

Modeling approach to providing spring outflow

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Longfin Smelt Spring Outflow Requirement

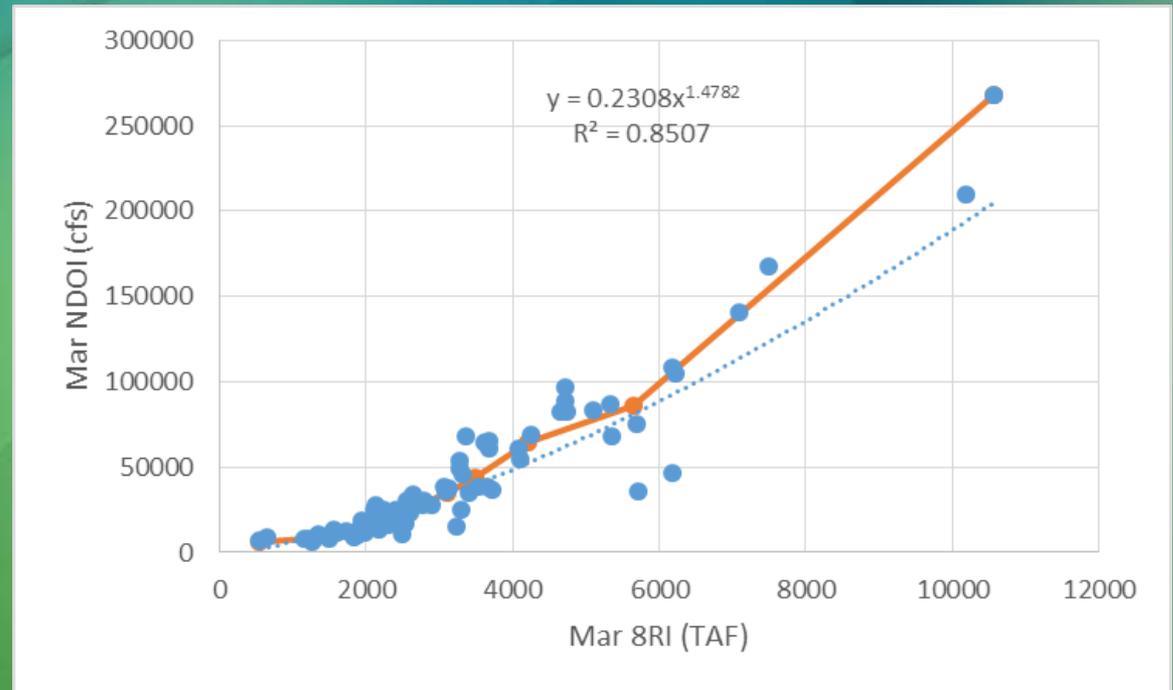
- CWF Proposed Action (PA) described in the Biological Assessment (BA) included a spring outflow requirement.
- Table 3.3-1 of the BA states:
 - “Initial operations will maintain the March–May average delta outflow that would occur with existing facilities under the operational criteria described in the 2008 USFWS BiOp and 2009 NMFS BiOp.”
 - “The 2011 NMFS BiOp action IV.2.1 (San Joaquin River i-e ratio) will be used to constrain Apr–May total Delta exports under the PA to meet March–May Delta outflow targets per current operational practices.”

Longfin Smelt Spring Outflow Requirement

- DWR and CDFW agreed to modify proposed spring (March–May) outflow requirement in the BA as part of the 2081(b) application.
- Modified requirement ensures March – May average outflow under existing climate would be maintained with CWF in the future.
- Modified CWF spring outflow requirement would
 - Maintain incidental increase in spring (Mar-May) Delta outflow resulting from 2008 – 2009 BiOps
 - Maintain Mar – May average outflow under historical climate

Eight River Index vs Net Delta Outflow

March

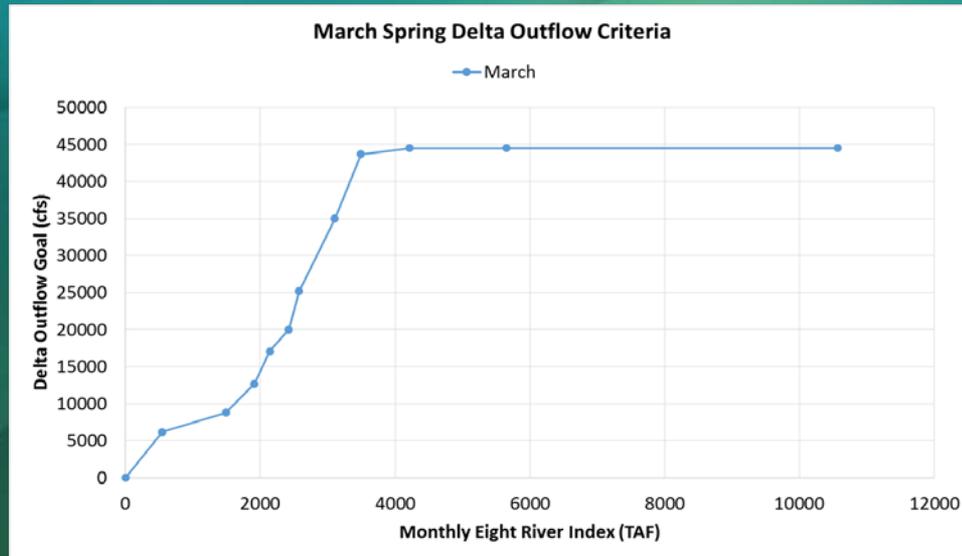


Legend

- 8RI and NDOI with same frequency of exceedance
- Regression relationship

Spring Outflow Criteria

- Determine monthly 8RI based Outflow targets for March



Eight River Index (TAF)	Monthly NDOI (cfs)
0	0
545	6200
1488	8800
1911	12700
2140	17100
2421	20000
2575	25200
3104	35000
3492	43700
4217	44500
5655	44500
10569	44500
99999	44500

Note: NDOI targets are linearly interpolated for 8RI values falling between those shown in the table.

- Use Delta export curtailments during March up to a minimum of 1500 cfs.
- For April and May, determine outflow target based on SJR i-e ratio export constraint up to a maximum DO target of 44,500 cfs.

Modeling of Spring Outflow Criteria

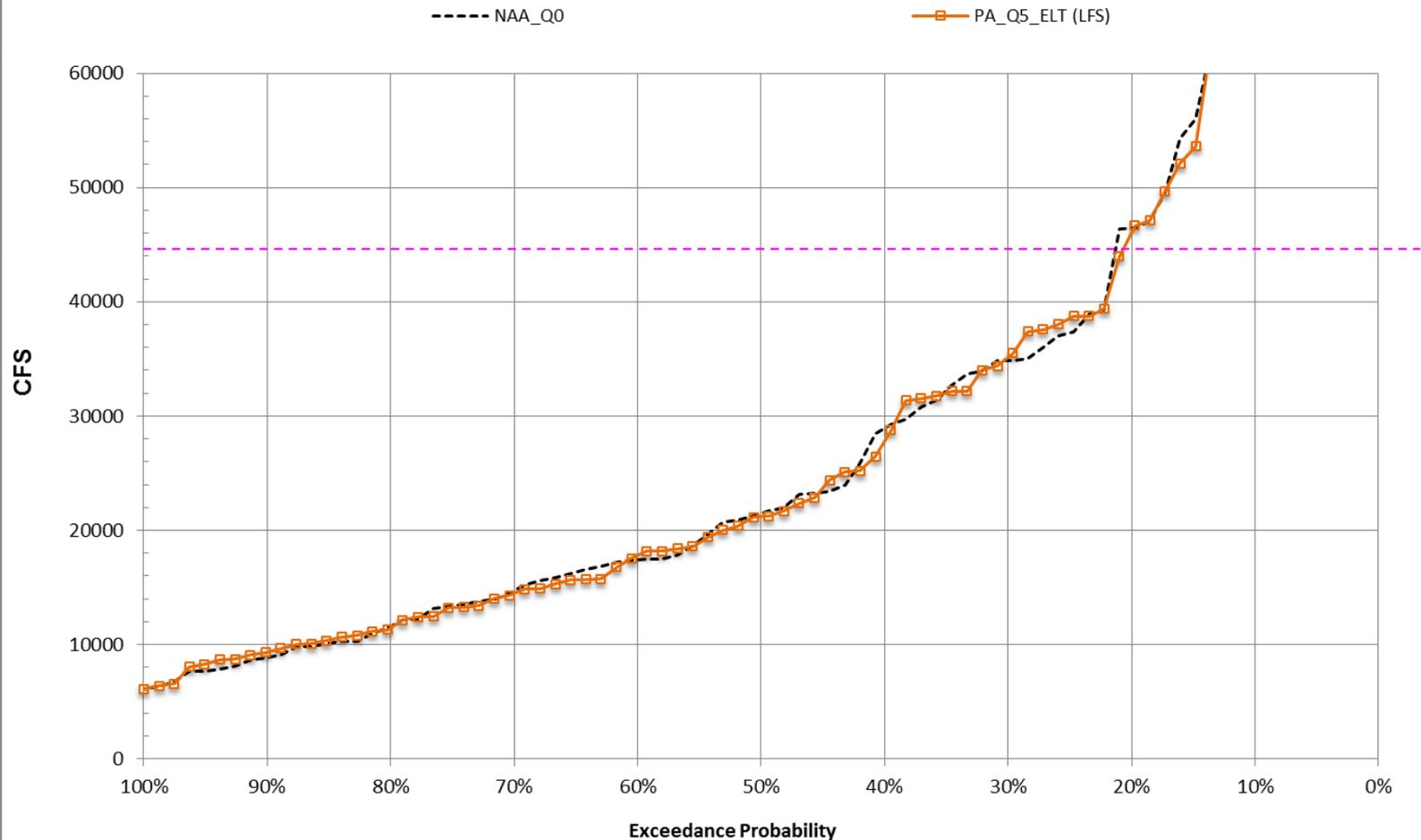
- Determine monthly 8RI based Delta Outflow targets for March.
- Use export curtailments during March up to a minimum of 1500 cfs.
- For Apr and May, total Delta exports constrained per SJR i-e ratio requirement – consistent with the BA.
- Apr and May SJR i-e ratio constraint is relaxed, if Delta Outflow is greater than 44,500 cfs.
- Starting from the PA_Q5_ELT CalSim II model used in the BA, implemented modified spring outflow criteria.
- BA and 2081(b) modeling assumed a certain degree of climate change (Q5_ELT) and sea level rise (15cm) inherent at about year 2030.

Key Modeling Results

March through May Average Delta Outflow

Results Exceedance Probability

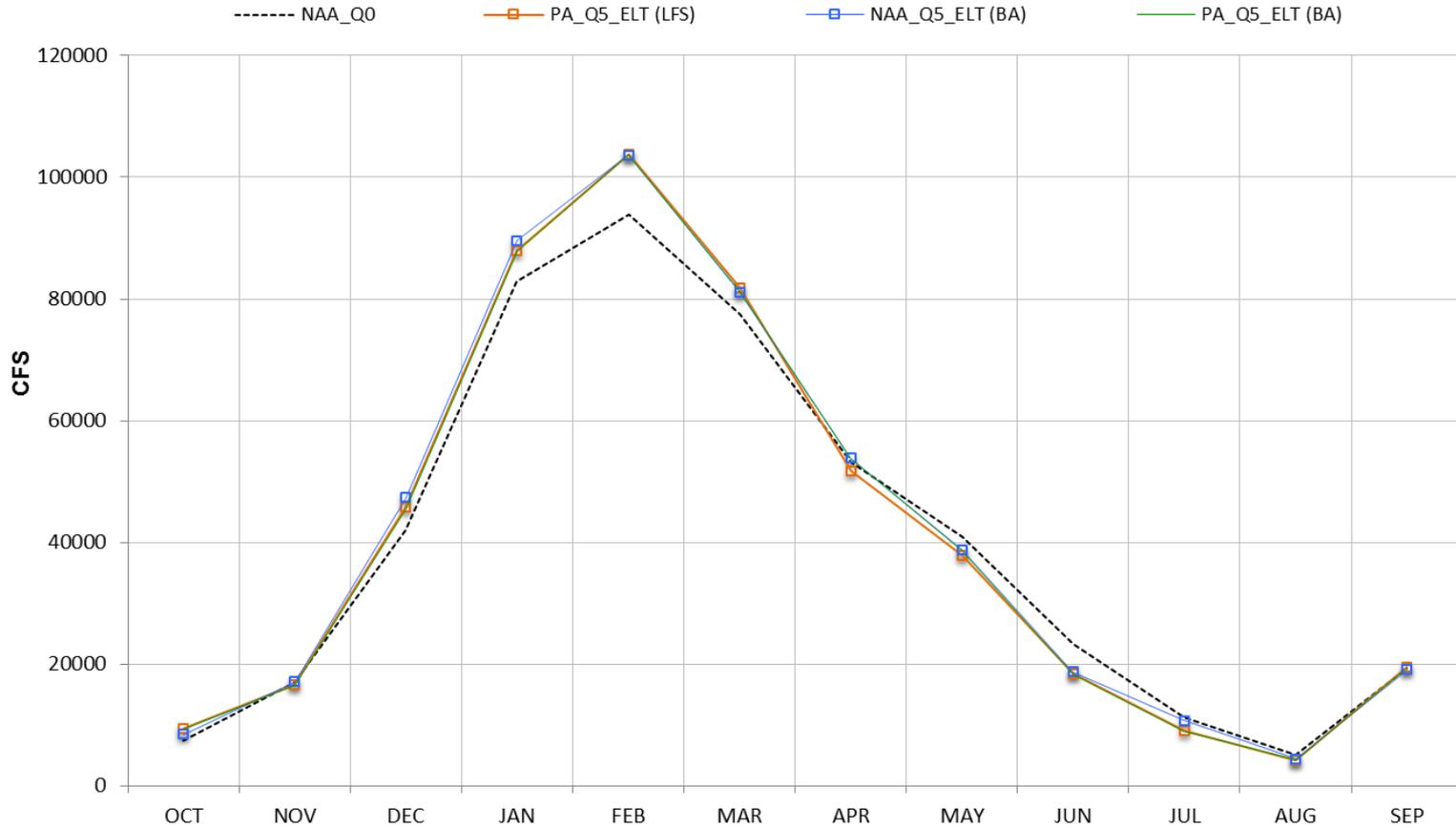
Delta Outflow MAR-MAY period average



Delta Outflow – Wet Year Average

Multi Study Comparison - Monthly Avg Results - WET Years Delta Outflow

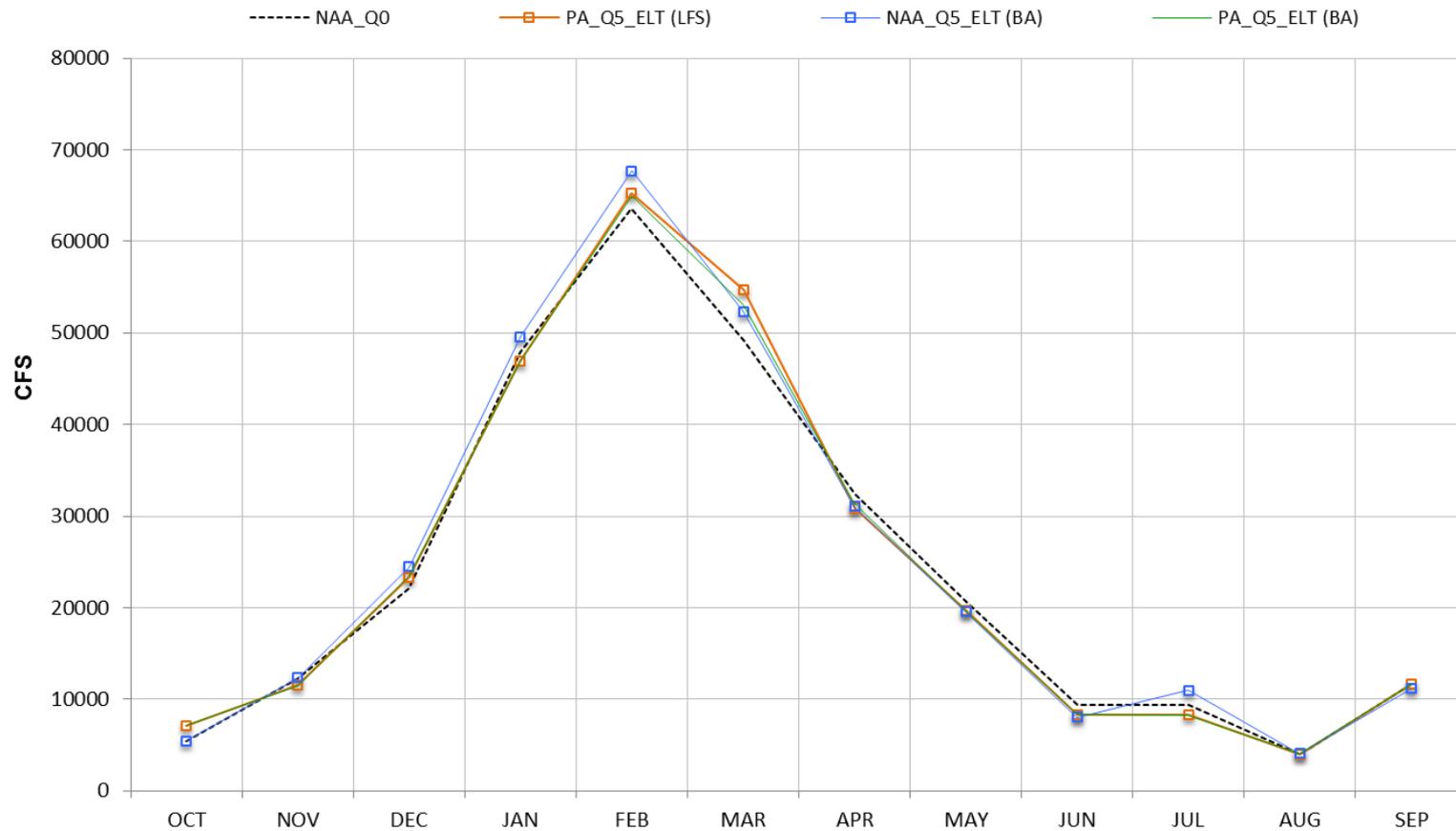
Water Year Classification: SAC 40-30-30



Delta Outflow – Above Normal Year Average

Multi Study Comparison - Monthly Avg Results - ABOVE NORMAL Years Delta Outflow

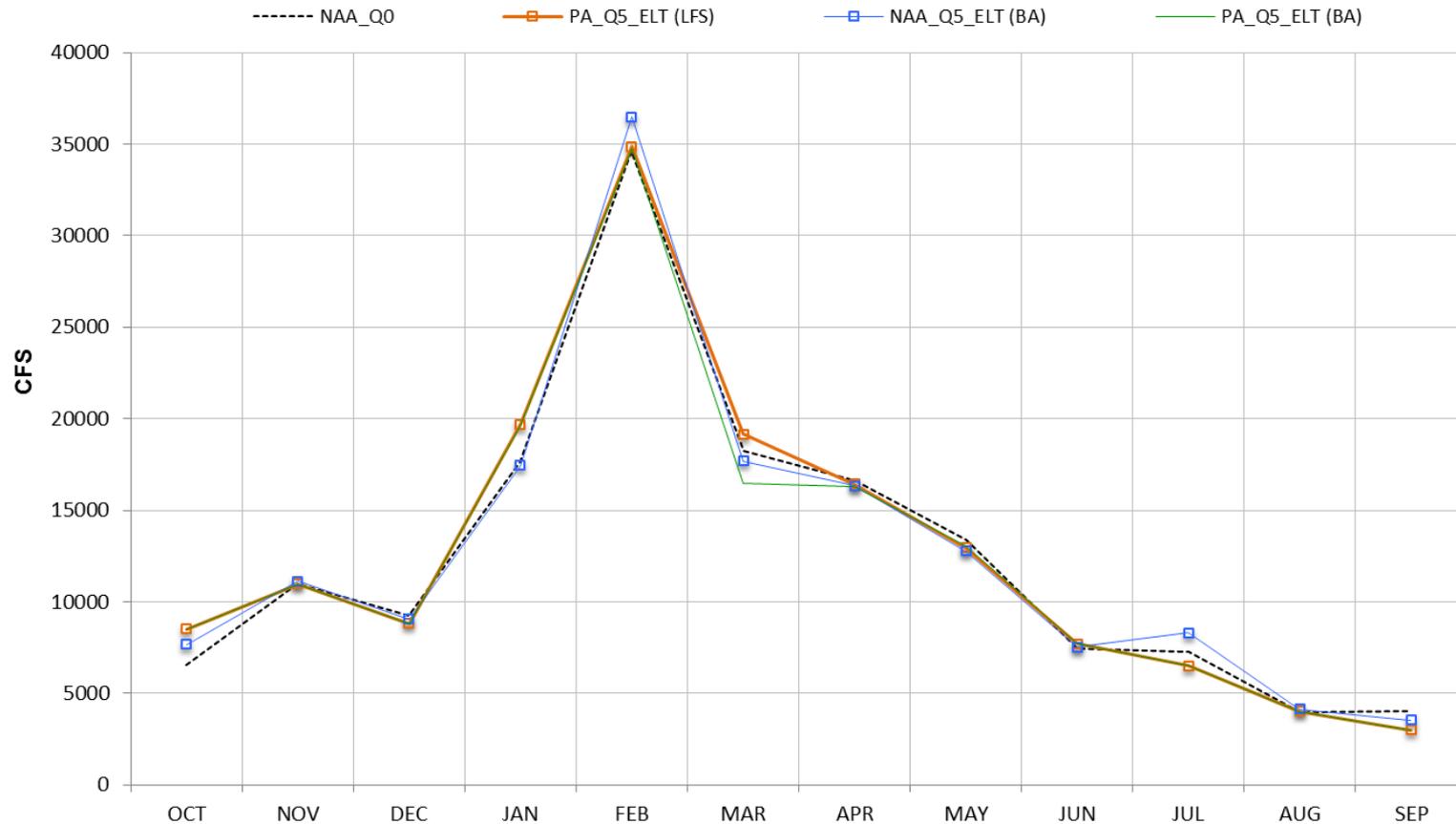
Water Year Classification: SAC 40-30-30



Delta Outflow – Below Normal Year Average

Multi Study Comparison - Monthly Avg Results - BELOW NORMAL Years
Delta Outflow

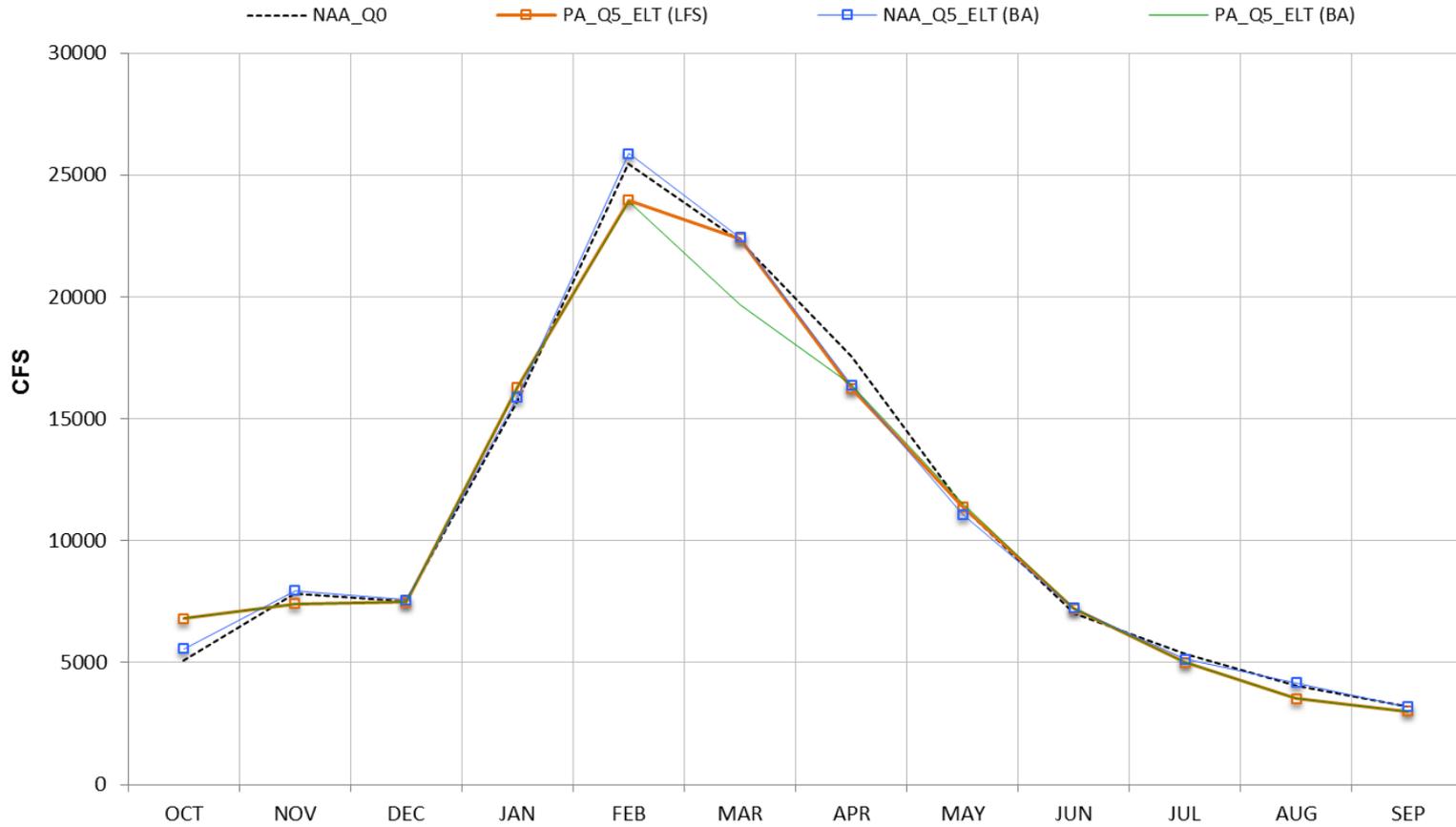
Water Year Classification: SAC 40-30-30



Delta Outflow – Dry Year Average

Multi Study Comparison - Monthly Avg Results - DRY Years Delta Outflow

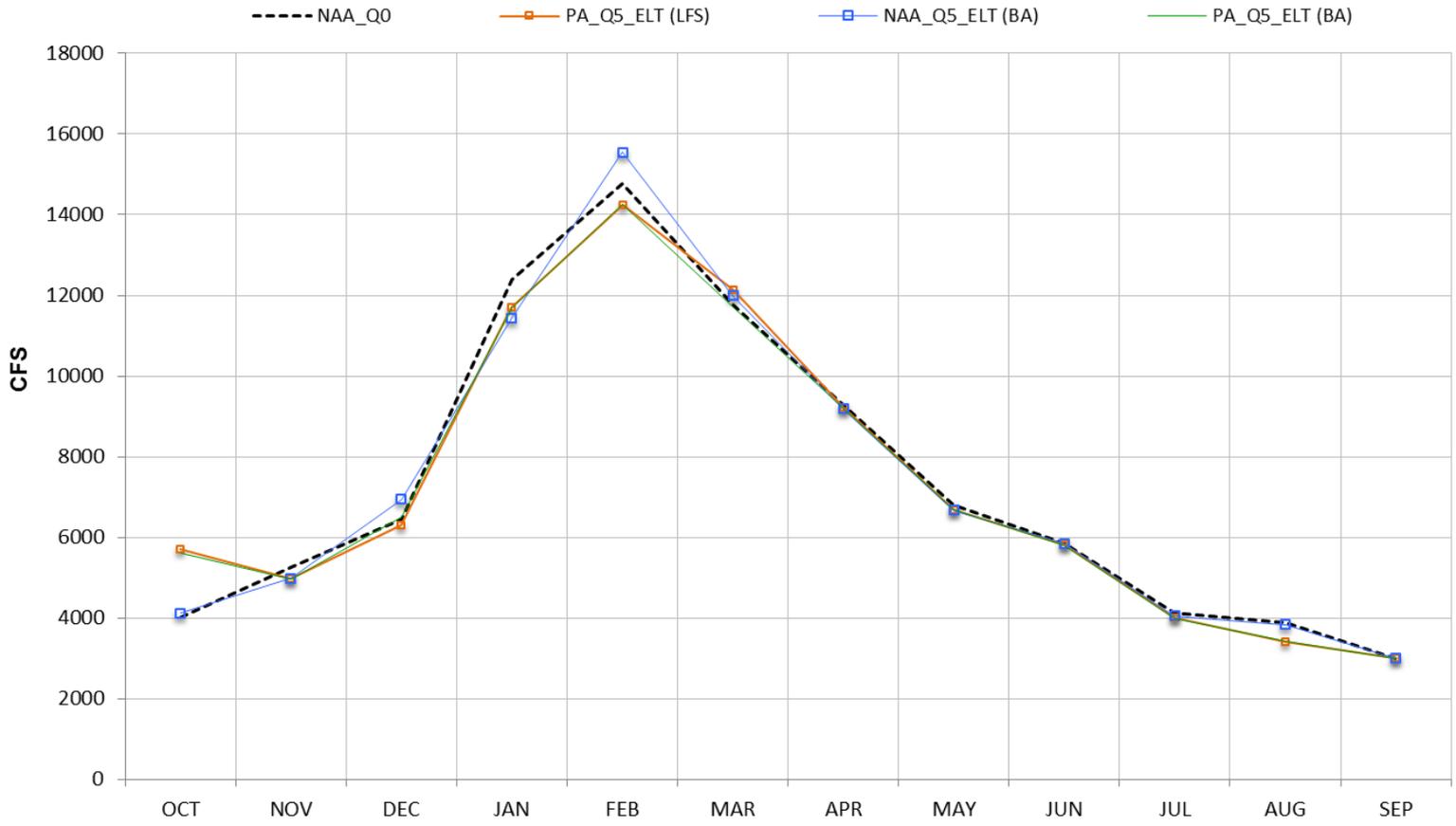
Water Year Classification: SAC 40-30-30



Delta Outflow – Critical Year Average

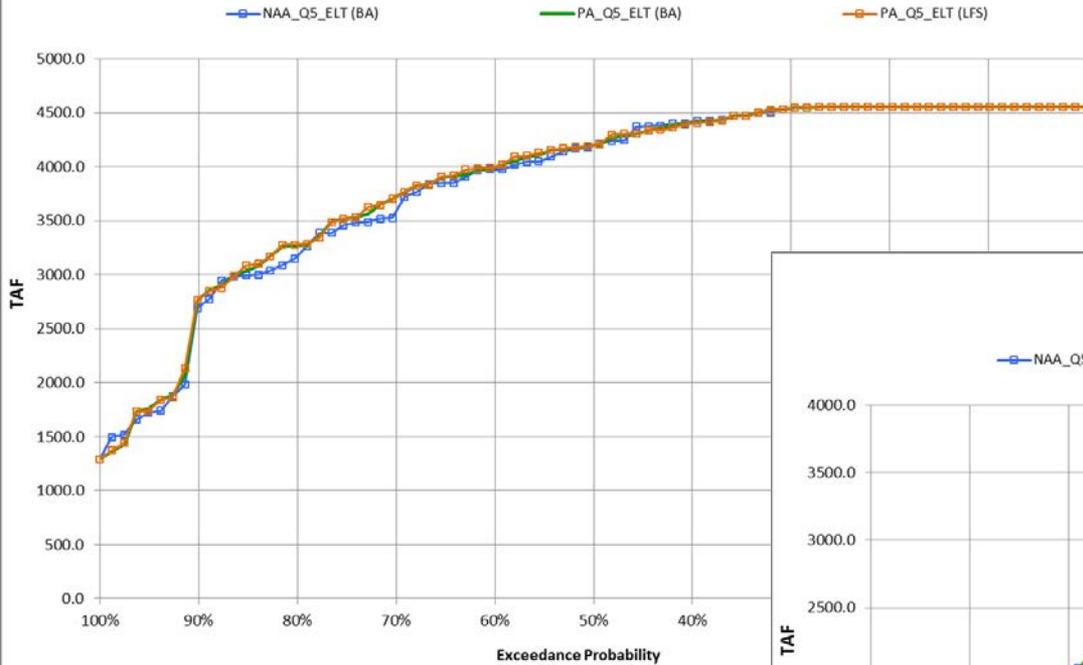
Multi Study Comparison - Monthly Avg Results - CRITICAL Years
Delta Outflow

Water Year Classification: SAC 40-30-30

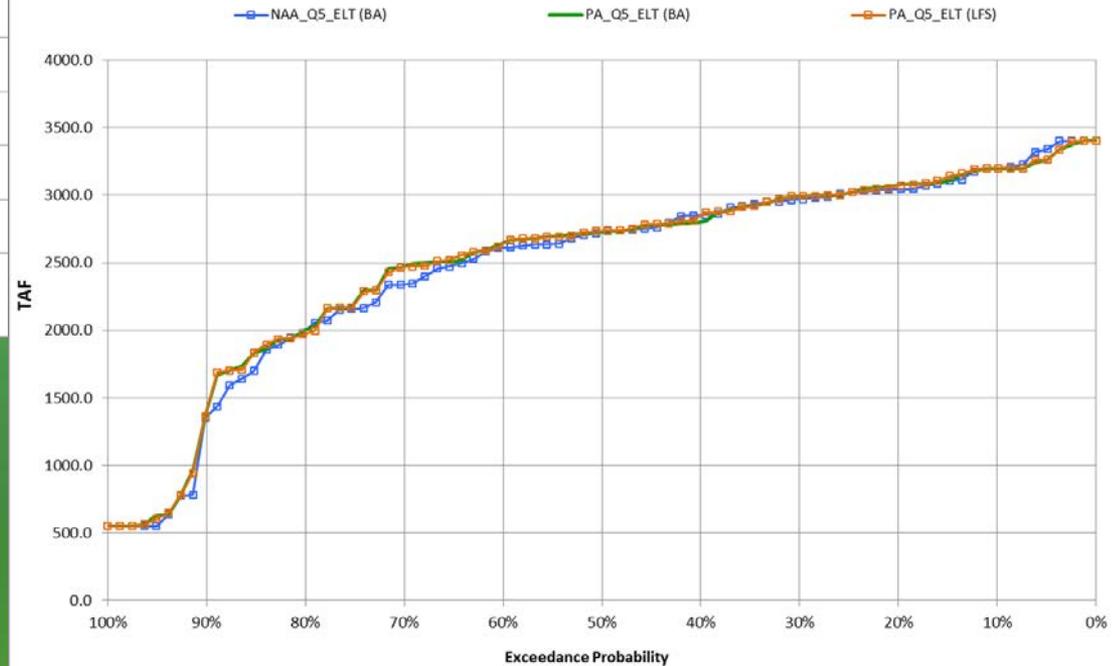


Shasta Lake Storage

Results Exceedance Probability
Shasta MAY

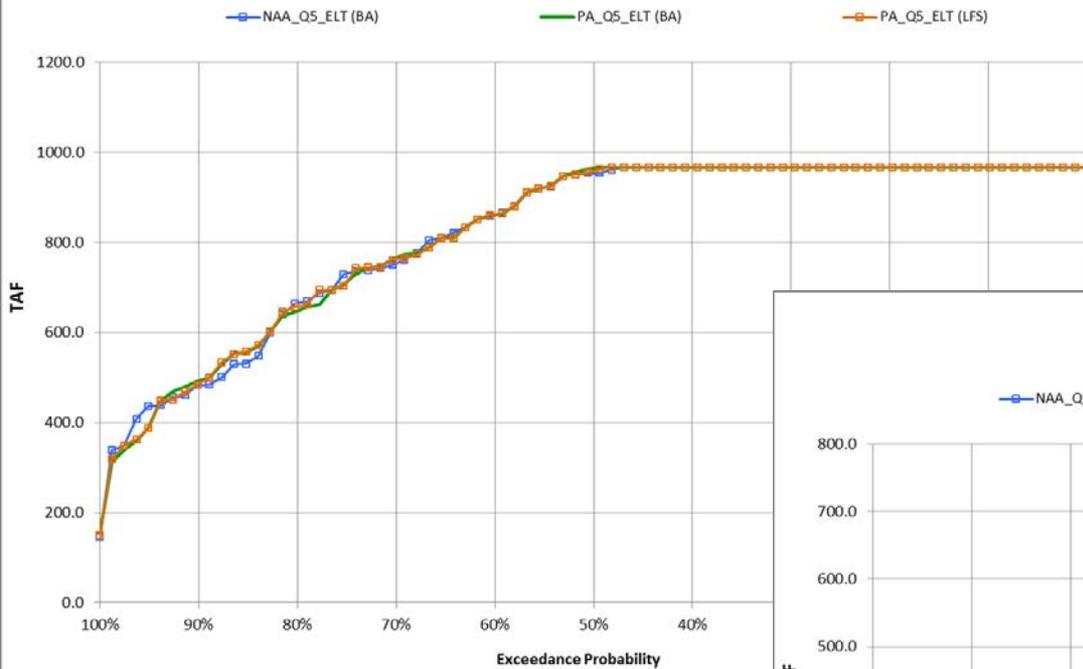


Results Exceedance Probability
Shasta SEP

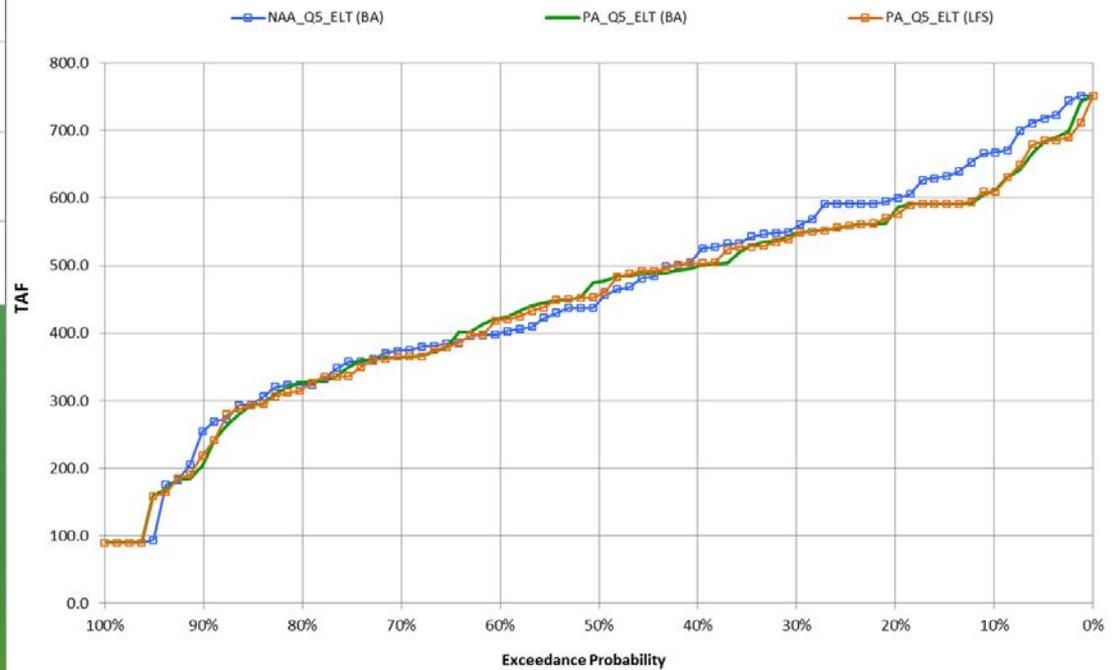


Folsom Lake Storage

Results Exceedance Probability
Folsom MAY

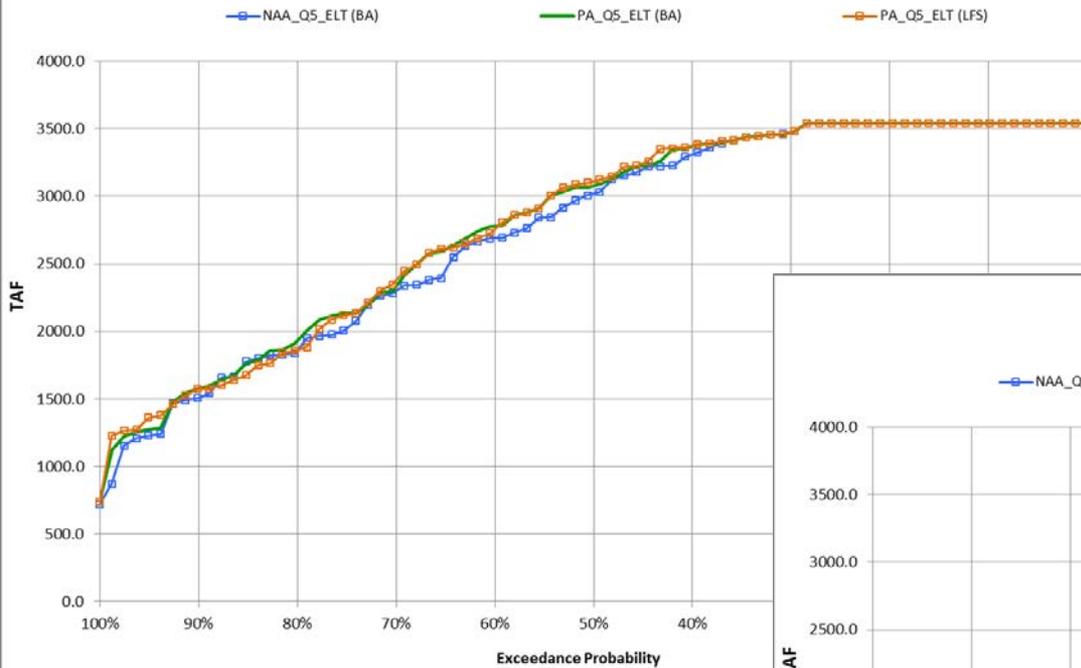


Results Exceedance Probability
Folsom SEP

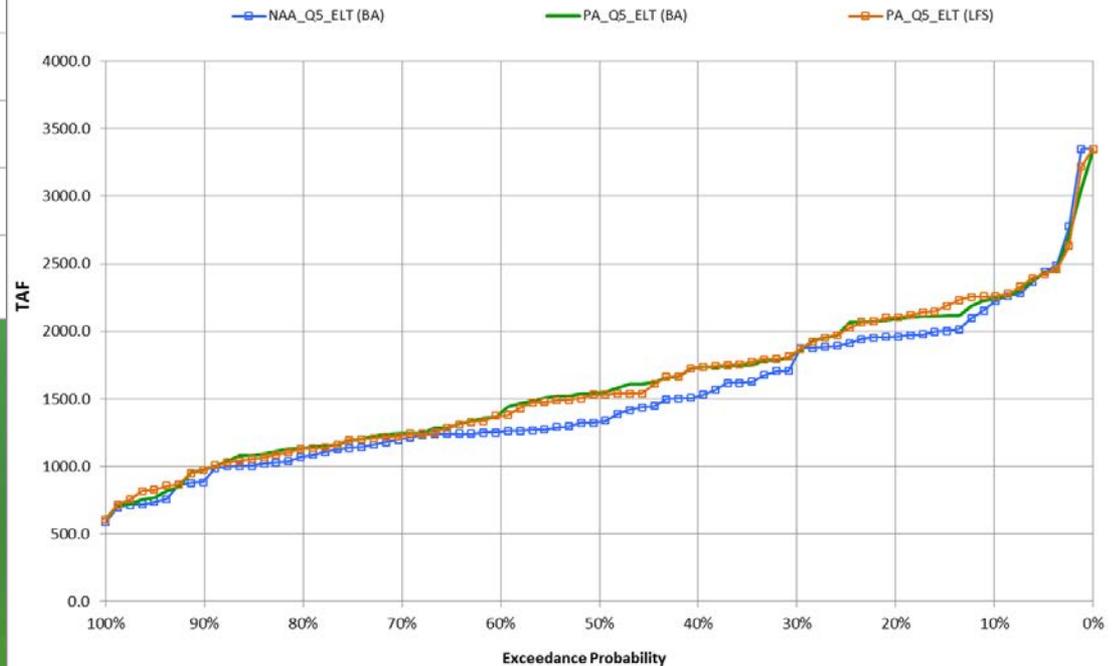


Lake Oroville Storage

Results Exceedance Probability
Oroville MAY



Results Exceedance Probability
Oroville SEP



Summary

- CWF 2081(b) application assumed Delta Outflow targets for March in addition to April – May requirements in the BA.
- Modeling shows that with the modified spring outflow criteria, Mar-May average Delta outflow under CWF is consistent with existing conditions.
- Compared to the BA, changes to other operations, such as (upstream storage, Delta outflow in other months) are negligible with the modified spring outflow criteria.
- The spring outflow criteria are being considered as part of the BA.