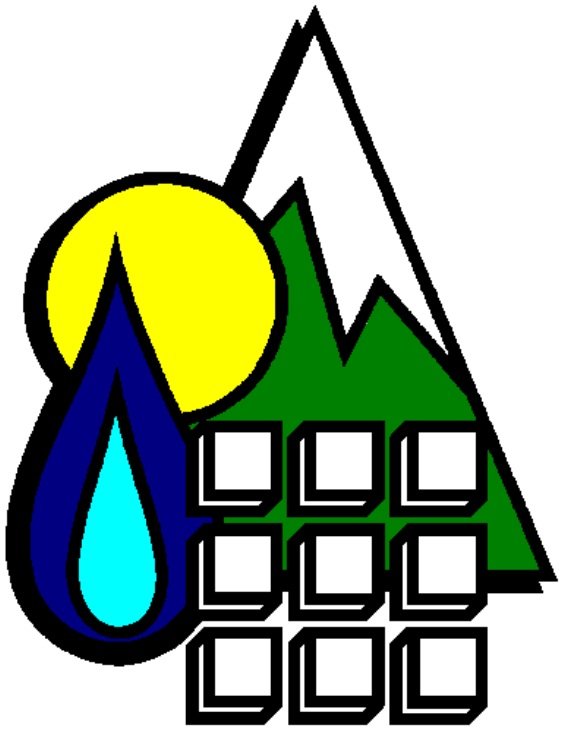
CASE NO. EAG-W-00-1

STAFF INVESTIGATION OF EAGLE WATER COMPANY AND ITS ABILITY TO PROVIDE ADEQUATE WATER SERVICE TO THE CUSTOMERS OF EAGLE SPRINGS ESTATES SUBDIVISION AND ADJACENT CERTIFICATED AREAS

Report of the
Idaho Public Utilities Commission Staff



Prepared by
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August 22, 2000

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EXECUTIVE SUMMARY

On the afternoon of Saturday July 1, 2000, Eagle Water Company's Well No. 4 failed causing low pressure in the water system. Pressure was particularly low in the Eagle Springs subdivision located east of Horseshoe Bend Road and south of Floating Feather Road. Numerous customers complained to the Commission stating that they had very little water pressure, and in some cases, no water at all.

During the outage, Eagle Water and the subdivision developer provided bottled water to residents of the subdivision and made water from a tank truck available at a central location for other uses.

Eagle Water worked to get the pump back online by installing a new variable speed control unit to replace the one that had failed. The new controller was installed and Well No. 4 was returned to service at 6:15 p.m. on July 3. The pump operated for 45 hours before the new controller also failed. Parts were obtained from the manufacturer and installed, and service was again restored at 12:30 a.m. on July 7.

A new booster pump was installed by Eagle Water and put into service at 2:30 p.m. on July 11. The new booster has increased pressures in the Eagle Spring subdivision by about 20 psi. Pressures have been measured continuously in Eagle Springs and Bonita Hills since July 11. Pressures at nearly the highest point in Eagle Springs range from 35-40 psi in the early morning hours, to 60 to 70 psi during afternoon hours. These pressures satisfy the minimum pressure requirements of the Department of Environmental Quality (minimum design working pressure of 35 psi, and a normal working pressure of 60 psi).

Fire flow tests were conducted at two locations in Eagle Springs. The first test conducted at the subdivision's clubhouse showed that fire flows of 1400 gpm could be provided. This is slightly less than the 1500 gpm required by the Eagle Fire District; however, the District recognizes that the test was conducted on a very hot summer day when the temperature was high, and that better results are probable at other times of the year. A second fire flow test conducted at a different location showed that flows well in excess of the required 1500 gpm could be provided.

Eagle Water has plans to drill a new well that they believe will further help alleviate water pressure problems. They have obtained a water rights permit and are awaiting a well drilling permit. They expect to drill the well this winter and have it operational by the summer of 2001.

The Company is also in the preliminary planning stages for a new storage reservoir that would be located in the foothills northeast of Eagle Springs. If the reservoir is built, it would help maintain and stabilize water pressures in the system as well as provide additional fire protection.

Staff concludes that the failures of Well No. 4 cannot be attributed to any actions or inaction of Eagle Water. Staff believes the efforts taken by the Company in responding to the

pump outage were appropriate. The installation of the new booster pump has significantly improved water pressure in Eagle Springs. While pressure meets minimum DEQ standards, Staff agrees that the addition of a new supply well and the construction of a new storage reservoir would improve service.

Staff recommends that pressure measurements continue to be recorded until the lawn irrigation season ends. Staff also recommends that the Commission require Eagle Water to provide quarterly reports describing its progress in completing a new well and in constructing a new storage reservoir. Staff further recommends that Eagle Water conduct tests during the winter to determine the ability of the new booster pump to provide adequate flow and pressure when supply wells in the system are not operating. Finally, Staff also recommends that the Company investigate the possibility of trimming the impeller of the new booster to increase flow and/or pressure.

CASE NO. EAG-W-00-1

STAFF INVESTIGATION OF EAGLE WATER COMPANY AND ITS ABILITY TO PROVIDE ADEQUATE WATER SERVICE TO THE CUSTOMERS OF EAGLE SPRINGS ESTATES SUBDIVISION AND ADJACENT CERTIFICATED AREAS

BACKGROUND

On Monday, July 3, 2000, the Idaho Public Utilities Commission, Consumer Assistance Division received 15 telephone calls from Eagle Water Company (Eagle Water; Company) customers in the Eagle Springs Estates subdivision[1] complaining of low water pressure and in some cases no water at all. The subdivision is located east of Horseshoe Bend Road and south of Floating Feather Road. Figure 1 shows the location of the Eagle Water's certificated area and its proximity to United Water's certificated area. Also shown is the location of the Eagle Springs Estates and Bonita Hills subdivisions. Eagle Water Company is a regulated public utility providing water service to approximately 2,000 customers in the Eagle area of Ada County, Idaho.

On Wednesday, July 5th the Commission received a petition signed by 25 residents of the Eagle Springs Estates subdivision stating that the problem of low water pressure has been an ongoing problem for many months. Repeated calls to the developer and to Eagle Water Company, the petitioners stated, elicit promises of improvement, but result in little action.

On Friday, July 7, 2000, the Commission pursuant to notice held an emergency meeting regarding water service problems in the Eagle Springs subdivision. In attendance were Robert DeShazo, President of Eagle Water Company and a number of the Company's affected customers. The Company identified the cause of the problem as equipment failure and indicated that it was taking steps to remedy the problem.

At the emergency meeting, the Commission decided to open a docket (EAG-W-00-1) for investigation of Eagle Water Company and its ability to provide adequate water service (*Idaho Code* 61-302) to the customers of Eagle Springs Estates subdivision and adjacent certificated areas. It was further ordered that the Commission Staff initiate an investigation in the case and to file a status report with the Commission within 30 days (Order No. 28449). This report is submitted by the Commission Staff in fulfillment of the Commission's order.

[1] The Eagle Springs Estates subdivision is recorded by Ada County as the Brenson Subdivisions Phases 1-4, named after the Brenson Corporation, the subdivision developer. Phase 4 is sometimes also referred to as the Eagle Springs Ranch subdivision.

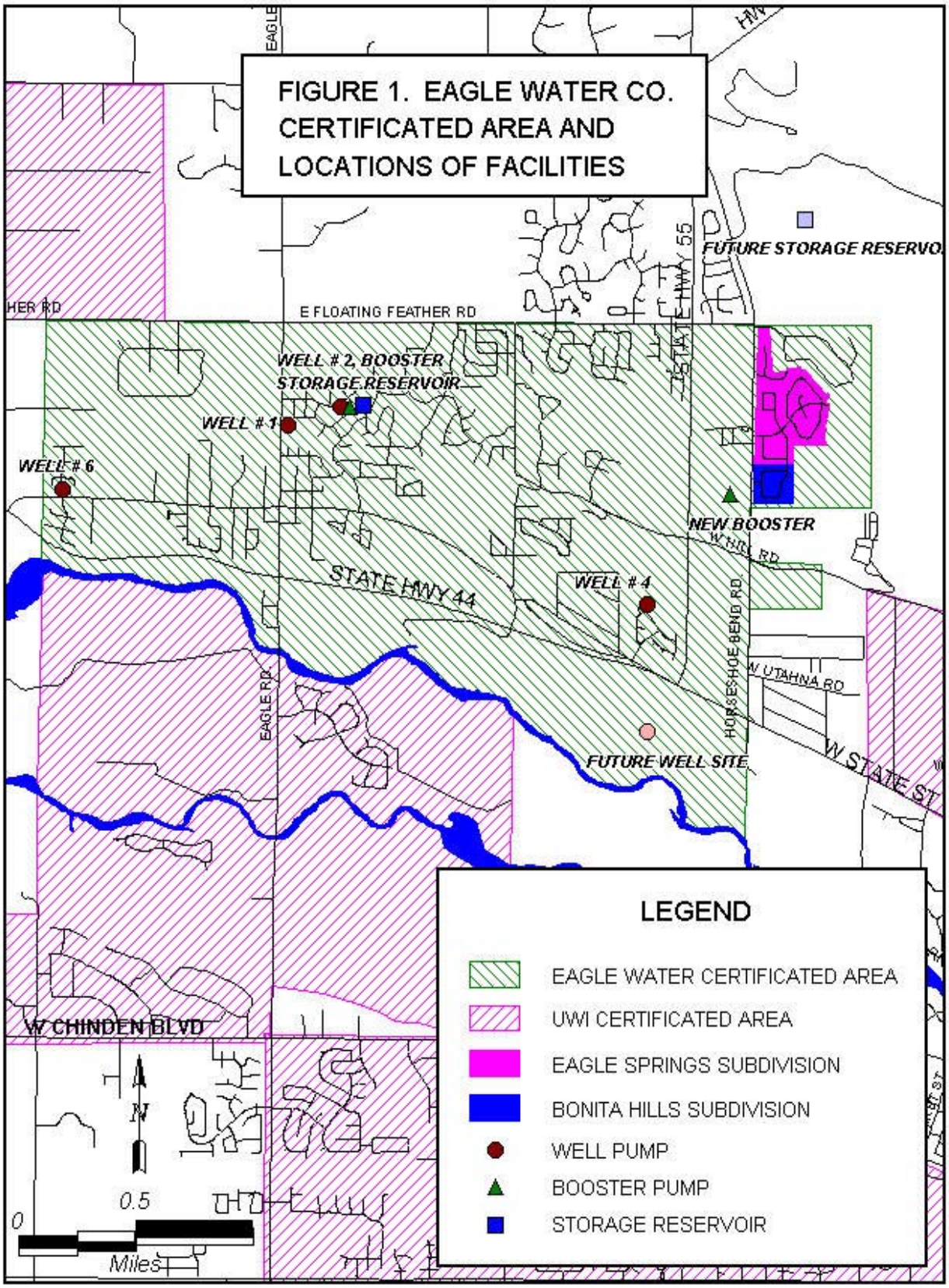


FIGURE 1. EAGLE WATER CO. CERTIFICATED AREA AND LOCATIONS OF FACILITIES
FUTURE STORAGE RESERVO
E FLOATING FEATHER RD
STATE HWY 55
WELL # 2, BOOSTER STORAGE RESERVOIR
WELL # 1
WELL # 6
NEW BOOSTER
W HILL RD
STATE HWY 44
WELL # 4
HORSESHOE BEND RD
W UTAHNA RD
EAGLE RD
FUTURE WELL SITE
W STATE ST
W CHINDEN BLVD
N
0.5
0
Miles
LEGEND
EAGLE WATER CERTIFICATED AREA
UWI CERTIFICATED AREA
EAGLE SPRINGS SUBDIVISION
BONITA HILLS SUBDIVISION
WELL PUMP
BOOSTER PUMP
STORAGE RESERVOIR

Figure 1

SCOPE OF THE REPORT

This report is intended to address Eagle Water Company's ability to provide adequate water service to the residents of the Eagle Springs Estates subdivision and adjacent areas. For purposes of the investigation, the Bonita Hills subdivision was included because it is immediately adjacent to Eagle Springs. No other Eagle Water customers are immediately adjacent to these subdivisions, thus no other customers are included in this investigation. The Sage Acres Ranchettes subdivision is immediately northeast of Eagle Springs; however, no residents of the subdivision are customers of Eagle Water Company. All residents of Sage Acres are served by private wells.

In addition to the complaints and the petition received following the events of July 1-7, 2000, several additional complaints about low pressure were received at about the same time from Eagle Water customers not located in either Eagle Springs or Bonita Hills. Although these complaints could possibly have been triggered by the events of July 1-7, Staff believes that the underlying causes of the problems, if there are any, are not related to the causes of the problems in the Eagle Springs and Bonita Hills subdivisions. Consequently, these complaints will continue to be investigated separately and will not be addressed in this report.

EAGLE WATER COMPANY

Eagle Water Company is a regulated public utility and provides water service to 1,947 residential customer and 154 commercial customers in the general vicinity of the City of Eagle. The locations of the Company's major facilities are shown in Figure 1. The Company maintains a total of five wells, only four of which are now regularly being used. Two of the wells, Well No. 4 and Well No. 6, have variable speed capability. At Well No. 2 there is one relatively small storage reservoir that holds 90,000 gallons, in addition to a booster station consisting of three pumps. A new booster station consisting of a single 60 horsepower variable speed pump was put into service on July 11, 2000.

EAGLE SPRINGS ESTATES AND BONITA HILLS SUBDIVISIONS

The general location of the Eagle Springs Estates and Bonita Hills subdivisions is shown in Figure 1. Figure 2 shows the subdivisions in greater detail.

Eagle Springs Estates is comprised of five phases. The first four phases consist of a total of 181 lots, including common areas, a park, and a clubhouse (recreation center) with a swimming pool. Eagle Springs Estates first began to be developed in June, 1995. Eagle Water currently serves 171 of those lots, with the remaining lots still undeveloped. Phase 5 of Eagle Springs has just recently begun to be developed and contains 51 lots. Construction on the first home in Phase 5 began during the week of July 17, 2000.

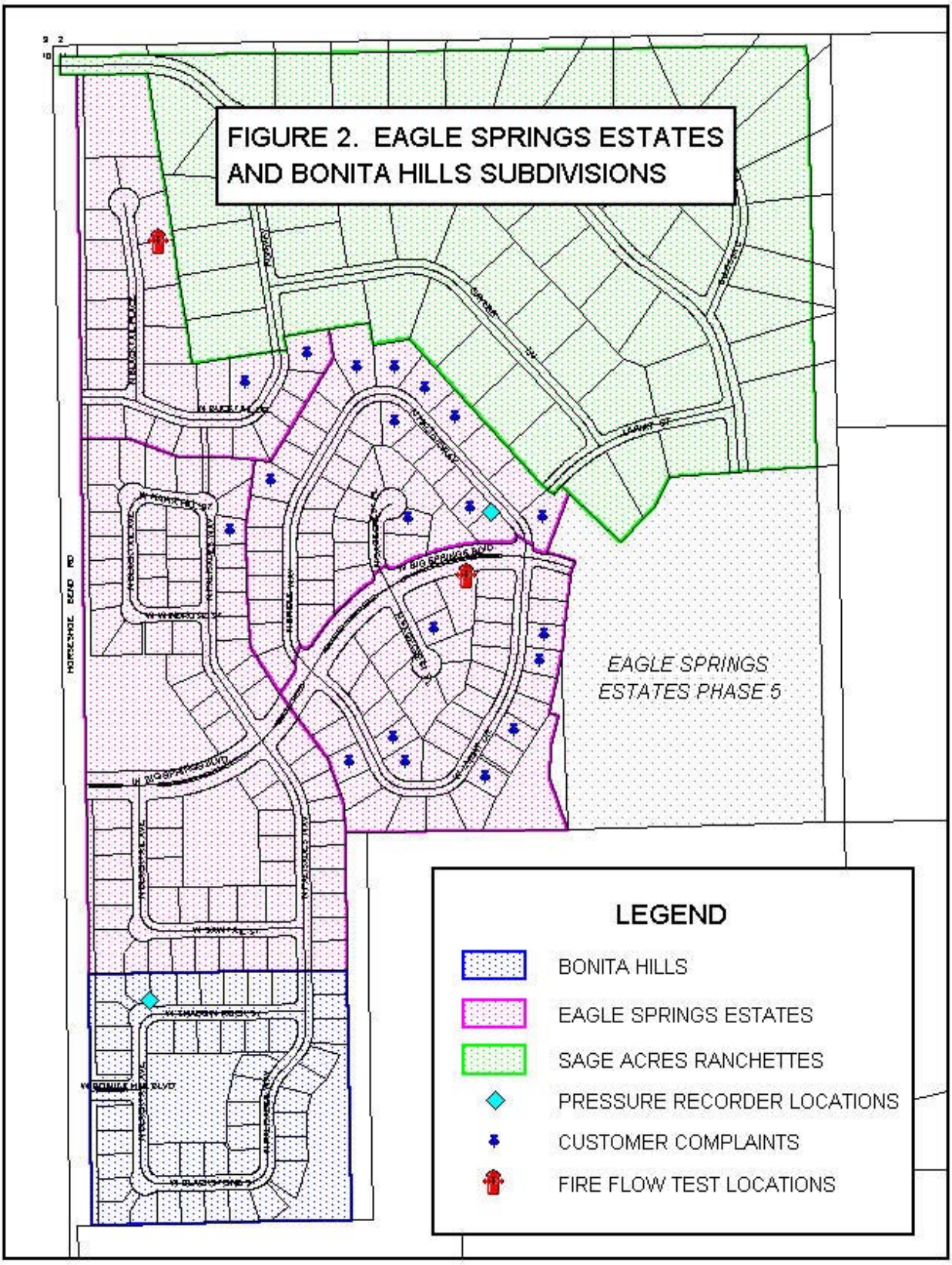


FIGURE 2. EAGLE SPRINGS ESTATES AND BONITA HILLS SUBDIVISIONS
EAGLE SPRINGS ESTATES PHASE 5
LEGEND
BONITA HILLS
EAGLE SPRINGS ESTATES
SAGE ACRES RANCHETTES
PRESSURE RECORDER LOCATIONS
CUSTOMER COMPLAINTS
FIRE FLOW TEST LOCATIONS

Figure 2

Bonita Hills contains 47 lots. Development of the first lots began in May, 1999. Eagle Water currently serves 40 lots with the remainder still undeveloped. There are no additional phases of Bonita Hills planned or under development.

The Eagle Springs and Bonita Hills subdivisions are both higher in elevation than the rest of Eagle Water's customers. Figure 3 is a topographic map of the Eagle area, and includes an elevation profile along a line from downtown Eagle to the upper edge of Eagle Springs. The increase in elevation from the intersection of State St. and Eagle Road to the highest point in Eagle Springs is approximately 165 feet. Within the Eagle Springs and Bonita Hills subdivisions, there is also an increase in elevation. From the lowest point in Bonita Hills near Horseshoe Bend Road to the highest point in Eagle Springs, the elevation increases about 80 feet, being generally higher to the north and to the east.

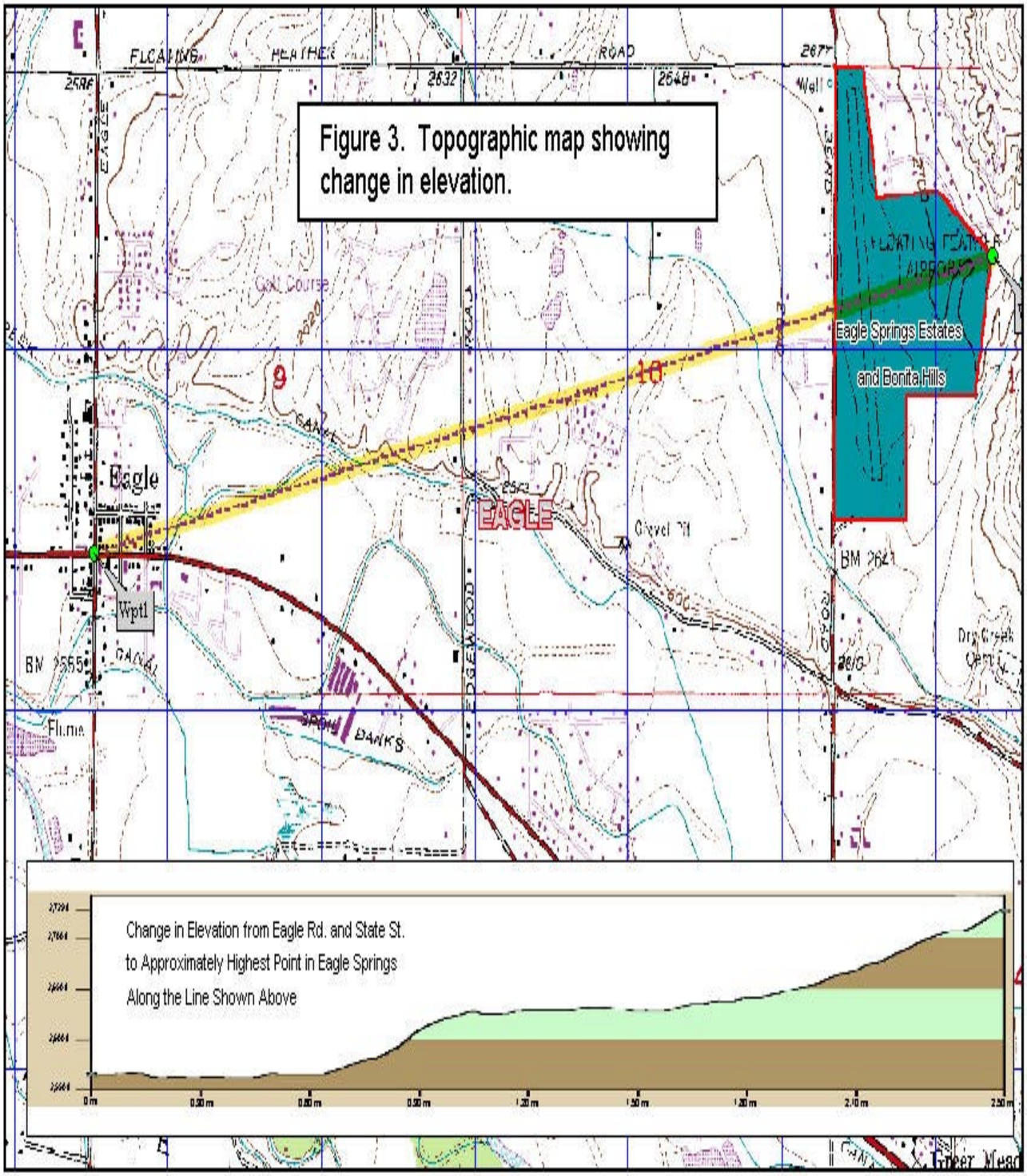


Figure 3. Topographic map showing change in elevation.
Eagle Springs Estates
and Bonita Hills
Eagle
Wpt1
EAGLE
Change in Elevation from Eagle Rd. and State St.
to Approximately Highest Point in Eagle Springs
Along the Line Shown Above

Figure 3

PRIOR EAGLE SPRINGS ESTATES AND BONITA HILLS REGULATORY ACTIVITY

Certificated Area Dispute

On July 18, 1995, Eagle Water filed an application requesting an amendment to its certificated area to incorporate the land now occupied by the Eagle Springs and Bonita Hills subdivisions, in addition to some as yet undeveloped adjacent property. United Water, Idaho also had a pending request to incorporate the same area now occupied by Eagle Springs and Bonita Hills. The Commission, in Order No. 26338 awarded the contested area to Eagle Water. United Water, Idaho petitioned for reconsideration. The Commission ordered Eagle Water to file a detailed financial plan demonstrating its ability and wherewithal to provide future water service including extension, replacement, repair and maintenance. Upon reconsideration, in Order No. 26525, the Commission modified some of their decisions regarding contested areas, but did not change their decision concerning the area of Eagle Springs and Bonita Hills. Eagle Water began providing water to the first phase of the Eagle Springs subdivision in June, 1995 when the first homes were constructed.

Bonita Hills Complaint

On January 14, 1998, V. Scott Brown, Trustee for the S.A. Brown Charitable Trust (Trust) filed a letter with the Idaho Public Utilities Commission requesting Commission approval of a Trust request to obtain water service from United Water Idaho, Inc. to the Bonita Hills Subdivision, a planned subdivision owned by the Trust. The Bonita Hills Subdivision was adjacent to and immediately south of Eagle Springs, and was located within the service territory of Eagle Water Company. The Trust represented that Eagle Water Company, despite repeated requests, had failed to provide service to Bonita Hills.

The Commission processed the Trust filing as a Complaint against Eagle Water Company, Case No. EAG-W-98-1. A Summons was issued January 22, 1998. An Answer was filed February 17, 1998.

The dispute arose because the Department of Environmental Quality (DEQ) had placed sanitary restrictions on any further development in Eagle Springs Phase 3 until Eagle Water completed system modifications and prepared engineering hydraulic analysis demonstrating that Eagle Water had the capability of providing adequate pressure. DEQ, Eagle Water, and Eagle Water's engineer apparently disagreed over assumptions and conditions used in the hydraulic analysis. The sanitary restrictions placed on Eagle Springs also applied to Bonita Hills so that Eagle Water was precluded from providing water service to Bonita Hills, and Bonita Hills, in turn, could not proceed with construction as long as the restrictions remained in place.

An informal meeting of interested parties was held at the Public Utilities Commission on March 6, 1998. The meeting resulted in a commitment by Eagle Water to serve the Bonita Hills subdivision and to provide required and related information, studies or plans to the Idaho Division of Environmental Quality. Eagle Water and its engineer did eventually provide satisfactory hydraulic analysis to DEQ demonstrating its ability to provide sufficient pressures in the future given the planned level of development and the expected water consumption of customers. Eagle Water proceeded to provide service, thus ending the dispute. The docket was closed on December 22, 1998 by Order No. 27834.

COMPLAINT HISTORY

As previously mentioned, Staff received 15 calls after the failure of Well No. 4 and subsequently received a petition signed by 25 residents of the Eagle Springs Estates subdivision complaining of low water pressure. These complaints and the pump outage with which they were associated led to the Commission ordering Staff's investigation. As part of its investigation, Staff reviewed previous complaints about low water pressure from customers in the same area. The following is a brief summary of these complaints:

1996

Out of four complaints filed in 1996, only one concerned water pressure problems in the Eagle Springs subdivision. Note however, that development in Eagle Springs had just begun about a year earlier and that few homes had been completed by that time. The Company's response was that Well No. 4 was having problems with automatic shut-offs due to the massive multi-state power outages. Eagle Water also asked for cooperation from the subdivision developer to irrigate large common areas during off-peak times, and noted that customers were watering lawns during the time that people are getting up, showering and eating breakfast, further compounding the low pressure problems. The critical time seemed to be about 5:30 a.m. but fairly good pressure was available the rest of the time. The Company believed that bringing the new Well No. 6 on-line would help to alleviate pressure problems. The Company also discussed plans to extend a new main line from Well No. 4 to Eagle Springs subdivision. A booster pressure pump was also mentioned as an interim solution. The complaining customer pledged to file a petition with PUC if the problems were not resolved, but no petition was received from the customer.

1997

No complaints concerning water pressure were filed in 1997 with the PUC.

1998

There were four complaints filed in 1998, but only one concerned low water pressure problems in the Eagle Springs subdivision. The customer complained of very low pressure in the early morning from about 6 to 8 a.m. Eagle Water attributed the problem to difficulties in getting the variable speed controls for Well No. 6 (a new well) programmed correctly, thus forcing increased usage of Well No. 4. Meanwhile, the safety device on Well No. 4 kept shutting down due to a malfunction. Electricians were called to work on pump controls at both wells. The Company again mentioned plans for a holding tank or reservoir to be built on hill behind the subdivision to help with pressure problems, but no construction schedule was set. The Company also noted that no remedial action had been ordered by the PUC. Eagle Water measured the complainant's water pressure at 65 pounds per square inch (psi), but the customer contended it was not that high during the early morning hours. Eagle Water referred the customer to DEQ to voice any additional water pressure concerns.

1999

In 1999, one of two inquiries concerned too much pressure (between 95 and 100 psi) and two out of seven complaints concerned water pressure in the Eagle Springs subdivision[2]. Eagle Water reported that they were still having problems with a pump (no specific number) cyling off when it gets hot. They requested that customers do alternate day watering and that the developer stop watering the common area during peak usage times of the day. Eagle Water again stated their plans to build a storage reservoir to help with pressure problems by the time Phase 5 of the subdivision is completed. The complainant in August was considering filing a petition with the Commission but none was received.

2000

No complaints were filed in 2000 concerning water pressure prior to the calls that began on July 3, 2000 when the Well No. 4 pump failed over the holiday weekend.

All of the informal complaints received by the Commission Staff since 1996 were considered resolved and therefore closed because the Company appeared to be working on the problems that initiated the complaints.

Staff also requested a summary of the complaints received directly by Eagle Water in 1999 and 2000. The Company reported 12 complaints, seven of which were from customers in Eagle Springs complaining of low water pressure. Two of these seven complaints were received in January when Well No. 4 was out of service.

[2.] Inquiries and complaints are tracked separately by the Commission Staff. An inquiry is a question, but not necessarily a complaint.

PRESSURE PROBLEMS DURING THE PERIOD OF JULY 1 – 7, 2000

Initial Failure of Well No. 4

On July 1 at 2:19 p.m. Eagle Water's Well No. 4 pump failed. Figure 4 shows the Well No. 4 pump house. Figure 5 shows the well pump. This failure caused a significant reduction in system pressure. Those customers most affected by the failure were those located at the highest elevations in Eagle Water's service area, and to a lesser extent, customers on the east side of Eagle Water's system who live in the vicinity of the pump. Because Eagle Springs Estates and Bonita Hills subdivisions are located at the highest elevations in Eagle Water's system, they were the areas most affected. The PUC Staff received 22 complaints. Figure 2 shows the locations from which the complaints originated. As shown by the figure, most of the complaints came from customers generally located in the highest areas of Eagle Springs Estates. This is to be expected since water pressure decreases by one psi for each 2.3 foot increase in elevation. Customer reports varied from little or no water pressure to simply inadequate pressure to operate lawn sprinklers and shower at the same time. Although some customers reportedly complained of no water pressure at all, Staff has been unable to verify whether this was actually the case.

Figure 4. Well No. 4 pump.

Figure 5. Well No. 4 Pump

The initial failure of Well No. 4 was caused by burned out capacitors in the variable speed control unit of the well pump. Figure 6 shows the exterior of the variable speed drive. The function of the drive unit is to change the frequency of the current going to the well pump. As the frequency is changed, the operating speed of the pump changes. The pump, in turn, delivers more or less water in order to maintain the desired pump discharge pressure. The capacitors that failed are large high-voltage

Figure 6. Exterior of the variable speed drive.

(480 volt) units, much different from the small electronic components that failed in the new controller. With burned out capacitors, the drive unit will not operate. Figure 7 shows the interior of the control unit. Figure 8 shows the burned out capacitors in more detail.

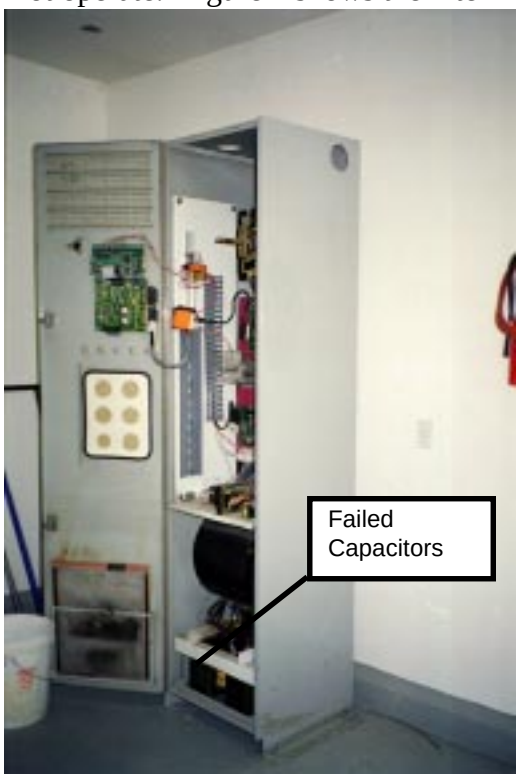


Figure 7. Well No. 4 variable speed controller (interior).

The failed drive, manufactured by Centralift, was eventually returned to Riverside, Inc. of Parma, Idaho, the local manufacturer's representative. The drive was examined to determine the likely cause of the failure. This particular drive was equipped with the capability of recording and subsequently reporting an operating history. Consequently, the drive was repowered at the manufacturer's representative's shop and an operating history printed. The operating history report indicates that a voltage spike occurred at the time of the drive failure.

A voltage spike is a very rapid increase in voltage on the electric utility's system. They normally occur very infrequently, and can be caused by many different things. While the cause of the voltage spike is unknown, it is certain that the cause cannot be attributed to Eagle Water. Well No. 4 is located in a small industrial park, and it is possible that one or a combination of industrial machinery starts or problems could have triggered the spike. The industrial park includes a machine shop, a book bindery, a body shop, a cabinet shop, a boat motor repair shop, hardwood sales, and others. Extreme weather conditions are another possibility. At this point, there is really no way of knowing the exact cause.

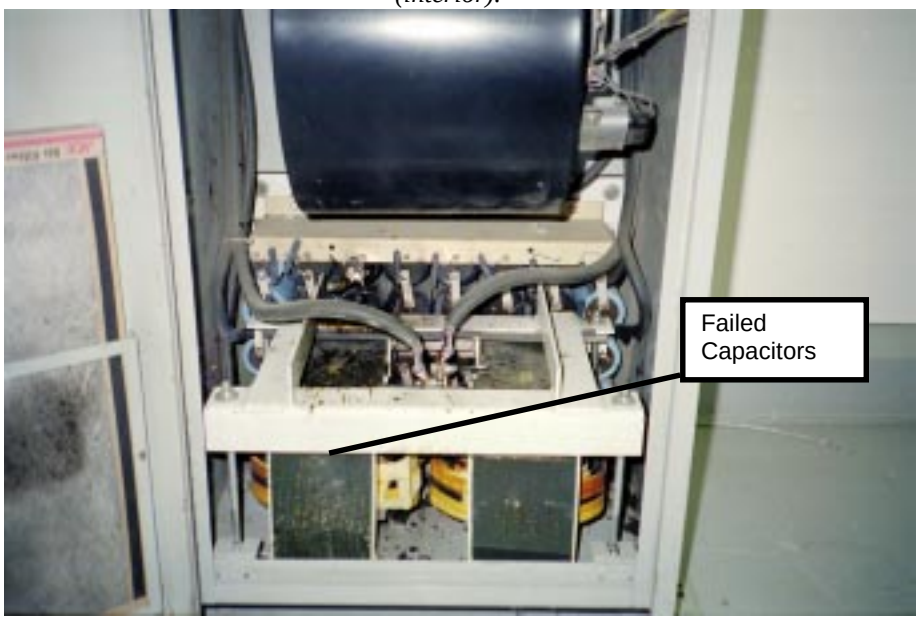


Figure 8. Well No. 4 variable speed controller capacitors.

Eagle Water's Response to Well No. 4 Failure

Prior to the failure of the variable speed drive, Eagle Water on June 12, 2000, had ordered a new variable speed drive which they intended to install at a new well they planned to drill this winter. A motor for the new well had already been purchased earlier because one had become available at an attractive price. The new variable speed drive was purchased to match the size of the motor. When the original variable speed drive at Well No. 4 failed on Saturday July 1, Eagle Water tried to contact Priest Electric to see if the new variable speed drive that had been ordered had arrived. On Sunday, Priest Electric called Eagle Water to inform them that the new controller had arrived, but that because of the holiday weekend, they could not deliver the new controller until Monday morning, July 3. Mitchell Electric, Eagle Water's electrical contractor, was called Sunday and requested to be at the pump house on Monday morning to begin installing the new equipment

The replacement drive unit was installed and Well No. 4 was returned to service at approximately 6:15 p.m. on Monday, July 3. The replacement drive operated normally for about 45 hours, until it too failed on Wednesday afternoon, July 5. The failure of the replacement drive was diagnosed by Priest Electric, the manufacturer's representative. It was determined that the cause of the failure of the replacement drive was the failure of two capacitors located inside the 24-volt electronic part of the drive unit. These capacitors are small, simple electronic components, each about the size of a bean. Figure 9 shows some of the electronics inside a variable speed drive unit.

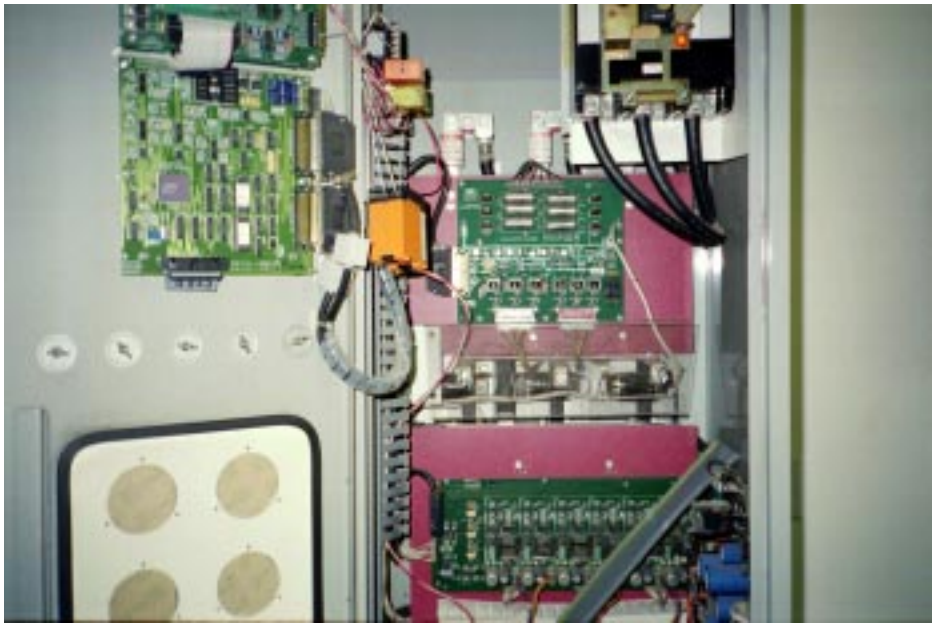


Figure 9. Well No. 4 variable speed controller electronics.

Initially, the manufacturer attributed the failure of the electronic components to manufacturing defects. However, further investigation is being done to determine whether a voltage surge could have also caused this failure. In this particular controller, protective devices are incorporated to prevent damage to sensitive components caused by power quality problems. In either case, the failure was not caused by anything Eagle Water did or did not do.

Because the failed parts were integral parts of a larger circuit board, an entire replacement board had to be ordered. The replacement board was ordered from Danfoss, the manufacturer in Chicago. The part was shipped immediately by overnight mail. The replacement part was received and installed on July 7. The pump was returned to service at approximately 12:30 a.m. on July 7. The replacement variable speed drive unit has operated normally since it was returned to service.

The original failed drive unit, after being analyzed by the manufacturer's representative, can be repaired. Repairs are estimated to cost about $2500. Eagle Water has not yet decided whether to proceed with repairs. If they do decide to repair the unit, it could be returned to service at either Well No. 4 or possibly at the new well planned to be completed this winter.

At the time of its initial failure, it was an option to simply repair the failed drive unit instead of replacing it with a new drive. However, with the new drive already on-hand, it was felt it would be faster to install the new drive. No one expected it to fail after less than 24 hours of operation. Repair parts could be obtained locally, but with the weekend failure and the 4th of July holiday, they could not be obtained quickly.

Another option considered at the time of both drive failures was to simply re-configure the wiring to the pump so that the variable speed drives were removed from service. This would have precluded variable speed operation of the pump, and required that it be operated manually at full speed. Eagle Water felt that by doing this, they would risk over pressurizing the system, possibly damaging the motor and possibly causing additional worse problems. With no significant storage capability in their system, pressures would increase as long as the pump was running. Eagle Water personnel would have to monitor pressures in the system and manually turn the pump on and off to maintain adequate pressure while being careful not to exceed maximum pressure. Eagle Water decided not to take this risk.

The pump at Well No. 4 is a 250 horsepower pump that was initially installed in 1993. It had failed twice previously - once in November 1995 when a leaking check valve, two inline fuses, and one capacitor were replaced, and again in April 1997 when bearings were replaced in the flow meter. Staff does not believe this history of failures is unusual for this type of pump.

Eagle Water Response to Customers

Besides making efforts to get the damaged equipment repaired or replaced, Eagle Water redirected flow in the water system so that Eagle Springs would receive as much water as possible. Well No. 1 was manually operated and the output pressure set point of Well No. 6 was increased to 102 psi. At Well No. 2, the reservoir pump and one of the boosters were also set to be operated manually.

After the first failure of Well No. 4 occurred and after it was apparent that it could not be returned to service in a short time, Eagle Water made efforts to provide alternate water supplies

to Eagle Springs residents. The Company obtained 22 cases of bottled water and left them at the Eagle Springs clubhouse. Peter Harris, the developer of the subdivision, obtained 22 more cases of bottled water and delivered them to homeowners. In addition, a 2000-gallon tank truck was filled and parked at the corner of Halter and Big Springs to be used as a source of water for other household use. The water truck was checked daily to insure that there was enough water for homeowner use.

SERVICE STANDARDS

Idaho Public Utilities Commission

The Idaho Public Utilities Commission has no specific standards for water companies related to minimum water pressure. The Commission's authority to insure sufficient water pressure stems from the general authority to regulate water utilities as granted by the *Idaho Code*. The following excerpt from the *Idaho Code* requires that utilities maintain adequate service:

> **302-302. Maintenance of adequate service. -** Every public utility shall furnish, provide and maintain such service, instrumentalities, equipment and facilities as shall promote the safety, comfort and convenience of its patrons, employees and the public, and shall be in all respects adequate, efficient, just and reasonable.

A subsequent section of the *Idaho Code* grants the Commission the authority to set service standards for water utilities:

> **61-520. Service of electric, gas, and water corporations - Determination of standards. -** The Commission shall have the power, after hearing had upon its own motion or upon complaint, to ascertain and fix just and reasonable standards, classifications, regulations, practices, measurements or service to be furnished, imposed, observed, and followed by all electrical, gas and water corporations; to ascertain and fix adequate and serviceable standards for the measurement of quantity, quality, pressure, initial voltage or other condition pertaining to the supply of the product, commodity or service furnished or rendered by any such public utility; to prescribe reasonable regulations for the examination and testing of such product, commodity or service and for the measurement thereof; to establish reasonable rules, regulations, specifications and standards to secure the accuracy of all meters and appliances for measurements; and to provide for the examination and testing of any and all appliances used for the measurement of any product, commodity or service of any such public utility.

Department of Environmental Quality

The *Idaho Code*, pursuant to Title 37, Chapter 21 and Title 39, Chapter 1, grants the Idaho Department Board of Environmental Quality the authority to promulgate rules governing quality and safety of drinking water. These rules are known as the "Idaho Rules for Public Drinking Water Systems." *IDAPA 58, TITLE 01, Chapter 8.*

These rules do contain specific requirements concerning minimum water pressures for public drinking water systems. Pertinent sections of the rules are repeated below.

550. DESIGN STANDARDS FOR PUBLIC DRINKING WATER SYSTEMS.

…

6. Distribution System. Any supplier of water for a public water system shall ensure that the distribution system complies with all of the following requirements:

…

b. Booster pumps must comply with the following:

i. In-line booster pumps shall maintain an operating pressure no less than twenty (20) psi, and shall be supplied with an automatic cutoff when intake pressure is less than or equal to five (5) psi.

552. OPERATING CRITERIA FOR PUBLIC WATER SYSTEMS.

01. Quantity and Pressure Requirements.

a. Minimum Pressure.

i. Any public water system shall be capable of providing sufficient water during maximum hourly demand conditions (excluding fire flow) to maintain a minimum pressure of twenty (20) psi within the system measured at the consumer's water tap.

ii. Any public water system constructed after July 1, 1985 shall maintain a minimum design working pressure of thirty-five (35) psi and a normal working pressure of sixty (60) psi, measured at the consumer's water tap.

b. Fire Flows.

i. Any public water system designed to provide fire flows shall be designed to provide such flows in addition to maximum daily demand for all other uses combined.

ii. Fire flows shall be compatible with the water demand of existing and planned fire fighting equipment and fire fighting practices in the area served by the system.

Staff consulted with DEQ engineers to clarify proper interpretation of the standards. According to DEQ, section 552.01.a.ii should apply to Eagle Water's system in the area of Eagle Springs and Bonita Hills because this part of the system is considered an expansion to an existing water system (as opposed to infill to an existing system). As an expansion, the same rule applies as if it were new.

A "minimum design working pressure of 35 psi" is generally interpreted by DEQ to mean the minimum pressure during maximum hourly demand conditions. The terminology "measured at the consumer's water tap" is interpreted to mean measured at an indoor faucet, not measured at the point where the customer's service line is tapped into the utility's main line.

INSTALLATION OF NEW BOOSTER PUMP

Even before the failure of the Well No. 4 pump, Eagle Water recognized that pressures in the Eagle Springs area were low. The Company had determined that the addition of a booster pump in the area would help to improve pressures. A new booster pump had been designed and construction of the pump house was well underway when Well No. 4 failed. The booster pump itself had been obtained and installed. At the time of the failure of Well No. 4, work had just begun to get three-phase power to the pump house from the nearest point on Idaho Power's system where three-phase power was available.

Figure 10. New booster pump house under construction.

After Well No. 4 failed, Eagle Water stepped up its efforts to complete the installation of the new booster pump. Idaho Power was requested to instruct its contract line extension crew to expedite the line extension work. Electricians were called in to complete wiring inside the pump house. A variable speed drive unit for the booster pump had previously been ordered, and installation commenced soon after the outage. Figure 10 shows the pump house for the new booster under construction on July 11.

Figure 11. Underground electrical line extension to new booster pump house.

Idaho Power contract crews completed the line extension work on July 10. Figure 11 shows the underground line extension to the new booster station. Electricians hired by Eagle Water completed wiring of the pump house and the variable speed drive controller on the following day. The new booster pump was put on-line at approximately 2:00 p.m. on July 11. Figure 12 shows the new booster pump during final installation.

Figure 12. New booster pump during final installation.

Before the pump was started, pressure at the pump house was 63 psi. After the pump was started, pressure at the pump house immediately increased. The variable speed drive manufacturer's representative, who also was responsible for supplying the booster pump, programmed the drive and adjusted it to operate properly. Today, during normal operation at full speed, intake pressure at the booster is about 60 psi. Outlet pressure is about 93 psi. Since the pump was installed, Eagle Water has experienced no problems. The booster pump has operated continuously since first going online on July 11.

DATA COLLECTION

In beginning its investigation, Staff first requested that Eagle Water begin collecting pressure measurements at two locations. Prior to the investigation, Eagle Water had no pressure recording devices installed in either Bonita Hills or Eagle Springs. Continuous pressure recording devices were installed in meter boxes at two locations. Figure 2 shows the locations of these recorders.

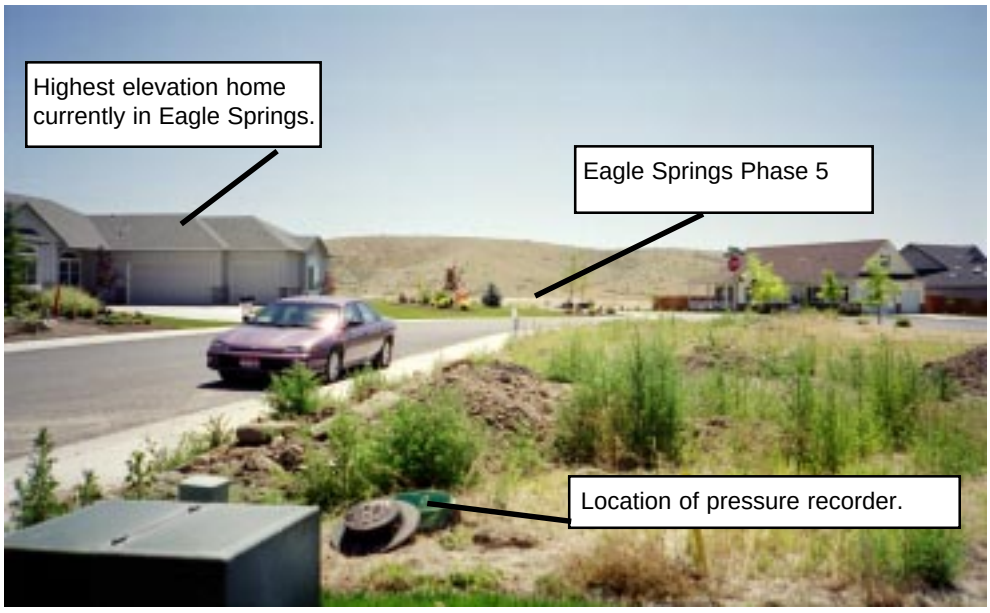


Figure 13. Location of continuous pressure recorder in relation to the highest elevation customer and to Phase 5 of Eagle Springs Estates.

Figure 14. 24-hour continuous pressure recorder installed in meter box.

One recorder was placed on a vacant lot in Eagle Springs near the corner of W. Big Springs Blvd. and N. Halter Way. Figure 13 shows a photo of the location of this recorder. Figure 14 is a closer view of this pressure recorder.

Several days later, another pressure recorder was placed on a vacant lot in Bonita Hills near the corner of N. Blacktail Ave. and W. Shadow Rock Street. The recorders continuously measure water pressure and record it with pen and ink on a 24-hour circular paper chart. Charts are changed daily by Eagle Water.

Figure 15. Location of continuous pressure recorder in the Bonita Hills subdivision.

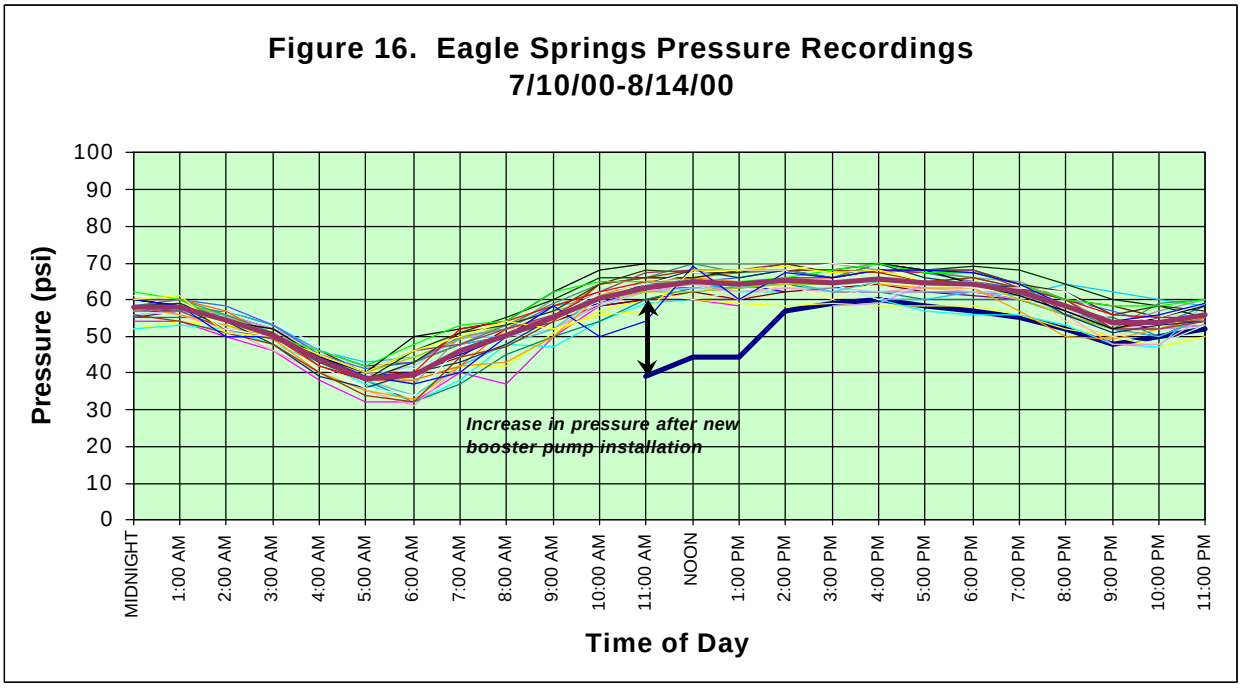


Figure 16 shows the results of pressure recordings at the Eagle Springs location from the period July 12 through August 15. Each line on the graph represents a different 24-hour period. The heavy blue line that begins near the lower middle part of the graph shows pressures measured prior to the new booster pump going online. Because the booster pump was put online so soon after pressure recording began, there were few pressure measurements taken to show pre-booster conditions. Nevertheless, the graph clearly shows the effect of the booster pump. Pressure recording began at approximately 11:00 a.m. on July 12. The new booster pump went online at approximately 2:00 p.m. on the same day. The booster pump increased pressure at the highest point in Eagle Springs by about 20 psi. The effect was evident within minutes.

Staff believes that the effect of the booster continues to be about a 20 psi increase over pressures that existed prior to installation of the new booster. Eagle Water has estimated that they believe the minimum water pressure at the highest point in Eagle Springs prior to the new booster going online (e.g., at 6 a.m. during the summer) was 45 to 48 psi. However, based on the pressures measured in Eagle Springs so far and the effect of the booster pump, Staff believes minimum pressures were much lower. Even now, with the new booster pump operating, pressures drop daily from 5 to 6 a.m. to the 40 psi range, and have been below 35 psi on a few occasions. Without the new booster, pressures would have been much lower.

With the new booster online, pressures do appear to meet DEQ minimum standards. Although pressures are low in the early morning hours, they are still almost always above 35 psi. During the afternoon and early evening hours, pressures are usually above 60 psi. It is important to note that the pressures indicated here, because they have been measured at nearly the highest point in Eagle Springs, are the lowest pressures to be experienced by any customer.

Pressure measurements have also been taken in Bonita Hills beginning July 12. Because this pressure recorder is located at close to the lowest point in the subdivision, it represents the highest water pressures to be expected for any customer. The results of these measurements are shown in Figure 17. As indicated by the graph, DEQ minimum standards are easily being met at this location.

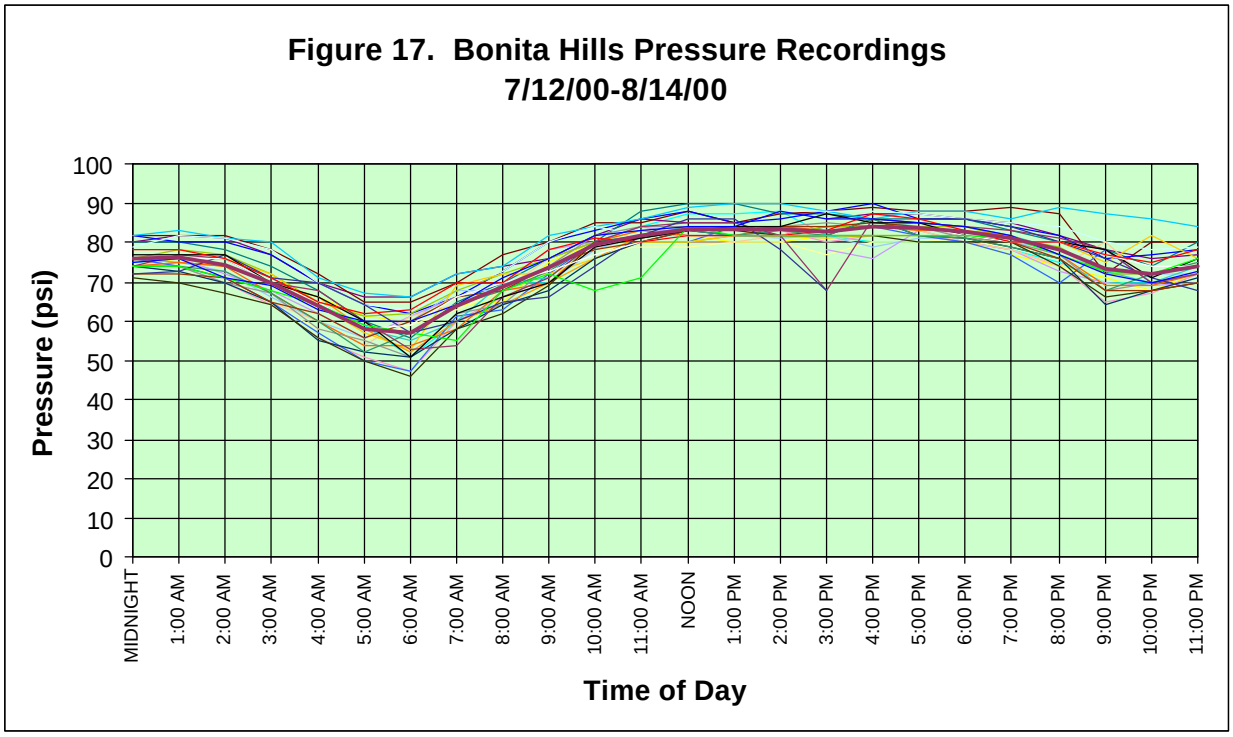
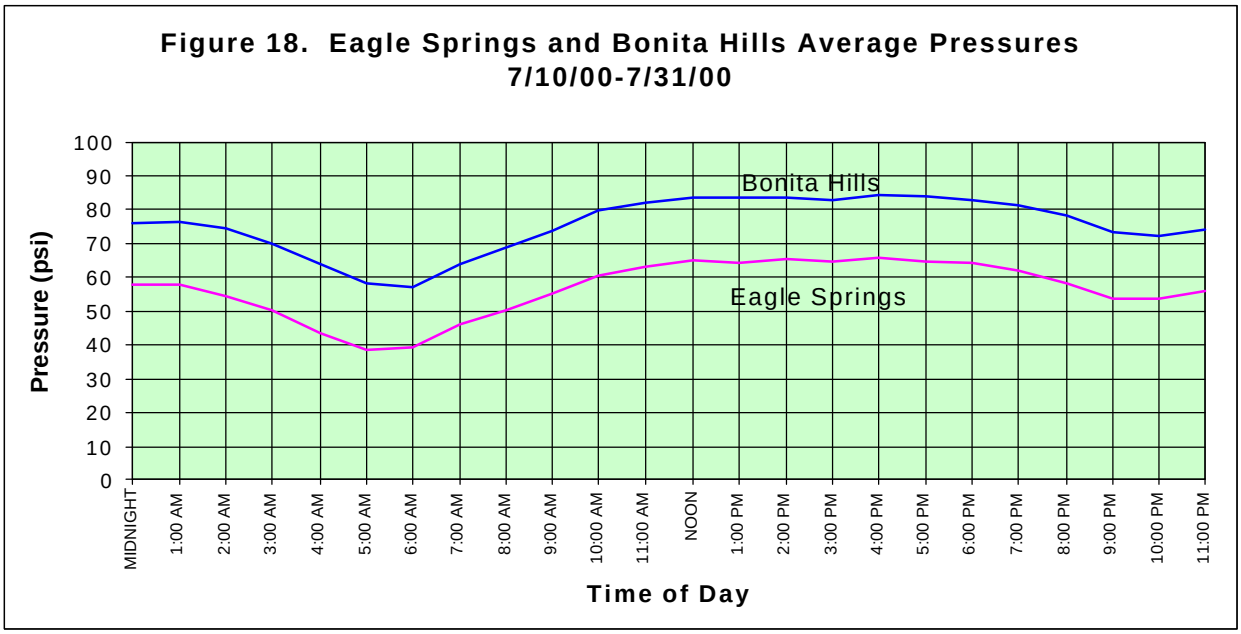


Figure 18 shows average pressures at both locations. Pressures at the Eagle Springs location follow a nearly identical pattern as those at Bonita Hills, but are generally about 20 psi lower.



At other locations in the water system, Eagle Water tries to maintain pressures of 60 psi or greater. Staff reviewed pressure recordings from Well No. 2, which is located roughly in the middle of the area served by Eagle Water, both in terms of directional location and in terms of elevation. Pressures at this location range from 60 to 70 psi nearly all of the time. Pressures occasionally drop below this range, but never lower than 50 psi. Eagle Water states that they believe minimum expected pressures at critical locations in the system other than Eagle Springs are 50 psi.

It should be pointed out that water pressures throughout Eagle Water's system, and any other system for that matter, will always vary throughout the system because of differences in elevation and in water usage. Customers at lower elevations will tend to have higher than average pressures while customers at higher elevations will have lower than average pressures. Water companies should strive to provide similar pressures to all customers, but it is impossible to provide pressures that are exactly the same. The best any utility can be expected to do is to keep pressures in a reasonable range that is neither too high nor too low.

FIRE FLOW TESTS

The *Uniform Fire Code*, which has been adopted by the Eagle Fire District, requires that the minimum fire flow and flow duration requirements for one- and two-family dwellings having a fire area which does not exceed 3,600 square feet shall be 1,000 gallons per minute. Minimum fire flows and flow durations for buildings having a fire area in excess of 3,600 square feet are specified by the code based on the buildings' type of construction and square footage. Fire flow is defined by the code as the flow rate of a water supply, measured at 20 psi residual pressure, that is available for firefighting. The Eagle Fire District is responsible for enforcing the fire code.

Figure 19. Norman Revels of Eagle Water Company and Kurt McClenny of the Eagle Fire District perform a fire flow test on a hydrant at the Eagle Springs Clubhouse on July 27, 2000.

Fire flow tests were conducted at two locations in the Eagle Springs subdivision on July 27, 2000. The tests were conducted by Eagle Water under the supervision of the Eagle Fire District. Commission Staff also witnessed the tests. The locations of each test are shown on the map in Figure 2.

The first test was conducted at a hydrant located on the lot where the Eagle Springs clubhouse and pool are located. Figures 19 and 20 show this test in progress. Because of the clubhouse at this location, the Eagle Fire District in accordance with the *Uniform Fire Code* requires that fire flows of at least 1500 gpm at 20 psi be available. The test was conducted at approximately 2:00 p.m. when pressures in the system were about 5 psi below

Figure 20. Norman Revels of Eagle Water Company check pressure during a fire flow test on July 27, 2000.

the highest expected for the day. During the test, the hydrant delivered 1280 gpm at a static pressure of 55 psi and a residual pressure of 27 psi. Using a computer program, the Eagle Fire District estimates that at 20 psi a fire flow of 1400 gpm could be provided. This is less than the 1500 gpm required.

Although the required minimum fire flow could not be attained at the Eagle Springs clubhouse location, the Eagle Fire District is not overly concerned. First, the clubhouse is less than 3600 square feet and its construction is similar to the residential construction in the subdivision. If not for the clubhouse, required fire flows would only be 1000 gpm. It is only because of the type of use to which the clubhouse is put and its possibility of being occupied by many people at one time that the 1500 gpm requirement is imposed by the Eagle Fire District. Second, the test was done on July 27 when the outside temperature was over 95 degrees and the pressure in the water system was lower than any other time of year. If the test were performed on a cooler day or at a different time of day, the results would be different. If the test was conducted at 7 a.m. for example, 1500 gpm could not be provided during many days of the summer. However, if the test was conducted in the afternoon on any but the hottest days of the summer, it is probable that the required fire flow of 1500 gpm could be provided. The Eagle Fire District plans to conduct additional tests as new development progresses in Eagle Springs Phase 5.

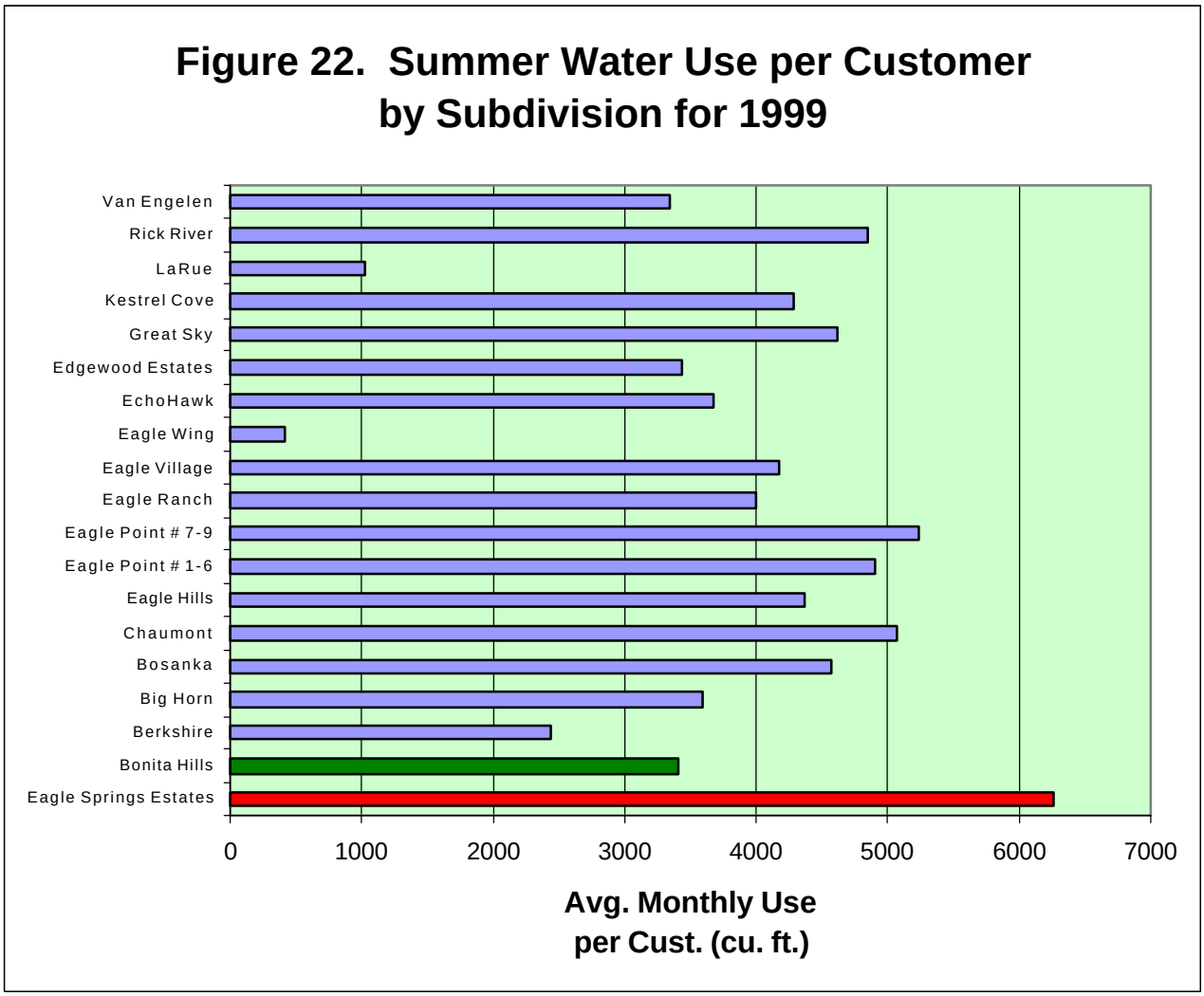
Figure 21. Fire flow test on July 27, 2000 at a hydrant located on N. Blacktail Place.

The second test was conducted at a hydrant located approximately 100 yards north of the corner of W. Bucktail Drive and N. Blacktail Place. Figure 21 shows this test in progress. During this test, flow was measured as 1630 gpm at a static pressure of 62 psi and a residual pressure of 32 psi. At a residual pressure of 20 psi, it is estimated that a flow rate of 2000 gpm could be sustained. As indicated by the results of the test, Eagle Water is easily capable of meeting fire flow requirements at this location. The reason Eagle Water has greater capability to provide higher fire flows at this location than at the clubhouse is because of the difference in elevation between the two locations.

The closest fire station to Eagle Springs and Bonita Hills is located near the corner of Horseshoe Bend Road and Floating Feather Road, which is very near both subdivisions.

WATER USAGE BY CUSTOMERS

Staff gathered water usage data for customers in numerous subdivisions served by Eagle Water to try to make at least a rough comparison between the water usage of customers in Eagle Springs and Bonita Hills and customers in other subdivisions. Figure 22 shows the summer water usage per customer for the subdivisions examined. As shown by the Figure, customers in Eagle Springs Estates used more water than customers in any other subdivision. Customer usage in Bonita Hills was much closer to average.



Staff cautions against drawing too many conclusions from this comparison. It should be pointed out that Eagle Springs Estates is still a developing subdivision. Many residents are still establishing new lawns; consequently, they are likely to use more water. In addition, lot sizes vary between subdivisions and soil types may be considerably different.

Staff is uncertain whether the higher per customer consumption in Eagle Springs will continue, but believes it may eventually moderate somewhat. Nevertheless, the current higher consumption rate by Eagle Springs customers exacerbates low pressure problems.

The timing of customers' water usage also plays a big part in the severity of pressure problems. As in most residential areas, the highest water demand in the summer is generally from about 5 a.m. to 9 a.m. and is caused primarily by lawn watering using automatic sprinkler systems.

SERVICE LINE PRESSURE REDUCTIONS

The *Uniform Plumbing Code*, in section 610.4, specifies the size of meter and the size of service line that must be installed from the meter to the customer's dwelling. Both the meter size and the service line size are based on "fixture units" which are relative indicators of the water usage requirements for various fixtures such as sinks, toilets or automatic sprinkler heads. Typically, for homes with automatic sprinkler systems, the required service line size is one inch (nominal size) or larger. All homes in both Bonita Hills and Eagle Springs have automatic sprinkler systems with water supplied by Eagle Water. Meter sizes in Eagle Springs are ¾-inch. The *Uniform Plumbing Code* is enforced by the Idaho Division of Building Safety, Plumbing Bureau. According to the Plumbing Bureau, service line sizes in new subdivisions such as Bonita Hills and Eagle Springs are usually one inch or one and one-quarter inches. The Plumbing Bureau is not aware of any violations of the code requirement in these subdivisions.

For the service line between the customer's meter and the Company's main line, Eagle Water typically runs a single $1\,^{1}/_{2}$-inch line that tees at the meter box and serves two customers. Questions have been posed to Staff as to whether using a single pipe to serve two customers can cause more pressure loss than if one service line was used for each individual customer. The answer is that no additional pressure loss will occur if the single line that serves two customers is properly sized. A $1\,^{1}/_{2}$ line that carries twice as much flow will cause slightly more pressure loss than a one-inch line that carries half as much flow. Staff estimates that only about one psi of additional pressure loss can be attributed to Eagle Water's practice of serving two customers with only one line from the main line to the meter box.

LONG-TERM SOLUTIONS TO PRESSURE PROBLEMS

Eagle Water obtained a water right permit for a new well to be located approximately 500 feet southwest of the intersection of Highway 44 (State Street) and Highway 55, between the Boise River and State Street. Figure 1 shows the location of the proposed new well. The permit was issued by the Department of Water Resources (IDWR) on March 2, 2000. The permit requires that Eagle Water commence construction of the well within one year of the date of the permit, and submit proof of beneficial use on or before March 1, 2002. The permit allows up to 2,200 gpm to be diverted.

In addition to a water right, Eagle Water is required by the Department of Water Resources to obtain a well drilling permit. An application for a well drilling permit was submitted by Eagle Water on December 15, 1999. A drilling permit has yet to be issued. The proposed drilling site must be examined by the Department of Environmental Quality who, in turn, must forward their approval to Water Resources. Although a well drilling permit usually requires that drilling begin within two months and proceed diligently, IDWR generally requires that it be informed of any delay and insists that construction be completed within the time permitted in the water right permit. Eagle Water tentatively plans to begin drilling sometime during the coming winter.

Eagle Water's engineer has completed an evaluation of the proposed well site. The engineer has concluded that the proposed site is suitable for a public water supply if the surface water and any aquifer above 150 below the ground surface are sealed so no water can be conveyed to the lower aquifer.

Eagle Water reports that it desires to construct a storage tank in the foothills northeast of the Eagle Springs subdivision. Figure 1 shows the location generally being considered for the new reservoir. Eagle Water could be prepared to construct the tank this winter and have it ready for the 2001 peak season, but is concerned about whether the Commission would allow it to be ratebased. The size for the proposed reservoir is two million gallons. This is based on the number of users and the possibility that this will be the only reservoir on the system. The Company is currently exploring purchase of private property or lease of county property. A preliminary general location has been selected and negotiations with the Ada County Sanitary Landfill manager (the Ada County Landfill controls the property being considered) are in progress. The final location is still to be determined based on elevation and desire of the landfill to "hide" the tank.

A rough cost estimate for the reservoir has been made based on the quantity of water to be stored. Most tanks can be constructed for $0.40 per gallon, thus a tank of the size desired by Eagle Water would likely cost approximately $800,000. The tank supplier will provide the final construction plans for the tank's steel part. Eagle Water's engineer will design the foundation when the supplier transmits the required supporting loads.

CONCLUSIONS

1. The initial failure of the Well No. 4 pump was caused by the failure of the original variable speed drive unit. The failure of the variable speed drive unit, in turn, was caused by a voltage spike on Idaho Power's system. The failure cannot be attributed to Eagle Water.

2. The second failure of the Well No. 4 pump was caused by the failure of electronic components in the new replacement variable speed drive unit. The manufacturer of the unit admits that the problem was manufacturing defects, and not attributable to Eagle Water.

3. Eagle Water's response to the pump outage was as good as could be expected under the circumstances. It would not be reasonable to expect the Company to keep spare parts on-hand like the type that failed. The fact that the pump outages occurred during and immediately following the 4th of July weekend added to the delay in obtaining replacement parts and in retaining qualified tradesmen to complete the repairs. Eagle Water does have arrangements with service technicians to be available for after-hours emergencies, but the holiday caused delays in obtaining parts, although generally not in obtaining service.

RECOMMENDATIONS

1. Staff recommends that Eagle Water continue to monitor pressures at both locations in the Bonita Hills and Eagle Springs subdivisions throughout the months of August and September.

2. Staff recommends that Eagle Water continue to pursue the construction of a new well to be located south of Highway 44 and north of the Boise River. Staff also recommends that Eagle Water continue to pursue planning and construction of a new storage reservoir to be located in the foothills north of the Eagle Springs Estates subdivision.

3. Staff recommends that the Commission direct Eagle Water to provide quarterly reports to the Commission describing the activity and progress during the quarter related to construction of a new well, planning and construction of a new storage reservoir, any pressure problems in the Eagle Springs and Bonita Hills area, and any other activity related to increasing the pressure in the Eagle Springs area.

4. Staff recommends that Eagle Water, under the supervision of Commission Staff, conduct tests during the winter by shutting down Well No. 4, operating the new booster pump, and measuring the resulting pressures in Eagle Springs. This testing would be intended to determine the vulnerability of the most critical points in Eagle Water's system to well pump outages.

5. Staff recommends that Eagle Water investigate the possibility of modifying the new booster pump to provide greater flow and/or pressure. It may be possible that minor pump impeller trimming could improve performance.