

# Memorandum

**Date:** November 1, 2023  
**From:** Blake Burkard  
**To:** Water Right File 32-13275  
**Subject:** Licensing Review of Certified Water Right Examiner Report

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Permit 32-13275 authorized hydropower use from Middle Creek tributary to Medicine Lodge Creek in Clark County, approximately 25 miles northwest of Dubois, Idaho. The field exam for this right was performed by Certified Water Right Examiner Randall G. Johnson, an engineer with Forsgren Associates Inc., on May 30, 2012. This report for this water right had additional information submitted on September 18, 2012. The purpose of this memo is to review the field exam report and to recommend license elements based on the information given.

## **Ownership:**

The proof statement was submitted by the permit holder months prior to the submittal of the beneficial use exam report with a \$300 fee. The fee was refunded when the Department could not perform the exam right away (see Shelley Keen's memo to the file August 28, 2012). A condition of approval required either a measuring device or a CWRE examination. Upon my review, the permit holders, John and Kathleen Young, still own the parcel appurtenant to the water right. There are no ownership concerns.

## **Overlap:**

There are no overlapping water rights.

## **Point of Diversion and Place of Use:**

The examiner confirms the location of the point of diversion and place of use with satellite imagery and a USGS digital raster graphic with PLSS. A photograph of the POD in the stream was also included in the exam report. No amendments are recommended.

### **Diversion Rate and Volume:**

The examiner initially recommended a rate of 3.77 cfs, which was considered a typical or average flow rate. As the Department is interested in finding the maximum flow rate used during the beneficial use period, more information was requested to help support a higher rate for licensing. At the same time, the Department can only license a rate that was demonstrated by the permit holder.

The diversion system consists of a culvert directing water to a 4-ft long penstock with a 15-inch diameter, where a submersible impeller sits inside. A small impoundment created by arranging streambed rocks channels water through the pipe and excess water spills over the top of the impoundment during higher flows. The flow was measured by the examiner during high-flow season, as the exam was conducted on May 30, 2012. A photo submitted with the exam shows the culvert completely submerged and water spilling over the dam structure. The examiner also stated that the submersible turbine, an *Aquair U.W.*, is not used during “peak flows” as it tends to overheat the energy storage system. Given these factors, I believe that the rate measured by the examiner is the maximum rate developed by the permit holders.

Upon request for more information, the examiner provided that the measured voltage of the turbine was 12V, which indicated that the generator used was the 12V version and not the 24 or 48 versions. The system was also producing 12 watts during the exam. This would mean that the turbine was producing 1 amp of current ( $\text{Voltage} * \text{Current} = \text{Power}$ ). According to the attached specifications sheet, which matches the product shown in the application, to produce 1 amp, the stream would need a velocity of ~1 m/s or 3.3 ft/s. The measured velocity at the culvert was between 1.79 ft/s and 1.76 ft/s, but the velocity increases proportionally as the cross-sectional area decreases ( $Q = V * A$ ) and from the schematics included in the exam, we know that the pipe is not completely full as water returns to the stream. It is reasonable to assume that since the turbine is made to be fully submerged, there is a reduction in power generated due to the inefficient setup.

The season of use was not specified by the examiner in the original report, but it was later stated that the expected use was between March and October. As hydropower licenses are not usually restricted by a season of use, I am recommending 1/1 to 12/31.

### **Conditions:**

The examiner stated that all conditions had been complied with during the development period. I recommend removing 026 as the use was developed in a timely manner during the development period. I also recommend updating 17H to R22 and 17M to 916. As term limits typically correspond with the equipment lifespan from the permit issuance date, I recommend a term expiration date of January 27, 2034 as the typical lifespan of micro-hydropower generators are 25 years. Condition 01N has been followed and can be removed.

# MEMORANDUM

**Date:** September 18, 2012  
**To:** Water Right File 32-13275  
**From:** medl  
**Re:** license review

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## **Applicant**

I created the POD and POU shapes based on the examiners map. Both are on the applicants property.

## **Source and POD**

The source is Middle Creek. The diversion and power canal is a corrugated metal pipe culvert imbedded in the creek bed.

## **Water Use**

At the time of the exam the hydro was producing 12 watts. This is very lean but still useable generation. It charges a DC system.

The hydro is a submersible turbine which requires a minimum depth 13in of water to allow the turbine to run and keep the propeller from impacting the streambed.  
This is a micro version of Swan Falls bulb turbine.

The hydro is supplemental to a solar system

## Season of use

The use is seasonal not fall/winter

## Rate

The examiner found a typical rate but at request submitted info in support of a more rate.  
? license at permitted 9 cfs? Need culvert flow equations calcs ?

## Volume

This is run-of-river power generation. No volume is required for the license.

## **Place of Use**

The turbine is submersible. And removable.

## **Status and Comb Use.**

No overlapping water rights. This hydro use is not piggybacking on non-subordinated use.

The power is not being sold.

The property is owned by the applicant. PUC and FERC do not have jurisdiction.

The draft license will carry the directors review condition

**From:** Randall G. Johnson [RJohnson@Forsgren.com]  
**Sent:** Tuesday, September 18, 2012 2:20 PM  
**To:** Edl, Michele  
**Subject:** Water Right Exam for John D and M Kathleen Young Permit No. 32-13275  
**Attachments:** [http\\_\\_streamstatsags.cr.usgs table.pdf](http://streamstatsags.cr.usgs/table.pdf)

Michele,

As we discussed, here is some additional information related to the power production at the facility for which I performed the water right examination.

#### REGARDING POWER GENERATION

I noted that at the time I was taking the test, an estimated 12 watts of electricity was being generated. It was also noted that the voltage meter at the unit read 12 volts.

Based on the manufacturer's curve for the generator, the unit should produce 12 watts of electricity when in a stream flowing at velocity of ~3.3 ft/s

At the flow rate I estimated, the velocity through the culvert (15" dia) if flowing full would be approximately 3.1 ft/s

The owner (John Young) reported that the power generation at the time of measurement was probably about average for the unit and that as flows drop in the fall power generation is 0. Therefore, it is estimated that the power generation ranges from 0 to 24 watts. For reference, the owner had manufacturer's information relating stream velocity to power generated. The data points are recorded are as follows:

| Power generated<br>(Watts) | Stream Velocity |        |
|----------------------------|-----------------|--------|
|                            | (m/s)           | (ft/s) |
| 12                         | 1               | 3.3    |
| 48                         | 2               | 6.6    |
| 80                         | 3.25            | 10.7   |

#### REGARDING RANGE OF FLOW

Based on USGS regional regression data, the 20%, 50%, and 80% exceedence flow values for the highest month (May) are approximately 16 cfs, 7.07 cfs, and 2.53 cfs. The estimated sustained low stream flow is about 1 cfs. The flow report is attached. The flow report also includes estimates of peak flood conditions with varying return intervals. I assume we don't want to base the estimate off flood peaks because they tend to occur not more than once /year and the owner says he doesn't like to operate the power unit during the flood flows because it tends to overheat the leads from the generator.

This information also appears to be in general agreement with flow measurements. Assuming that the measurements were taken on a day experiencing average flows for the month, the measured flow rate represents approximately half of the 50% exceedence flow rate. The configuration of the channel and pipe appeared to divert approximately half of the flow through the pipe.

I would anticipate the range of flow in the stream at the hydro facility typically ranges from 1 cfs to 20 cfs.

#### REGARDING SEASON OF OPERATION

The facility use is seasonal. They do not operate it late fall because of low flow nor do they operate during winter because of freezing concerns. The owner reported that an allowable operation period of March through October would work well for them.

Does this provide the information that you need? Please let me know if you require further clarification.

Randy



Randall G. Johnson, P.E.  
Project Manager  
350 North 2nd East  
Rexburg, ID 83440  
208.356.9201 / 208.351.2607 Cell  
208.356.0206 Fax

**FORSGREN**  
*Associates Inc.*



## Idaho StreamStats

### Streamstats Ungaged Site Report

Date: Tue Sep 18 2012 13:04:32 Mountain Daylight Time

Site Location: Idaho

NAD27 Latitude: 44.4042 (44 24 15)

NAD27 Longitude: -112.4964 (-112 29 47)

NAD83 Latitude: 44.4042 (44 24 15)

NAD83 Longitude: -112.4972 (-112 29 50)

Drainage Area: 12.52 mi<sup>2</sup>

Percent Urban: 0 %

Percent Impervious: 0.0271 %

| Peak-Flow Basin Characteristics                 |       |                                 |        |
|-------------------------------------------------|-------|---------------------------------|--------|
| 100% Peak Flow Region 6 (12.5 mi <sup>2</sup> ) |       |                                 |        |
| Parameter                                       | Value | Regression Equation Valid Range |        |
|                                                 |       | Min                             | Max    |
| Drainage Area (square miles)                    | 12.5  | 4                               | 6236.7 |
| Mean Annual Precipitation (inches)              | 23.1  | 15.26                           | 31.98  |

| Low-Flow Basin Characteristics                 |                               |                                 |        |
|------------------------------------------------|-------------------------------|---------------------------------|--------|
| 100% Low Flow Region 6 (12.5 mi <sup>2</sup> ) |                               |                                 |        |
| Parameter                                      | Value                         | Regression Equation Valid Range |        |
|                                                |                               | Min                             | Max    |
| Drainage Area (square miles)                   | 12.5                          | 6.4                             | 6236.7 |
| Mean Basin Slope from 30m DEM (percent)        | 40.5                          | 8.6                             | 66.2   |
| Percent Forest (percent)                       | 23                            | 14.5                            | 80.2   |
| Mean Basin Elevation (feet)                    | 7790                          | 6258.1                          | 9461   |
| Relief (feet)                                  | 2470 (below min value 3015.2) | 3015.2                          | 9419.7 |
| Mean Annual Precipitation (inches)             | 23.1                          | 15.3                            | 42.3   |

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

| Zero-Flow Probability Basin Characteristics                   |       |                                 |        |
|---------------------------------------------------------------|-------|---------------------------------|--------|
| 100% Low Flow Region 6 Prob Zero Flow (12.5 mi <sup>2</sup> ) |       |                                 |        |
| Parameter                                                     | Value | Regression Equation Valid Range |        |
|                                                               |       | Min                             | Max    |
| Drainage Area (square miles)                                  | 12.5  | 6.4                             | 6236.7 |
| Mean Annual Precipitation (inches)                            | 23.1  | 15.3                            | 42.3   |
| Ag Land Percentage (percent)                                  | 0     | 0                               | 9.27   |

| Monthly and Annual Basin Characteristics       |                               |                                 |        |
|------------------------------------------------|-------------------------------|---------------------------------|--------|
| 100% Low Flow Region 6 (12.5 mi <sup>2</sup> ) |                               |                                 |        |
| Parameter                                      | Value                         | Regression Equation Valid Range |        |
|                                                |                               | Min                             | Max    |
| Drainage Area (square miles)                   | 12.5                          | 6.4                             | 6236.7 |
| Mean Basin Slope from 30m DEM (percent)        | 40.5                          | 8.6                             | 66.2   |
| Percent Forest (percent)                       | 23                            | 14.5                            | 80.2   |
| Mean Basin Elevation (feet)                    | 7790                          | 6258.1                          | 9461   |
| Relief (feet)                                  | 2470 (below min value 3015.2) | 3015.2                          | 9419.7 |
| Mean Annual Precipitation (inches)             | 23.1                          | 15.3                            | 42.3   |

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

| Peak-Flow Streamflow Statistics |                           |                            |                            |                                |
|---------------------------------|---------------------------|----------------------------|----------------------------|--------------------------------|
| Statistic                       | Flow (ft <sup>3</sup> /s) | Prediction Error (percent) | Equivalent years of record | 90-Percent Prediction Interval |
|                                 |                           |                            |                            | Minimum      Maximum           |

|        |      |    |  |      |     |
|--------|------|----|--|------|-----|
| PK1_5  | 37.4 | 63 |  | 10.9 | 129 |
| PK2    | 49   | 62 |  | 18.4 | 131 |
| PK2_33 | 54   | 60 |  | 20.7 | 141 |
| PK5    | 85.4 | 56 |  | 34.5 | 211 |
| PK10   | 111  | 56 |  | 45   | 273 |
| PK25   | 146  | 56 |  | 58.5 | 364 |
| PK50   | 173  | 57 |  | 68.4 | 440 |
| PK100  | 203  | 58 |  | 78.4 | 523 |
| PK200  | 229  | 60 |  | 86.7 | 606 |
| PK500  | 274  | 62 |  | 101  | 745 |

| Low-Flow Streamflow Statistics |                           |                            |                            |                                |         |
|--------------------------------|---------------------------|----------------------------|----------------------------|--------------------------------|---------|
| Statistic                      | Flow (ft <sup>3</sup> /s) | Estimation Error (percent) | Equivalent years of record | 90-Percent Prediction Interval |         |
|                                |                           |                            |                            | Minimum                        | Maximum |
| M1D10Y                         | 0.83                      |                            |                            |                                |         |
| M7D10Y                         | 0.92                      |                            |                            |                                |         |
| M7D2Y                          | 1.38                      |                            |                            |                                |         |
| M30D5Y                         | 1.28                      |                            |                            |                                |         |

If the Zero-Flow Probability Basin Characteristics given above are within the valid range and one of the probabilities below is greater than  $1/n$  where  $n$  is the recurrence interval in years (i.e. 0.1 for M1D10Y or M7D10Y, 0.2 for M30D5Y, or 0.5 for M7D2Y), then the flow estimate for the corresponding flow statistic is zero (0), and 0 should be used instead of the above low-flow estimate derived using regression equations. Also note that Wood and others (2009) presented alternative regression equations for 7-day 2-year low flow (M7D2Y) better suited to extrapolation to small streams, and used those equations to model perennial streams. The perennial streams model results may be viewed in the interactive map by turning on the Perennial Streams Model layer in the Map Contents listing.

| Zero-Flow Probability Statistics |        |                          |
|----------------------------------|--------|--------------------------|
| Statistic                        | Value  | Standard Error (percent) |
| PROB_1DAY                        | 0.0268 |                          |
| PROB_7DAY                        | 0.0257 |                          |
| PROB_30DAY                       | 0.0102 |                          |

| Monthly and Annual Streamflow Statistics |                           |                            |                            |                                |         |
|------------------------------------------|---------------------------|----------------------------|----------------------------|--------------------------------|---------|
| Statistic                                | Flow (ft <sup>3</sup> /s) | Estimation Error (percent) | Equivalent years of record | 90-Percent Prediction Interval |         |
|                                          |                           |                            |                            | Minimum                        | Maximum |
| QA                                       | 8.01                      |                            |                            |                                |         |
| JAND20                                   | 2.9                       |                            |                            |                                |         |
| JAND50                                   | 2.1                       |                            |                            |                                |         |
| JAND80                                   | 1.75                      |                            |                            |                                |         |
| FEBD20                                   | 2.93                      |                            |                            |                                |         |
| FEBD50                                   | 2.1                       |                            |                            |                                |         |
| FEBD80                                   | 1.66                      |                            |                            |                                |         |
| MARD20                                   | 3.42                      |                            |                            |                                |         |
| MARD50                                   | 2.39                      |                            |                            |                                |         |
| MARD80                                   | 1.7                       |                            |                            |                                |         |
| APRD20                                   | 6.91                      |                            |                            |                                |         |
| APRD50                                   | 4.06                      |                            |                            |                                |         |
| APRD80                                   | 2.79                      |                            |                            |                                |         |
| MAYD20                                   | 16                        |                            |                            |                                |         |
| MAYD50                                   | 7.07                      |                            |                            |                                |         |
| MAYD80                                   | 2.53                      |                            |                            |                                |         |
| JUND20                                   | 13.4                      |                            |                            |                                |         |
| JUND50                                   | 4.93                      |                            |                            |                                |         |
| JUND80                                   | 0.95                      |                            |                            |                                |         |

|        |      |  |  |  |  |
|--------|------|--|--|--|--|
| JULD20 | 11.6 |  |  |  |  |
| JULD50 | 6.32 |  |  |  |  |
| JULD80 | 3.89 |  |  |  |  |
| AUGD20 | 5.24 |  |  |  |  |
| AUGD50 | 3.39 |  |  |  |  |
| AUGD80 | 2.4  |  |  |  |  |
| SEPD20 | 3.81 |  |  |  |  |
| SEPD50 | 2.64 |  |  |  |  |
| SEPD80 | 1.99 |  |  |  |  |
| OCTD20 | 4.35 |  |  |  |  |
| OCTD50 | 3.11 |  |  |  |  |
| OCTD80 | 1.8  |  |  |  |  |
| NOVD20 | 3.77 |  |  |  |  |
| NOVD50 | 2.67 |  |  |  |  |
| NOVD80 | 2.15 |  |  |  |  |
| DECD20 | 3.15 |  |  |  |  |
| DECD50 | 2.32 |  |  |  |  |
| DECD80 | 1.87 |  |  |  |  |

RECEIVED

JUL 19 2012

STATE OF IDAHO  
DEPARTMENT OF WATER RESOURCES  
**BENEFICIAL USE FIELD REPORT**

RECEIVED

JUL 13 2012

Department of Water Resources  
Eastern Region

A Beneficial Use Field Report is prepared by a water right examiner as the result of an examination to clearly confirm and establish the extent of the beneficial use of water established in connection with a permit during the development period authorized by the permit and any extensions of time previously approved.

**A. GENERAL INFORMATION**Permit No. 32-132751. Owner John D and M Kathleen YoungPhone No. 208-604-2156Current address 1047 N 800 E Shelley, ID 832742. Examiner's name Randall JohnsonEXAM DATE May 30, 20123. Accompanied by John and Chad Young

Email \_\_\_\_\_

Address 1047 N 800 E Shelley, ID 83274Relationship to permit holder SelfPhone No. 604-21564. Source Middle Creektributary to Medicine Lodge Creek**B. OVERLAP REVIEW**1. Other water rights with the same place of use None2. Other water rights with the same source and point of diversion None**C. DIVERSION AND DELIVERY SYSTEM**

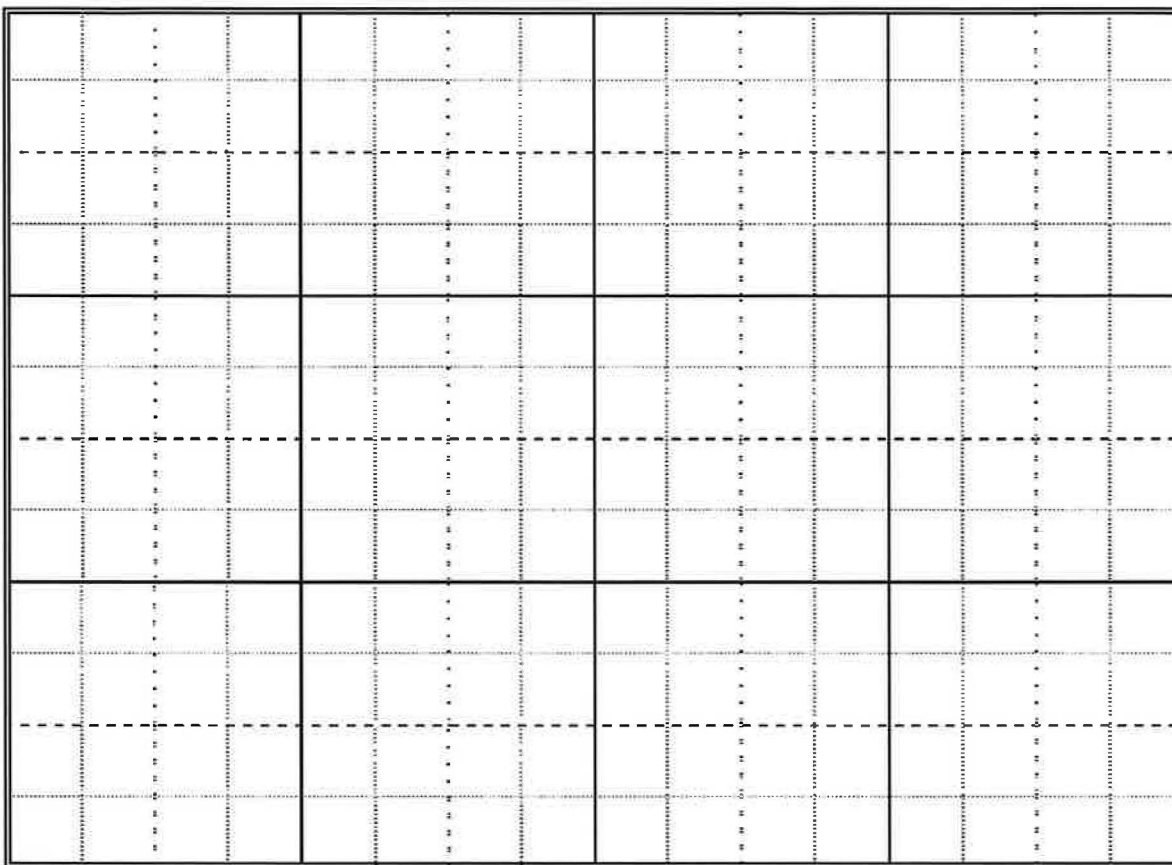
## 1. Point(s) of Diversion:

| Ident. No. | Gov't Lot | ¼ | ¼  | ¼  | Sec | Twp | Rge | County | Method of Determination/Remarks  |
|------------|-----------|---|----|----|-----|-----|-----|--------|----------------------------------|
| 1          |           |   | SW | SW | 32  | 13N | 34E | Clark  | Garmin 60CSx GPS & IDWR Map Tool |
|            |           |   |    |    |     |     |     |        |                                  |
|            |           |   |    |    |     |     |     |        |                                  |
|            |           |   |    |    |     |     |     |        |                                  |

2. Place(s) of Use: Method of determination Visual Inspection

| Twp | Rge | Sec | NE |    |    |    | NW |    |    |    | SW |    |    |    | SE |    |    |    | Totals |
|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|
|     |     |     | NE | NW | SW | SE | NE | NW | SW | SE | NE | NW | SW | SE | NE | NW | SW | SE |        |
| 13N | 34E | 32  |    |    |    |    |    |    |    |    |    |    | X  |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |
|     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |        |

3. **Delivery System Diagram:** Indicate all major components and distances between components. Indicate weir size/ditch size/pipe diameter (inside), as applicable. Use the space provided or ☒ see attached.



Scale: 1" = \_\_\_\_\_

- ☒ Copy of USGS Quadrangle attached showing location(s) of point(s) of diversion and place(s) of use (**required**)  
☒ Aerial photo attached (required for irrigation of 10+ acres)  
☒ Photo of diversion and system attached

4.

| Well or Diversion Identification No.* | Motor Make | Hp | Motor Serial No. | Pump Make | Pump Serial No. or Discharge Size |
|---------------------------------------|------------|----|------------------|-----------|-----------------------------------|
| 1                                     | NA         | NA | NA               | NA        | NA                                |
|                                       |            |    |                  |           |                                   |
|                                       |            |    |                  |           |                                   |

\*Code to correspond with no. on map and aerial photo

#### D. FLOW MEASUREMENTS

1.

| Measurement Equipment    | Type   | Make    | Model No. | Serial No. | Size | Calib. Date |
|--------------------------|--------|---------|-----------|------------|------|-------------|
| Pitot Tube and Manometer | U-Tube | Collins | -         | -          | -    | NA          |
|                          |        |         |           |            |      |             |

2. **Measurements:** \_\_\_\_\_

Measurements were taken at a transition inlet to the 15" culvert that serves as the penstock for the micro-hydro turbine. Two separate measurements were taken, each on an evenly spaced grid pattern covering the opening. Cross sectional dimensions at location of measurement were 17" depth x 18" width .

**E. NARRATIVE/REMARKS/COMMENTS**

The facility evaluated is a micro-hydro power facility intended to provide supplementary power for a cabin adjacent to the creek. The facility includes a rectangular tapered inlet connected to a 4-foot length of 15" corrugated metal pipe. Rocks from the creek have been fashioned into a diversion structure to impound water sufficiently to direct it through the culvert. The propeller driven power generation turbine has a hinged connection to the top of the CMP. When power generation is desired, the turbine is lowered into the culvert. Power cables are connected to a panel adjacent to the creek. A photograph of the facility is attached.

On the day of measurement, the system inlet was just submerged with upstream water surface elevation approximately at the top elevation of the pipe. The manometer was set adjacent to the culvert with one attached to the pitot tube device and the second leg with tubing held beneath the approaching water surface to register static pressure. The head difference in the manometer tubes was read as the pitot tube measuring device transversed the rectangular opening in a grid pattern. Measurements were taken at approximately equal spacing. The recorded velocities were averaged and multiplied by the opening area to determine flow rate.

Has the permit holder met all conditions of permit approval, including any mitigation requirements and/or measuring device installation requirements? ☒ Yes ☐ No If no, what must be done to meet the permit requirements?

**F. FLOW CALCULATIONS**☒ Additional computation sheets attached**Measured Method:**

A manometer and single port pitot tube were used to determine inlet velocity. As described in the attached calculation sheets, the manometer graduations are in ft/s for a dual port pitot tube. To convert to single port velocity, the reading is multiplied by 1.4142. The accuracy of graduations were checked by measuring graduations using an electronic micrometer and calculating velocity based on the velocity head equation:  $h = v^2/2g$ .

**G. VOLUME CALCULATIONS****1. Volume Calculations for Irrigation:**

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = \text{Not Required}$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 = \text{Not Required}$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} = \text{Not Required}$$

**2. Volume Calculations for Other Uses:**

Not Required

**H. RECOMMENDATIONS****1. Recommended Amounts**

| Beneficial Use   | Period of Use |       | Rate of Diversion<br>Q (cfs) | Annual Volume<br>V (afa) |
|------------------|---------------|-------|------------------------------|--------------------------|
|                  | From          | To    |                              |                          |
| Power Generation | 01/01         | 12/31 | 3.77                         |                          |
|                  |               |       |                              |                          |
|                  |               |       |                              |                          |
|                  |               |       |                              |                          |
|                  |               |       |                              |                          |
| Totals:          |               |       | 3.77                         |                          |

**2. Recommended Amendments**☐ Change P.D. as reflected on page 1☐ Add P.D. as reflected on page 1☒ None☐ Change P.U. as reflected on page 1☐ Add P.U. as reflected on page 1☐ Other**I. AUTHENTICATION**

Field Examiner's Signature



Date

7/2/12

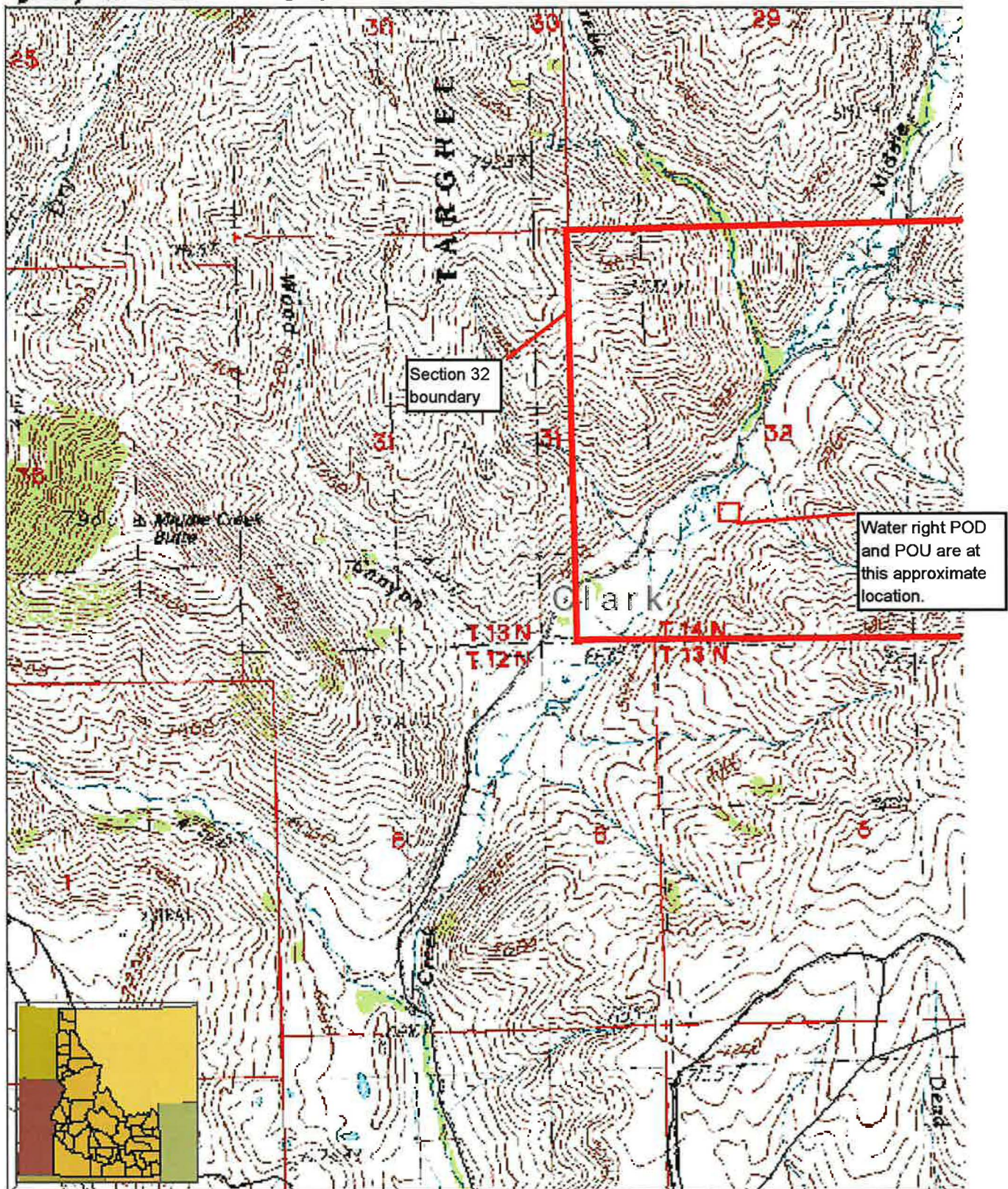
Reviewer

Date

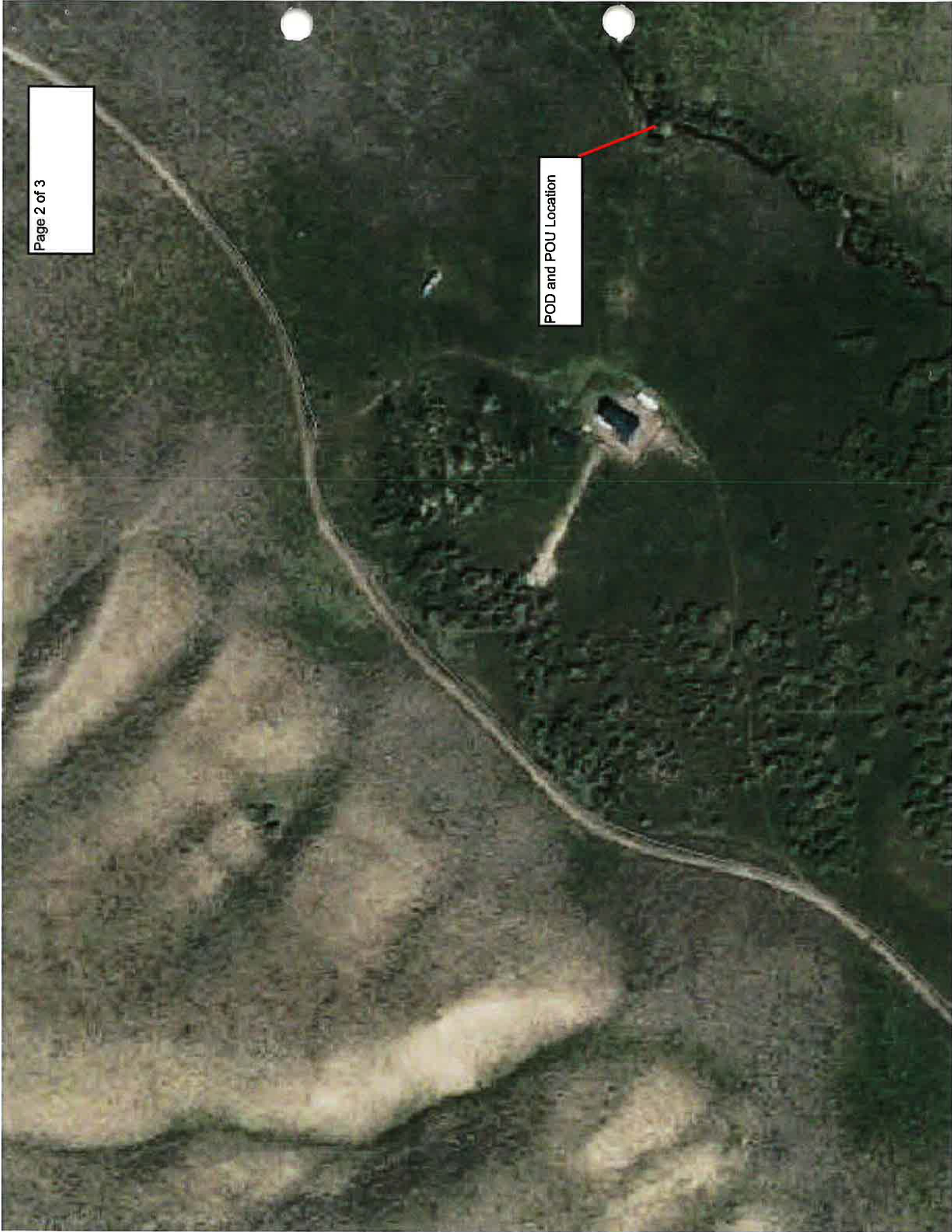


# IDAHO

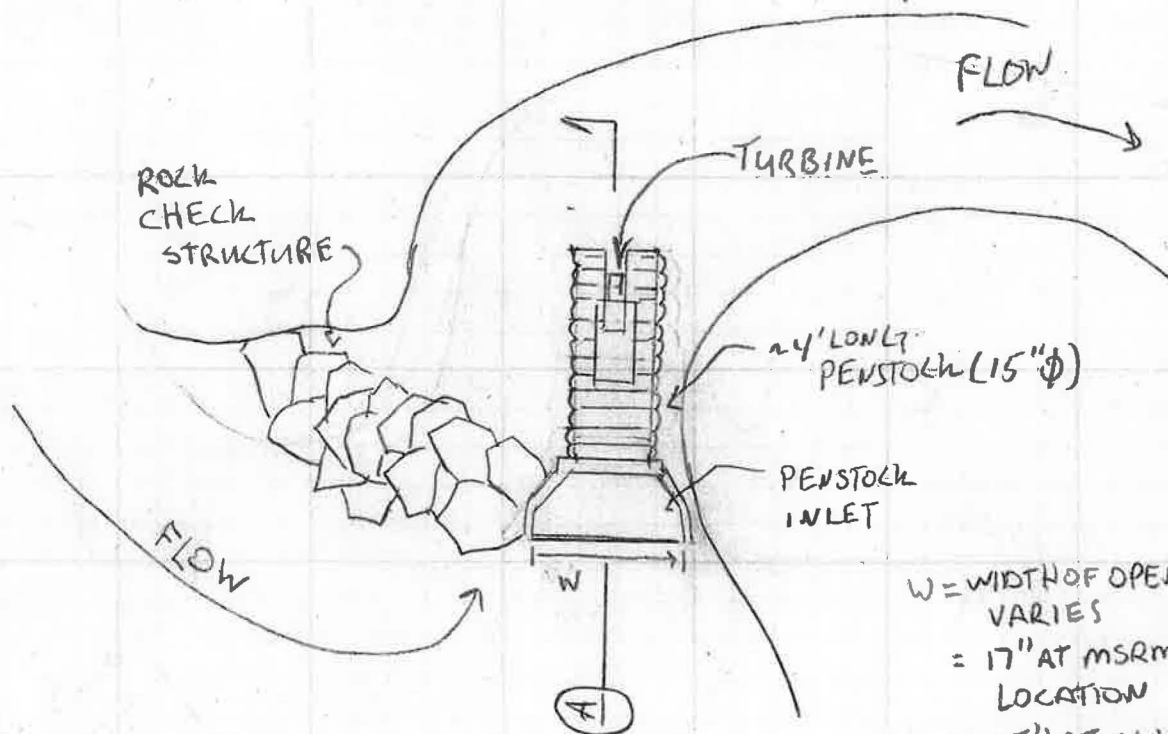
Department of Water Resources  
Geographic Information Services



POD and POU Location

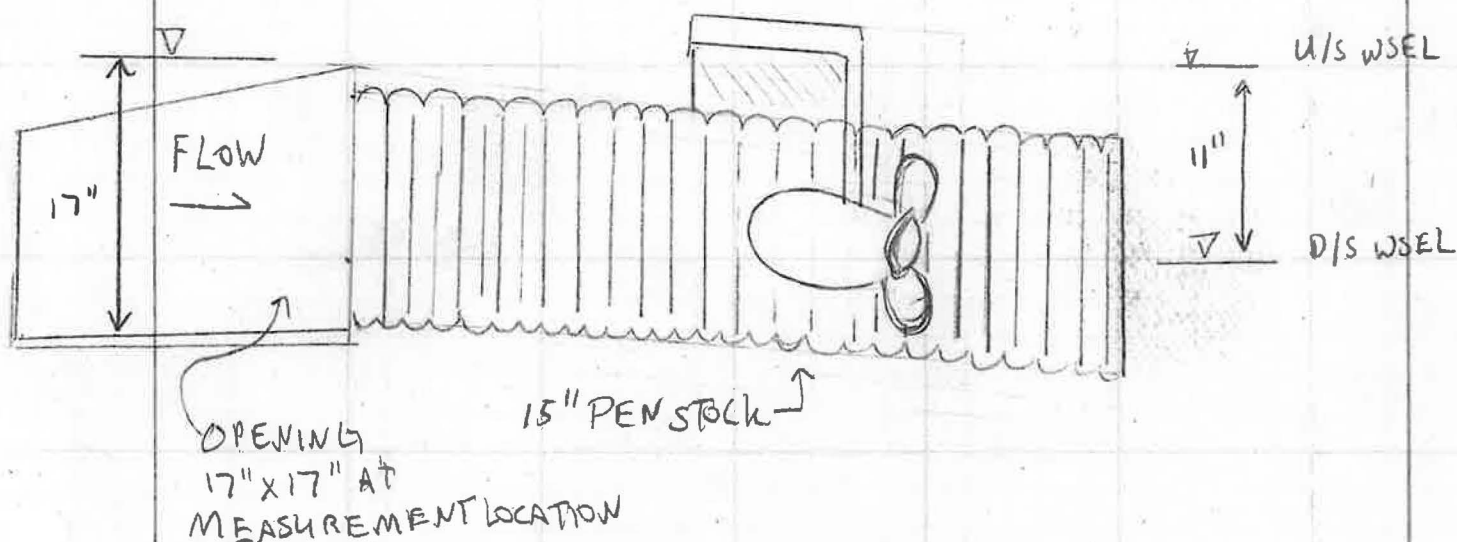






W = WIDTH OF OPENING, VARIES  
 = 17" AT MSRMT LOCATION  
 = 15" AT CULVERT OPENING

HYDROPOWER PLAN VIEW 1" ~ 3'



(A) HYDROPOWER SECTION 1" ~ 1'



# FLOW CALCULATION WORKSHEET

Measurement Method: Single Port Pitot Tube  
with Manometer

MEASUREMENT DATE: May 30, 2012

Project No. 01-12-0955-106-0001  
Project: Middle Cr Water Right Examination  
Client: John Young  
Date: 8-Jun-12  
Prepared by: RGJ

Culvert Diameter 15 inches  
Water Height at Msrmt Location 17 inches  
Width at Measurement Location 18 inches

| Manometer Reading | Velocity for Single-Port Pitot Measurement (ft/s) | Manometer Reading | Velocity for Single-Port Pitot Measurement (ft/s) |  |
|-------------------|---------------------------------------------------|-------------------|---------------------------------------------------|--|
| 1.40              | 1.98                                              | 1.30              | 1.84                                              |  |
| 1.30              | 1.84                                              | 1.30              | 1.84                                              |  |
| 1.30              | 1.84                                              | 1.00              | 1.41                                              |  |
| 1.20              | 1.70                                              | 1.00              | 1.41                                              |  |
| 1.00              | 1.41                                              | 1.30              | 1.84                                              |  |
| 1.00              | 1.41                                              | 1.35              | 1.91                                              |  |
| 1.00              | 1.41                                              | 0.75              | 1.06                                              |  |
| 1.40              | 1.98                                              | 1.00              | 1.41                                              |  |
| 1.60              | 2.26                                              | 1.00              | 1.41                                              |  |
| 1.60              | 2.26                                              | 0.75              | 1.06                                              |  |
| 1.00              | 1.41                                              | 1.00              | 1.41                                              |  |
| 1.00              | 1.41                                              | 1.20              | 1.70                                              |  |
| 1.20              | 1.70                                              | 2.05              | 2.90                                              |  |
| 1.30              | 1.84                                              | 1.30              | 1.84                                              |  |
| 1.40              | 1.98                                              | 1.20              | 1.70                                              |  |
| 1.50              | 2.12                                              | 1.10              | 1.56                                              |  |
|                   |                                                   | 1.00              | 1.41                                              |  |
|                   |                                                   | 1.90              | 2.69                                              |  |
|                   |                                                   | 2.00              | 2.83                                              |  |
|                   |                                                   | 1.40              | 1.98                                              |  |
| Average           | 1.79                                              | Average           | 1.76                                              |  |

Flow Area at Measurement Location 2.13 ft<sup>2</sup>  
Estimated Flow Rate, Test 1 3.79 cfs  
Estimated Flow Rate, Test 2 3.74 cfs

Estimated Flow Rate for Location 3.77 cfs

Date: **July 12, 2012**

## LETTER of TRANSMITTAL

**To:** **James Cefab**  
**Company:** **Idaho Department of Water Resources**  
**Address:** **900 N Skyline Drive, Suite A**  
**Idaho Falls, ID 83402 - 1718**

**From:** **Randy Johnson, P.E.**

**RE:** **John D Young**  
**Project No.** **01-12-0955-106-0001**

via US Mail are the following items:

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**REMARKS:**

Please find enclosed a Beneficial Use Field Report for Permit Number 32-13275. Feel free to contact me if you need clarification or additional information.

Copy to \_\_\_\_\_

Signed \_\_\_\_\_