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EXECUTIVE SUMMARY
SQUAW CREEK WATER SUPPLY
LEVEL II STUDY

FOR THE

WYOMING WATER DEVELOPMENT
COMMISSION

AND

SQUAW CREEK WATER DISTRICT
SEPTEMBER 2012

PREPARED BY:
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• ENGINEER'S AND GEOLOGIST'S CERTIFICATE •

We hereby certify that we have prepared or directly supervised the preparation of this report and that we are duly registered professionals in the State of Wyoming.

James K. Murphy
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SEPTEMBER 2012

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SQUAW CREEK WATER SUPPLY LEVEL II STUDY
EXECUTIVE SUMMARY

- INTRODUCTION -

AUTHORIZATION AND PURPOSE, SQUAW CREEK STUDY LEVEL II, 2010

A Level II Water Supply Study for the Squaw Creek Water District was approved by the Legislature during the 2010 Session. The Water Development Commission selected the team of AVI Professional Corporation, Dahlgren Consulting, Pierson Land Works, and Stockdale Consulting to complete the project.

The purpose of the study is “To perform a Level II study to explore the feasibility of acquiring additional source supply to supplement the existing system.”

PROJECT LOCATION AND SUMMARY

The District includes 540 acres located in Section 35 T40N R116W seven miles south of the Town of Jackson. In 2012, the District had 72 occupied lots. Eight additional lots are available for development. Build out of these lots would cause an incremental increase in water demand.

The District is now supplied by two wells and a spring collection system. The wells are permitted as Squaw No. 1 and Squaw No. 2 and are completed in the Game Creek alluvium. The spring is centrally located in the District. Water is pumped from the wells to the spring, comingled with spring water, and pumped to four storage tanks in the southeast corner of the District. The tanks have a total capacity of 50,000 gallons.

GOAL OF CURRENT STUDY

- Evaluate options for a supplemental water supply
- Evaluate options to enhance system operations.
- Evaluate options to provide fire suppression/protection capability.
• ALTERNATIVES AND RECOMMENDATIONS •

REVIEW OF EXISTING INFORMATION

The following reports and documents were reviewed in the course of the current study.

- **Draft Report, Construction and Results of the Squaw Creek Water District #1 Test Well.** Lidstone and Anderson, Inc. March 3, 1993.

ADDITIONAL INFORMATION

- District Water Quality And Consumer Confidence Reports
- United States Environmental Protection Agency Sanitary Survey
- District records of water metered through the Spring pump and end user meters
- District assessment and billing records.
- Wyoming State Engineer records
- WYDOT construction plans for widening U.S. Highway 89
- WYDOT records of bridge piling bore holes, Snake River and Flat Creek
- FEMA Flood Plain maps, Confluence of Flat Creek and the Snake River
- Love and Love, Geologic Mapping of Squaw Creek District and environs.
- Geologic Bedrock Map of Jackson 1:24,000 quad

IDENTIFICATION OF ALTERNATIVES

AVI evaluated multiple options for a new supplemental water supply, for enhancements to the existing system, and for operational changes to use the existing sources efficiently.

- **Flat Creek Alluvial Wells on South Park Wildlife Habitat Management Area**

  Existing wells in the alluvial deposits of Flat Creek and the Snake River are producing water above the 35-40 gpm sought by the District. Old West Cabins near the intersection of Game Creek Road and U.S. Highway 89 and adjacent to the SPWHMA has two wells
producing over 100 gpm from the Flat Creek alluvium. However, AVI was unable to obtain a special use permit from the Wyoming Game and Fish Department for test wells in this location.

- **Convert Test Well No. 3 to Production**

Squaw Creek No. 3 test well was completed into the Camp Davis Formation near the southeast corner of the District in 2006 during the ground water exploration project managed by Rendezvous Engineering. The well maintained a constant flow of 5 gpm over the two-week pumping period but showed continuous drawdown without reaching equilibrium level. Recovery was also disappointing; 13 days to recover to 90 percent of original static water level. Projected long-term production capacity and rate of recharge do not justify the expense of converting the well to production and connecting to the District system.

- **Mackenzie Well**

AVI contacted owners of wells near the District to determine if wells or water was available for purchase. A representative of the owner of a well, storage tanks, and water system on 40 acres south of the District expressed interest. The Mackenzie well (Permit No. 165487) has a priority date of September 24, 2008 and is adjudicated for 90 gpm (Enlargement Permit No. 189032). Acquisition of the Mackenzie well and water system was rejected by the District due to conditions imposed by the owner, who would not sell the water system unless the District also purchased the 40 acres the system serves.

- **Old West Cabins, Well or Water Purchase**

Larry Huhn, the owner of Old West Cabins, was contacted during this study but declined to participate in negotiations to provide water to the District or allow construction of a well on his property.

- **Flat Creek and Snake River Alluvial Test Wells**

AVI contacted representatives of a landowner with property on the alluvial plains of Flat Creek and the Snake River west of the District boundary. Access to these sites would allow construction of alluvial wells in the vicinity of known productive wells. However, distance from test well sites to the District pump house or storage tanks and the pumping head make these options expensive. Pipeline construction costs would be high and ongoing operation costs excessive. The landowner declined to negotiate for access.

As alternatives for a new supplemental water supply dropped from consideration, AVI evaluated upgrades for more efficient operation of the existing system.

- **Additional Water Storage**

Another 15,000 gallon buried fiberglass tank at the location of the existing tanks would provide water during periods of maximum/peak demand. Access to the tank site is limited by steep terrain. A new tank would require purchase of an additional easement.

- **Replace System Pumps and Install New Controls**

Game Creek well pumps and the two pumps at the spring are nearing the end of useful life. Replacement of all four pumps will be required within the 20-year planning horizon. The existing system controls are rudimentary. The wells and spring must be allowed to
recover after pumping at capacity. An upgraded SCADA (Supervisory Control and Data Acquisition) system that monitored well and spring levels would maximize the fluctuating yields of those sources. Better controls will be necessary of a new source is added to the system.

- **Replace Game Creek Well Pumps**

  Well pump replacement cost estimates were developed for inclusion in the financial analysis. As long as the existing pumps are functional, the District should delay replacement as no significant additional yield or system efficiency would be achieved by immediate replacement.

- **Rehabilitation of Game Creek Wells**

  During inventory and evaluation of the system, potential to increase production of the Game Creek wells was considered. These wells are officially Squaw No. 1 and Squaw No. 2 on State Engineer permit documents, but are referred to as Game Creek wells. AVI developed a cost estimate for acid treatment and mechanical cleaning of the well screens. Given the high acidity of product water from this process, it is unlikely that permits would be issued by the Forest Service or Department of Environmental Quality. Rehabilitation has limited potential to increase yields influenced by variation in alluvial flow.

- **Replace the Spring Booster Pump**

  The spring booster pump, a 10 HP US Electric motor driving a Peerless pump with a variable frequency drive, is capable of pumping no more than 85 gpm regardless of the amount of water produced by the wells and spring. When more than 85 gpm is available from the wells and spring, the excess cannot be pumped to storage regardless of tank level or system demand and is released to waste. Replacing the 10 HP motor and pump with a unit capable of moving 100 gpm or more would require bringing three-phase power to the pump house, an improvement beyond the financial resources of the District. The limitation imposed by the pump is another reason to install upgraded controls.

- **Rehabilitation/Reconstruction of District Spring**

  The existing collection system maximizes the amount of water available the spring. Construction work to increase yield could result in a protest from the senior water right immediately downstream. No action is recommended for this option and no cost estimate was prepared.

Additional options were evaluated at the request of the Bridger Teton National Forest staff and the WWDO.

- **Connect to the Town of Jackson**

  AVI assessed the option of connecting to the Town of Jackson’s water system. Representatives of the Town confirmed that the connection could be made. The cost is estimated at $5,000,000.
- **Connect to the Rafter J Improvement and Service District**

  Representatives of the Squaw Creek District met with the Board of Directors of the Rafter J District to ask if water was available for purchase. Rafter J declined to negotiate for sale of water outside its boundaries.

- **Wells on Porcupine Plateau**

  AVI developed cost estimates for test and production wells in the Nugget and Camp Davis Formations inside the District boundary. Given the complex geology in the area and the results of previous test wells, a thorough geologic analysis should precede the siting of another well. Even with such analysis, there is no guarantee of positive results. However, proximity to the District’s system, the absence of intervening landowners, and the lack of federal permitting requirements may justify the risk of constructing additional test wells to the target formations.

- **Drill and Test a New Well in the Vicinity of Teton County No. 1**

  Teton County No. 1, also known as the Transfer Station well, was drilled on the Bridger-Teton National Forest in 1986 as an exploratory geotechnical borehole to determine site suitability for a County landfill. According to U.W. 6 forms received by the State Engineer’s Office in September of 1988, the well was drilled and cased to a total depth of 295 feet and completed with 3/8” x 1-7/8” mill perforations. The depth to static water level was 176 feet. Water bearing zones were encountered at depths between 184 feet and 214 feet and 220 feet to 264 feet. Depth to principal water bearing formation was listed at 220 feet to 231 feet.

  A pump test was conducted on June 5 and 6, 2012. The well was pumped at 100 gpm for 32 hours with a drawdown of 13 feet. After 10 hours, water level had recovered approximately 7 feet.

  The well was video logged on June 7. Only 25% of the perforations observed during the video log were open. Others were clogged with encrustation or obstructed with what appeared to be rock chips. The video log revealed that approximately 25 feet of sediment had accumulated in the bottom of the well.

  Due to the age of the well, the method of completion, the lack of a surface seal, the accumulation of sediment and the costs of rehabilitation, AVI concluded that Teton County No. 1 is not suitable as a long-term supply source for the District. The well does not meet Department of Environmental Quality Chapter 12 requirements for a public water system source. Recovery to static water level was slow.

  A new well completed to DEQ Chapter 12 requirements in the vicinity of Teton County #1 well is an advantageous alternative. A new well could be pump tested extensively to verify aquifer conditions and potential to provide a reliable long-term supply.

AVI recommends the District request an extension of the WWDC Level II study to construct a test well in the vicinity of the County well. This approach resolves many issues:

1. The District would own and control the well.
2. The District would not be responsible for maintaining a water supply to the Shooting Range and Transfer Station.

3. The District would take possession of a well designed and constructed according to public water system standards.

4. The water rights issues associated with the Teton County No. 1 will not affect a new well, with the exception that the District would have a junior ground water right.

Whether the District negotiates to acquire Teton County No. 1 or requests WWDC Level II funding for new test well, AVI recommends the additional source be used only as a backup supply for the relatively brief periods in July and August when water use in the District exceeds 30,000 gallons per day.

The District must decide if this amount of supplemental water justifies the expenditures required to construct a new well and finance a pipeline and pump station. The District should continue vigorous promotion of water conservation to preserve existing sources and a new source, either the County well or a new well. Refer to the table at the end of this section a summary of cost estimates for all options including a new well and pipeline.

If the District is successful in securing an extension of the present Level II study and an appropriation is made to construct a new well, there would be no initial cost to the District. If the new well is successful and the District decides to proceed with construction of a pipeline, the District would be required to purchase the well. Purchase terms would be determined in the Level III negotiations, but are assumed to be 33% of the cost of drilling the well during the Level II work.

- **Construct Pipeline from the New Well to the District System**

If the results of testing the new well are positive, the District should request WWDC Level III funding for a pipeline and appurtenances to connect the well to the existing system. Preliminary costs estimates were prepared and included in this report. Concept designs and cost estimates of sufficient accuracy to request construction funding will be prepared in the next phase of the project.

**PRIORITIZATION OF RECOMMENDATIONS**

1. Request an extension of the Level II Study to construct a new test well in the vicinity of Teton County No. 1. Submit an application to the USFS for a temporary easement to drill the well. Request that the existing Special Use Permit for the access road and pipeline be placed on hold pending outcome of the test well project. Stay in communication with the WGFD regarding a new access agreement across the shooting range to the USFS boundary.

2. Negotiate a binding agreement with owner of the Mackenzie well and water system for permanent access to the fire suppression storage tanks. This agreement should be structured to protect the District’s interests in the event of a change in ownership and would meet one of the goals of the present study.

3. Install meters on the Game Creek Wells and submit annual reports to the State Engineer’s Office. Conditions and Limitations on the permits for both Squaw No. 1 and Squaw No. 2
require the District to submit annual reports that include the total quantity of water produced from the wells and at least two semi-annual measurements of the static water leveling the wells as measured twenty-four consecutive hours after pumping has ceased. (SEO Permit Nos. 102953 and 102954). Meters and records of well production would be useful in managing the District’s supply. Complete the adjudication process for both wells.

4. Implement the recommendations in the EPA Sanitary Survey. Priority should be given to those items such as concrete well pads which will prevent contamination by surface water infiltration and/or a determination by EPA that the source is under the influence of surface water. If that determination is made, the source would be taken off line or a water treatment system installed. The District should develop a Source Water Protection Plan to reduce the potential for such a determination.

5. Install 2” flushing hydrants at high points on the distribution system in each of the two pressure zones. Purge these hydrants when customers complain of air in the distribution system and on a regular basis during periods of high demand.

6. Continue to practice water conservation through customer education and a progressive rate schedule.

7. Existing storage tanks should be professionally inspected and cleaned or relined if necessary.

8. If water loss in the system can be documented in the range of 13-15%, the District should consider a leak detection survey. However, loss up to 10% is considered normal. Reducing loss from 15% to 5% would save only 3000 gallons per day, the equivalent of less than 2 gpm.

The following options were evaluated during the study, but are not recommended pending the District’s request for an extension of the Level II project and results of the testing of a new well.

1. Request Level II funding from the WWDO for a feasibility study to site and construct a deep well to the Camp Davis or Nugget formation. This request should be delayed until the County well option is resolved.

2. Request Level III funding from the WWDO for the design and construction of 15,000 gallons of additional water storage. Storage is not as desirable as an additional source of supply, but will assist the District in meet peak instantaneous and peak hour demand.

COST ESTIMATES
Cost estimates were prepared for all options. See table immediately following this page for a summary of costs.

DISTRICT MAP WITH ALTERNATIVES
A map of the District with alternatives follows the Cost Estimate Summary table.
### Table 13.1 Summary of Costs for Supply Alternatives and System Upgrade Options

<table>
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<tr>
<th>Alternative</th>
<th>Component Cost</th>
<th>Pre-Construction Costs</th>
<th>Components &amp; Engineering</th>
<th>Contingency</th>
<th>Well Purchase (Estimate)</th>
<th>Total Project Cost (Use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Flat Creek Well, SPWHMA</td>
<td>$625,200.00</td>
<td>$68,890.00</td>
<td>$687,720.00</td>
<td>$103,158.00</td>
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<td>2 Convert Test Well #3 to Production</td>
<td>$388,000.00</td>
<td>$46,100.00</td>
<td>$426,800.00</td>
<td>$64,020.00</td>
<td>$0.00</td>
<td>$540,000.00</td>
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<td>3 Purchase/Connect Mackenzie Well</td>
<td>$346,600.00</td>
<td>$41,995.00</td>
<td>$381,260.00</td>
<td>$57,189.00</td>
<td>$650,000.00</td>
<td>$1,150,000.00</td>
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<td>4 Drill Well at Old West Cabins</td>
<td>$726,000.00</td>
<td>$94,450.00</td>
<td>$786,600.00</td>
<td>$117,190.00</td>
<td>$0.00</td>
<td>$1,025,000.00</td>
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<tr>
<td>5 Snake River Alluvial Well</td>
<td>$832,000.00</td>
<td>$112,400.00</td>
<td>$915,200.00</td>
<td>$137,280.00</td>
<td>$0.00</td>
<td>$1,175,000.00</td>
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<td>6 Flat Creek Alluvial Well East</td>
<td>$569,600.00</td>
<td>$77,320.00</td>
<td>$626,560.00</td>
<td>$93,984.00</td>
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<td>7 15,000 Gallon Fiberglass Tank</td>
<td>$71,700.00</td>
<td>$11,377.00</td>
<td>$78,870.00</td>
<td>$11,830.50</td>
<td>$0.00</td>
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<td>8 Replace Pumps, Upgrade SCADA</td>
<td>$104,500.00</td>
<td>$9,337.00</td>
<td>$915,200.00</td>
<td>$137,280.00</td>
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<td>9 Replace Game Creek Well Pumps</td>
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<td>$7,000.00</td>
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<td>10 Rehab Game Creek Wells</td>
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<td>$12,180.00</td>
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<td>11 Replace Spring Booster Pump</td>
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<td>$2,150.00</td>
<td>$23,650.00</td>
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<td>12 Drill/Test Nugget Well (w/pipeline)</td>
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<td>$467,445.00</td>
<td>$70,116.75</td>
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<td>13 Drill/Test Camp Davis Well (w/pipeline)</td>
<td>$314,990.00</td>
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<td>14 Connect to Town of Jackson System</td>
<td>$3,605,750.00</td>
<td>$330,431.25</td>
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<td>$594,948.75</td>
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<td>15 Connect to Rafter J System</td>
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<td>16 Purchase/Connect Teton County #1</td>
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<td>$70,960.00</td>
<td>$723,760.00</td>
<td>$107,712.00</td>
<td>$350,000.00</td>
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<td>17 Drill/Test New Well at Teton County #1</td>
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<td>18 Pipeline/appurtenances, New Well</td>
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<td>$685,240.00</td>
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