

MEMORANDUM

Date: December 11, 2013
To: Water Right File 37-22334
From: medl
Re: license rate & volume

I was asked to provide quick additional review/check on the rate and volume recommended by the examiner.

Rate

The field examiner recommended a rate based on the pump curve rather than the rate of water that the heat exchangers could accept. The production well pump is capable of more than the permit authorized.

The examiner mentioned the design rate for the system was approximately 100 gpm (~0.22 cfs). I assumed that this design rate was for the open loop on the well side of the heat exchangers, not the rate for the closed loops on the building side.

Volume

The examiner provides period-of-record, pump-motor hours and I used that run-time to estimate the beneficial volume.

I assumed that the Flahertys were the residents during the 5 year, period-of-record, and that the system was not significantly altered during that time. Therefore, the system response and occupant response to the weather is represented by the run-time.

The KSUN station is a nearby weather station. I pulled HDD (Heating Degree Day) and CDD (Cooling Degree Day) from weatherunderground for this site. (This website is capable of calculating HDD and CDD based on user selected dates.) I selected by the dates of the periods when the system was running.

According to the examiner, the HVAC system ran 12623 hours from 2009 to 2013. The total HDD for the period-of-record was 25322. The total CDD for the period-of-record was 1153. Obviously the heating season is dominant but occasional cooling is needed

To check the volume, I set up a simple ratio of degree days to run-time. During the broken chain of run-time days, 25322 HDD and 1153 CDD or a total of 26475 anyDD required climate control. That reduces to 0.476 run-time hour per anyDD. ($12623 \text{ run-time hours} / 26475 \text{ anyDD} = 0.476$)

The weather was not extreme in the period of record years and IDWR can allow for extreme weather. A review of the DD data for Ketchum RS gives 10268.5 as the maximum HDD in 1982.

If they system runs ~ 0.476 hr per anyDD then for an extreme HDD season then I expect the system to run 4895.912 hr ($= 0.476 \text{ hr/anyDD} \times 10268.5 \text{ HDD}$).

The system uses 100 gpm or 6000 gph. (This is less than the examiner recommended.) For a run-time of 4895.912 hours, it could be expected to use 29,375,473 gal or 90 AF in heating in during an extreme heating demand year. But what about cooling?

An extreme cooling use year would not occur in the same year as an extreme heating use year. In an

extreme heating year the cooling season would be shorter. But even the extreme heating years had some CDD. I found that there were 80-100 CDD at Ketchum RS during years with extremely high HDDs. I added 100 CDD to the extreme HDD and calculated again.
 $100 \text{ CDD} + 10268.5 \text{ HDD} = 10368.5 \text{ anyDD}$. $0.476 \text{ hr/anyDD} \times 10368.5 \text{ anyDD} = 4943.59 \text{ hr run time}$.
Using 100 gpm, that's 296,61,547 gal or 91.0 AF.

The examiner used his judgment to recommend 92 AF based on 25% above his calculations. I used a quick but rough method based on some assumptions about the system and some easily retrieved weather data to arrive at a similar volume.

	HDD	CDD										
2009	3262	66										
2010	7932	150										
2011	8272	180										
2012	4624	322										
2013	1232	435		12623	total run hr given							
				25322	HDD total	KSUN						
				1153	CDD total	KSUN						
				26475	climate adj needed							
				0.476789	hr per DD			0.476789	hr per DD			
						info from sta104845						
				10268.5	extreme HDD			10368.5	xHDD+CDD			
				100	CDD in ext HDD yr							
				4895.912	hr per extreme yr			4943.591	xHDD+CDD hr per yr			
				60	min/hr			60	min/hr			
				100	gal/min	325851.4		100	gal/min	325851.4	=constant gal/AF	
				29375473	gal per extreme yr	90.1499	29661547		91.02782	AF		

KETCHUM RANGER STN, IDAHO

Monthly Total Heating Degree Days

(104845)

Base Temperature = 65 F

File last updated on Apr 4, 2013

*** Note *** Provisional Data *** After Year/Month 201304

a = 1 day missing, b = 2 days missing, c = 3 days, ..etc.,

z = 26 or more days missing, A = Accumulations present

Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.

Months with 5 missing days or less use mean for missing day(s)

Individual Months not used for annual or monthly statistics if more than 5 days are missing.

Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR (S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1973	0.00z	0.00z	0.00z	0.00z	234.50n	190.00g	89.50	131.23a	436.55a	477.50k	1116.96b	1345.18c	3119.43
1974	1550.50	1288.52a	1141.83d	534.00i	364.00n	112.00p	2.00x	212.72b	297.00f	723.91d	999.00e	1417.98b	7334.47
1975	1520.50	1313.50	1260.50	1070.40e	679.70d	488.08d	84.00	315.50	326.50f	731.48e	1119.60e	1266.50	9849.76
1976	1414.00	1228.20b	1310.02b	546.00i	395.00f	279.00g	75.71e	268.15a	366.92d	479.00k	938.89c	1285.90e	6887.80
1977	1477.87e	738.00i	866.00h	680.77d	707.32a	167.00	141.16c	166.22b	405.58d	360.50o	1155.54b	1322.67a	6224.12
1978	1352.50	1169.78a	990.00	829.14a	645.83a	328.45a	131.50	260.73c	442.80e	626.89d	1060.71b	1632.31b	9470.64
1979	1741.00	1227.00	1087.00	837.50	524.50	346.20e	114.46e	166.76b	244.50h	655.28b	917.50g	1337.50	8037.20
1980	1560.50	1122.00	1173.50	724.00	569.50	409.29b	133.50	314.50	382.20e	710.42a	1067.50	1317.00	9483.90
1981	1321.00	1198.50	998.50	714.00	585.90a	363.21b	135.92e	74.06d	358.50	837.00	991.55a	1367.00	8945.14
1982	1586.50	1344.50	1141.50	1014.50	608.50	364.00	178.50	112.50	411.00	799.00	1241.00	1467.00	10268.50
1983	1347.50	1157.50	1072.00	937.50	569.00	378.00	235.50	124.00	412.00	677.00	1127.50	1645.50	9683.00
1984	1581.00	1303.00	1152.00	868.00	595.50	401.50	84.50	114.50	0.00z	889.00	1191.50	1647.00	9827.50
1985	1532.00	1449.00	1228.00	712.00	492.50	255.50	28.00	241.50	570.00	816.00	1348.50	1568.00	10241.00
1986	1327.00	1046.00	907.00	749.50	559.50	205.00	223.50	84.50	563.50	700.50	1015.50	1318.50	8700.00
1987	1503.00	1109.50	1026.00	612.50	482.50	283.50	224.00	192.00	322.50	606.00	985.00	1432.50	8779.00
1988	1488.50	1200.50	1049.00	719.00	566.50	230.00	67.50	161.00	401.50	494.00	1174.00	1534.50	9086.00
1989	1641.00	1348.50	1087.00	712.00	592.00	311.00	89.50	255.50	407.00	762.50	1045.00	1293.00	9544.00
1990	1394.00	1341.00	1029.00	649.00	673.50	371.50	135.00	163.50	278.00	780.37e	1114.00	1768.00	9696.87
1991	1514.00	959.50	1207.00	883.00	686.00	451.50	106.50	129.50	424.00	770.50	1233.50	1502.00	9867.00
1992	1440.00	1095.00	893.00	724.50	442.00	285.50	248.00	213.00	453.00	646.00	1190.00	1522.00	9152.00
1993	1549.00	1283.50	1054.00	867.00	451.00	477.50	413.50	268.00	448.00	701.50	1238.00	1460.50	10211.50
1994	1338.00	1266.00	955.00	691.50	438.00	323.50	121.00	167.00	305.00	767.50	1344.50	1429.50	9146.50
1995	1376.00	1043.50	1125.50	782.00	600.00	382.50	172.00	200.50	342.41a	659.50f	474.00o	1399.50	7423.91
1996	1435.50	1222.50	1036.00	760.00	599.50	289.50	45.00	188.50	480.00	769.00	981.00	1359.50	9166.00
1997	1414.00	1225.50	1065.50	829.50	422.00	264.31a	147.00	104.50	333.50	737.50	1032.50	1348.50	8924.31
1998	1332.48a	1143.50	1125.50	755.00	568.00	427.50	25.00	68.00	249.50	738.50	1031.50	1433.00	8897.48
1999	1375.00	1251.60c	1121.50	811.73d	382.50k	342.60e	141.64b	100.46d	399.83a	633.50	833.79a	1283.06d	8294.71
2000	1389.32a	1080.00	1081.50	498.00f	503.50	231.43b	91.00	68.41b	405.00	536.00g	1198.45a	1354.59c	7403.20
2001	1382.00	1229.00	929.48a	776.90a	404.07b	173.50j	155.00a	121.50	331.61b	697.00	995.00	1579.97a	8601.52
2002	1439.00	1303.00	1250.00	718.50	474.00	203.00	16.00	174.50	337.00	784.50	1056.50	1271.00	9027.00
2003	1176.00	1175.50	1004.50	786.50	534.00	240.50	52.50	55.00	328.00	552.00	1173.00	1297.50	8375.00
2004	1481.50	1280.50	952.00	647.50	547.50	265.00	93.50	168.00	421.55a	697.00	1006.00	1316.50	8876.55
2005	1365.50	0.00z	1030.50	803.00	583.50	422.50	63.50	126.50	449.50	688.50	1065.50	1423.00	8021.50
2006	1378.47a	1334.50	1195.50	768.50	451.00	206.00	28.00	149.50	390.00	722.50	1063.00	1392.00	9078.97
2007	1542.00	1081.00	924.00	701.50	455.50	230.00	9.00	101.50	380.50	746.00	777.00h	1451.32a	7622.32
2008	1636.00	1258.50	1214.50	970.50	525.50	327.00	41.50	109.50	465.60e	189.50v	655.50h	1406.88a	7955.48
2009	1342.50	1172.50	1163.00	750.00	215.00v	343.00	0.00z	196.00	246.00	866.50	1053.50	1498.50	8631.50
2010	1302.50	1203.50	1063.50	832.50	703.50	375.00	171.00	238.50	443.00	665.00	1080.50	1384.50	9463.00

2011	1427.50	1250.00	1136.50	664.50	h	0.00	z	433.85	d	152.50	123.48	a	300.00	a	632.29	b	1154.00	1320.60	a	7930.72
2012	1377.00	1252.50	1070.50	654.50		547.50		336.21	a	71.96	c	89.00	h	266.50	g	777.00	950.17	a	1354.50	8391.84
2013	1539.00	1128.00	1005.50	39.50	z	0.00	z	0.00	z	0.00	z	0.00	z	0.00	z	0.00	z	0.00	z	3672.50

Period of Record Statistics

MEAN	1447.27	1212.79	1083.51	781.26	552.60	326.67	119.39	164.89	391.17	717.69	1093.67	1418.86	9307.97
S.D.	112.29	101.83	102.98	104.53	83.78	83.63	79.30	68.50	74.57	84.22	111.99	119.56	511.48
SKEW	0.30	-0.24	0.12	0.91	0.11	0.02	1.39	0.48	0.21	-0.37	0.29	0.98	0.44
MAX	1741.00	1449.00	1310.02	1070.40	707.32	488.08	413.50	315.50	570.00	889.00	1348.50	1768.00	10268.50
MIN	1176.00	959.50	893.00	612.50	404.07	167.00	9.00	55.00	246.00	494.00	833.79	1266.50	8375.00
NO YRS	40	38	39	35	34	36	38	39	35	34	36	40	23

Weather History for Hailey, ID

April 1, 2013 through September 1, 2013

April 1, 2013 through September 1, 2013

- TO -

	Max	Avg	Min	Sum
Temperature				
Max Temperature	98 °F	73 °F	37 °F	
Mean Temperature	78 °F	60 °F	31 °F	
Min Temperature	64 °F	46 °F	21 °F	
Degree Days				
Heating Degree Days (base 65)	34	8	0	1232
Cooling Degree Days (base 65)	14	3	0	435
Growing Degree Days (base 50)	28	12	0	1782
Dew Point				
Dew Point	64 °F	35 °F	1 °F	
Precipitation				
Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	29 mph	8 mph	0 mph	
Gust Wind	40 mph	20 mph	12 mph	
Sea Level Pressure				
Sea Level Pressure	30.83 in	30.07 in	29.53 in	

Weather History for Hailey, ID

January 1, 2012 through October 1, 2012

January 1, 2012 through October 1, 2012

January 1 2012 - TO - October 1 2012

	Max	Avg	Min	Sum
Temperature				
Max Temperature	93 °F	61 °F	23 °F	
Mean Temperature	76 °F	49 °F	14 °F	
Min Temperature	62 °F	37 °F	3 °F	
Degree Days				
Heating Degree Days (base 65)	52	17	0	4624
Cooling Degree Days (base 65)	11	1	0	322
Growing Degree Days (base 50)	26	7	0	2036
Dew Point				
Dew Point	64 °F	30 °F	-6 °F	
Precipitation				
Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	31 mph	8 mph	0 mph	
Gust Wind	52 mph	20 mph	9 mph	
Sea Level Pressure				
Sea Level Pressure	31.00 in	30.06 in	28.72 in	

Weather History for Hailey, ID

January 1, 2011 through December 31, 2011

January 1, 2011 through December 31, 2011

January 1 2011 - TO - December 31 2011

	Max	Avg	Min	Sum
Temperature				
Max Temperature	91 °F	53 °F	10 °F	
Mean Temperature	76 °F	43 °F	2 °F	
Min Temperature	62 °F	32 °F	-7 °F	
Degree Days				
Heating Degree Days (base 65)	64	23	0	8272
Cooling Degree Days (base 65)	10	0	0	180
Growing Degree Days (base 50)	26	5	0	1697
Dew Point				
Dew Point	61 °F	28 °F	-15 °F	
Precipitation				
Precipitation	0.01 in	0.00 in	0.00 in	0.01 in
Snowdepth	-	-	-	-
Wind				
Wind	31 mph	7 mph	0 mph	
Gust Wind	46 mph	19 mph	9 mph	
Sea Level Pressure				
Sea Level Pressure	30.68 in	30.05 in	29.41 in	

Weather History for Hailey, ID

January 1, 2010 through December 31, 2010

January 1, 2010 through December 31, 2010

January 1 2010 - TO - December 31 2010

Daily

Weekly

Monthly

Custom

	Max	Avg	Min	Sum
Temperature				
Max Temperature	91 °F	54 °F	6 °F	
Mean Temperature	73 °F	44 °F	-2 °F	
Min Temperature	62 °F	34 °F	-9 °F	
Degree Days				
Heating Degree Days (base 65)	66	22	0	7932
Cooling Degree Days (base 65)	8	0	0	150
Growing Degree Days (base 50)	23	4	0	1505
Dew Point				
Dew Point	61 °F	28 °F	-26 °F	
Precipitation				
Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	29 mph	8 mph	0 mph	
Gust Wind	41 mph	19 mph	9 mph	
Sea Level Pressure				
Sea Level Pressure	30.61 in	30.03 in	28.96 in	

Weather History for Hailey, ID

August 10, 2009 through December 31, 2009

August 10, 2009 through December 31, 2009

August 10 2009 - TO - December 31 2009

	Max	Avg	Min	Sum
Temperature				
Max Temperature	93 °F	54 °F	8 °F	
Mean Temperature	73 °F	43 °F	3 °F	
Min Temperature	59 °F	32 °F	-5 °F	
Degree Days				
Heating Degree Days (base 65)	62	23	0	3262
Cooling Degree Days (base 65)	8	0	0	66
Growing Degree Days (base 50)	23	5	0	698
Dew Point				
Dew Point	63 °F	26 °F	-11 °F	
Precipitation				
Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snowdepth	-	-	-	-
Wind				
Wind	108 mph	7 mph	0 mph	
Gust Wind	37 mph	19 mph	9 mph	
Sea Level Pressure				
Sea Level Pressure	30.50 in	30.08 in	28.95 in	