Folsom Dam Water Control Manual Update

Stakeholder Discussion

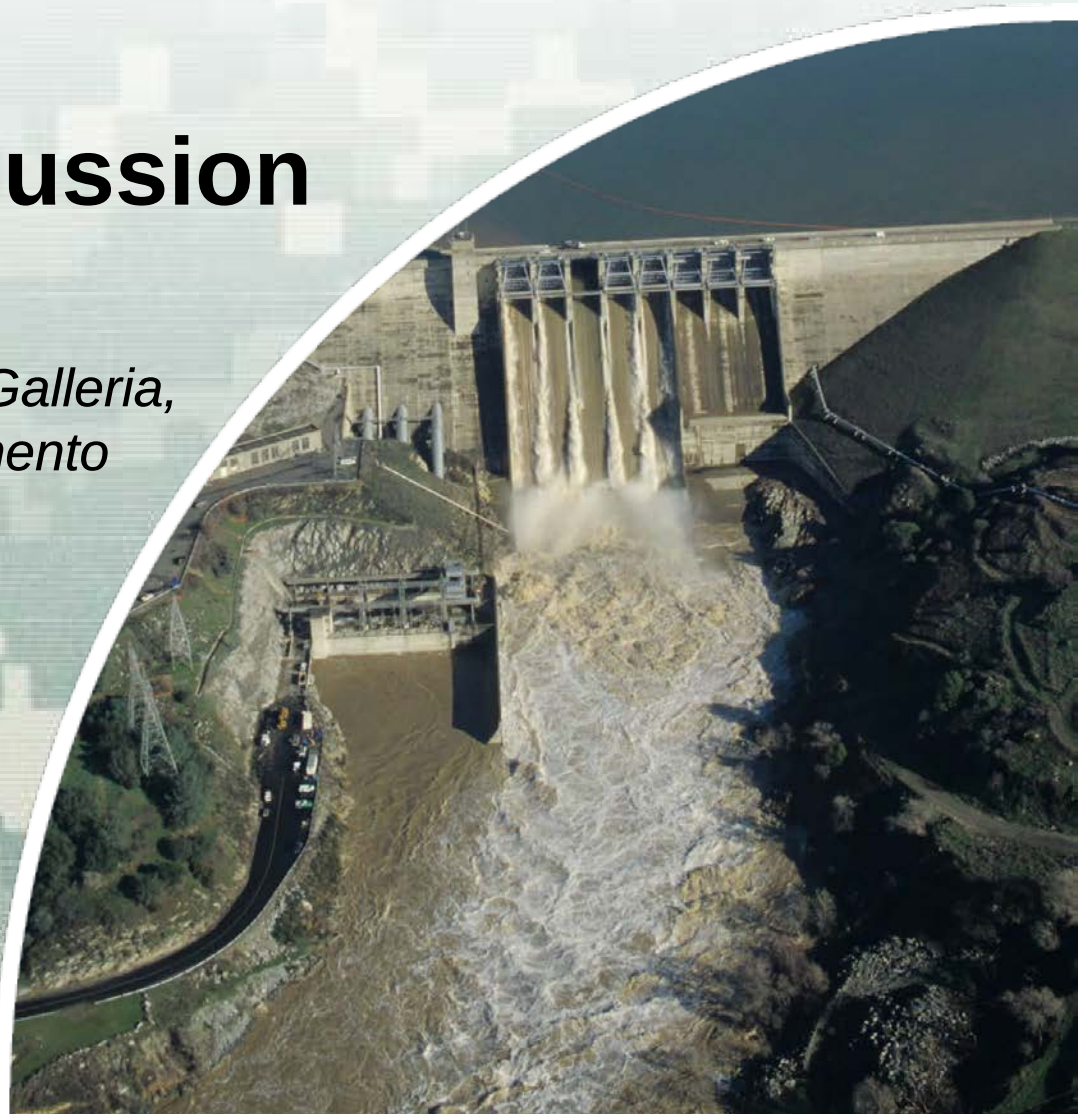
October 31, 2013

Location: Tsakopoulos Library Galleria, East Room, 828 I Street, Sacramento

Reclamation
Mid-Pacific Region
Sacramento, CA

Sacramento Area Flood Control Agency

US Army Corps of Engineers
BUILDING STRONG®



WELCOME
&
INTRODUCTIONS

PURPOSE OF MANUAL UPDATE

- Revise operation rules for Folsom Dam to reduce flood risk based on the capabilities of the Folsom Joint Federal Project (JFP).
- Reflect operational capabilities created by improved weather forecasts.
- Potentially reduce the volume of flood control reservation in Folsom Reservoir at any particular time by comparison to the operations that have been in effect since 1995.

OBJECTIVES OF MANUAL UPDATE

- Pass the Probable Maximum Flood while maintaining 3 feet of freeboard below the top of dam to stay within the dam safety constraints of the U.S. Department of Interior, Bureau of Reclamation.

- Control a 1/100 annual chance flow (“100-year flood”) to a maximum release of 115,000 cubic feet per second as criteria set by the Sacramento Area Flood Control Agency to support Federal Emergency Management Agency levee accreditation along the American River.

- Control a 1/200 annual chance flow (“200-year flood”) as defined by criteria set by the State of California (State) Department of Water Resources to a maximum release of 160,000 cubic feet per second, when taking into account all the authorized modifications within the American River Watershed.

PURPOSE OF TODAY'S AGENDA

- Involving Public, Other Government Agencies, & Non-Governmental Organizations
- Project Schedule
- Presentation on Environmental Effects Approach
- Presentation on Technical / Modeling Work
- Group Discussion & Summary Comments

INVOLVING THE PUBLIC,

OTHER GOVERNMENT AGENCIES
&
NON-GOVERNMENTAL ORGANIZATIONS

INTERESTS

- Regional Flood Management
- Folsom Lake, Lake Natoma and Lower American River Recreation
- In-Basin Water Supply & Irrigation
- Other Water Supply & Irrigation
- Generation of Hydropower

REVIEW ISSUES
&
CONCERNS

PUBLIC INVOLVEMENT

- Quarterly Public/ Stakeholder Session
- In-Depth Sessions - Government Entities:
  - Quarterly Technical / Modeling
  - Quarterly Environmental Effects
- In-Depth Sessions - Non-Governmental & Public
  - Quarterly Meetings convened by SAFCA.
- Other Conversations USACE

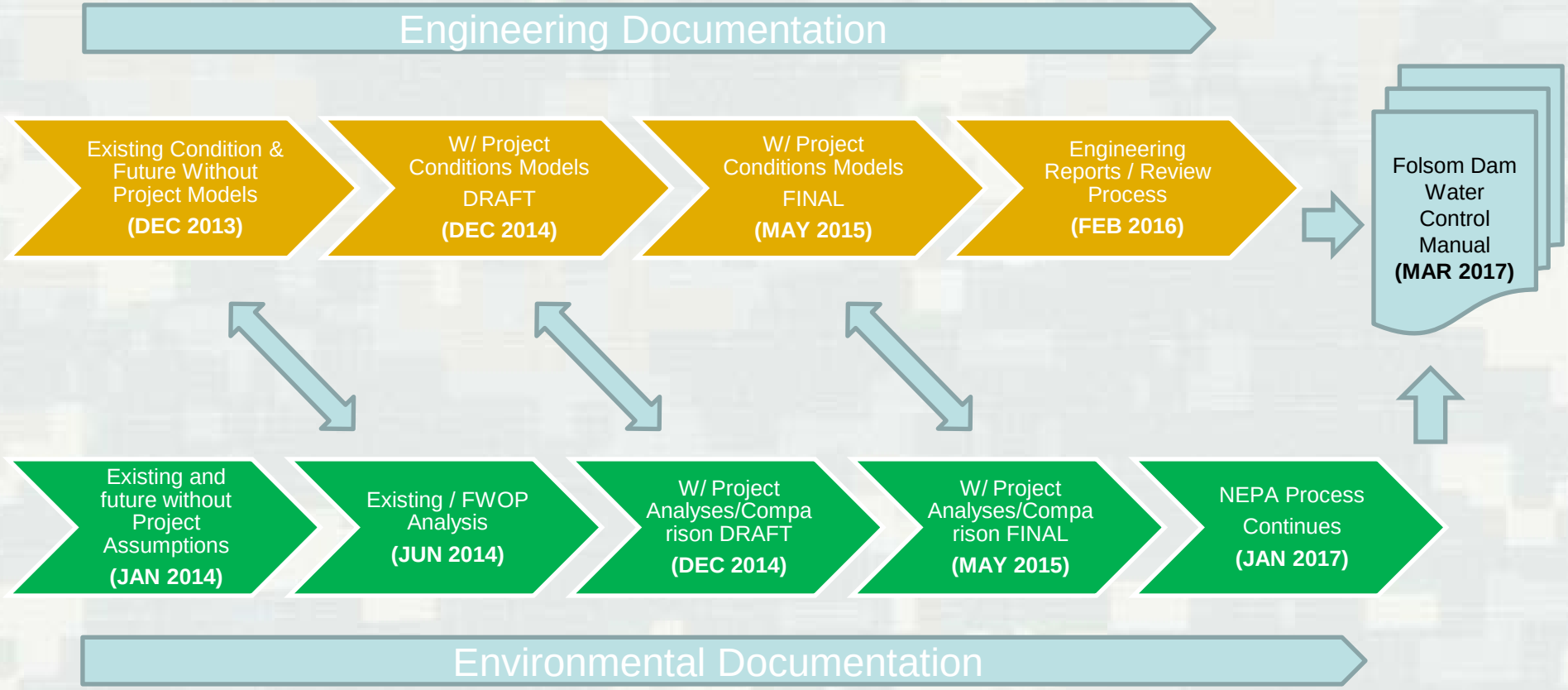
INFORMATION AVAILABLE ON LINE
Folsom Dam Water Control Manual Update

- July 2012 Briefing Paper
- Summary of 2012 Scoping Meetings
- Stakeholder Assessment
- Other Documents

http://www.spk.usace.army.mil/Missions/CivilWorks/FolsomDamAuxiliarySpillway.aspx

PROJECT MILESTONE SCHEDULE

SCHEDULE


Engineering Documentation
Existing Condition & Future Without Project Models
(DEC 2013)
W/ Project Conditions Models DRAFT
(DEC 2014)
W/ Project Conditions Models FINAL
(MAY 2015)
Engineering Reports / Review Process
(FEB 2016)
Folsom Dam Water Control Manual
(MAR 2017)
Existing and future without Project Assumptions
(JAN 2014)
Existing / FWOP Analysis
(JUN 2014)
W/ Project Analyses/Comparison DRAFT
(DEC 2014)
W/ Project Analyses/Comparison FINAL
(MAY 2015)
NEPA Process Continues
(JAN 2017)
Environmental Documentation

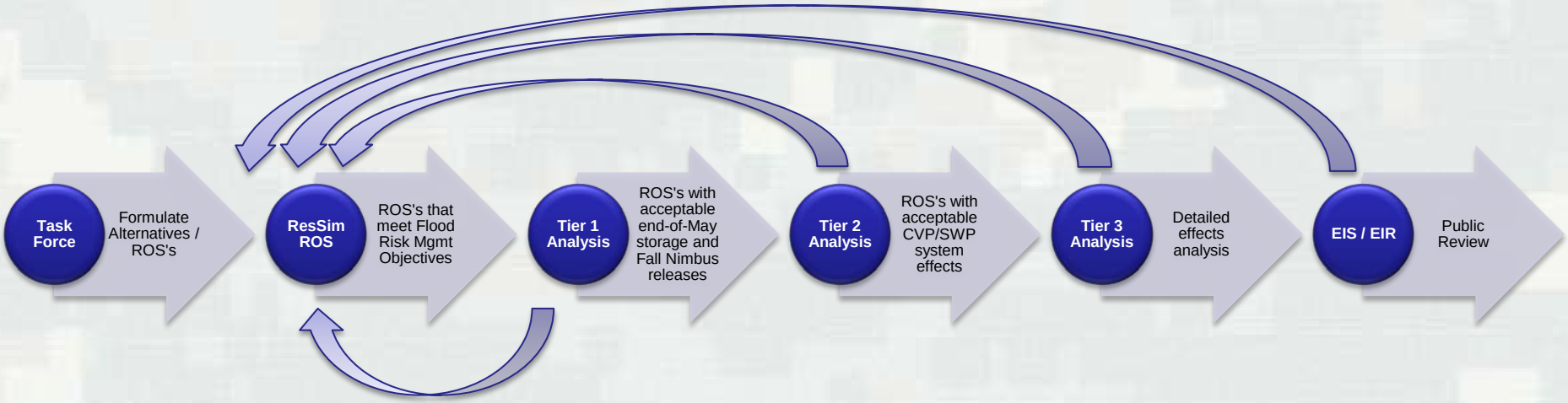
SCHEDULE

		Technical Focus of Meetings		Technical Work Group (TWG)	Environmental Working Group (EWG)	SAFCA Meetings with NGOs	All Stakeholder/ Public Workshops	Stakeholder Input Due
Meeting Sequence		Engineering	Environmental					
1	Aug-13	*Final engineering baseline runs	*Approach to effects evaluation	Aug-13				
	Sep-13	*Tier 1 evaluations	*Baseline assumptions		Sep-13			
	Oct-13					Oct-13	Oct-13	
2	Nov-13	*Draft with-project runs	*Draft baseline runs	Nov-13				*Engineering baseline runs - 11/29/13
	Dec-13	*Tier 1 evaluations	*Tier 2 evaluations		13-Dec			
	Jan-14					Jan-14	Jan-13	
3	Feb-14	*Draft with-project runs	*Final baseline runs	Feb-14				*Draft engineering with-project and draft environmental baseline runs - 2/28/14
	Mar-14	*Tier 1 evaluations	*Tier 2 evaluations		Mar-14			
	Apr-14					Apr-14	Apr-14	
4	May-14	*Draft with-project runs	*Draft with-project runs vs. final baseline	May-14				*Engineering draft with-project and final environmental baseline runs - 5/31/14
	Jun-14	*Tier 1 evaluations	*Tier 2 and 3 evaluations		Jun-14			
	Jul-14					Jul-14	Jul-14	
5	Aug-14	*Final with-project runs	*Draft with-project vs final baseline runs	Aug-14				*Draft engineering with-project and draft environmental with-project runs - 8/31/14
	Sep-14	*Tier 1 evaluations	*Tier 2 and 3 evaluations		Sep-14			
	Oct-14					Oct-14	Oct-14	
6	Nov-14		*Final with-project runs vs final baseline runs	Nov-14				TBD
	Dec-14		*Tier 2 and 3 evaluations		Dec-14			
	Jan-15					Jan-15	Jan, 15	
								TBD

Discussion / Questions

ENVIRONMENTAL EFFECTS APPROACH

CURRENT MODELING PLAN OVERVIEW



Task Force = Corps, Reclamation, CVFPB/DWR, SAFCA representatives

ROS = Reservoir Operations Set

ResSim ROS = ResSim model developed for each ROS and evaluated for flood risk management performance

Tier 1 Analysis

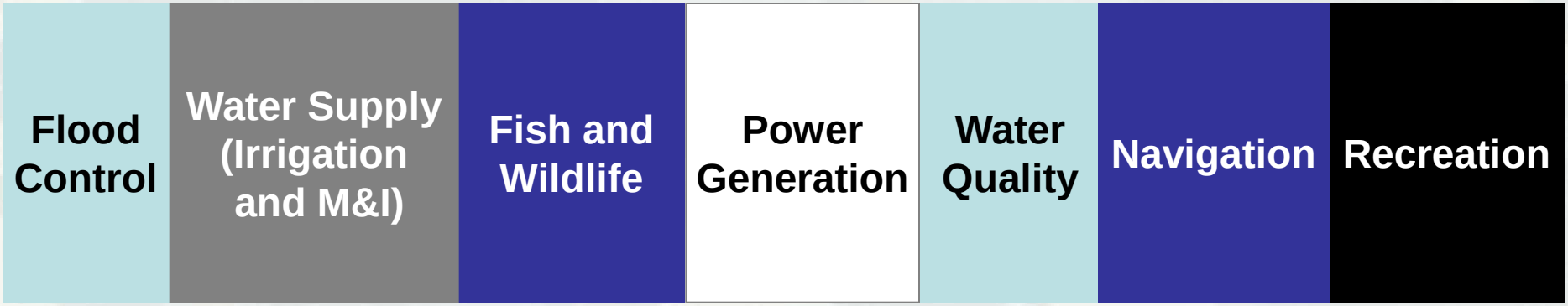
- ‘High level’ evaluation of effects to project beneficial uses
- Developed from period of record (POR) HEC-ResSim and CalSim II runs using the same flood storage reserve requirements
- Compares HEC-ResSim and CalSim II end-of-month storages and lower American River (LAR) fall flows
- General consistency between the two models is viewed as consistency with meeting project beneficial uses

CalSim II Model Build

- Current CalSim II model build subject to concurrence between USACE, Reclamation and DWR
- Any modifications to base model assumptions will be further discussed by the partner agencies

Environmental Effects Analysis

- Environmental effects analyses will be centered around effects flood management operations alternatives would have on the other Folsom Dam Project purposes:



Tier 2 Analysis

- Comparison of ‘with ROS’ CalSim II run with baseline CalSim II run
- Monthly flood storage reserve requirement in Folsom is feature of ROS that is incorporated into CalSim II
- Screening level comparison of SWP/CVP beneficial uses of project water using key system indicators

Tier 2 System Indicators

- Water delivery to CVP municipal and industrial contractors north and south of the Delta;
- Water delivery to settlement and exchange contractors;
- Water deliveries to Feather River SWP contractors;
- Water delivery to CVP agricultural contractors north and south of the Delta;
- Minimum release requirements (MRR) CVP and SWP conveyances;
- SWP Delta exports;

Tier 2 System Indicators (cont.)

- Old and Middle River (OMR) flows;
- The position of the X2 (the near-bottom 2 parts per thousand isohaline boundary);
- The Delta export to inflow (E/I) ratio;
- Delta Outflow;
- Water delivery to refuges north and south of the Delta;
- May end-of-month storage in Shasta, Oroville and Folsom Reservoirs, and
- September end-of-month storage in Shasta, Oroville and Folsom Reservoirs.

Tier 3 Analysis

- Evaluate other system effects that CalSim II cannot simulate
- Comparison of alternatives to baseline conditions
  - ► Long-term average values (period of record) and sorted by water year type
- Closer evaluation of effects in Lower American River
- Screening level evaluation for more distant parts of CVP/SWP system followed by detailed evaluation, as needed

Baseline Conditions - Folsom Reservoir Flood Operation and Configuration

- Existing Conditions/Current Operations
- Future Without Project/No Action
- Cumulative Effects

Existing Conditions/ Current Operations (E504)

- Flood Storage: 400,000/670,000 Acre-Feet (AF)
- Outlet Configuration: Existing (No Auxiliary Spillway)
- Temperature Control Devices (TCD): 3-2-4 shutter configuration
- Operations: Current (2004 Operation Rules)

Future Without Project/ No Action (J604)

- Flood Storage: 400,000/670,000 AF
- Outlet Configuration: Existing plus Auxiliary Spillway (JFP)
- TCDs: 3-2-4 shutter configuration
- Operations: Current + use of auxiliary spillway for emergency releases only

Cumulative Effects

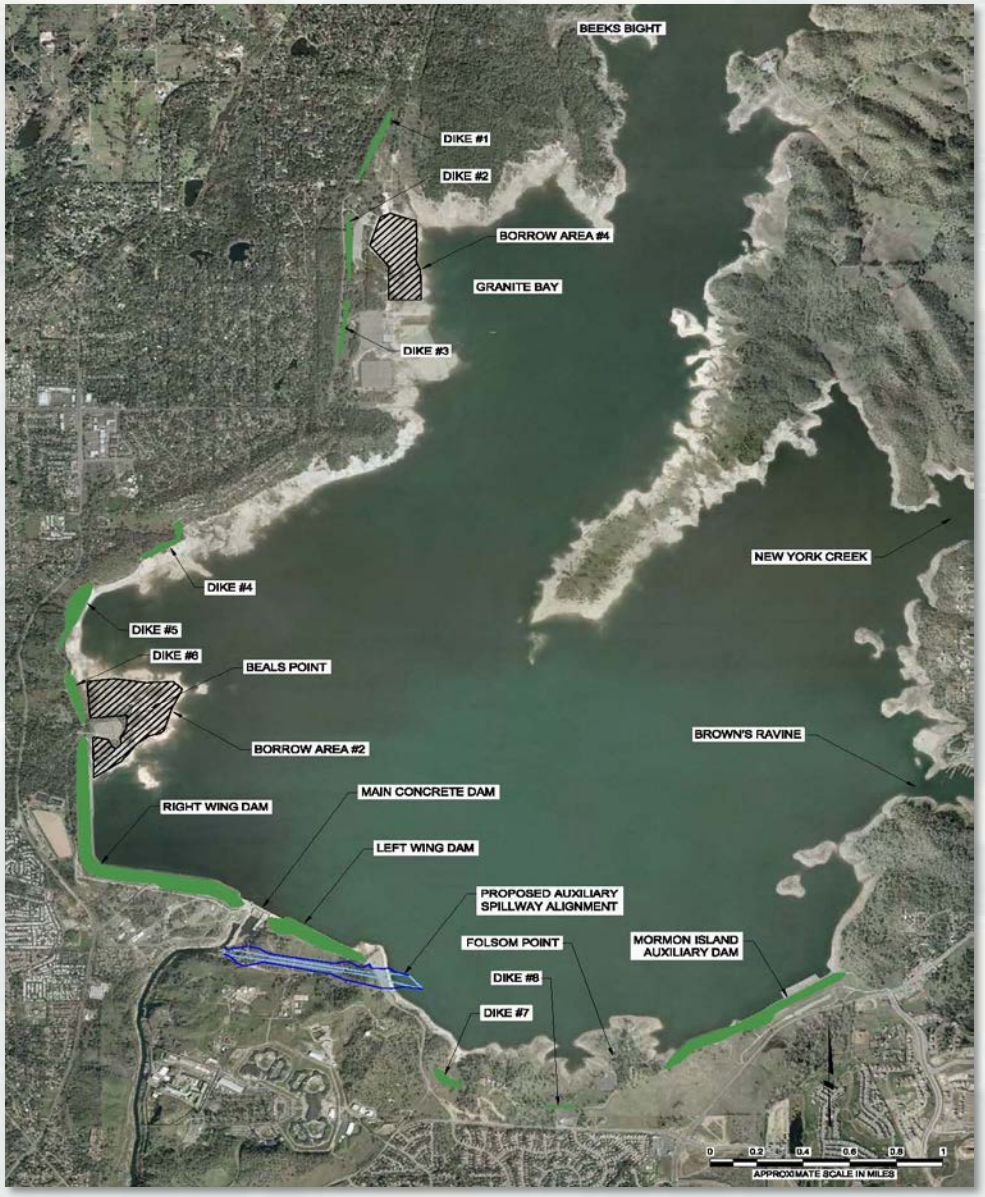
- **Past** – 400,000 AF (Fixed) flood space; no JFP; 1-1-7 shutter configuration;1987 WCD (E503 ResSim Model)
- **Present** – 400,000/670,000 AF flood space; no JFP; 3-2-4 shutter configuration; 2004 WCD (E504 ResSim Model)
- **Future** – 400,000/600,000 AF flood space; Authorized 3.5-ft Dam Raise; JFP; 7(1)-2 shutter configuration; 2017 WCD updated for Dam Raise (R702 ResSim Model)

Dam Raise – Future Project

- Not a with-project alternative for this WCM Update; however, considered in cumulative effects analysis

- Features
  - ► Automation of TCD – 7(1)-2 configuration
  - ► Raise auxiliary dikes by 3.5 feet
  - ► Retrofit emergency spillway gates
  - ► Ecosystem restoration at 2 sites on LAR

Dam Raise – Future Project



Other Baseline Assumptions Under Discussion

- Bay Delta Conservation Plan (BDCP)
- Lower American River (LAR) Purveyor Demands
- Level of Development
- Biological Opinions
- Climate Change
- Other Future Projects

EVALUATIONS BY RESOURCE

Ag, M&I Water Supply

- CalSim II Outputs
- Model Parameters
  - Deliveries from Folsom Lake and to the City of Sacramento
  - CVP/SWP deliveries South of Delta
  - Non-CVP/SWP water rights deliveries
  - End-of-May Storage: Trinity, Shasta, Oroville, Folsom Reservoirs
  - End-of-September Storage: Trinity, Shasta, Oroville, Folsom Reservoirs

Power

- CalSim II reservoir storages and releases applied to LTGen and SWPGen models

- Evaluation of:
  - Total capacity, quantity and timing of energy production
  - Any changes in Project use
  - Net capacity and energy at load center
  - Effects to timing of peaking operations at Folsom Dam

Fisheries Resources

- Effects analysis based on river flows, lake levels and water temperature modeling.
- Special-status fish species (i.e., steelhead, Chinook salmon, delta smelt, green sturgeon, etc.).
- Recreationally important species (e.g., striped bass and American shad).

Water Quality

- Parameters evaluated as part of the Fisheries analysis:
  - Water temperature in the Lower American River
  - Salinity dynamics in the Delta
- Salinity dynamics in the Delta
  - addressed at a screening level (changes in X2, total Delta inflow/outflow, and the E/I ratio).
  - Substantial changes may warrant more detailed evaluation using DSM2
- Salinity quality at key in-Delta points for local Ag and M&I supplies

Terrestrial Resources

- Shoreline understory and wooded areas.
- Reservoir parameters:
  - water surface elevations
- Riverine parameters:
  - Flow

Recreation

- Primary focus is Folsom Lake and Lower American River
- Folsom Lake
  - Water surface elevation as it relates to access, inundation, aesthetics, and time of year
- Lower American River
  - Flows and timing

Erosion

- Changes in erosion rates at key index points along LAR
- Focus is period between completion of JFP/auxiliary spillway and completion of Common Features project

NEPA and CEQA

Corps of Engineers

NEPA Lead Agency

Central Valley Flood Protection Board

CEQA Lead Agency

Bureau of Reclamation

NEPA Cooperating Agency

Department of Water Resources

CEQA Responsible Agency

Sacramento Area Flood Control Agency

CEQA Responsible Agency

BASIS OF ALTERNATIVE DEVELOPMENT

Parameters Common to Each Alternative

- Flood Storage: As directed by Congress, 400,000/600,000 AF at Folsom with upstream storage credit considerations
- Outlet Configuration: Existing outlets and auxiliary spillway
- Temperature Control Diagram Configuration: 3-2-4 shutter configuration

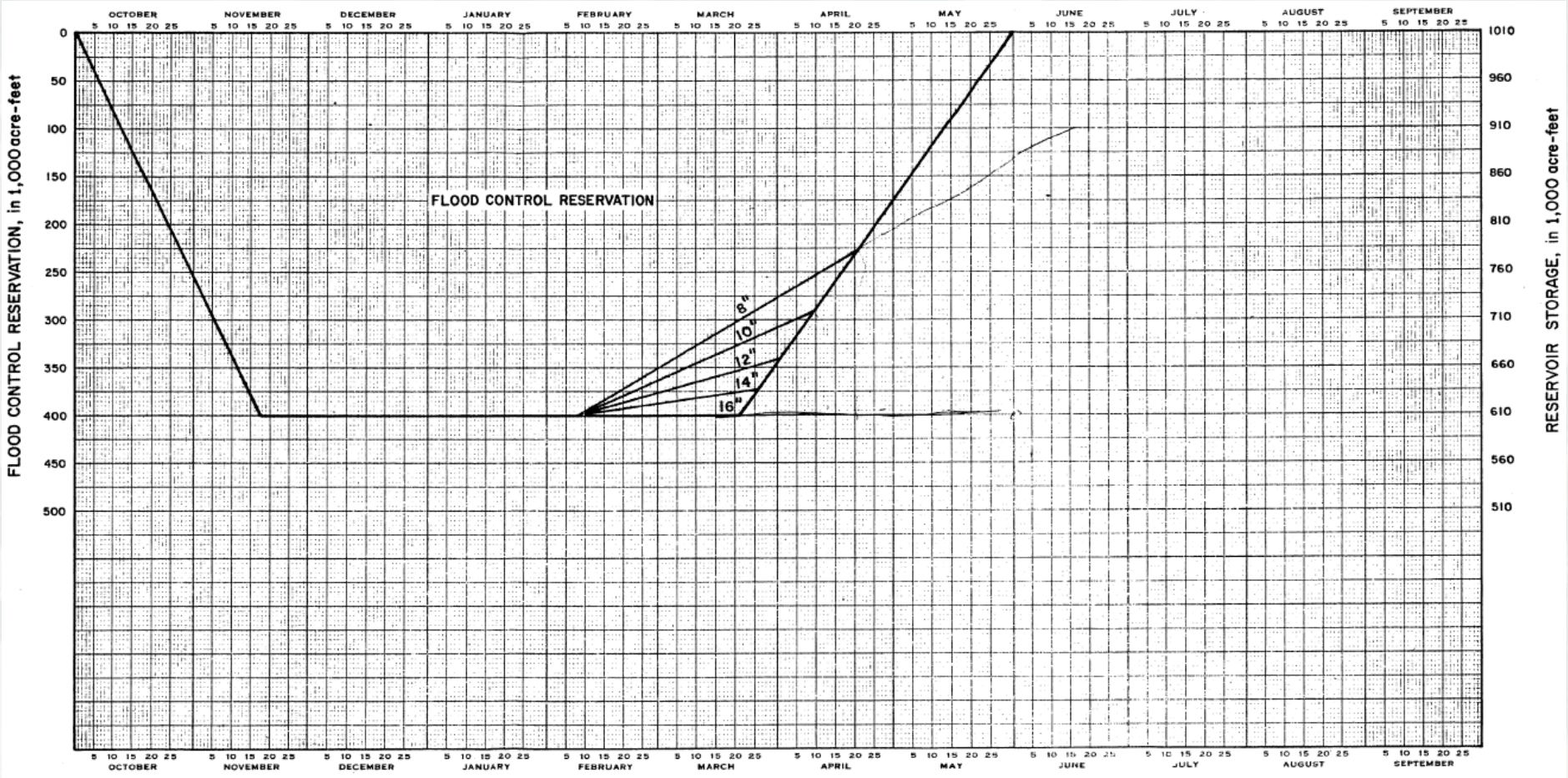
Variable Alternative Parameter

- Operating Rules: Rule curves that derive flood storage reserve requirements from some combination of the following:
  - Basin Wetness
  - Forecast Information

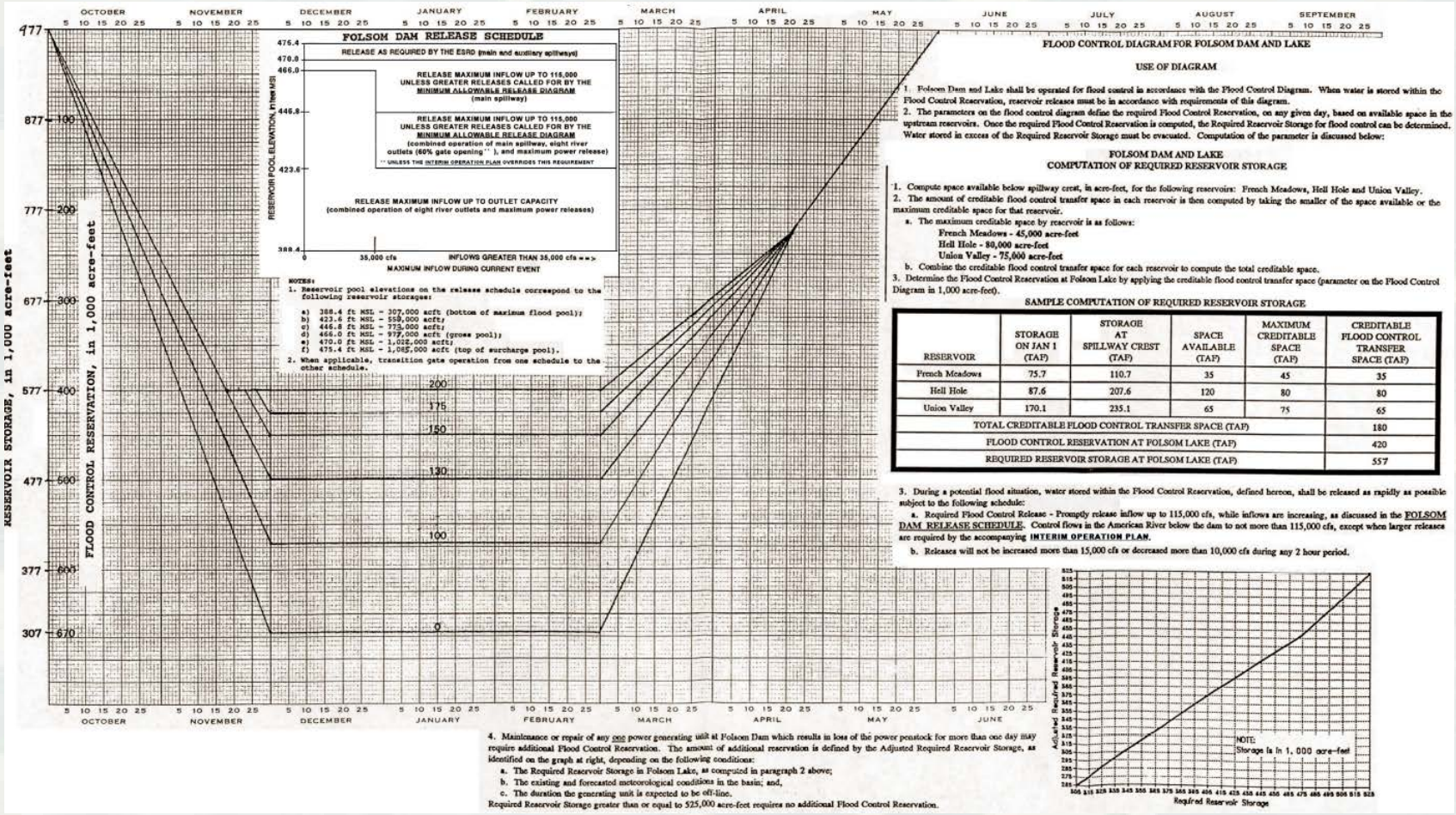
Discussion / Questions

PRESENTATION ON TECHNICAL / MODELING WORK

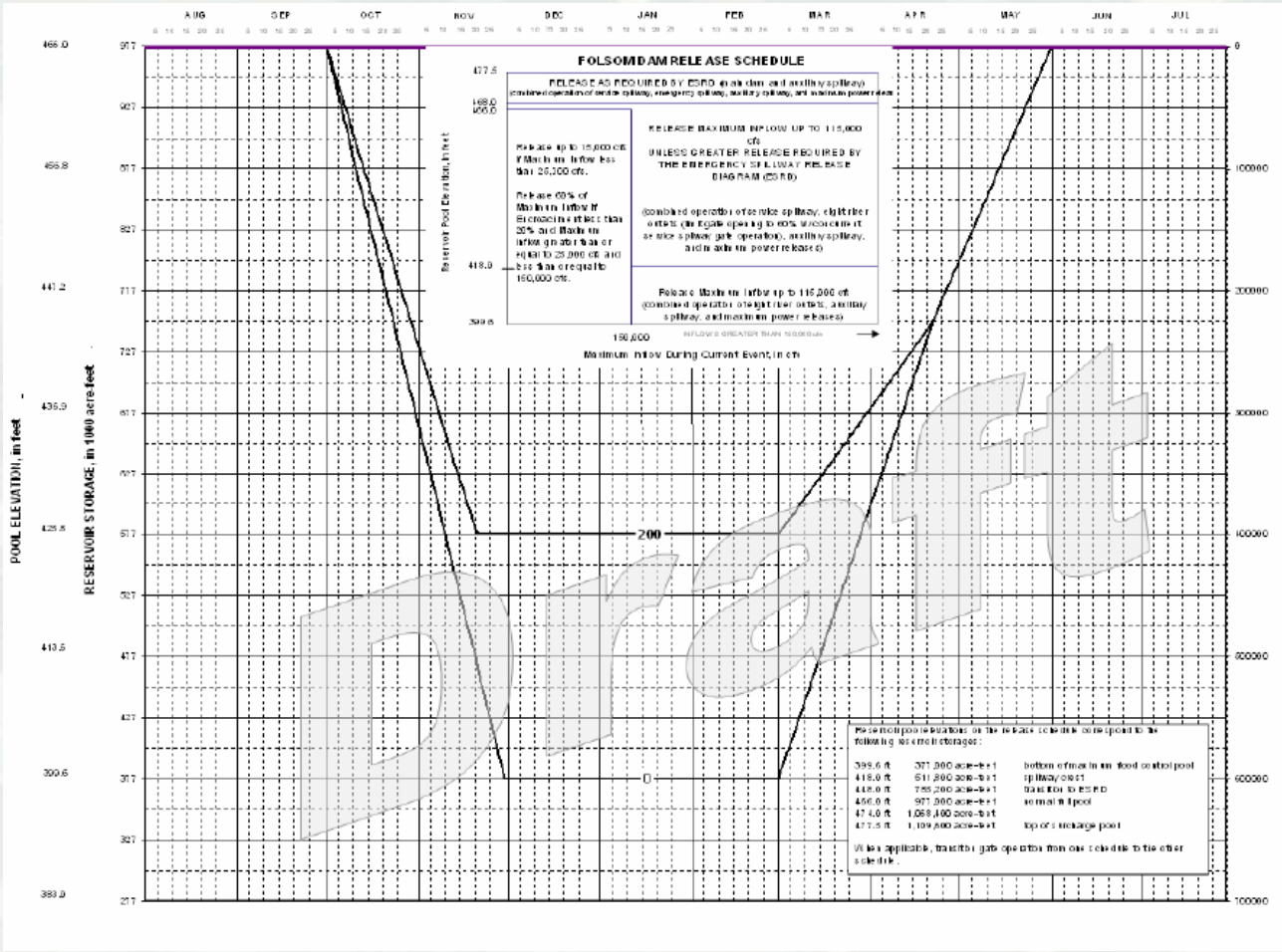
Baseline Comparisons to the With Project Condition
-- Cumulative Past --
400-Fixed Flood Control Storage



Baseline Comparisons to the With Project Condition
-- Existing --
400-670 Flood Control Storage



Baseline Comparisons to the With Project Condition
-- With Project --
400-600 Flood Control Storage



FLOOD CONTROL DIAGRAM

USE OF DIAGRAM

1. Folsom Dam and Lake shall be operated for flood control in accordance with the Flood Control Diagram. When water is stored within the Flood Control Reservation, reservoir releases must be in accordance with the requirements of this diagram.

2. The parameters on the flood control diagram define the required Flood Control Reservation, or any given day, based on available space in the upstream reservoirs. Once the required Flood Control Reservation is computed, the Required Reservoir Storage for flood control operation for that day is determined. Water stored in excess of the Required Reservoir Storage must be evacuated. Computation of the parameter is discussed below:

COMPUTATION OF REQUIRED FLOOD RESERVATION STORAGE

1. Compute space available in the spillway crest, in acre-feet, for the following reservoirs: Prosser Meadows, Hell Hole and Union Valley.

2. The amount of creditable flood control transfer space in each reservoir is then computed by taking the smaller of the space available or the maximum creditable space for that reservoir.

   a. The maximum creditable space by reservoir is as follows:

French Meadows	45,000 acre-feet
Hell Hole	80,000 acre-feet
Union Valley	75,000 acre-feet

   b. Combine the creditable flood control transfer space for each reservoir to compute the total creditable space.

   c. Determine the Flood Control Reservation at Folsom Lake by applying the creditable flood control transfer space parameter to the Flood Control Diagram in 1,000 acre-feet.

SAMPLE COMPUTATION OF REQUIRED RESERVOIR STORAGE

RESERVOIR	STORAGE ON JUNE 1 (TAF)	ESTIMATED 66 SPILLWAY CREST (TAF)	SPACE AVAILABLE (TAF)	MAXIMUM CREDITABLE SPACE (TAF)	CREDITABLE FLOOD CONTROL TRANSFER SPACE (TAF)
FRENCH MEADOWS	847	1107	26	45	26
HELL HOLE	678	2018	120	80	80
UNION VALLEY	180.1	256.1	76	75	76
TOTAL CREDITABLE FLOOD CONTROL TRANSFER SPACE (TAF)					182
FLOOD CONTROL RESERVATION AT FOLSOM LAKE (1000 AF)					977
REQUIRED RESERVATION STORAGE AT FOLSOM LAKE (TAF)					977

RELEASE SCHEDULE

3. During a potential flood situation, water stored within the Flood Control Reservation, defined herein, shall be released as rapidly as possible subject to the following schedule:

   a. Required Flood Control Release - Promptly release inflow up to 115,000 cfs while inflows are increasing, as discussed in the FOLSOM DAM RELEASE SCHEDULE. Control flows in the American River below the dam to not more than 115,000 cfs, except when larger releases are required by the accompanying EMERGENCY SPILLWAY RELEASE DIAGRAM (ESRD). Once the reservoir pool begins falling, maintain releases in excess of inflow until water stored in the Flood Control Reservation is evacuated.

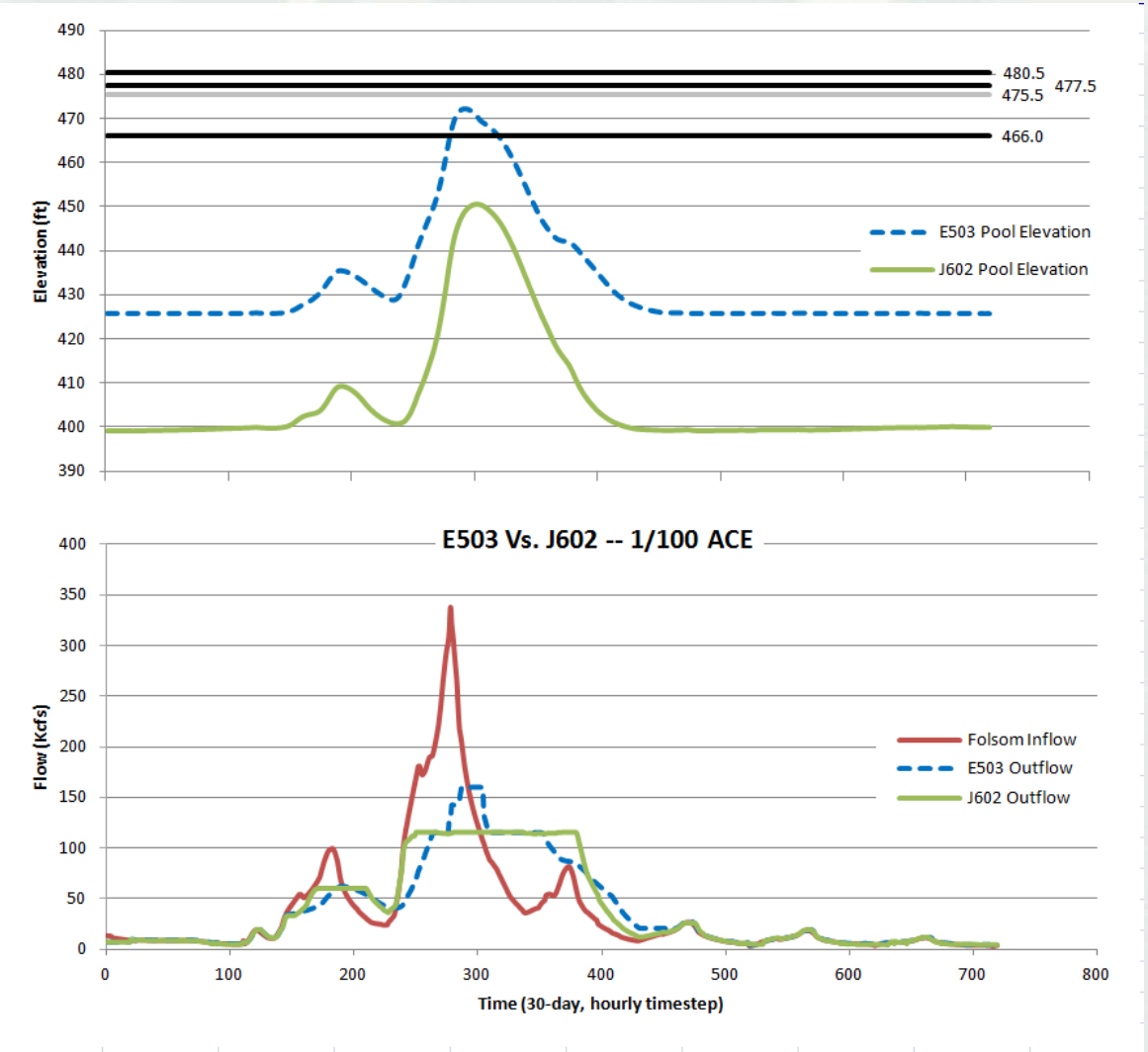
   b. Releases will not be increased more than 30,000 cfs or decreased more than 10,000 cfs during any 2-hour period.

AMERICAN RIVER WATERSHED PROJECT
FOLSOM DAM AUXILIARY SPILLWAY
GENERAL DESIGN DOCUMENTATION REPORT

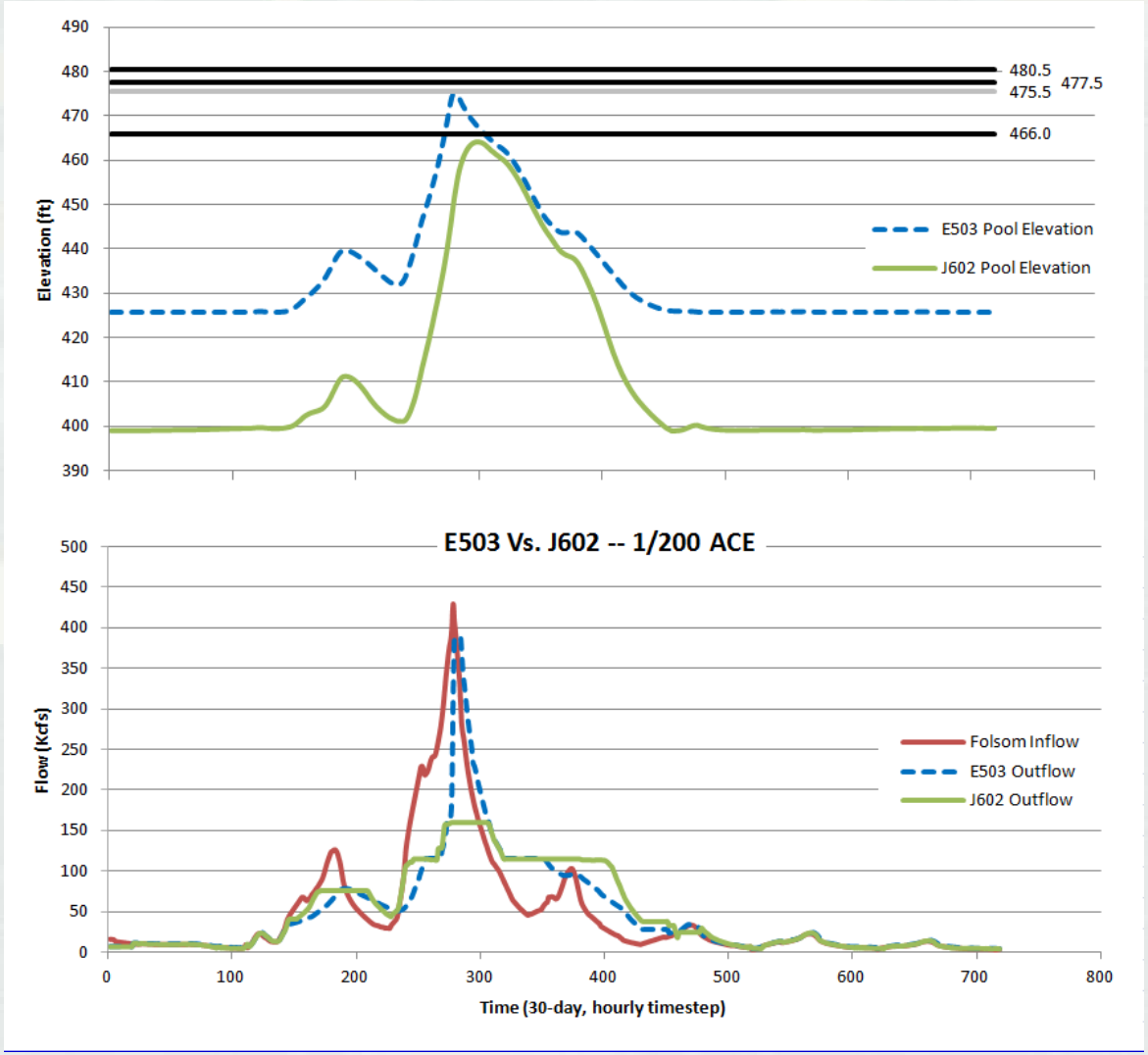
DRAFT WATER CONTROL PLAN

FIGURE 5-5

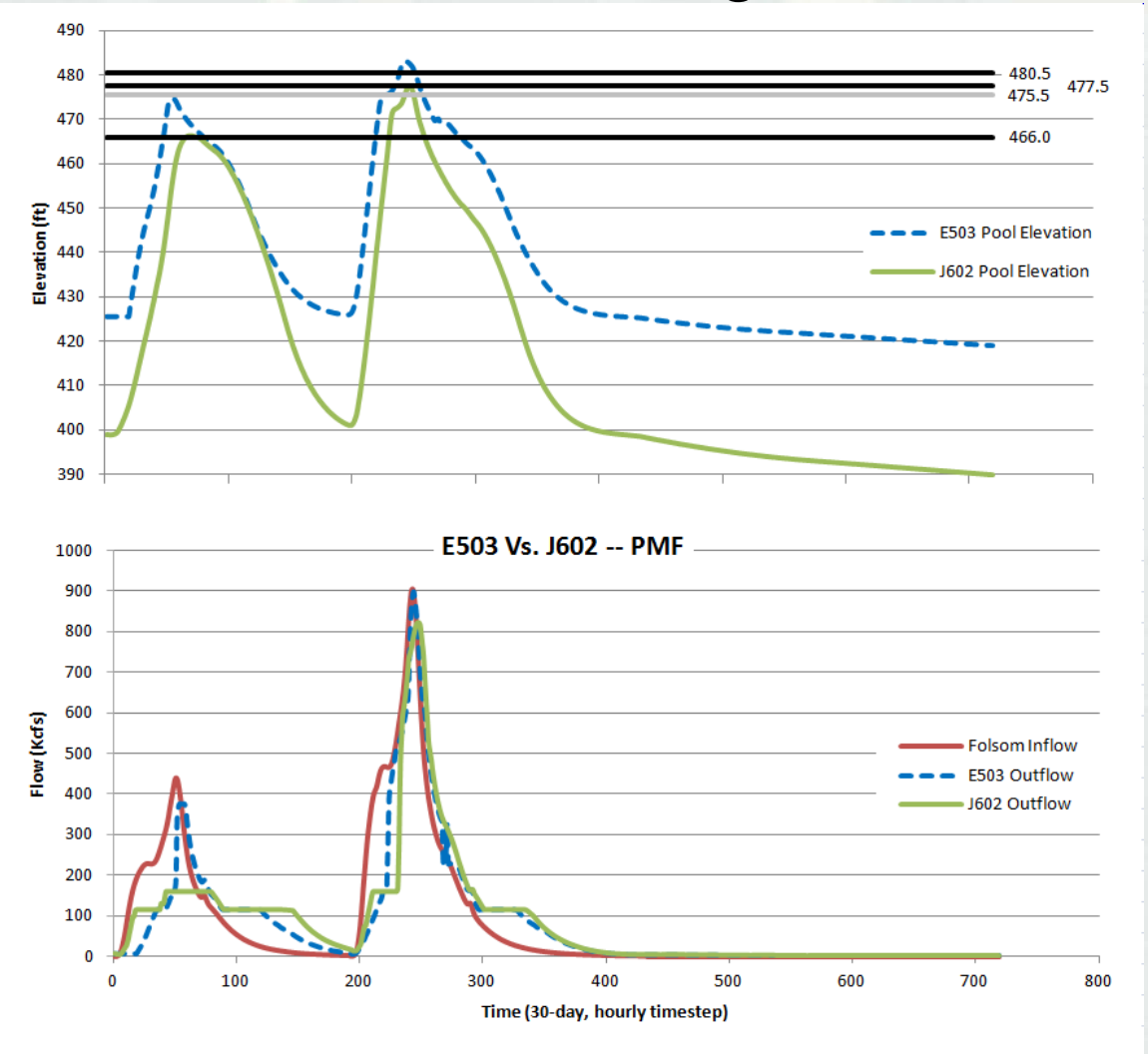
Cumulative Past Vs. With Project Condition
400-Fixed Vs. 400-600 Flood Control
1/100 Routing



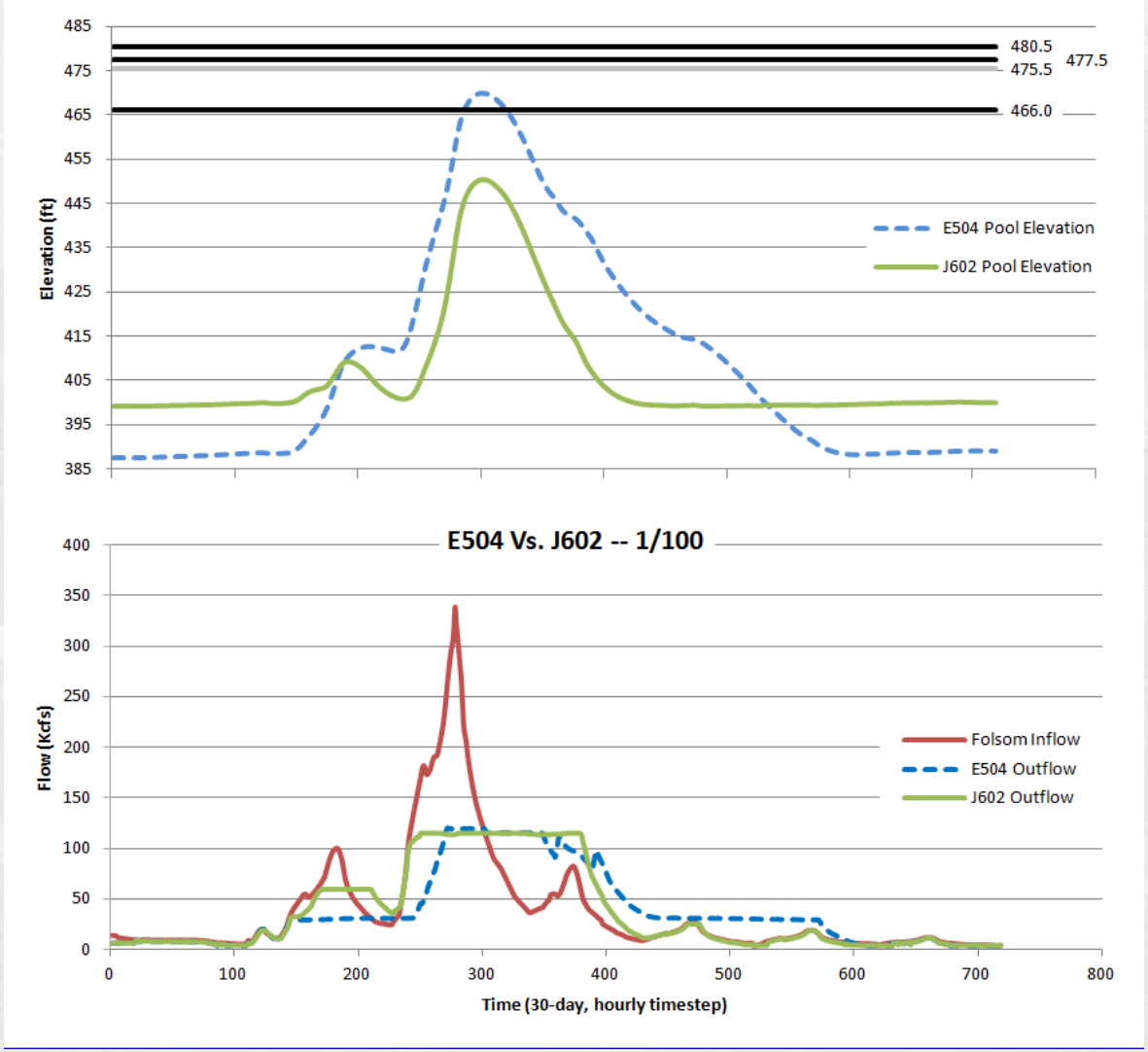
Cumulative Past Vs. With Project Condition
400-Fixed Vs. 400-600 Flood Control
1/200 Routing



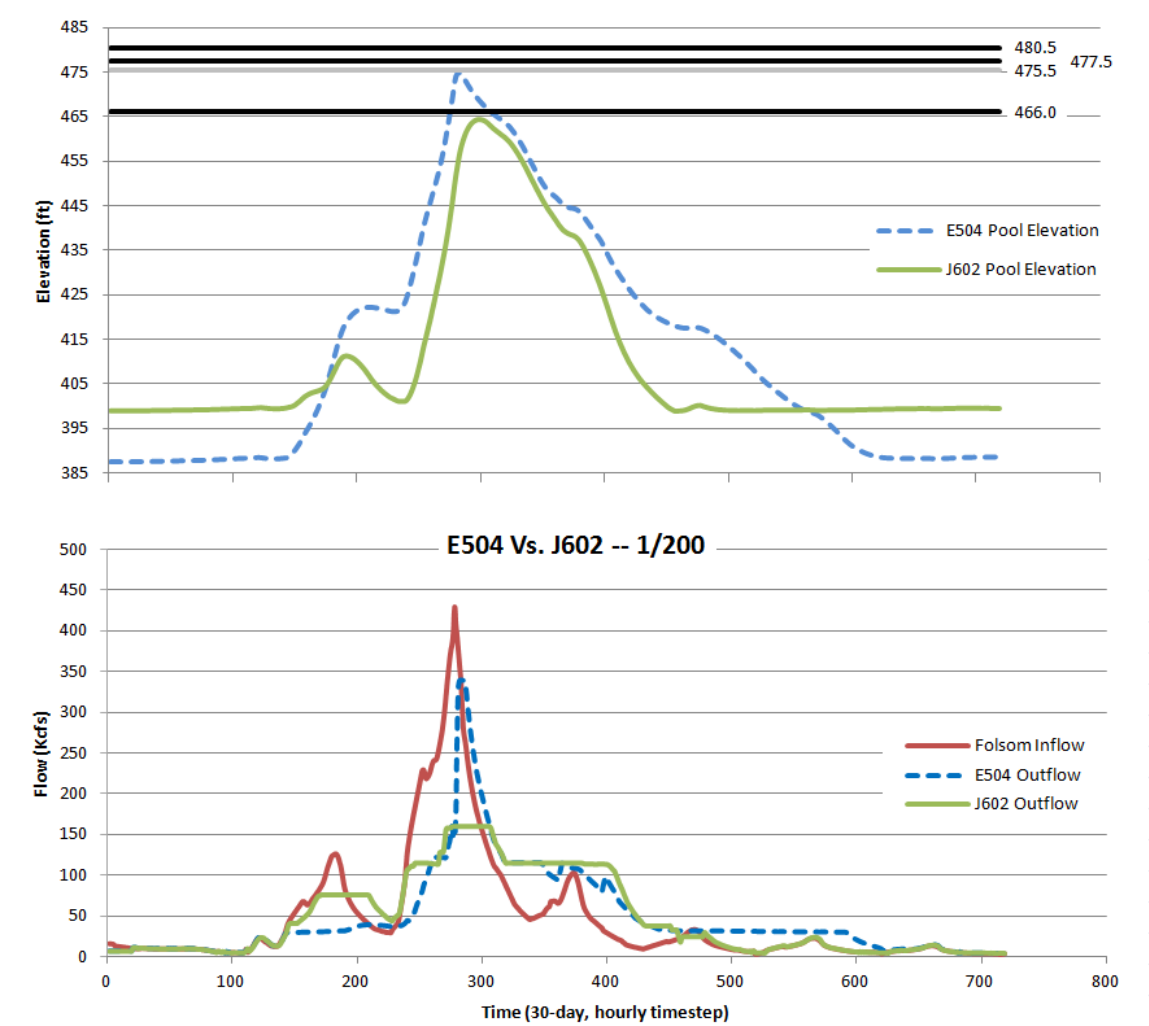
Cumulative Past Vs. With Project Condition 400-Fixed Vs. 400-600 Flood Control PMF Routing



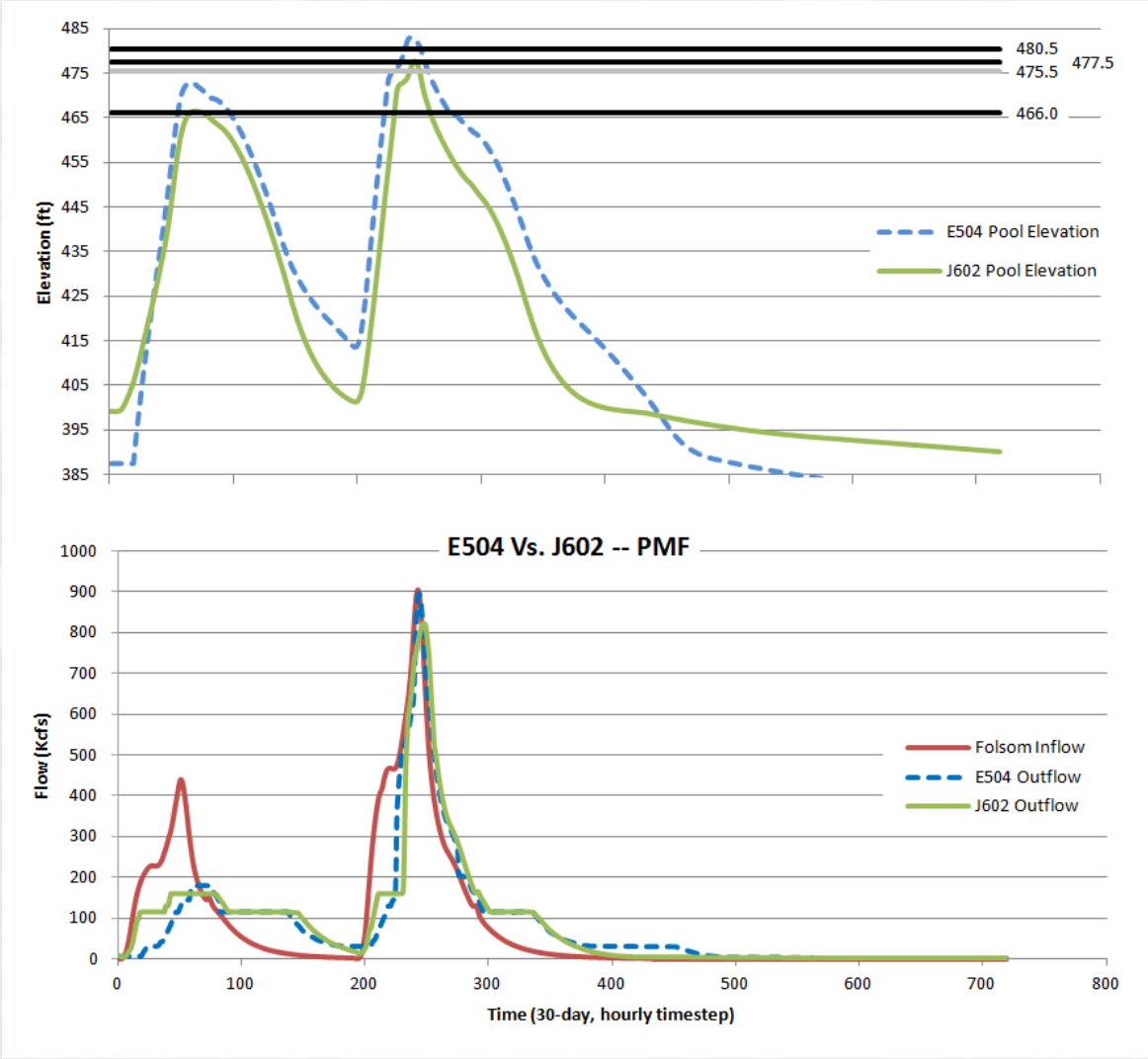
Existing Vs. With Project Condition 400-670 Vs. 400-600 Flood Control 1/100 Routing



Existing Vs. With Project Condition 400-670 Vs. 400-600 Flood Control 1/200 Routing



Existing Vs. With Project Condition 400-670 Vs. 400-600 Flood Control PMF Routing

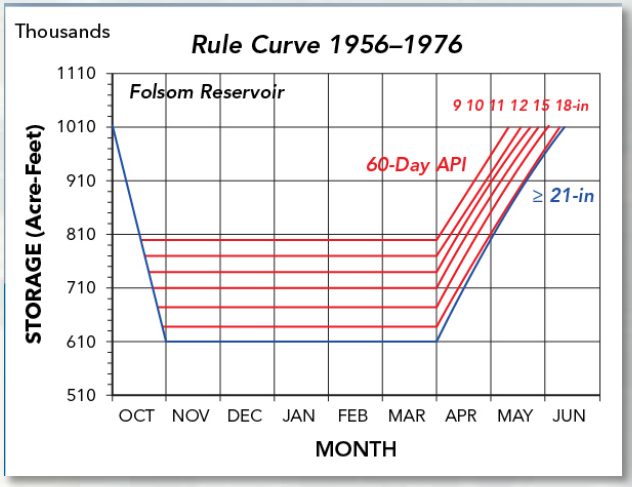


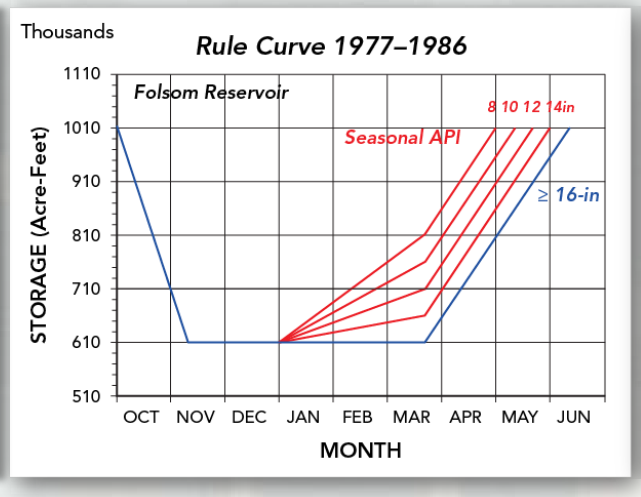
Basin Wetness

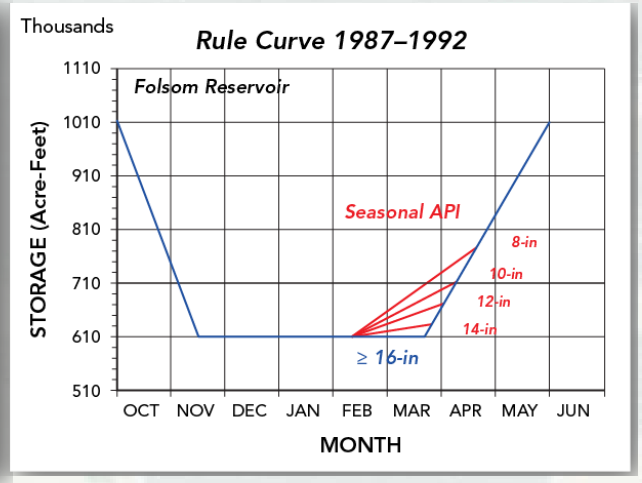
Basin Wetness Index

- Index could be based on basin precipitation, inflow, or projected snowmelt runoff.
- An index has been utilized in the past:

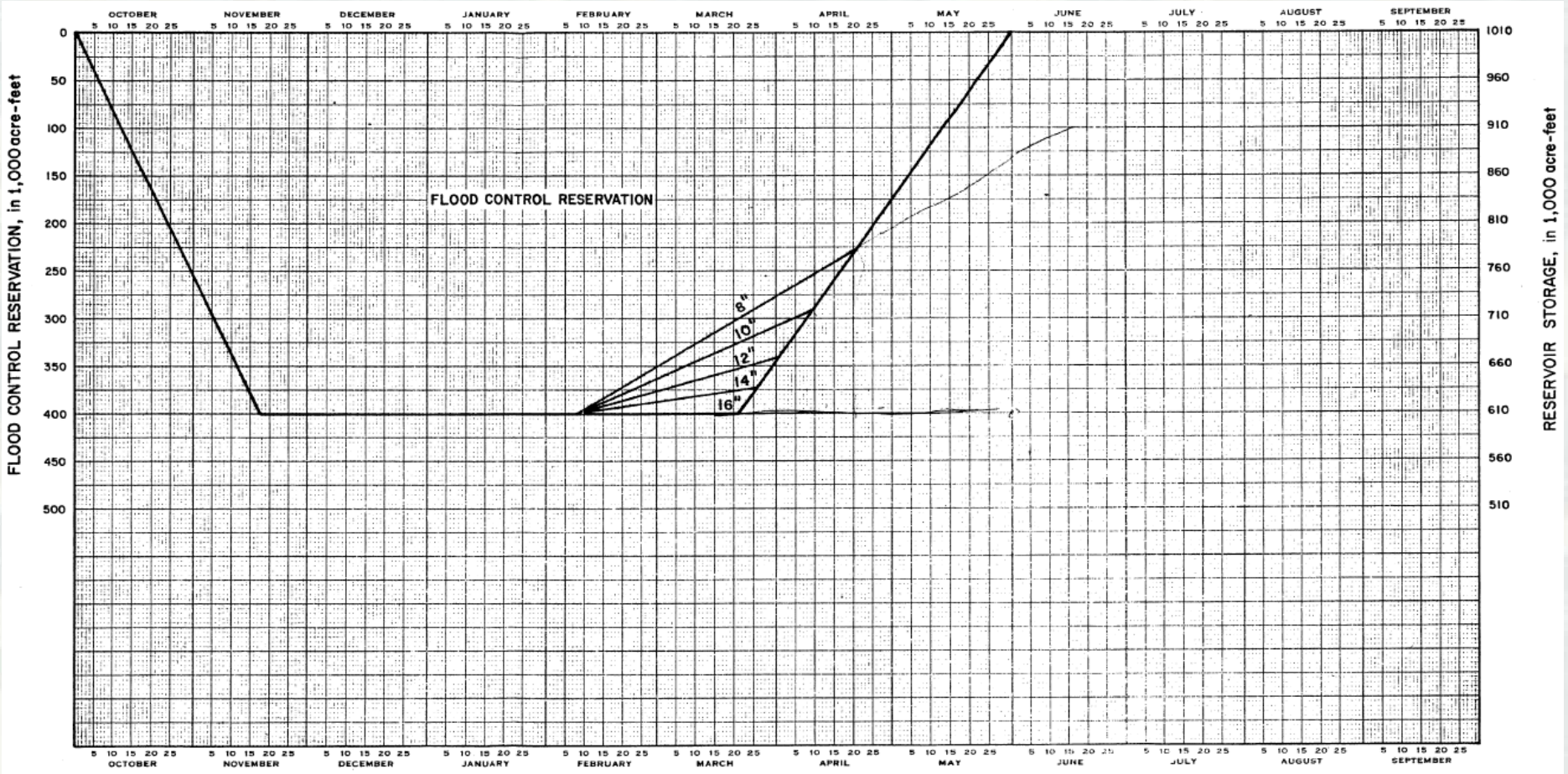
$$PAR = P_{(today)} + [(\%\ Persistence) * PAR_{(yesterday)}]$$



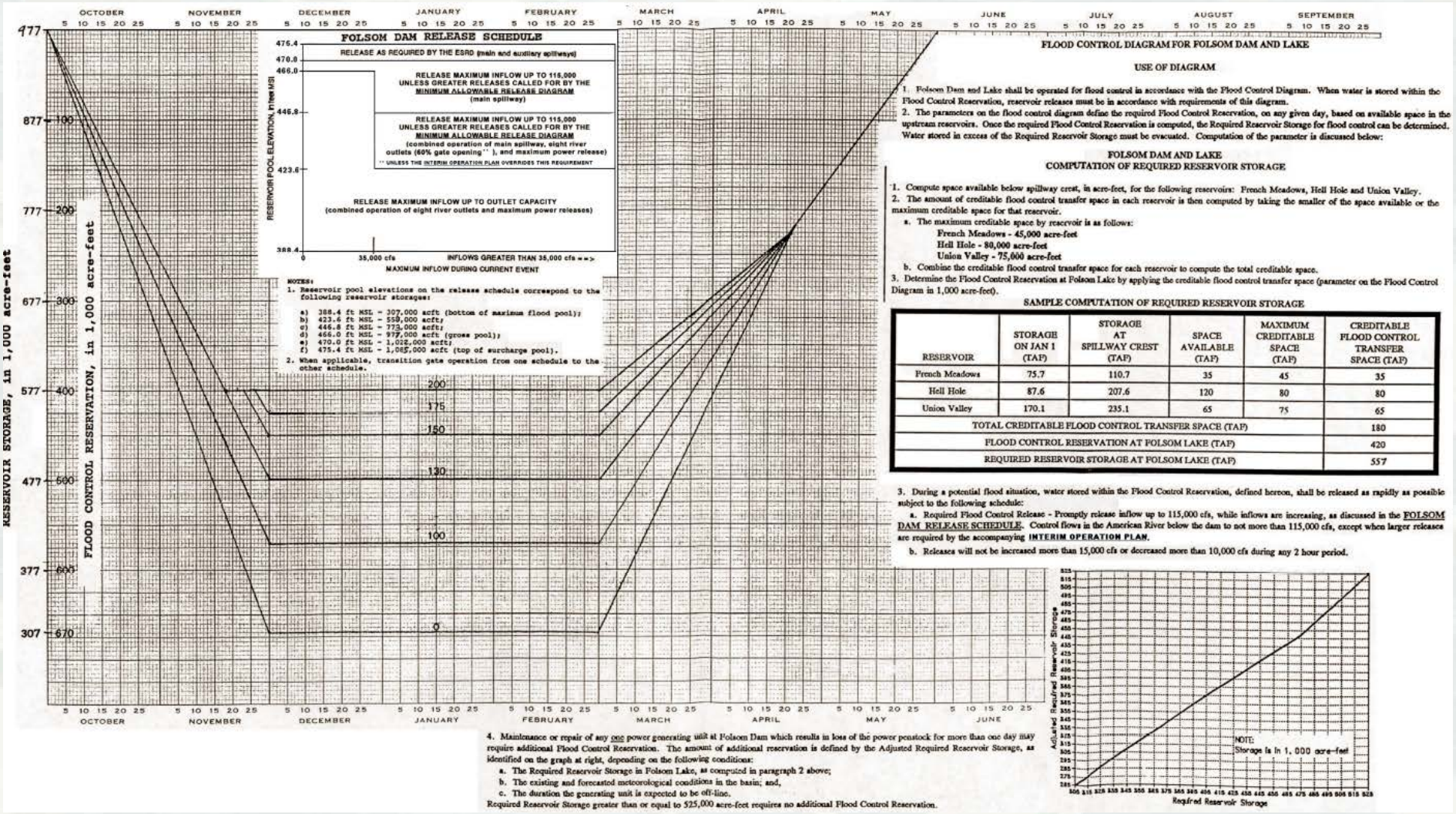




Basin Wetness Index



Basin Wetness Index



FOLSOM DAM RELEASE SCHEDULE

RELEASE AS REQUIRED BY THE ESRD (main and auxiliary spillways)

RELEASE MAXIMUM INFLOW UP TO 115,000 UNLESS GREATER RELEASES CALLED FOR BY THE MINIMUM ALLOWABLE RELEASE DIAGRAM (main spillway)

RELEASE MAXIMUM INFLOW UP TO 115,000 UNLESS GREATER RELEASES CALLED FOR BY THE MINIMUM ALLOWABLE RELEASE DIAGRAM (combined operation of main spillway, eight river outlets (60% gate opening **), and maximum power release)

** UNLESS THE INTERIM OPERATION PLAN OVERRIDES THIS REQUIREMENT

RELEASE MAXIMUM INFLOW UP TO OUTLET CAPACITY (combined operation of eight river outlets and maximum power releases)

RESERVOIR POOL ELEVATION, in feet MSL: 475.4, 470.0, 466.0, 446.8, 423.6, 388.4

0 — 35,000 cfs — INFLOWS GREATER THAN 35,000 cfs ==>

MAXIMUM INFLOW DURING CURRENT EVENT

NOTES:
1. Reservoir pool elevations on the release schedule correspond to the following reservoir storages:
   a) 388.4 ft MSL - 307,000 acft (bottom of maximum flood pool);
   b) 423.6 ft MSL - 559,000 acft;
   c) 446.8 ft MSL - 775,000 acft;
   d) 466.0 ft MSL - 977,000 acft (gross pool);
   e) 470.0 ft MSL - 1,028,000 acft;
   f) 475.4 ft MSL - 1,085,000 acft (top of surcharge pool).
2. When applicable, transition gate operation from one schedule to the other schedule.

FLOOD CONTROL DIAGRAM FOR FOLSOM DAM AND LAKE

USE OF DIAGRAM

1. Folsom Dam and Lake shall be operated for flood control in accordance with the Flood Control Diagram. When water is stored within the Flood Control Reservation, reservoir releases must be in accordance with requirements of this diagram.
2. The parameters on the flood control diagram define the required Flood Control Reservation, on any given day, based on available space in the upstream reservoirs. Once the required Flood Control Reservation is computed, the Required Reservoir Storage for flood control can be determined. Water stored in excess of the Required Reservoir Storage must be evacuated. Computation of the parameter is discussed below:

FOLSOM DAM AND LAKE
COMPUTATION OF REQUIRED RESERVOIR STORAGE

1. Compute space available below spillway crest, in acre-feet, for the following reservoirs: French Meadows, Hell Hole and Union Valley.
2. The amount of creditable flood control transfer space in each reservoir is then computed by taking the smaller of the space available or the maximum creditable space for that reservoir.
   a. The maximum creditable space by reservoir is as follows:
      French Meadows - 45,000 acre-feet
      Hell Hole - 80,000 acre-feet
      Union Valley - 75,000 acre-feet
   b. Combine the creditable flood control transfer space for each reservoir to compute the total creditable space.
3. Determine the Flood Control Reservation at Folsom Lake by applying the creditable flood control transfer space (parameter on the Flood Control Diagram in 1,000 acre-feet).

SAMPLE COMPUTATION OF REQUIRED RESERVOIR STORAGE

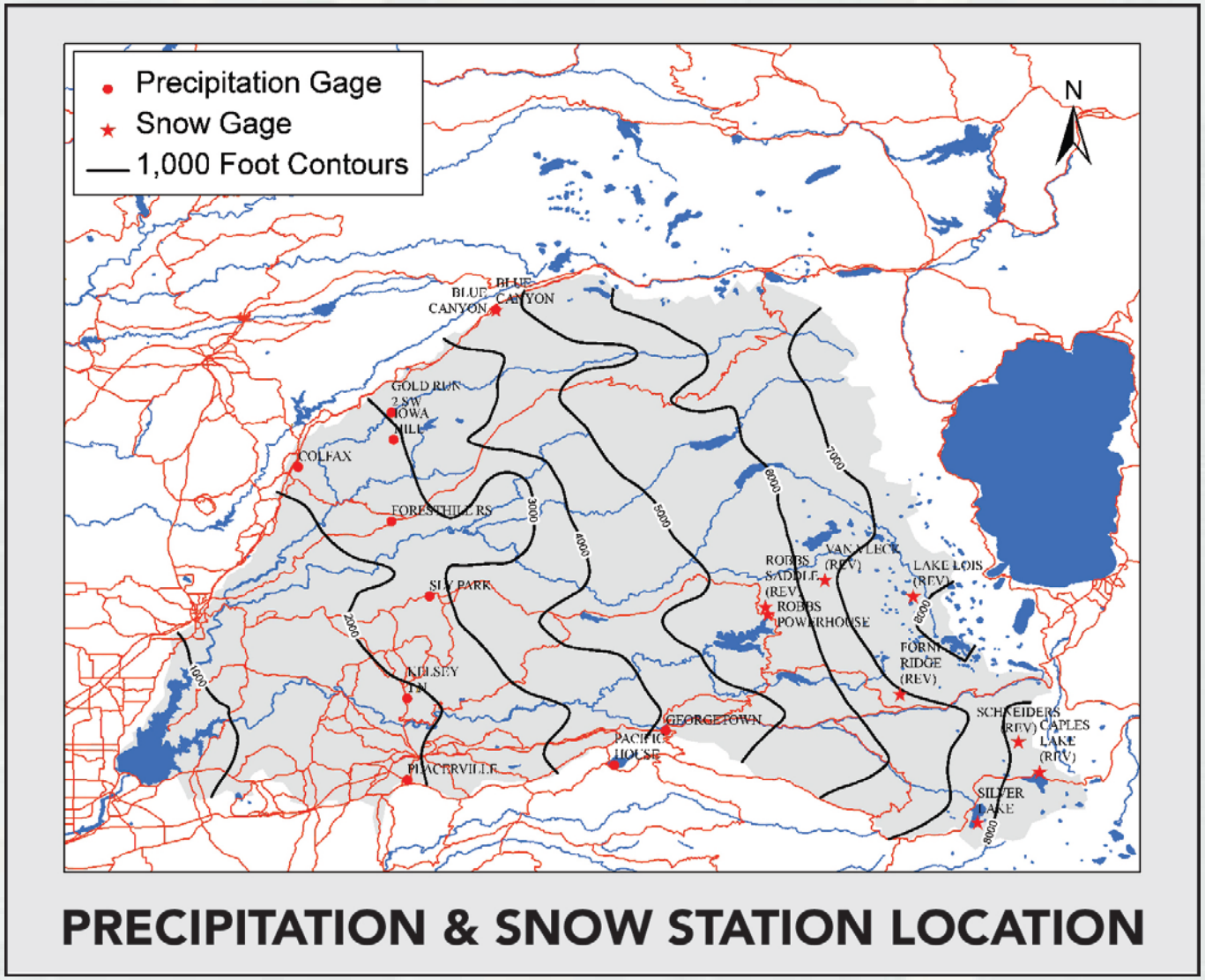
RESERVOIR	STORAGE ON JAN 1 (TAF)	STORAGE AT SPILLWAY CREST (TAF)	SPACE AVAILABLE (TAF)	MAXIMUM CREDITABLE SPACE (TAF)	CREDITABLE FLOOD CONTROL TRANSFER SPACE (TAF)
French Meadows	75.7	110.7	35	45	35
Hell Hole	87.6	207.6	120	80	80
Union Valley	170.1	235.1	65	75	65
TOTAL CREDITABLE FLOOD CONTROL TRANSFER SPACE (TAF)					180
FLOOD CONTROL RESERVATION AT FOLSOM LAKE (TAF)					420
REQUIRED RESERVOIR STORAGE AT FOLSOM LAKE (TAF)					557

3. During a potential flood situation, water stored within the Flood Control Reservation, defined herein, shall be released as rapidly as possible subject to the following schedule:
   a. Required Flood Control Release - Promptly release inflow up to 115,000 cfs, while inflows are increasing, as discussed in the FOLSOM DAM RELEASE SCHEDULE. Control flows in the American River below the dam to not more than 115,000 cfs, except when larger releases are required by the accompanying INTERIM OPERATION PLAN.
   b. Releases will not be increased more than 15,000 cfs or decreased more than 10,000 cfs during any 2 hour period.

4. Maintenance or repair of any one power generating unit at Folsom Dam which results in loss of the power penstock for more than one day may require additional Flood Control Reservation. The amount of additional reservation is defined by the Adjusted Required Reservoir Storage, as identified on the graph at right, depending on the following conditions:
   a. The Required Reservoir Storage in Folsom Lake, as computed in paragraph 2 above;
   b. The existing and forecasted meteorological conditions in the basin; and,
   c. The duration the generating unit is expected to be off-line.

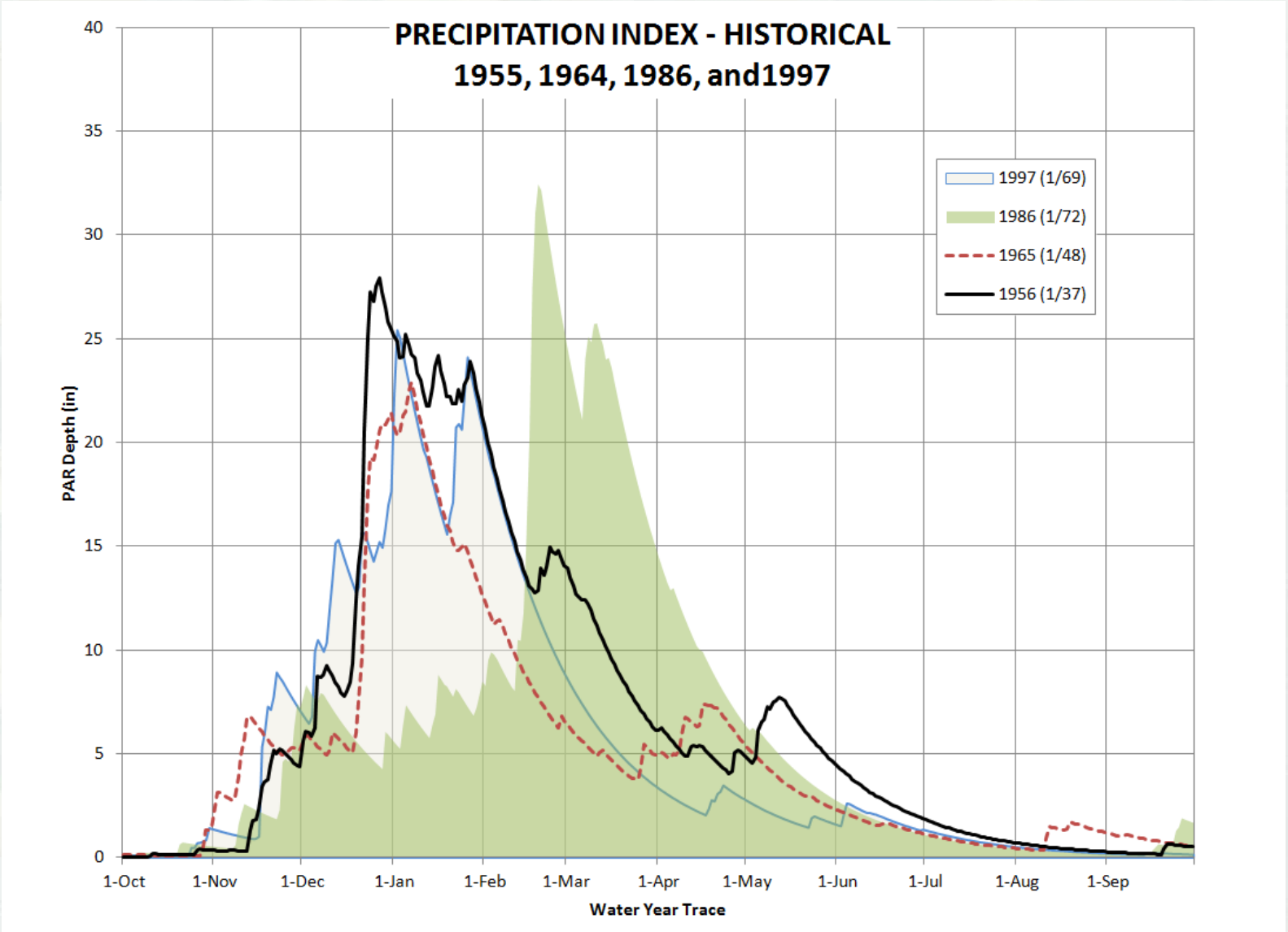
Required Reservoir Storage greater than or equal to 525,000 acre-feet requires no additional Flood Control Reservation.

Basin Wetness Index

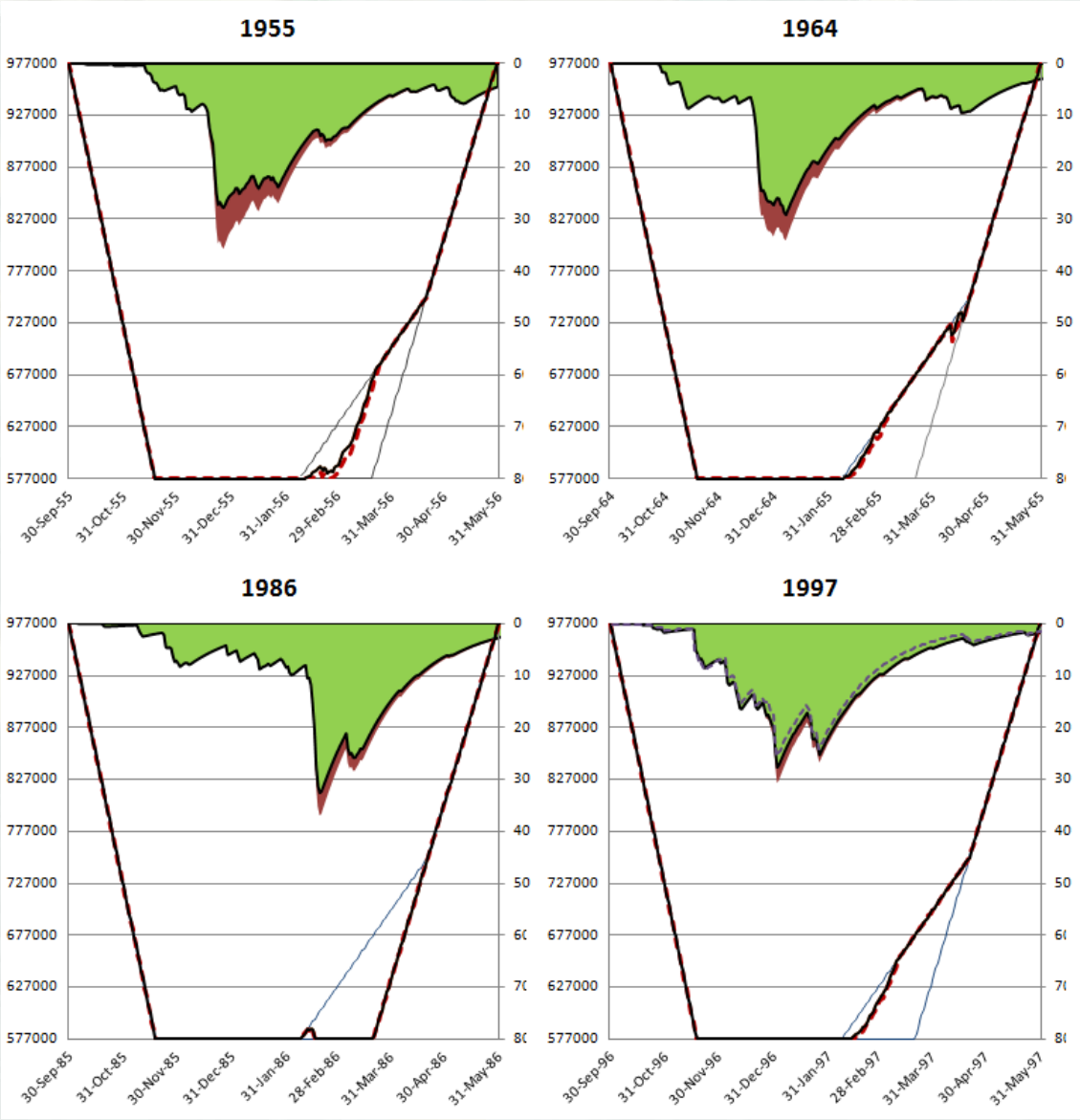


PRECIPITATION & SNOW STATION LOCATION

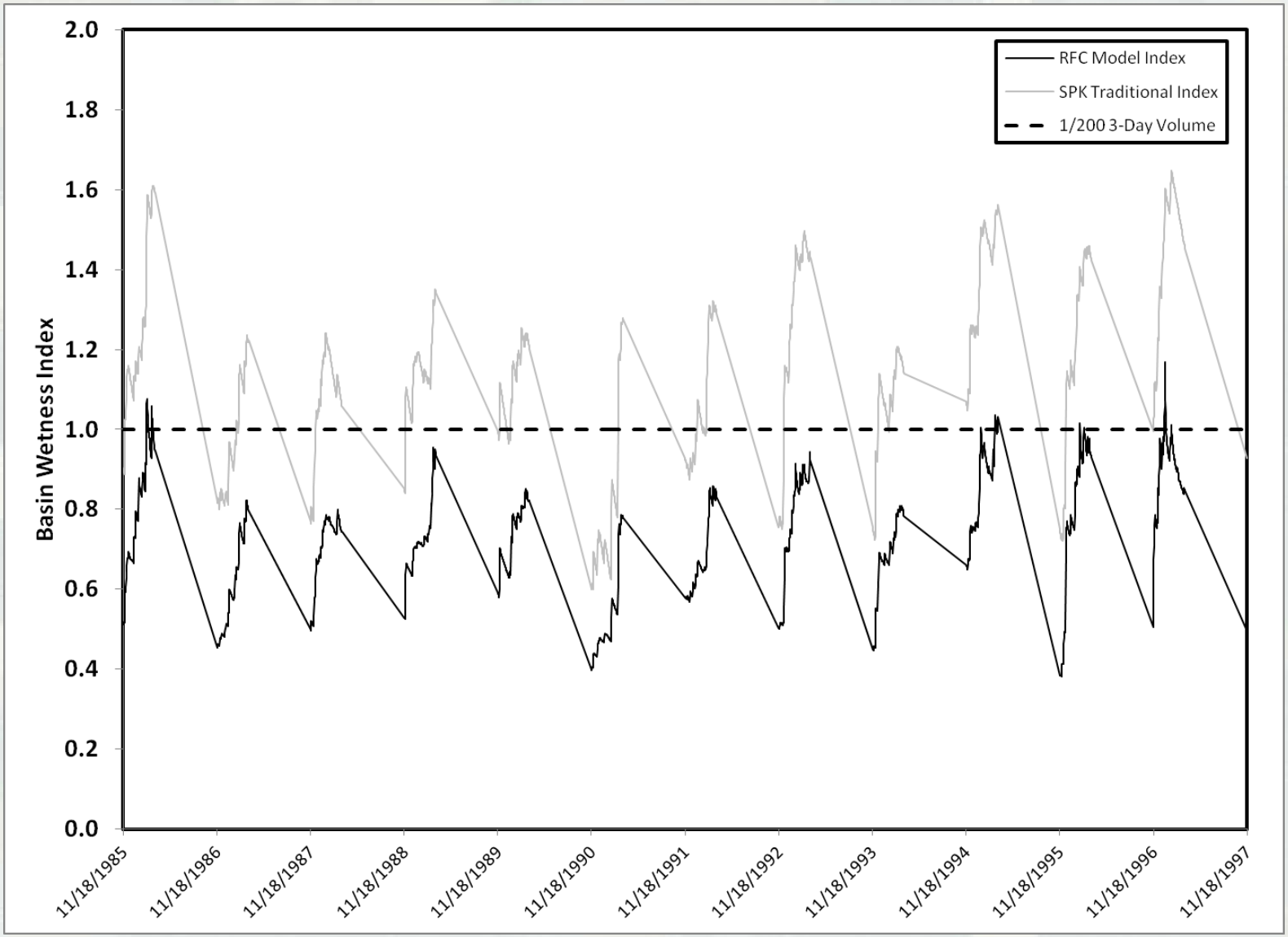
Basin Wetness Index



Basin Wetness Index



Basin Wetness Index



Discussion / Questions

GROUP DISCUSSION
&
SUMMARY COMMENTS

- Summary Discussion.
  - Existing issues and concerns addressed
  - New issues and concerns from today's meeting

Closing Remarks