CWEMF
California Water & Environmental Modeling Forum

Session 1. CalSim and CalLite Development and Application

CalLite 4 Model and GUI Update

04/17/2023

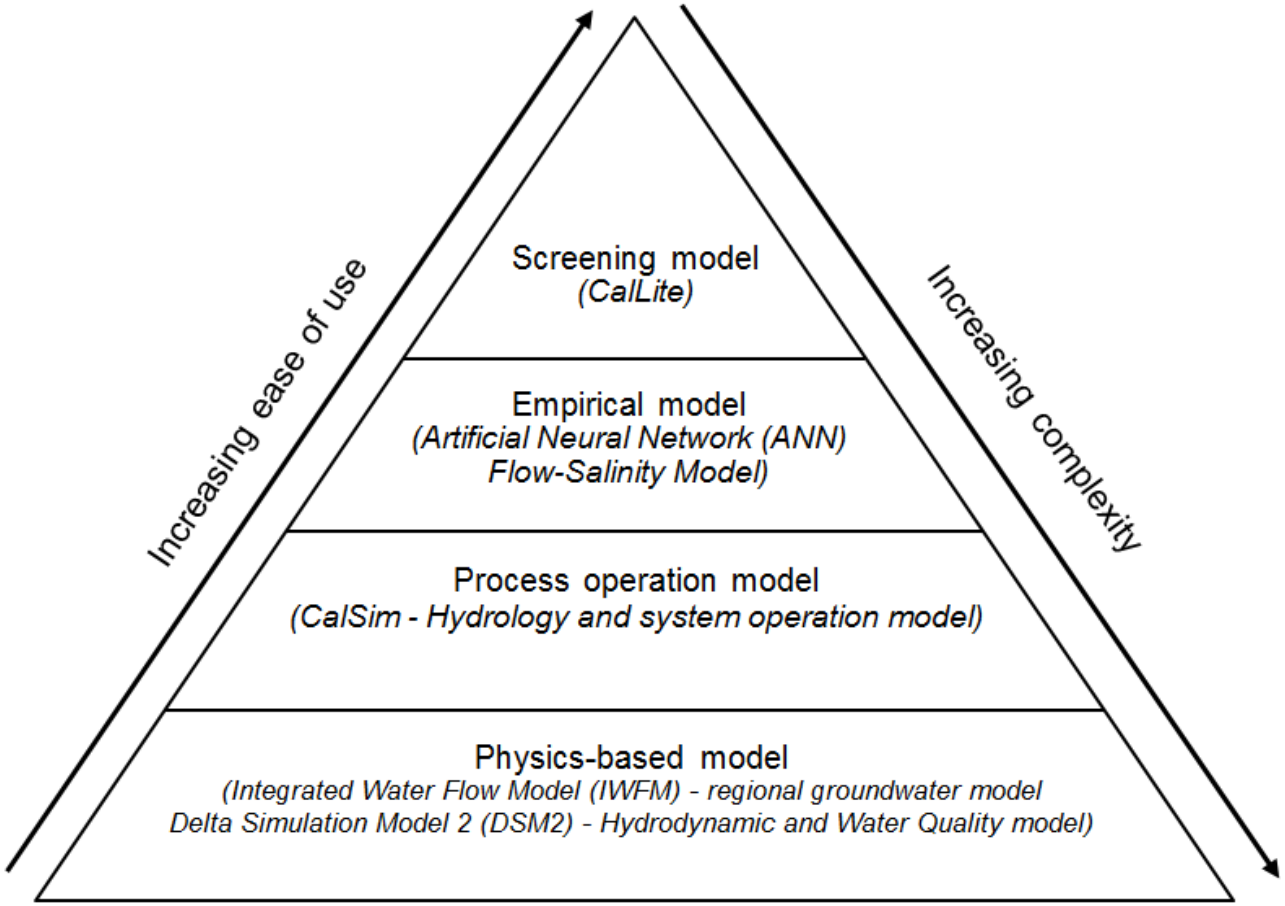
MBK ENGINEERS Stantec HDR DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA · U.S. DEPARTMENT OF THE INTERIOR · BUREAU OF RECLAMATION

Outline

- Background
- Key Updates
  - Hydrology
  - Delta
  - Operations
- Corroboration
- GUI
- Q&A

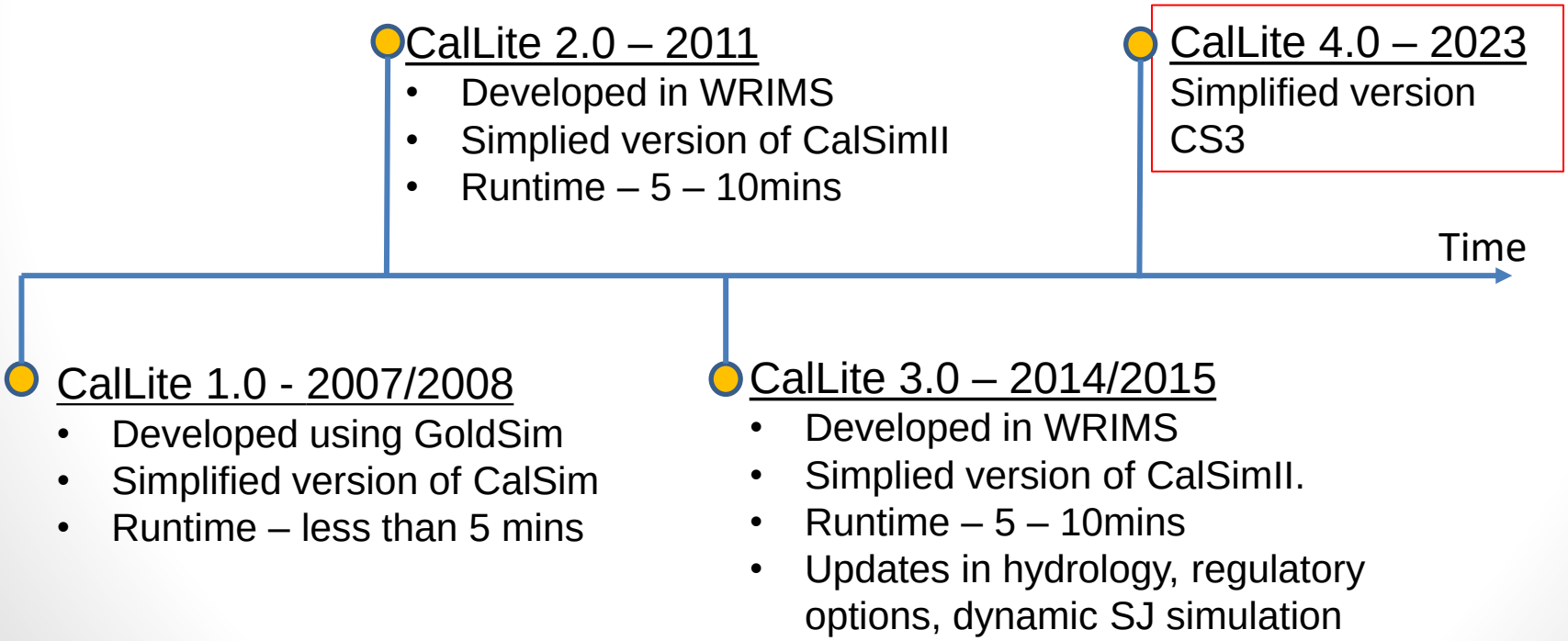
Background – What is CalLite

- Central Valley Water Management Screening Tool
- Simplified model of SWP and CVP systems for rapid screening of alternative studies
- Fast runtime and interactive (GUI)
- Screening and exploration tool for managers/decision makers
- Educational tool for students



Background – What is CalLite

- Central Valley Water Management Screening Tool
- Maintains hydrology, key facilities, regulations, and operating criteria as is represented in a CalSim model.



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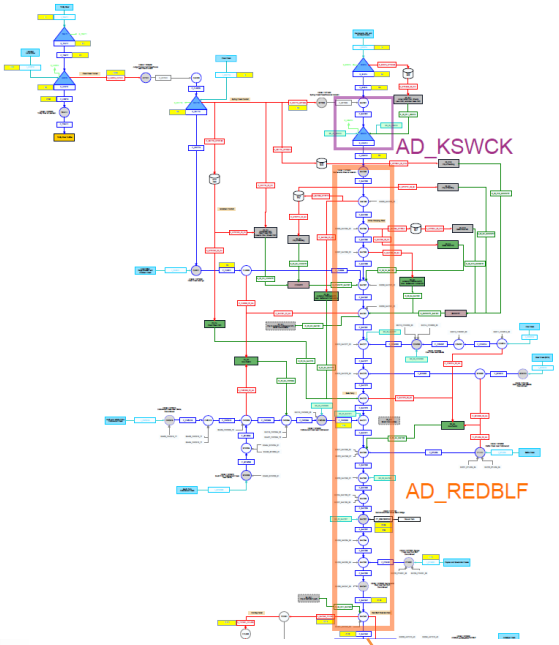
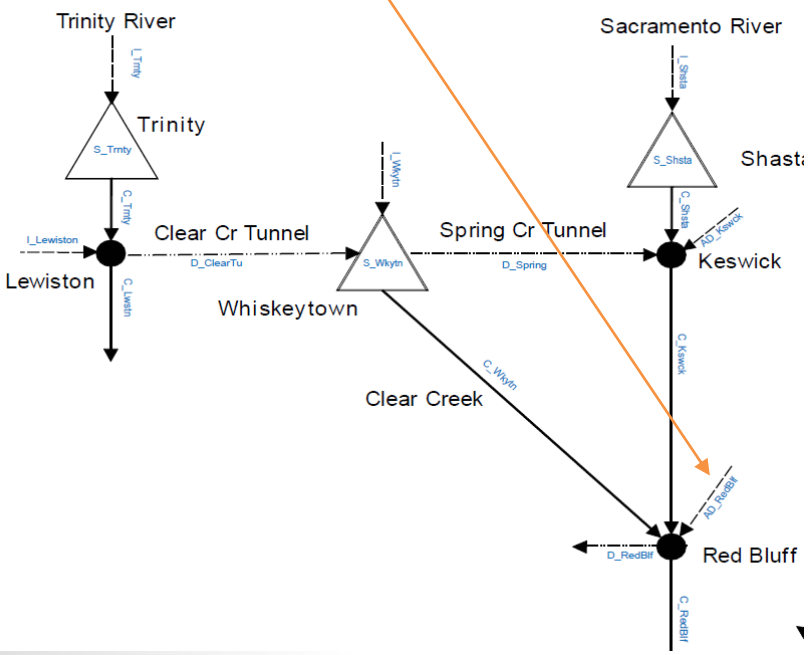
CL4 Hydrology Update





- Objective: Bring finer system resolution from CS3 to CL
  - Update and/or add accretion-depletion (AD) terms in the Sacramento Valley
  - Update and/or add non-project demands in the Sacramento Valley

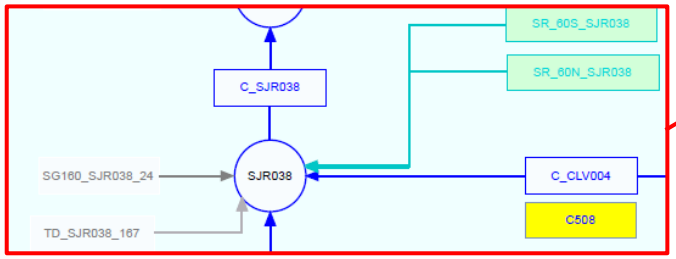
- Upper Sacramento River
  - AD_KSWCK
  - AD_REDBLF
  - AD_WILKNS
- Feather River
  - AD_THERM
  - AD_YUBFEA
- American River
  - AD_NIMBUS
  - AD_HST
- Lower Sacramento River
  - AD_SACFEA
  - AD_YOLOBP
  - AD_SACAME
  - AD_FREEPORT
  - AD_CBDRAINYOLO
  - AD_HOOD
  - AD_SACND

New

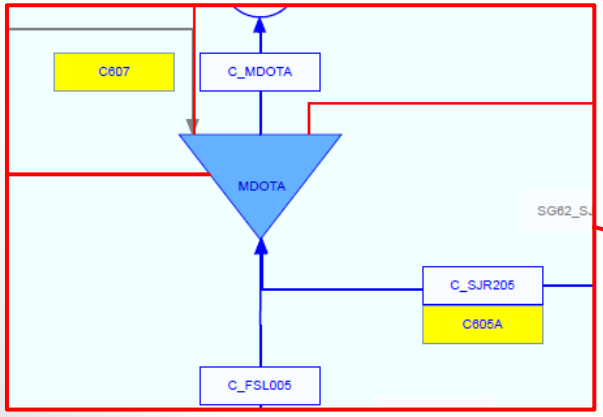
CL4 Hydrology Update: Representation of Dynamic SJR

Direct incorporation of CS3 SJR without aggregation as CL4.0 dynamic SJR module.

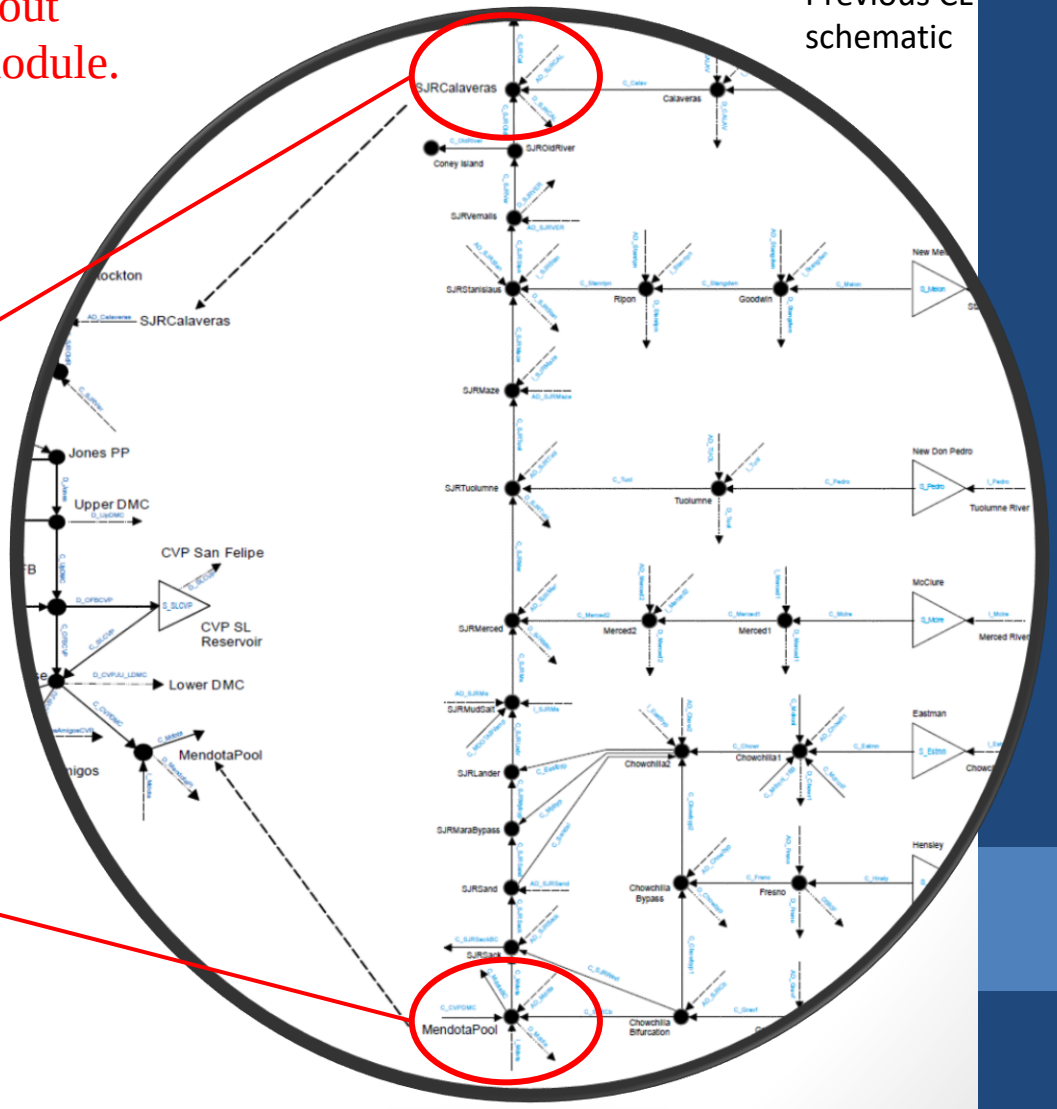
CS3 Schematic



CS3 Schematic



Previous CL schematic



Delta Schematic and Mass Balance Updates

19 CalLite nodes were reviewed and updated

Process flow for each node:

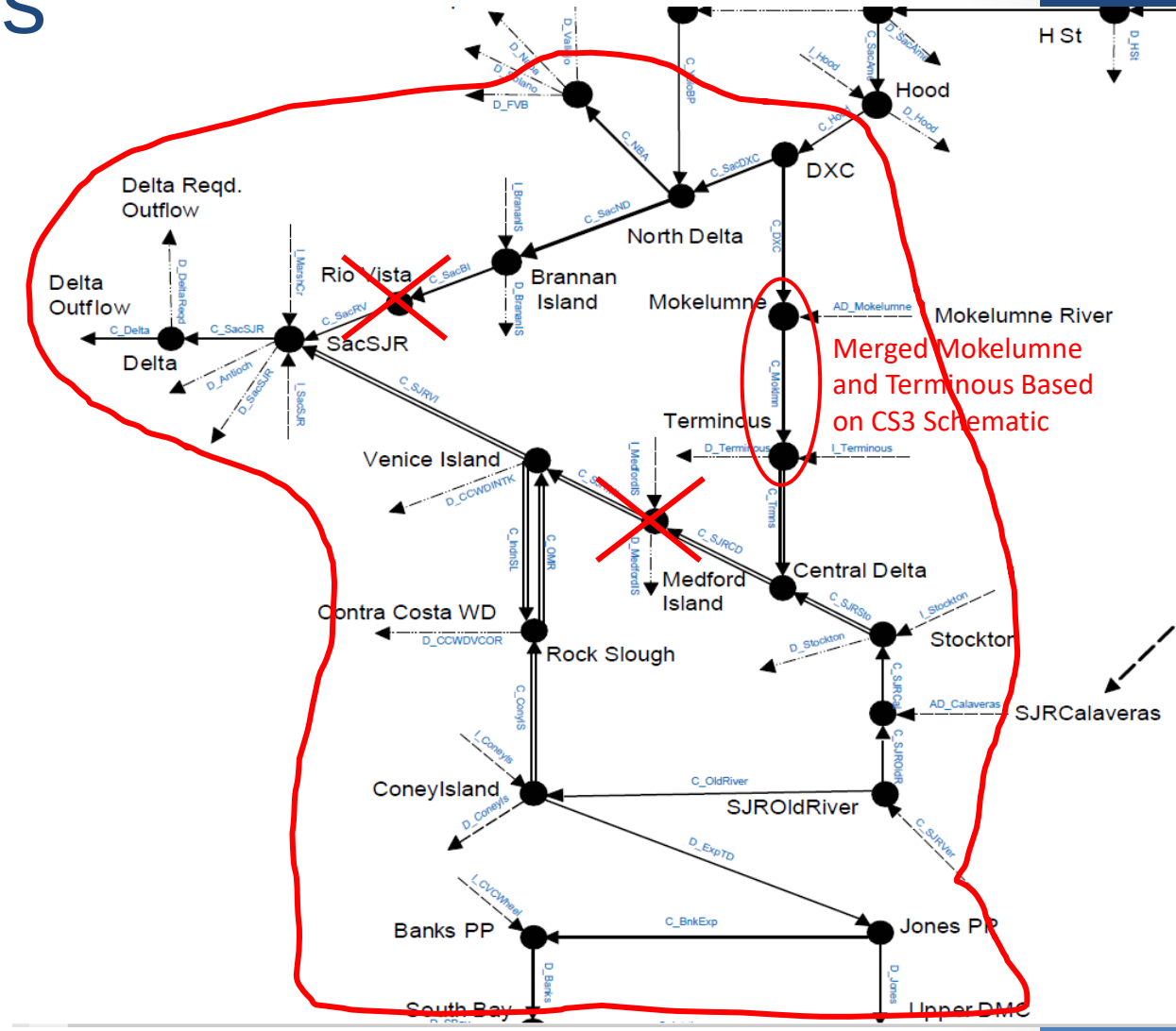
1. Comparison of CL and CS3 schematic to delineate CV of interest. (sometimes refer back to CSII schematic to understand why)
2. Validate again by comparing mass balance equations in CL and CS3.
3. Extract mass balance equations for comparison. Merge equations if needed.
4. Assign corresponding CS3 variables to CL variables.
5. CS3 mass balance numerical validation.

<u>Other Updates</u>

ANN

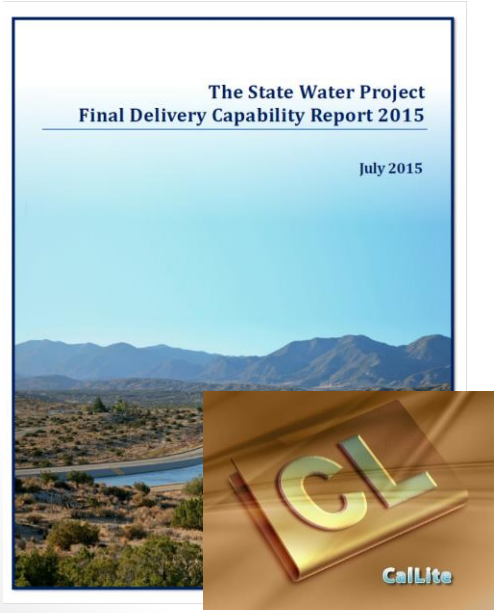
Net DICU

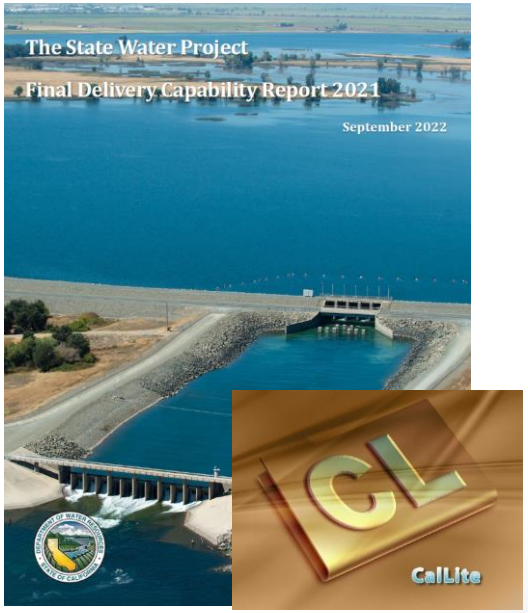
NDOI



Operational/Regulatory Updates

- Update the CL project operations from the 2015 DCR CalSim II model (2008-2009 BO RPAs) to be consistent with operations and regulatory environment from the 2023 DCR public model (2019 BOs and 2020 ITP, etc.)





Operational/Regulatory Updates

Category	Additional comments
2018 COA Addendum	Implement new COA without running an additional cycle
ROC LTO	
2020 ITP	
Delta hydrology and mass balance; NDOI, OMR Index, etc.	
SJRR restoration and recapture	
CVP ops updates	Shasta, Folsom flood controls ops, allocation logic, Wilkins Slough MIF based on Shasta storage
SWP ops updates	Oroville EOS target, San Luis rule curve, SOD renaming, SWP demands and demand patterns, Article 56 and Article 21 delivery logic
Combined CVP/SWP	Jersey Point guidance, San Luis deadpool storage values
2021 DCR improvements and fixes	Hood MIF, Banks pumping 500 cfs summer reserved capacity, reservoir initial conditions, weights readjustments, negative carriage water, etc.

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Corroboration

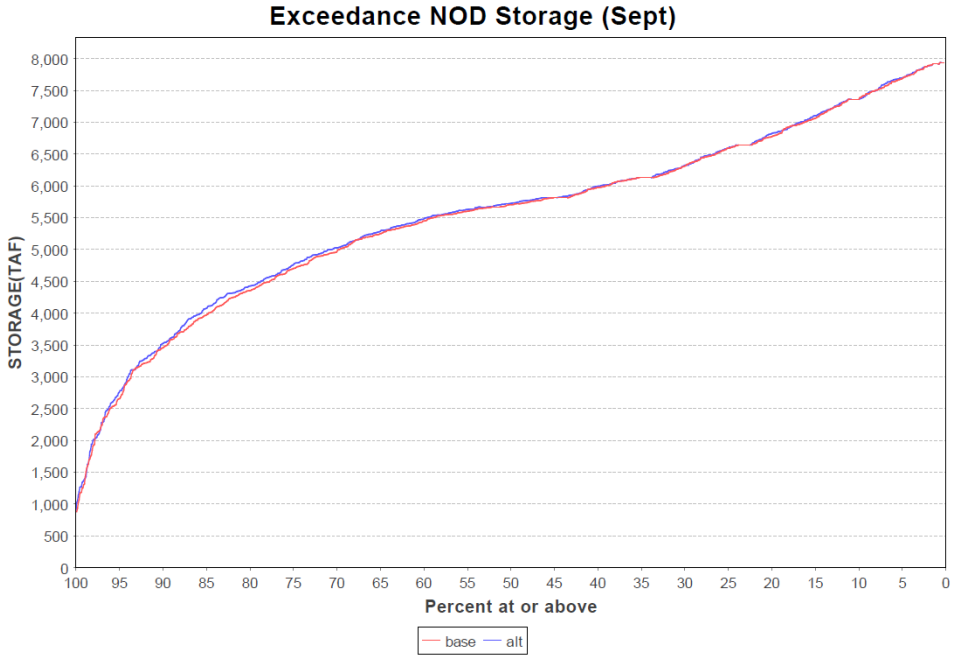
- Corroborate CL4 through comparison to DCR 2021 CS3 study.
- Hydrology
  - Use mass balance comparison to verify that all inflows, diversions, return flows, groundwater-stream interactions, closure terms, etc. that are represented in CalSim 3 are included in CalLite 4 aggregated hydrology.
- SWP and CVP Operations
  - Compare annual average and monthly timestep CS3 and CL4 results to verify consistent SWP and CVP operations procedures, regulation, and constraints.

Annual Average Comparison of CL4 and CS3 Results

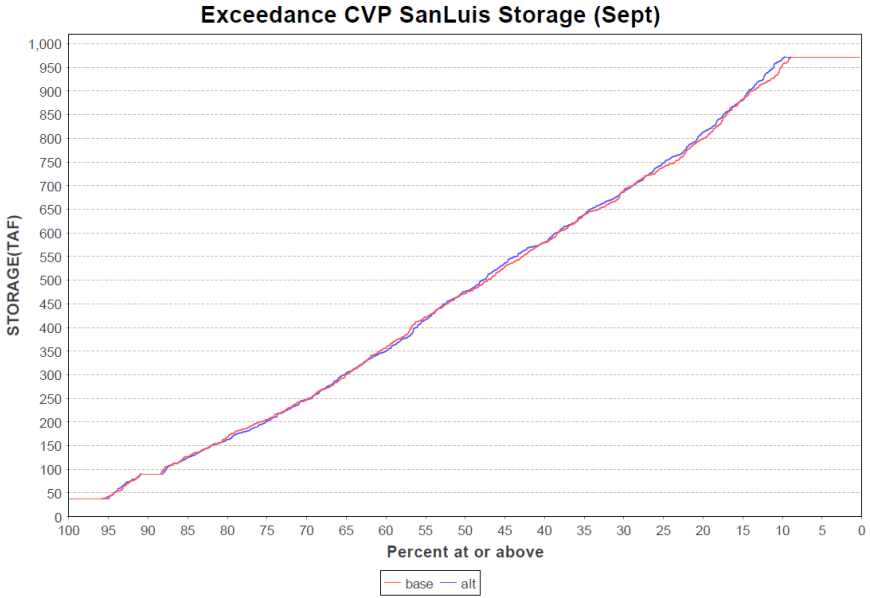
Overall, the differences are less than one percent but there are individual months when there are significant differences.

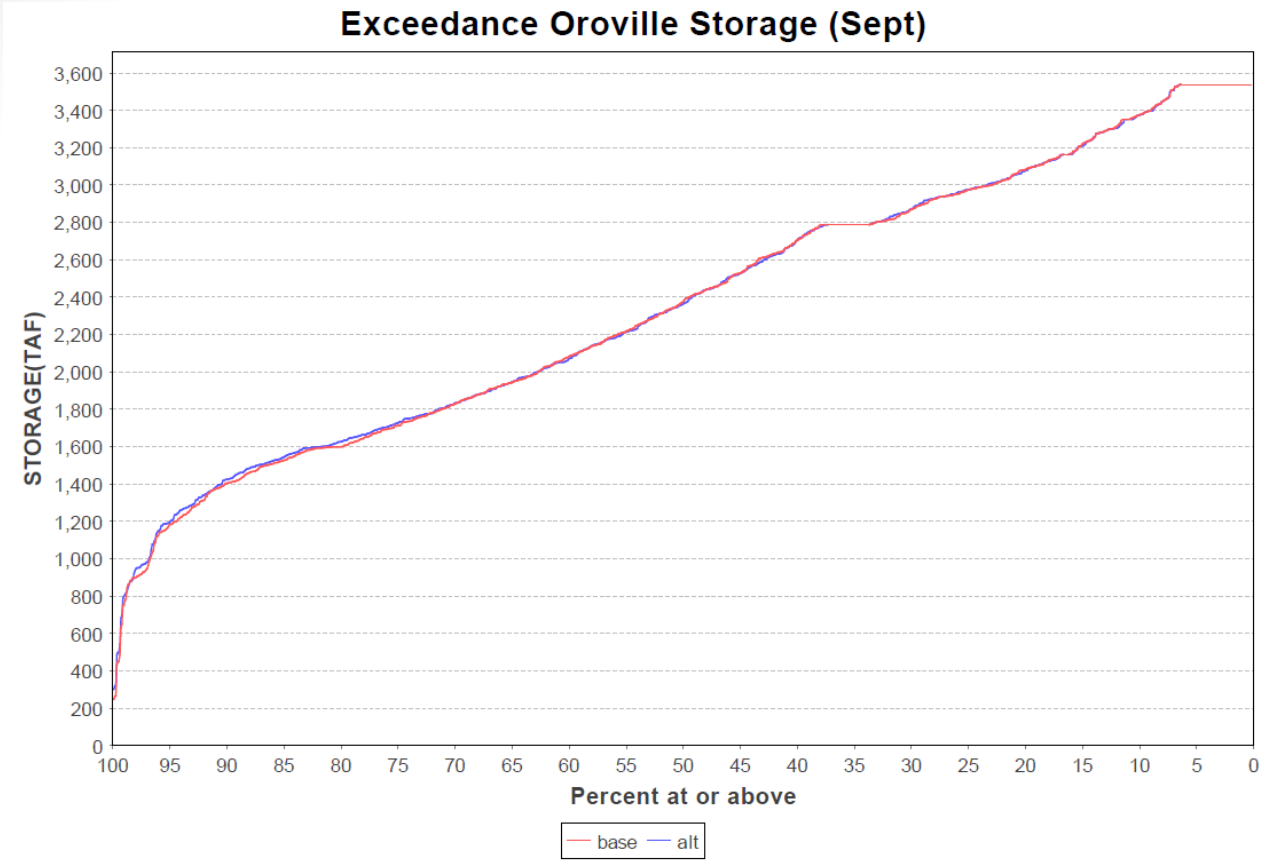
	1922-2015			
	alt	base	Diff	% Diff
Reservoir Releases				
Shasta Releases	5516	5517	0	0
Trinity Releases	1214	1214	0	0
Oroville Releases	3890	3890	-1	0
Folsom Releases	2450	2432	18	1
River Flow				
Trinity R blw Lewiston	771	768	3	0
Trinity Export	480	483	-3	-1
Spring Creek Tunnel	585	588	-4	-1
Clear Cr blw Whiskeytown	149	149	0	0
Sacramento R @ Keswick	6144	6147	-4	0
Sacramento R @ Red Bluff	8010	8012	-2	0
Delta Inflow	**21445**	**21440**	**5**	**0**
Sacramento R @ Hood	15541	15512	29	0
Yolo Bypass	2311	2326	-14	-1
Mokelumne R	845	845	0	0
Calaveras R	111	111	0	0
San Joaquin R d/s Vernalis	2636	2646	-9	0
NDOI	**15081**	**15108**	**-27**	**0**

CVP North of Delta Storage: Trinity, Shasta, Folsom



CVP SL Storage





These differences between the two models can be attributed to:

- Simplifications in CL4 of CVP and SWP operations as compared to detailed representations in CS3.
- Potential errors in the input of data and implementation of modeling assumptions and constraints in CL4.

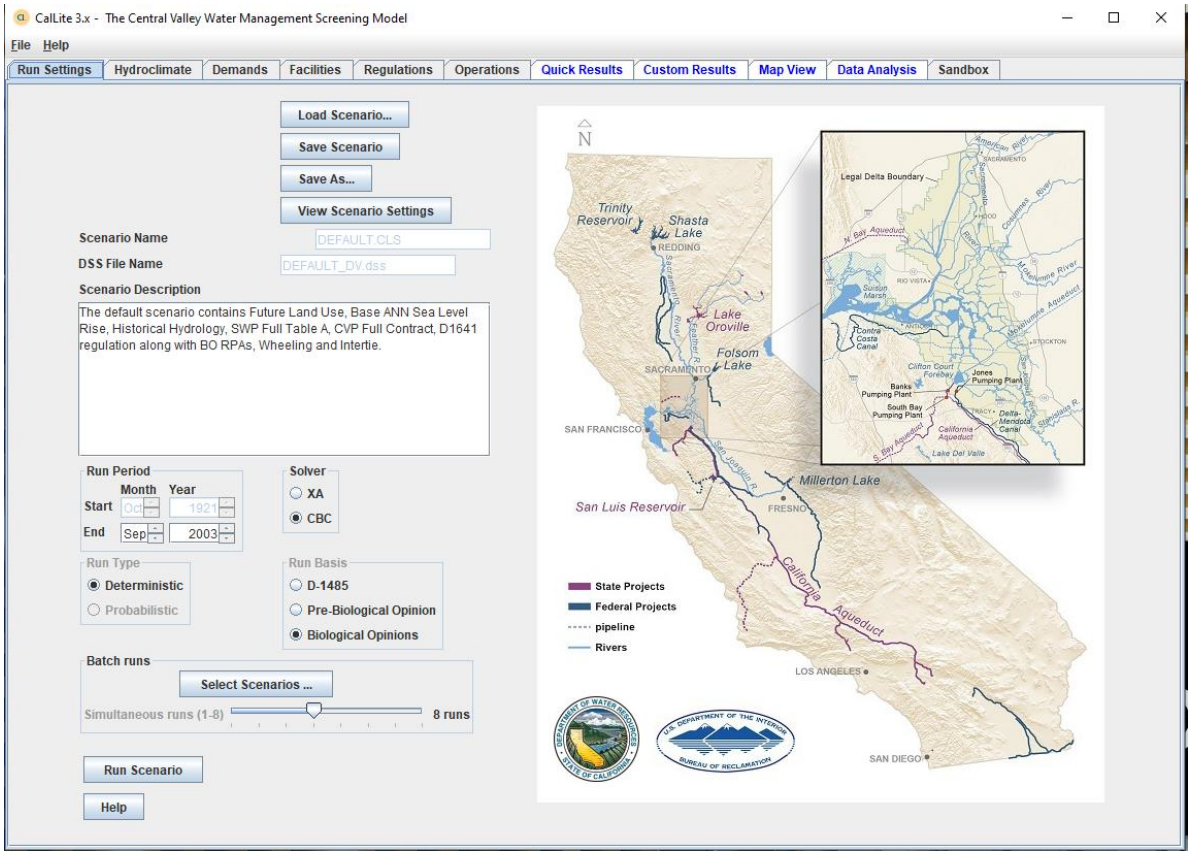
Overall, the corroboration results show CL4 performs reasonably well.

Graphic User Interface (GUI)

Hayley Huerd
HDR

GUI UPDATE

Updated the CalLite GUI to reflect and run CL4



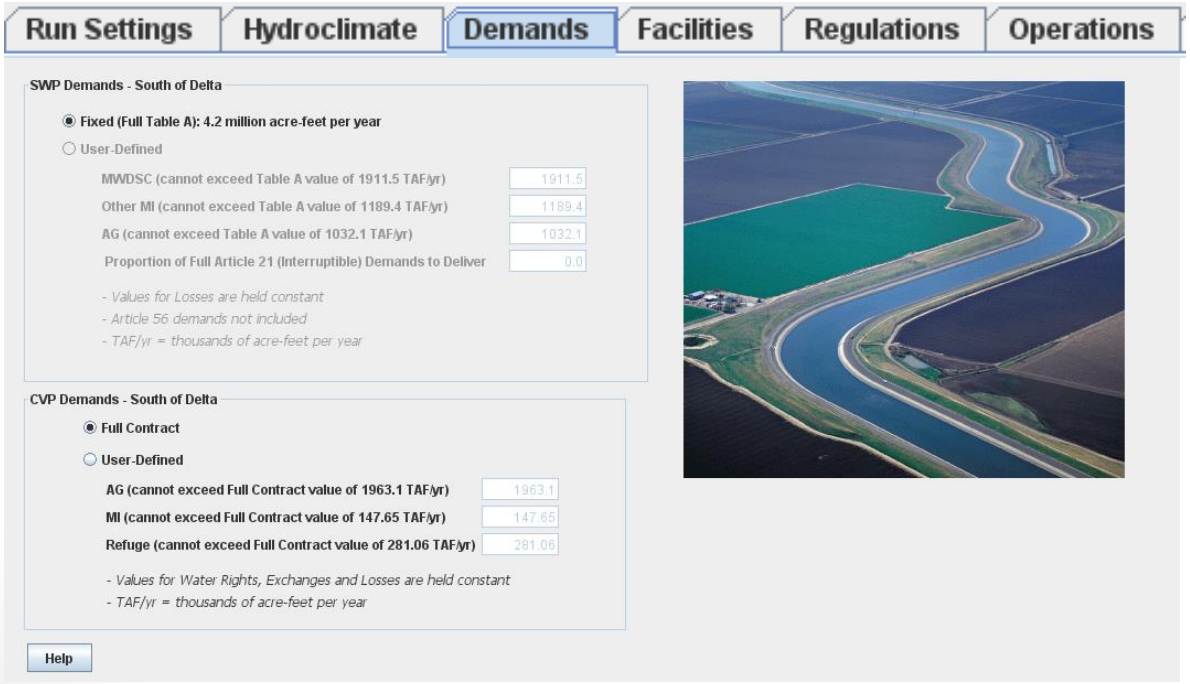
GUI Updated to Current Version of CL

Replaced the CS3 WRIMS framework with the CL4 WRIMS framework

- Longer period of record (from WY 2003 to 2015, even 2021)
- Other file structure-related updates

Removed Unsupported Options

- Updated GUI options to reflect CL4 functionality
- Deleted or greyed out options
  - Deleted: no longer available
  - Greyed out: not currently available, may become available in future updates



Updates and Additions

- Hydroclimate
  - Updated climate change period to reflect 2040 (2025-2055)
  - Added options for 15 cm, 55 cm, and 105 cm / ANNX2 for sea level rise
- Regulations
  - Added “’Current regulations as of 2022” as a “Quick Select” option
- Operations
  - Added editable tables for North of Delta and South of Delta CVP allocation
  - Added adjustable Oroville and Shasta End-of-September Storage Options

Acknowledgements

- Sacramento hydrology
  - Hayley Huerd, Olivia Hunt, Megan Lionberger, and Jeff Weaver (HDR), Tom FitzHugh (Stantec), Shankar Parvathinathan (MBK)
- San Joaquin hydrology
  - Shankar (MBK), Tom (Stantec)
- Delta hydrology and operation
  - HDR staff, Dan Easton and Shankar (MBK)
- Operations
  - Everyone!
- Corroboration
  - Dan and Shankar (MBK)
- GUI
  - Hayley, Olivia, and Max Barry (HDR)

Q/A