

Heart Canyon

Moccasin
(no services)

Vermilion Cliffs

PIPE SPRING
NATIONAL MONUMENT
(enlarged area)

Visitor Center

389

To Zion National Park,
Utah

To North Rim,
Grand Canyon
National Park,
Arizona

KAIBAB-PAIUTE RESERVATION
PIPE SPRING NATIONAL MONUMENT

East Cabin

Chicken
coop

Corral

Winsor
Castle

Garden

Dugout site

Wash

Loop trail

West
Cabin

Ponds

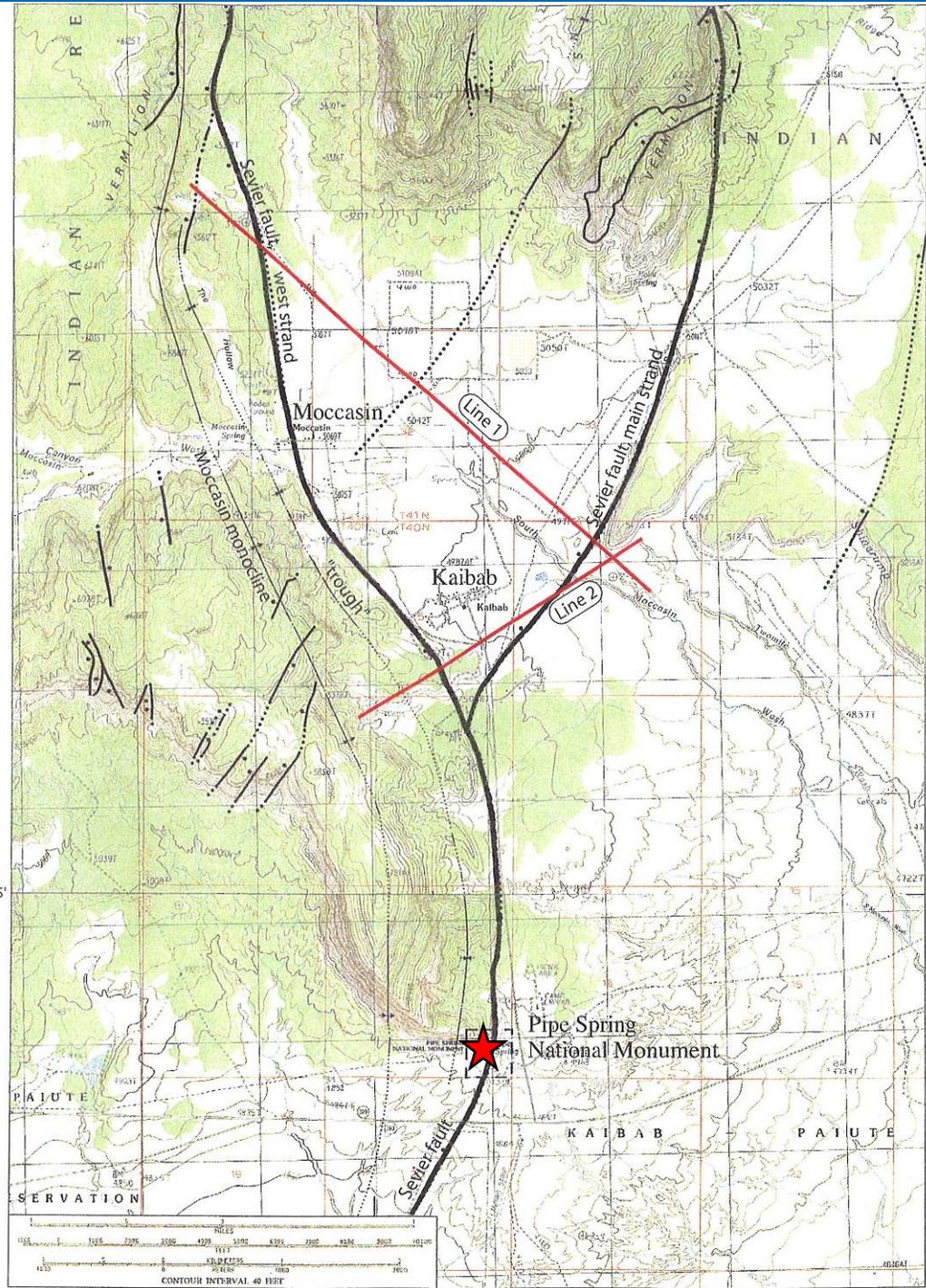
Paved walkway

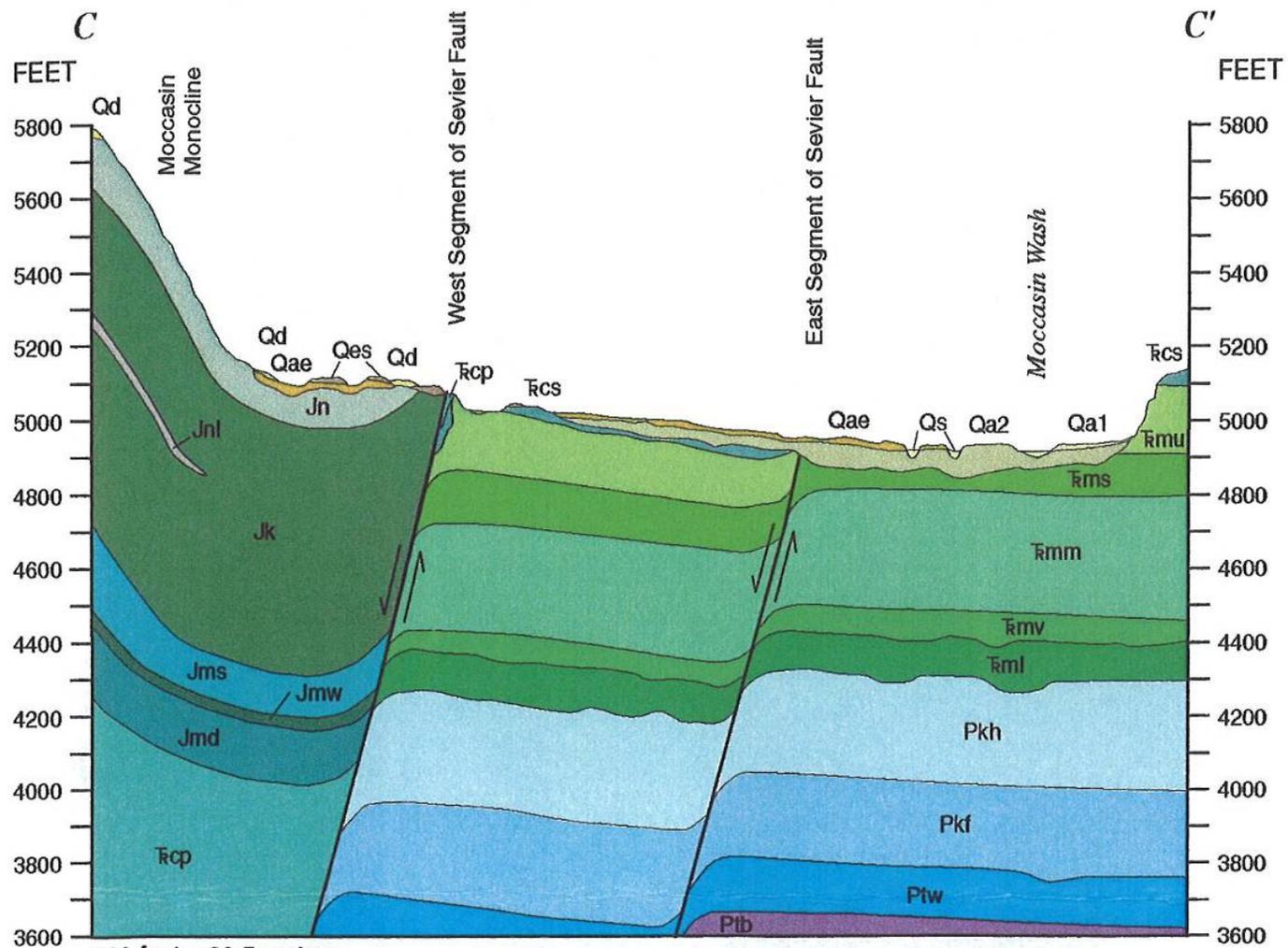
Visitor Center

Pasture

Orchard

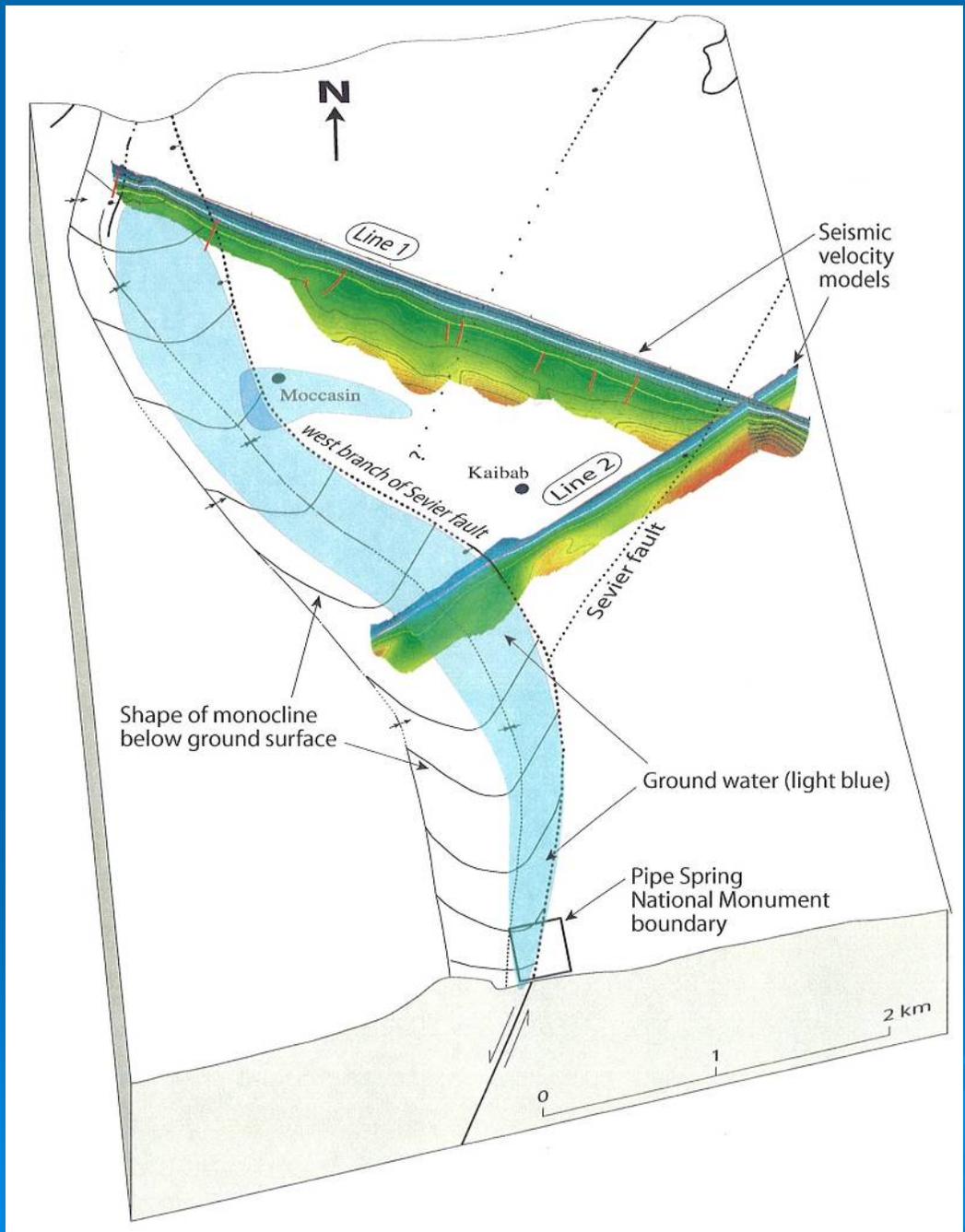






100 feet = 30.5 meters
 Ptw and Ptb shown only in cross section

VERTICAL EXAGGERATION X 4



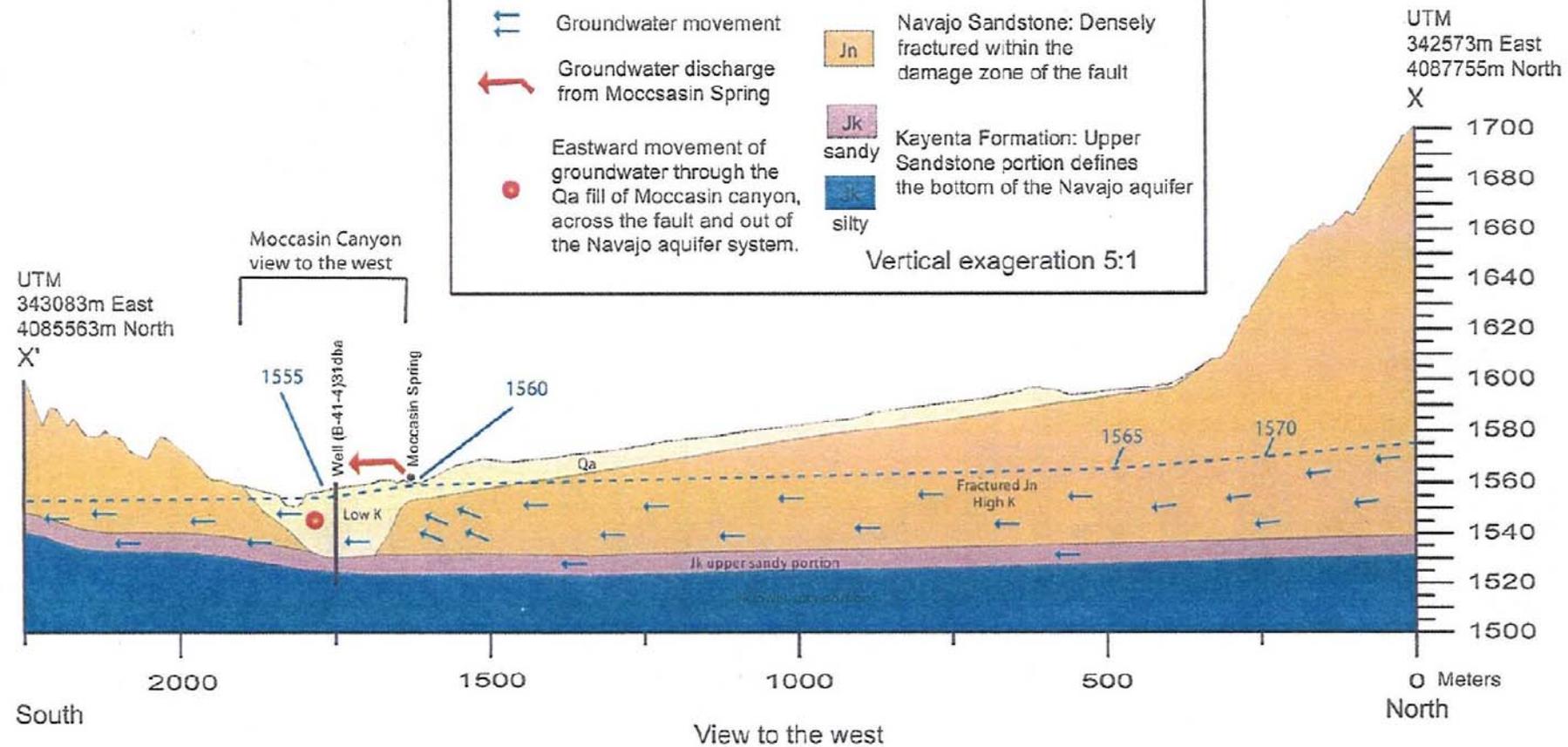
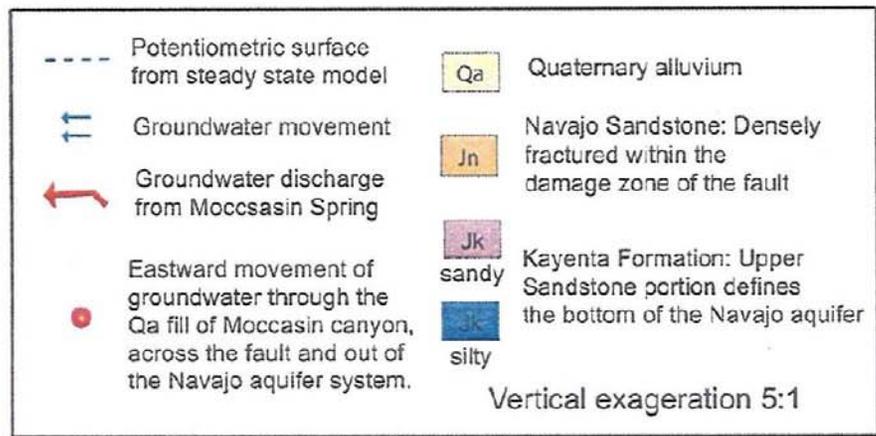
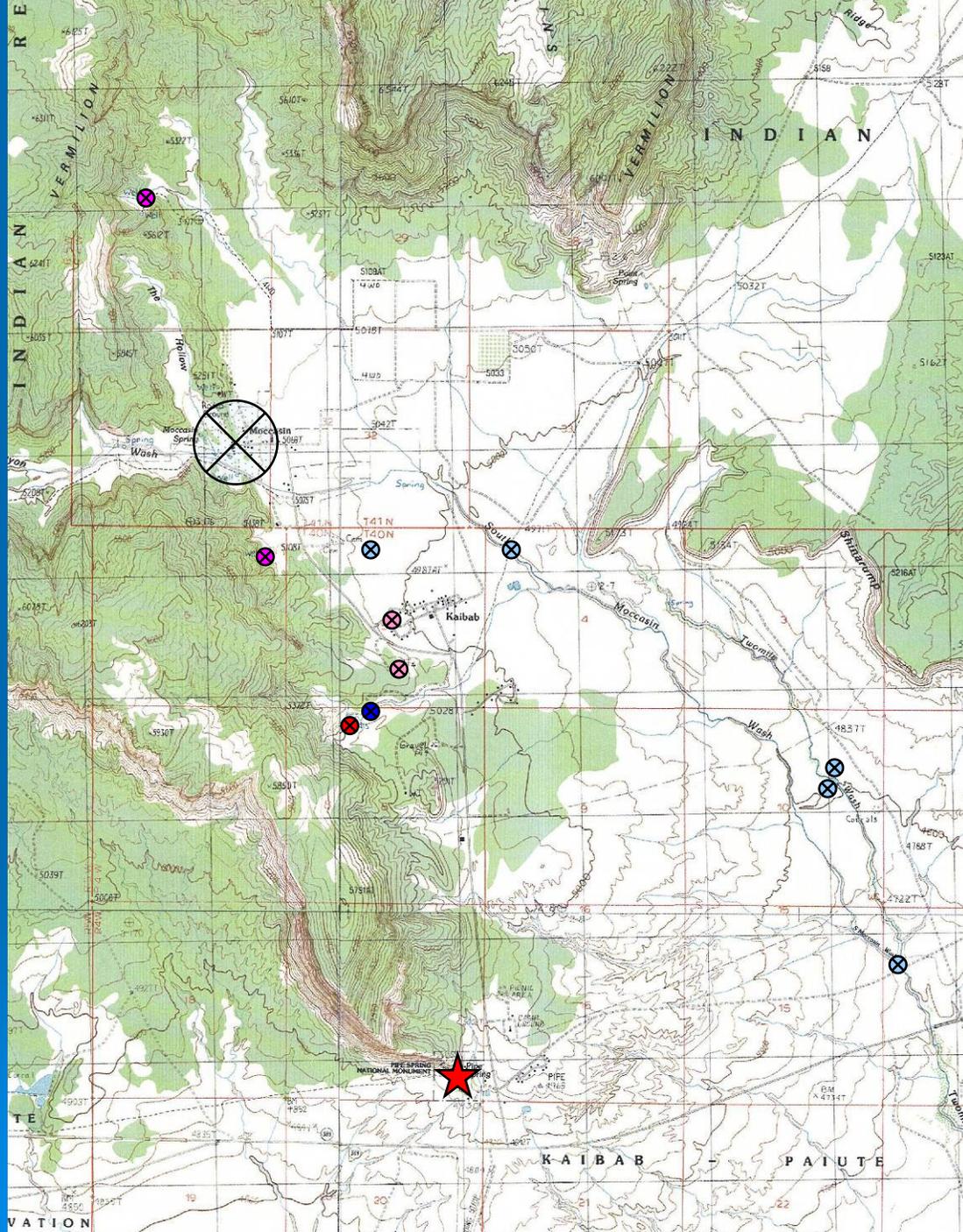
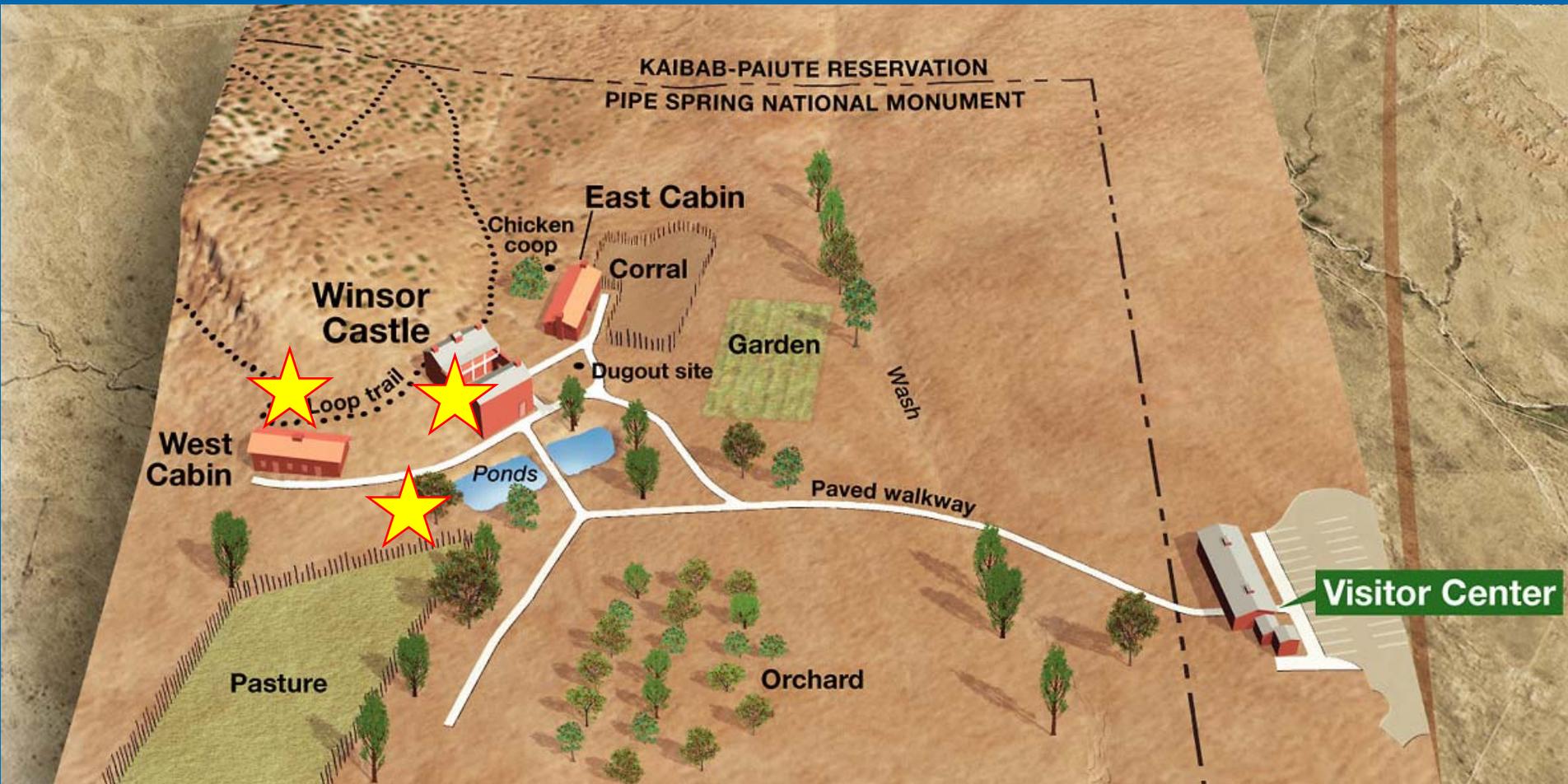


Figure 22 - Movement of groundwater in the fractured Navajo Sandstone is bisected and interrupted by the relatively low K alluvium filling Moccasin Canyon. This causes the discharge of groundwater from Moccasin Spring. See Figure 19 for location of X-X'.



Springflow at Pipe Spring

- 1933 – 42 gpm
- 1934 – 42 gpm
- 1959 – 35 gpm
- 1969 – 38 gpm
- July 1976 Started Monthly Measurements
- Winter 2007-08 – 12 gpm

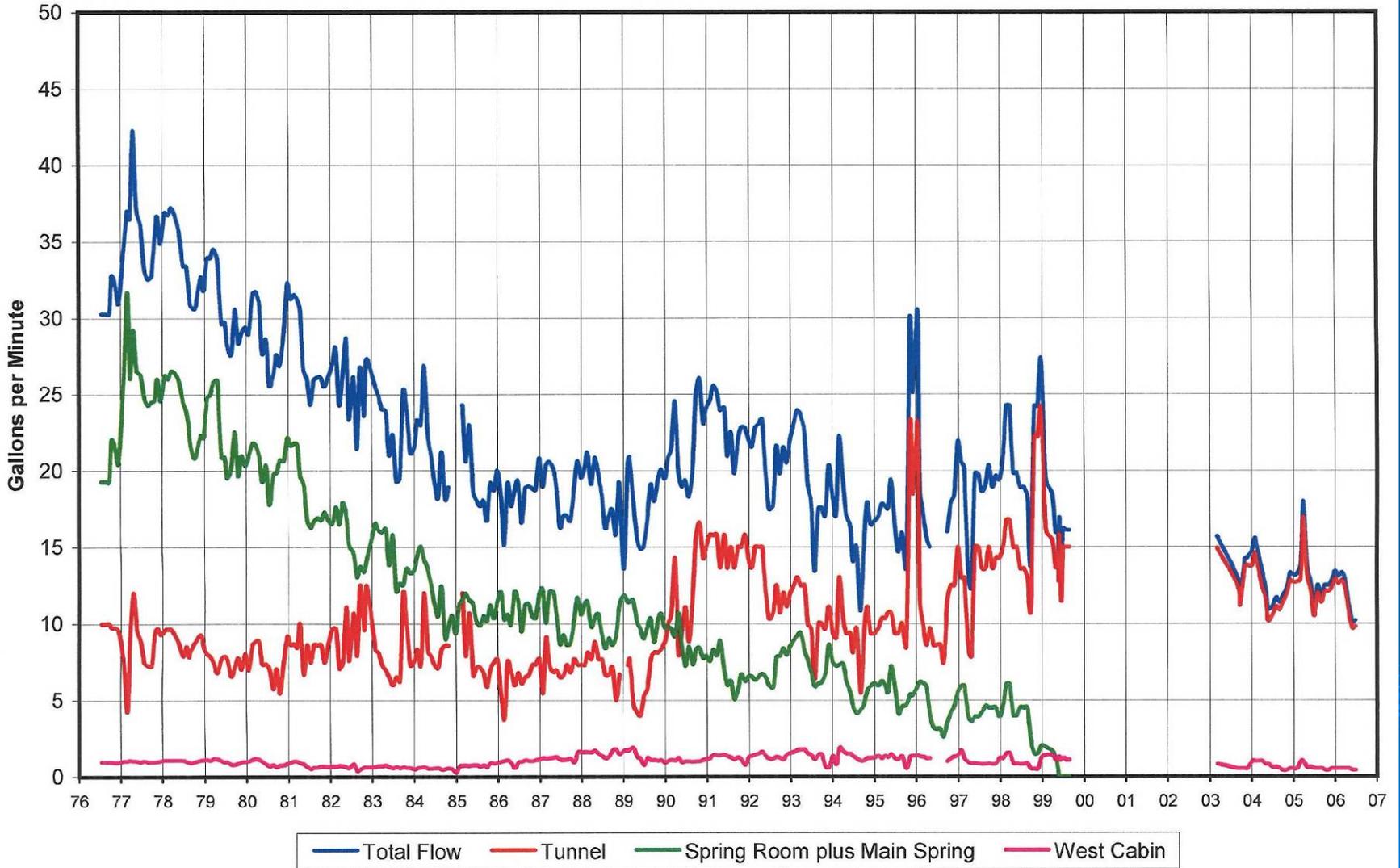


Spring Room and Main Spring (aka Big Spring)

Tunnel Spring

West Cabin Spring

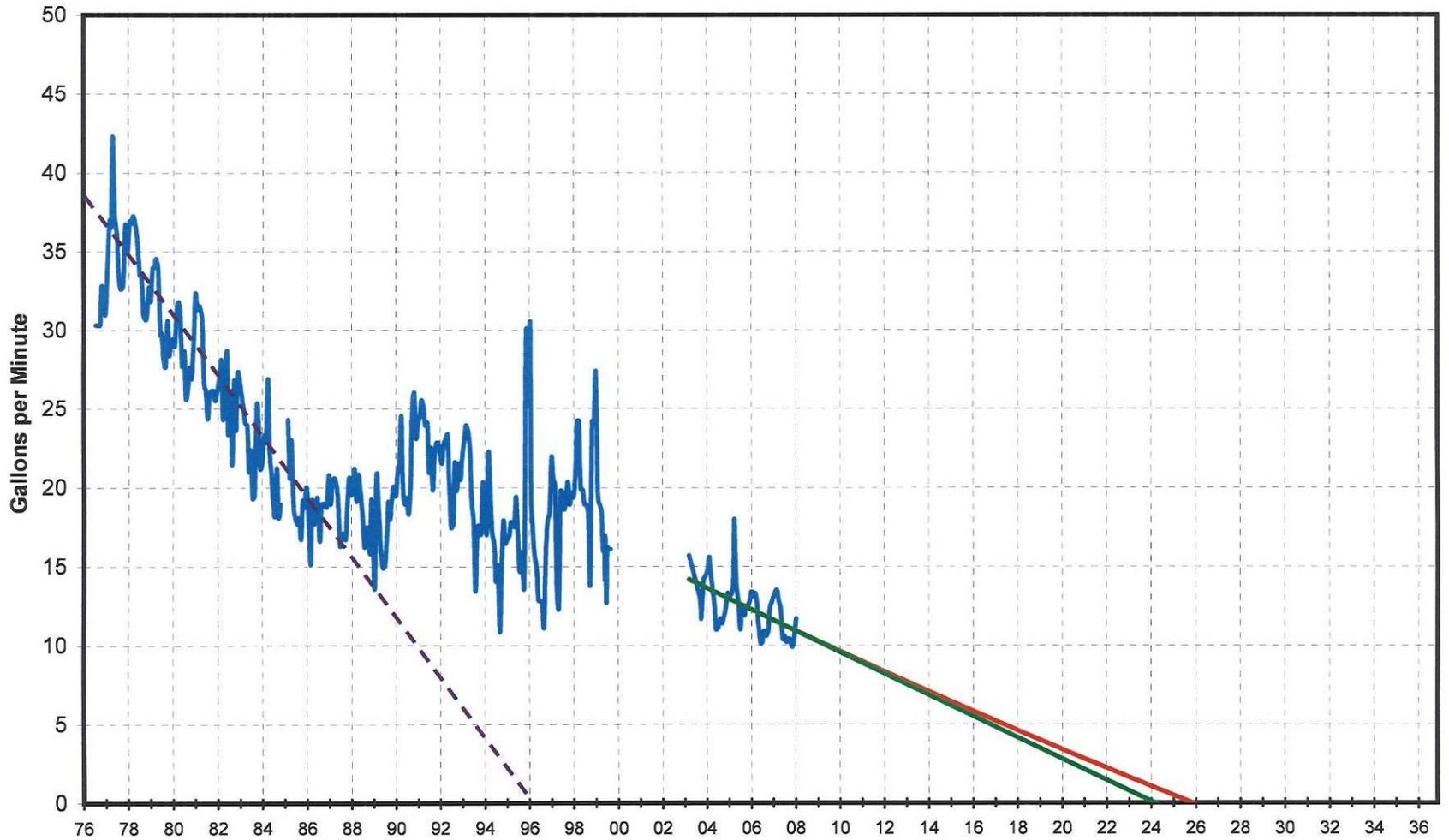
Pipe Spring Spring Flow

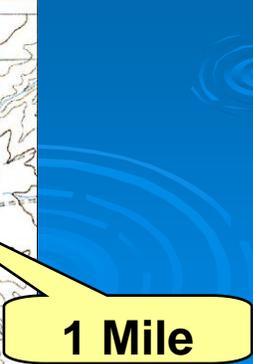
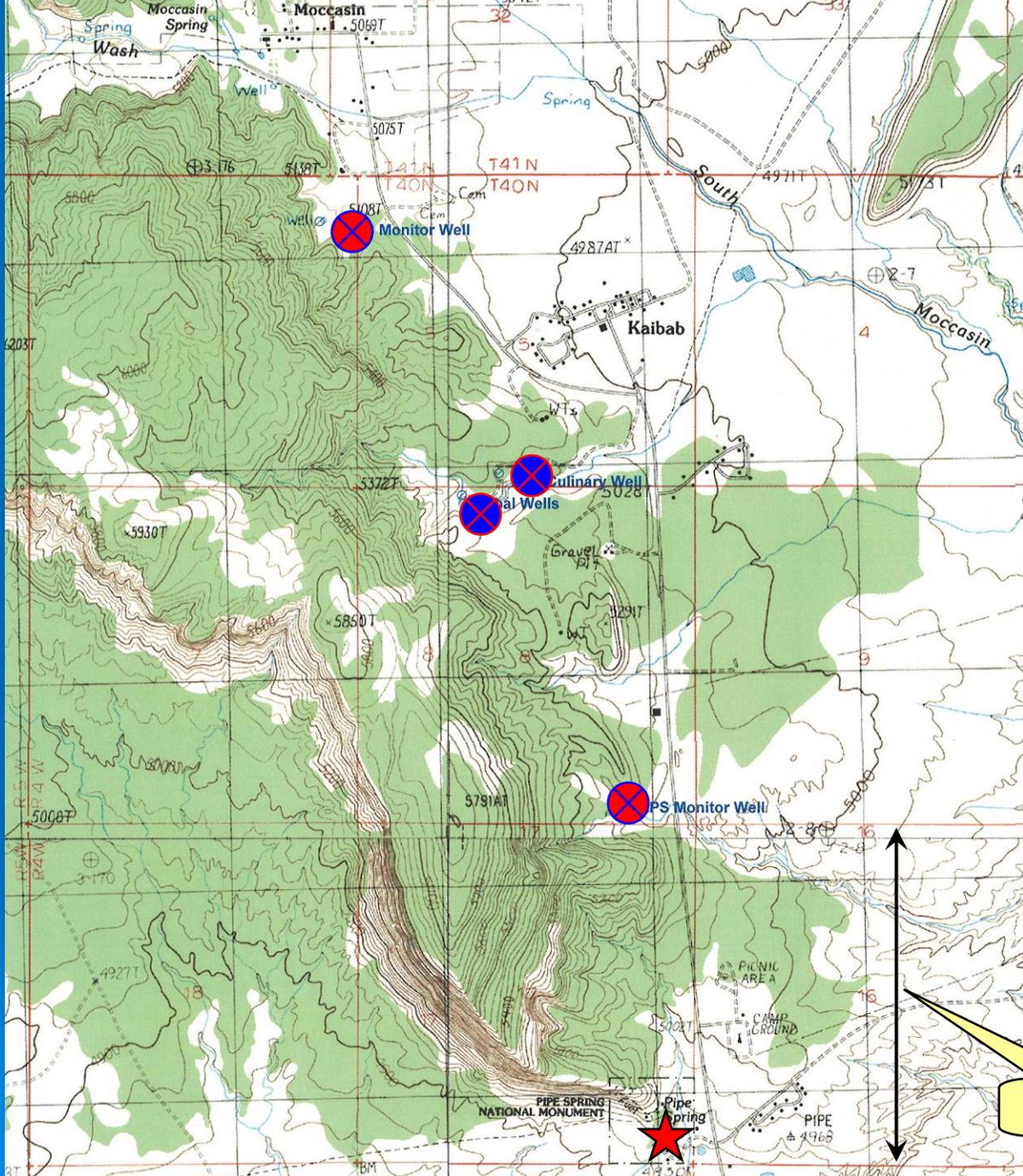


Total Springflow 3-month moving average

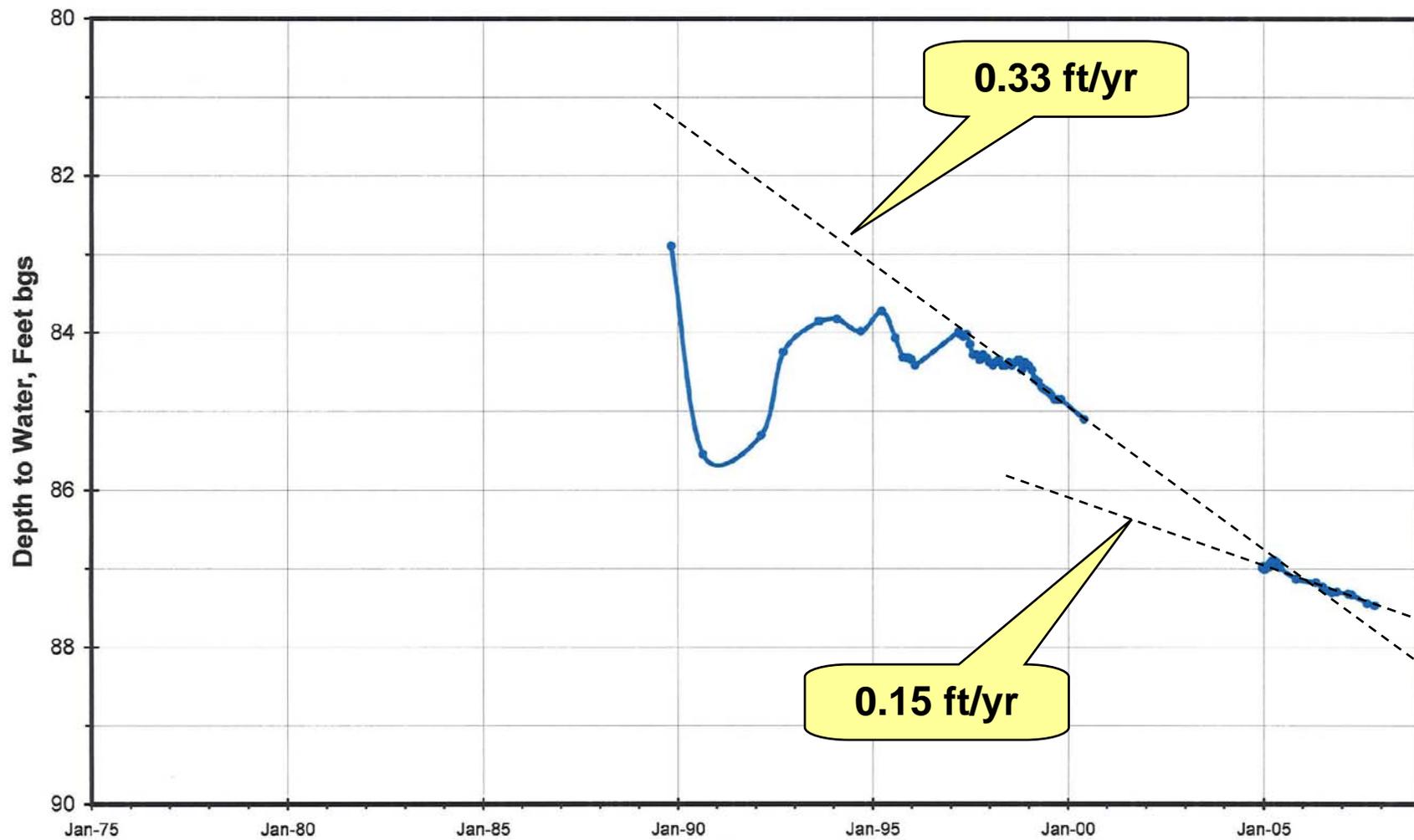


Total Spring Flow at Pipe Spring National Monument

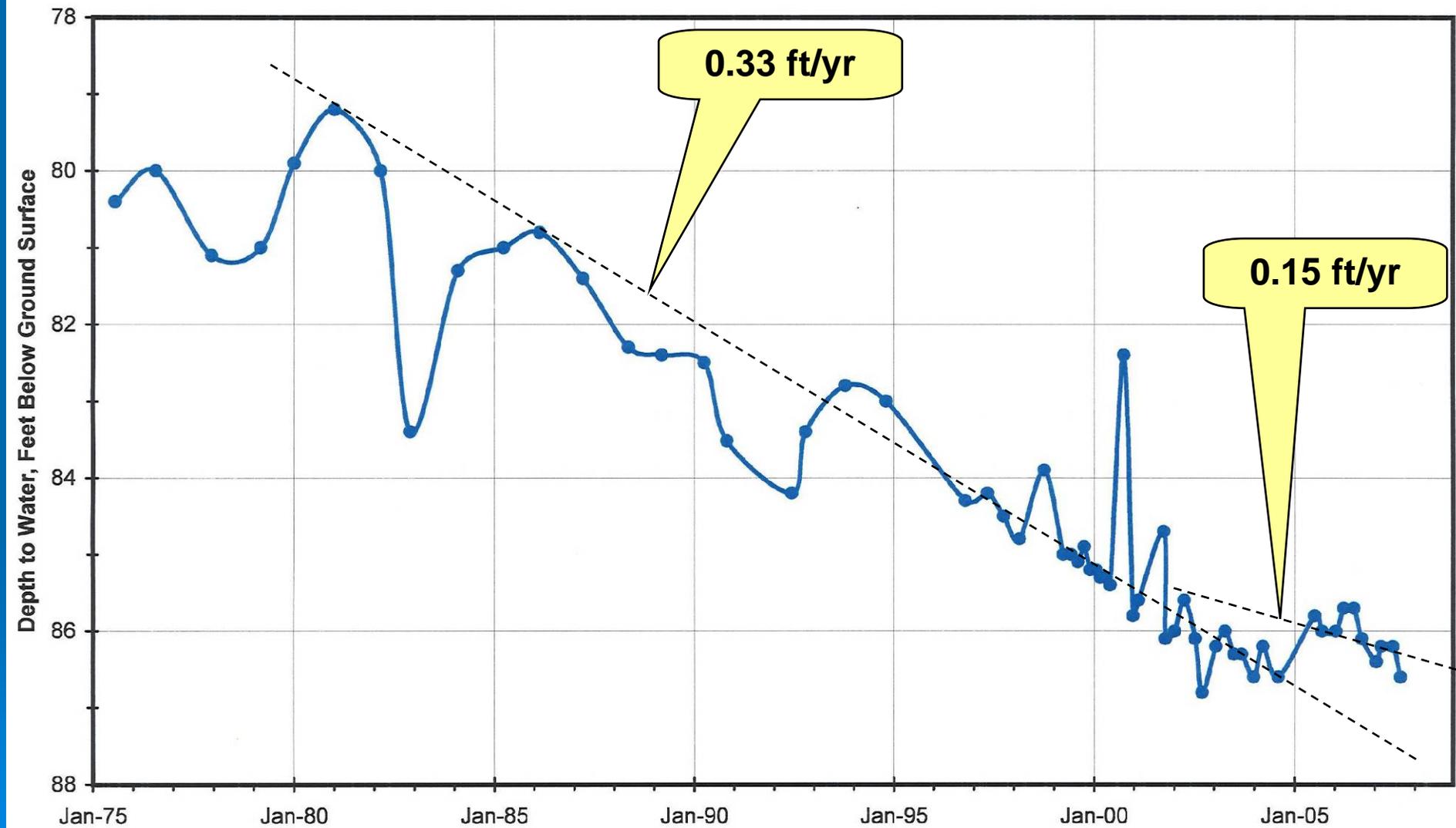




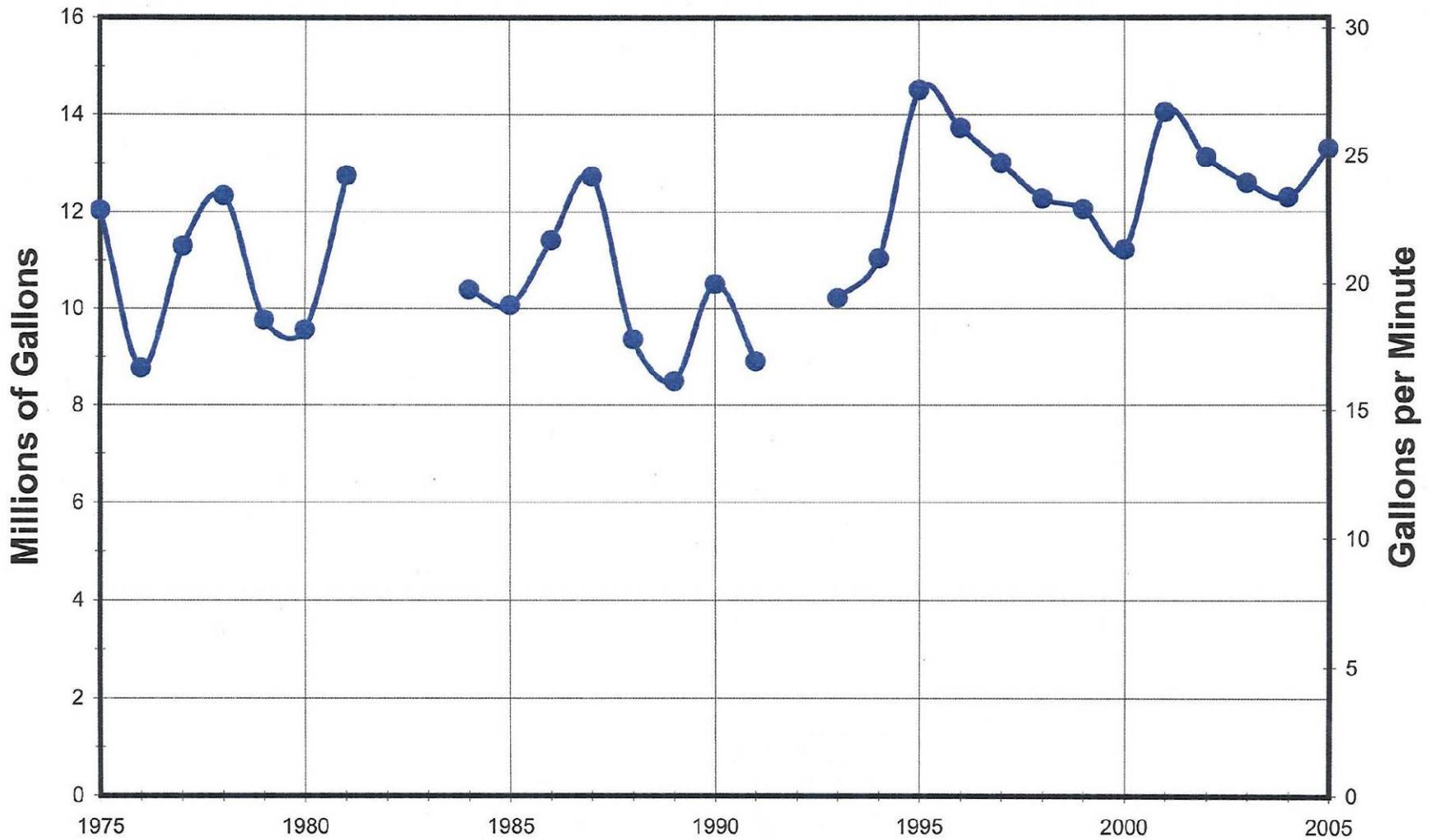
NPS Monitor Well B-40-04-17aac



USGS Monitor Well
B-40-04-06AAC



Groundwater Pumping from NPS Supply Well

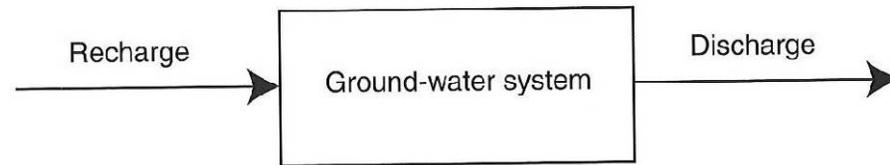


Water Use in Spring 2006

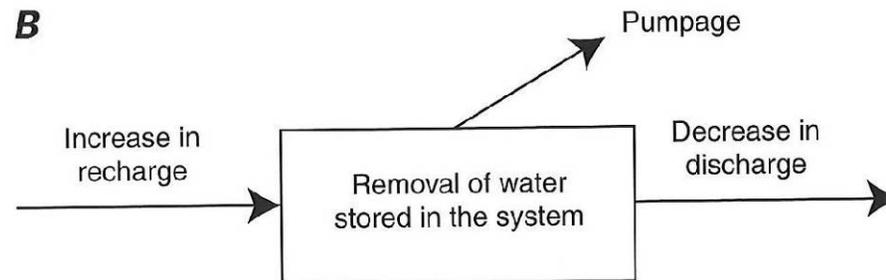
- Tribal Well was not in use. NPS Well provided all water for Tribe and monument.
- Average pumping rate -- 60 gpm.
 - Tribal use was 51 gpm (85%)
 - NPS use was 9 gpm (15%)
- Average use by NPS 4 gpm (Jan 06 – Feb 07)
- Average pumping rate from NPS well is 25 gpm

OUTFLOW = INFLOW +/- STORAGE

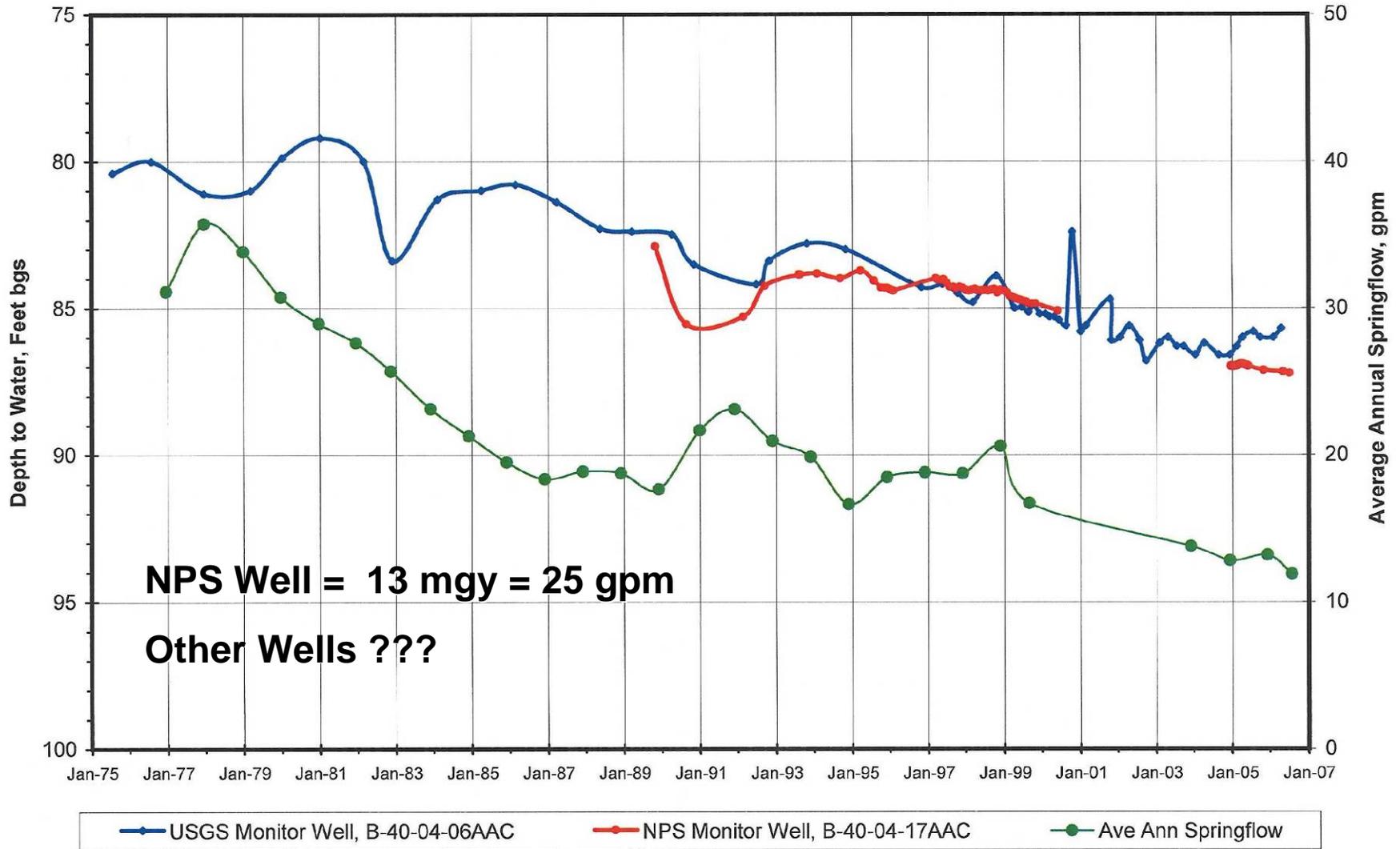
A



B

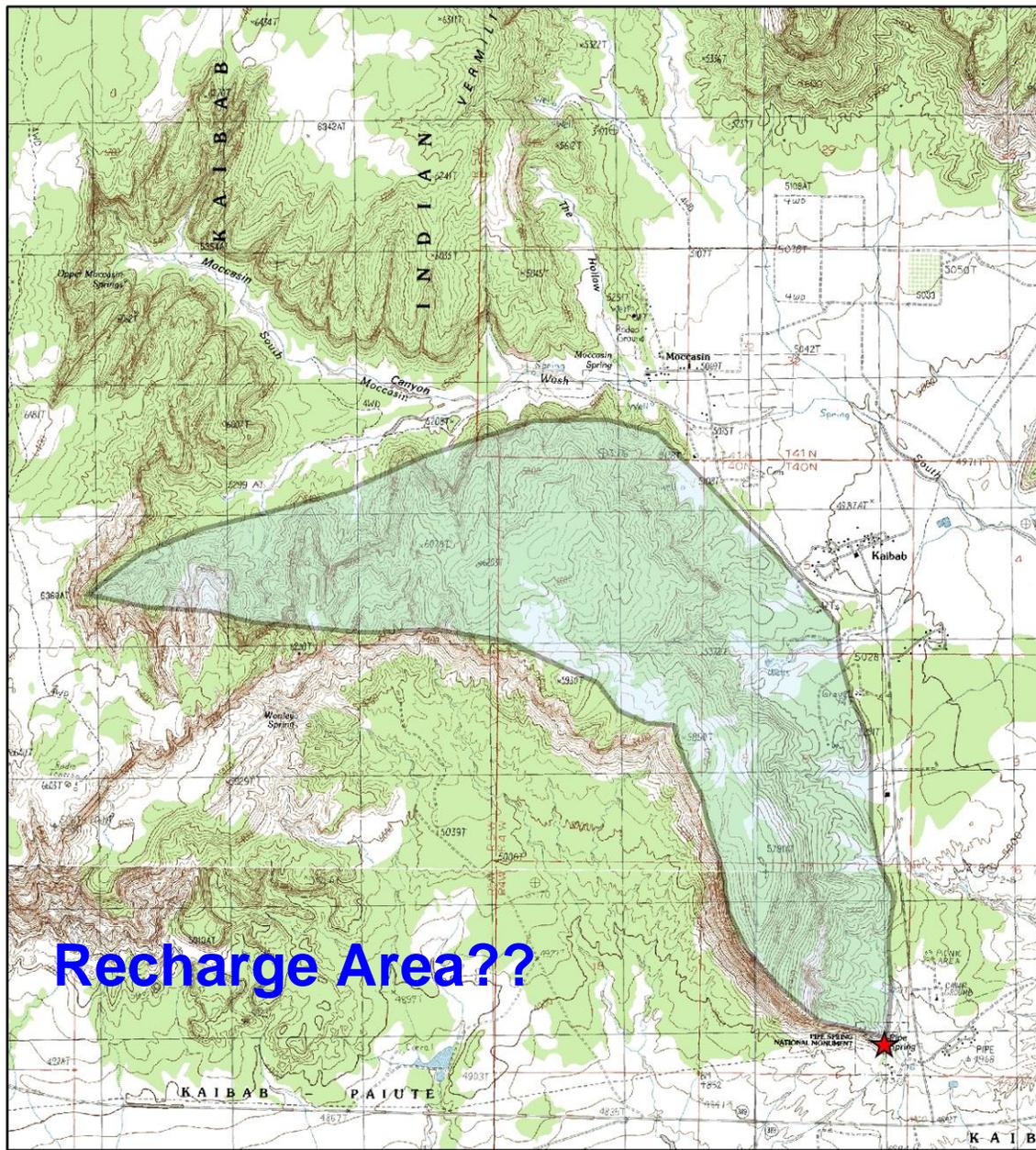


Hydrologic Monitoring Near Pipe Spring National Monument



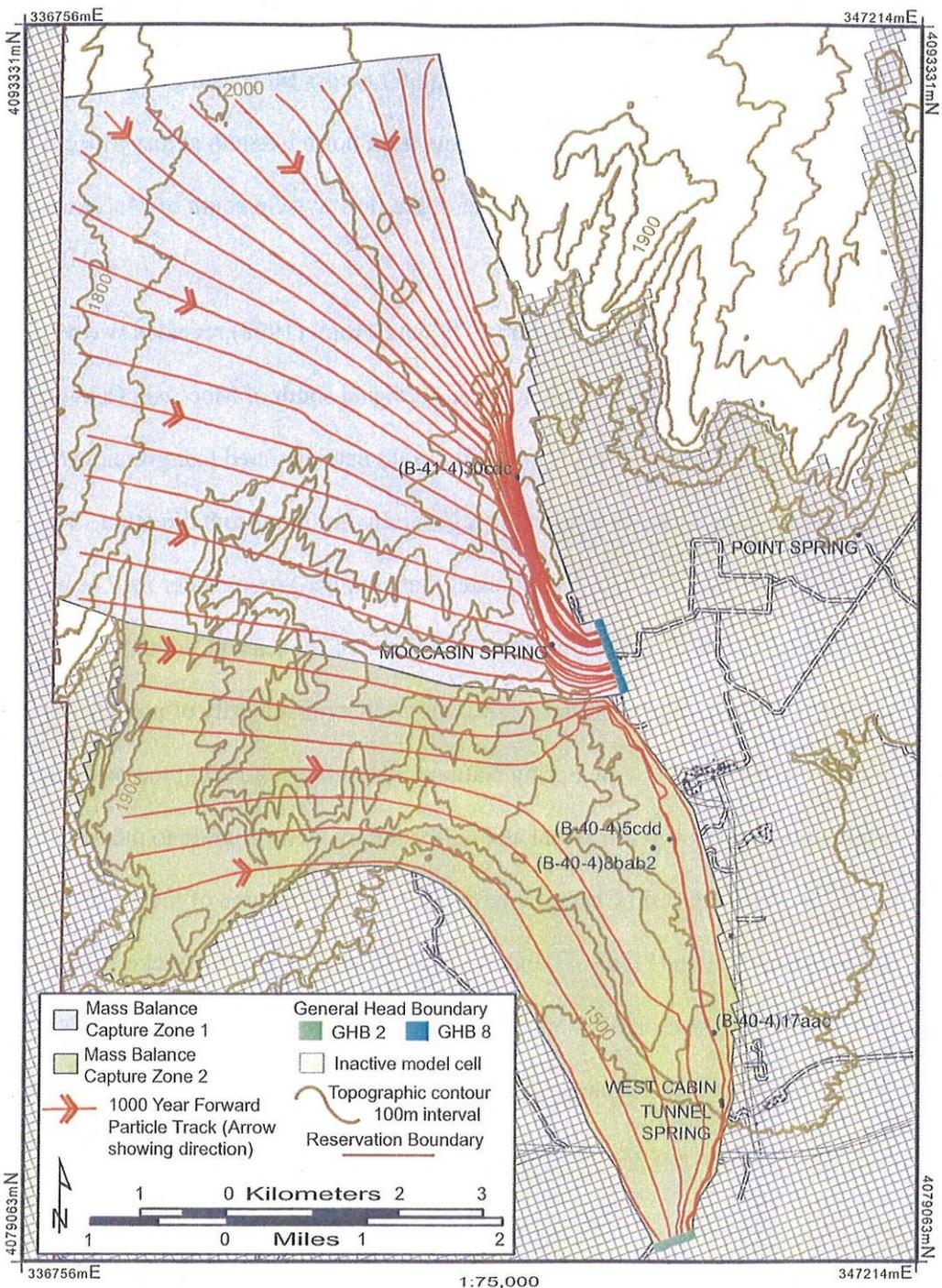
How large is the recharge area for the springs at Pipe Spring National Monument?

- $35 \text{ gpm} = 50,400 \text{ gpd} = 18,396,000 \text{ gpy}$
- $18,396,000 \text{ gallons} = 2,459,358 \text{ ft}^3 = 56 \text{ af}$
- $\text{RCH} = \frac{1}{2}''/\text{yr} \text{ (5\% ppt)} = 0.04167'/\text{yr}$
- Each mi^2 is $5280' \times 5280'$
- $0.04167' \times 5280' \times 5280' = 1,161,600 \text{ ft}^3 = 8,688,768 \text{ gallons}$
- Need a little more than 2 mi^2 to provide enough groundwater recharge to sustain the springs



Recharge Area??





Tom Sabol, NAU, 2005

Additional Studies

- Groundwater pumping at Moccasin and north of Moccasin has an unknown effect on the groundwater flow system south of Moccasin Wash
- Geophysics at Moccasin Wash
- Geochemistry of groundwaters north & south of Moccasin Wash
- Moccasin area is Tribal land & multiple private landowners. No NPS land

Conclusion

- Spring flow at Pipe Spring National Monument will continue to decline and likely **cease entirely** unless NPS and the Tribe discontinue groundwater pumping from the existing supply wells
- Move GW pumping to north of Moccasin Wash
- Tap into the Lake Powell-St. George pipeline

