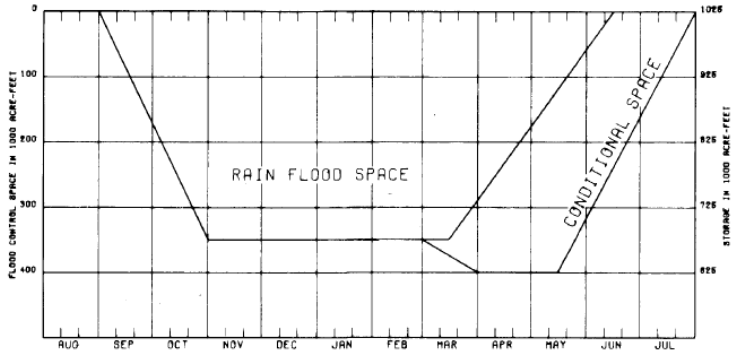
New Exchequer Dam Water Control Diagram



USE OF DIAGRAM

1. Water stored in Rain Flood Space will be released as rapidly as possible without causing flows in Merced River at Stevinson to exceed 6000 c.f.s. unless greater releases are required by the emergency spillway release diagram.

2. Water stored in Conditional Space that is required for flood control must be released as a supplemental release in addition to releases for power and other uses. The Conditional Space required for flood control is equal to the space required to store estimated runoff in excess of demand for power and other uses. This can be determined from the nomograph below using the forecasted runoff from a given date to 31 July and the forecasted demand for power and other uses from the given date to 15 June (after 25 May, use the forecasted demand for power and other uses for the next 20 days or through 31 July whichever is less). The supplemental release is also determined from the nomograph below.

3. When the forecasted runoff is large the nomograph below may indicate that a supplemental release is necessary even though the Conditional Space is empty. Although such releases do not fall under Corps of Engineers authority to regulate flood control space, it is advisable that in such cases supplemental releases be made to preclude larger releases or spills later.

4. The Corps of Engineers may direct that flood releases be increased or decreased from those required by this diagram based on conditions prevailing at the time.

SAMPLE COMPUTATION

GIVEN DATA:

Date	1 May
Forecasted runoff from 1 May to 31 July	650,000 ac.-ft.
Forecasted demand for power and other uses from 1 May to 15 June	160,000 ac.-ft.
Required release to meet demand for power and other uses on 1 May	1,500 c.f.s.
Space available in Lake McClure on 1 May	250,000 ac.-ft.

COMPUTATION OF SPACE REQUIRED TO STORE ESTIMATED RUNOFF IN EXCESS OF DEMAND FOR POWER AND OTHER USES:

1. Enter nomograph at "A" with current date "1 May" and draw a line from "A" through the forecasted runoff from the current date through 31 July (650,000 ac.-ft.) at "B" and read the estimated runoff prior to maximum pool (550,000 ac.-ft.) at "C".
2. From "D", using the same value obtained at "C", draw a line through the demand for power and other uses from the current date to 15 June (160,000 ac.-ft.) at "E" (after 25 May, use the forecasted demand for power and other uses for the next 20 days or until 31 July whichever is less) and obtain the space required to store the estimated runoff in excess of demand for power and other uses (390,000 ac.-ft.) at "F".

COMPUTATION OF SUPPLEMENTAL RELEASE:

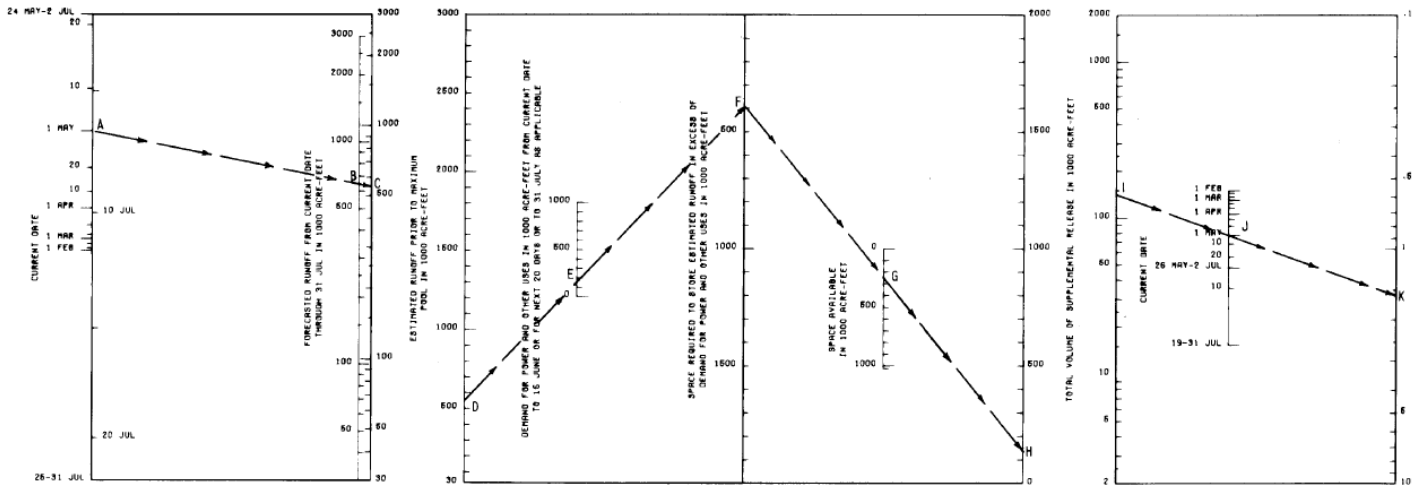
1. Draw a line from "F" through the space available in Lake McClure (250,000 ac.-ft.) at "G" to obtain the volume of the supplemental release (140,000 ac.-ft.) at "H".
2. From "I", using the same value obtained at "H", draw a line through the current date (1 May) at "J" to obtain the supplemental release (1,573 c.f.s.) at "K".

COMPUTATION OF TOTAL RELEASE:

Add the release required to meet demand for power and other uses (1,500 c.f.s.) to the supplemental release (1,573 c.f.s.) to obtain the total release (3,070 c.f.s.).

NORMAL DEMAND FOR POWER AND OTHER USES

MONTH	VOLUME (ac.-ft.)	AVERAGE FLOW (c.f.s.)
Oct	61,400	1,000
Nov	29,700	500
Dec	30,700	500
Jan	30,700	500
Feb	27,700	500
Mar	61,400	1,000
Apr	89,100	1,500
May	153,500	2,700
Jun	148,500	2,700
Jul	122,800	2,700
Aug	122,800	2,700
Sep	89,100	1,500



NEW EXCHEQUER DAM AND RESERVOIR
MERCED RIVER, CALIFORNIA
FLOOD CONTROL DIAGRAM
PREPARED PURSUANT TO FLOOD CONTROL REGULATIONS FOR NEW EXCHEQUER DAM AND RESERVOIR, 33 CFR 208.11

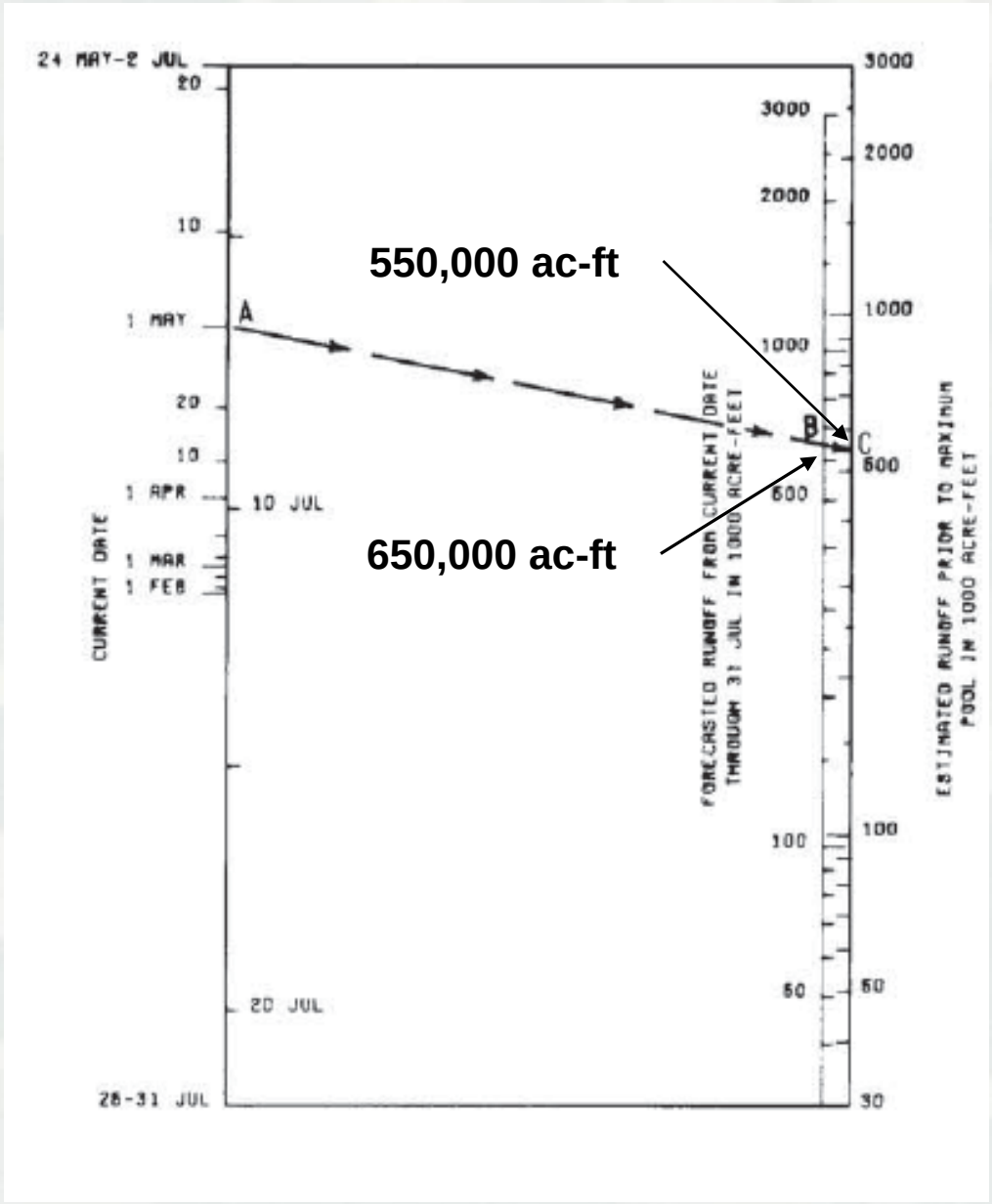
APPROVED: _____
CHIEF ENGINEER, MERCED IRRIGATION DISTRICT

APPROVED: _____
BRIGADIER GENERAL, USA, DIVISION ENGINEER, SOUTH PACIFIC DIVISION

EFFECTIVE DATE: 19 APR ... FILE NO.

Feb 1st – July 31st

- Parameters included in TOC computation are:
  - ►Future irrigation demand
  - ►Bulletin 120 50% Chance Exceedence runoff forecasts
  - ►Using the example computation notes on the Water Control Diagram (WCD)



Based on Example Comps on WCD:

- **Date 1 May**
- **Forecasted Runoff from 1 May to 31 July 650,000 ac-ft**
- **Forecasted Demand from 1 May to 15 June 160,000 ac-ft.**
- **Required release to meet demand for power and other uses on 1 May 1,500 cfs**
- **Space Available in Lake McClure on 1 May 250,000 ac-ft**

(1) Remaining Runoff Reduction Factor

- Need to compute remaining runoff reduction factor for snowpack?

$$Eq1 = 0.9 - e^{(-0.03 \times (309 - julian\ day))}$$

$$Eq2 = 0.8$$

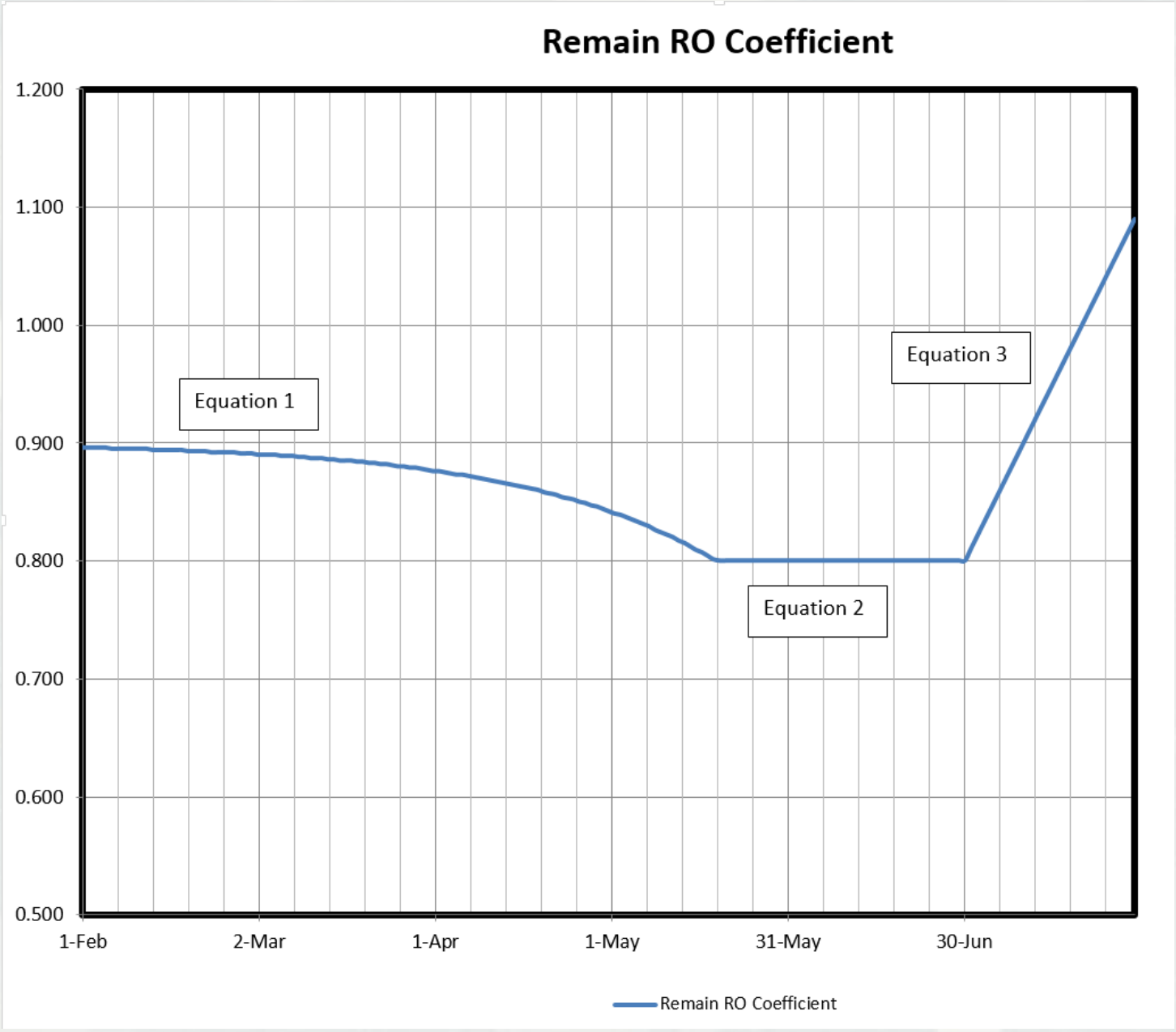
$$Eq3 = 1 - (\left(\frac{(1-0.8)}{20}\right) \times (295 - julian\ day))$$

Oct 1 is Water Year Julian Day 1
Feb 1 is Water Year Julian Day 124

- Logic to use equations:

  If ((295-Julian Day) ≥ 20, If (Eq1 ≥ Eq2, Eq1, Eq2),Eq3)

Julian Day 295 is 22 July (21 July on Leap Year)
Julian Day 309 is 05 Aug (04 Aug on Leap Year)


Remain RO Coefficient
1.200
1.100
1.000
0.900
0.800
0.700
0.600
0.500
1-Feb
2-Mar
1-Apr
1-May
31-May
30-Jun
Equation 1
Equation 2
Equation 3
Remain RO Coefficient

Based on previous slides and on the text of the example, The Following would be computed:

Remaining Runoff

650,000 ac-ft (from example)

Correction Coefficient

0.842 for May 1

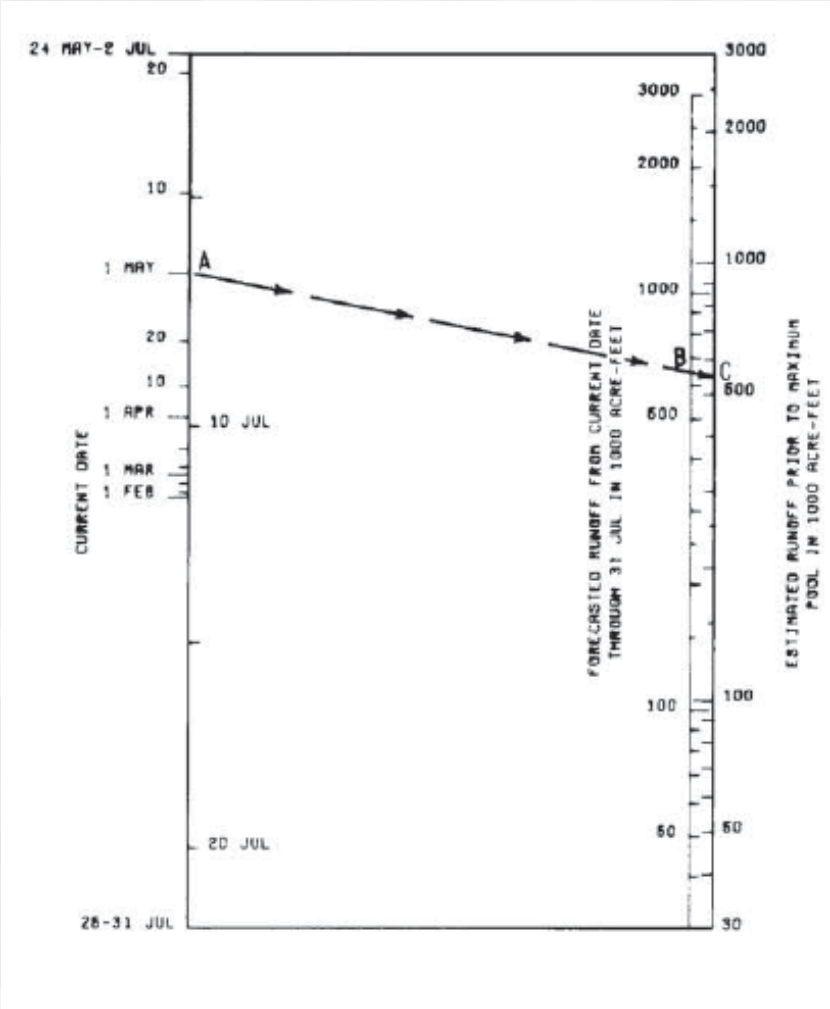
(From Eq 1 Slide 4 and JD 214)

Adjusted Runoff

650,000 X 0.842

547,300 or approx.

550,000 ac-ft.



Future Irrigation Demand

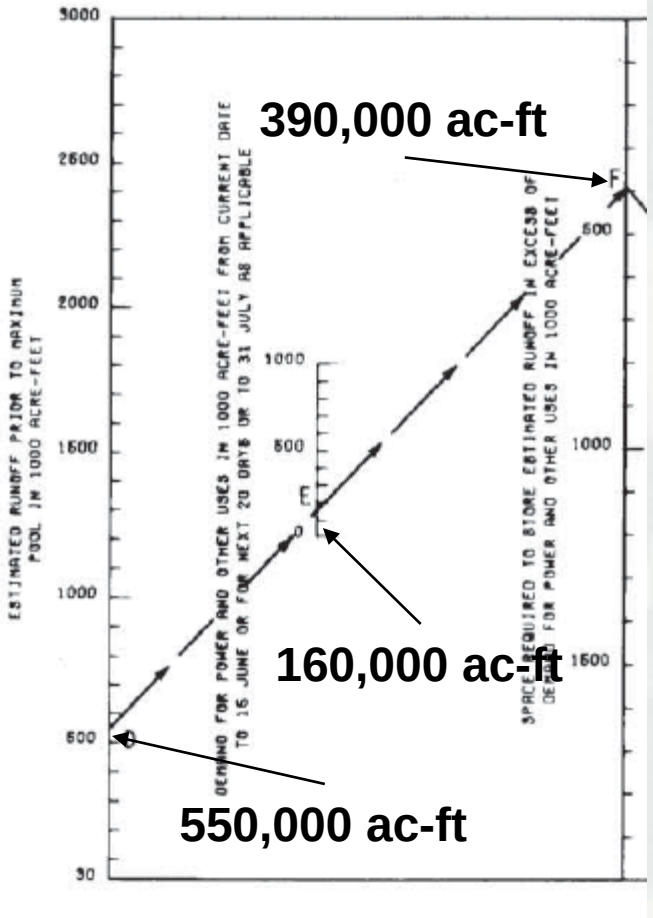
From Example Text, Estimated Demand is 160,000 ac-ft (Summation of Forecasted daily release values from 1 May to 15 June, converted to ac-ft).

For a time series of daily values representing demand release, Sum values from a given date to 15 June. After 25 May sum the values for the next 20 days or through 31 July, which ever is less.

Convert the summation to ac-ft.

Result is space required in Exchequer in ac-ft

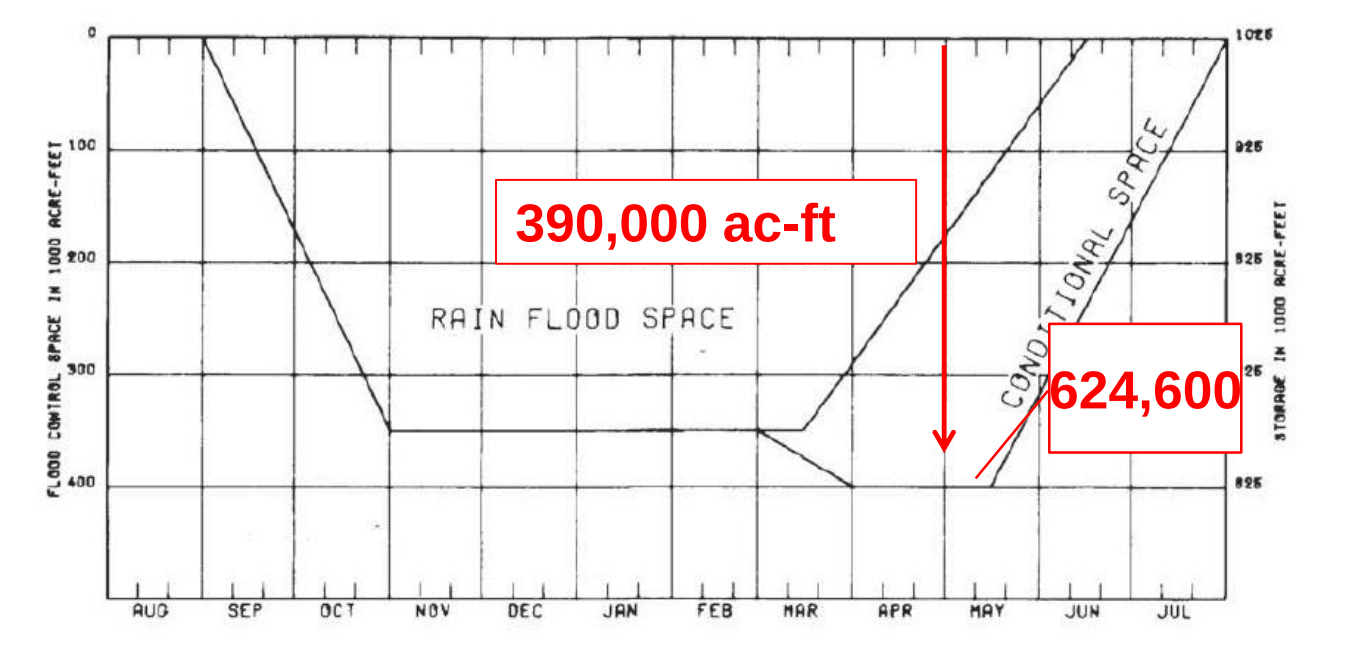
550,000 – 160,000 = 390,000



Calculate Amount of Conditional Space

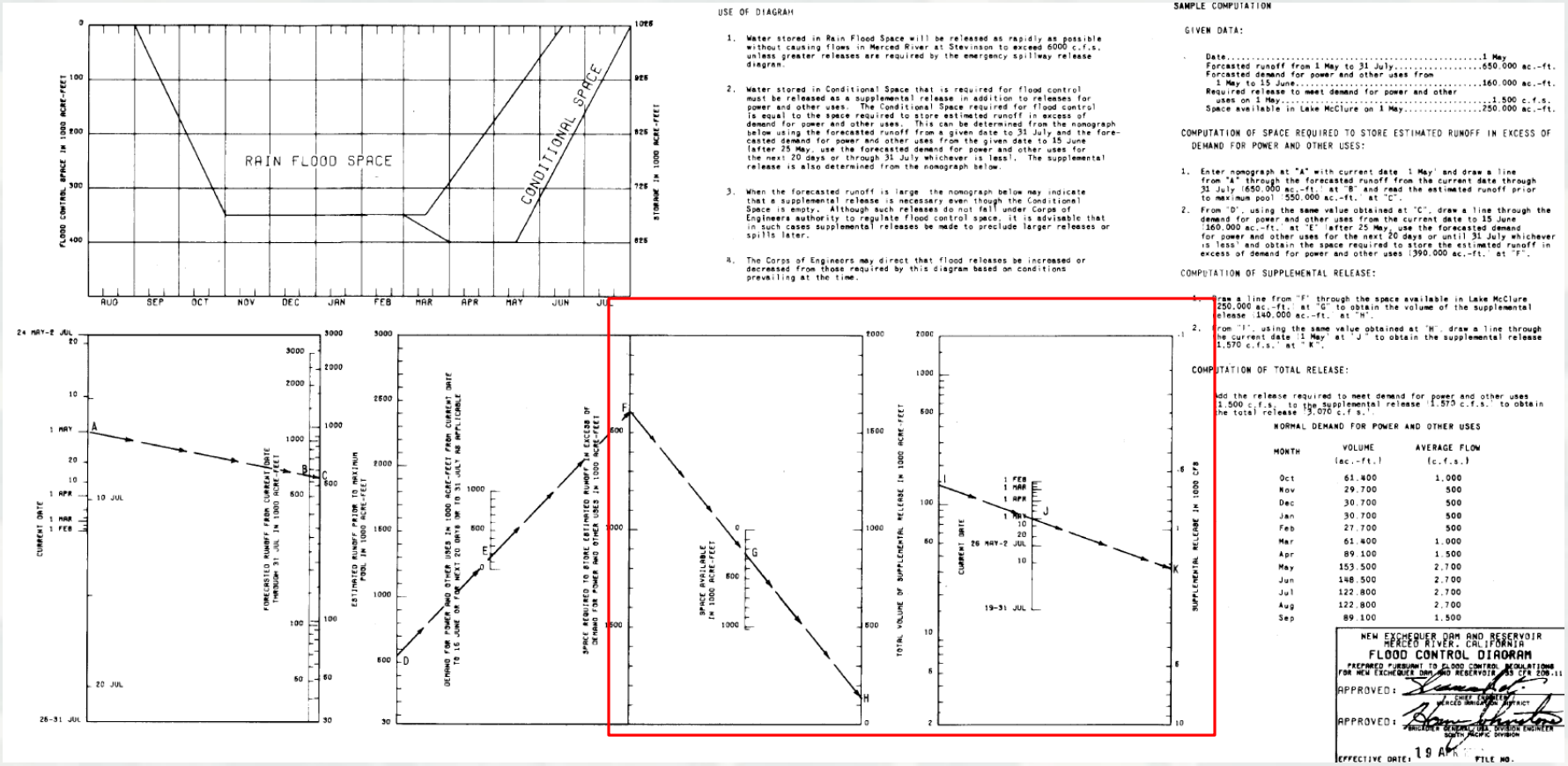
- On May 2nd (Compute TOC for May 1st):
  - ► Top of Conservation = 1,024,600 – 390,000
  - ► = 634,600 ac-ft
  - ► The hardwired limit line would not require it

  To be any lower than 624,600 ac-ft



New Exchequer Dam Water Control Diagram

Supplemental Release Computation



New Exchequer Dam Water Control Diagram

Supplemental Release Computation

Only applies to the Snowmelt Season

Required Information:

- **Amount of Excess runoff volume that cannot be managed by the combination of future demand and current space available in New Exchequer**
- **Amount of Time available to deal with the excess volume (evacuation period).**

By example, space available is 250,000 ac-ft
(or an active storage of 1,024,600-250,000 = 774,600 ac-ft)

Excess volume can be computed as:

Active Storage – Top of Conservation
OR
Space Required – Space Available

774,600 – 634,600 = 390,000 – 250,000 = 140,000 ac-ft

Evacuation period.
Evacuation Period Equations:

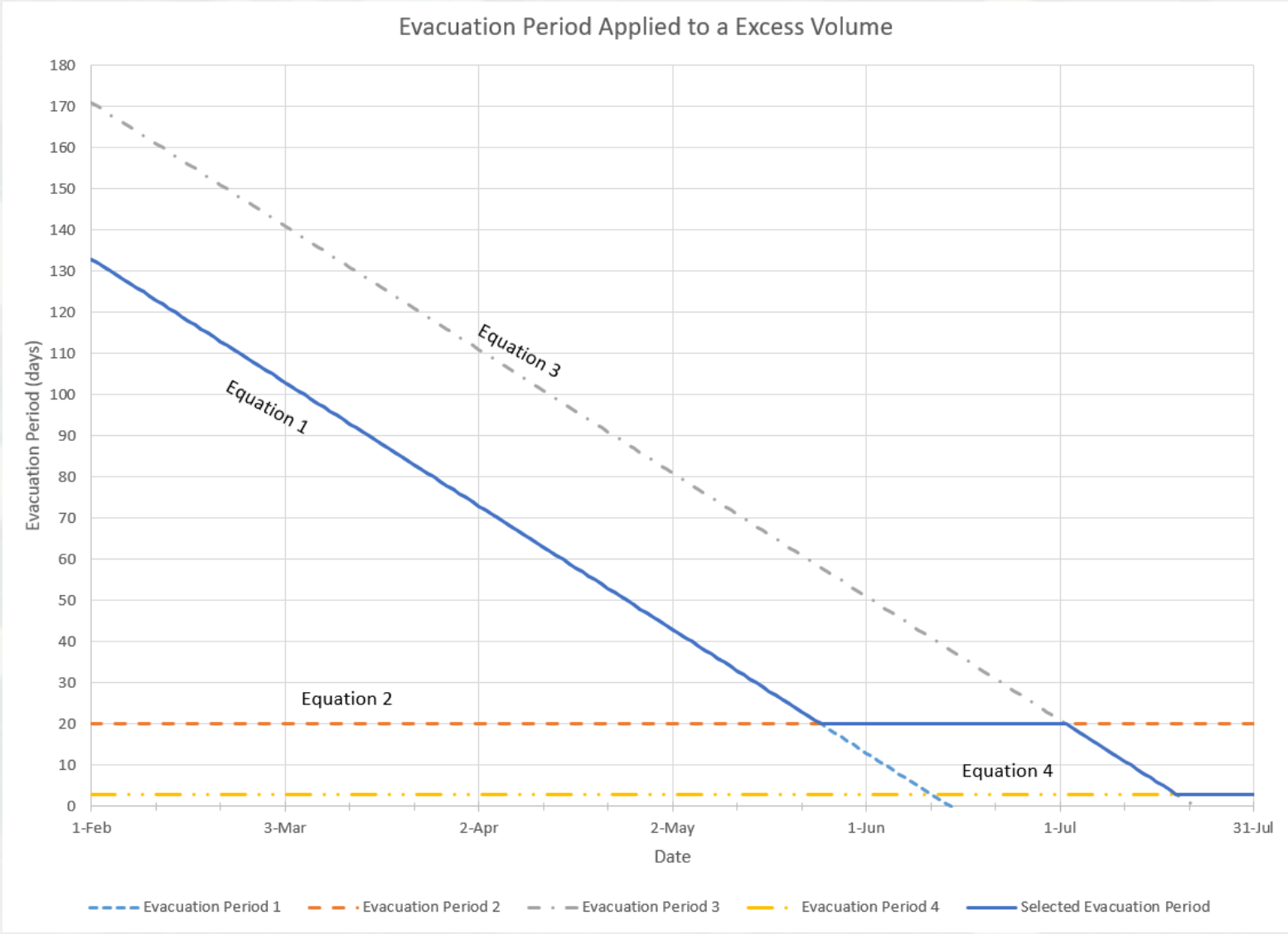
Equation 1 = 257 – Julian day
Equation 2 = 20 days
Equation 3 = 295 – Julian day
Equation 4 = 3 days

Julian Day 257 = 14 June
13 June LY
Julian Day 295 = 22 July
21 July LY

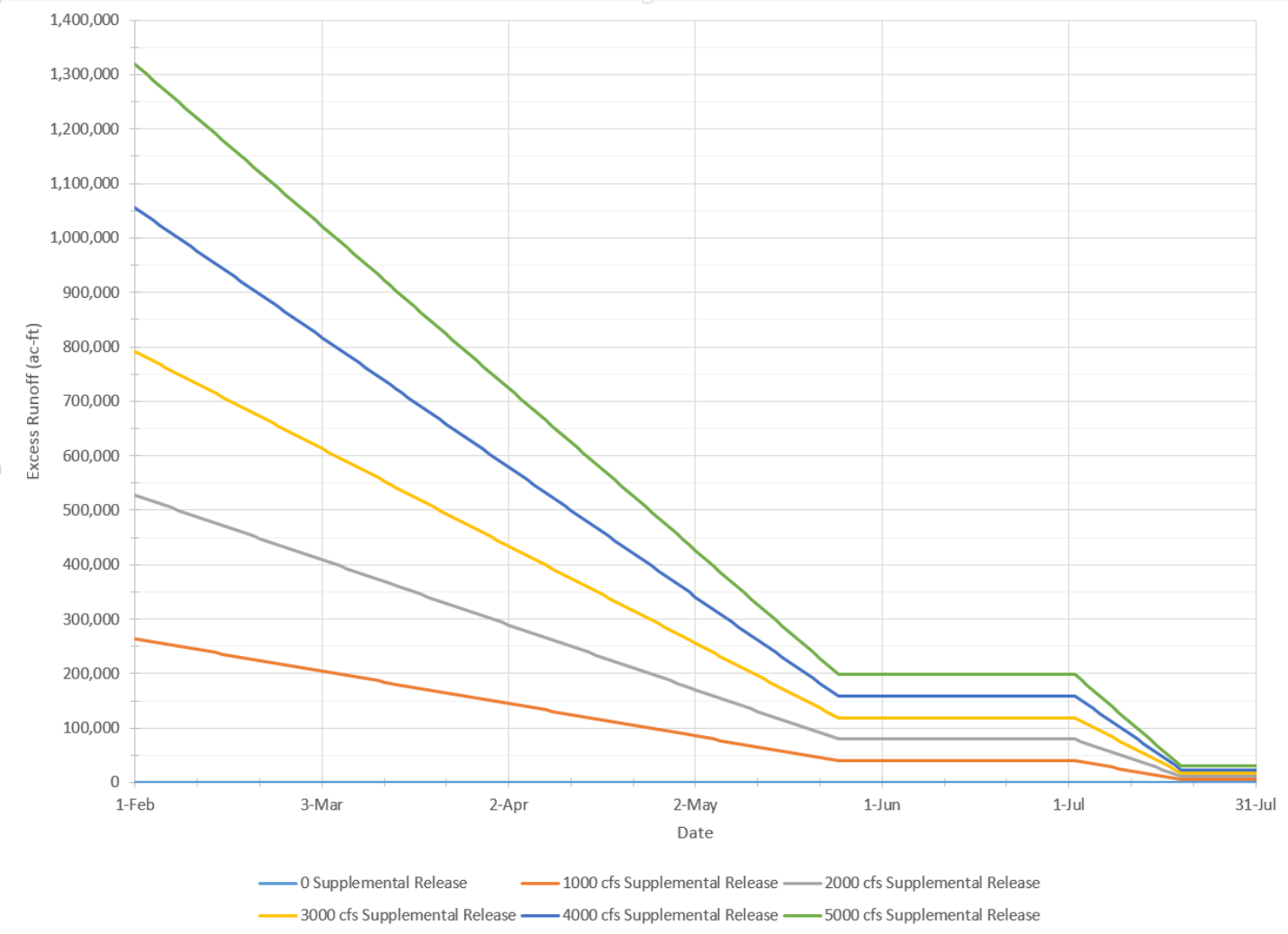
Oct 1 2400 hrs is the end of Water Year Julian Day 1

Equation Application Logic:
If (Eq1 > Eq2, Eq1, If (Eq2 < Eq3, Eq2, if (Eq3 > Eq4, Eq3, Eq4)))

Result of Evacuation Period Logic



Application of chosen Supplemental Release values to the evacuation period logic to determine magnitude of volume that can be managed.



To finish the example, for the computed excess volume of 140,000 ac-ft and applying the evacuation period of 44 days for May 1st, the supplemental release would be :

Supplemental Release = ((140,000 ac-ft / 44 days)/1.9835)
= approx. 1,600 cfs

QUESTIONS