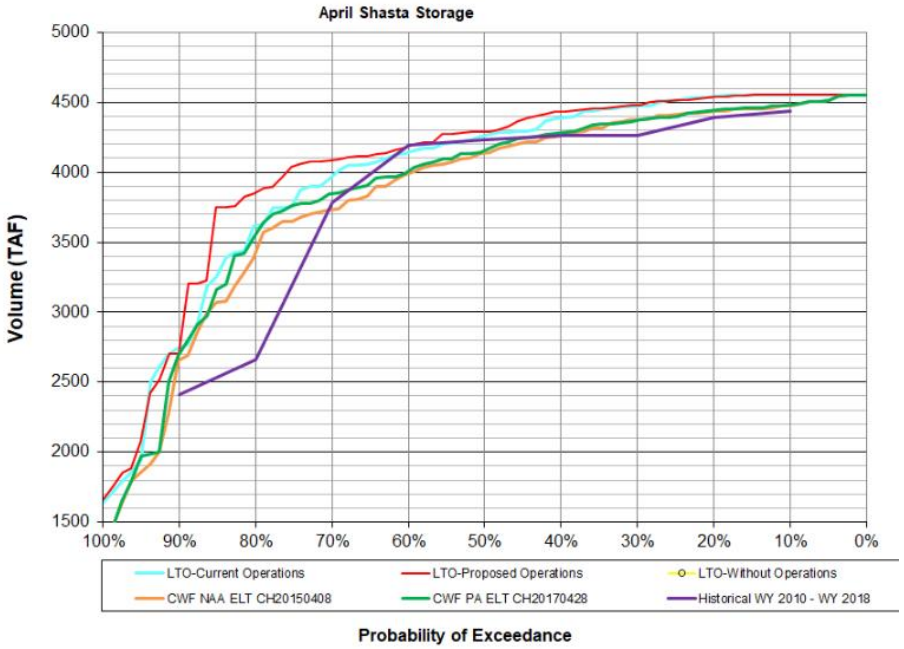
20190339 UPDATED Summary of Derek Hilts' responses to NOAA questions regarding CalSimII modeling of the Current Operations Scenario (COS) and Proposed Action Scenario (PA) done for Reclamation's Biological Assessment for the Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project (ROConLTO) and Shasta Temperature Operations outlined in the Proposed Action

1. Frequency of May 1st storage being at 4.0 and 4.1 MAF

    a. The PA simulation showed Shasta storage was at or above 4.0 MAF (the potential threshold for doing a pulse flow on the Sacramento) 75% of years.

    b. The PA simulation showed Shasta storage was at or above 4.1 MAF (the threshold for using Tier 1 summer temperature approach) ~ 69% of years.

    c. I plotted the ROConLTO COS frequency, ROConLTO PA frequency along with CWF NAA's frequency, CWF last PA's frequency and HISTORICAL frequency. You will notice the CWF runs hit the marks less frequency even though all the simulations are using Early Long Term climate conditions. That is largely due to the ROConLTO PA not including Fall X2, based on the following. I arbitrarily looked at years when the storage was 200 TAF or more higher in the PA. There were 16 such years. Of those, 12 were due to the absence of Fall X2 in the preceding Fall and 3 were due to persistence from a prior year with Fall X2. Please note, the PA storage varied in those years, I was only looking at the relative storage differences. The picture would become much cloudier and year/month specific if I were to look at years using a smaller difference as my criterion. Also contributing to ROConLTO PA's greater May 1st is the reduced deliveries to Sacramento River Settlement Contractors (now limited to historical levels of diversion) which wasn't in the CWF modeling.



d. The Historical frequency varies depending which years one considers. Below is a summary of that.

	Period used	% of time > 4.0	% of time > 4.1	
i.				
ii.	1953-2018	67%	57%	(limit of readily available data)
iii.	1980-2018	64%	49%	(since New Melones and D1485)
iv.	1996-2018	67%	52%	(since D1641)
v.	2010-2018	65%	62%	(since the NMFS BiOp)

2. Frequency of PA's Tier 1, Tier 2, Tier 3, Tier4 implementation

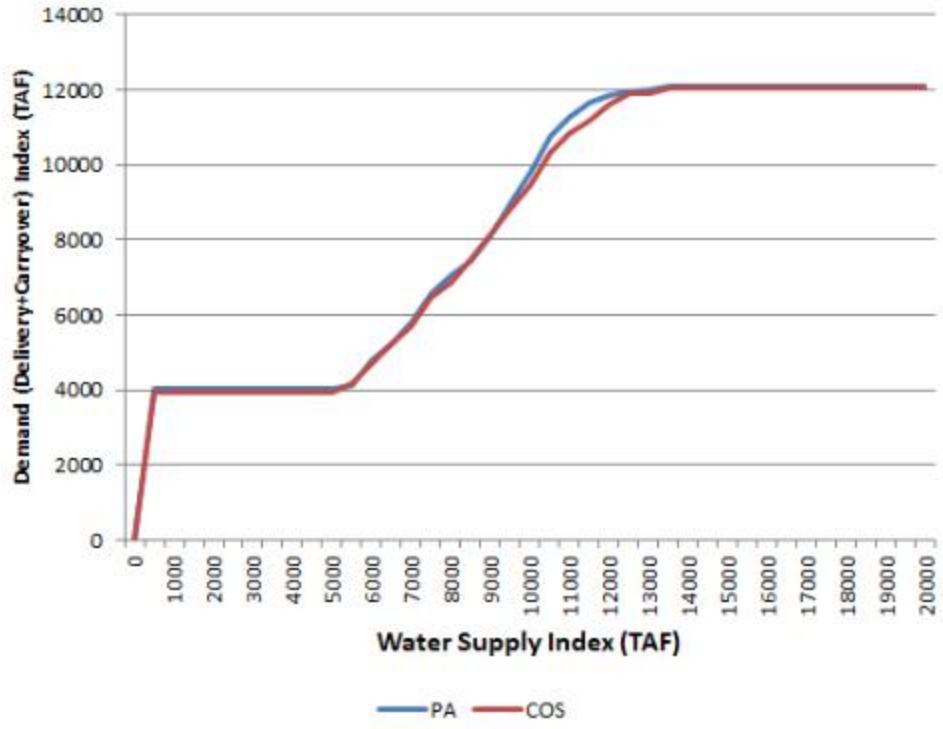
   a. Ostensibly, based on Appendix A (pages 4-28 and 4-29), I think the HEC-5Q modelers would have simulated Tier 1 ops when CalSimII-simulated May 1st Shasta storage was at or above 4.1 MAF (corresponding to a cold water pool of 2.8 MAF). Similarly, Tier 2 ops presumably would have been simulated when CalSimII-simulated May 1st Shasta storage was at or above 3.5 MAF (corresponding to a cold water pool of 2.3 MAF). Similarly, Tier 3 ops presumably would have been simulated until CalSimII-simulated May 1st Shasta storage was at or below 2.5 MAF (corresponding to a cold water pool of 1.5 MAF) at which point Tier 4 ops would have been simulated.

   b. Per an email from Katrina Harrison (USBR), "when we did the TCD shutter operation in the 5Q model, we just tried to get it as good as possible targeting colder temps in July / August, with the available cold water resource. We did not split it into tiers first."

3. Provisions in the COS modeling to explicitly build Shasta storage.

   a. The only thing I found that could be called explicit was NCP's minimum flow requirement that is set based on Shasta storage conditions and contractor allocations. Another thing that helps build storage relative to older CalSimII studies is the relaxation of delta standards during drought conditions. USBR put in logic to mimic the SWRCB's TUCP process during these very dry conditions.

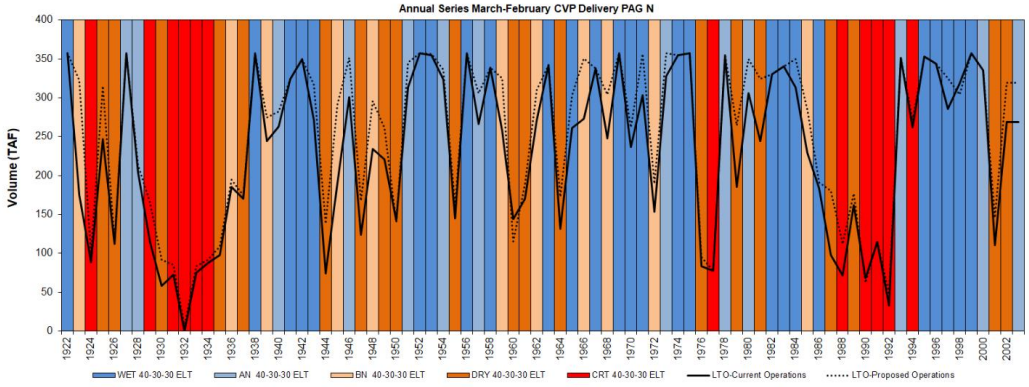
   b. Lastly, CalSimII modelers input many things that affect the balance between annual deliveries and annual carryover and the balance between the various CVP reservoirs. The input file splitting the estimated quantity of overall available water (called Demand Index or DI) between deliveries and carryover is the same in the COS and PA simulations (filename=delcar_cvp_sys.table). This is essentially general guidance to CalSimII. It doesn't ensure specific reservoir carryover levels. The input files that annually identifies overall available water (DI) for a given water supply index (WSI) are almost the same between the COS and the PA simulations. See chart below. The blue line being slightly higher than the red line suggests the PA simulation is VERY SLIGHTLY more aggressive about delivering water.



The input files balancing the CVP reservoirs in the COS and PA use the same logic as pre-ROConLTO runs (e.g., the CWF NAA) as far as I can see.

4. Answers to specific question.

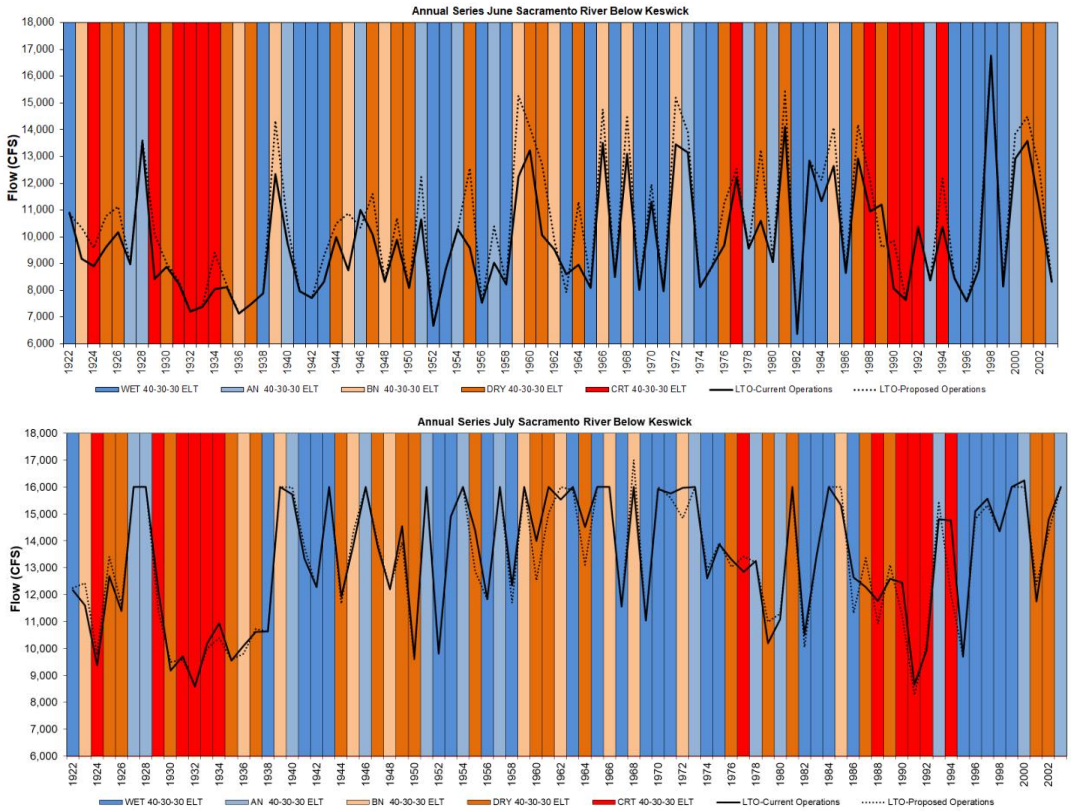
   a. Did CalSimII for the COS simulation in dryer years cut all non-discretionary deliveries? No. Only in 1932 are CVP ag service contracts allocated zero. See chart below.



   b. Did CalSimII for the COS simulation in dryer years explicitly draw on Folsom and Oroville and reduce exports to meet Delta requirements before pulling on Shasta? No, there are many inputs that work together to keep the reservoirs in balance.

c. Did CalSimII for the COS simulation in dryer years reduce the required flow level at Wilkins? Yes, the required level drops below 5000 cfs as a function of Shasta storage and delivery levels.

d. Did CalSimII for the COS simulation in dryer years explicitly limit June and July flows out of Keswick to 7500 cfs? No. See June releases - first chart below and July releases - second chart below.



e. Did CalSimII for the COS simulation in dryer years consider the location of temperature compliance on the Sacramento? No.

f. What is the frequency of the tiers **based on CalSimII modeling** (End-of-April Shasta storage)? Below is the ostensible frequency, but see Katrina Harrison's comment above.

   i. Tier1 - ~69% of years (May 1st storage at or above 4.1 MAF)
   ii. Tier2 - ~17% of years (May 1st storage between 4.1 MAF and 3.5 MAF)
   iii. Tier3 - ~ 7% of years (May 1st storage between 3.5 MAF and 2.5 MAF)
   iv. Tier4 - ~ 7% of years (May 1st storage below 2.5 MAF)

g. Why is May 1st storage being used as an indicator instead of June 1st? I don't know. Looking at BN, DRY & CRT years, Shasta storage decreases in May, on average, 147 TAF.

h. Are the yeartypes used by CalSimII for Stanislaus operations in Column G of the Conv_Flags worksheet in the trend reporting workbook provided by Jacobs? Yes, Column G of the "Conv_Flags" worksheet is what you should use for 60-20-20 yeartypes at the Early Long Term climate. Those yeartypes match what was input into CalSimII for both the COS and PA runs. HOWEVER, heretofore I was using a timeseries of 60-20-20 ELT yeartypes that classified 1933, 2002 and 2003 as DRY, DRY, DRY rather than CRT, CRT, BN, respectively and apparently the person who generated the yeartype-based values in Table 37-3 must have also used DRY, DRY, DRY despite Column G on "Conv_Flags" because when you use DRY, DRY, DRY for those three water years you get the values AND the yeartype percentages shown in Table 37-3.