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Alpensee Water District
Board of Directors
PO Box 2204
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Dear Board of Directors.

I know that the AWD Board is concerned with reliable service and fire mitigation for the customers of AWD and the citizens of Summit County. As you know the AWD water system is a dynamic and not passive system. The water service is dependent on electrical power. The loss of electrical power is not an insignificant event. I encourage you to ask the power company Excel for the statistical data and history of outages for the past 5 years for area in which the AWD is located.

The Board has discussed the acquisition of electrical generators in water board meetings as a way to ensure water will be available at times of emergency to fight a fire in the AWD. A single fire event where even a single fire water pump is turned on results in an increase cost of electrical power of \$4000-\$5000 for the year the event takes place. The burden of a single event can be off-set to the insurance coverage of the affected properties through a fee system, if the fee system is put in place soon.

The original water system for the Highland Meadows PUD and surrounding community was supposed to be a passive gravity based system. But during the development, Pearson Engineering found the same issue I did in analysis. Lot A cannot provide the service pressure without a tower more than 100ft tall. This very high water tower was unacceptable in Summit County and so the design was changed to a dynamic system where pumps must be on all times and fire protection reliability is based on the reliability of the electrical system. Further, the system drains when the electrical power is off through down-hill customers. New rules and regulations place severe penalties and testing requirements on systems that lose pressure to protect the integrity and quality of the water in the system as a matter of public health.

Before any changes are made to enhance the dynamic water system AWD operates, it is time to revisit conversion to a passive system. What would that ideal state look like? How would it operate? What are the advantages? Who would benefit?



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THE IDEAL FUTURE STATE OF AWD

WATER SOURCE

The water source for the AWD comes from two wells that are limited by permit to 100gpm each up to the limit of water provided for in the water rights of the AWD. So the immediate future and service area is limited by the amount of water available from these wells.

The analysis here will be limited to a district the size of which is described in the original Highland Meadows PUD filing. Please note not all of the lots from the original filing were developed.

One change for the future in the source of AWD water is to put the wells on solar power. Since the primary demand for water is during the day this maps well for the source water. During the day water is added to the treatment storage tank. The water level in the treatment tank would then fall at night during the period of low demand. This solar system would of course be backed up by grid electrical power. Since we have winter to summer variations in sunshine, the AWD would produce excess power sold to the grid in the summer which would be balanced by the need to buy power in winter during very dark days.

For example: Current water demand is about 3000gallons per day. At 200gpm permitted pump rate the pumps only need to be on 15 minutes per day. Of course the AWD will double its demand when the PUD is complete. But this means you would be better off running one well for hours each day and alternating wells, thus having 100% installed backup.

WATER STORAGE AND TREATMENT

The treatment plant for the AWD would not change much from what it is today. The supply side of the treatment plant would change. To make the system reliable in the event of electrical power loss and to eliminate the energy losses now present in the dynamic system, AWD needs to switch to a passive system for distribution.

A new underground storage tank would need to be built at significant elevation or height to service the AWD. This means putting the tank in the National Forest above the Highland Meadows PUD. At the time of the original development of the AWD this was nearly impossible because trees would need to be knocked down to construct the tank. However today the trees are gone due to beetle kill and the forest is undergoing the process of re-forestation.

The new water storage system would need to be at least 250,000 gallons. This is the amount I estimate would be needed to fight a substantial fire in and around the AWD. The ideal size would be determined by consultation of the local fire protection units and Summit County emergency services. Since this project requires the cooperation of many groups it should benefit as many people as possible. The storage tank must be underground as it is now to prevent freezing in the winter. So the only items above ground are an access conduit or shaft, 12" vent pipe, and manual



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handles for shut-off valves. These above ground items will be easily hidden by the natural growth placed on top of the tank.

DISTRIBUTION SYSTEM

Lot 27 of the Highlands Meadow PUD is the highest property now served. The service elevation is about 9343'. So we need to put the tank high enough up the hill to provide enough service pressure for the houses and hydrants. The service pressure for the house is 60 psig or about 130' of head. The best location of the new storage tank is from the end of the AWD distribution system along lot 27/28 lot lines into the National Forest. However, there is no easement at this time for this to take place. The current easement is between lots 22 and 23. This would work as well, but is not the most ideal.

Getting permission to locate a storage tank in the National Forest could be a substantial battle with part of the public who might see this being done as a benefit for singular group. So it would likely be better to do a land swap. The Highland Meadows PUD would trade some of the open space of the PUD for strip of land in the National Forest to support the AWD. Of course this means getting the Highland Meadows HOA to cooperate. Since the concerned properties are adjacent, this would mean changing boundary lines. Thus the public's trust would remain intact and everyone would benefit. The Highland Meadows PUD would then need to grant public access across the storage facility land.

The public now benefits because Summit County would now have a secured source of water of about 500,000 gallons: 250,000 gallons in the treatment plant plus what is need for fire mitigation. ***Please note an open lake is not a secure water source.*** Daily use of water is negligible compare to what is needed for emergency service. The fire water would be available regardless of the state of the electrical grids. There would be enough pressure to fight fires in the areas of high density housing so that a pump truck is not required.

The fire pumps now in the AWD treatment plant would be sold or relocated to communities where no elevation is possible for passive system. The electrical power transformers for the fire pumps which are 90% of the potential power demand could be relocated where they would be used instead of sitting idle. The demand pumps would remain for backup.

Currently water pressure for ordinary use is provided by a two speed pump. At low speed the pump maintains pressure on the AWD system 24 hours per day every day. When pumped water is not used the flow is sent back to the storage tank, which results a loss of work or energy. If substantial use occurs in the AWD the primary or Jockey pump would shift to high speed. If there is still not enough water for the demand based on the pressure, one of the 165 gpm service pumps comes on. A second demand pump should come in delayed sequence if the demand for water is not met. So there is never a need for a fire water pump to be started. The system has about 1.25 miles of 10" pipe according to AWD records. 10" pipe has about 0.54ft³/ft. So the system volume $1.25 \times 5280 \times 0.54 = 3564 \text{ ft}^3$ total dynamic system volume: 26,660gallons. If the power goes off and the lower elevation customers drain the system, it will take $26,660 / (2 \times 165) =$



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80 minutes to refill the system. You are better off waiting the 40 to 80 minutes to restore pressure than paying \$4000 in additional electric costs to use the fire pumps.

The new or ideal system would operate the Jockey pump only during the day because there is enough water in the elevated tank to last through the night. The elevated tank would need to always have the reserve needed to fight a fire plus the maximum customer demand needed for the period of time in which there would be no power. The new system would run off solar panels which would operate the primary pump at the higher speed to fill the elevated tank from the treated water tank. Once the elevated storage tank is full any excess power goes back to the grid. The solar panels would be located on the roof of the current treatment plant. The AWD would be better off buying a new smaller primary pump and selling all the other pumps. The AWD would in fact be solar operated. Since the system is actually potential energy storage system all the loss work of pumping goes away. The maximum pressure at the pump house is the height of the water pool: about 12' plus the elevation difference: $9343' - 9068 = 275'$ + height to base of new tank 130' = 417' of head or 191 psig. The current system pressure is 188 psig and is maintained by continuous electrical power.

The solar system at the treatment plant would supply electricity to pump the water up the hill to fill the elevated storage. A 40 gpm pump would get the job done in 4 hours per day at a maximum 10,000 gallon per day customer demand. The excess power generated when the pumps are not operating would go back on the grid. So in fact AWD would only need one solar installation at the treatment plant. The treatment plant solar installation produces excess power to cover what the well pumps draw off the grid. So only a single solar installation is needed. Net electrical power consumption for this system would be zero or negative. The reliability if the system would be the highest possible since the new system would be passive. Please note AWD could then tolerate more than 3 weeks power outage because the 250,000 gallons in the treatment plant is being sent into the gravity based AWD distribution system via solar power. This means AWD would have up to 3 weeks to do well service.

Of course there is the potential of 250,000 to 500,000 gallons of water sitting up the hill. Because the tank would be buried with respect to grade of the hill for freeze protection, the risk of sudden release is quite small. Then the sudden release is limited to what would flow through a 10" pipe as it is now.

Of course all this costs money to set up. The nice thing about passive systems is that maintenance is very small reliability is very high. The surrounding Community benefits in many way. The question would then be: Do we have enough energy in the local Community to push for funds and development of such a system?

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