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Capturing Non-Storable Flows in the Lower Colorado River and All American Canal

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Brief Introduction to the Issues...

- **US / Mexico Colorado River Treaty dates to 1944**
- **Lower Colorado River**
 - 9 million ac-ft (MAF) released from Lake Mead
 - 7.5 MAF delivered to US water right holders
 - ❖ ~4 MAF to Imperial Irrigation District (IID)
 - 1.5 MAF delivered to Mexico: NIB & SIB
 - ❖ Typically 60,000 to 250,000 AF annual excess delivery
- **All American Canal**
 - Capacity = 10,155 cfs; generates power
 - Delivers water to IID; faster route to NIB
 - AAC lining project

Project Area



Facilities:

- Parker Dam
- Imperial Dam
- Senator Wash
- Laguna Dam
- All American Canal

Users:

- Palo Verde
- Gila Gravity Main Users
- Imperial Irr. Dist.
- Coachella Valley
- Yuma County
- Reservation Division



How Non-Storable Flows Develop

- **Constraints on operations and water scheduling**
 - Three-day travel time from Parker Dam to major diversion at Imperial Dam
 - Irrigation Districts may change orders after water is released from Parker Dam
 - Limited storage d/s of Parker Dam

Capturing Non-Storable Flows...

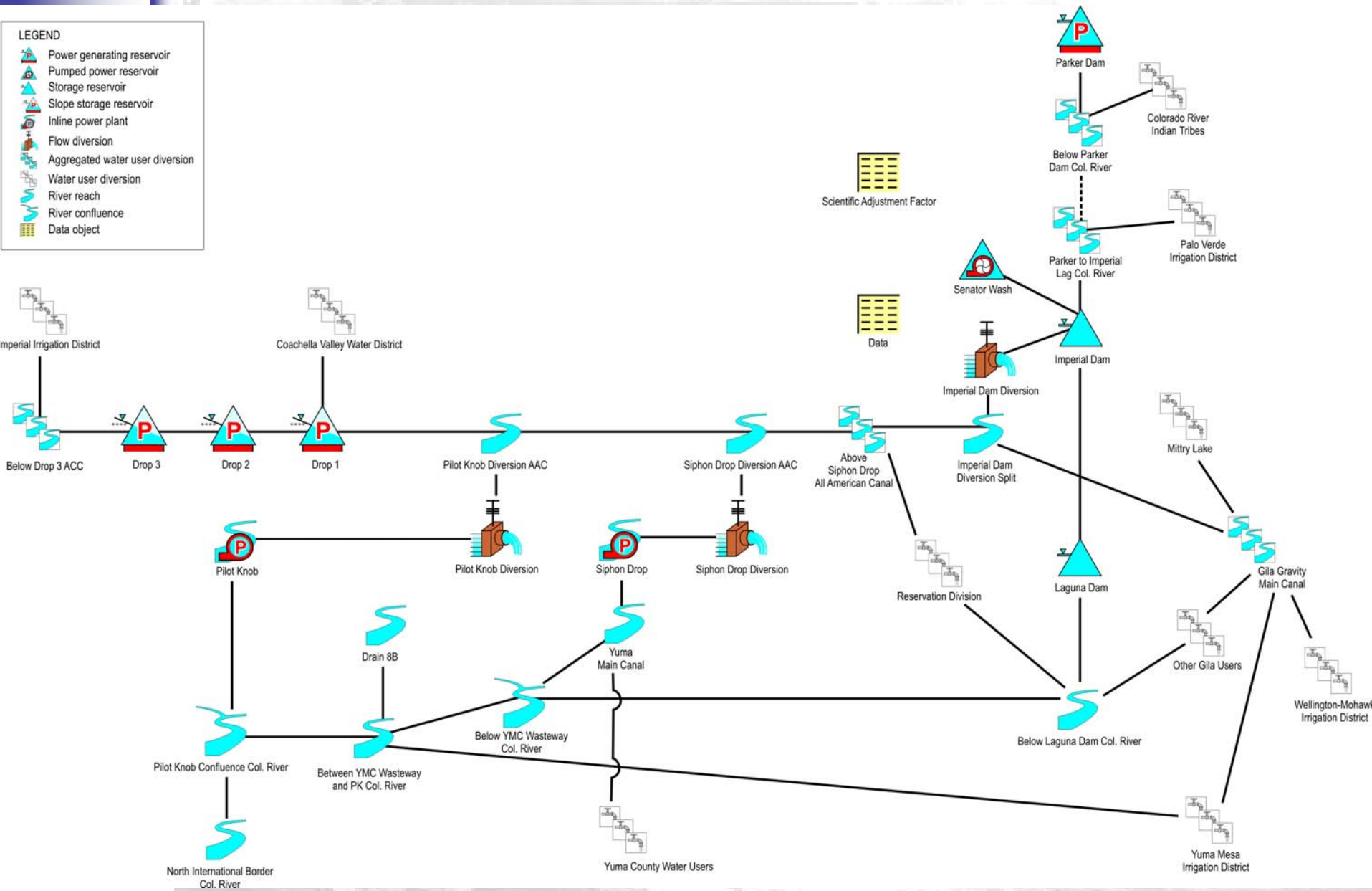
Our RiverWare Study

- Evaluate different sites & reservoir sizes
- Historical operation used as baseline
- What if experiments – revise historical operations to use proposed reservoir
- Multi-objectives not considered in this study
 - Power generation
 - Salinity management
 - Senator Wash reservoir optimization

RiverWare View of the Area

LEGEND

- Pumped power reservoir
- Storage reservoir
- Slope storage reservoir
- Inline power plant
- Flow diversion
- Aggregated water user diversion
- Water user diversion
- River reach
- River confluence
- Data object



Calibrating the RiverWare Model

- **Viable model should reproduce flow measurements at NIB**
- **Seems simple, but it isn't!**
- **Quantify sources of uncertainty**
 - Time lag from Parker to Imperial Dam
 - Gauge uncertainties
 - Gaining and losing reaches downstream of Laguna Dam
- **Incorporate seasonal corrections as “Hydrologic Inflows” to attain seasonal and annual mass balance between RiverWare model and NIB gauge**

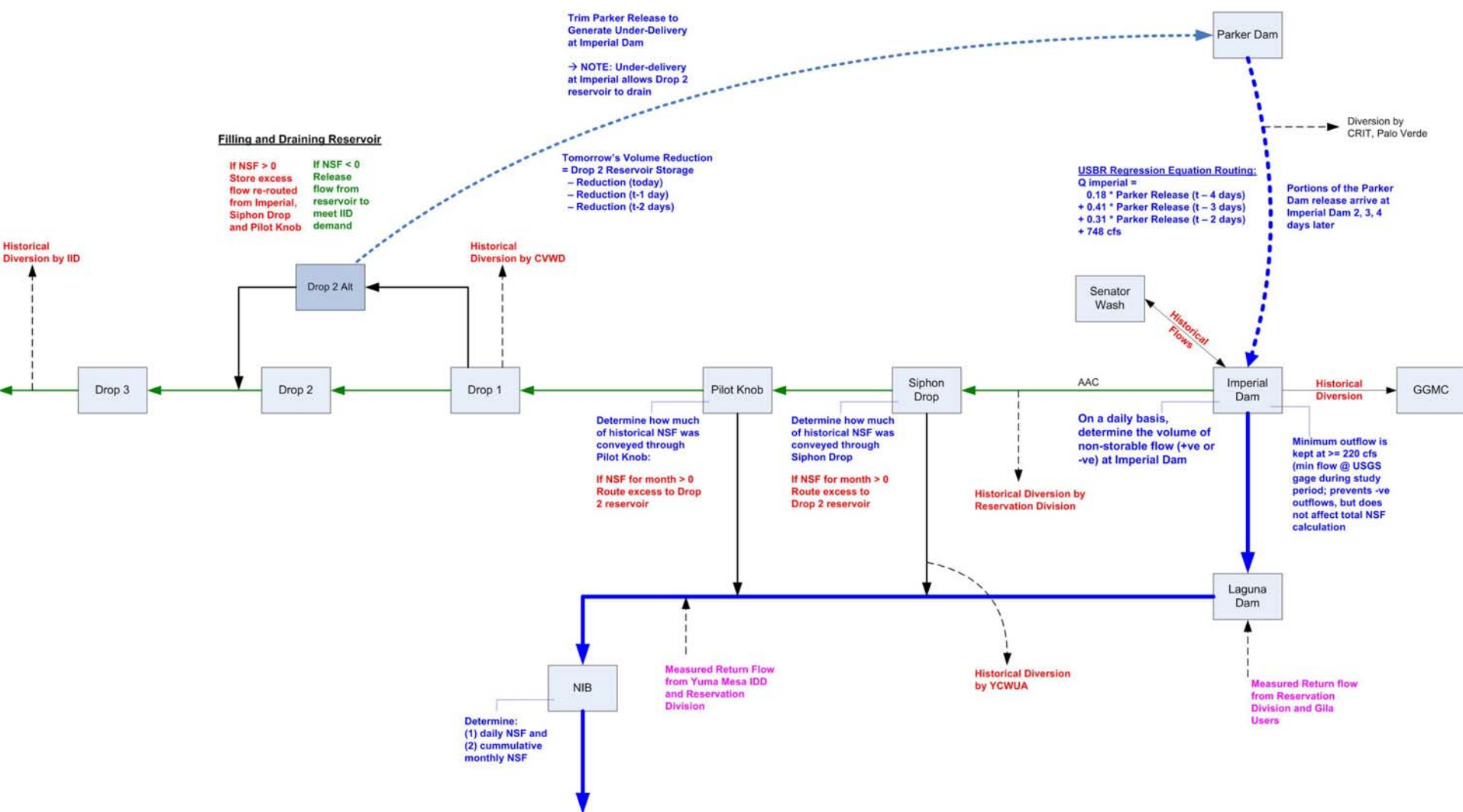
Incorporating New Reservoir into RiverWare Model

- **Add new reservoir to RiverWare model**
 - Set size, inlet/outlet capacities

- **Incorporate rules and constraints**
 - For each day, recognize and route excess flow to new reservoir
 - Excess flow delivered via 3 pathways to NIB
 - ❖ LCR, Pilot Knob, Siphon Drop
 - ❖ RiverWare routes a portion of historical flows to new storage reservoir
 - ❖ Trims tomorrow's release from Parker Dam

Drop 2 Reservoir Example

DROP 2 ALTERNATIVE

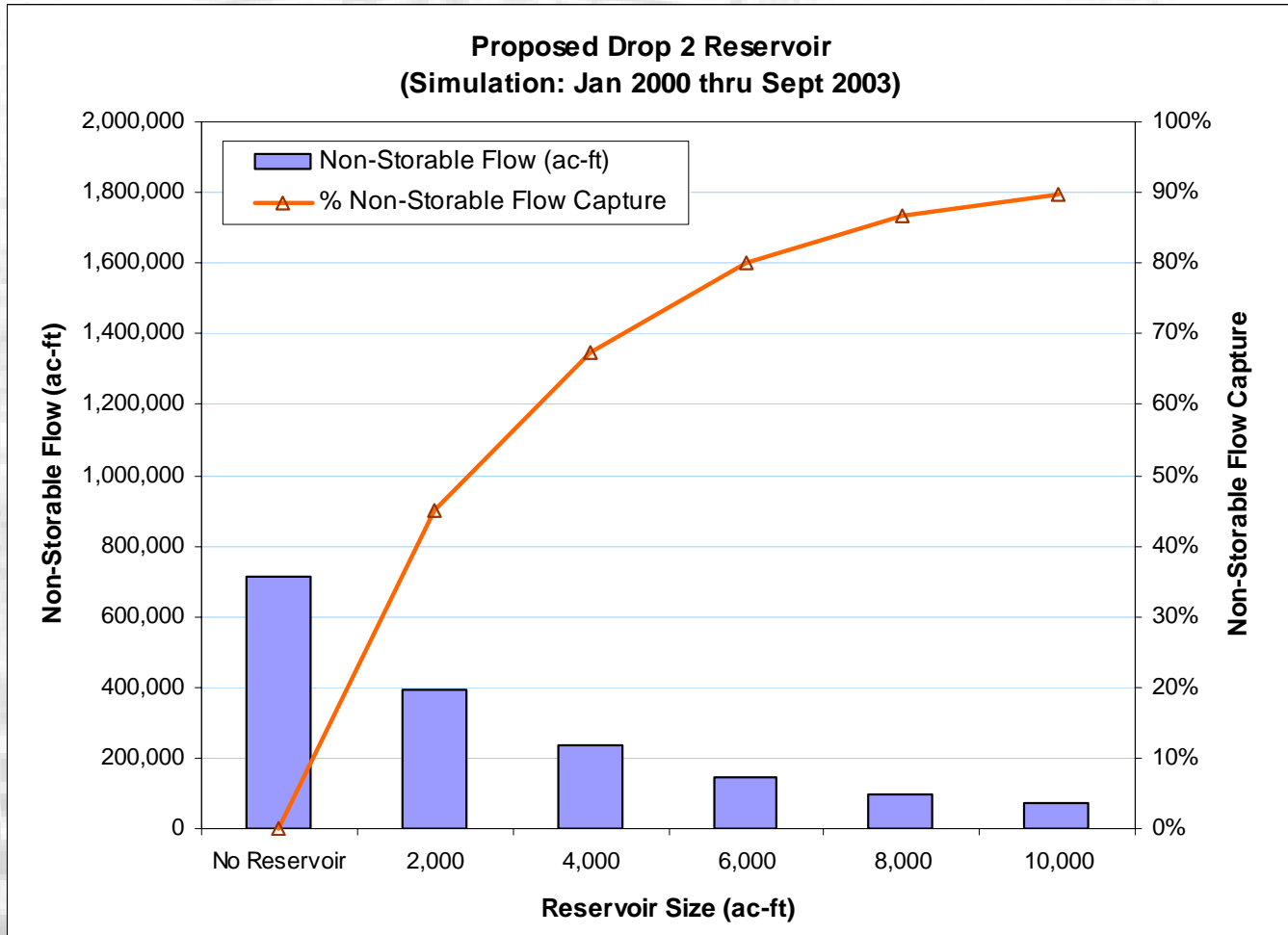


Proposed Reservoir Sites and Sizes

**Table 8-1
Storage Alternatives and Capacities Considered and
Evaluated**

Storage Alternative	Storage Capacity Options Evaluated (AF)				
	4,700	2,000	1,500	2,000	10,000
Senator Wash Reservoir	4,700	-	-	-	-
Laguna Reservoir	2,000	4,000	-	-	-
Drop 1 Reservoir	1,500	3,000	6,000	-	-
Drop 2 Reservoir	2,000	4,000	6,000	8,000	10,000

Drop 2 Reservoir Summary Results



Next Steps in AAC Lining and Reservoir Projects...

- **USBR proceeding with AAC lining project and Drop 2 reservoir**
- **Starting operations study of proposed Drop 2 reservoir**
 - Revise non-storable flow capture analysis based on proposed flow control equipment
 - RiverWare and HEC-RAS analysis
 - Link to other USBR operations/controls studies

Acknowledgements

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Questions?