

Exam Date: 3/4/2005

- [illegible]

Method of Determination: Site Visit and GIS.

3. ☒ Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.
- ☒ Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be 1:24,000 or greater.
- ☐ Aerial Photo Attached (required for irrigation of 10+ acres).
- ☒ Photo of Diversion and System Attached

4.

<u>Well or Diversion</u> <u>ID No.*</u>	<u>Motor Make</u>	<u>Hp</u>	<u>Motor Serial No.</u>	<u>Pump Make</u>	<u>Pump Serial No. or Discharge</u> <u>Size</u>
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SEE FIELD NOTES FOR INFORMATION ON GENERATORS AND SYSTEM LAYOUT.

*Code to correspond with No. on map and aerial photo

D. FLOW MEASUREMENTS

1.

<u>Measurement</u> <u>Equipment</u>	<u>Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calib. Date</u>
DOES NOT APPLY						

2. Measurements:

NOTE THAT THERE IS NOT A DIRECT WATER MEASURING DEVICE HOWEVER THE POWER GENERATED IN THE FACILITY IS MONITORED VIA POWER METERS AND WITH APPROPRIATE CONVERSION PARAMETERS APPLIED THE WATER FLOW CAN BE DETERMINED. SEE ATTACHED SPREADSHEET CALCULATIONS.

E. FLOW CALCULATIONS

☒ Additional Computation Sheets Attached

Measured Method:

SEE ATTACHED SPREADSHEET ANALYSIS.

F. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) =$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation season}) \times 1.9835 =$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} =$$

2. Volume Calculations for Other Uses:

TOTAL VOLUME CALCULATED IS 17,820 AFA.

SEE ATTACHED NARRATIVE

G. NARRATIVE/REMARKS/COMMENTS

SEE ATTACHED NARRATIVE

Have conditions of permit approval been met? ☒ Yes ☐ No**H. RECOMMENDATIONS**

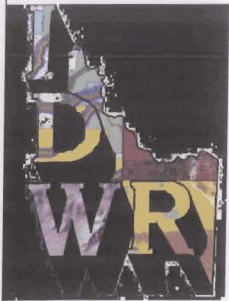
1. Recommended Amounts

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
POWER	01/01 to 12/31	50.000 CFS	17,820 AF
<u>Totals:</u>		50.000 CFS	17,820 AF

2. Recommended Amendments

☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☒ None☐ Change P.U. as reflected above ☐ Add P.U. as reflected above ☐ Other**I. AUTHENTICATION**Field Examiner's Name  Date 1/2/08

Reviewer _____ Date _____



Idaho Department of Water Resources

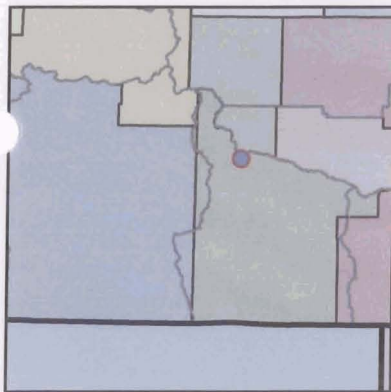
Field Exam for

47-7700

(Power)

Legend

-  Place of Use
-  Point of Diversion
-  Townships
-  PLS Sections
-  Quarter Quarters



Twin Falls County
IDWR Basin 47



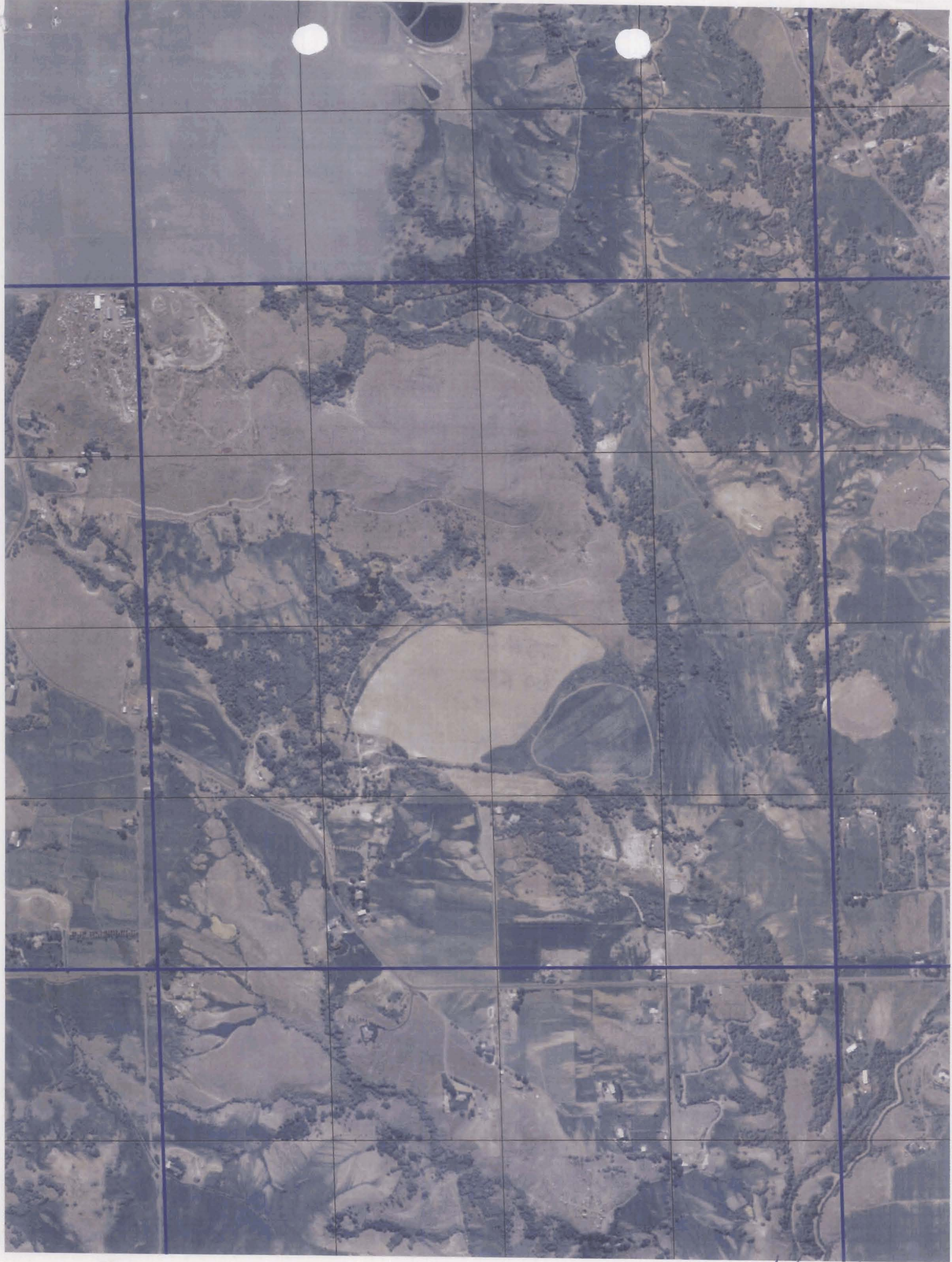
0 0.4 0.8 Miles



Owner: H K Hydro LLC

NOTE: Only one owner is listed. There may or may not be more than this in the IDWR database.

Prepared by A. Merritt
On Wednesday, January 2, 2008
2004 Aerial Photography



3/9/05 ADW



3/9/05



47-7700 Diversion from Mud Creek

Truck parked on box culvert supplying diversion head canal leading to penstock for upper power plant. Pumps on left are diversions for irrigation.



End of head canal. Near gate goes to Campbell for irrigation/fish. Over weir is spill back to creek. Screened in background goes to penstock to upper power plant. Far left goes to irrigation.

47-7700 Upper Power Plant looking upstream. Mud Creek on left. Generators in building.



Diversion from Mud Creek below upper power plant diverting water to lower power plant. View looking downstream.

Lower power plant diversion viewed from east side of Mud Creek. Spill goes into a box culvert under roadway to head canal to lower power plant.

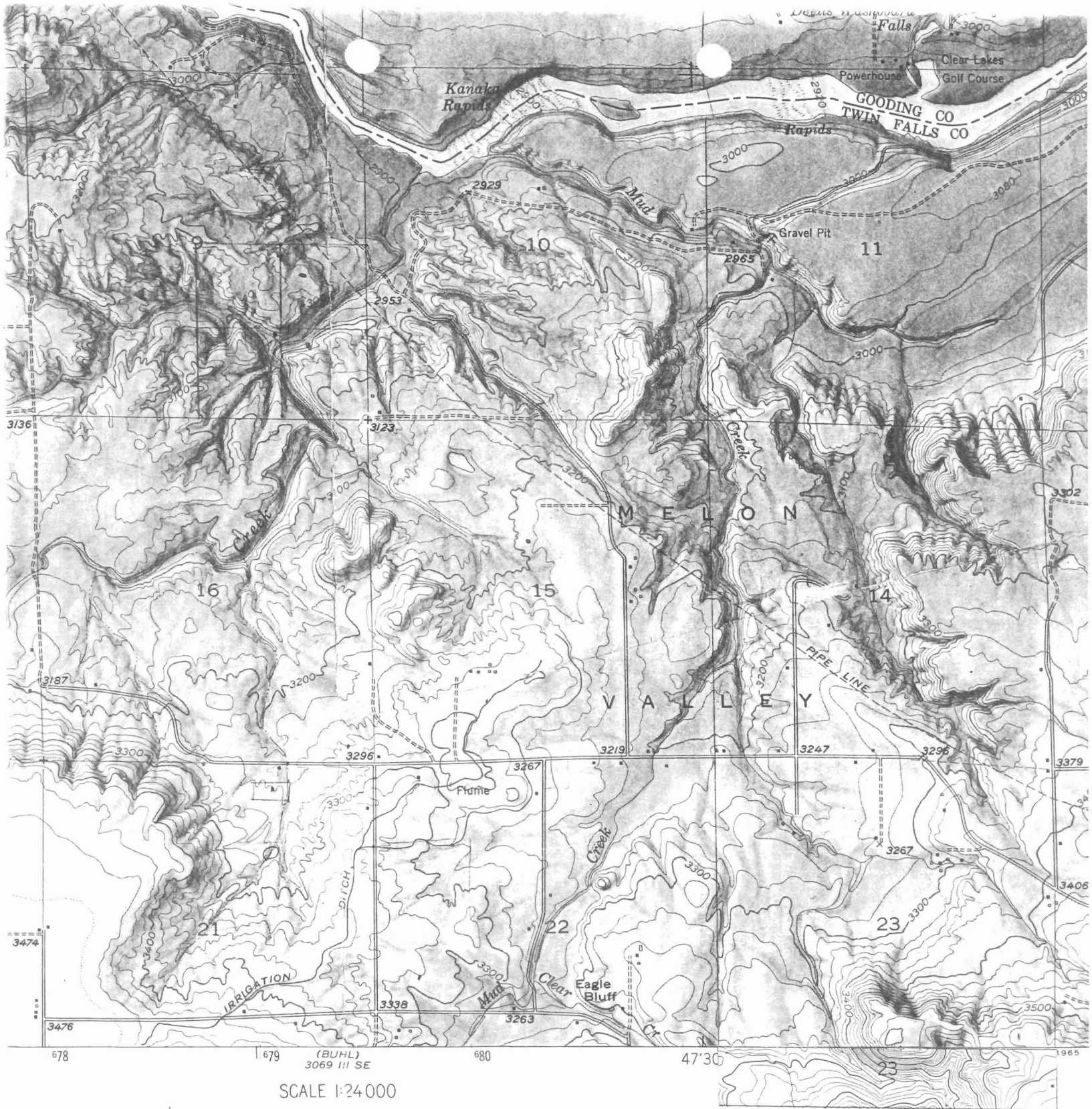


Pipeline supplying wastewater (47-7702) into lower head canal leading to lower power plant. View looking downstream. Note that the pipeline crosses Mud Creek and diversion of wastewater is at head of pipeline.

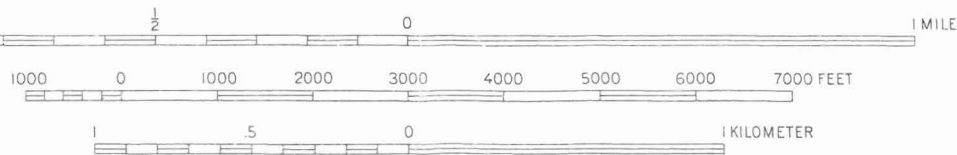
47-7700 and 47-7702 Head of penstock to at end of lower head canal. Weir provides spill back to Mud Creek with screened portion at far end is inlet to penstock.



Lower power plant. Generators in building.



SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
 DOTTED LINES REPRESENT HALF-INTERVAL CONTOURS
 CONTOUR INTERVAL ON RIVER SURFACE 5 FEET
 DATUM IS MEAN SEA LEVEL



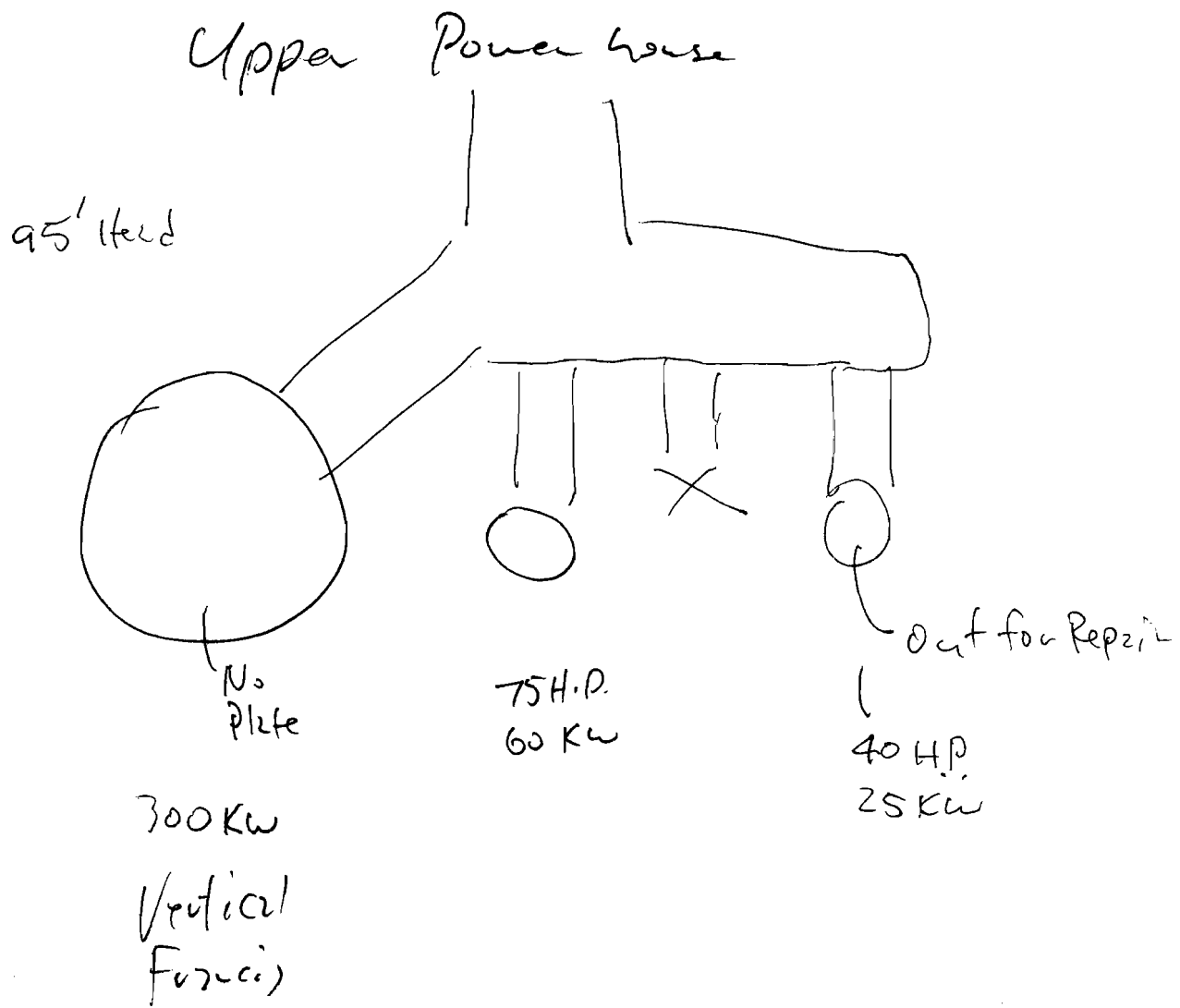
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225 OR WASHINGTON, D. C. 20242.

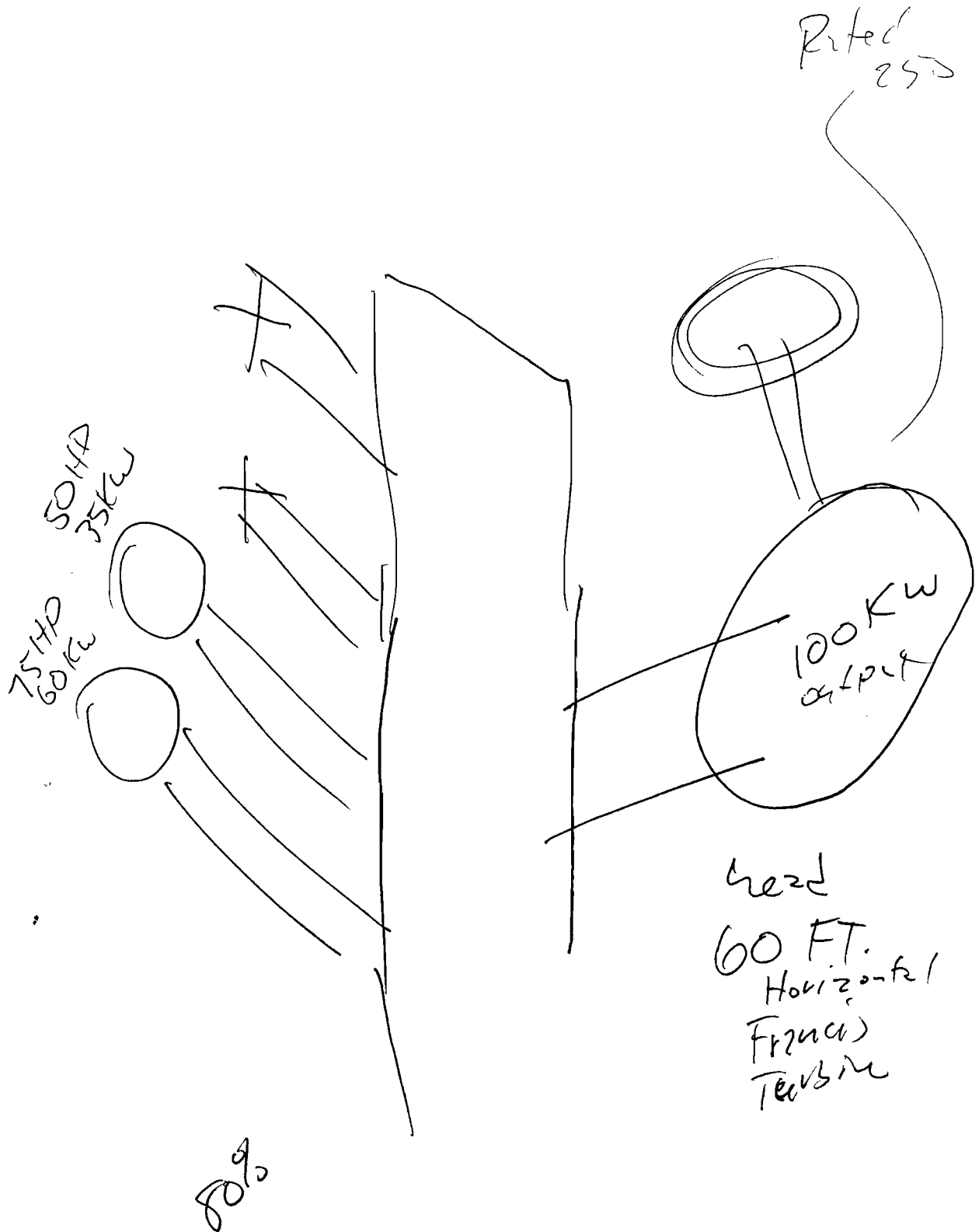
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

THIS MAP AVAILABLE WITH OR WITHOUT SHADED RELIEF OVERPRINT



3/4/05 ADM

Lower



3/4/05 ADm

NARRATIVE FOR FIELD EXAM FOR 47-7700 AND 47-7702

By Allen Merritt

On 3/4/2005 I met with Scott Kaster at the site of the HK Hydro LLC facilities northwest of Buhl Idaho.

The upper power plant diverts water from Mud Creek in the SWSESE Section 15, T9S, R14E. via a head canal from the creek. (**Note that all further legal descriptions are in the T9S, R14E.) The head canal conveys water to a penstock for the upper power plant. The penstock starts in the NWNWSW S14 and terminates at the upper power plant building in the SWSWNW S14 and at that locations dumps water back into Mud Creek. The head canal also delivers water for irrigation use for other users. The head canal also has an overflow allowing excess water to spill back to Mud Creek near the upper power plant.

The upper power plant building contains a 4 station manifold that directs flow to three installed generators (1 station has no generator). It was reported that the three generators were 300 Kw, 60 Kw and 25 Kw. The upper power plant has a head of 95 feet.

The lower power plant diverts water from Mud Creek via a head canal just below the upper power plant in the SWSWNW S14. A pipeline conveying wastewater from Don Campbell's fish hatchery crosses Mud Creek and discharges into the lower power plant's head canal within the SWSWNW S 14. The lower head canal conveys water to a penstock for the lower power plant. The penstock starts in the NWNWNW S14 and terminates at the lower power plant building in the NWNWNW S14 and at that location dumps water back into Mud Creek. This lower head canal also has an overflow allowing excess water to spill back to Mud Creek.

The lower power plant building contains a 5 station manifold that directs flow to three installed generators (2 stations have no generators). It was reported that the three generators were 100 Kw, 60 Kw and 35 Kw. The lower power plant has a head of 60 feet.

Mr. Kaster indicated the power plants were initially developed by Dan Skeem utilizing irrigation pumps as generators. He indicated that since HK Hydro obtained the facilities in the late 1980's or early 1990's they have upgraded the generators replacing the pumps as money allowed. He indicated that the upper plant has more efficient equipment than the lower plant. Mr. Kaster further indicated that the flows of Mud Creek since the late 1990's has decreased. He provided power records for the years 1996 and 1997 and indicated that these represented the peak power generating period with higher flows during the time that HK Hydro had operated the facility. He could not provide records when Skeem operated the facility.

After the field exam I met with Don Campbell in an attempt to understand the availability of the wastewater that flows from his fish facility and discharges into the lower head canal. The water from the Campbell fish farm comes from various sources including

Mud Creek and some tributary streams as well as ground water from artesian hot wells. These waters are used to raise warm water fish and at times irrigate his property. Mr. Campbell provided a list of discharge measurements ranging in dates from 2001 through 2005 that represent the wastewater discharged to the lower head canal. The measurements were made for the purpose of reporting water quality to DEQ. The flows varied from 6 to 8 cfs. The average of the gross measurements was 6.9 cfs.

Utilizing the power records and the Campbell flow records the attached spreadsheet was developed to analyze and quantify the water diverted at the upper and lower power plants. Note that between the upper and lower diversions water from side streams at times enters Mud Creek so there are times when there is more water available from Mud Creek at the lower diversion. Also note that there is a diversion for Kanaka Rapids diverting for irrigation and recreation uses between the upper and lower HK Hydro diversions. The spreadsheet utilizes an overall estimate of plant efficiency based on the attached portions of publications about hydropower. On the high end the efficiency is 0.8 or 80% and at the lower end the efficiency is 0.6 or 60%. These upper and lower end values were used based on Mr. Kaster's statement of comparative efficiencies of the two plants. Assumptions in analyzing the power records are that the plants were run continuously. This assumption is reasonable to calculate peak flows but not critical in estimating volume of water diverted. The spreadsheet was constructed to account for the water diverted from the Campbell facility in the lower plant. The average of 6.9 cfs was used to calculate the volume of this wastewater flow. Based on this analysis it is determined that at times more water from Mud Creek may be diverted at the lower diversion than what is diverted at the upper diversion and then discharged then re-diverted. Taking this into account it is recommended that the lower diversion on Mud Creek not only serve as a re-diversion but also as a primary diversion. The peak annual diversion from Mud Creek was calculated to be approximately 17,820 AF. The peak diversion from Mud Creek was 50.76 cfs so the permitted 50 cfs is recommended for license under 47-7700.

Permit 47-7702 is recommended to be amended to cover the wastewater utilized from the Campbell fish facility. The point of diversion is the point where the water is put in the pipeline crossing the creek. The peak diversion is 8 cfs based on the information from Don Campbell and the annual diversion volume was the average of 6.9 cfs times 365 days/year times 1.9835 af/cfs/day or 5000 afa.

The attached photographs were taken of the facility. Photographs from inside the power houses did not turn out.

H K Hydro LLC Permits 47-7700 and 47-7702 Analysis														
Prepared by ADM 12/14/2007														
Plant 1 (Upper)					Plant 2 (Lower)				days in month		Diff 2 - 1	minus 6.9	Vol	Total Ann Vol
1996	KWH	KW	CFS	VOL	Annual Vol	KWH	KW	CFS						
Jan	82320	110.6452	17.17912	1056.318		63000	84.67742	27.75538	31		10.57626	3.676259	226.0477	
Feb	57480	82.58621	12.8226	737.5749		54360	78.10345	25.60057	29		12.77798	5.877979	338.1102	
March	46560	62.58065	9.716469	597.4511		46920	63.06452	20.67115	31		10.95468	4.054678	249.3161	
April	35040	48.66667	7.55614	449.6281		32760	45.5	14.91389	30		7.357749	0.457749	27.23833	
May	46080	61.93548	9.616299	591.2918		56040	75.32258	24.68907	31		15.07277	8.172769	502.5313	
June	54240	75.33333	11.69649	695.9997		57720	80.16667	26.27685	30		14.58036	7.680361	457.0199	
July	56400	75.80645	11.76995	723.7165		55200	74.19355	24.319	31		12.54905	5.649047	347.3514	
August	90000	120.9677	18.78183	1154.867		72360	97.25806	31.87903	31		13.0972	6.197199	381.0564	
September	182400	253.3333	39.33333	2340.53		79680	110.6667	36.27407	30		-3.05926	-9.95926	-592.626	
October	243240	326.9355	50.76104	3121.22		80400	108.0645	35.42115	31		-15.3399	-22.2399	-1367.5	
November	158160	219.6667	34.10614	2029.486		78360	108.8333	35.67315	30		1.567008	-5.33299	-317.34	
December	139560	187.5806	29.12436	1790.813		78720	105.8065	34.681	31		5.55664	-1.34336	-82.6012	
1997					15288.8963									2528.671 17817.57
Jan	97800	131.4516	20.40959	1254.955		72000	96.77419	31.72043	31		11.31084	4.410838	271.2158	
Feb	58920	87.67857	13.61325	756.0528		60720	90.35714	29.61706	28		16.00381	9.103812	505.6075	
Mar	57240	76.93548	11.94525	734.4953		49440	66.45161	21.78136	31		9.836116	2.936116	180.5374	
Apr	48240	67	10.40263	619.0086		40680	56.5	18.51944	30		8.116813	1.216813	72.40645	
May	51120	68.70968	10.66808	655.9643		46440	62.41935	20.45968	31		9.791596	2.891596	177.7999	
Jun	73080	101.5	15.75921	937.7518		55920	77.66667	25.45741	30		9.698197	2.798197	166.5067	
Jul	60720	81.6129	12.67148	779.1501		58680	78.87097	25.85215	31		13.18067	6.280673	386.1892	
Aug	110400	148.3871	23.03905	1416.637		68640	92.25806	30.24014	31		7.201094	0.301094	18.51383	
Sep	156840	217.8333	33.82149	2012.548		81600	113.3333	37.14815	30		3.326657	-3.57334	-212.632	
Oct	222840	299.5161	46.50382	2859.45		89160	119.8387	39.28047	31		-7.22335	-14.1234	-868.424	
Nov	159960	222.1667	34.4943	2052.583		87120	121	39.66111	30		5.166813	-1.73319	-103.133	
Dec	98880	132.9032	20.63497	1268.814		78360	105.3226	34.5224	31		13.88743	6.987427	429.6464	
					15347.40955									2208.423 17555.83
Plant 1			Head (ft)=	95		Effic =	0.8							
Plant 2			Head (ft)=	60		Effic =	0.6							

When working with cubic feet per second, 709 is divided by 60 and the result is:

$$P_{kw} = \frac{Q \times h \times e}{11.8}$$

where Q = flow in cfs

h = net head in feet

e = turbine-generator efficiency.

Component efficiency varies both with design and engineering refinement. Some designs are inherently more efficient than others and some products show better engineering than others. Equipment vendors should have some idea of the efficiency of their equipment even though those numbers may be a bit inflated. In any event, when flow and head data is provided, the vendor should give power output and price numbers. The difference between actual and theoretical output is the system efficiency. If you feel that your flow and head data is sound, you may request that the vendor guarantee the power output. Keep in mind that micro plants are typically less efficient than their full size counterparts.

Typical Efficiencies

Turbines:

Pelton.....	70-85%
Cross flow.....	60-70%
Francis.....	75-90%
Propeller.....	75-90%

Generators: 85-90%

Belt Drive (where used): 95%

Example: The site has a flow of 15 cfs and a net head of 150 feet. The turbine will be Pelton with direct drive to a good Synchronom generator. Theoretical output is

$$P_{th} = \frac{15 \times 150}{11.8} = 190.7 \text{ KW}$$

The efficiency of the turbine and generator are 80% and 95% respectively. No belts are used. "E" is thus $80 \times .95 = .76$, so the actual power output is

$$P = \frac{15 \times 150 \times .76}{11.8} = 150 \text{ KW}$$

Estimating Power Requirements

Individuals considering a stand alone system should make an effort to determine their power requirements and then to see that the proposed system output is adequate. An important distinction must be made between the total energy that is consumed in a given period and the peak demand that may be required at any given moment. A 5KW plant running continuously for one month (720 hours) will generate 3600 kilowatt hours, which should be enough for a typical single family household. However, the system will produce only 5000 watts at any given moment. On a typical morning, these items might be in use:

To convert this to horsepower, the equation becomes:

$$P_{th} = \frac{62.4 Q \times h}{33,000}$$

$$= \frac{Q \times h}{529}$$

Q cfs

$$H.P. = \frac{62.4 Q \times h \times \text{eff.}}{550}$$

To convert to Kilowatts, the same equation becomes:

$$P_{th} = \frac{62.4 Q \times h}{33,000} \times 0.745$$

$$= \frac{Q \times h}{709}$$

$$Kw. = \frac{62.4 Q \times h \times \text{eff.}}{737.26}$$

For example:

Using a flow rate (Q) of 5 cfm and a net head (h) of 100 feet, the theoretical power, in Kilowatts, is

$$P_{th} = \frac{Q \times h}{709}$$

$$= \frac{5 \times 100}{709}$$

$$= 0.7 \text{ KW}$$

$$= 700 \text{ Watts}$$

The theoretical power available represents more power than you will get out of your equipment. All of the machinery and other equipment that you use to convert the power available in the flowing water to mechanical shaft or electrical power are less than 100% efficient. As an indication, typical efficiencies of water wheels and turbines are listed below. More precise figures are available from the manufacturers.

Typical Efficiency Ranges for Small Water Wheels and Turbines

<u>Prime Mover</u>	<u>Efficiency Range</u>
Water Wheels - Undershot	25 - 45%
- Breast	35 - 65%
- Poncelet	40 - 60%
- Overshot	60 - 75%
Turbines- Reaction	80%
- Impulse	80 - 85%
- Crossflow	60 - 80%

To transmit the power from water wheel or turbine to a generator, alternator, or some mechanical system also entails losses. Belt drives are 95 to 97% efficient for each belt; gear boxes 95% and higher; alternators and generators 80%. If you use second hand equipment, you can adjust the efficiency rating down slightly.

Typical overall efficiencies for electrical generation systems can vary from 50 to 70%, with the higher overall efficiencies occurring in the high head, high speed impulse turbines. Overall efficiencies of systems using water wheels are usually well under 50%.

For example:

Using our previous figures, the theoretical power available (P_{th}) was 700 Watts. If an impulse turbine, with efficiency of 80%, is used with a single belt drive to an 80% efficient alternator, then the useful power (P) is

$$P = 700 \text{ Watts} \times 0.8 \text{ (turbine)} \times 0.95 \text{ (belt drive)} \\ \times 0.8 \text{ (alternator)}$$

$$P = 426 \text{ Watts}$$

In summary, here are the steps to follow to determine the hydro potential of your site:

1. Measure the water flow rate using one of the following:
 - timed container filling method,
 - float method, or
 - Weir method.
2. Determine the usable flow -- that portion of the stream flow you can use.
3. Measure the total or gross head, preferably with:
 - surveyor's equipment or
 - carpenter's level and stand.
4. Determine the net head by subtracting friction and other losses from the gross head.

5. Calculate the theoretical power available using either

$$P_{th} = \frac{Q \times h}{529} \text{ horsepower} \quad \text{or} \quad P_{th} = \frac{Q \times h}{709} \text{ Kilowatts}$$

where Q = usable flow rate in cubic feet per minute
 h = net head, in feet.

6. Calculate the useful power available by multiplying P_{th} by the efficiency of each piece of machinery linked into the system between and including the water wheel or turbine and the unit giving out the useful power.

4TH Jan YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT LAKE STATE UT ZIP 84111 PHONE 543-5171

	FACILITY OUTPUT	LOCAL SERVICE	REACTIVE SUMMARY (SYNCHRONOUS MACHINES ONLY)
METER NUMBERS	<u>15342</u>	<u> </u>	KOH/KVARH OUT <u> </u>
END OF MONTH KWH METER READING	<u>14817</u>	<u> </u>	KOH/KVARH IN <u> </u>
BEGINNING OF MONTH KWH READING	<u>525</u>	<u> </u>	METER CONSTANT <u> </u>
DIFFERENCE	<u>120</u>	<u> </u>	
TIMES METER CONSTANT	<u>63000</u>	<u> </u>	
KWH FOR THE MONTH	<u>63000</u>	<u> </u>	= NET GENERATION <u>63000</u>
METERED DEMAND	<u> </u>	<u> </u>	

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

SIGNATURE Leo Kaste DATE 2-1-96

NTH Jan YEAR 96

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764482026
CITY Buhl STATE ID ZIP 83316 PHONE 543-5971

[illegible]

[Signature] 2-1-76
SIGNATURE DATE

MONTH Feb YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT LAKE STATE UT ZIP 84111 PHONE 543-5171

[illegible]

SIGNATURE Scott Koster DATE 3-1-96

MONTH Feb YEAR 1964

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764487086
CITY Buhl STATE ID ZIP 83316 PHONE 543-5971

METER NUMBERS	_____	KQH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>21749</u>	KQH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>21370</u>	METER CONSTANT	_____
DIFFERENCE	<u>479</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>57480</u>	=	NET GENERATION <u>57480</u>
METERED DEMAND	_____		

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Lea Carter 3-1-96
SIGNATURE DATE

MONTH Mar YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT LAKE STATE UT ZIP 84111 PHONE 593-5171

[illegible]

SIGNATURE 4-1-96
DATE

NTH Mar YEAR 96

NAME H-K Hydro PLANT 1 Leasing FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 76448708G
CITY Buhl STATE ID ZIP 83316 PHONE 543-5971

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>22137</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>21749</u>	METER CONSTANT	_____
DIFFERENCE	<u>388</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>46560</u>	=	NET GENERATION <u>46560</u>
METERED DEMAND	_____		

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

COMPLETE IS REQUIRED BY THE POWER OR ENERGY
SALES AGREEMENT TO WHICH I AM A PARTY.

Luc K. [Signature] 4-1-76
SIGNATURE DATE

MONTH April YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 764298386
CITY SALT LAKE STATE UT ZIP 84111 PHONE 543-5171

[illegible]

SAMPLE WAS RECEIVED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Lee Kark 5-1-96
SIGNATURE DATE

NTH April YEAR 96

NAME H-K Hydro Plant 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764487086
CITY Buhl STATE ID ZIP 83316 PHONE 542-5971

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>22429</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>22137</u>	METER CONSTANT	_____
DIFFERENCE	<u>292</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>35040</u>	=	NET GENERATION <u>35040</u>
METERED DEMAND	_____		

NO COMPLETE NO REQUIRED BY THE POWER OR ENERGY
SALES AGREEMENT TO WHICH I AM A PARTY.

Frank Korte 5-1-76
SIGNATURE DATE

MONTH May YEAR 96

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764482086
CITY Buhl STATE ID ZIP 83316 PHONE 543-5971

[illegible]

Scott Kaster 6-1-96
SIGNATURE DATE

MONTH May YEAR 96

NAME H-K Hydro Plant 2 Zions
ADDRESS _____
CITY SALT Lake STATE UT ZIP 84111

FACILITY NR. 31415004
METER NR. 764298386
PHONE 543-5171

	FACILITY OUTPUT	LOCAL SERVICE	REACTIVE SUMMARY (SYNCHRONOUS MACHINES ONLY)
METER NUMBERS	<u>16926</u>	<u> </u>	KOH/KVARH OUT <u> </u>
END OF MONTH KWH METER READING	<u>16459</u>	<u> </u>	KOH/KVARH IN <u> </u>
BEGINNING OF MONTH KWH READING	<u>467</u>	<u> </u>	METER CONSTANT <u> </u>
DIFFERENCE	<u>120</u>	<u> </u>	
TIMES METER CONSTANT	<u>56040</u>	<u> </u>	
KWH FOR THE MONTH	<u> </u>	<u> </u>	= NET GENERATION <u>56040</u>
METERED DEMAND	<u> </u>	<u> </u>	

[illegible]

1 LACK OF ADEQUATE PRIME MOVER
2 FORCED OUTAGE OF FACILITY
3 DISTURBANCE ON IPCo SYSTEM
4 SCHEDULED MAINTENANCE
5 TESTING OF PROTECTION SYSTEMS
6 CAUSE UNKNOWN
7 OTHER (EXPLAIN)

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

SIGNATURE John Kaster DATE 6-1-96

MONTH June YEAR 96

NAME H-K Hydro PLANT 1 Leasing FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764482026
CITY Buhl STATE ID ZIP 83316 PHONE 542-5971

METER NUMBERS		KOH/KVARH OUT
END OF MONTH KWH METER READING	<u>23290</u>	KOH/KVARH IN
BEGINNING OF MONTH KWH READING	<u>22838</u>	METER CONSTANT
DIFFERENCE	<u>452</u>	
TIMES METER CONSTANT	<u>120</u>	
KWH FOR THE MONTH	<u>54240</u>	= NET GENERATION <u>54240</u>
METERED DEMAND		

SCOOP KASTER 7-1-96
SIGNATURE DATE

DATE 11th June YEAR 96

NAME H-K Hydro Plant 2 Zions
ADDRESS _____
CITY SALT LAKE STATE UT ZIP 84111

FACILITY NR. 31415004
METER NR. 76429838G
PHONE 543-5171

LOCAL
SERVICE

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

END OF MONTH KWH METER READING	17407
BEGINNING OF MONTH KWH READING	16926
DIFFERENCE	481
TIMES METER CONSTANT	120
KWH FOR THE MONTH	57720
METERED DEMAND	

KOH/KVARH OUT _____
KOH/KVARH IN _____
METER CONSTANT _____

= NET GENERATION 57720

[illegible]

1 LACK OF ADEQUATE PRIME MOVER
2 FORCED OUTAGE OF FACILITY
3 DISTURBANCE ON IPCo SYSTEM
4 SCHEDULED MAINTENANCE
5 TESTING OF PROTECTION SYSTEMS
6 CAUSE UNKNOWN
7 OTHER (EXPLAIN)

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kest 7-1-96
SIGNATURE DATE

MONTH July YEAR 96

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764487026
CITY Buhl STATE ID ZIP 83316 PHONE 542-5971

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

KQH/KVARH OUT _____
KQH/KVARH IN _____
METER CONSTANT _____

= NET GENERATION 56400

COMPLETE AS REQUIRED BY THE POWER OR ENERGY
SALES AGREEMENT TO WHICH I AM A PARTY.

 8-1-96

SIGNATURE DATE

1TH July YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT Lake STATE UT ZIP 84111 PHONE 543-5971

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

METERED DEMAND _____

COGEN CAD-A-1 5-12-83

MONTH Aug YEAR 96

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 76448202G
CITY Buhl STATE ID ZIP 83316 PHONE 543-5971

METER NUMBERS	_____	KQH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>24510</u>	KQH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>23760</u>	METER CONSTANT	_____
DIFFERENCE	<u>750</u>		
TIMES METER CONSTANT	<u>9</u>		
KWH FOR THE MONTH	<u>9000</u>	=	NET GENERATION <u>9000</u>
METERED DEMAND	_____		

DATE _____

ITH Aug YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT LAKE STATE UT ZIP 84111 PHONE 543-5171

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

SALES AGREEMENT TO WHICH I AM A PARTY.

Art Korte 7-1-96
SIGNATURE DATE

TH Sept YEAR 96

NAME H-K Hydro Plant 2 Zions
ADDRESS _____
CITY SALT LAKE STATE UT ZIP 84111

FACILITY NR. 31415004
METER NR. 764298386
PHONE 543-5171

LOCAL
SERVICE

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

METERED DEMAND

METER CONSTANT

= NET GENERATION 79680

10-1-96

MONTH Sept YEAR 96

NAME H-K Hydro Plant 1 Leasing FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 76448708G
CITY Buhl STATE ID ZIP 83316 PHONE 542-5971

REACTIVE SUMMARY
(SYNCHRONOUS MACHINES ONLY)[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kates 10-1-96
SIGNATURE DATE

INTH Oct YEAR 96

NAME H-K Hydro PLANT 1 Leasing ^{Zions} FACILITY NR. 31415004
ADDRESS 1300 E 1420 N METER NR. 764487026
CITY Buhl STATE ID ZIP 83316 PHONE 542-5971

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>28057</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>26030</u>	METER CONSTANT	_____
DIFFERENCE	<u>2027</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>243240</u>	= NET GENERATION	<u>247240</u>
METERED DEMAND	_____		

SIGNATURE 11-1-96
DATE

TH Oct YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 76429838G
CITY SALT Lake STATE UT ZIP 84111 PHONE 543-5171

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

METER CONSTANT _____

NET GENERATION 80900

SALES AGREEMENT TO WHICH I AM A PARTY.

David K. Oster 11-1-96
SIGNATURE DATE

MONTH Nov YEAR 96

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERCO SALES AGREEMENT TO WHICH I AM A PARTY.

Peter Werth 12196

TH Nov YEAR 96

NAME H-K Hydro Plant 2 Zions FACILITY NR. 31415004
ADDRESS _____ METER NR. 764298386
CITY SALT LAKE STATE UT ZIP 84111 PHONE 543-5171

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Peter Werth 12 1 96
SIGNATURE DATE

MONTH Dec YEAR 96

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP PHONE 543-8931

[illegible]

SALES AGREEMENT TO WHICH I AM A PARTY:

Don Koster 1/1-97

MONTH Dec YEAR 96

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

END OF MONTH KWH METER READING	21113
BEGINNING OF MONTH KWH READING	20457
DIFFERENCE	656
TIMES METER CONSTANT	170
KWH FOR THE MONTH	73720
METERED DEMAND	

KOH/KVARH IN _____
METER CONSTANT _____

DIFFERENCE 656
TIMES METER CONSTANT 120
KWH FOR THE MONTH 78720
METERED DEMAND

= NET GENERATION 78720

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Foster 1-1-97

When working with cubic feet per second, 709 is divided by 60 and the result is:

$$P_{kw} = \frac{Q \times h \times e}{11.8}$$

where Q = flow in cfs

h = net head in feet

e = turbine-generator efficiency.

Component efficiency varies both with design and engineering refinement. Some designs are inherently more efficient than others and some products show better engineering than others. Equipment vendors should have some idea of the efficiency of their equipment even though those numbers may be a bit inflated. In any event, when flow and head data is provided, the vendor should give power output and price numbers. The difference between actual and theoretical output is the system efficiency. If you feel that your flow and head data is sound, you may request that the vendor guarantee the power output. Keep in mind that micro plants are typically less efficient than their full size counterparts.

Typical Efficiencies

Turbines:

Pelton.....	70-85%
Cross flow.....	60-70%
Francis.....	75-90%
Propeller.....	75-90%

Generators: 85-90%

Belt Drive (where used): 95%

Example: The site has a flow of 15 cfs and a net head of 150 feet. The turbine will be Pelton with direct drive to a good Synchronom generator. Theoretical output is

$$P_{th} = \frac{15 \times 150}{11.8} = 190.7 \text{ KW}$$

The efficiency of the turbine and generator are 80% and 95% respectively. No belts are used. "E" is thus $80 \times .95 = .76$, so the actual power output is

$$P = \frac{15 \times 150 \times .76}{11.8} = 150 \text{ KW}$$

Estimating Power Requirements

Individuals considering a stand alone system should make an effort to determine their power requirements and then to see that the proposed system output is adequate. An important distinction must be made between the total energy that is consumed in a given period and the peak demand that may be required at any given moment. A 5KW plant running continuously for one month (720 hours) will generate 3600 kilowatt hours, which should be enough for a typical single family household. However, the system will produce only 5000 watts at any given moment. On a typical morning, these items might be in use:

MONTH Jan YEAR 91

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

NET GENERATION 97800

Scott Kaster 2-1-97

MONTH Jan YEAR 97

NAME H-K Hydro PLANT 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP _____ PHONE 593-8731

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

= NET GENERATION 72000

SALES AGREEMENT TO WHICH I AM A PARTY.

Steve Josten 2-1-97
SIGNATURE DATE

ONTH Feb YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487086
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

Ken Rast 3-1-97
SIGNATURE DATE

MONTH Feb YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP PHONE 593-8731

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

= NET GENERATION 60720

Letter Kats 3-1-77

ONTH Mar YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76448708G
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

	FACILITY OUTPUT	LOCAL SERVICE	REACTIVE SUMMARY (SYNCHRONOUS MACHINES ONLY)
METER NUMBERS	_____	_____	KOH/KVARH OUT _____
END OF MONTH KWH METER READING	<u>32321</u>	_____	KOH/KVARH IN _____
BEGINNING OF MONTH KWH READING	<u>31844</u>	_____	METER CONSTANT _____
DIFFERENCE	<u>477</u>	_____	
TIMES METER CONSTANT	<u>120</u>	_____	
KWH FOR THE MONTH	<u>57240</u>	_____ =	NET GENERATION <u>57240</u>
METERED DEMAND	_____	_____	

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kask 4-1-97
SIGNATURE DATE

MONTH Mar YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

REACTIVE SUMMARY
(SYNCHRONOUS MACHINES ONLY)

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>22631</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>22219</u>	METER CONSTANT	_____
DIFFERENCE	<u>412</u>		
TIMES METER CONSTANT	<u>4120</u>		
KWH FOR THE MONTH	<u>47440</u>	=	NET GENERATION <u>49440</u>
METERED DEMAND	_____		

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

MONTH APR YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

Sept Kaster 5-1-97
SIGNATURE DATE

MONTH APL YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

= NET GENERATION 40680

Academy 5-1-97

MONTH May YEAR 1997

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

Scott Kaster 6-7-97
SIGNATURE DATE

MONTH May YEAR 1997

NAME H-K Hydro PLANT 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP PHONE 593-8931

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

= NET GENERATION 46440

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kaster 6-1-97

MONTH Jun YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kase 7-1-97
SIGNATURE DATE

MONTH Jun YEAR 97

NAME H-K Hydro PLANT 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP PHONE 593-8931

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

= NET GENERATION 55920

SALES AGREEMENT TO WHICH I AM A PARTY.

MONTH July YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487086
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

REACTIVE SUMMARY (SYNCHRONOUS MACHINES ONLY)

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>34271</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>33765</u>	METER CONSTANT	_____
DIFFERENCE	<u>506</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>60720</u>	=	NET GENERATION <u>60720</u>
METERED DEMAND	_____		

[illegible]

- I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY AGREEMENT TO WHICH I AM A PARTY.

COMPLETE AS REQUIRED BY THE POWER OR ENERGY
SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kaste 8-1-97
SIGNATURE DATE

MONTH July YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

== NET GENERATION 5 0680

Scott Kast 8-1-97
SIGNATURE DATE

ONTH 945 YEAR 1997

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76448708G
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

SALES AGREEMENT TO WHICH I AM A PARTY.

[Signature] 7-1-97
SIGNATURE DATE

MONTH May YEAR 1997

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

[illegible]

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kask 9-1-97

SIGNATURE DATE

MONTH Sept YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487086
CITY SALT LAKE STATE UT ZIP PHONE 543-8931

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

COMPLETE AS REQUIRED BY T
SALES AGREEMENT TO WHICH

Scott Kast

10-1-97

MONTH Sep YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

= NET GENERATION 81600

Scott Easter 10-19-77

MONTH Oct YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487086
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

[illegible]

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERGY SALES AGREEMENT TO WHICH I AM A PARTY.

SALES AGREEMENT TO WHICH I AM A PARTY.

Lee Katz 11-1-97

SIGNATURE DATE

MONTH Oct YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP PHONE 593-8731

REACTIVE SUMMARY

(SYNCHRONOUS MACHINES ONLY)

KOH/KVARH OUT _____
KOH/KVARH IN _____
METER CONSTANT _____

NET GENERATION 89/60

Lea Kast 11-1-97

MONTH Nov YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487086
CITY SALT LAKE STATE UT ZIP PHONE 543-8931

METER NUMBERS	_____	KOH/KVARH OUT	_____
END OF MONTH KWH METER READING	<u>39688</u>	KOH/KVARH IN	_____
BEGINNING OF MONTH KWH READING	<u>38355</u>	METER CONSTANT	_____
DIFFERENCE	<u>1333</u>		
TIMES METER CONSTANT	<u>120</u>		
KWH FOR THE MONTH	<u>159960</u>	=	NET GENERATION <u>159960</u>
METERED DEMAND	_____		

[illegible]

- BREAKER OPENING REASON CODES

- 1 LACK OF ADEQUATE PRIME MOVER
2 FORCED OUTAGE OF FACILITY
3 DISTURBANCE ON IPCo SYSTEM
4 SCHEDULED MAINTENANCE
5 TESTING OF PROTECTION SYSTEMS
6 CAUSE UNKNOWN
7 OTHER (EXPLAIN)

I HEREBY CERTIFY THAT THE ABOVE METER READINGS ARE TRUE AND CORRECT AS OF MIDNIGHT ON THE LAST DAY OF THE ABOVE MONTH AND THAT THE SWITCHING RECORD IS ACCURATE AND COMPLETE AS REQUIRED BY THE POWER OR ENERCSALES AGREEMENT TO WHICH I AM A PARTY.

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Kersh 12-1-97
SIGNATURE DATE

MONTH Nov YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY Salt Lake STATE UT ZIP _____ PHONE 593-8931

REACTIVE SUMMARY
(SYNCHRONOUS MACHINES ONLY)

KOH/KVARH OUT _____
KOH/KVARH IN _____
METER CONSTANT _____

= NET GENERATION 87/20

SALES AGREEMENT TO WHICH I AM A PARTY.

Scott Past 12-1-97

MONTH Dec YEAR 97

NAME H-K Hydro Plant 1 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 764487080
CITY SALT LAKE STATE UT ZIP _____ PHONE 543-8931

= NET GENERATION 98880

SALES AGREEMENT TO WHICH I AM A PARTY.

 1-7-8
SIGNATURE DATE

MONTH Dec YEAR 97

NAME H-K Hydro Plant 2 FACILITY NR. 31415004
ADDRESS Zion's Leasing METER NR. 76429838 G
CITY SALT LAKE STATE UT ZIP PHONE 593-8931

REACTIVE SUMMARY
(SYNCHRONOUS MACHINES ONLY)

= NET GENERATION 783100

1-1-38