

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 75-7668

Exam Date: 9/12/2012

1. Current Owner: SUE M GALLIGAN

OR

WILLIAM B GALLIGAN
1304 ROSE PARK CIR
BOISE ID 83702-4440
(208)343-4418

2. Accompanied by: Mr. Galligan. Phone No: (208) 394-2148 in North Fork. He spends most of the summer at this cabin.

Address: 219 Spring Creek Rd., North Fork, ID 83466. The Galligan cabin is located near the intersection of Forest Service Rd #42 and #38 in Lemhi County.

Relationship to Permit Holder: Mr. Galligan is one of the permit holders.

Assisted by: Sandy Thiel who took measurements and photos

3. SOURCE

SPRING

TRIBUTARY

WEST FORK SPRING CREEK

B. OVERLAP REVIEW

1. Other water rights with the same place of use: none

2. Other water rights with the same point of diversion: none

The POD is a spring very close to the boundary line separating Salmon-Challis National Forest property from the Galligan property (H.E.S. #544). The intake for the hydro originates in a spring box.

The domestic use developed under the Galligan's licensed right 75-7520 originates at a different, but nearby spring box. That domestic right is served by separate diversion and distribution piping which runs parallel to the penstock much of the distance from the sources to the cabin.

C. DIVERSION AND DELIVERY SYSTEM1. LOCATION OF POINT(S) OF DIVERSION:

SPRING NE1/4SE1/4SW1/4 Sec. 7, Twp 24N, Rge 19E, B.M.

LEMHI County

Method of Determination:

GPS coordinates for the penstock intake and the turbine/generator housing were recorded during the site visit. The projection of the coordinates for the hydro's springbox puts it outside of the permit holder's property. However, the POD was found and documented to be within H.E.S. #544.

Both the GPS projections and the H.E.S. boundary projections have error. Photos of the property taken during the exam show the USFS boundary stakes in relation to the Galligan property and to the spring source. The separation distance is within the margin of error for our electronic tools.

2.

PLACE OF USE:

POWER

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	<u>NE</u>	<u>NW</u>	<u>SW</u>	<u>SE</u>	
24N	19E	7															X		

Method of Determination:

GPS coordinates for the penstock intake and the turbine/generator housing were recorded during the site visit. The POU was also confirmed by consultation over aerial photography with the permit holder.

- 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.

Well or Diversion ID No.*

<u>Turbine Make</u>	<u>Discharge (cfs)</u>	<u>Generator Description.</u>	<u>Size (W or kW)</u>
Harris; 2 x 1/2 inch nozzle	~0.13 cfs (design)	permanent magnet alternator 570 stator winding;	150-300 W (theoretical)

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

D. FLOW MEASUREMENTS

1.

<u>Measurement Equipment</u>	<u>Type</u>	<u>Make</u>	<u>Model No.</u>	<u>Serial No.</u>	<u>Size</u>	<u>Calib. Date</u>
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Mr. Galligan constructed a collection box under the turbine to accumulate the discharge. The file indicates that a V notch weir was cut into one side of the box and that this measuring device was intended to satisfy permit condition 6. The weir was not in place at the time of the exam. Instead, a length of PVC pipe suitable for a bucket measurement had been fit into one side of the collection box.

2.

Measurements:

This micro turbine is fitted with the same 2 nozzles year-round. Mr. Galligan measured their sizes at my request and found each of them to have a 1/2 inch orifice.

According to the topo map, this site has at most, 30 ft of static head available. The nozzles are passing less water than the permit authorized. Each 1/2 inch nozzle would deliver ~27 gpm at this head. See attached spreadsheet.

E. FLOW CALCULATIONS

☒ Additional Computation Sheets Attached

Measured Method:

Several 5 gallon bucket measurements were made from the pipe conveying the turbine discharge back into the East Fork of Spring Creek. The measurements indicated that ~ 0.11 cfs was being used for power generation at the time of the exam.

This rate is less than the permit authorized and less than the design rate.

The permit holder stated that he measured 0.13 cfs before the fire which swept through the area earlier this summer. (One of the attached photos shows melted pipe at the intake collection box).

It is reasonable to allow for some error in the measurements taken during the exam.

I am recommending 0.12 cfs as the rate. 0.11 cfs or 50 gpm + 3.8 gpm (0.05 sec error) = 53.8 gpm or 0.119 cfs

F. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation: Not applicable

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

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

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

2. Volume Calculations for Other Uses:

Power Use

I recommend a volume based on continuous use for 214 days of the year which is the length of the irrigation season in this portion of Basin 75. This hydropower system relies on gravity flow through a buried pipe from spring source. The power house is a semi-enclosed box. The configuration would be subject to freezing during the winter months.

I am recommending 50.9 AF. The volume calculation is $(0.12 \text{ cfs}) \times (214 \text{ days}) \times 1.9835 = 50.9 \text{ AF}$

G. NARRATIVE/REMARKS/COMMENTS

This is a combined photovoltaic and micro hydro system sharing a common battery bank. A single inverter handles the DC to AC conversion for both solar and hydro systems so the inverter size does not bound the hydro system capacity. The permit holder stated that the shunt load which is dedicated to the micro hydro system can handle 700 Watts. This micro hydro configuration cannot generate 700 Watts.

The maximum design flow for this 2 nozzle turbine was supplied by the permit holder. In ideal conditions the turbine was expected to utilize ~60 gpm or 0.13 cfs total. The penstock is buried most of the distance from the spring to the turbine housing. Permit holder stated that the penstock pipe is PVC; 4 inch diameter, and ~600 ft length. The exposed pipe above the powerhouse was not suitable for a pipe flow measurement.

The micro hydro was proven to work during the exam. It can provide ~200 Watts of continuous generation in real-time. It is a lean system and does not supply all of the power needed by a typical roster of appliances. The cabin uses propane for refrigeration, cooking and heating. A backup generator is occasionally deployed as a power source. There is no access to any utility company's power distribution/transmission grid. Therefore the PUC has no involvement in this right.

The place-of-use for this right is located at approximately 4000 ft elevation, and approximately 3 miles, as the crow flies, due North of Shoup, Idaho. The Galligan property is Homestead Entry Survey (H.E.S.) #544, an island of private property surrounded by Salmon-Challis National Forest. A copy of the G.L.O. map is attached. The data entry names William B and Susan M Galligan as the patent holders.

Only a portion of H.E.S. #544 is dewatered by diverting or containing these springs. The penstock to the hydro turbine begins and ends on Galligan property and is fully contained within H.E.S. #544. Therefore FERC has no jurisdiction. The locations of the penstock intake and the turbine/generator were resolved by referencing available aerial photography. I created the POD and POU shapes.

Water in excess of the hydro system's capacity flows from the spring into the West Fork of Spring Creek either as overland flow or through a buried overflow pipe. The turbine discharges into the East Fork of Spring Creek a few feet above the confluence of the East Fork of Spring Creek and the West Fork of Spring Creek.

The official surveyed address for this property is Homestead Entry Survey (H.E.S.) #544 not a Public Land Survey System address. Because the IDWR forms and database configuration expect a PLSS address for the POU and the POD, H.E.S. #544 has been overlaid with a virtual Public Land Survey grid. The PLSS addresses assigned by the permit and this exam report are only for ease in locating features important to this water right. They are not intended to replace the official survey record. The PLSS address for the POD is the NESESW. The PLSS for the POU is SWSE. These are different PLS locations than were authorized by the permit, but both are found within H.E.S. #544. Because the H.E.S. can be considered a large government lot, no amendment should be required.

The permitted season-of-use is summer season only. However, there is an existing domestic water right associated with the Galligan's cabin. I recommend that the season-of-use for this hydro power right be extended to complement the year-round domestic use.

This power right should be term-limited and made subordinate to any subsequent rights also served by the hydropower spring box.

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	1/01 to 12/31	0.12 CFS	50.9 AF
<u>Totals:</u>		0.12 CFS	

2. Recommended Amendments

☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☒ None POD and POU are in H.E.S. #544

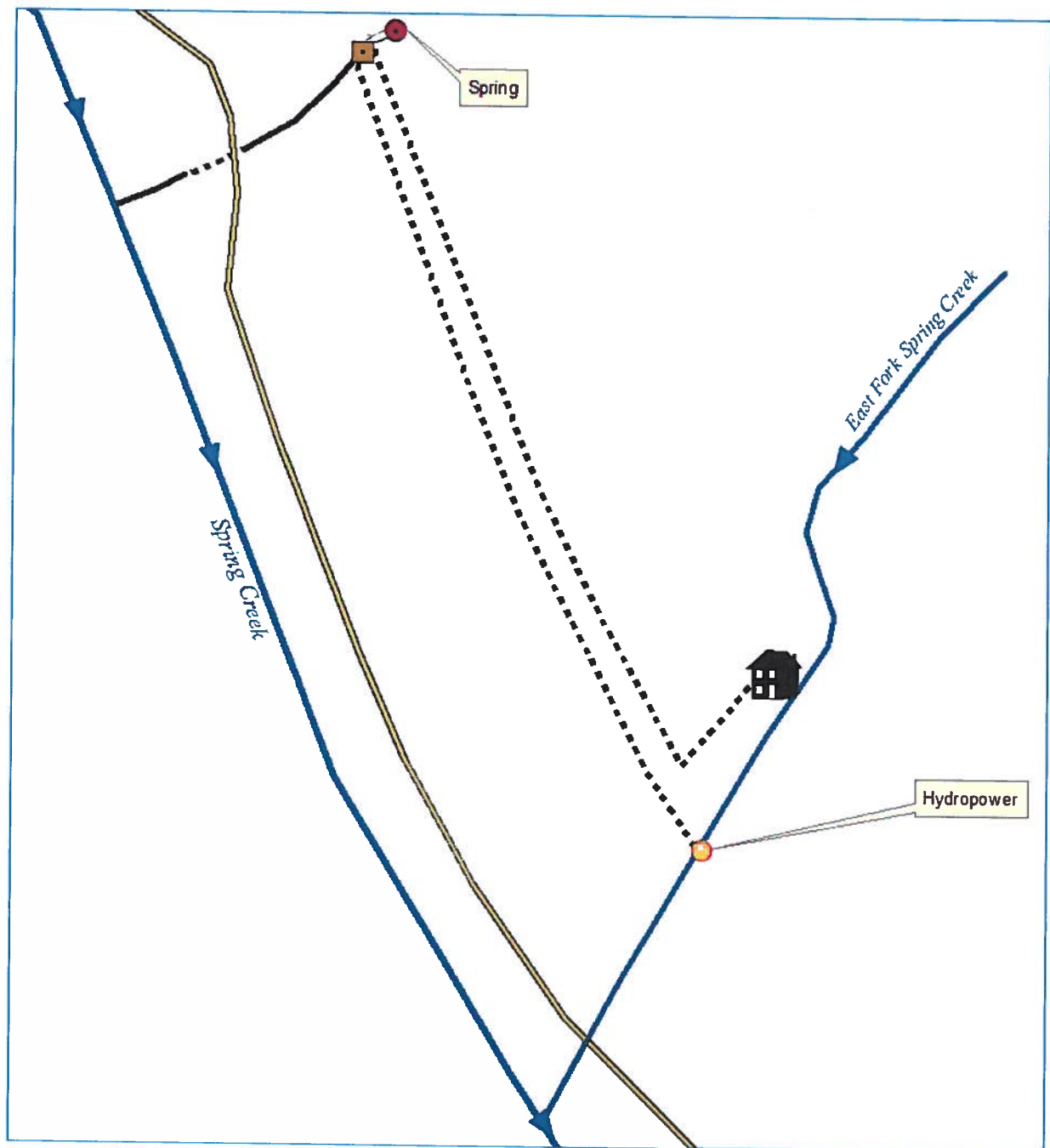
☐ Change P.U. as reflected above ☐ Add P.U. as reflected above ☐ Other

I. AUTHENTICATION

Field Examiner's Name Michelle S. Dale Date 10/19/2012

Reviewer _____ Date _____

System Diagram for Water Right 75-7668



A spring supplies water for a hydropower turbine located on the East Fork of Spring Creek. Water is piped from a fenced spring area to a diversion roughly 20 feet southwest of the spring. Two pipes originate at the diversion. The one to the east supplies domestic water to a house and yard upstream from the turbine. The second pipe, 15 feet west of the first, delivers water to the turbine. Following the use for hydropower, water flows into the East Fork Spring Creek. There is also an outflow from the diversion. Water flows to the southwest, through a culvert under the road and discharges into Spring Creek.

HYDROPOWER ANALYSIS SHEET

Galligan Hydro on Spring in H.E.S. 554

	Static Head -----		30 Feet			Nominal Pipe Size-		4.00	Inches I.D.
	Penstock Length -		600 Feet			Turbine Type -----		Harris w/ 2 x 1/2" nozzles	
						%			
	FLOW CFS	FLOW GPM	BYPASS CFS	POWER CFS	SPILL CFS	VELOCITY Feet/Sec	TOTAL efficiency %	NET HEAD Feet	POWER WATTS
	0	0	0	0	0	0	0	30.00	0.00
	0	0	0	0	0	0	0	30.00	0.00
	0	0	0	0	0	0	0	30.00	0.00
	0.050	22.4	0	0.050	0.0	0.57	70	29.72	88.07
	0.060	26.9	0	0.060	0.0	0.69	70	29.60	105.28
	0.070	31.4	0	0.070	0.0	0.80	70	29.47	122.28
	0.080	35.9	0	0.080	0.0	0.92	70	29.32	139.05
	0.090	40.4	0	0.090	0.0	1.03	70	29.16	155.55
	0.100	44.9	0	0.100	0.0	1.15	70	28.98	171.76
	0.110	49.4	0	0.110	0.0	1.26	70	28.78	187.66
	0.120	53.9	0	0.120	0.0	1.38	70	28.57	203.20
	0.130	58.3	0	0.130	0.0	1.49	70	28.34	218.37
	0.140	62.8	0	0.140	0.0	1.60	70	28.10	233.14
	0.150	67.3	0	0.150	0.0	1.72	70	27.84	247.49
	0.160	71.8	0	0.160	0.0	1.83	70	27.56	261.38
	0.170	76.3	0	0.170	0.0	1.95	70	27.27	274.80
	0.180	80.8	0	0.180	0.0	2.06	70	26.97	287.72
	0.190	85.3	0	0.190	0.0	2.18	70	26.65	300.10
	0.200	89.8	0	0.200	0.0	2.29	70	26.31	311.94
	0.210	94.3	0	0.210	0.0	2.41	70	25.97	323.20
	0.220	98.7	0	0.220	0.0	2.52	70	25.60	333.85
	0.230	103.2	0	0.230	0.0	2.64	70	25.23	343.89
	0.240	107.7	0	0.240	0.0	2.75	70	24.83	353.27
	0.250	112.2	0	0.250	0.0	2.86	70	24.43	361.97
	0.260	116.7	0	0.260	0.0	2.98	70	24.01	369.98
	0.270	121.2	0	0.270	0.0	3.09	70	23.57	377.27
	0.280	125.7	0	0.280	0.0	3.21	70	23.13	383.82
	0.290	130.2	0	0.290	0.0	3.32	70	22.67	389.59
	0.300	134.6	0	0.300	0.0	3.44	70	22.19	394.57
	0.310	139.1	0	0.310	0.0	3.55	70	21.70	398.74
	0.320	143.6	0	0.320	0.0	3.67	70	21.20	402.07
	0.330	148.1	0	0.330	0.0	3.78	70	20.68	404.54
created by Michele Edl, associate engineer									
created on October 12, 2012									



Banned area - spring

Sanja





(091) normal for inlet soon in .8/10



air treatment inlet

Spring



turbine intake



buried overflow pipe



W. Fork Spring Cr →

overflow pipe



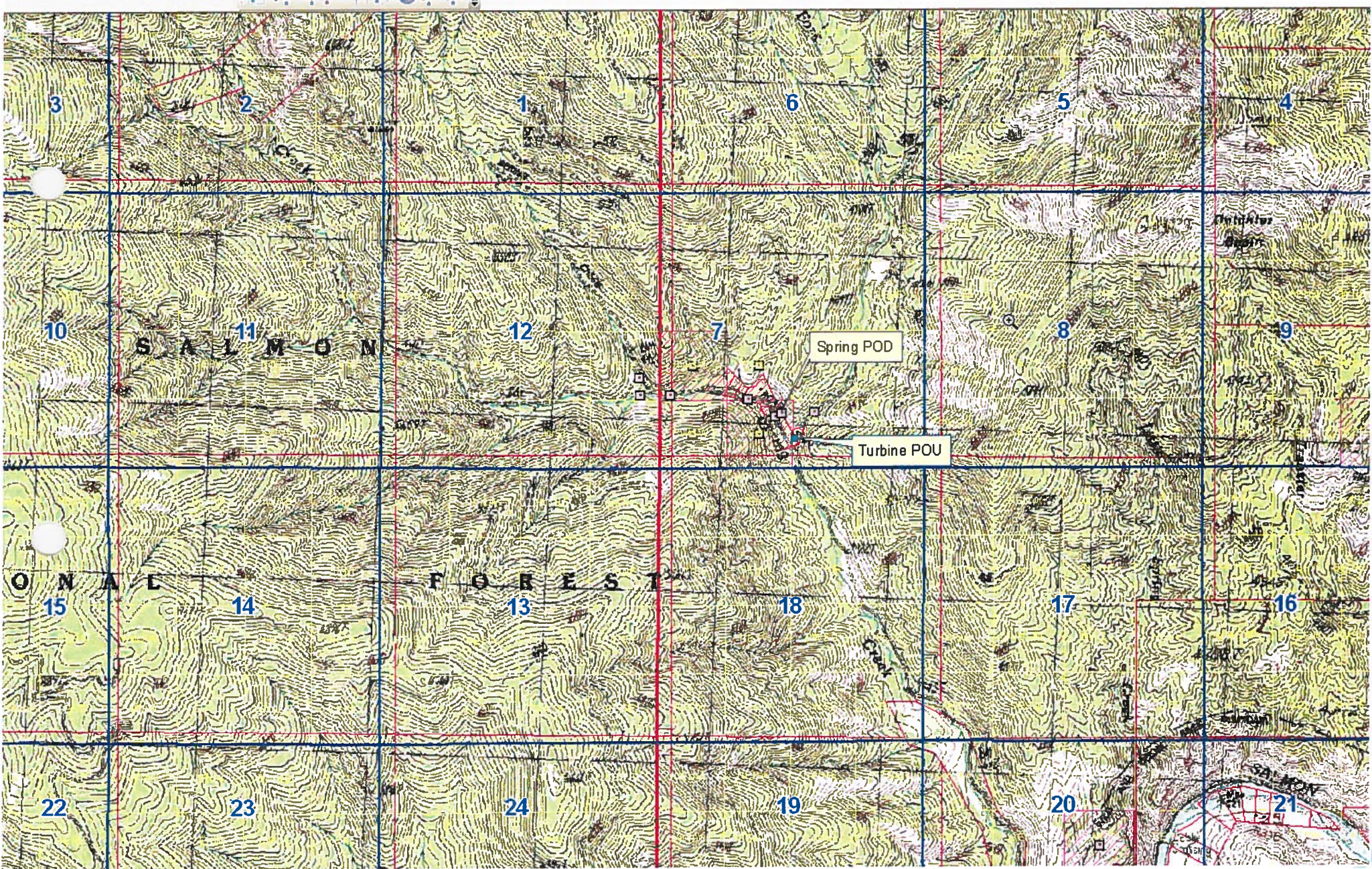


1:24,000

Drawing

Arial 10 B I U A

Process POU POD Wells SC WMLS Dam Safety UIC WRA WSB Hydrologic



Land Patent Details							
Accession Nr: IDI 031227		Document Type: Serial Patent		State: Idaho		Issue Date: 10/25/1988	
Cancelled: No							
Names On Document				Miscellaneous Information			
☐ GALLIGAN, SUSAN M, ☐ GALLIGAN, WILLIAM B, ☐ USA				Land Office: Idaho			
				US Reservations: Yes			
				Mineral Reservations: No			
				Tribe: ---			
				Militia: ---			
State In Favor Of: ---				Authority: January 12, 1983: Sale-FS Small Tract Act (96 Stat. 2535)			
Military Rank: ---							
Document Numbers				Survey Information			
Document Nr: 10251988		Total Acres: 1.01		Survey Date: ---			
Misc. Doc. Nr: ---		Geographic Name: ---		Metes/Bounds: No			
BLM Serial Nr: IDI 031227							
Indian Allot. Nr: ---							
Land Descriptions							
State	Meridian	Twp - Rng	Aliquots	Section	Survey #	County	
ID	Boise	024N - 019E		7		Lemhi	
REMARKS: COMMENCING AT COR NO 1 OF COMMENCING AT COR NO 1 OF HES 544 THENCE N 26D 46M HES 544 THENCE N 26D 46M 51s W 300 FT THENCE N 51s W							

Survey accepted April 8, 1921.
G.L.O.

Plat of
**HOMESTEAD
ENTRY SURVEY**

No. 544

in the

**SALMON
NATIONAL FOREST**

in

Approximate
Section 7 Unsurveyed, T. 24 N., R. 19 E.
Section 12 Unsurveyed, T. 24 N., R. 18 E.

of the

BOISE BASE AND MERIDIAN.

IDAHO.

This plat of Homestead Entry Survey
No. 544 State of Idaho is
strictly conformable to the field notes
thereof on file in this office, which
have been examined and approved.

U.S. Surveyor General's Office,
Boise, Idaho, December 22, 1919.

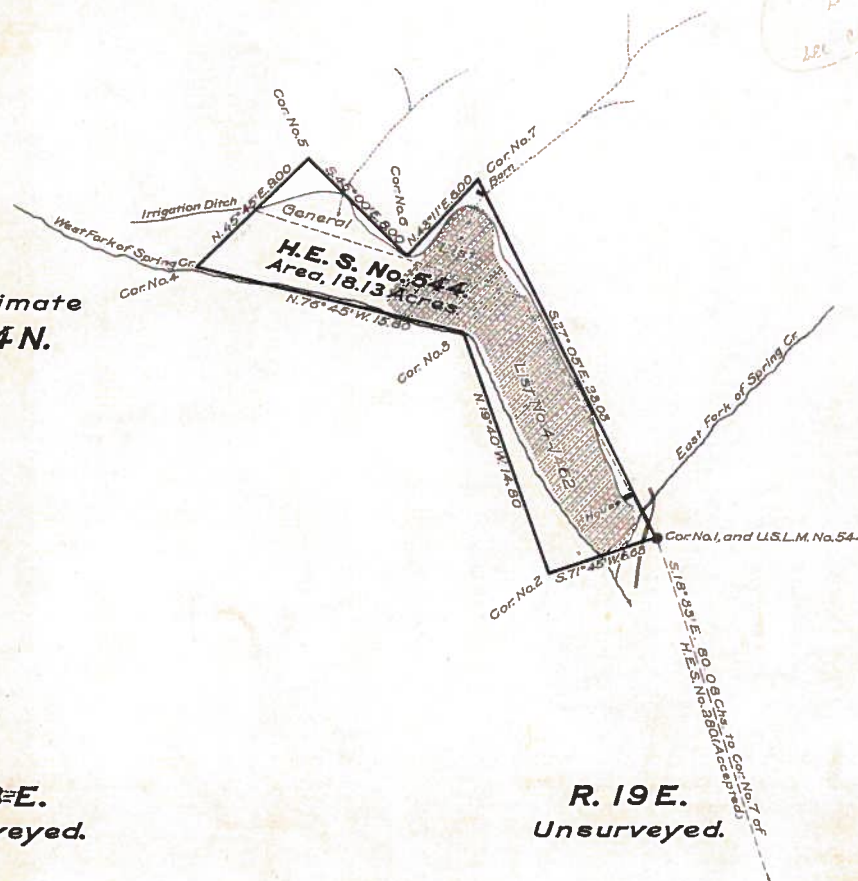
Edward Hedden

U.S. Surveyor General

Approximate
T. 24 N.

R. 18 E.
Unsurveyed.

R. 19 E.
Unsurveyed.



SCALE, 5 chains to 1 inch.

Surveys Designated	By whom Surveyed	Inst. Cont. Group		When Surveyed		Date of Approval
		No.	Date	Began	Completed	
H. E. S. No. 280	Earl R. Gilbreath	280	Aug. 12, 1914	Sept. 11, 1914	Sept. 13, 1914	May 18, 1918
H. E. S. No. 544	Frank D. Maxwell	544	Feb. 28, 1917	June 4, 1918	June 6, 1918	Dec. 22, 1919
	Sur. U. S. Forest Service					

Areas in Acres	
H. E. Survey No. 544	Conflicts
Area Listed	13.42
Area Unlisted	4.71
In Section	
In Section	
Total	18.13

Act of June 11, 1906	Act of March 4, 1917
List No. 4-1462	Dated July 18, 1914
Latitude 45° 25' N.	Observations at
Longitude 114° 10' W	(corner No. 1)
Mean Mag. Decl. 21° 30' E	

Edl, Michele

From: wbgalligan@q.com
Sent: Sunday, July 08, 2012 11:26 AM
To: Edl, Michele
Subject: photos
Attachments: solar panels.jpg; batteries.jpg; turbine.jpg

Michele - I am attaching some photos of my hydro-solar setup. The turbine sits along the East Fork of Spring Creek where the flow from the turbine is discharged into the Creek. Power from both the turbine and the solar panels flow into the battery bank, and the wooden box above the batteries contains an inverter which changes the direct current into regular household alternating current.

I hope you received the information I sent you by mail last week all right, and I just want to thank you for attempting to get this permit finalized.

Bill Galligan
permit 75-7668





