EXHIBIT C

PRADO DAM QPF/API INFLOW VOLUME FORECAST METHOD

PRADO DAM

SANTA ANA RIVER

RIVERSIDE COUNTY, CALIFORNIA

Los Angeles District Office

U.S. Army Corps of Engineers

September 1991

PRADO DAM QPF/API INFLOW VOLUME FORECAST METHOD

PRADO DAM WATER CONTROL MANUAL

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Exhibit C

I - PROCEDURE OUTLINE

PURPOSE: Given a current Antecedent Precipitation Index (API) value for the Prado Basin and a 24hr basin average Quanitative Precipitation Forecast (QPF), a forecast inflow volume to Prado Reservoir can be determined.

1-01 **QPF/API Inflow Volume Forecast Method**. The QPF/API inflow volume forecast method was developed by the Reservoir Regulation Section, LAD. An unpublished study dated August 1989 entitled "Inflow Forecasting for Incidental Flood Season Water Conservation" was prepared using historical precipitation data from the NWS and historical inflow records from the Corps. In order to obtain a flood inflow volume forecast a BASIN AVERAGE API and BASIN AVERAGE QPF must be generated from the ZONAL AVERAGE precipitation and the ZONAL AVERAGE QPF values. The zones of interest are zones 1 through 5 of the Santa Ana River Watershed (Plate 6-02). The basin average API and QPF values are not required for zones 7 and 8 because Lake Elsinore normally traps the runoff from these two sub-basins. Zone 6 is not considered because it is downstream of Prado Dam.

The method of determining the basin average precipitation and the QPF is as follows:

$$P_j = \sum_{i=1}^{5} C_i P_{ij} \qquad \text{(Eq. C-01)}$$

$$QPF = \sum_{i=1}^{5} C_i QPF_i \qquad \text{(Eq. C-02)}$$

where:

P_j	=	the basin average precipitation for day j;
QPF	=	the basin average Quantitative Precipitation Forecast (QPF);
C_i	=	the zonal weighting factor for zone i;
P_{ij}	=	the zonal precipitation for zone i, day j; and
QPF_i	=	the QPF for zone i.

Table C-1 gives the zonal weighting factors for the five zones. These values were determined by considering the basin size and physiography.

The API is calculated using:

$$API_j = k\,(API_{j-1}) + P_j \qquad \text{(Eq. C-03)}$$

where:

API_j	=	the API on the day j;
k	=	a recession constant (assumed to be 0.90);
API_{j-1}	=	the API of the previous day (i.e., at 2400 hours of the previous day); and
P_j	=	the basin average precipitation for day j (i.e., from 0000 hours to the present time).

Once the basin average API_j (Eq. C-03) and the basin average QPF (Eq. C-02) have been calculated, the forecast inflow volume to Prado Dam is read off of Plate C-01.

The QPF/API Algorithm was newly developed in 1989. Care should be exercised when using it. As experience is gained in actual use, modifications may be necessary.

II - EXAMPLE APPLICATION OF THE METHOD

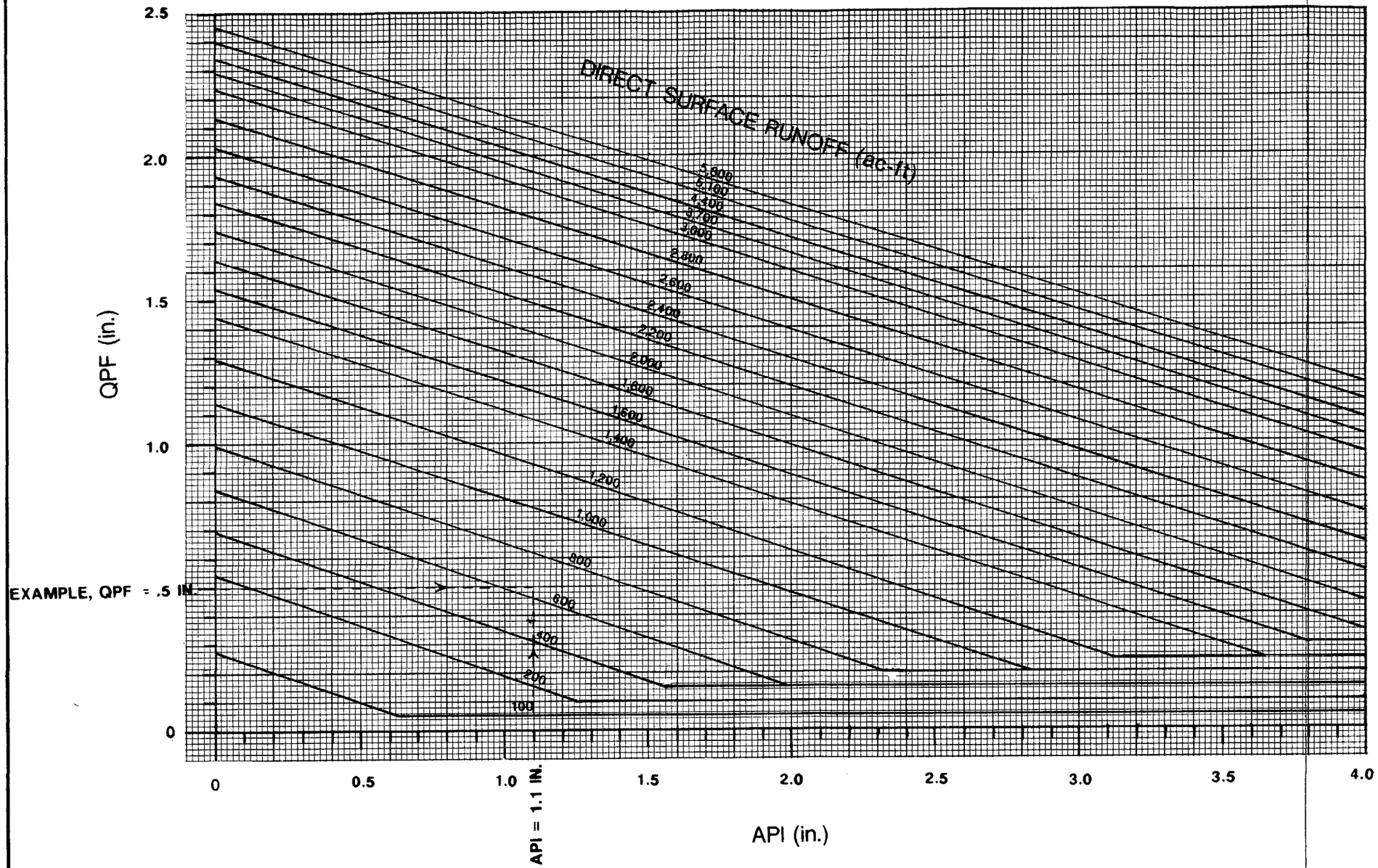
2-01 Example Problem. An example problem is illustrated on Plate C-01.

Exhibit C

Table C-1

Precipitation Zone
Weighting Factors

Zone (i)	Zonal Weighing Factor (c_i)
1	0.12
2	0.14
3	0.12
4	0.41
5	0.21



For Example: If the QPF for the five zones are:

Zone	Zonal QPF (inches)
SA01	0.9
SA02	0.5
SA03	0.8
SA04	0.3
SA05	0.4

The Average Basin QPF is calcilated using the Zonal weighting factors:

Zone	Zonal QPF (inches)		Zonal weighing factor		
1	0.9	X	0.12	=	0.1
2	0.5	X	0.14	=	0.1
3	0.8	X	0.12	=	0.1
4	0.3	X	0.41	=	0.1
5	0.4	X	0.21	=	0.1
			Average Basin QPF		0.5

If the API were currently 1.1 inches, as determined by the calculation described in Exhibit C, the forecasted inflow into Prado would be approximately 700 ac-ft as shown on the QPF/API correlation to the left.

PRADO DAM
SANTA ANA RIVER, CALIFORNIA
WATER CONTROL MANUAL

QPF/API FORECAST INFLOW VOLUME CORRELATION

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE C-01