Division of Water **February 28, 2020**

Re: Public Comment Concerning the Draft Groundwater Management Plan for the Cedar City Valley

The purpose of this letter is to share several thoughts and concerns in relationship to the Draft Groundwater Management Plan for the Cedar City Valley. I recognize the challenging situation facing the valley in relationship to the declining ground water levels, but I am concerned that the Groundwater Management Plan as presented will have high economic impact but little ground water impact for at least the first 30 years, and the first proposed cut will in fact serve to take water that is currently in beneficial use and instead allow much of it to be lost through evapotranspiration and increasing water availability to invasive species. I am suggesting a modification to the Draft Plan.

- First - I would like to share why I think the Draft Management Plan as laid out will have limited impact with phase 1 cuts and will actually lead to water being taken out of beneficial use and lost to evapotranspiration. 46% of Phase 1 cuts are to Rush Lake where there is ground water equilibrium, and 5700 af of recharge from the north and east uniquely go to Rush Lake and not to other areas of the basin.
- Second – The Draft Ground Water Management Plan needs to recognize the economic consequences and give time to farmers, homeowners and other water users to absorb the economic impact
- Third – The Management Plan should address areas of high depletion by preventing points of diversion from being relocated to points of high depletion
- Forth - The Management Plan should uniquely address ground water in the Rush Lake sub-basin area that has seen relative equilibrium since the 1980's. It would be beneficial to consider smaller subarea delineations such as the north and south subareas, especially where there is unique recharge that occurs to the Rush Lake area.
- Fifth – The Management Plan should protect Springs rights if they are impacted by decreasing ground water.

Recommendation - Give the valley time to implement a recharge program, and if it is not successful, combine the first two phases together and have those cuts occur on Jan 1, 2050. This will give time for an economic absorption for the first cuts. Consider creating a Rush Lake subarea that addresses the uniqueness of having 5700 af of recharge that comes from the north and east that does not flow to other areas of the valley, and potentially exclude water rights with points of diversion in Rush Lake from the first cuts where the Rush Lake area is in relative equilibrium. Prevent water from being relocated into areas of high groundwater decline and protect spring rights by allowing them to transfer to underground.

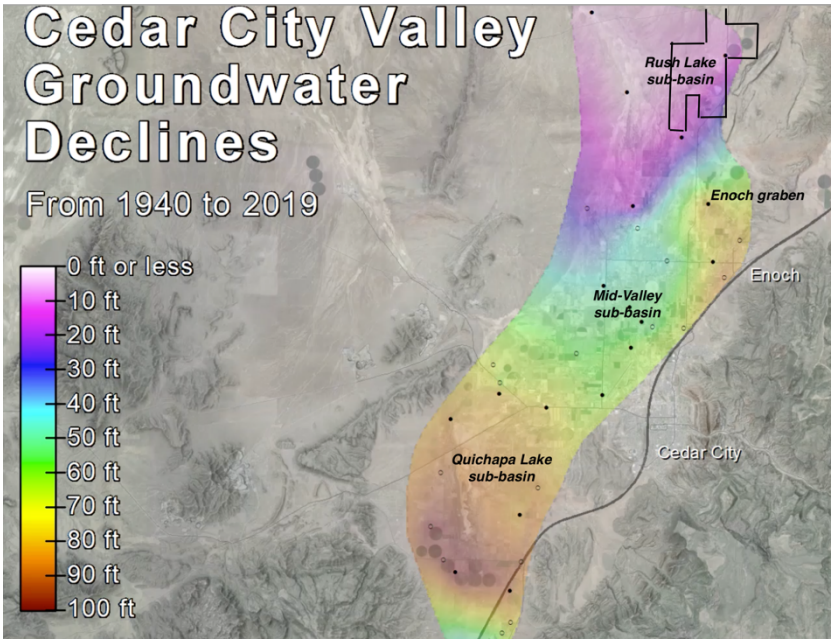
1. *The Draft Management Plan as laid out will have limited impact with phase 1 cuts and will actually lead to water being taken out of beneficial use and lost to evapotranspiration*

To explain this conclusion, let me illustrate with a couple of sub-points

- ***Majority of phase 1 water right cuts have limited impact on areas of heavy depletion***

I took a look at the water rights scheduled to be cut in the first phase within the Draft Plan. In doing this I pulled up water rights over 50 af and noted their points of diversion. Doing this I was able to capture a little over 80% of the total water rights proposed to be cut in the first phase (excel spreadsheet attached). For simplicity, I have grouped the valley into 4 areas that were defined in "The Geology of Cedar Valley, Iron County, Utah, and it's relation to Ground-Water Conditions", Special Study 103, Utah Geological Survey 2002. While I realize those areas are more specific to the underlying basin fill deposits, they ironically also correspond to 4 pronounced areas in the ground water depletion map, plus a 5th for areas outside of the depletion map:

- Quichapa Lake sub-basin – Very Heavy Depletion
- Enoch Graben – Heavy Depletion
- Mid-Valley sub-basin – Moderate Depletion
- Rush Lake sub-basin – Light Depletion
- Areas outside of unconsolidated fill and depletion map



Of the rights to be cut in the first phase, what I saw was the following:

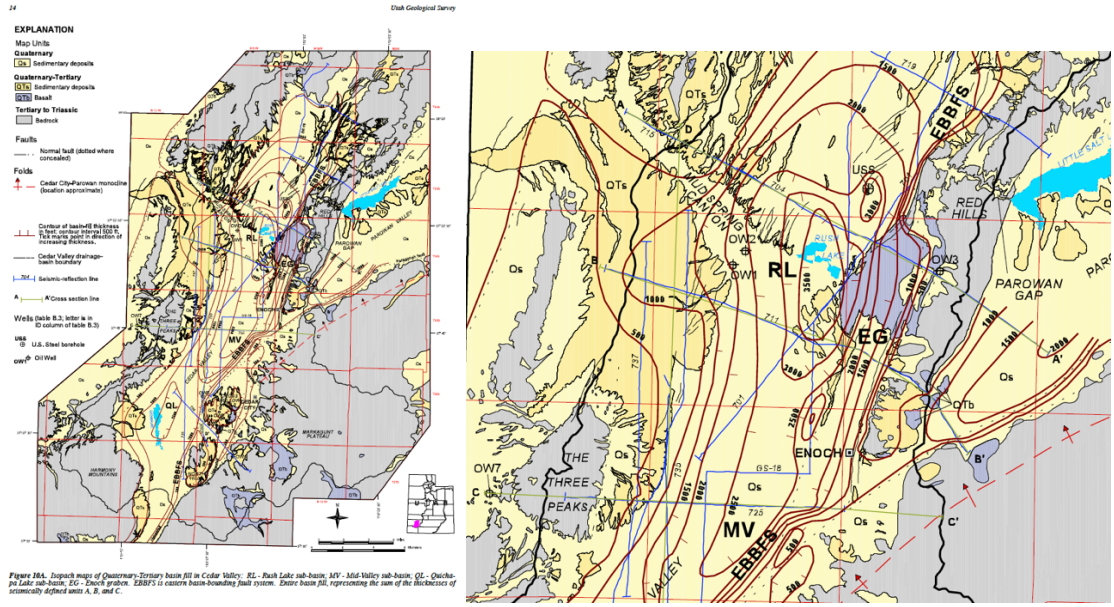
- ~8% are not directly in the unconsolidated basin fill (Three Peaks, Summit area – Unknown depletion, estimated to be light depletion)
- ~39% are in the Rush Lake sub-basin (light depletion)
- ~7% are in the Rush Lake sub-basin, but have been temporarily transferred to the Enoch Graben area each year (based in light but moved to heavy depletion)
- ~26% are in the Mid-Valley sub-basin (Moderate Depletion)
- ~8% are in the Enoch Graben area (Heavy Depletion)
- ~12% are in the Quichapa Lake sub-basin (Very Heavy Depletion)

This means that over 54% of the phase 1 cuts will be from areas of light depletion or unknown depletion (thought 7% of the phase 1 cuts do have temporary change applications that move them to areas of Heavy Depletion each year). Approximately 20% of the phase 1 cuts will be in the Very Heavy or Heavy Depletion areas of the Enoch Graben and Quichapa Lake sub-basin. 26% will be in the Mid-Valley sub-basin with Moderate Depletion.

It is important to note that ***46% of the rights slated to be cut are tied to the Rush Lake sub-basin where there is relative ground water equilibrium***, and ***those rights account for 2083 af of depletion***

- ***Rush Lake sub-basin has unique attributes to the rest of the valley***

The next subpoint deals particularly with the Rush Lake sub-basin. Rush Lake is a seasonal lake at the low elevation point of the valley, collecting water from both the south, north and east. Historically it also collected water via the Parowan Gap from overflow from the Little Salt Lake. There is still a narrow neck of unconsolidated fill allowing ground water to flow from the Parowan Valley west. The unconsolidated basin fill exceeds 3500 feet deep in the Rush Lake sub-basin, which is the deepest in the valley. As Rush Lake fills, it overflows out of the valley via Mud Spring Canyon west to the Escalante Desert.



The water table in the Rush Lake sub-basin is relatively high compared to the rest of the basin, and according to the USGS Report (USGS Hydrology and Simulation of Ground-Water Flow in Cedar Valley, Iron County, Utah (Scientific Investigations Report 2005-5170, pg 26)), *" water levels appear to have stabilized in the (Rush Lake area) from the mid-1980's to 2002".* The report, published in 2005, went on to say… "*It is possible that the decreased evapotranspiration in this area is balancing the 1990's withdrawal rates"*

This balancing is important to consider in implanting a ground water management plan. While most of the valley recharges from the Coal Creek drainage, Rush Lake additionally recharges from the hills and mountains to the north and the east of Rush Lake, as well as from precipitation occurring on the unconsolidated fill to the north. The below charts, taken from the USGS 2005 study, shows that an estimated 5700 af of recharge to the basin aquifer comes from either north of Rush Lake or east of Rush Lake (2,200 af of recharge from precipitation on unconsolidated basin fill north of Rush Lake, 2,900 af of recharge from Jackrabbit and Steer Hollow north of Rush Lake, and 600 af of recharge from the Red Hills east of Rush Lake)

Table 2. Ground-water budget prior to large-scale development and for 2000, Cedar Valley, Iron County, Utah

	Prior to development (acre-feet)	2000 (acre-feet)
Recharge		
Recharge from irrigation with ground water	6,600	7,100-8,600
Seepage from streams and major irrigation canals	5,100-5,500	4,700-5,100
Recharge from irrigation with surface water	9,400	4,900
Recharge from land application of waste-water effluent	negligible	1,500
Recharge from irrigation of lawns and gardens	negligible	600-1,000
Precipitation on unconsolidated basin fill[1]	10,300	10,300
Bedrock inflow from surrounding hills and mountains[2]	9,900	9,900
Subsurface inflow	2,000-5,000	2,000
Total recharge (rounded)	43,000-47,000	41,000-43,000
Discharge		
Evapotranspiration	22,000	3,000
Wells	13,200	[3]36,000
Springs	4,300	negligible
Subsurface outflow	1,000	1,000
Total discharge (rounded)	40,000	40,000

[1] 2,200 acre-feet per year occur north of Rush Lake.
[2] 2,900 acre-feet per year occur north of Rush Lake.
[3] Burden and others, 2001.

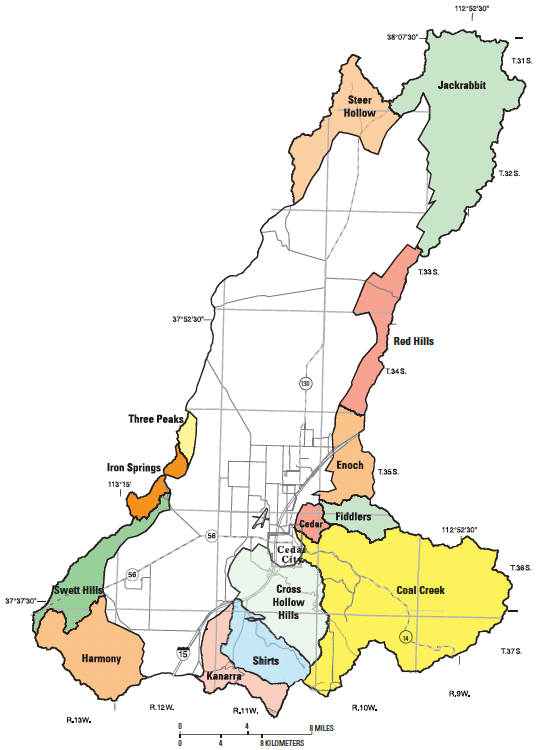


Figure 6. Areas of estimated subsurface inflow from adjacent consolidated rock to the unconsolidated basin fill, Cedar Valley, Iron County, Utah.

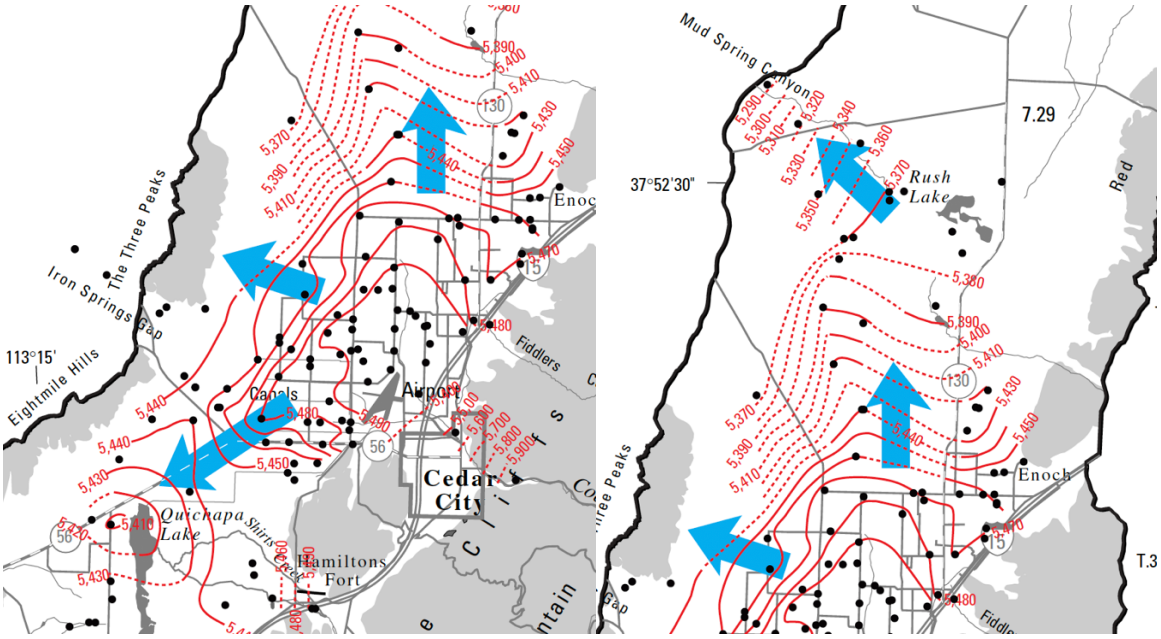
Table 3. Average annual precipitation and recharge for contributing areas, Cedar Valley, Iron County, Utah

[Recharge, log Recharge = -1.74 +1.10 x log (Precipitation$_{\text{Precipitation > 8 inches per year}}$), Harrill and Prudic, 1998, p. A25]

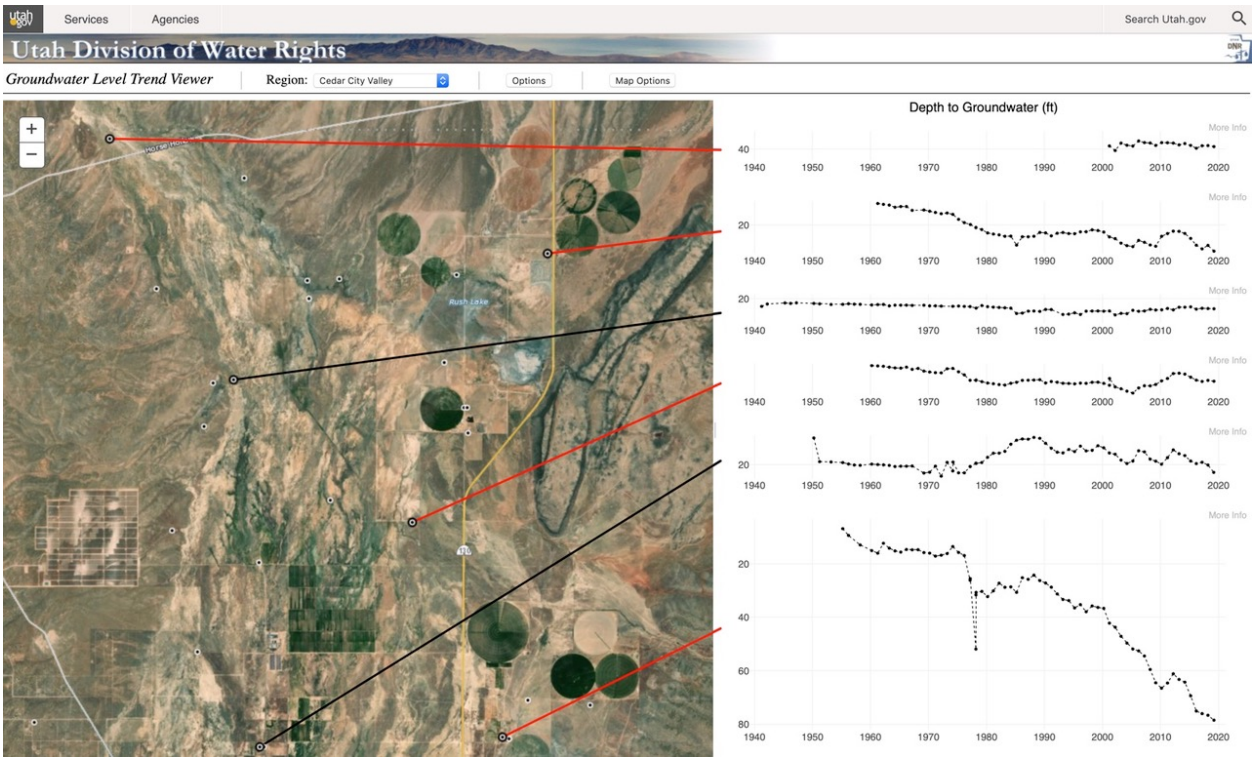
Contributing area[1]	Area (acres)	Precipitation (acre-feet per year)	Recharge (acre-feet per year, rounded)
Red Hills	13,520	13,090	600
Jackrabbit and Steer Hollow	47,570	53,900	2,900
Three Peaks and Iron Springs	4,480	4,850	200
Swett Hills	9,490	13,290	600
Harmony	14,460	24,260	1,200
Kanarra	7,490	14,320	700
Shirts	9,230	17,860	900
Cross Hollow Hills	16,070	24,620	1,200
Cedar	2,030	2,080	100
Fiddlers and Enoch	23,910	29,120	1,500
Total (rounded)	**148,000**	**197,000**	**9,900**

[1]Does not include the Coal Creek area shown in figure 6.

Because Rush Lake is the bottom of the valley, the ground water from the south, east and north all flow to the Rush Lake sub-basin, then overflow to the west and out Mud Springs Canyon to the Escalante Desert. The aquifer beneath Rush Lake is very deep and close to the surface.



The USGS 2005 study suggested that the withdrawal's occurring south of the Rush Lake sub-basin are "possibly captur(ing) water that previously flowed north to this area" pg 26. This assumption could further be supported by the well logs shown on the Division of Water's website. The well logs around Rush Lake are relatively stable, while the well logs directly south of Rush Lake are showing ground water level declines (this particular well might be located in the Enoch Graben, an area with a geologic barrier preventing ground water from flowing E-W). Well logs to the southwest are steady, however, possibly experiencing recharge from the Cedar City Water Treatment facility.



The flow of ground water to Rush Lake is an important element to look at in the Ground Water Management Plan. According to the USGS report, approximately 5700 af of recharge comes from the north and east of Rush Lake. There are no farms or major ground water points of diversion to the North and East of the Rush Lake sub-basin. Because of topography, ground water flows come down to Rush Lake, then flow west out of Mud Springs Canyon. Right now, the Rush Lake sub-basin is at a relative equilibrium. Ground water withdrawals are in relative balance with recharge.

If ground water were curtailed in the Rush Lake sub-basin it would have very little effect on the rest of the valley as the ground water in Rush Lake is all at the low point of the valley, then flows west out of the valley and not south and uphill to the areas of depletion. If Rush Lake were a closed basin without the outlet via Mud Spring Canyon it would be plausible that the ground water flow could reverse and flow to the south, but because there is a lower elevation outlet to the west the ground water would continue to flow in that direction out of the basin.

It should also be noted that in the USGS 2005 study, several 30-year scenarios were computer modeled, and all scenarios showed *no* water drawdown in the Rush Lake area. According to the report, *"flow from the area north of Rush Lake out Mud Springs Canyon is not affected by any of the simulations."pg. 105.*

- **Curtailing Water Rights in the Rush Lake sub-basin would lead to water that is in beneficial use being lost to evapotranspiration.**

As noted in the USGS report, the Rush Lake ground water level is relatively stable, with 5700 af of recharge ground water flowing from the north and east toward the Rush Lake sub-basin from areas where there is no demand on that water, in addition to the ground water flow from the south. That 5700 af of recharge is used in the Rush Lake sub-basin and not in critical depletion areas higher up in elevation. Approximately 46% of the Draft Management Plans phase 1 cut, or 2083 af of depletion, would come from water rights whose points of diversion are in the Rush Lake sub-basin. The proposed phase 1 cut of these rights would do very little to impact the depleting ground water table, especially in the Enoch Graben and Quichapa Lake sub-basin areas.

The impact of the Phase 1 cuts on Rush Lake ground water, however, would be to take 2083 af out of beneficial use and allow it to be lost to evapotranspiration. Evapotranspiration is the sum of evaporation and plant transpiration that comes from the soil, canopy and waterbodies. Because the water table is high in the Rush Lake sub-basin, evapotranspiration has the potential to be high as well. Greasewood and tamarisk (an invasive species), both with root depths of 20-30 feet, would proliferate and absorb the water that was once put to beneficial use. What remains would ground water flow to the lower elevations to the west and out the Mud Springs Canyon, with that water being lost to beneficial use.

The Draft Management Plan as Laid out will have limited impact with Phase 1 cuts and will actually lead to water being taken out of beneficial use and lost to evapotranspiration

2. The Draft Management Plan as laid out will have very real economic impacts that need time to be absorbed.

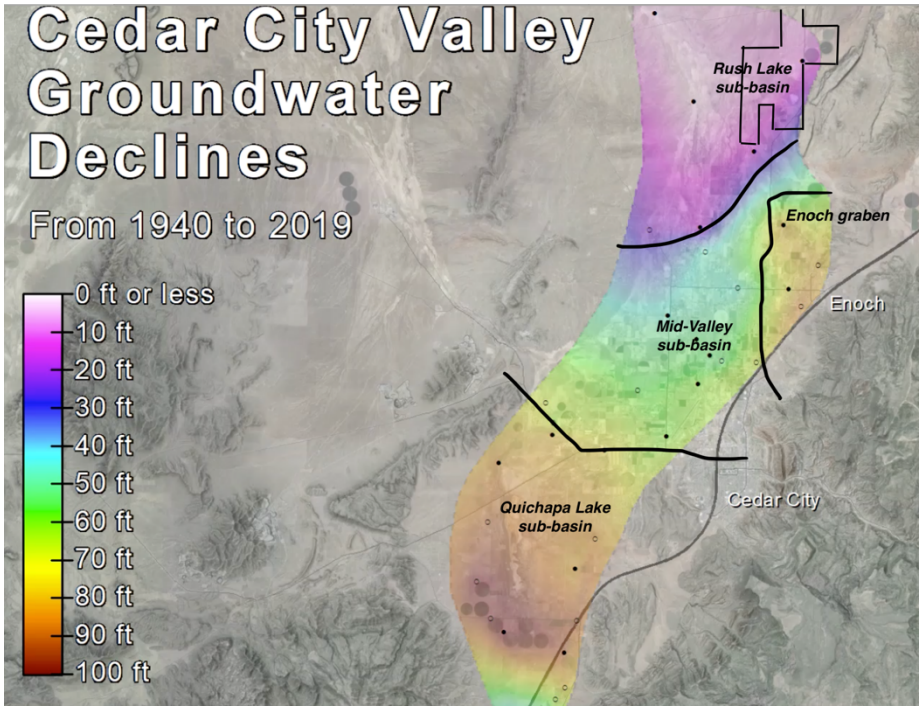
There are very real and individually severe economic consequences from the plan as laid out. Farmers, homeowners and commercial users need and deserve time to absorb the economic impact that a water cut entails. Many people have 30-year mortgages on their properties. Financial institutions have made commitments based upon water rights. Homeowners have built homes based upon water rights; farmers have made investments into the land based upon water rights. If water rights are going to be curtailed, there needs to be additional time in order for the economic impact to be absorbed.

About 5 years ago, when rumors started to circulate about a potential water cut, I dropped by the old division of water office to ask about the security of purchasing water that is currently slated to be cut. I asked about the rumor that I had heard, and I was assured that the water I was acquiring was fine and that no water cuts were being planned. I made an economic decision to acquire and put to use that water based upon that assurance. I took out a loan based upon that assurance. In hindsight, that was of course before a formal decision was

made to create the ground water management plan, and of course the cuts being proposed are currently still in draft form, but my point is there are very real economic consequences associated with the water cuts where peoples livelihoods were based upon decisions surrounding the water rights that are proposed to be cut. Water right owners should not bear the full economic burden of misunderstanding of local hydrologic processes.

From an economic standpoint, it would be much fairer if the cuts could be slid out by an additional 15 years, or if Phase 1 and Phase 2 cuts could be combined to occur together on January 1, 2050. As illustrated in Point 1, Phase 1 cuts alone will have very little impact on the water table. By grouping Phase 1 and 2 together, it would allow a period of time for not just the economic impacts of the water cuts to be absorbed, bank loans to be repaid, and plans to be adjusted, but also for potential recharge plans to be implemented that could eliminate the need to make the cuts in general.

3. The Management Plan/Policy should address areas of high depletion by preventing points of diversion from being relocated there



In developing a Ground Water Management plan, I think it would make sense to prevent further water from being relocated into areas of Heavy depletion like the Quichapa Lake and Enoch Graben areas, further exacerbating the groundwater decline in those areas. The proposal to adjust the boundary between the North and South subareas to follow State Highway 56 to Iron Springs Rd, then Iron Springs Rd to the Area 73 boundary is a good move.

Likewise, it would also make sense to create an additional subarea to encompass the Enoch Graben. The subarea could follow State Highway 130 from the mountains on the south to approximately 7500 N and cover the area of High Groundwater Decline. It would make sense to not allow further rights to be relocated into the Enoch Graben subarea.

4. The Management Plan should uniquely address ground water in the Rush Lake sub-basin area that has seen relative equilibrium since the 1980's.

As mentioned in Point 1, the Rush Lake area recharges not only from the South, but also receives approximately 5700 af of recharge from the North and East. This is recharge that would not flow up hill to the rest of the valley, but instead would be either placed into beneficial use through points of diversion in the Rush Lake area, lost through evapotranspiration, or migrate down Mud Springs Canyon. As such, it would make sense to have a Rush Lake subarea that would restrict future water rights from being relocated out of the Rush Lake area, where there is 5700 af of recharge, to other areas of the basin that do not have the same access to that recharge.

Likewise, in looking at Phase cuts, because the Rush Lake sub-basin area is in relative equilibrium, in the management plan it would make sense to not cut the Rush Lake water rights and instead restrict their points of diversion to only the Rush Lake area where they are in relative equilibrium.

5. The Management Plan should protect Springs rights, allowing them the priority if they are impacted by decreasing ground water.

Historic spring rights should be protected as many of those rights have been impacted by jr ground water rights. Springs rights should be given the ability to convert to ground rights where it can be demonstrated that the spring water would no longer be put to use and instead be recharged into the aquifer.

Recommendation - Give the valley time to implement a recharge program, and if it is not successful, combine the first two phases together and have those cuts occur on Jan 1, 2050. This will give time for an economic absorption to the first cuts. Consider more specific recommednations for water cuts according to smaller watershed delineations in creating a Rush Lake subarea that addresses the uniqueness of having 5700 af of recharge that comes from the north and east that does not flow to other areas of the valley, and exclude water rights with points of diversion in the Rush Lake area from the first phase cuts where the Rush Lake area is in relative equilibrium. Prevent water from being relocated into areas of high groundwater decline and protect spring rights by allowing them to transfer to underground.

Sincerely,

David Curtis
Cedar Valley Ranch