NOV 20 1989 gk

Beaver, Urah
Nov. 15, 1989

Robert L. Morgan
1636 West North Temple
Salt Lake City, Utah 84116

Dear Sir:

The Water Users of West Beaver Valley do hereby protest the new Presserizrd sprinkling system for Beaver City. We are protesting on the grounds that the return flow will be reduced to 27% of the normal flow. This means that the meadows and the farm land of Beaver will dry up to the point where it will be impossibe to servive. This also includes the winter flow to Minersville.

The Rights are as old as the City. Will you please check with Reed Mower, Hydrologist, who has made a three year study of the system? This will reduce all the farmers water west of the city, making it a very serious situation, and also effecting this valley in years to come.

The sloughs and the springs are totally dependent on this return water. Please help us with this situation, Come and observe the problem that is facing the Beaver Valley water users, so that a true study can be made. This is an unique valley, like no other in the state.

We would like to have a compromise worked out before it goes to court.

Sincerely,

Roy Yardley

Chairman of The Beaver Valley
Water Users' Association

Box 166
Beaver, UT 84713

REED W MOWER, HYDROLOGIST
55 West 200 North
P. O. Box 67
Fairview, Utah 84629
Phone 801-427-9447
November 6, 1989

Beaver Valley Water Users
Beaver, Utah

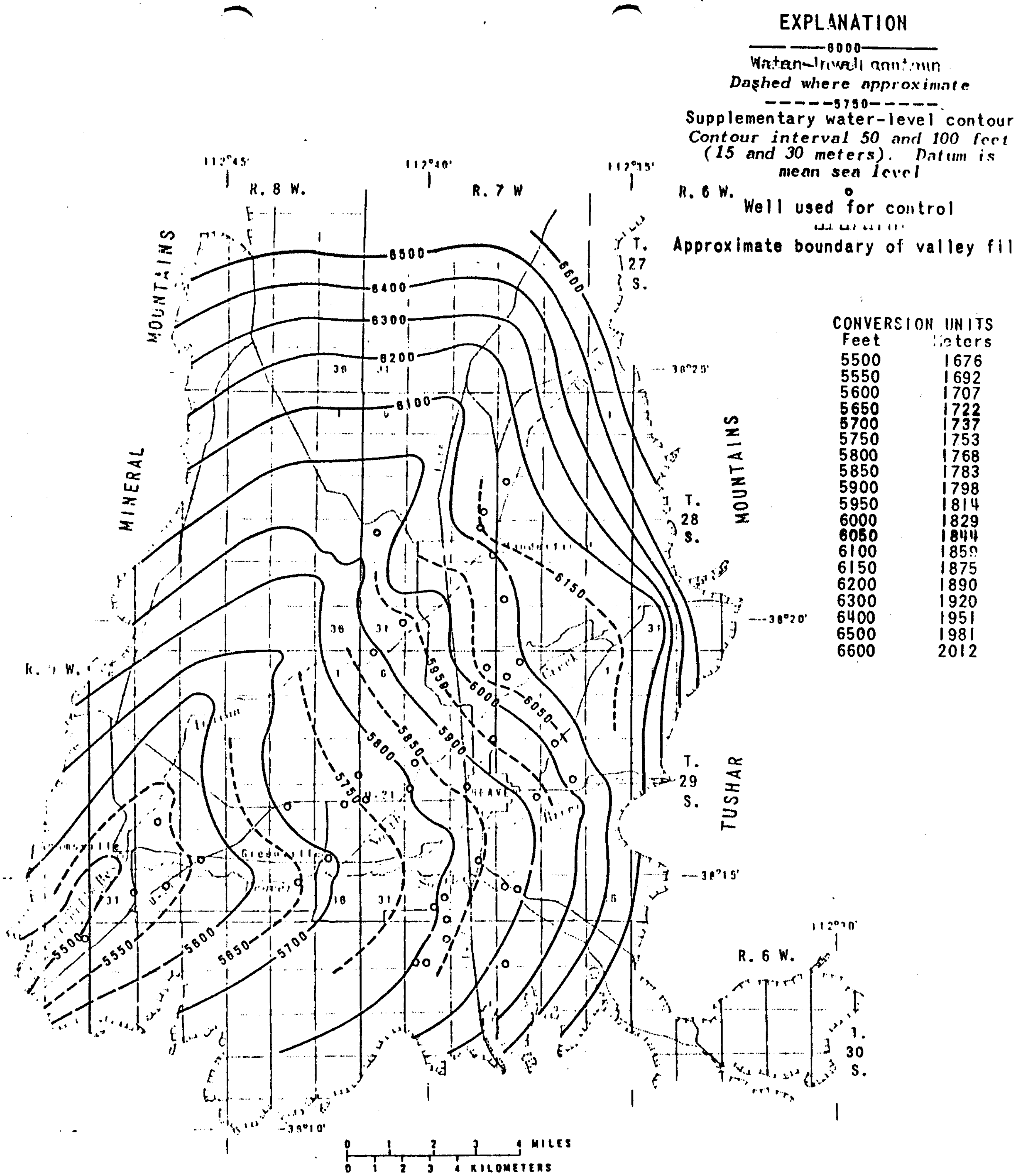
Dear Sirs:

This brief preliminary report is in response to a request from Mr. Sam Kerksick that I express my opinion as to what the effect would be on springs that are in or near the Southwestern part of Beaver City, Beaver County, Utah if the method of irrigation is changed from ditches and flood irrigation to sprinkler irrigation. Water users below Beaver City are concerned that by so changing the method of irrigation the ultimate result will be a reduction in the rate of spring discharge upon which their farms are dependent.

Under the present method of irrigation, consisting of unlined ditches and flood irrigation, excess water applied to lands above the springs is not wasted (considering the valley hydrologic system as a whole), but the deeply percolating excess water becomes an important source of recharge to the underlying ground-water reservoir. Most of the excess water is applied in late spring and early summer when there is, usually, an abundance of surface water. This excess water, which recharges the ground-water reservoir, subsequently becomes available for reuse by down-stream water users who have water-rights in springs and wells.

The definition of excess water as used in this report is--that water not consumed by vegetation and that percolates to depths below the root zone from ditches, pipelines, irrigated fields and yards. Most of such water in the vicinity of Beaver City percolates to the water table which is the upper boundary of the ground-water reservoir. Thence, it flows (percolates) laterally in the direction of the slope of the water table in the vicinity of the southwestern part of Beaver City, is generally westward to southwestward toward the major springs of which there is major concern (See Plate 1 and Figure 7 in Utah Dept. of Natural Resources, Tech. Pub. No. 63). A copy of figure 7 is available on page 2 of this report.

All of the water-bearing deposits in Beaver Valley are interconnected and compose the principal ground-water reservoir in the valley (See Tech. Pub. No. 63, page 14). For this reason a stress, such as increased recharge



CONVERSION UNITS

Feet	Meters
5500	1676
5550	1692
5600	1707
5650	1722
5700	1737
5750	1753
5800	1768
5850	1783
5900	1798
5950	1814
6000	1829
6050	1844
6100	1859
6150	1875
6200	1890
6300	1920
6400	1951
6500	1981
6600	2012

Figure 7.—Map of Beaver Valley showing water-level contours, spring 1974.

or discharge to name two common stresses, acting upon the ground-water reservoir at any place in the valley will have at least a small effect everywhere in the valley. The closer that the stress point is to an observation point the greater and the quicker will be the observed response to the stress. For example, a reduction in the rate of recharge, such as by reduced return flow from irrigation, at a site, say one tenth mile above a spring will result in a greater reduction of spring flow and sooner than if the same reduction had occurred at a greater distance from the spring.

Data are not available with which to determine a reliable estimate of the quantity of recharge within the area encompassed by the proposed sprinkler system. However, it is reasonable to assume that there is a direct relation in the quantity of recharge each year with the varying quantities of flow in the Beaver River. It was found in a comprehensive computer model study that about 73 percent of the water diverted for irrigation in the vicinity of Beaver City became ground-water recharge (See Tech, Pub. No. 63, table 6, page 20). Therefore, it is reasonable to assume that 73 percent of the water diverted into the City irrigation system becomes recharge. But in an efficient sprinkler system the percent going into recharge would be virtually nil.

The change in the level of the water table in the ground-water reservoir is a measure of the quantity of recharge. A record of periodic water-level measurements in an observation well in the area of concern is a measure of the amount of water in storage. The change in water levels between any two selected dates is a measure of the change in the quantity of water in storage during the elapsed time.

The water-level hydrographs in figure 9 (Tech. Pub. No. 63 a copy of which is shown on page 4 of this report) show ground-water level fluctuations at five sites in Beaver Valley. The three middle hydrographs in figure 9 are for wells that are in or near the Beaver City limits. Recharge exceeds discharge when water-levels are rising and is less than the rate of discharge when water levels are declining. Thus, water-level measurements in observation wells in Beaver Valley indicate that recharge exceeds discharge usually during the period between March-April and June-August each year. The exact time of increased recharge varies from year to year in direct response to the changing rates of flow in the Beaver River. The rate of flow in the river varies with changing climatic conditions and rates of precipitation.

To summarize: an irrigation sprinkler system within Beaver City will result in less ground-water recharge in the valley and subsequently reduced spring discharge

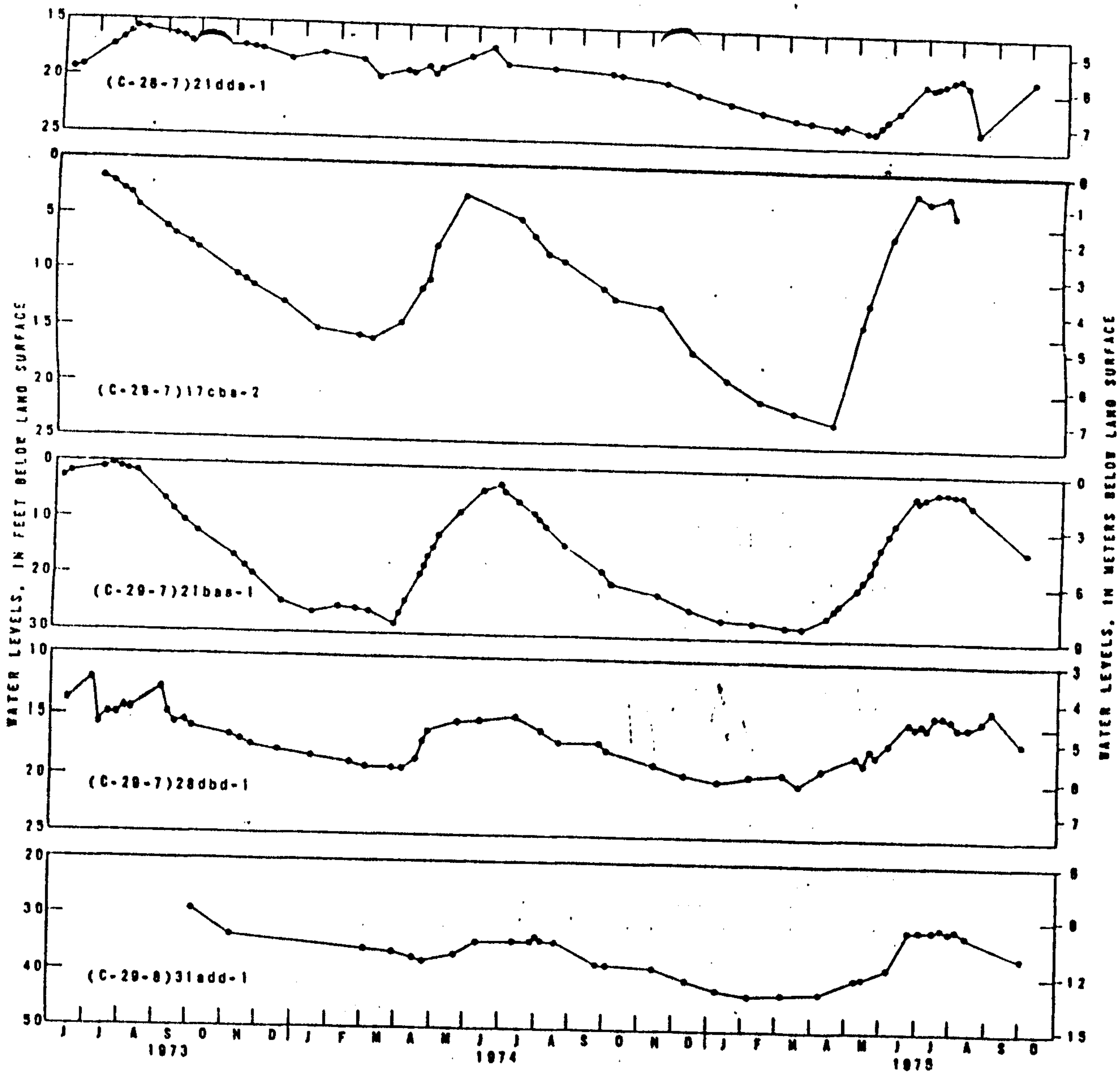


Figure 9.— Seasonal water-level fluctuations in selected wells in Beaver Valley, 1973-75.

west and southwest of the City. The reason that this will happen is because deep seepage losses from ditches and flood irrigation will be eliminated or greatly reduced. The ultimate reduction in the quantity of recharge supplying springs and wells will approximate the reduced quantity of surface water diverted to the City.

Selected methods of irrigating at Beaver City are described and discussed below:

1. Points of diversion, quantity of water diverted, conveyance methods and application methods remain as they now exist. Under this scenario there would be little or no change in the rate of recharge and there would be little or no reduction in spring discharge.

2. Install a sprinkler system to serve lands having water rights within the City limits and the elimination of unlined open ditches and flood irrigation systems. The "saved" water would be used to irrigate lower-lying farm lands other than those presently being irrigated in the City. Under this scenario virtually all recharge in the sprinkler service area from deep percolation losses would be eliminated. The ultimate reduction in spring discharge would be approximately equivalent in quantity to the reduction in recharge.

3. Install a sprinkler system to serve lands having water rights within the City limits and the elimination of unlined open ditches and flood irrigation; plus, extend the sprinkler system into residential areas not served by any irrigation system. Under this scenario eventually all of the City's water rights in the Beaver River would be used in the system, with little or no deep percolation losses going to recharge within the area served by the sprinkler system. The ultimate reduction in spring discharge would be approximately equal to the reduced quantity of water now occurring as deep percolation losses in the City irrigation system.

4. Install a sprinkler system to serve lands having water rights within the City limits and the elimination of unlined open ditches and flood irrigation systems. The "saved" water would be delivered by some means, other than by underground flow, to the several springs of present concern in order to offset the reduction in spring discharge resulting from reduced recharge in the City. This procedure would come closer to mitigating the negative effects of a sprinkler system on the discharge of the springs than either scenario 2 or 3, but there would be one important negative effect that could not be lessened. That is, the water delivered to the springs would be available earlier in the irrigation season when there generally is sufficient water from surface sources than it would be otherwise. An advantage of the present pattern of

spring discharge is that the peak rate of spring discharge occurs during the late summer months when flows in the surface streams are low often resulting in an insufficient irrigation water supply. Therefore, there would be less water available in the latter part of the irrigation season when it is greatly needed than is now available.

Reed W. Mower
Hydrologist