

Weaver, Mathew

From: Charles G. Brockway [charles.g.brockway@brockwayeng.com]
Sent: Monday, December 06, 2010 2:35 PM
To: Weaver, Mathew
Cc: Peppersack, Jeff
Subject: Fish Creek recharge
Attachments: GW diversion calc.xls; 1996-2006 recharge tables.xls

Hello Mat,

I reviewed your draft memo dated 7/6/2010. Can you set up a phone call with Jeff this week or next? Here's my schedule:

Wed 12/8 afternoon
Thu 12/9 any time
Fri 12/10 any time
Next week any time except Tuesday

IF I USE 5/1 - 9/30 SEASON
LIMIT MOLYNA TO 28 DAY
I GET A GW V OF 2,262 AF

121: 273

The groundwater diversion of 3,525 ac-ft seems high based on the info from the watermaster (see attached spreadsheet). If I take his flow rates for the start and end of the season, and assume a linear decline, I get 2014 to 2627 ac-ft depending on the assumed length of season. Maybe I am missing something – I can't duplicate your numbers.

EX. ASSUMES V_w = FOREGONE, NOT ACTUAL 2000 VAL

In your first example on page 10, the foregone storage in 2000 was only 4595 ac-ft, so there would not have been 8896 ac-ft measured at the weir and the calculated recharge would not have reached the 6,322 ac-ft limit.

I think we are basically at the same point as before, trying to determine what portion of the foregone storage would have been consumptively used and therefore allowable as a credit. I attempted to resolve this in my original report by estimating an average value for incidental irrigation recharge. With the new METRIC data and your analysis, I think we can do better. It appears we have enough data to say that the irrigation efficiency is at or near 100% when the total water supply is below approximately 13,000 to 14,000 ac-ft, and lower when sufficient or surplus water is available. This is pretty much the result that we would expect. I am not comfortable with using a single year as a "control," but would suggest some attempt to vary the irrigation efficiency according to water supply magnitude based on the METRIC data. If this can be done, then the calculation is "self-limiting" – no need to set a control other than the 8896 ac-ft.

Here's a step-by-step approach that makes sense to me (this is similar to the approach you took on page 10 of your memo). This calculation would be made at the end of each season.

Step 1: Calculate total irrigation water supply for the season.

TWS = Effective P + SW diversions + GW diversions

Picabo station for effective P

SW diversions from watermaster

GW diversions assumed constant unless actual records are available in the future

Step 2: Calculate gross recharge based on volume measured at the weir, limited to 8,896 ac-ft.

$R = \min \left[\begin{array}{l} \text{Measured volume} \\ 8896 \text{ ac-ft} \end{array} \right]$

ASSUME $E_i = 1$, PROBABLY TRUE IN DRY YEARS
NOT IN WET YEARS

Step 3: Calculate seepage loss prior to average historical date of first water in creek

$S = (s / (1-s)) * \text{Volume measured through the weir prior to April 21}$

Step 4: Adjust the measured gross recharge by the irrigation efficiency that would have applied to the block of water that passed the weir. Irrigation efficiency varies as calculated using METRIC data and supply analysis.

$$R_{adj} = e * (R + S)$$

$e = 1.0$ for $TWS < 13,500$ and something lower for $TWS \geq 13,500$. Range 78% to 86%, maybe a linear function from 13,500 to 20,000? (need to discuss)

Step 5: Calculate the recharge credit by adding the reduction in reservoir evaporation and subtracting the increase in evaporation due to the recharge activity.

$$R_{credit} = R_{adj} + 271 - 14 = R_{adj} + 257$$

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All information, calculations, maps, drawings, or other documents transmitted via e-mail are preliminary unless explicitly stated in the e-mail text or in the documents themselves.