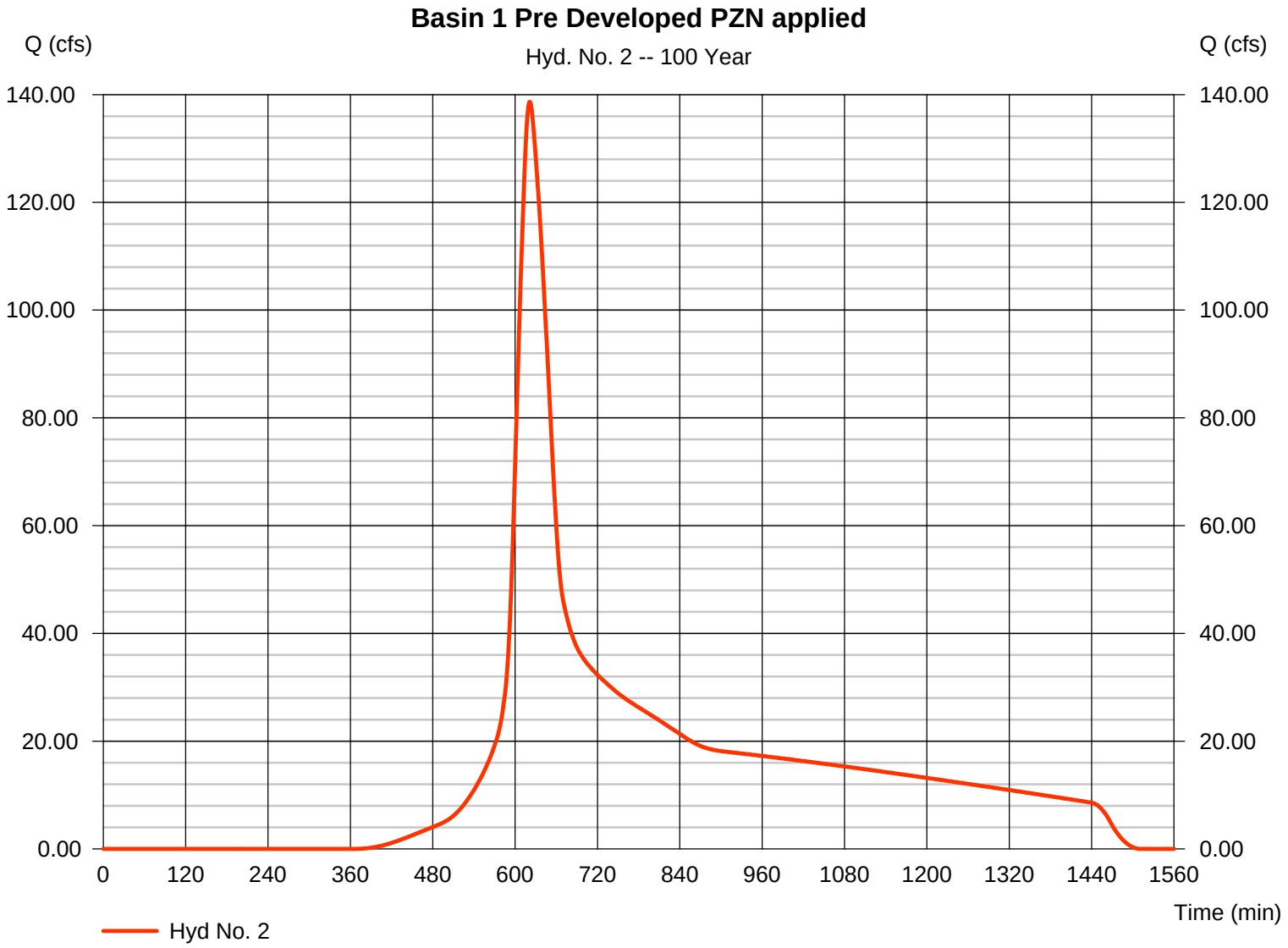
Hydrograph Report

Hyd. No. 2

Basin 1 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	138.66 cfs
Storm frequency	=	100 yrs	Time to peak	=	621 min
Time interval	=	1 min	Hyd. volume	=	1,366,964 cuft
Drainage area	=	146.010 ac	Curve number	=	76.5*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	44.20 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.610 x 55) + (67.400 x 86)] / 146.010



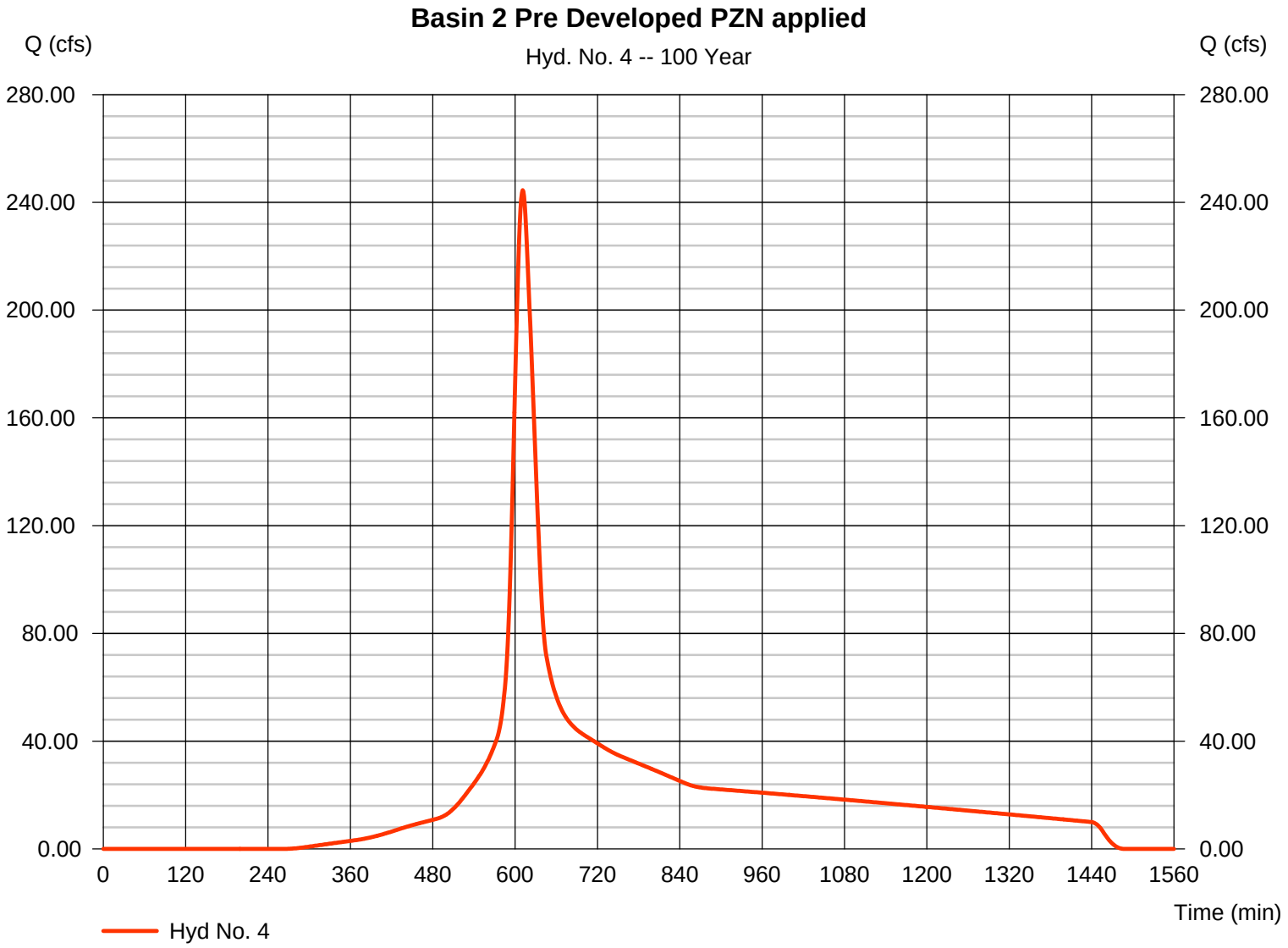
Hydrograph Report

Hyd. No. 4

Basin 2 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	244.52 cfs
Storm frequency	=	100 yrs	Time to peak	=	611 min
Time interval	=	1 min	Hyd. volume	=	1,838,100 cuft
Drainage area	=	159.530 ac	Curve number	=	83*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	29.20 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



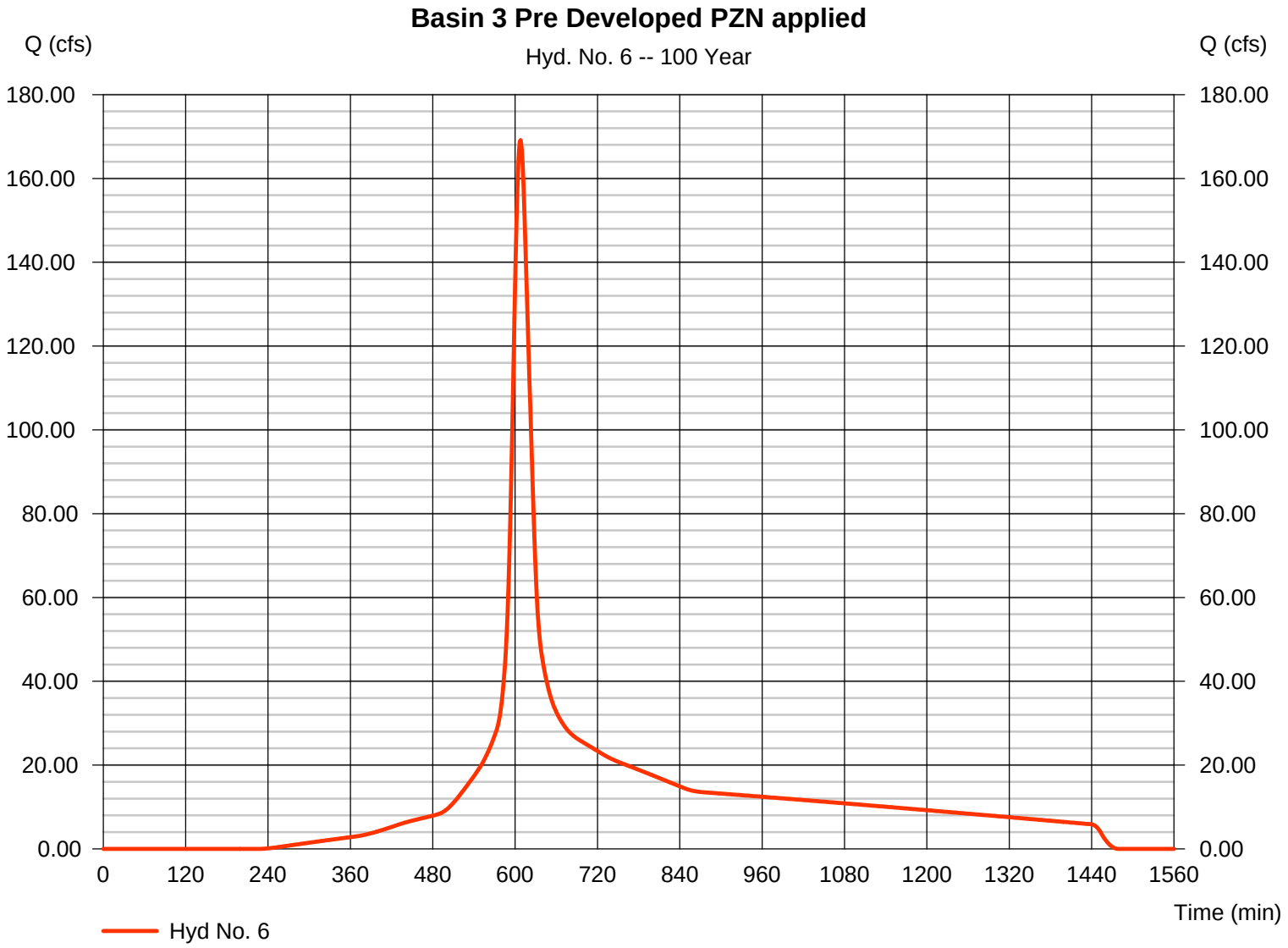
Hydrograph Report

Hyd. No. 6

Basin 3 Pre Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	169.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	608 min
Time interval	=	1 min	Hyd. volume	=	1,144,611 cuft
Drainage area	=	92.270 ac	Curve number	=	85.5*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	23.90 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



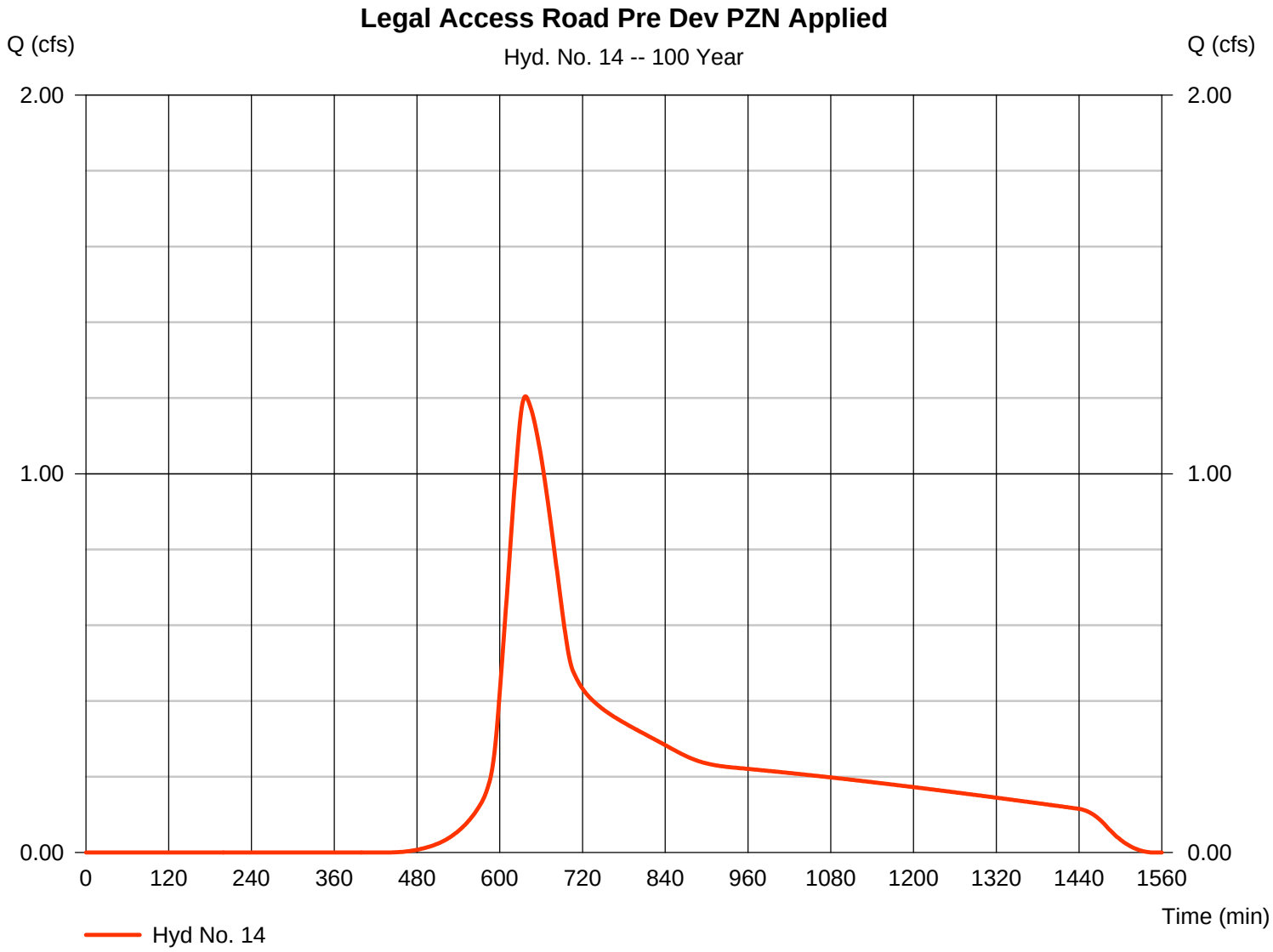
Hydrograph Report

Hyd. No. 14

Legal Access Road Pre Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.205 cfs
Storm frequency	=	100 yrs	Time to peak	=	637 min
Time interval	=	1 min	Hyd. volume	=	16,081 cuft
Drainage area	=	2.060 ac	Curve number	=	71.5*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	68.20 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 55) + (0.910 x 72)] / 2.060



POST-DEVELOPED HYDROGRAPHS

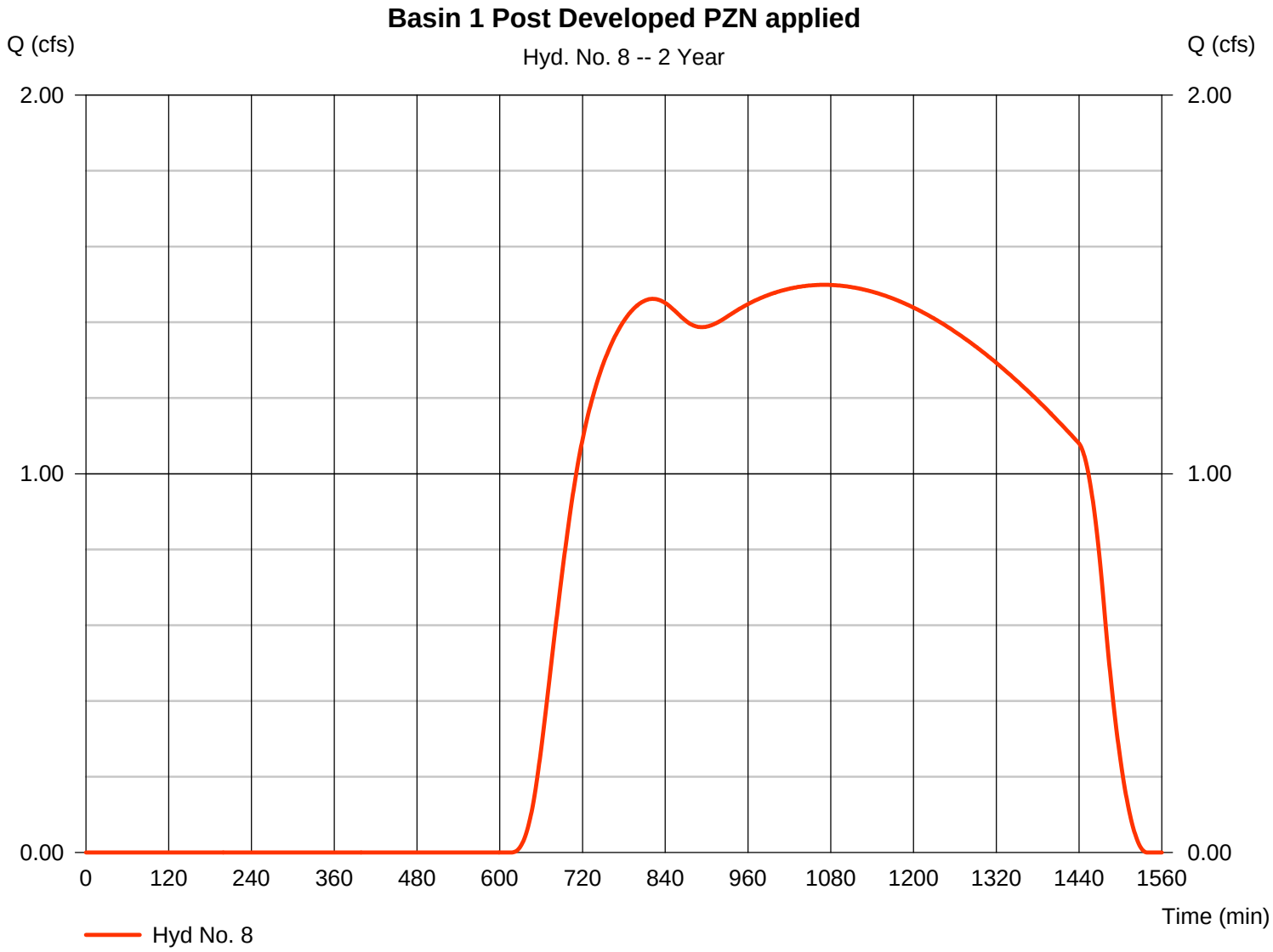
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.499 cfs
Storm frequency	=	2 yrs	Time to peak	=	1070 min
Time interval	=	1 min	Hyd. volume	=	65,332 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



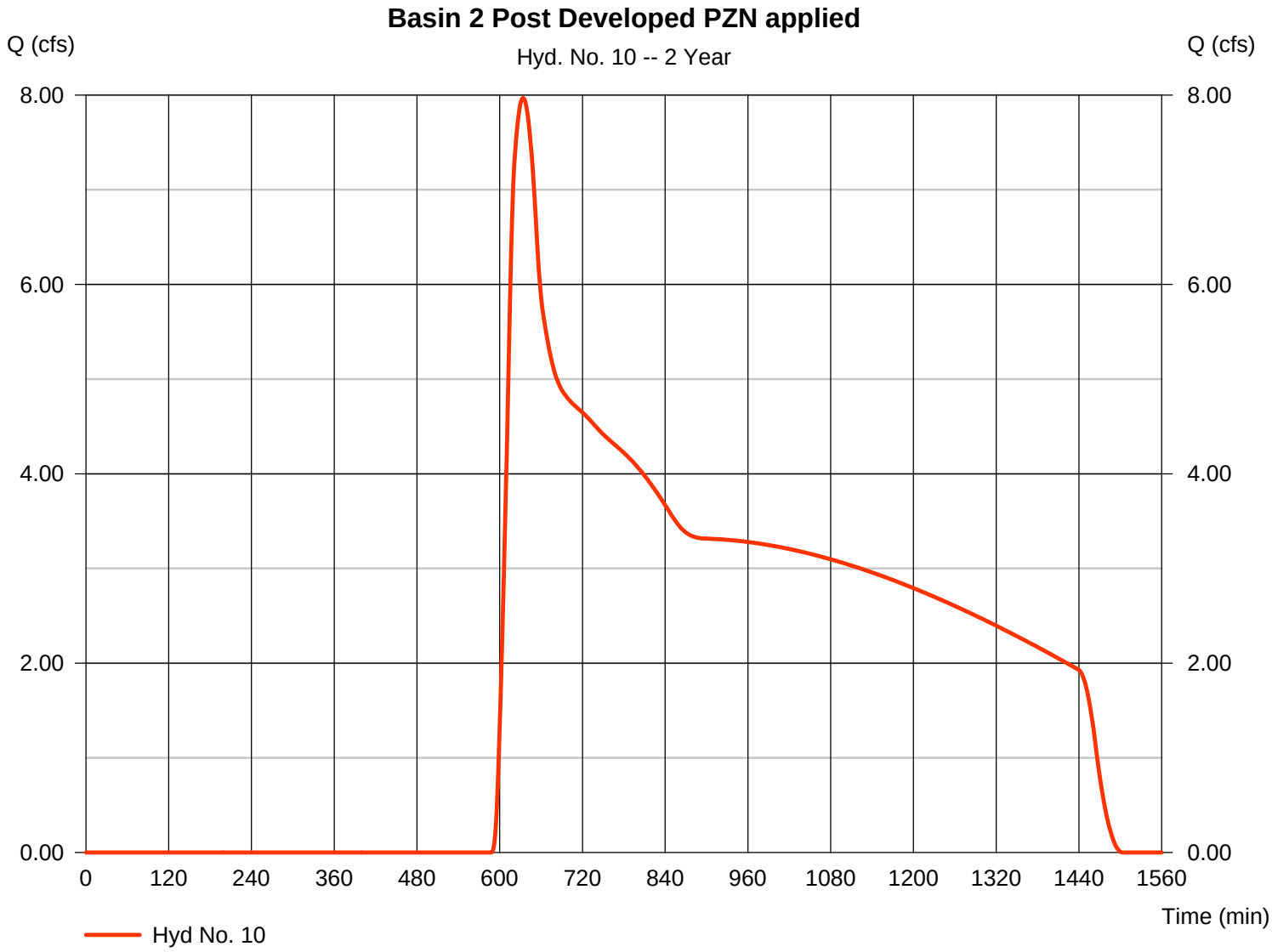
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.969 cfs
Storm frequency	=	2 yrs	Time to peak	=	634 min
Time interval	=	1 min	Hyd. volume	=	177,256 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



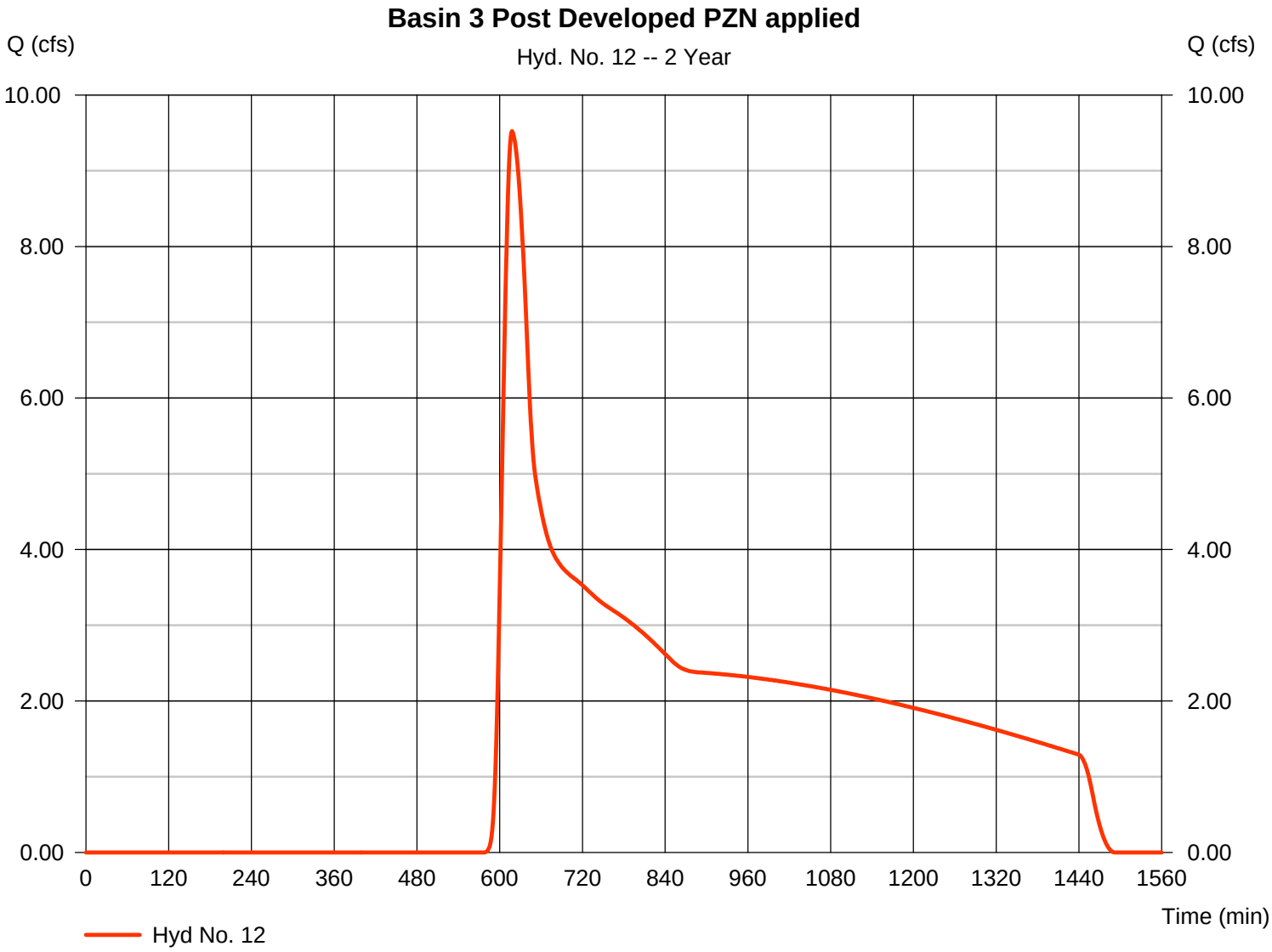
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.522 cfs
Storm frequency	=	2 yrs	Time to peak	=	618 min
Time interval	=	1 min	Hyd. volume	=	135,476 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



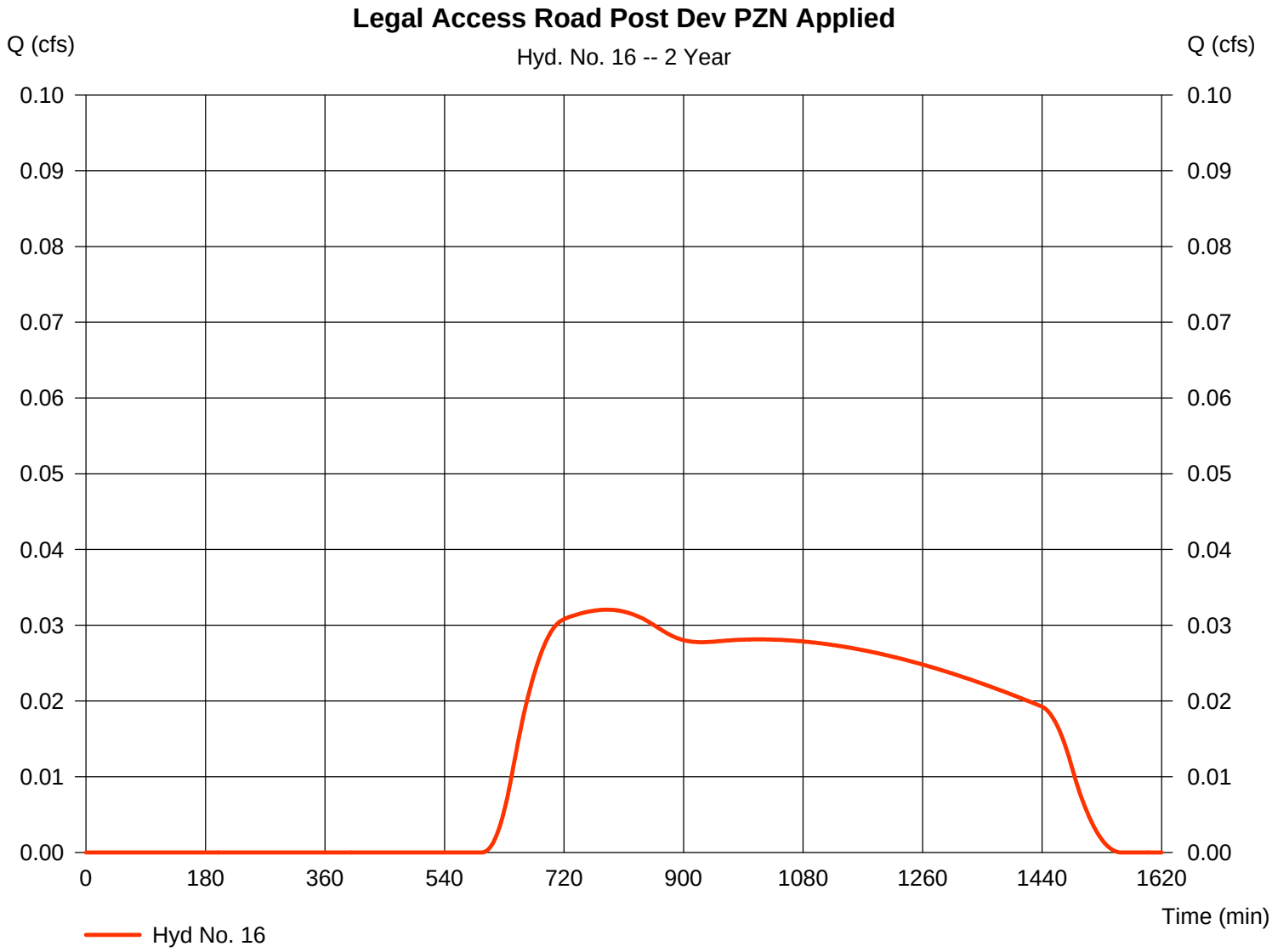
Hydrograph Report

Hyd. No. 16

Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.032 cfs
Storm frequency	=	2 yrs	Time to peak	=	784 min
Time interval	=	1 min	Hyd. volume	=	1,343 cuft
Drainage area	=	2.060 ac	Curve number	=	67.3*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	2.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



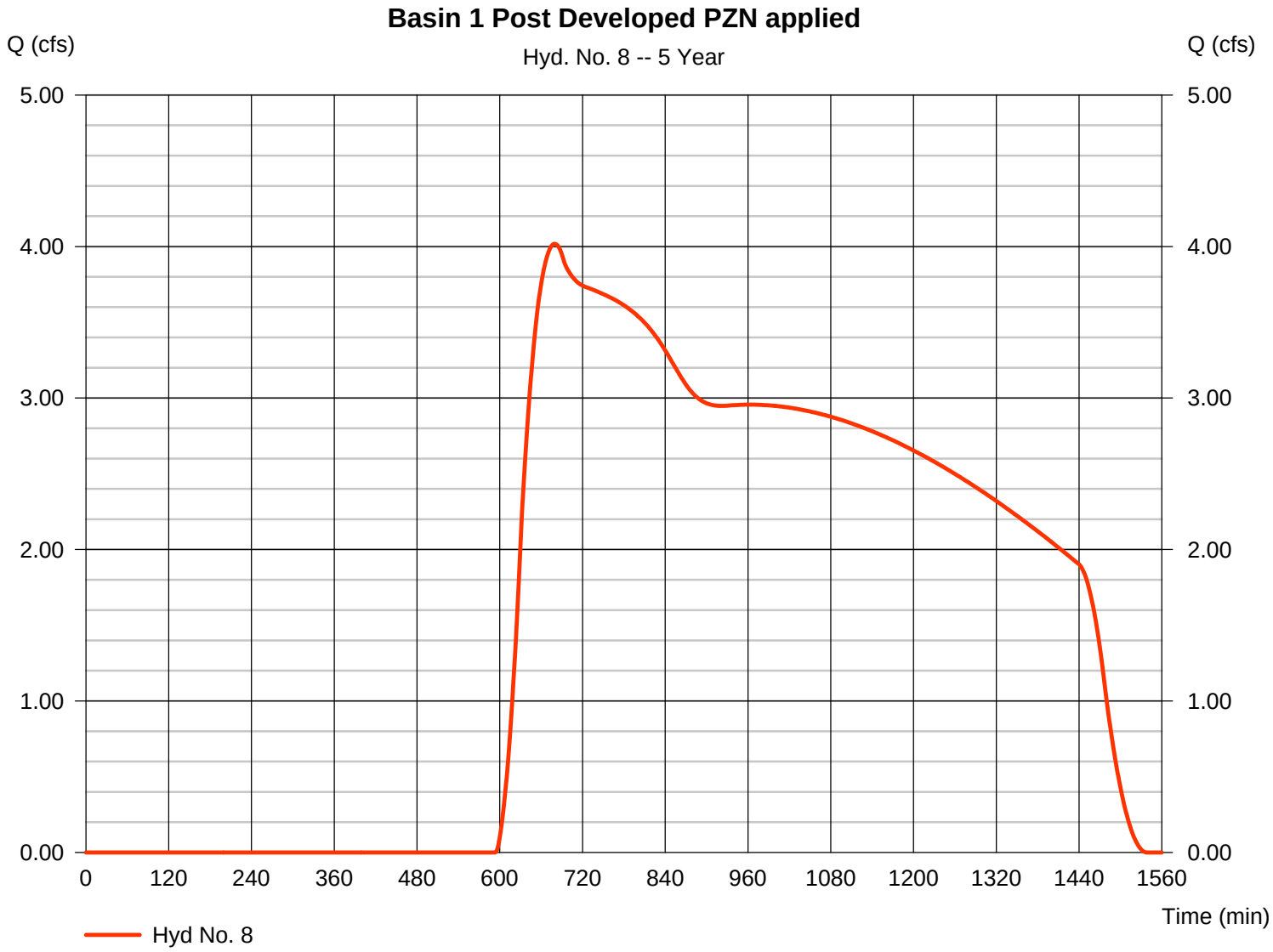
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.018 cfs
Storm frequency	=	5 yrs	Time to peak	=	680 min
Time interval	=	1 min	Hyd. volume	=	147,905 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



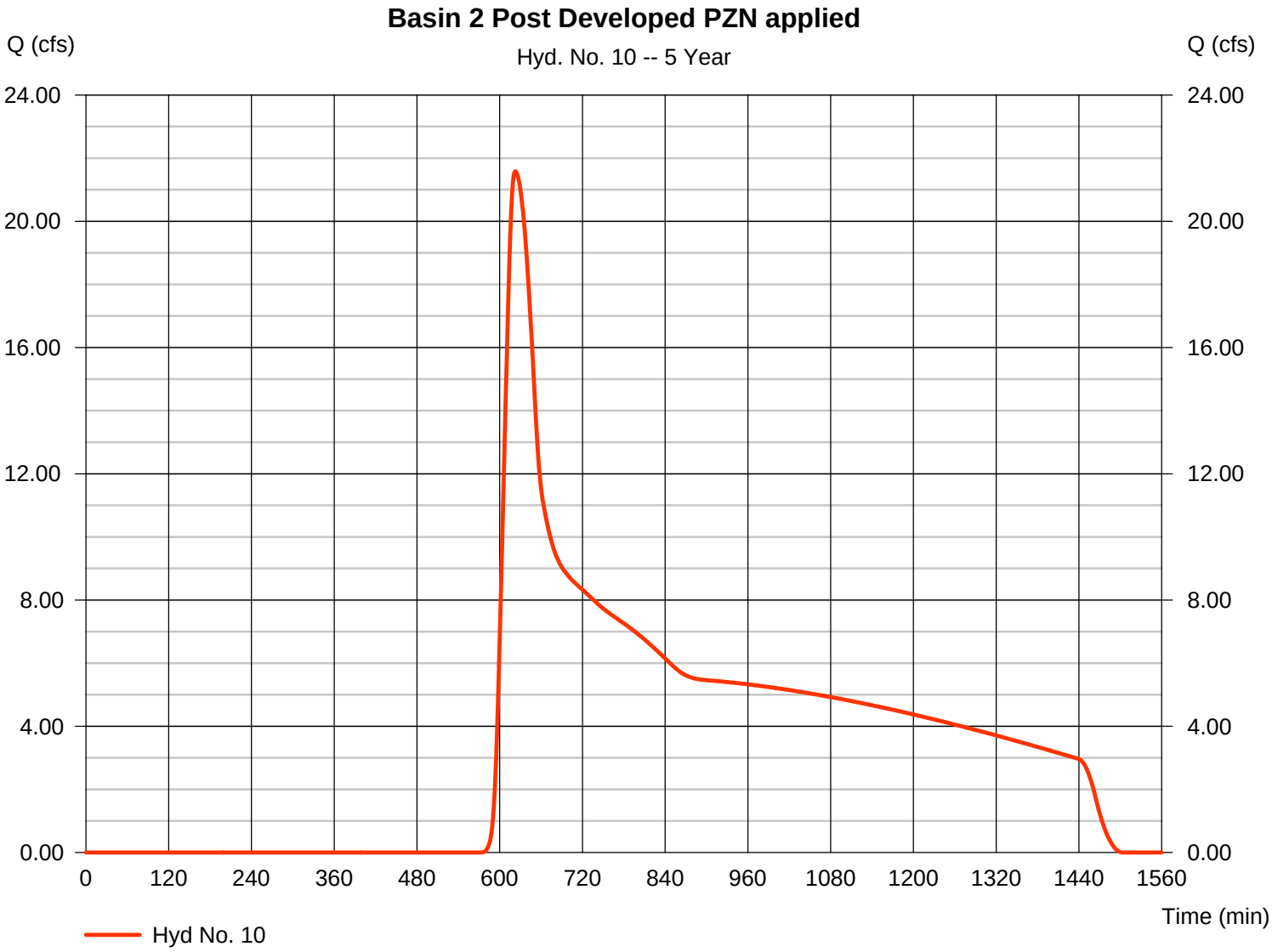
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.58 cfs
Storm frequency	=	5 yrs	Time to peak	=	623 min
Time interval	=	1 min	Hyd. volume	=	317,292 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



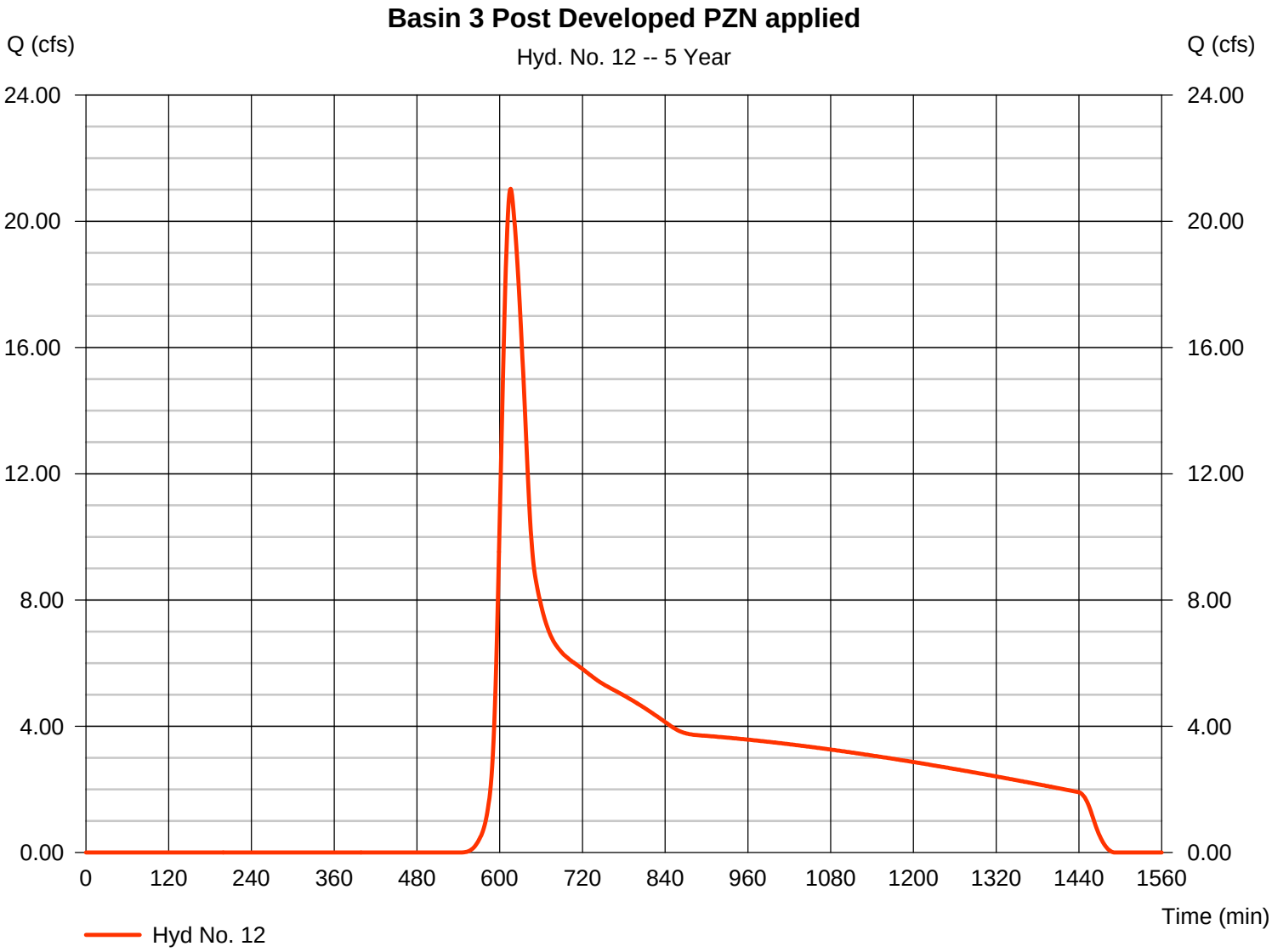
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.03 cfs
Storm frequency	=	5 yrs	Time to peak	=	616 min
Time interval	=	1 min	Hyd. volume	=	228,200 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



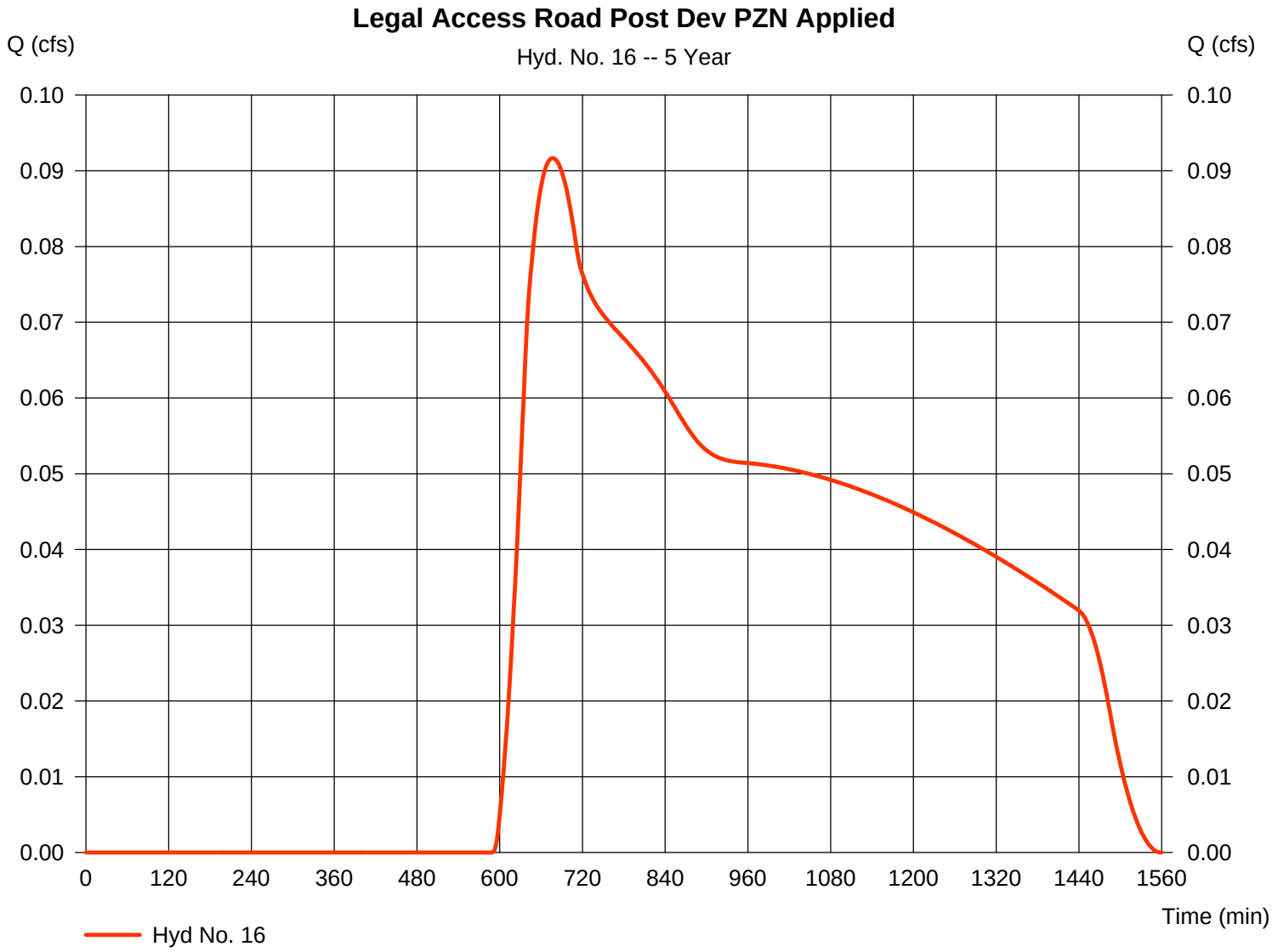
Hydrograph Report

Hyd. No. 16

Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.092 cfs
Storm frequency	=	5 yrs	Time to peak	=	677 min
Time interval	=	1 min	Hyd. volume	=	2,734 cuft
Drainage area	=	2.060 ac	Curve number	=	67.3*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	2.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



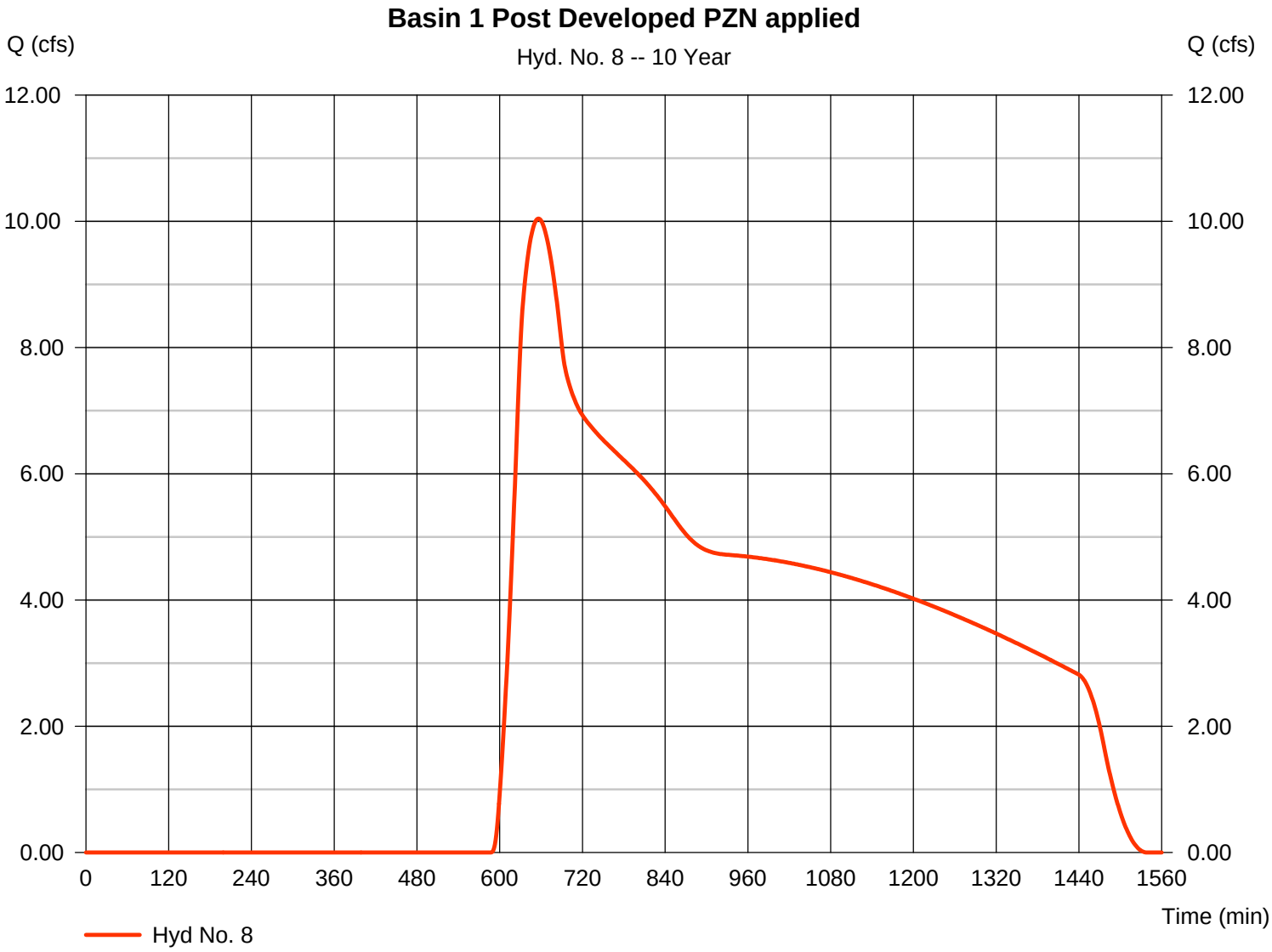
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.04 cfs
Storm frequency	=	10 yrs	Time to peak	=	656 min
Time interval	=	1 min	Hyd. volume	=	255,160 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



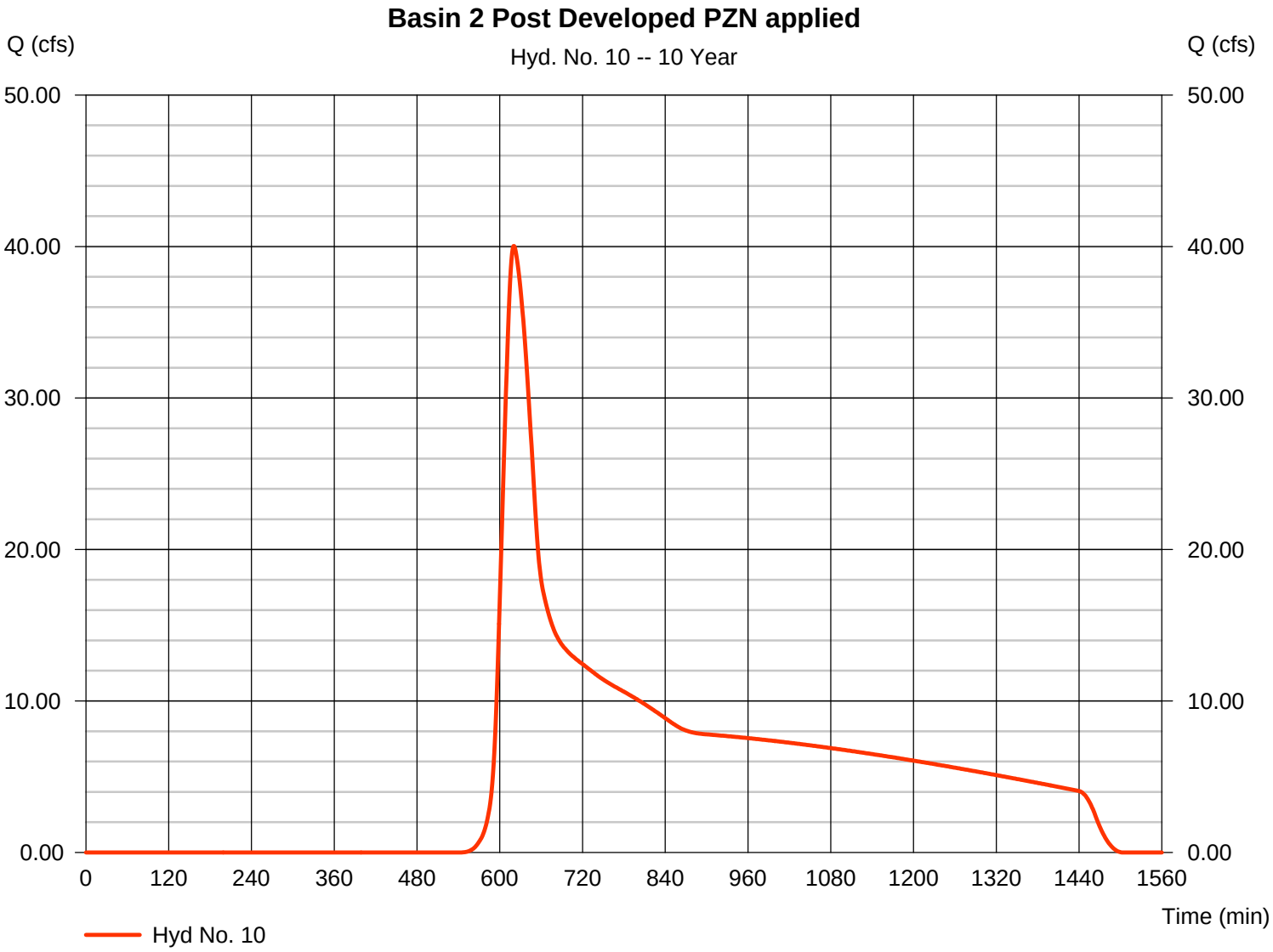
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	40.03 cfs
Storm frequency	=	10 yrs	Time to peak	=	621 min
Time interval	=	1 min	Hyd. volume	=	482,103 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



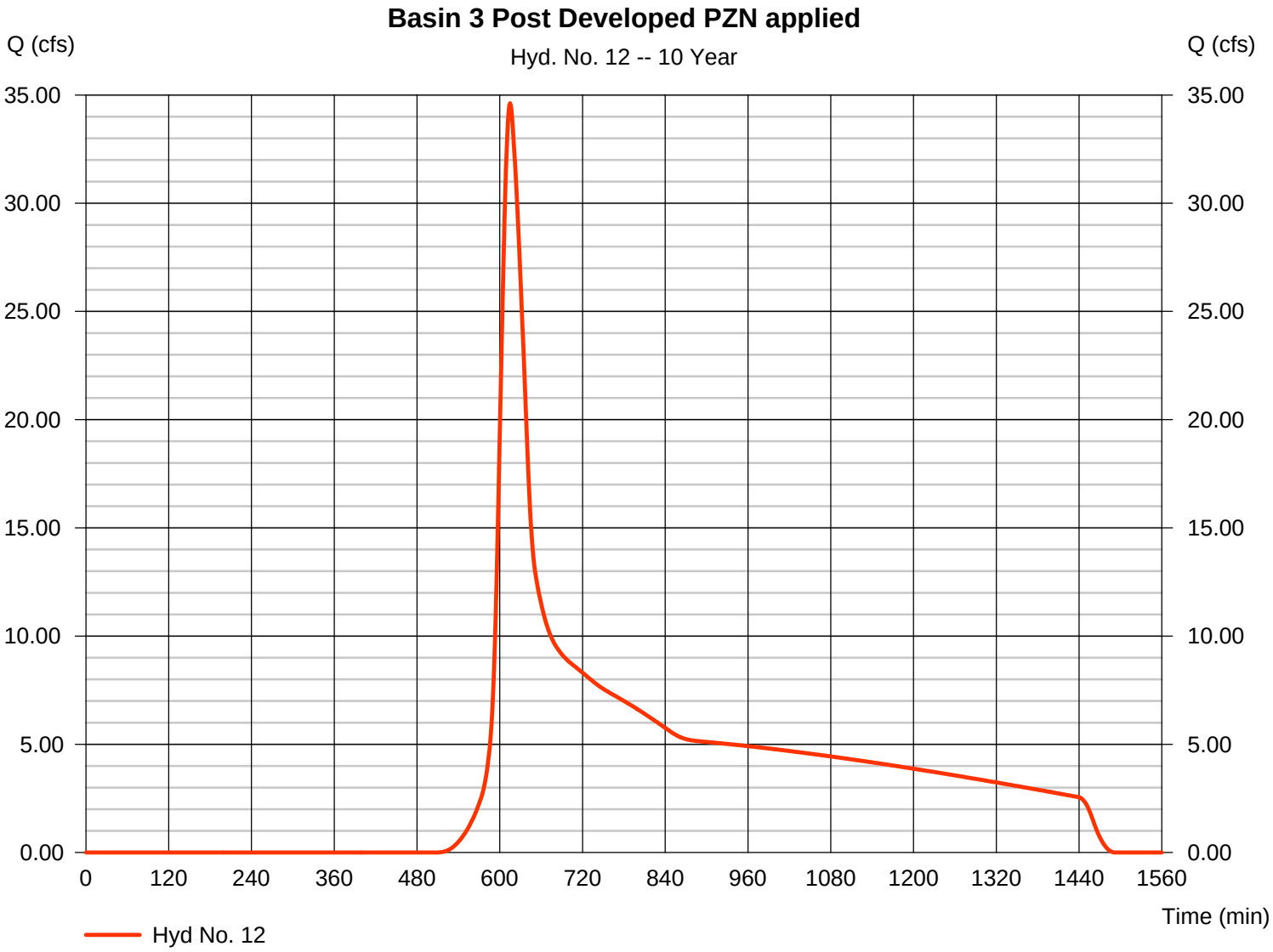
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	615 min
Time interval	=	1 min	Hyd. volume	=	334,194 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



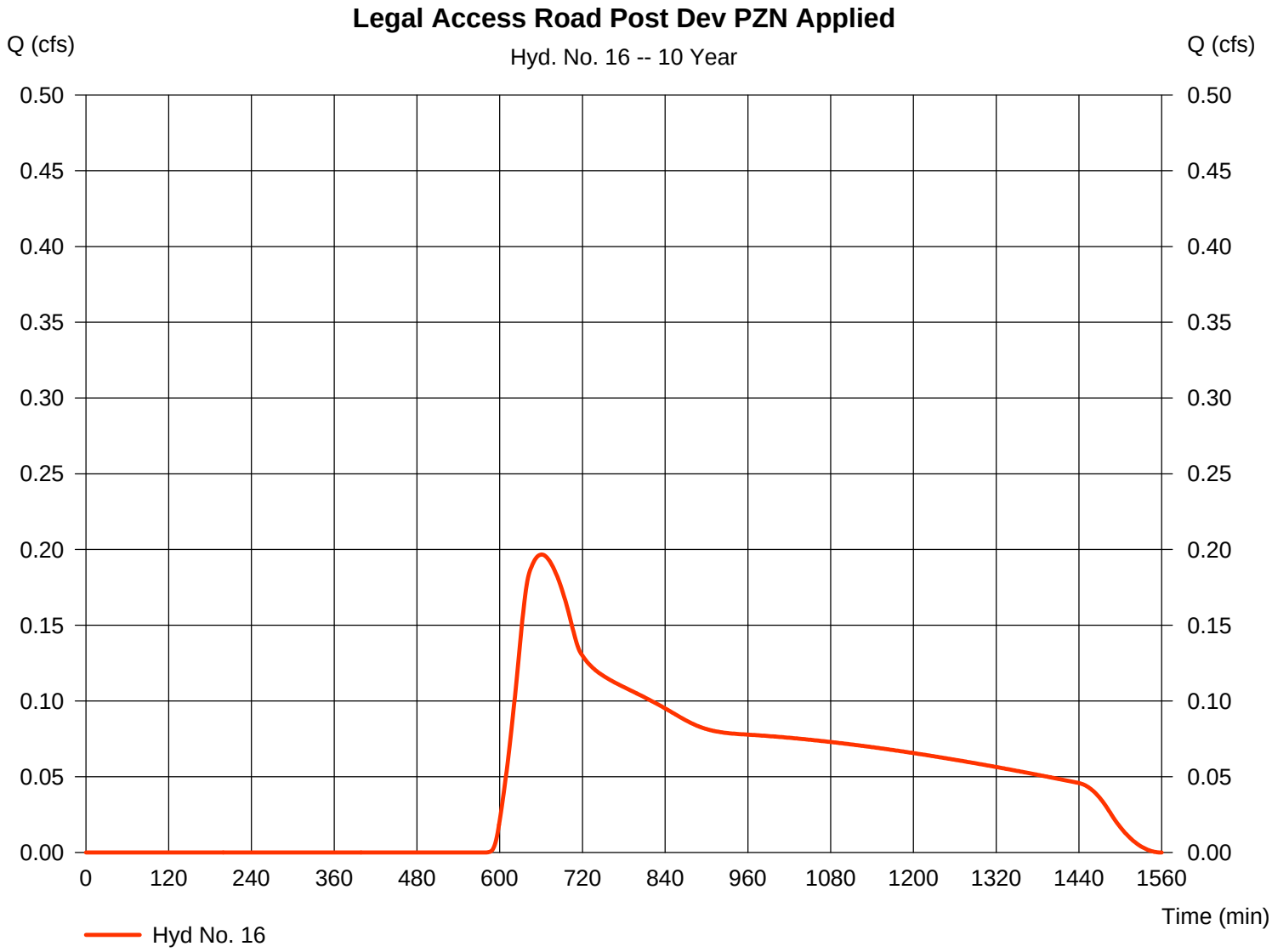
Hydrograph Report

Hyd. No. 16

Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.197 cfs
Storm frequency	=	10 yrs	Time to peak	=	661 min
Time interval	=	1 min	Hyd. volume	=	4,467 cuft
Drainage area	=	2.060 ac	Curve number	=	67.3*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	3.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



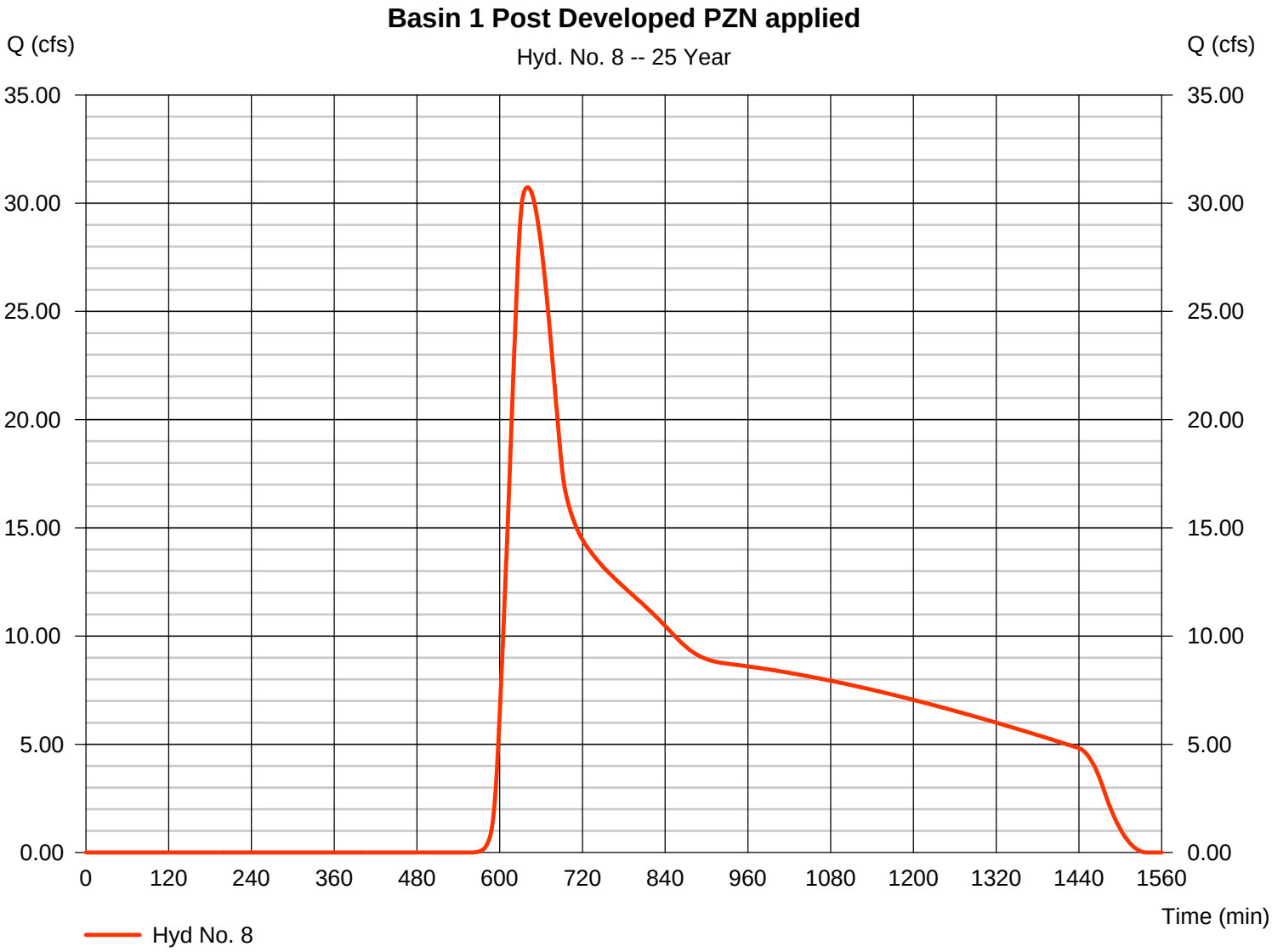
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	30.74 cfs
Storm frequency	=	25 yrs	Time to peak	=	640 min
Time interval	=	1 min	Hyd. volume	=	526,011 cuft
Drainage area	=	146.010 ac	Curve number	=	64.3*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	61.70 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



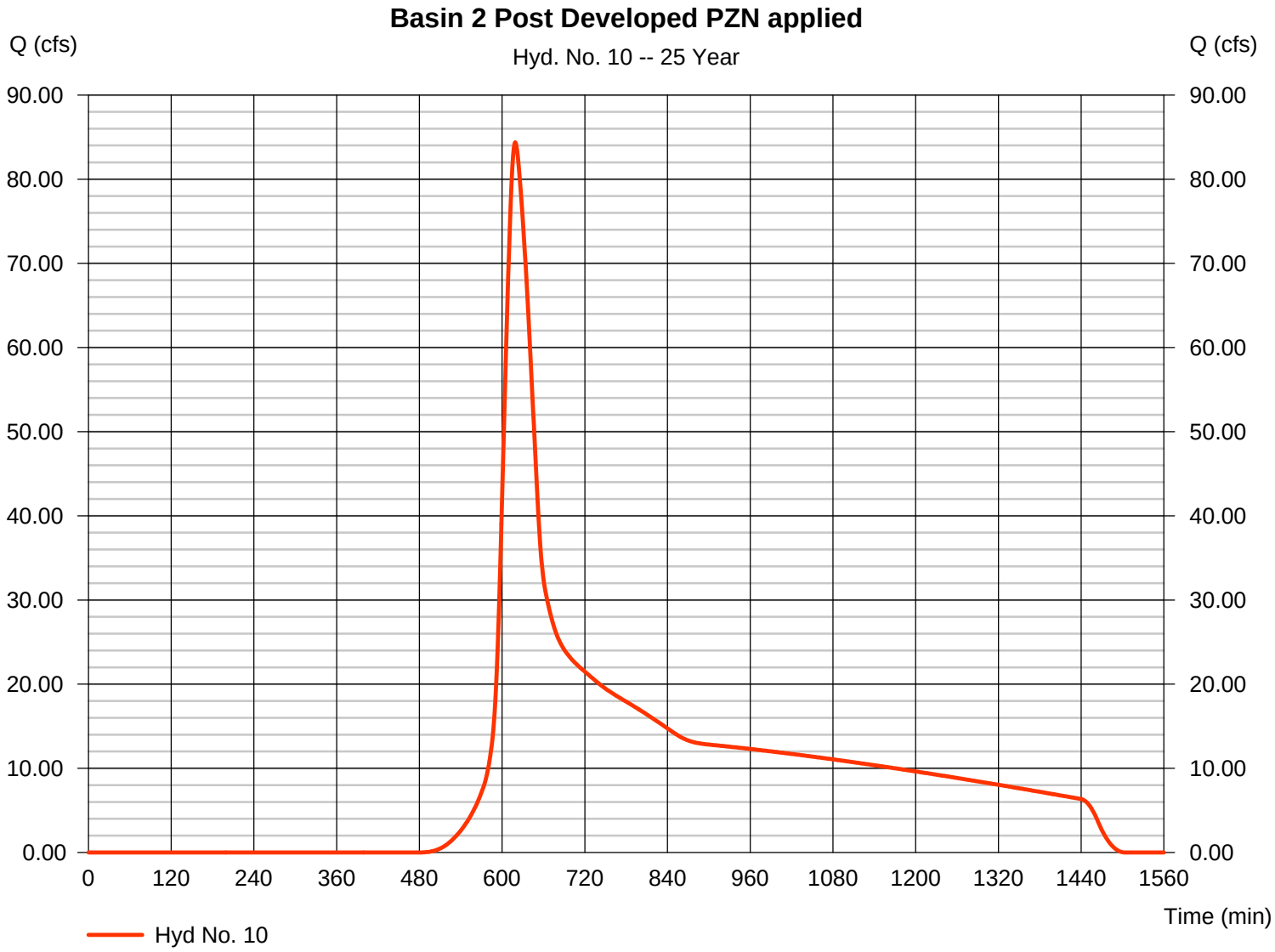
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	84.39 cfs
Storm frequency	=	25 yrs	Time to peak	=	619 min
Time interval	=	1 min	Hyd. volume	=	864,921 cuft
Drainage area	=	159.530 ac	Curve number	=	72.5*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	40.10 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



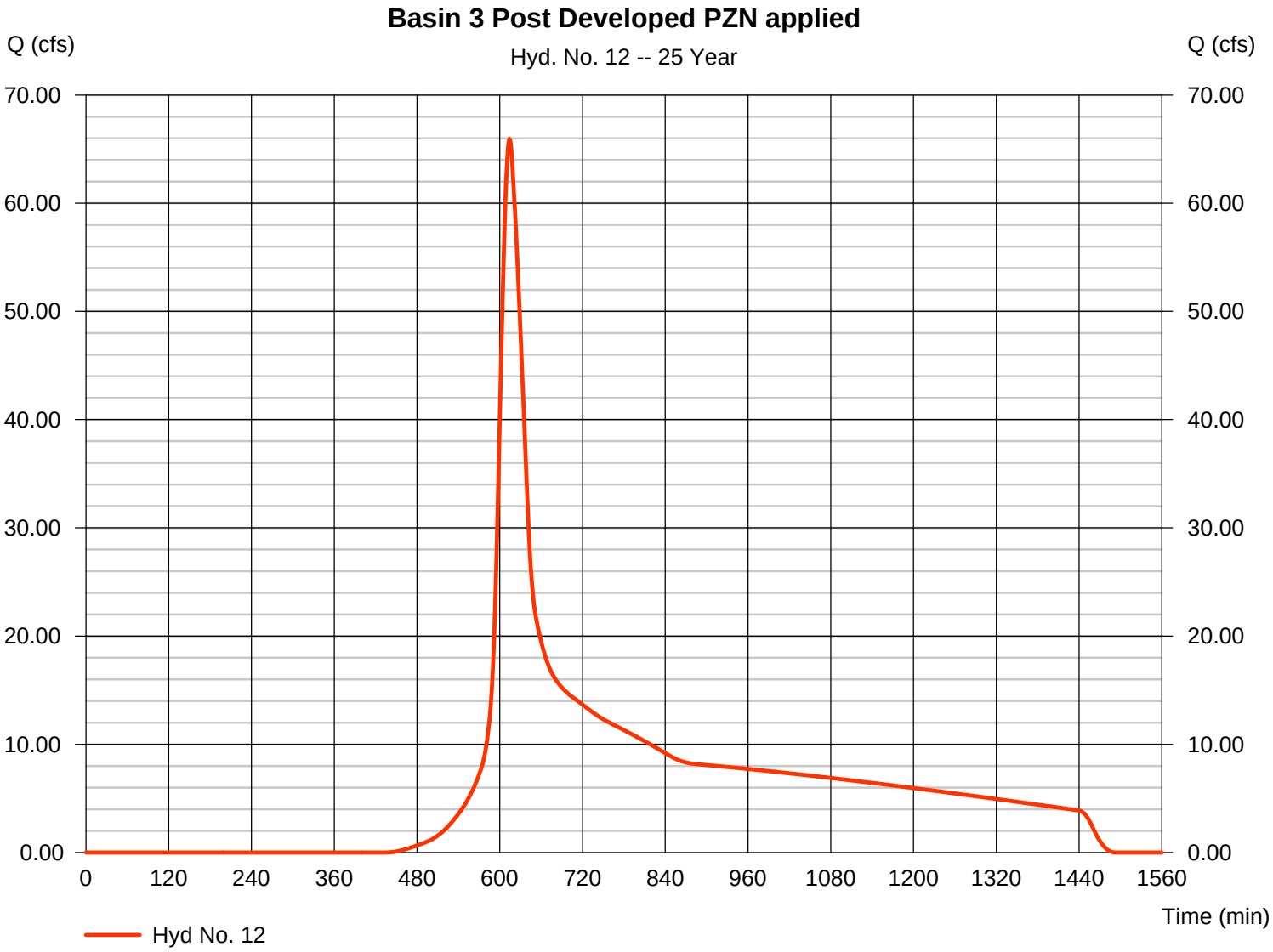
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	65.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	614 min
Time interval	=	1 min	Hyd. volume	=	573,842 cuft
Drainage area	=	92.270 ac	Curve number	=	75.8*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	32.60 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



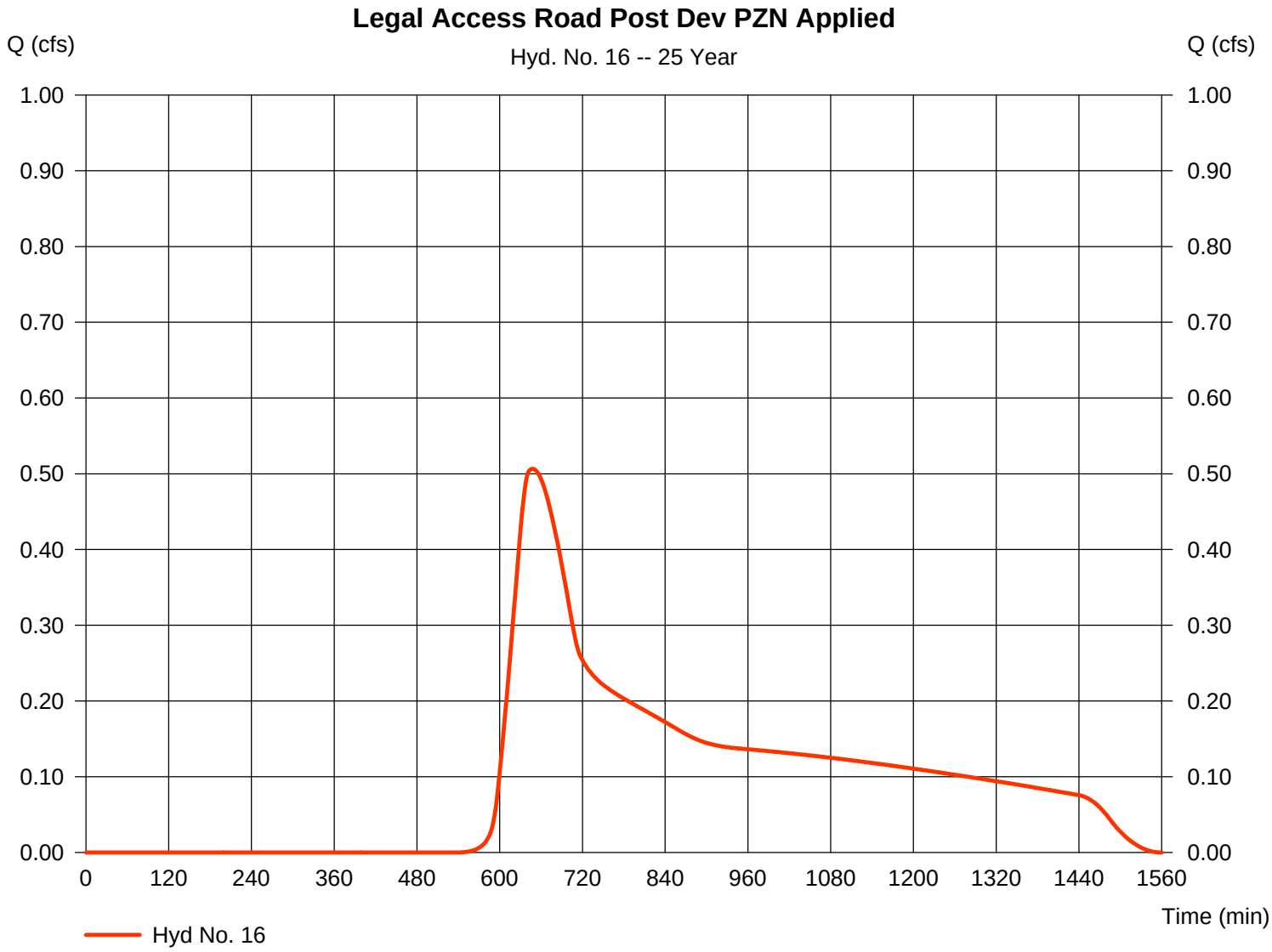
Hydrograph Report

Hyd. No. 16

Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.506 cfs
Storm frequency	=	25 yrs	Time to peak	=	648 min
Time interval	=	1 min	Hyd. volume	=	8,694 cuft
Drainage area	=	2.060 ac	Curve number	=	67.3*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	4.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



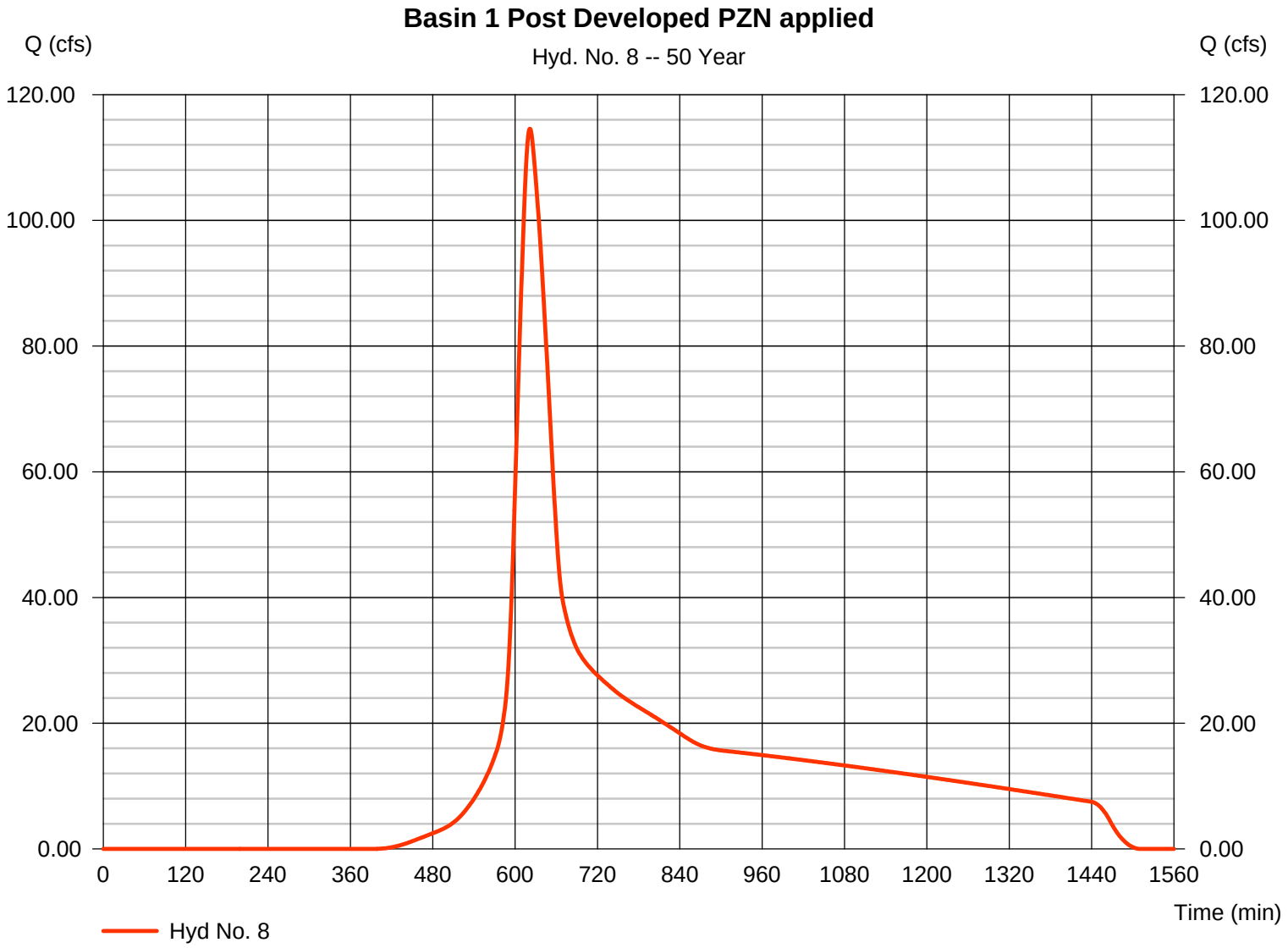
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	114.56 cfs
Storm frequency	=	50 yrs	Time to peak	=	622 min
Time interval	=	1 min	Hyd. volume	=	1,150,154 cuft
Drainage area	=	146.010 ac	Curve number	=	76.5*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	44.20 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



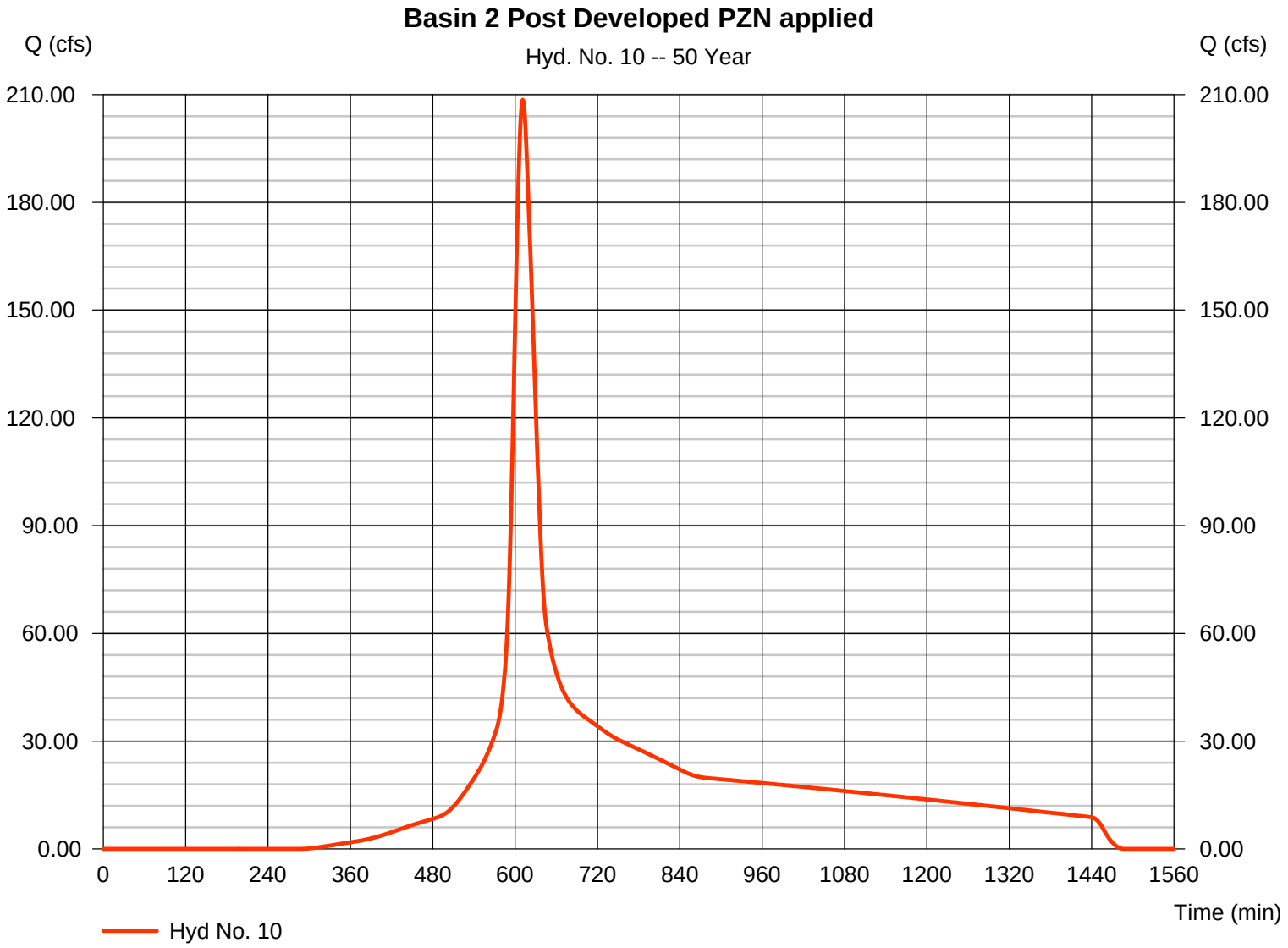
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	208.54 cfs
Storm frequency	=	50 yrs	Time to peak	=	611 min
Time interval	=	1 min	Hyd. volume	=	1,578,362 cuft
Drainage area	=	159.530 ac	Curve number	=	83*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	29.20 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



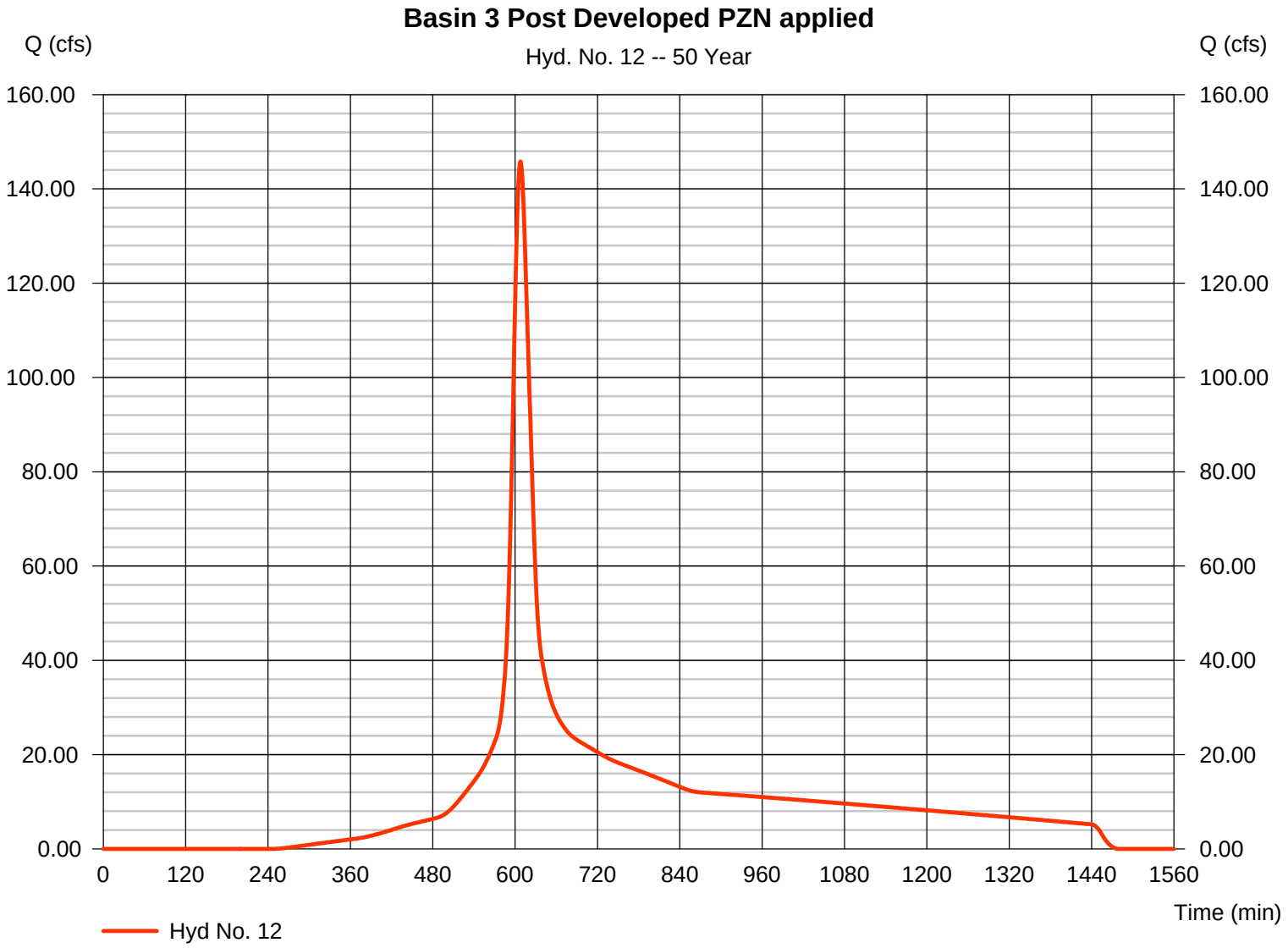
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	145.83 cfs
Storm frequency	=	50 yrs	Time to peak	=	608 min
Time interval	=	1 min	Hyd. volume	=	990,079 cuft
Drainage area	=	92.270 ac	Curve number	=	85.5*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	23.90 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



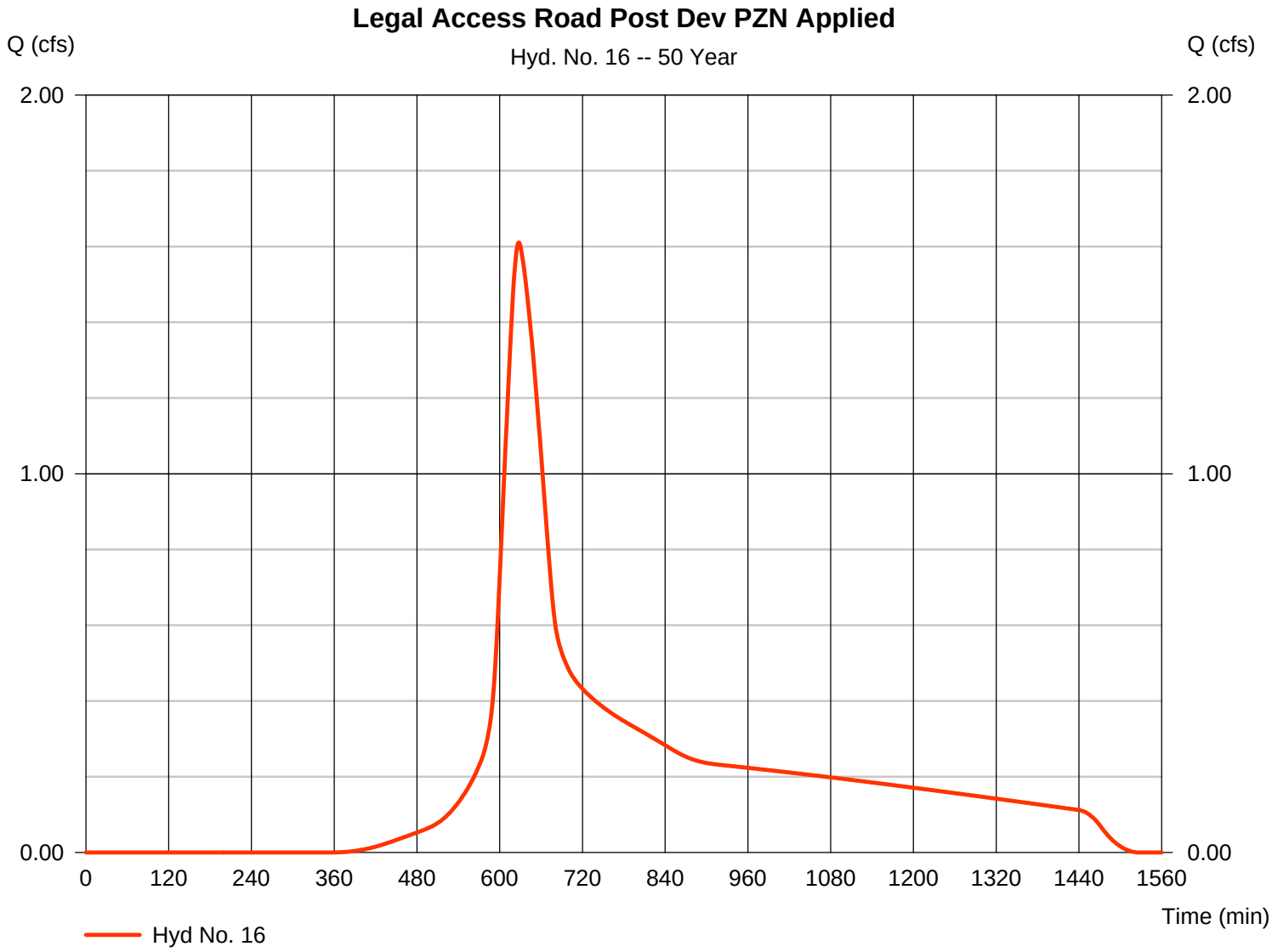
Hydrograph Report

Hyd. No. 16

Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.611 cfs
Storm frequency	=	50 yrs	Time to peak	=	628 min
Time interval	=	1 min	Hyd. volume	=	17,771 cuft
Drainage area	=	2.060 ac	Curve number	=	79*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	54.90 min
Total precip.	=	4.50 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



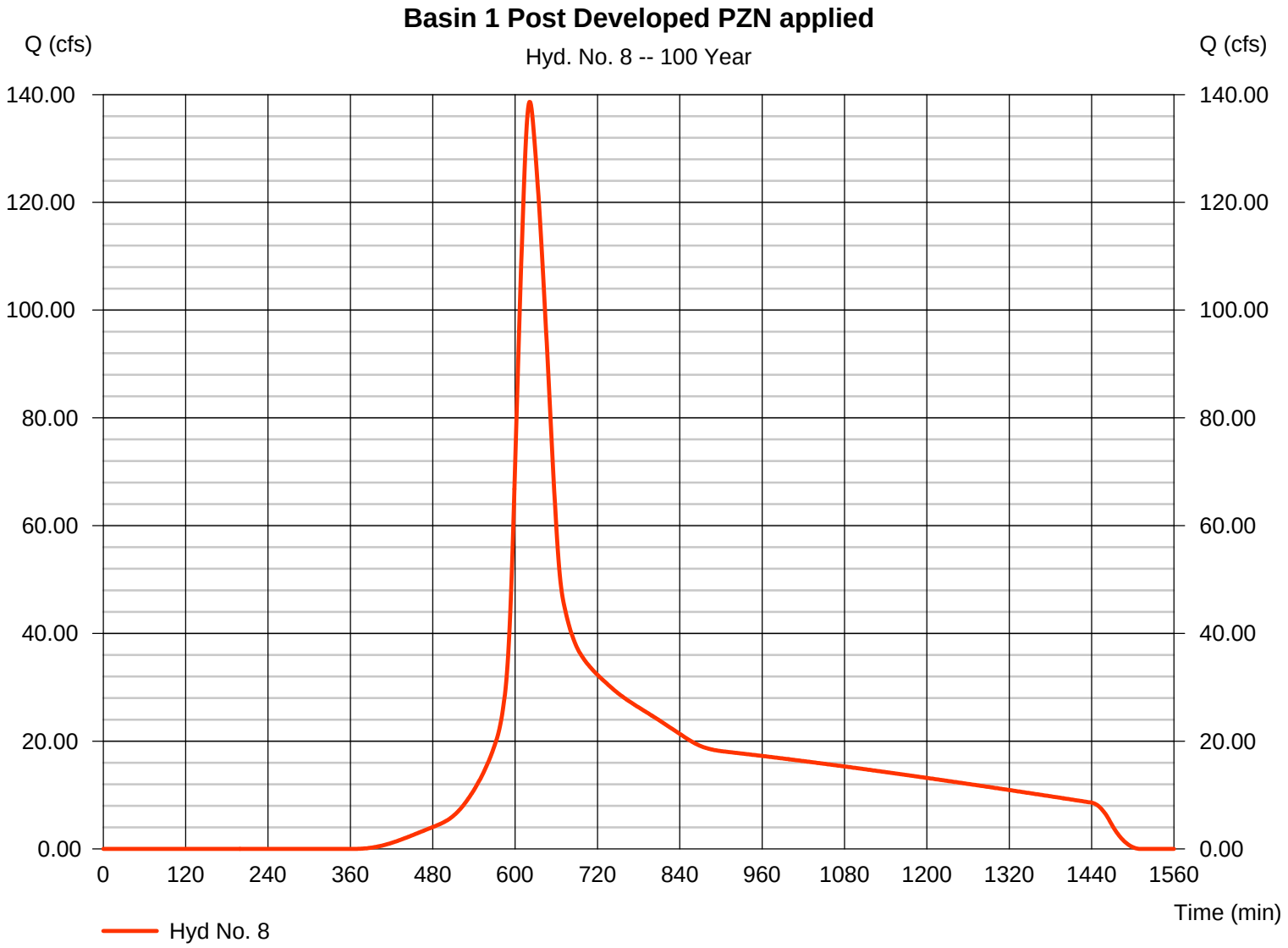
Hydrograph Report

Hyd. No. 8

Basin 1 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	138.66 cfs
Storm frequency	=	100 yrs	Time to peak	=	621 min
Time interval	=	1 min	Hyd. volume	=	1,366,964 cuft
Drainage area	=	146.010 ac	Curve number	=	76.5*
Basin Slope	=	13.7 %	Hydraulic length	=	6775 ft
Tc method	=	LAG	Time of conc. (Tc)	=	44.20 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(78.250 x 55) + (67.400 x 86) + (0.360 x 72)] / 146.010



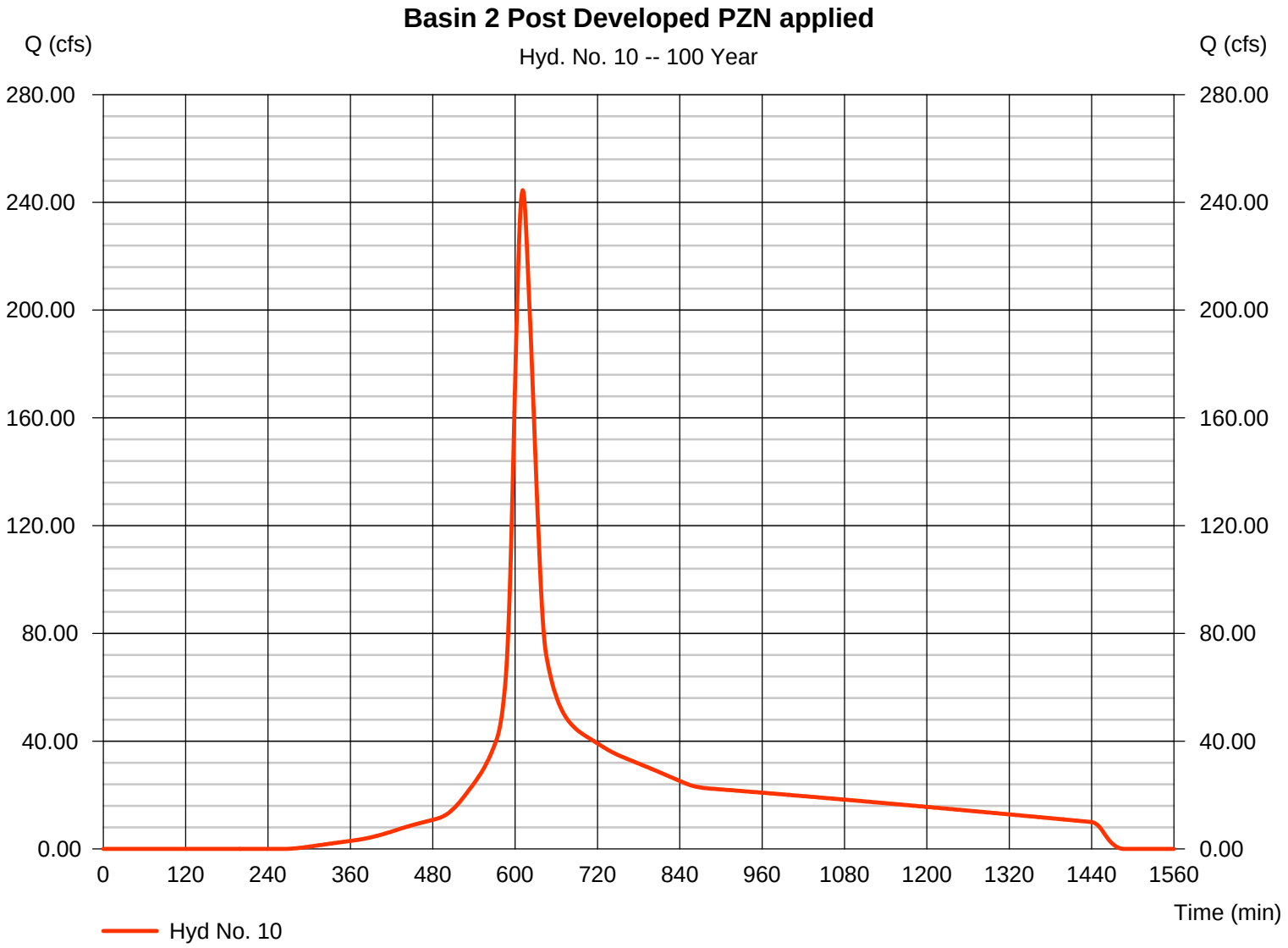
Hydrograph Report

Hyd. No. 10

Basin 2 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	244.52 cfs
Storm frequency	=	100 yrs	Time to peak	=	611 min
Time interval	=	1 min	Hyd. volume	=	1,838,100 cuft
Drainage area	=	159.530 ac	Curve number	=	83*
Basin Slope	=	16.1 %	Hydraulic length	=	5751 ft
Tc method	=	LAG	Time of conc. (Tc)	=	29.20 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(45.800 x 55) + (113.730 x 86)] / 159.530



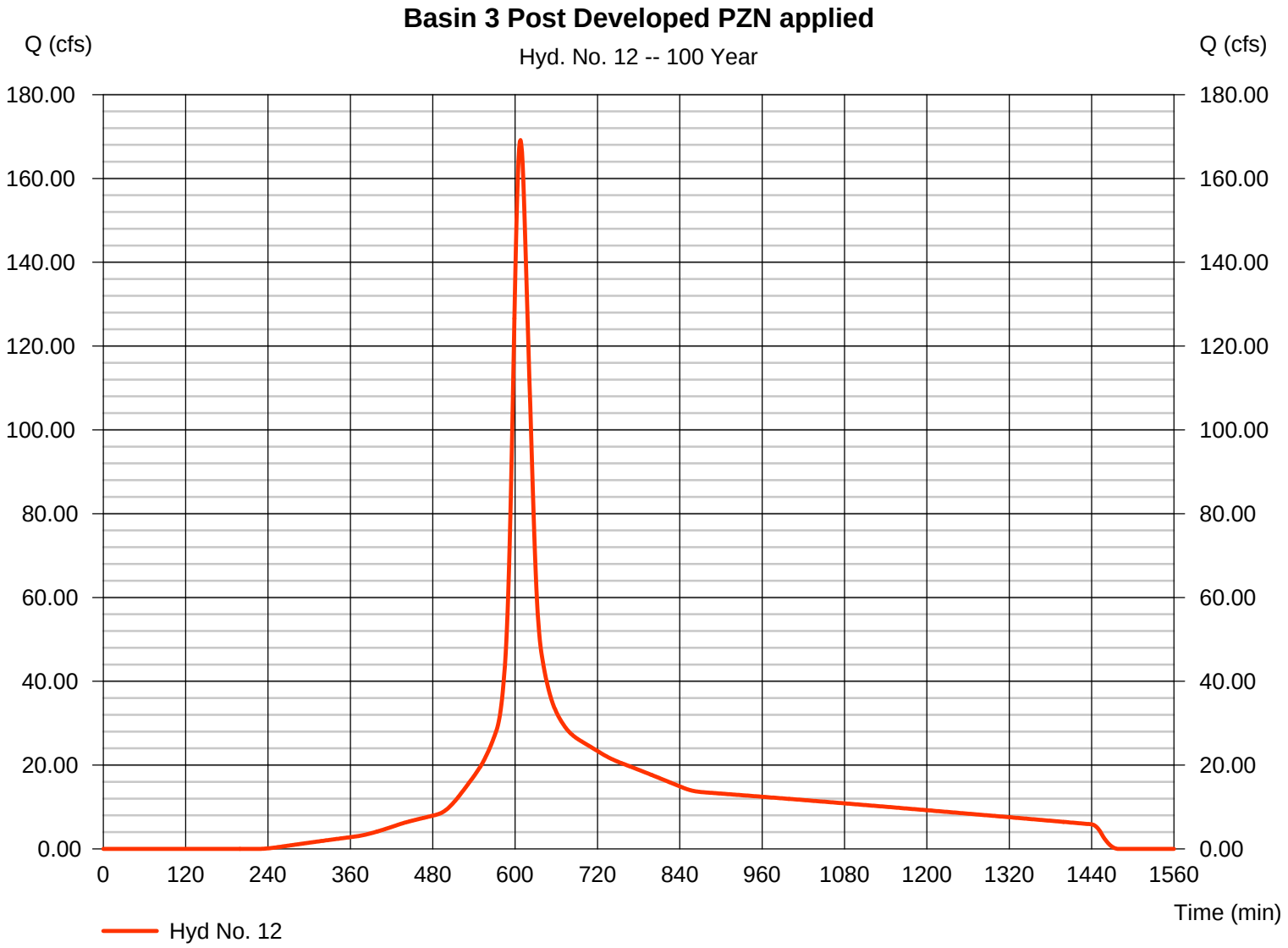
Hydrograph Report

Hyd. No. 12

Basin 3 Post Developed PZN applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	169.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	608 min
Time interval	=	1 min	Hyd. volume	=	1,144,611 cuft
Drainage area	=	92.270 ac	Curve number	=	85.5*
Basin Slope	=	16.9 %	Hydraulic length	=	5165 ft
Tc method	=	LAG	Time of conc. (Tc)	=	23.90 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(16.750 x 55) + (75.520 x 86)] / 92.270



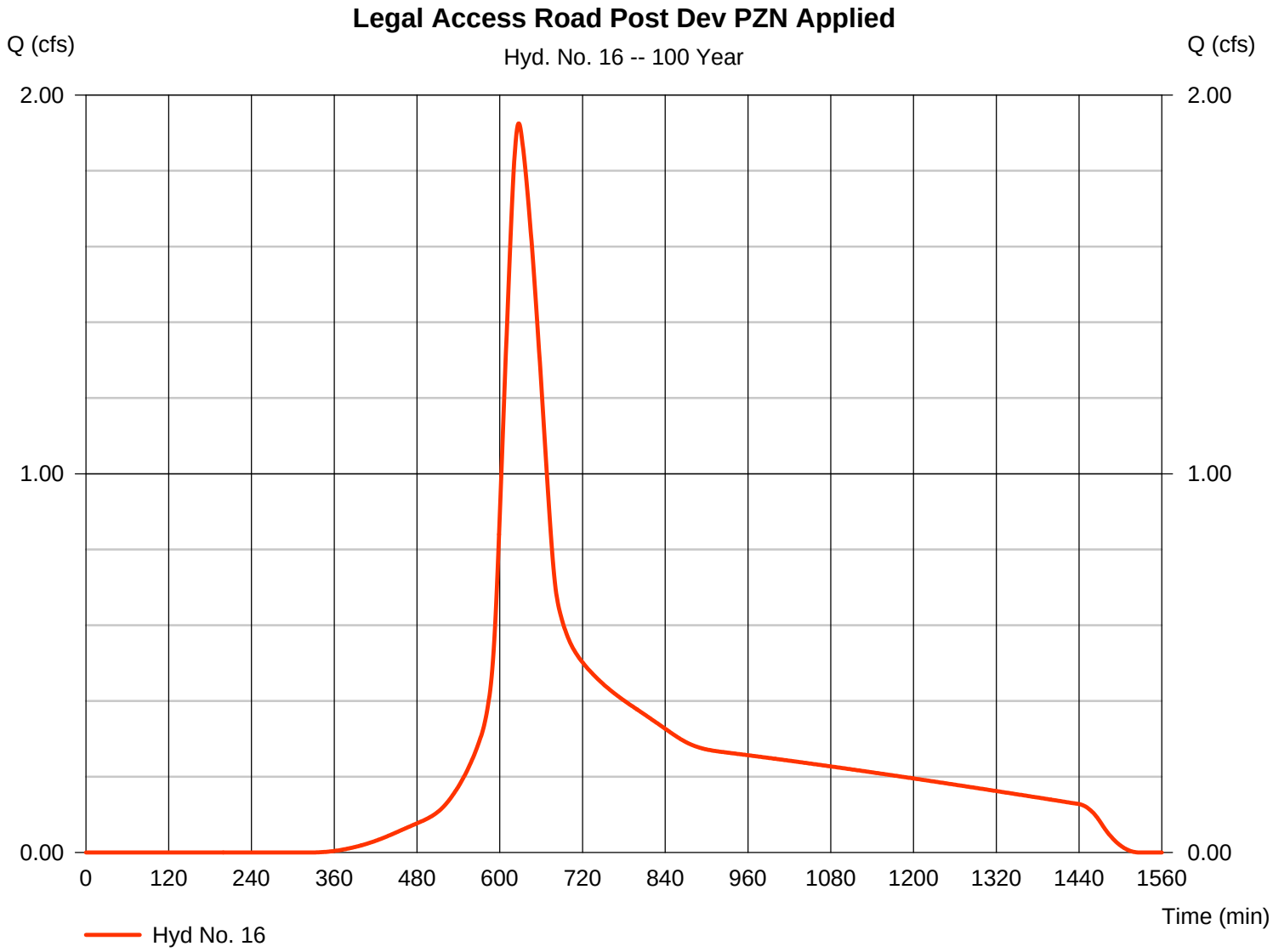
Hydrograph Report

Hyd. No. 16

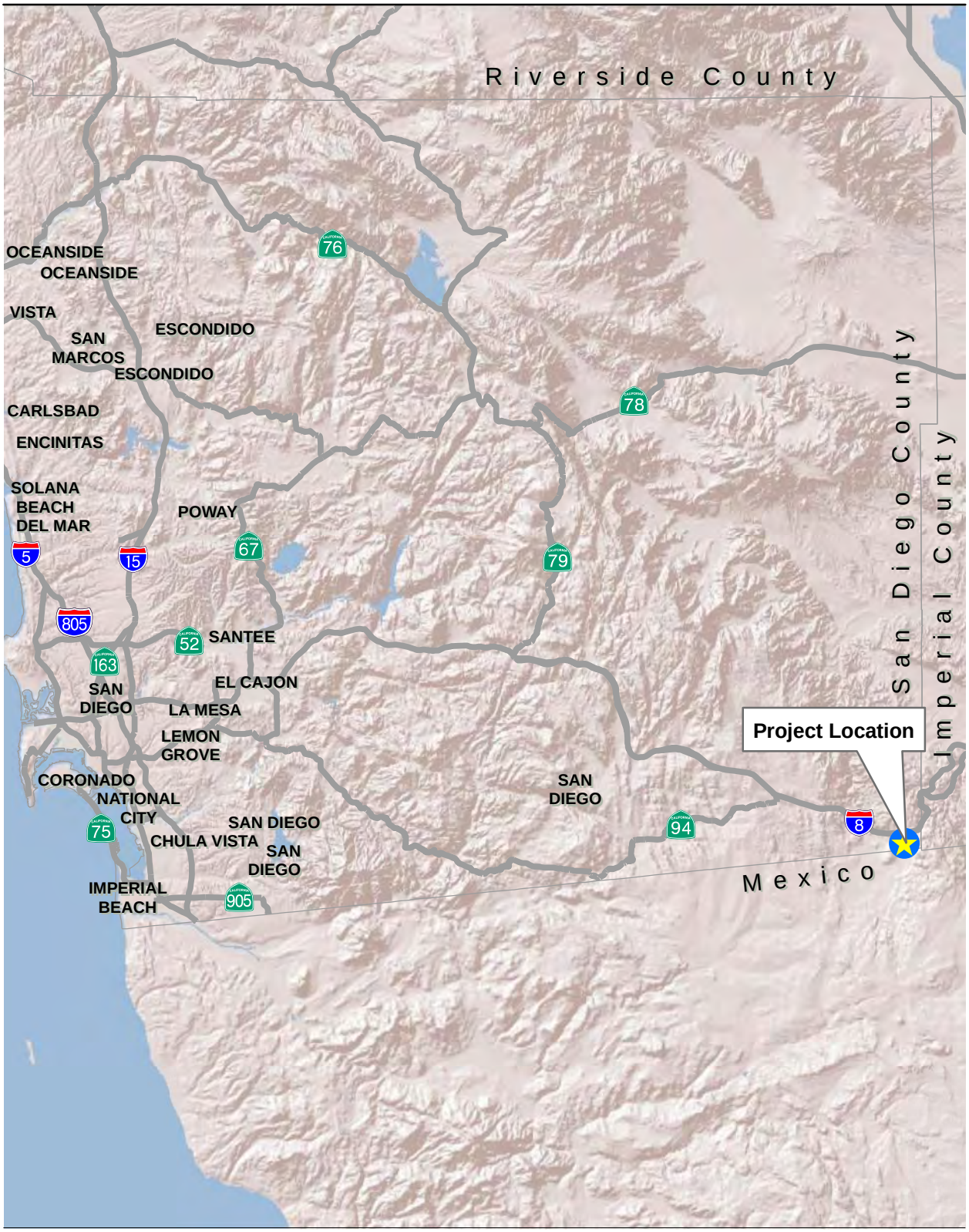
Legal Access Road Post Dev PZN Applied

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.925 cfs
Storm frequency	=	100 yrs	Time to peak	=	628 min
Time interval	=	1 min	Hyd. volume	=	20,950 cuft
Drainage area	=	2.060 ac	Curve number	=	79*
Basin Slope	=	3.9 %	Hydraulic length	=	4452 ft
Tc method	=	LAG	Time of conc. (Tc)	=	54.90 min
Total precip.	=	5.00 in	Distribution	=	Type I
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.060 x 72)] / 2.060



APPENDIX



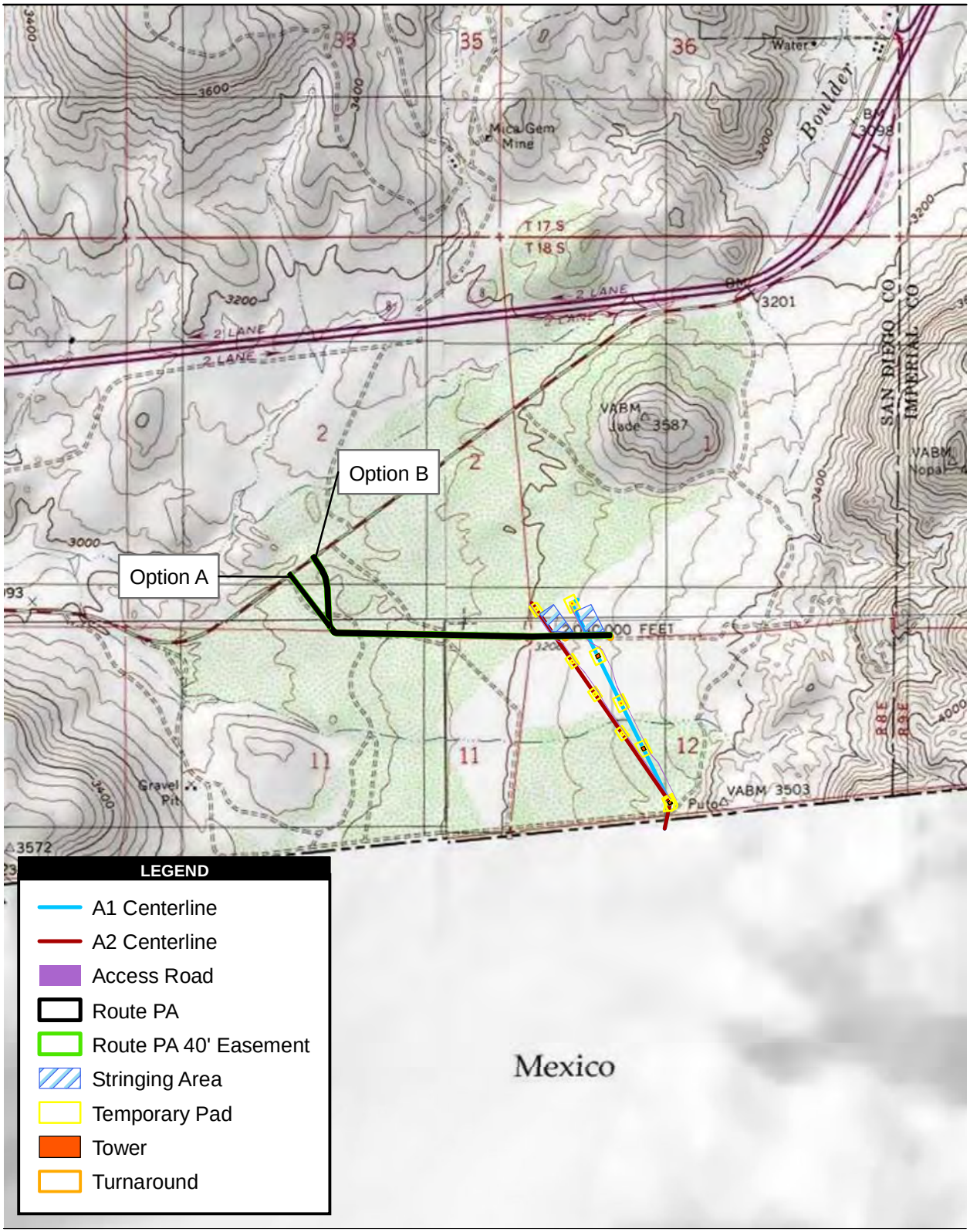
Source: SANGIS 2008, ESRI 2009

11 5.5 0 11 Miles

Scale: 1 = 696,960; 1 inch = 11 mile(s)

Figure 1
Regional Location Map

Path: P:\2009\09080001 ESJ Gen-Tie\6.0 GIS\6.3 Layout\ProjDesc\Figure1_Regional_Location.mxd, 05/15/09, sorensenj



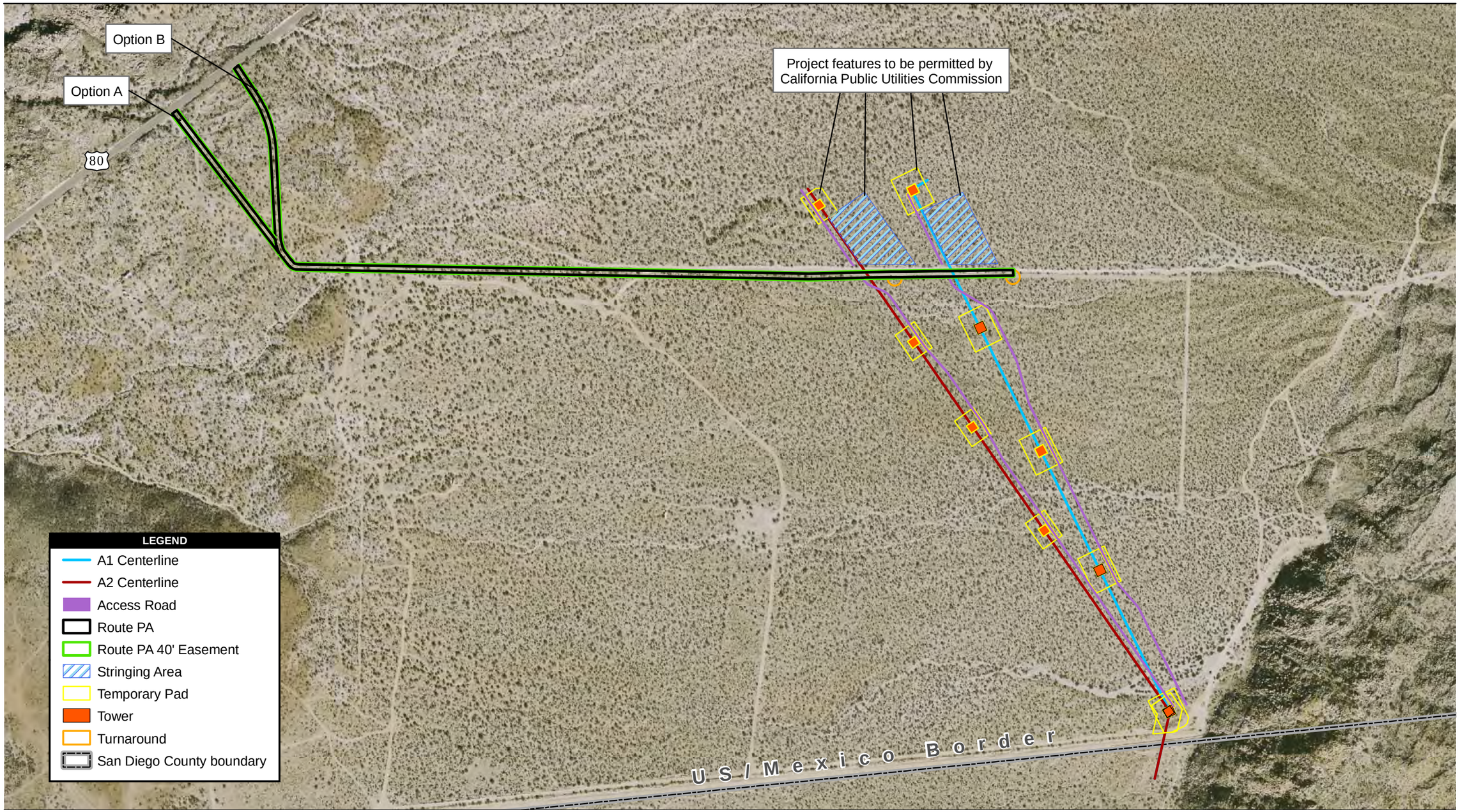
Source: ESRI 2009, USGS Topographic Quadrangle In-Ko-Pah Gorge 1975, Jacumba 1975

2,000 1,000 0 2,000 Feet

Scale: 1 = 24,000; 1 inch = 2,000 feet

Figure 2
Project Vicinity

Path: P:\2009\09080001 ESJ Gen-Tie\6.0 GIS\6.3 Layout\ProjDesc\20100305\Figure2_Project_Vicinity20100315.mxd, 03/15/10, SorensenJ



Source: DigitalGlobe 2008, Sempra Energy 2009, SANGIS 2008

500 250 0 500 Feet

Scale: 1 = 6,000; 1 inch = 500 feet

Figure 3
Study Area and Site Plan

The adjustment for PZN Condition may be made to the composite CN for the watershed. It is not necessary to make the PZN Condition adjustment to each of the CNs for the different combinations of ground cover and soil group within the watershed before calculating the composite CN.

Table 4-6

PZN ADJUSTMENT FACTORS FOR FLOW COMPUTATIONS (San Diego County)

Storm Frequency	Coast (PZN = 1.0)	Foothills (PZN = 2.0)	Mountains (PZN = 3.0)		Desert (PZN = 4.0)
Less than 35-year return period	1.5	2.5	2.0	1.75	1.5
Greater than or equal to 35-year return period	2.0	3.0	3.0	2.5	2.0

Notes: PZN is the precipitation zone number (see Map, Appendix C). The PZN adjustment factor represents the PZN Condition that the CN for the watershed should be adjusted to.

4.1.3 Rainfall-Runoff Relationship

A relationship between accumulated rainfall and accumulated runoff was derived by NRCS from experimental plots for numerous soils and vegetative cover conditions. The following NRCS runoff equation is used to estimate direct runoff from 24-hour or 6-hour storm rainfall. The equation is:

$$Q_a = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad \text{(Eq. 4-1)}$$

where: Q_a = accumulated direct runoff (in)

P = accumulated rainfall (potential maximum runoff) (in)

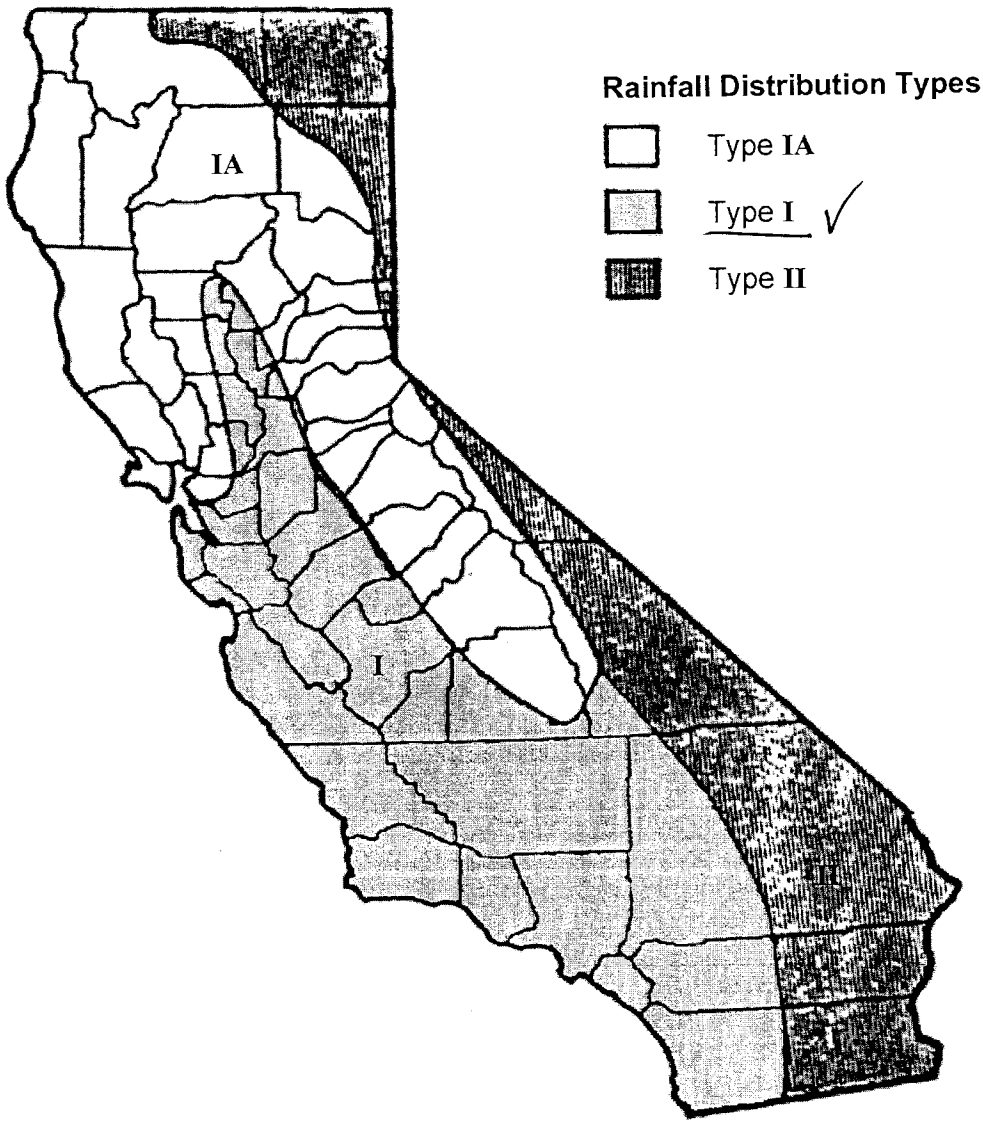
I_a = initial abstraction including surface storage, interception, evaporation, and infiltration prior to runoff (in)

S = potential maximum soil retention (in)

Table 4-10

RUNOFF CURVE NUMBERS FOR PZN CONDITIONS 1.0, 2.0, AND 3.0

CN For:			CN For:		
PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0	PZN Condition = 1.0	PZN Condition = 2.0	PZN Condition = 3.0
100	100	100	40	60	78
97	99	100	39	59	77
94	98	99	38	58	76
91	97	99	37	57	75
89	96	99	37	56	75
87	95	98	34	55	73
85	94	98	34	54	73
83	93	98	33	53	72
81	92	97	32	52	71
80	91	97	31	51	70
78	90	96	31	50	70
76	89	96	30	49	69
75	88	95	29	48	68
73	87	95	28	47	67
72	86	94	27	46	66
70	85	94	26	45	65
68	84	93	25	44	64
67	83	93	25	43	63
66	82	92	24	42	62
64	81	92	23	41	61
63	80	91	22	40	60
62	79	91	21	39	59
60	78	90	21	38	58
59	77	89	20	37	57
58	76	89	19	36	56
57	75	88	18	35	55
55	74	88	18	34	54
54	73	87	17	33	53
53	72	86	16	32	52
52	71	86	16	31	51
51	70	85	15	30	50
50	69	84			
48	68	84	12	25	43
47	67	83	9	20	37
46	66	82	6	15	30
45	65	82	4	10	22
44	64	81	2	5	13
43	63	80	0	0	0
42	62	79			
41	61	78			



SOURCE: Wischmeier, 1977

FIGURE 5-3

Rainfall Distribution Regions in California