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ENGINEERING
P.L.L.C.

Hydraulics

Hydrology

Water Resources

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JUN 09 2004
DEPARTMENT OF
WATER RESOURCES

June 7, 2004

Idaho Department of Water Resources
Attn.: Jeff Peppersack
P.O. Box 83720
Boise, ID 83706

RE: Letter Dated 7/27/1995 to Ed Dumke regarding Spring Creek on Sage
Willow

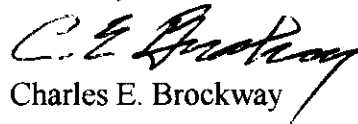
Dear Jeff:

Attached are the files and correspondence by Brockway Engineering that are
relative to the root zone storage diversion pipe.

The pipe is a 15' PVC, and the discharge from the pipe was measured on
10/24/1995 @ 3.17/cfs.

Please feel free to call me with any questions.

Sincerely,



Charles E. Brockway

CEB/jjd

Enclosures

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JUN 9 9 2004

DEPARTMENT OF
WATER RESOURCES



CHARLES
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July 27, 1995

Mr. Ed Dumke
204 Big Wells Rd
Sun Valley, ID 83353

Subject: Pipeline Design and Costs-Spring Creek on Sage Willow

Dear Ed:

Enclosed are the design sheets for the pipeline analysis for the proposed pipeline from Spring Creek to Pond 1 or Pond 2. The design is based on the elevations and ranch layout provided by Benchmark Associates. It assumes that the diversion structure from Spring Creek will be utilized and that the water level in the creek at the structure will be maintained at an elevation approximately 1.0 feet below the top of the structure. This can be maintained by adjusting the check boards in the structure.

Essentially, the Benchmark survey showed that there is approximately 8.3 feet of elevation difference (head) between the water level above the check structure at Spring Creek and the water level in Pond 1(northernmost pond). The elevation difference to Pond 2(big pond) is 13.4 feet. The pipeline length to reach Pond No 1 is 7570 feet assuming that the pipeline layout traverses southwest along the gravel road(landing strip) to the south end of the strip and thence west and southwest to the pond. The pipeline length to reach Pond No 2 is 6950 feet. The elevation difference is critical because it dictates the available hydraulic loss nor needed pump head to maintain the desired discharge. The head or pressure loss consists of entrance losses, friction losses in the pipe, fitting losses, and exit losses. PVC or polyethylene pipe are the smoothest inside and therefore require lower available head than steel or other pipe. Since the pressures in the pipe will always be low, less than 4 or 5 psi, low pressure pipe can be utilized. Steel pipe, although it would suffice, has higher friction losses, higher pressure ratings than necessary, and generally costs more than PVC. However, I did perform the hydraulic analysis for steel pipe, but not a cost analysis.

There is adequate available head to transmit the design discharge of 2.0 cfs (100 miner's inches) from Spring Creek to either Pond No 1 or Pond No 2. A 12 inch diameter PVC pipe will not convey the 2.0 cfs (100 miner's inches) design flow to Pond No 1 without a pump. It would require a 1.6 hp or greater pump if a 12 inch PVC pipe is utilized. A 15 inch PVC pipe will convey approximately 2.86 cfs(143 miner's inches) to Pond 1. ←
This diameter pipe allows some additional capacity over the design discharge.

A 12 inch diameter PVC pipe will convey 2.14 cfs(107 miner's inches) to Pond No 2 without using a pump. A 15 inch PVC pipe will convey 3.79 cfs to Pond No 2 without a pump. The estimated capacity of the 12 inch PVC(2.14 cfs) exceeds, but is very close to the design discharge, and includes no margin for possible excessive roughness in the

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pipe, higher entrance losses than estimated or possible error in the estimated available head. The 15 inch PVC is therefore the recommended pipe diameter for this gravity installation even though it has an estimated capacity considerably in excess of the design flow. It would also be less subject to flow restriction by debris at the inlet.

Jerry Pancheri has corresponded with Dale Peterson of Golden West regarding prices of PVC pipe for this project. Dale indicated that he had 2.1 miles of 16 inch diameter salvaged high density polyethylene pipe from INEL which could be installed for the Sagewillow pipeline for \$9.50 per foot. This pipe is good quality, low pressure pipe with hydraulic properties similar to PVC. However, it apparently requires fusion but welding for field joining and must be installed by Golden West. Therefore, Dale quoted only installed prices. I have assumed that Gary and assistants would install the PVC pipe and have estimated costs accordingly. The estimated costs as shown on the accompanying calculation sheet may be high or low depending on the number of feet of pipe that can be installed in a day, equipment cost, and labor costs.

Costs for a 15 inch diameter PVC pipe to Pond No 1 are estimated at \$47,313 for materials (\$6.25/ft) and \$2846 for installation (\$0.38 /ft) for a total cost of \$50,159. Total cost of the 16 inch diameter salvaged poly pipe is estimated at \$71,915.

Estimated costs for a 15 inch diameter PVC pipe to Pond No 2 are \$43,438 for material(\$6.25/ft) and \$2,613 for installation (\$0.38 /ft) for a total cost of \$46,051. Total cost of the 16 inch diameter salvaged poly pipe is estimated at \$66,025. A 12 inch diameter PVC pipe to Pond No 2 is estimated to cost \$26,579. However, the estimated hydraulic capacity of the 12 inch PVC is very close to the design discharge and I would not recommend it.

Any pipe installation will require a screw type gate at the inlet which will require some concrete work to modify the check board structure. The gate and concrete work is estimated at \$700.

If you are planning on Gary doing the pipe installation you should check with him regarding installation costs. I believe he is capable of installing the pipe and it would be less costly than commercial installation.

Let me know if you have additional questions.

Sincerely,



C. E. Brockway, P.E.

cc J. Pancheri

Sage Willow Spring Creek Pipe

SAGEPIPE.XLS

Objective: Design of pipeline from Spring Creek to Pond 1 or Pond 2 to convey storage water to ponds. Alternative 1 is pipe to Pond No 1. Alternative 2 is pipe to Pond No 2

Design Discharge: 100 miners inches C.E. Brockway P.E. 7/9/95

Assume pipe line from existing diversion structure to Pond

Elevation of top of headwall at diversion 107.9 (Benchmark Associates survey)
 Assumed water surface elev. below headwall 1
 Elevation of water surface at diversion 106.9
 Elevation of water surface at pond 1 98.6 (Benchmark Associates survey)
 Length of Pipeline 1 7570 (Benchmark Associates survey)
 Elevation of water surface at pond 2 93.5 (Benchmark Associates survey)
 Length of Pipeline 2 6950 (Benchmark Associates survey)
 Entrance Loss coeff= 0.5
 Exit loss coeff= 1
 Pipe type PVC
 k value smooth ft
 Water kinematic viscosity 1.20E-05 ft ^ 2/sec
 Pump Efficiency 0.65
 Electricity cost 0.045

PVC PIPE EVALUATION

Pipe Alternative No 1 to Pond No 1 PVC

Pipe Dia	Discharge	Velocity	Vel Head	Ent. Loss	Reynolds N	D/k	D-W f**	Friction	Exit L	Total loss	Elev H	TDH	H.P	\$/day
20	2	0.92	0.013	0.007	2.78E+05	smooth	0.015	0.889	0.013	0.909	8.3	-7.39	NA	NA
16	2	1.43	0.032	0.016	2.22E+05	smooth	0.0155	2.804	0.032	2.851	8.3	-5.45	NA	NA
15	2	1.63	0.041	0.021	2.08E+05	smooth	0.0160	3.996	0.041	4.058	8.3	-4.24	NA	NA
12	2	2.55	0.101	0.050	1.67E+05	smooth	0.0165	12.577	0.101	12.728	8.3	4.43	1.55	1.24
10	2	3.67	0.209	0.104	1.39E+05	smooth	0.0170	32.244	0.209	32.557	8.3	24.26	8.47	6.79

Pipe Alt. No 1	Gravity Flow	to Pond No 1	PV	Use a	15 inch dia.	PVC	buried pipe which will transmit	2.86 cfs
Pipe Dia	Available	Discharge		without a pump. An alternative is to use a	12 inch dia.	PVC	pipe with	1.6 hp
	Head	cfs		or greater pump capable of delivering	2 cfs under a total dynamic head of			4.43 ft
20	8.3	6.04						
16	8.3	3.41						
15	8.3	2.86						
12	8.3	1.62						
10	8.3	1.01						

Pipe Alternative No 2 to Pond No 2 PVC

SAGEPIPE.XLS

Pipe Dia	Discharge Velocity	Vel Head	Ent. Loss	Reynolds N	D/k	D-W f**	Friction	Exit L	Total loss	Elev H	TDH	H.P	\$/day
20	2	0.92	0.013	0.007	2.78E+05 smooth	0.015	0.816	0.013	0.836	13.4	-12.56	NA	NA
16	2	1.43	0.032	0.016	2.22E+05 smooth	0.0155	2.574	0.032	2.622	13.4	-10.78	NA	NA
15	2	1.63	0.041	0.021	2.08E+05 smooth	0.0160	3.669	0.041	3.731	13.4	-9.67	NA	NA
12	2	2.55	0.101	0.050	1.67E+05 smooth	0.0165	11.547	0.101	11.698	13.4	-1.70	NA	NA
10	2	3.67	0.209	0.104	1.39E+05 smooth	0.0170	29.603	0.209	29.916	13.4	16.52	5.77	4.63

Pipe Alt. No 2 Gravity Flow to Pond No 2 PV

Pipe Dia	Available Head	Discharge cfs	Use a	12 inch dia. PVC	buried pipe which will transmit	2.14 cfs
			without a pump. An alternative is to use a		10 inch dia. PVC	pipe with
			or greater pump capable of delivering		2 cfs under a total dynamic head of	5.8 hp
			Or use a	15 inch dia. PVC	buried pipe which will transmit	16.52 ft
			without a pump			3.79 cfs
20	13.4	8.01				
16	13.4	4.52				
15	13.4	3.79				
12	13.4	2.14				
10	13.4	1.34				

STEEL PIPE EVALUATION

Assume pipe line from existing diversion structure to Pond

SAGEPIPE.XLS

Elevation of top of headwall at diversion	107.9 (Benchmark Associates survey
Assumed water surface elev. below headwall	1
Elevation of water surface at diversion	106.9
Elevation of water surface at pond 1	98.6 (Benchmark Associates survey
Length of Pipeline 1	7570 (Benchmark Associates survey
Elevation of water surface at pond 2	93.5 (Benchmark Associates survey
Length of Pipeline 2	6950 (Benchmark Associates survey
Entrance Loss coeff=	0.5
Exit loss coeff=	1
Pipe type	STEEL
k value	0.0002 ft
Water kinematic viscosity	1.20E-05 ft ^ 2/sec
Pump Efficiency	0.65
Electricity cost	0.045

Pipe Alternative No 1 to Pond No 1 STEEL

Pipe Dia	Discharge	Velocity	Vel Head	Ent. Loss	Reynolds N	D/k	D-W f**	Friction	Exit L	Total loss	Elev H	TDH	H.P	\$/day
20	2	0.92	0.013	0.007	2.78E+05	8333	0.016	0.948	0.013	0.968	8.3	-7.33	NA	NA
18	2	1.13	0.020	0.010	2.50E+05	7500	0.0162	1.626	0.020	1.656	8.3	-6.64	NA	NA
15	2	1.63	0.041	0.021	2.08E+05	6250	0.0170	4.246	0.041	4.308	8.3	-3.99	NA	NA
12	2	2.55	0.101	0.050	1.67E+05	5000	0.0175	13.339	0.101	13.490	8.3	5.19	1.81	1.45
10	2	3.67	0.209	0.104	1.39E+05	4167	0.0182	34.520	0.209	34.833	8.3	26.53	9.26	7.43

Pipe Alt. No 1 Gravity to Pond No 1 STEEL

Use a 15 inch dia. STEEL buried pipe which will transmit 2.78 cfs without a pump. An alternative is to use a 12 inch dia. STEEL pipe with 1.9 hp or greater pump capable of delivering 2 cfs under a total dynamic head of 5.19 ft

Pipe Dia	Available Head	Discharge cfs
20	8.3	5.86
16	8.3	3.34
15	8.3	2.78
12	8.3	1.57
10	8.3	0.98

Pipe Alternative No 2 to Pond No 2 STEEL

Pipe Dia	Discharge	Velocity	Vel Head	Ent. Loss	Reynolds N	D/k	D-W f**	Friction	Exit L	Total loss	Elev H	TDH	H.P	\$/day
20	2	0.92	0.013	0.007	2.78E+05	8333	0.016	0.871	0.013	0.890	13.4	-12.51	NA	NA
18	2	1.13	0.020	0.010	2.50E+05	7500	0.0162	1.493	0.020	1.523	13.4	-11.88	NA	NA
15	2	1.63	0.041	0.021	2.08E+05	6250	0.0170	3.898	0.041	3.960	13.4	-9.44	NA	NA
12	2	2.55	0.101	0.050	1.67E+05	5000	0.0175	12.247	0.101	12.398	13.4	-1.00	NA	NA
10	2	3.67	0.209	0.104	1.39E+05	4167	0.0182	31.693	0.209	32.006	13.4	18.61	6.50	5.21

Pipe Alt. No 2 Gravity to Pond No 2 STEEL	Use a	12.00 inch dia. STEEL	buried pipe which will transmit	2.08 cfs
Pipe Dia Available Discharge	without a pump. An alternative is to use a		10 inch dia. STEEL pipe with	6.5 hp
Head cfs	or greater pump capable of delivering		2 cfs under a total dynamic head of	18.61 ft
20 13.4 7.76				
16 13.4 4.42				
15 13.4 3.68				
12 13.4 2.08				
10 13.4 1.29				

Evaluation based on Mannings n

Steel Pipe n 0.012

PVC pipe n 0.01

TP Pond No 1

Pipe Dia	Length	Available Head	Area	R	So	PVC Discharge	Velocity	STEEL Discharge	Velocity
20	7570	8.3	2.182	0.4167	0.00110	6.00	2.75	5.00	2.29
16	7570	8.3	1.396	0.3333	0.00110	3.31	2.37	2.76	1.98
15	7570	8.3	1.227	0.3125	0.00110	2.79	2.27	2.32	1.89
12	7570	8.3	0.785	0.2500	0.00110	1.54	1.96	1.28	1.63
10	7570	8.3	0.545	0.2083	0.00110	0.95	1.73	0.79	1.44

To pond No. 2

Pipe Dia	Length	Available Head	Area	R	So	PVC Discharge	Velocity	STEEL Discharge	Velocity
20	6950	13.4	2.182	0.4167	0.00193	7.96	3.65	6.64	3.04
16	6950	13.4	1.396	0.3333	0.00193	4.39	3.15	3.66	2.62
15	6950	13.4	1.227	0.3125	0.00193	3.70	3.01	3.08	2.51
12	6950	13.4	0.785	0.2500	0.00193	2.04	2.60	1.70	2.16
10	6950	13.4	0.545	0.2083	0.00193	1.25	2.30	1.04	1.92

Costs of Pipeline System

Pipeline to Pond No 1	Length=	7570				Total	
Pipe Type	Diameter	Cost	Installation	Total Cost	Material	Mat+Install	
	in	\$/ft	\$/ft	\$/ft		\$	
Poly	16			9.5		\$71,915	Salvaged Poly Pipe INEL
PVC	15	6.25	0.38	6.626	\$47,313	\$50,159	

Pipeline to Pond No 2 Length= 6950

Total

SAGEPIPE.XLS

Pipe Type	Diameter in	Cost \$/ft	Installatio \$/ft	Total Cost \$/ft	Material \$	Mat+Install \$	
Poly	16			\$9.50		\$66,025	Salvaged Poly Pipe INEL
PVC	15	\$6.25	\$0.38	\$6.63	\$43,438	\$46,051	
PVC	12	\$3.88	\$0.38	\$4.26	\$26,966	\$29,579	

Cost/ft to install assumes local employees install using backhoe. Crew is assumed to install

1000 ft/day

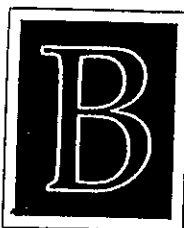
Backhoe cost per day \$160

Operator \$120

Installer \$96

Cost/day \$376

PVC pipe is low head , 80 psi pipe



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October 28, 1995

Mr. Ed Dumke
204 Big Wells Rd
Sun Valley, ID 83353

Subject: Sage Willow Pipeline from Spring Creek

Dear Ed:

On October 20, 1995, the discharge of the new pipeline from Spring Creek to Pond No 1 on Sage Willow was measured using a current meter in the outlet of the pipe. The gates were open on both the upstream end and downstream. Trash was cleaned from the inlet and allowed to flow through the entire pipeline before the measurement was made. It takes approximately 30 minutes for trash to flow from the inlet to the end of the pipe. The measured discharge was 3.71 cfs. The design discharge was 3.79 cfs so there is good agreement there.

Only one riser has been installed in the pipe to divert water to lands along the pipe if desired. When the downstream gate was throttled to about 75% open, water flowed from the riser. However, the downstream gate leaked quite profusely and no attempt was made to close it completely. The gate furnished by PIPCO is supposed to have a rated shutoff head greater than the operating head. I will explore replacement of the gate with PIPCO and Gary Kimbal. Additional risers can be installed at a later date if desired.

A review of the License and Certificate of Water Right (Water License 33-2130, Old No 5-833) shows that the license is for 2960 acre feet per annum equally divided between Upper Spring Creek and Little Lost River for soil root zone storage only. It was contemplated that the diversion from Little Lost River near the homestead would feed the ditch running east toward the ponds and be utilized along with the Spring Creek diversion and ditch running south west. The license is applicable to 1480 acres. On the copy of the license which I have there is no indication of maximum discharge allowable under the license nor can I find any period of allowable use. If the pipeline from Spring Creek is operated at 3.71 cfs for 180 days during the winter, it would divert 1321 acre feet or slightly less than one-half of the 2960 acre feet allowed under the license. The diversion from Little Lost River could be considered for additional winter time diversion of up to 1480 acre feet under this license.

A note by the license examiner on May 20, 1952 indicated that " The lands were too wet on this date for satisfactory inspection and a return for a clear check will be made in July. Mr. Hawley is well pleased with the improvement in grass and the

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increase in flowing of springs below the place that he feels is due to the winter spreading program. There are 8 small ponds to aid in holding and distribution"

Sincerely,

C. E. Brockway, P.E.

cc Kent Foster
Evan Robertson