

MEMORANDUM

TO: File 47-7485

FROM: Daniel Nelson – Staff Hydrologist

DATE: June 2, 2014

SUBJECT: Review of Field Examiner Exam Report.

There were two field exams done by two separate field examiners for this permit. The first field exam was done in November of 1989 and the second exam was done in March of 1998. Neither of the examiners clearly marked on an aerial photo the location of the ponds or the points of diversion. Both field examiners used a Quadrangle Map to designate the point of diversion, but neither marked the location of the ponds on the maps.

I tried to contact the owner by telephone, but I could not get through. I then wrote a letter to the owner, and received no response. My attempts to contact the owner were to try and find a way to sort out the pond locations and the point(s) of diversion for this system. Without proper mapping and not being able to contact the owner of the water right, I did my best with the information that was available.

Water Uses:

This permit was originally filed as a hydropower, aesthetic, and recreation water right. The original application did describe two ponds, and hydropower plant. Both of the field exams state that the hydropower was never developed. Both field exams struggled over the recreation use portion of this permit. The first exam stated that the pond was stocked with fish and that recreational use may have been fishing. The second exam stated that the fish had all been eaten, and the use should be changed to aesthetic. Aesthetic and recreation use description are very vague and could easily be interchangeable. I spoke with staff, and we have decided to remove the recreation use and retain the aesthetic use, but add a aesthetic storage and diversion to storage component to better describe the water right as it was originally filed.

Point of Diversion:

The maps supplied didn't provide accurate proof of where the point of diversion was located, however, I did find a Spatial Data point that is marked with the second field examiner's name and the date she took the GPS reading. Therefore, I am using this point as the point of diversion.

Place of Use:

The place of use for this permit is actually the most difficult piece of the puzzle for this permit. The maps in the two field exam files provide a diagram showing 2 ponds, but the ponds are not located on the map as the place of use. The photos taken on the second exam show a pond that the field examiner states no longer exists. The second field examiner also only described one pond when determining the storage volume for this component. From what I can tell when comparing the aerial photos with the photos taken of the place of use, a small pond was created at the point of diversion and a 3 inch pipeline was run down to a second pond below the rim of Rock Creek Canyon. I spoke about this with staff, and we have decided to not include the diversion pond, and to only show the pond below the rim of the canyon as the place of use.

Diversion Rate:

The diversion rate for this system is very hard to determine from both of the field exams. The first exam states that 0.16 cfs was measured through a 3 inch pipeline, 0.33 cfs was measured through a 16 inch culvert, and 5.12 cfs was measured over a weir. The second exam states that most of the original infrastructure was removed, and all that remained was the 3 inch pipe. Therefore, we are limiting the diversion rate for the aesthetic use and diversion to storage for this permit to 0.16 cfs. There is no diversion rate for aesthetic storage.

Diversion Volume:

The first field exam provided volumes for two ponds. One of the ponds had a volume of 0.73 af and the other 0.06 af. The second field exam provided a pond volume of 0.2 af. Both exams stated that the ponds were 3 to 4 feet deep. When I created the shape file from ArcMap for the pond, I found that the surface area of the pond was 0.1 acres. If the pond is 3 feet deep, then the volume for the pond would be 0.3 af (0.1 acre surface area X 3 ft deep = 0.3 af). This number does lean close to the second exam, and can be supported with current information available in ArcMap, so I am going to recommend 0.3 af for the capacity of the pond. Please see the attached spreadsheet for the evaporation and seepage losses for the pond which brings the total storage volume up to 0.7 af.

There is no discussion in either field exam concerning water flowing through the pond, but the diagrams in both field exams do show a channel flowing out of the pond and into Rock Creek. The channel flowing into Rock Creek can also be seen in the aerial photos in ArcMap. I have discussed this with staff, and we have agreed that the flow through should be considered a continuous flow through the 3 inch pipeline. Therefore the volume for the aesthetic use would be the amount of water the diversion rate could supply for all year long or 115 af [(0.16 cfs X 1.9835 X 365 days) - .7 af storage = 115.1 af recreation use].

Conditions:

The condition on this water right was to require the water user to provide a means for the Department to measure the water being diverted. Whereas the field examiners were able to measure this diversion, this condition is no longer needed. However, the original property has been split and the owner of the water right no longer owns the property where the pond is located. He does still own the point of diversion. Therefore, I am including the condition 004 to ensure that it is clear that this water right does not grant an easement. I also added condition 259 to clearly identify how the water flowing into the pond is used.

This right is in water district 47-O, so I included condition 47-O. According to the field examiner, a portion of this system did have a Cipolletti Weir, so I am not sure whether or not they still have measurement devices and headgates on this system. I spoke with southern region and discovered that this stretch of Rock Creek is technically in the district, but is not actively regulated by the district. The district generally only regulates down to a point that is several miles upstream of this location. The diversion rate is under 0.24 cfs, which may not be regulated by a water district. Considering all of the above information, I recommend that conditions 01P and 01R be used on this permit to require headgates and measurement devices if this stretch of Rock Creek is ever regulated by the water district.

Conclusion:

I tried to contact the owner of this permit both by letter and several telephone calls, and was not able to contact him. With the information that is available, the above recommendations for the licensing of this permit is the best that can be done at this time.

TOTAL STORAGE

FILE NUMBER	47-7485
REVIEWER	Dan Nelson
DATE	5/23/2014

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total seepage, evaporation and fill capacity required for a pond

Surface Area (in Acres)	0.1	"Surface Area" is automatically carried over from the "Seepage Loss Sheet"
Average Pond Depth (in feet)	3	"Average Pond Depth" depicts the actual depth of the pond either measured or estimated. Note: If you know the maximum depth and not the average depth, the field examiner's handbook suggests multiplying the maximum depth by 0.4 to get the average depth, or you can use any method that you know the capacity, divide the capacity by surface area and enter the average pond depth in the space above.
Pond Capacity (in acre feet)	0.3	

Volume Needed Above Initial Fill to Fulfill From Storage Needs- "Multiple Fills" (in acre feet)	0	The "Volume Needed Above Initial Fill" is the acre-feet of water required to meet <i>from storage</i> component if the <i>from storage</i> component exceeds a one time fill. This section should not include the amount of water needed to fill the pond initially or the amount of water needed to maintain the pond level due to evaporation or seepage. For example: if a pond has a capacity of 5 acre feet and 2.5 acre feet of seepage and evaporation, but the pond is used for irrigation that requires 10 acre feet of from storage for the irrigation use, then you would insert 5 acre feet into this location (10 acre feet needed - 5 acre feet from the initial fill = 5 acre feet of additional storage needed). PLEASE NOTE: You must have a "From Storage" component exceeding the initial fill on the permit to include a volume in this space.
Estimated Seepage Loss (in acre feet)	0.1	The "Estimated Seepage Loss" is automatically carried over from the Seepage Loss Sheet
Estimated Evaporation Loss (in acre feet)	0.3	The "Estimated Evaporation Loss" is automatically carried over from the Evaporation Loss Sheet
Total Volume Required (in acre feet)	0.7	"The Total Volume Required" is calculated by adding the Pond Capacity, Multiple Fills, Seepage Loss, and Evaporation Loss amounts to determine the total amount of storage required.

Flow Rate Into Pond (in cfs)	1.00	The "Flow Rate" Into the Pond depicts the actual flow either measured or estimated into the pond.
Highest Daily Evaporation Rate From Evaporation Tab. (in mm/day)	5.52	This number is automatically selected by picking the highest recorded number in the "Precipitation Deficit Table".
Maximum Required Daily Maintenance Volume (in acre feet per day)	0.00	"Maximum Required Daily Maintenance Volume" is the maximum volume of water needed on any given day during the year, and is calculated by adding the highest daily evaporation loss to the average daily seepage loss in acre feet. The average daily seepage loss is calculated by dividing the "Estimated Seepage Loss" by 365 days. This is acceptable, since the seepage rate shouldn't vary throughout the season unless the pond completely freezes over during the winter months. The highest daily evaporation loss is calculated by dividing the Highest Daily Evaporation Rate by the 304.8 conversion factor and multiplying this number by the pond surface area to attain a combined daily acre feet requirement.
Minimum Maintenance Flow (in cfs)	0.00	The "Minimum Maintenance Flow" is the minimum amount of flow required to maintain the level of the pond. This number is determine by dividing the "Maximum Required Daily Maintenance Volume" by 1.9835. This flow can be used to determine if the flow rate into the pond is adequate to maintain the pond level.
Days Required to Fill the Pond	0	The "Days Required to Fill the Pond" is calculated by dividing the "Pond Capacity" by the "Flow Rate" minus "Minimum Maintenance Flow" multiplied by 1.9835. This section will assist you in determining if the flow rate being diverted to the pond is adequate to fill the pond while maintaining the pond level. The length of time to fill the pond will help determine if the flow rate is adequate for the size of pond being proposed. This number should be between 1 and 365 days for a project to be successful.
Days Required to Fill the Pond at 13,000 gallons per day	8	The "Days Required to Fill the Pond at 13,000 gallons per day" is calculated converting the "Pond Capacity" and the "Maximum Daily Maintenance Volume" to gallons. The "Pond Capacity" is then divided by 13,000 gallons minus the "Maximum Daily Maintenance Volume" in gallons to determine the number of days to fill pond. This number should be between 1 and 365 if this pond is to described as a domestic use.

User Input

Calculated value

Formula Explanations

Evaporation Loss Calculation

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This spreadsheet has been designed by Idaho Department of Water Resources to estimate the annual evaporation losses from a pond.

The acronyms used on the Kimberly Research Center website are defined below:
P = Precipitation
ET= Evapotranspiration
P _d = Precipitation deficit
P _d =ET-P

User Input
Calculated value
Formula Explanations

USING THIS SPREADSHEET

To ascertain the evaporation from a pond, you will need to go to the Kimberley Research Center website. The link is found below. This web site provides the Precipitation Deficit for the area where the pond is located. The Precipitation Deficit is the total amount of free pan evaporation minus the precipitation for a given area, which gives the total amount of evaporative losses incurred by the pond. There are several weather sites that are used, and the entire state is pretty much covered. IDWR staff can find the nearest site using Arc Map. The shape file containing the sites can be found at <X:/Spatial/Climate/ETIdahostations.shp>.

Found at: <http://www.kimberly.uidaho.edu/ETIdaho/online.php>

Precipitation Deficit

Station: Twin Falls 2 NNE (NWS -- 109294)

Month	mm/day ¹	Days per month	mm/Month
Jan	0.00	31	0.00
Feb	0.58	28	16.24
March	1.37	31	42.47
April	2.83	30	84.90
May	3.46	31	107.26
June	4.32	30	129.60
July	5.52	31	171.12
August	4.67	31	144.77
September	3.53	30	105.90
October	2.40	31	74.40
November	0.44	30	13.20
December	0.00	31	0.00

PLEASE NOTE: We cannot use the season average, because there are several areas in Northern Idaho with a negative Precipitation Deficit. Therefore, we must enter each monthly deficit, and enter in a zero (0) for each negative month. The reason for this is that precipitation can only offset evaporation to the extent of the evaporation.

Please enter the daily average Precipitation Deficit as shown in the example below.

Although it has sometimes been useful to consider wintertime evaporation to be zero, Allen and Robison (2007, p. 169) noted, "Evaporation during nongrowing (wintertime) periods varies widely . . ."

¹Negative monthly mean values should be entered in the above table as "0".

Total mm/year = 889.86

$$[(\text{mm/yr}) \div (\text{convert to feet})] \times (\text{Surface area of pond, in acres}) = \text{Evaporation Loss in Acre Feet}$$

(889.86 ÷ 304.8) X 0.10 = 0.3 AFA

Surface Area of Pond is automatically Carried over from the Seepage Loss Sheet.

SEEPAGE CALCULATIONS

This spreadsheet has been designed by Idaho Department of Water Resources to estimate the total annual seepage losses from a pond.

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User Input
Calculated value
Formula Explanations

INPUTS

SQ. FT. Calculator Pond Surface area in acres
0.1

POND SURFACE AREA (SQ. FT.)	4356
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SUGGESTED SEEPAGE RATE (FT/DAY)	0.0030
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Use the table below to find the "SUGGESTED SEEPAGE RATES".

FORMULA: (Surface Area X Seepage Rate) / 7.48 = Gallons Per Day loss

CONVERT TO GPD	98	GPD
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TOTAL SEEPAGE LOSS (AFA)	0.1	AFA
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SUGGESTED SEEPAGE RATES FOR DIFFERENT SOIL TYPES:
GW, GP, GM, GC, SW, SP and SM (silty sand, sand silt mixtures and gravel mixtures) = 0.20 ft per day
OL and ML (inorganic silts - very fine sands, silty, or clayey fine sands) = 0.016 ft per day
SC (clayey sands, sand clay mixtures) = 0.007 ft per day
CL (Low to medium plasticity clays) = 0.003 ft per day
MH, OH, PT and CH (high plasticity clays) = 0.0003 ft per day
LINED PONDS (liners can be chemical, fabric, or bentonite) = 0 ft per day
Ponds Intercepting Groundwater (excavated ponds filled with shallow Ground Water) = 0 ft per day

PLEASE NOTE: The initial basis for the Suggested Seepage Rates in the table above is found on Page 16 of Seepage from Fish Ponds, Bulletin 599, August 1989 Alabama Agricultural experiment Station, Auburn University, Auburn University Alabama. If you don't know the soil type, please refer to the map provided at <X:\Spatial\Soils\USCS\PondSoils.lyr>. Use "0" if the ponds intersect the water table.

ET_{Idaho} 2012 -- Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

Please send suggestions for improving this site to robison at kimberly dot uidaho dot edu Copyright 2012, University of Idaho.

Twin Falls 3 SE (NWS -- 109299)

Statistics based on thirty year normal spans 1945 to 1977 years

For a different land cover or crop click on the above link.

You can highlight this table and copy via the clipboard to a Microsoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Open water - small stock ponds															
Precipitation Deficit (Click here for a graph)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season ^a	Non Growing Season ^b	Annual
Mean ^j	mm/day												mm		
Monthly ^c	0.11	0.58	1.37	2.83	3.46	4.32	5.52	4.67	3.53	2.40	0.44	0.22	874	0	874
15-Day Moving Average ^d	0.20	0.56	1.38	2.88	3.42	4.29	5.52	4.64	3.44	2.46	0.33	0.18			
7-Day Moving Average ^e	0.14	0.60	1.38	2.84	3.42	4.25	5.53	4.67	3.50	2.43	0.40	0.23			
3-Day Moving Average ^f	0.12	0.60	1.38	2.82	3.45	4.29	5.52	4.67	3.53	2.41	0.43	0.23			
Standard Deviation ^k	mm/day												mm		
Monthly ^c	0.98	0.65	0.76	0.85	1.48	0.89	0.51	1.15	0.80	1.07	0.68	0.92	98	0	98
15-Day Moving Average ^d	1.08	0.81	0.83	1.09	1.48	1.24	0.48	1.19	1.07	0.91	0.81	0.90			
7-Day Moving Average ^e	1.31	1.09	1.20	1.46	1.96	1.77	0.68	1.39	1.39	1.31	1.23	1.25			
3-Day Moving Average ^f	1.66	1.44	1.72	1.98	2.64	2.29	0.97	1.71	1.91	1.78	1.74	1.72			
20% Exceedance ^l	mm/day												mm		
Monthly ^c	0.36	1.09	1.84	3.44	4.46	5.19	5.84	5.24	4.16	2.95	1.03	0.27	941	0	941
15-Day Moving Average ^d	0.81	1.43	2.57	4.13	5.35	5.72	6.03	5.57	4.71	3.81	1.44	0.74			
7-Day Moving	1.19	2.02	3.16	4.72	5.90	6.46	6.49	5.85	5.40	4.24	2.23	1.10			

Average ^e																	
3-Day Moving Average ^f	1.44	2.38	3.85	5.54	6.78	7.13	6.92	6.30	5.71	4.99	2.77	1.41					
80% Exceedance^m	mm/day												mm				
Monthly ^c	0.56	0.03	0.94	2.09	2.41	3.57	5.24	4.19	2.63	1.83	0.24	0.63	754	0	754		
15-Day Moving Average ^d	1.81	0.84	-0.18	1.19	1.07	2.14	4.62	3.61	2.12	1.12	1.16	1.33					
7-Day Moving Average ^e	4.32	2.28	-1.31	0.25	-1.07	0.04	3.68	2.56	0.44	0.22	2.87	3.14					
3-Day Moving Average ^f	7.76	4.48	-3.15	3.70	-6.20	3.85	1.57	0.56	2.59	2.89	6.13	5.88					
Ave Highest P_{def}	mm/day												--				
15-Day Moving Average ^g	0.49	1.10	2.11	3.55	4.47	5.29	5.88	5.26	4.20	3.11	1.04	0.45					
7-Day Moving Average ^h	0.90	1.60	2.74	4.27	5.40	6.08	6.28	5.64	4.89	3.78	1.73	0.79					
3-Day Moving Average ⁱ	1.19	1.91	3.42	5.12	6.17	6.83	6.65	6.09	5.39	4.44	2.28	1.15					
Ave Lowest P_{def}	mm/day												--				
15-Day Moving Average ^g	0.74	0.12	0.66	2.07	2.39	3.35	5.15	4.09	2.76	1.74	0.30	0.79					
7-Day Moving Average ^h	1.82	0.80	-0.37	1.03	0.85	1.69	4.52	3.18	1.81	0.65	1.34	1.84					
3-Day Moving Average ⁱ	3.61	2.35	-2.13	1.15	-2.17	0.54	3.27	1.70	0.19	1.35	3.46	3.93					
Special normal distribution parameters for monthly, seasonal, and annual intervals																	
Skew ^m	0.43	0.38	-0.13	0.44	-0.13	0.41	0.21	0.78	0.72	0.22	0.13	0.35	-0.17	0.00	-0.17		
Kurtosis ^o	1.15	2.52	0.70	2.90	0.59	2.69	0.87	2.23	2.76	0.94	2.38	1.35	2.54	0.00	2.54		

^a Growing Season: This is usually the time from green up or planting in the spring to a killing frost or harvest in the fall. It is not applicable for entries without a growing season and will be blank.

^b Nongrowing Season: This is usually the time from a killing frost or harvest in the fall to the of green up in the spring. It is not applicable for entries without a growing season.

^c Mean of the average daily value for month

^d Mean of the fourteen 15-day period averages contained in the month