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GARY FISKE AND ASSOCIATES, INC.

Water Resources Planning and Management

Date: April 19, 2015
From: Gary Fiske
To: Water Supply Advisory Committee
Re: Modeling Results: Indirect Potable Reuse (CA-10)

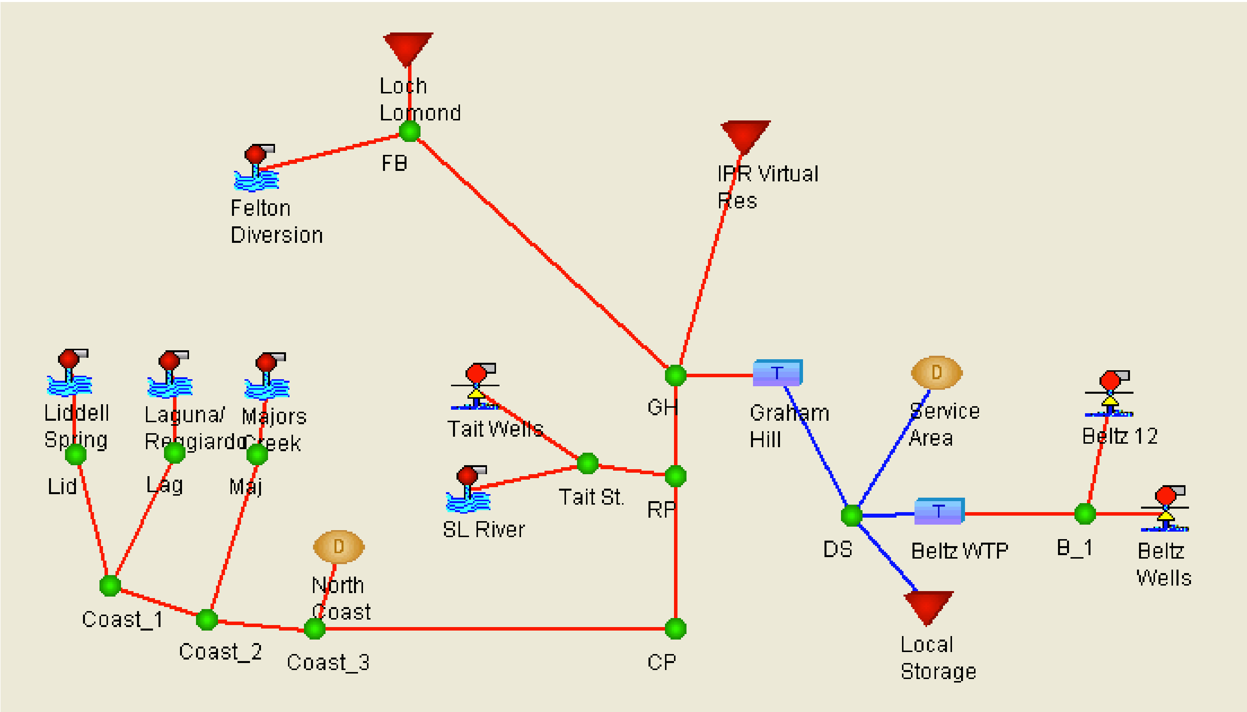
This memo reports the results of the Confluence modeling of CA-10, which produces approximately 3.64 mgd of recycled water 365 days per year for an annual total of 1330 mgy, which is stored in a virtual reservoir (VR) for use to serve demands.

The water supply impacts of this alternative are substantially more than the North Coast exchange (CA-13) analyzed previously. Not only is more water produced each year (1330 mg vs. 775 mg) but unlike CA-13, that water can be stored in an aquifer or surface reservoir for use in subsequent years. There are assumed to be no pumping or transmission capacity limitations on utilizing this new supply.

Modeling Approach

The Confluence system schematic for this alternative is shown in Figure 1.

Figure 1. Confluence System Schematic for CA-10



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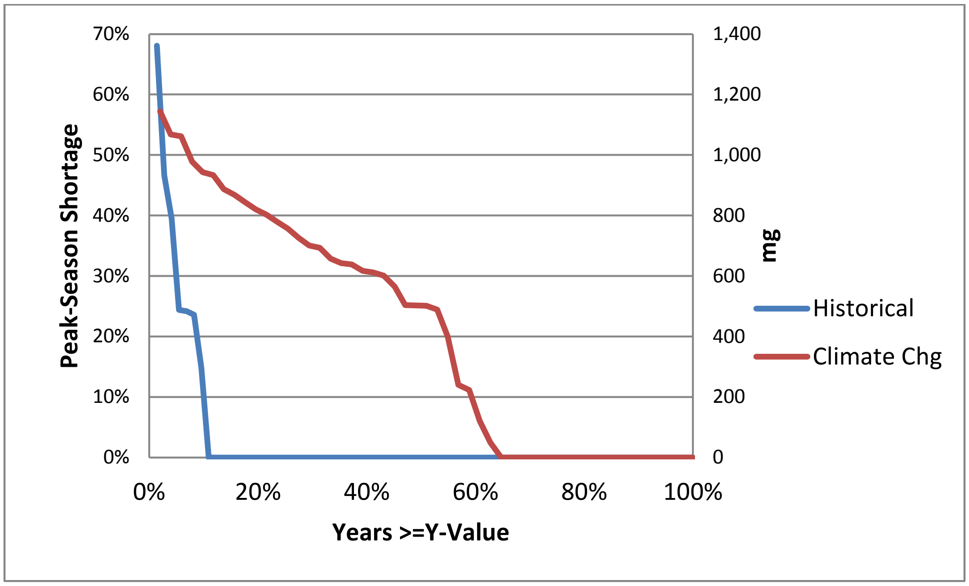
Impacts on System Reliability

Figure 2 shows the peak-season shortage duration curves assuming DFG-5 flows with current supplies that we have seen before (see my March 9 memo). The shortages are expressed as both percentages and volumes.

Figure 2. Peak-Season Shortage Duration Curves with Current System: DFG-5 Flows



As is the case for the winter harvesting alternatives (see April 6 memo), this IPR alternative drives these shortages to zero. That is, all demands can be served, even in the driest years, with DFG-5 flows and with or without climate change.

Virtual Reservoir Fill and Drawdown

Figure 3 shows the VR fill and drawdown in the 5 years leading up to the worst drought events in the historic and climate change records.[1] In each case, the VR starts at zero. Since the IPR source is drought-proof, the reservoir fill is the about same with or without climate change. Drawdown in both cases is small because on most days, the 3.6 million gallons added to storage equals or exceeds the drawdown needed to serve that day's demand, so there is much less reliance on storage. This means that much less storage capacity is needed for this alternative. The total drawdown in Figure 3 is between 1200 and 1400 mg. This provides an estimate of the maximum required storage capacity.

[1] Year 5 is the end of the worst drought sequence. For the historic record, the 5-year period shown is 1973-77.

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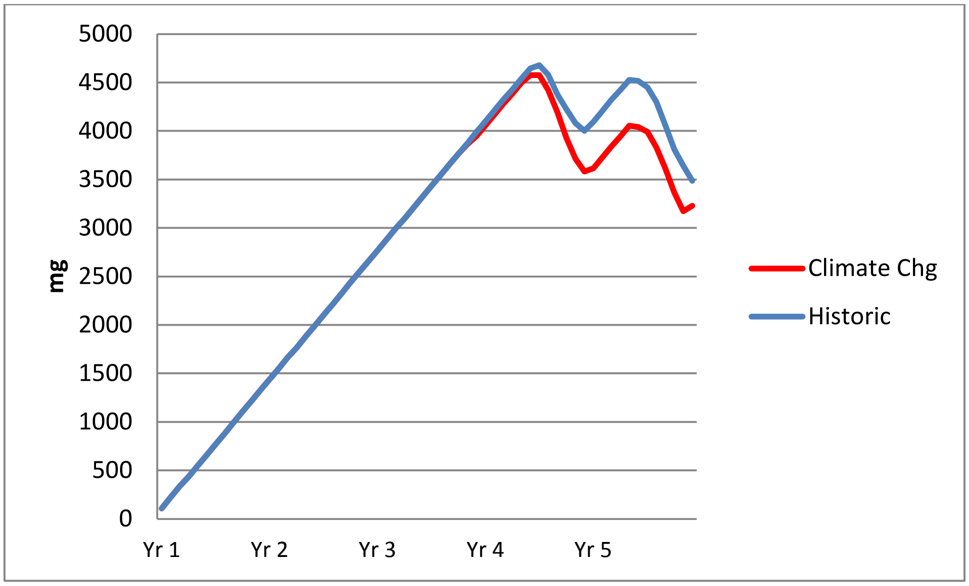
Figure 3. Virtual Reservoir Fill and Drawdown in 5 Years Fill Before Worst Drought Event



Project Yield

Since this alternative reduces shortages to zero, the worst-year yields of this alternative, i.e., how good a job this alternative does in reducing the worst-year peak-season shortages, are simply the highest points Figure 2. In volume, this is about 1360 mg with historic flows, and 1150 mg with climate change. Across all hydrologic conditions, the average reduction in peak-season shortage is about 60 mg with historic flows and 420 mg with climate change.

These benefits accrue for two reasons:

- The production (less losses) of the VR itself plus
- The change in production of Loch Lomond (which in many hydrologic years is negative)[2]

The second point is important. In dry years, the benefit of these alternatives derive not only from the VR itself but also from added production from Loch Lomond. In those years, Loch Lomond begins at higher elevations because use of the VR in previous years allowed the lake to “rest”.

Needed Infrastructure Capacities

The assumed daily recycled water production capacity is 3.64 mgd. Figure 4 shows the duration curves of the daily VR production during the peak season, which provide information on the capacity requirements for transmission from the VR to the treatment plant. The maximum production is between 12 and 13 mgd.

[2] The total also includes a slight increase in Tait Street production sent to GHWTP because of the assumed unlimited diversion capacity.

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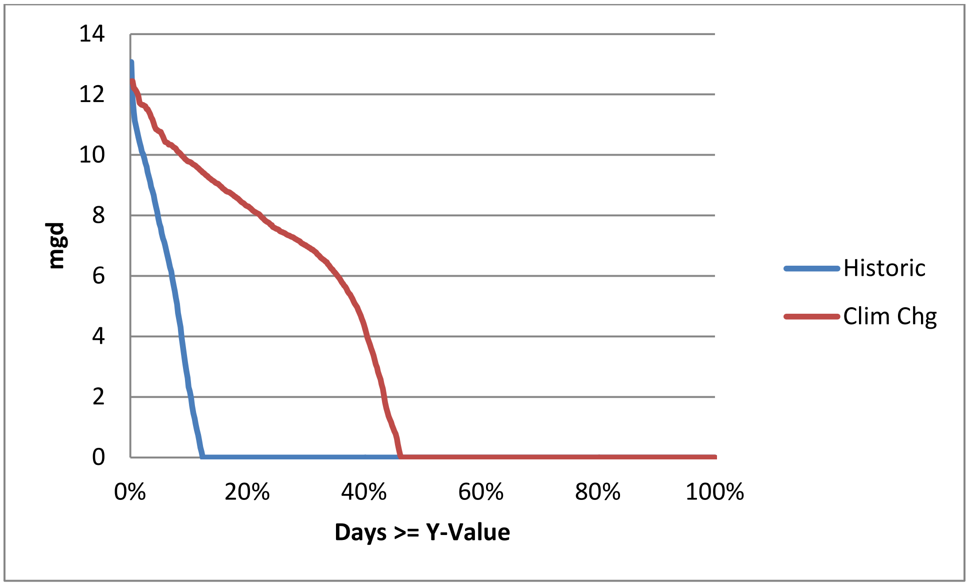
Figure 4. Duration Curves of Daily North Coast Exchange Production



Conclusion

CA-10, Indirect Potable Reuse, assumes daily recycled water production of 3.64 mgd (1330 mg annually). This recycled water is stored either in a surface reservoir or in an aquifer. As is the case with the winter flow harvesting alternatives, the ability to store the source and use it in subsequent years provides substantial system benefits and, in fact, is sufficient to eliminate all projected shortages under historic flows or with climate change. However, because this is source is fixed (i.e. hydrology-independent), it requires considerably less storage capacity to accomplish this than a flow-dependent supply.