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Last Chance Baseflow Monitoring - interim report

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April 28, 2005

NOTE: A map of Rowland-Charles reach is attached as a pdf file.

This is a synopsis of work conducted so far. It is meant to provide an update and give insight into progress made in this project. It is by no means a a comprehensive analysis of the hydrologic situation at these sites - which will not be possible until data collection is completed.

Sampling conducted so far

a. Data collection started November 17, 2004. The most recent samples were collected on April 26, 2005.

b. Samples were collected from streams, piezometers and precipitation.

c. Number of Samples collected so far 54. Samples analyzed in lab so far: 31 samples. Lab analysis in progress: 23 samples

Big Flat data - tentative analysis

Data plotting

1. Big Flat is a flood plain that extends roughly north-south with the channel of Cottonwood Creek flowing south.
2. In Figure 1 ground water data are shown as solid symbols. Surface water data are shown as open symbols.
3. Data from the same source taken at different dates are connected with a line.

Observations - Figure 1:

1. Ground water sampled in the piezometers in the southern and central meadow flood plain formation (black triangles) and the six-inch well (black star), plot in the upper right diagram. As expected the pond samples (blue) plot in the same area since they are connected to ground water.
2. This groundwater is not the same as that sampled in the springs emerging from bedrock east and west of Big Flat (Stony Creek Spring and East Spring - black ‘upside-down’ triangles).
3. Stream water composition changed significantly in less than two weeks (December 16 to 28). Stream water at the upstream (northern) stream gauge differs from ground water in the meadow. An exception is the northernmost piezometer (BFX-2) which plots midway between the incoming stream water and other ground water - suggesting that it is a mixture of stream and meadow ground water.
4. Stream water at the downstream gauge (red) plots closer to the meadow ground waters (blue), suggesting the influence of ground water emerging and mixing with stream water in the channel in the Big Flat flood plain (gaining stream, as expected).

Synopsis

1. Ground and stream water in the Big Flat system differ significantly, allowing distinction between these in the stream channel.
2. Stream water chemistry changes rapidly in response to precipitation.
3. The currently available data provide a framework for further data collection. From hereon sampling is expected to reveal the process of meadow aquifer recharge and base flow

augmentation later in the year.

4. We are looking forward to see how the interaction between stream and ground water further evolves from hereon, based on further data collection. It is anticipated that stream water composition will evolve towards that seen in the meadow ground waters at this stage.

Rowland-Charles Creek Reach of Last Chance Creek - tentative data analysis

Three rows of piezometers were monitored: CB2, RC4, and RC5 (see attached pdf file map).

Data plotting - Figures 2 and 3

1. Ground water samples, collected form piezometers are shown in solid symbols, colored red, green and blue.
2. Spring waters discharging from bedrock in the east and west, are shown in black
3. Surface waters are shown in open symbols: circle for Charles Cr., triangles for Last Chance Creek.

Observations

Figure 2:

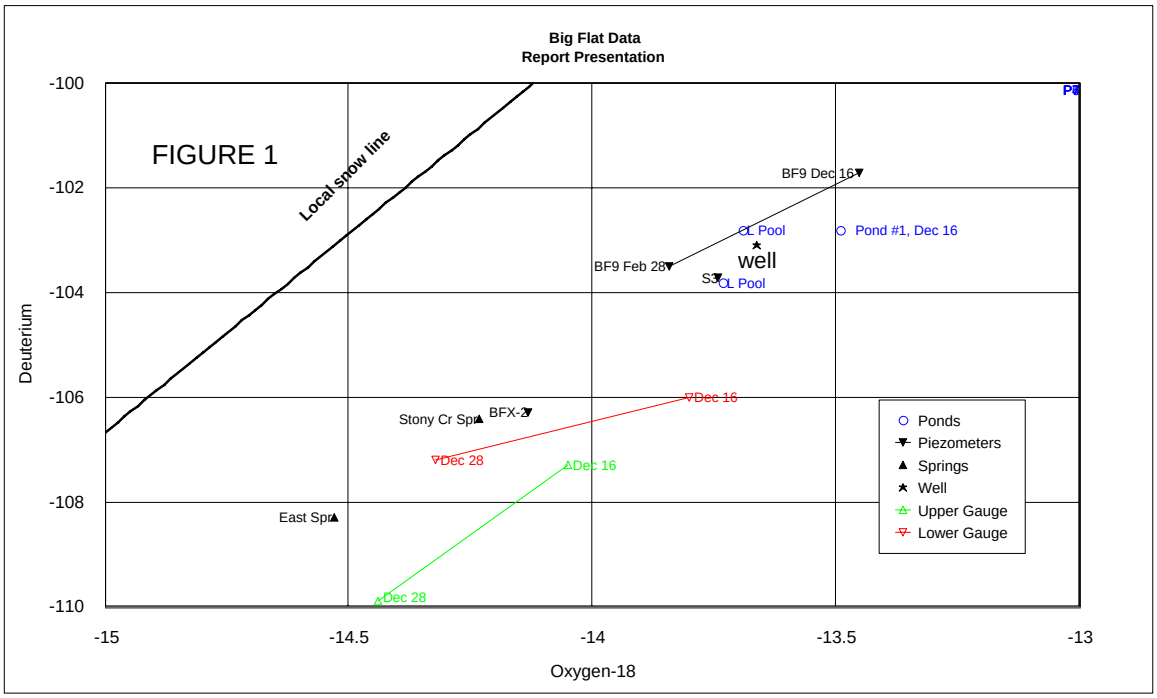
1. Last Chance Cr. composition changed flowing downstream.
2. Ground water samples collected from same piezometers shifted dramatically and consistently in the period of ten weeks (see water samples from same location, connected by a line).
3. Surface water composition mimicked the change observed in ground water, though to a lesser extent (see water samples from same location, connected by a line).

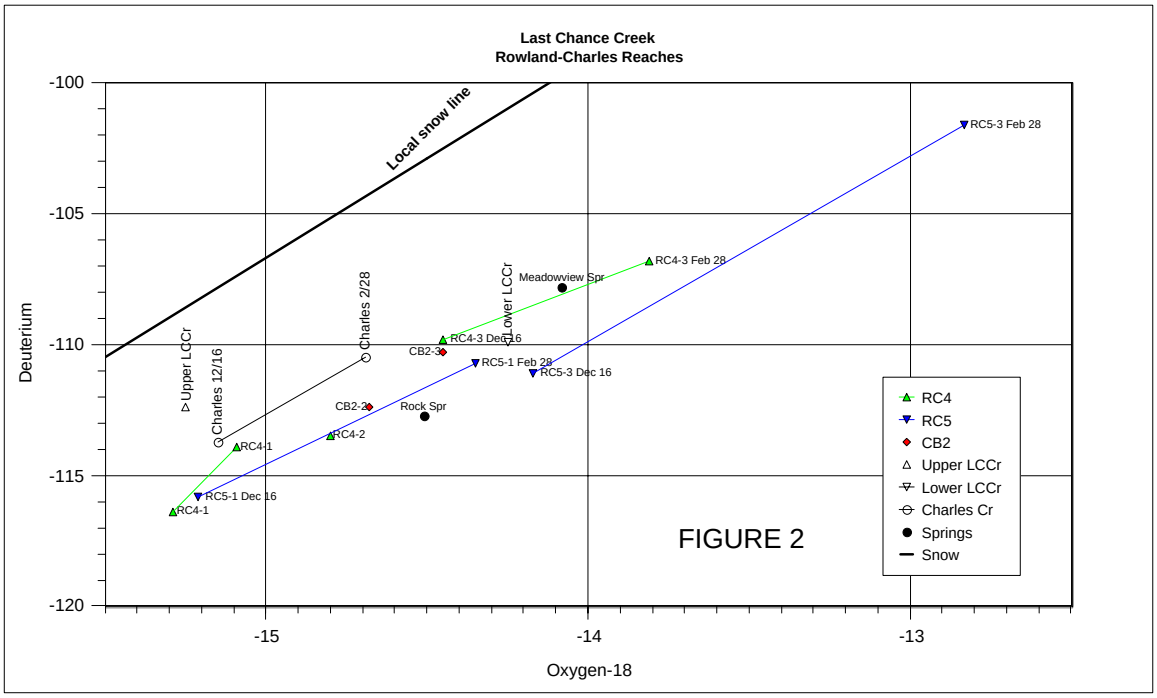
Figure 3:

1. Figure 3 shows schematic cross-sections, west to east, looking downstream of ground water composition, using deuterium. Clearly ground water in this flood plain is recharged from two sources, which are probably the high ridges west and east of the flood plain. The eastern source is probably similar to the springs.
2. Stream water composition included in this plot is about an average of the two ground water compositions.

Synopsis:

1. Ground and stream water in this reach differ significantly in isotope composition which makes it easier to distinguish one from the other in the channel at later stages in this study.
2. The data clearly indicate that ground and stream water in this reach are connected. Since in this case ground water changes are more significant it appears as if surface water composition changes are caused by emerging ground water (gaining stream) mixing with stream water entering the valley from the south. This is much more so than in Big Flat.
3. The significance of these observations is expected to become more clear with further data collection. We are looking forward to see how the interaction between stream and ground water further evolves from hereon, based on further data collection.


Big Flat Data
Report Presentation
FIGURE 1
Local snow line
BF9 Dec 16
L Pool
Pond #1, Dec 16
BF9 Feb 28
well
S3
L Pool
Stony Cr Spr
BFX-2
Dec 16
Dec 28
Dec 16
East Spr
Dec 28
Ponds
Piezometers
Springs
Well
Upper Gauge
Lower Gauge
-100
-102
-104
-106
-108
-110
Deuterium
-15
-14.5
-14
-13.5
-13
Oxygen-18


Last Chance Creek
Rowland-Charles Reaches
Local snow line
RC5-3 Feb 28
RC4-3 Feb 28
Meadowview Spr
Lower LCCr
Upper LCCr
Charles 2/28
Charles 12/16
RC4-3 Dec 16
CB2-3
RC5-1 Feb 28
RC5-3 Dec 16
CB2-2
Rock Spr
RC4-2
RC4-1
RC5-1 Dec 16
RC4-1
FIGURE 2
RC4
RC5
CB2
Upper LCCr
Lower LCCr
Charles Cr
Springs
Snow
-100
-105
-110
-115
-120
Deuterium
-15
-14
-13
Oxygen-18

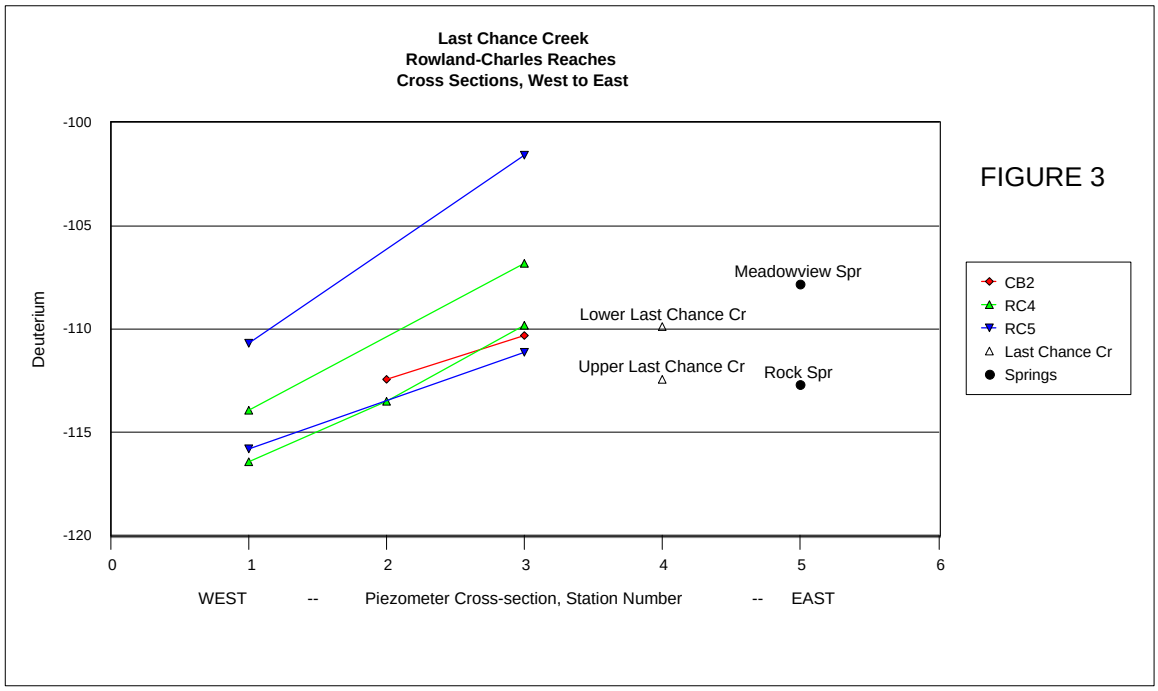

Last Chance Creek
Rowland-Charles Reaches
Cross Sections, West to East
-100
-105
-110
-115
-120
Deuterium
0
1
2
3
4
5
6
WEST -- Piezometer Cross-section, Station Number -- EAST
Meadowview Spr
Lower Last Chance Cr
Upper Last Chance Cr
Rock Spr
CB2
RC4
RC5
Last Chance Cr
Springs

FIGURE 3