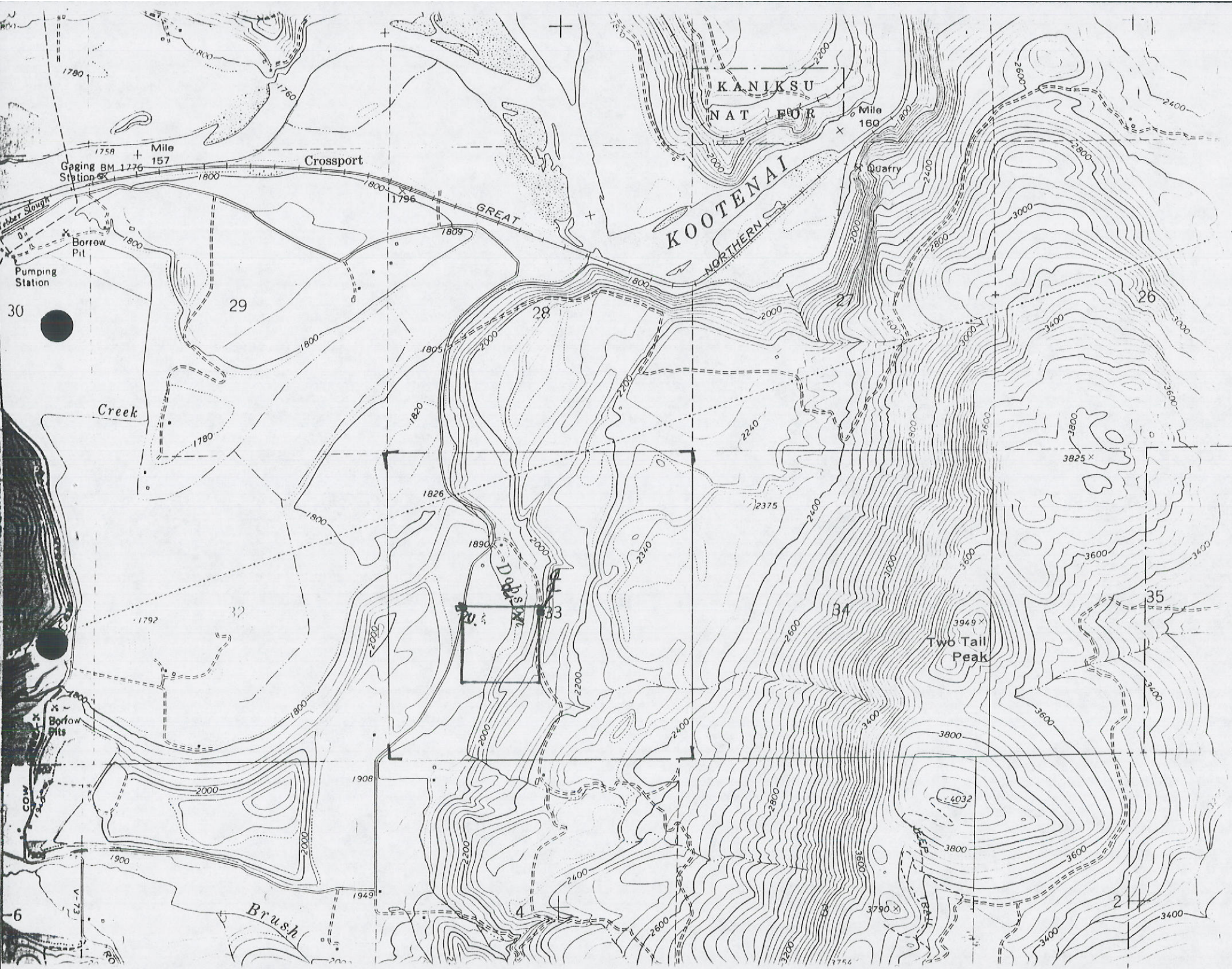




STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
COMMENCEMENT OF WORKS

Permit No. 98-7614

Name(s) of Permit Holder(s): Scot Lindsay

Post Office Address: Box 295

Bonners Ferry, Id.

Tel. No. 83805

☒ I hereby certify that construction of diversion works for the above referenced permit began on Sept 1 (date). I understand that I must continue to develop the water system with due diligence to maintain a valid permit.

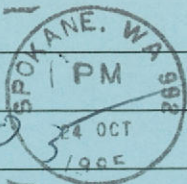
☐ I hereby certify that construction of diverting works on the above referenced project has not yet begun due to the following reason beyond my control*:

*Note: A financing difficulty is not an acceptable reason.

10/23/85
Date

[Signature]
Signature of Permit Holder

Lindson
295
8380



RECEIVED
FEB 08 1991

RECEIVED

OCT 28 1985

IDAHO DEPARTMENT OF WATER RESOURCES
STATEHOUSE
BOISE, IDAHO 83720

Department of Water Resources

RECEIVED

SEP 19 1990

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
PROOF OF BENEFICIAL USE

Department of Water Resources

The Idaho Department of Water Resources will consider this form as a statement that the permit holder(s) has/have completed all development that will occur under this permit and that water has been applied according to the provisions of the permit for the beneficial use(s) described below. This form must be accompanied by a license examination fee or a completed field examination report prepared by a certified water right examiner who has been appointed by the department.

Permit No. 98-07614 Telephone No. 267-7136
267-3755 work

Name(s) of Permit Holder(s): Scot S. Lindsay

Post Office Address: Rt. 1 Box 524 AB (NEW Address)

Source of Water: Un named Spring

If ground water, well driller's name: _____ Date drilled: _____

Extent of Use:
Domestic 1 (No. of households) Irrigation 1 (No. of acres)
Stockwater _____ (No. and type of stock) Other _____

Total rate and/or volume for which proof is submitted .04 cfs _____ acre/feet

Show date water was first diverted and beneficially used under this permit: September - 1985

One of the following may be a condition of approval of your permit:

Measuring device: Required? Yes ☒ No Installed? Yes ☒ No

OR

Flow Measurement Port: Required? Yes ☒ No Installed? Yes ☒ No

Fee Enclosed: \$ 0 (See License Examination Fee Schedule)

Person to contact to accompany the Department representative during the field examination:

Scot S. Lindsay 267-7136 work# is 267-3755
Name Telephone No.

Rt. 1 Box 524 AB.
Address

MICROFILMED

The above information is my true statement of the extent to which the above number permit has been developed and I relinquish any undeveloped portion of the permit to the state of Idaho.

9/17/90
Date

[Signature]
Signature (and title if on behalf of a company or organization)

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
APPLICATION FOR PERMIT

APPROVED

To appropriate the public waters of the State of Idaho

267-3755 WORK

1. Name of applicant Scot Lindsay Phone 267-7136

Post office address Box 295 Bonners Ferry, Id. 83805

2. Source of water supply Unnamed Spring which is a tributary of Dobson Creek

3. Location of point of diversion is NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 33 Township 62N

Range 2E B.M. Boundary County, additional points of diversion if any: _____

4. Water will be used for the following purposes:

Amount 0.04 ^{cfs} for Domestic purposes from Jan 1 to Dec 31 (both dates inclusive)
(cfs or acre-feet per annum)

Amount 0.02 ^{cfs} for Irrigation purposes from April 1 to Oct 31 (both dates inclusive)
(cfs or acre-feet per annum)

Amount 0.01 ^{cfs} for Stockwater purposes from Jan 1 to Dec 31 (both dates inclusive)
(cfs or acre-feet per annum)

Amount 0.03 ^{cfs} for Household Heating purposes from Oct 1 to April 30 (both dates inclusive)
(cfs or acre-feet per annum) Cooling 0.04 MAY 1 SEPT. 30 R6H 7/1/85

5. Total quantity to be appropriated:

0.11 33 10/10/85
a. 2.00 cubic feet per second and/or b. _____ acre-feet per annum.

6. Proposed diverting works:

a. Description of ditches, flumes, pumps, headgates, etc. Gravity Flow For 1700 feet across Hildemans field & Christensen Property to my Property

b. Height of storage dam 4 feet, active reservoir capacity _____ acre-feet; total reservoir capacity _____ acre-feet, materials used in storage dam: Concrete Spring Box

Period of year when water will be diverted to storage Jan 1 to Dec 31 inclusive.
(Month/Day) (Month/Day)

c. Proposed well diameter is _____ inches; proposed depth of well is _____ feet.

7. Time required for the completion of the works and application of the water to the proposed beneficial use is 5 years (minimum 1 year - maximum 5 years).

8. Description of proposed uses:

a. If water is not for irrigation:

(1) Give the place of use of water: NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 33 Township 62N
Range 2E B.M.

(2) Amount of power to be generated: _____ horsepower under _____ feet of head.

(3) List number of each kind of livestock to be watered _____

(4) Name of municipality to be served _____, or number of families to be

supplied with domestic water (1) (one family)

(5) If water is to be used for other purposes describe: Ground water Heat pump

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→ b. If water is for irrigation, indicate acreage in each subdivision in the tabulation below:

TWP	RANGE	SEC.	NE¼				NW¼				SW¼				SE¼				TOTALS
			NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	NE¼	NW¼	SW¼	SE¼	
62N	2E	33			1				1				1						3

DELETED PER TELECON MR. LINDSAY - 7/8/85-R

Total number of acres to be irrigated 3

c. Describe any other water rights used for the same purposes as described above. Claim # 98-4016

SAME P.D. DIFFERENT P/U - PER TELECON MR. LINDSAY 7/8/85/R

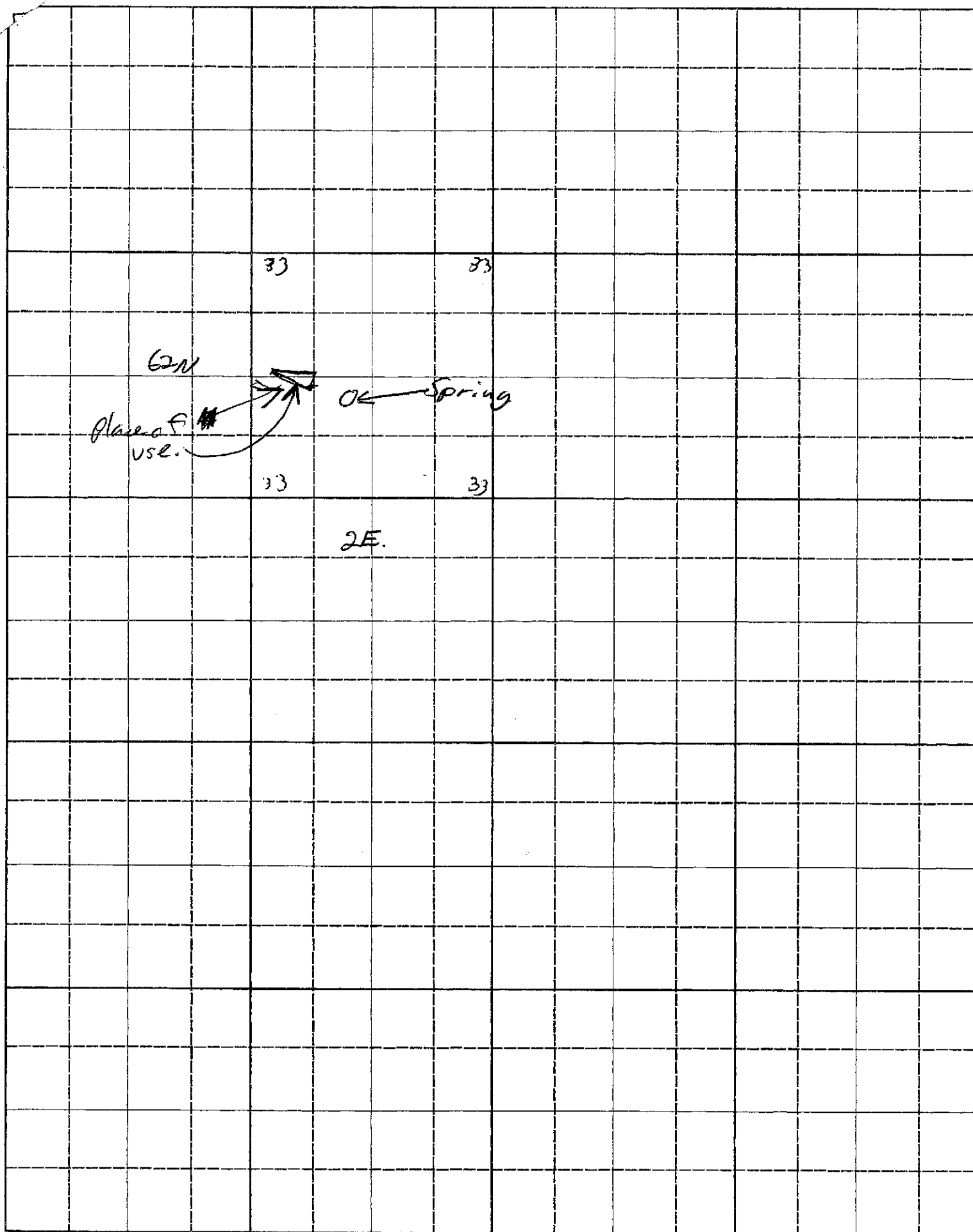
9. a. Who owns the property at the point of diversion Marcia Peterson

b. Who owns the land to be irrigated or place of use Scot Lindsay

c. If the property is owned by a person other than the applicant, describe the arrangement enabling the applicant to make this filing _____

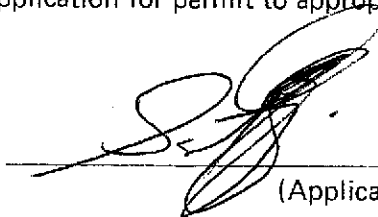
10. Remarks Permission Has been Given by Laurence Holdeman and Mrs. D.L. Christensen (D.L. Christensen is Deceased) for Scot Lindsay to attach to the Spring

11. Map of proposed project: show clearly the proposed point of diversion, place of use, section number, township and range number.



Scale: 2 inches equal 1 mile.

BE IT KNOWN that the undersigned hereby makes application for permit to appropriate the public waters of the State of Idaho as herein set forth.


(Applicant)

MICROFILMED

MICROFILMED

Proposed Priority: 6/14/85

Received by [Signature] Date 6/14/85 Time 1:00 PM
Preliminary check by R Fee \$ 65.00
Receipted by [Signature] Date 6/8/85 (31820)
Publication prepared by [Signature] Date 7/11/85
Published in Boise City Herald
Publication dates 7/18 & 25/85
Publication approved [Signature] Date 8/12/85
Protests filed by: None

Copies of protests forwarded by _____

Hearing held by _____ Date _____

Recommended for approval denial by [Signature] kw

ACTION OF THE DIRECTOR, DEPARTMENT OF WATER RESOURCES

This is to certify that I have examined Application for Permit to appropriate the public waters of the State of Idaho No. 98-7614, and said application is hereby APPROVED.

1. Approval of said application is subject to the following limitations and conditions:

a. SUBJECT TO ALL PRIOR WATER RIGHTS.

b. Proof of construction of works and application of water to beneficial use shall be submitted on or before October 1, 19 90.

c. The rate of diversion, if water is to be used for irrigation under this permit, when combined with all other water rights for the same land shall not exceed 0.02 cubic feet per second for each acre of land.

d. Other: Permit holder shall commence the excavation or construction of diverting works within one year of the date this permit is issued and shall proceed diligently until the project is complete.

The issuance of this permit in no way grants any right-of-way or easement across the land of another.

The maximum rate of diversion under this permit shall not exceed 0.11 cfs.

Witness my hand this 17th day of October, 1985.

J. Glen Sayton
Chief, Operations Bureau

We, Ione Christensen and Laurence Holdeman,
Give permission for Scot Lindsay to use the
spring (ground water) located at:
NE $\frac{1}{4}$ SW $\frac{1}{4}$ SEC 33 Twp 62N Rge 2E B.M. County
of Boundary
Claim No. 98-4016

Signed

Ione d. Christensen June 4, 1985

Signed

Laurence Holdeman June 7, 1985

STATE OF IDAHO)
County of Boudnary) ss.

SUBSCRIBED AND SWORN to before me this 7th day
June , 1985.

Irma F. Clark
Residing in Bonners Ferry

MICROFILMED

MEMORANDUM

TO: Shelley Keen / Northern Region *SWK*

FROM: Brenda Chapman

DATE: November 2, 1995

RE: Exam Deficiencies

=====

I recommend the exam for 98-07614 be returned to the region for clarification of the following matters:

1. The place of use description listed on the front of the exam and the locations drawn on the exam map do not agree with the metes and bounds description sent to us by the Boundary County Assessor's office. Also, a map of sufficiently large scale to clearly show the field boundaries for the irrigation use should accompany the report.
2. The stockwater volume recommendation was based on the annual flow rate rather than on the number of stock.
3. The 5 gallon bucket measurement indicated a flow of 5 gallons in 40 seconds, which is less than .02 cfs. However, the recommended total diversion rate was .11 cfs.
4. Proof of Beneficial use was filed for .04 cfs for domestic use and irrigation of 1 acre. Because no fee was paid, the license cannot be issued for more than .04 cfs.
5. The report should include a description and evaluation for the heating and cooling uses. Please refer to Application Processing Memo #23.

al, Here's the one I told you about this morning.

*SWK
11/7/95*

BENEFICIAL USE FIELD REPORT

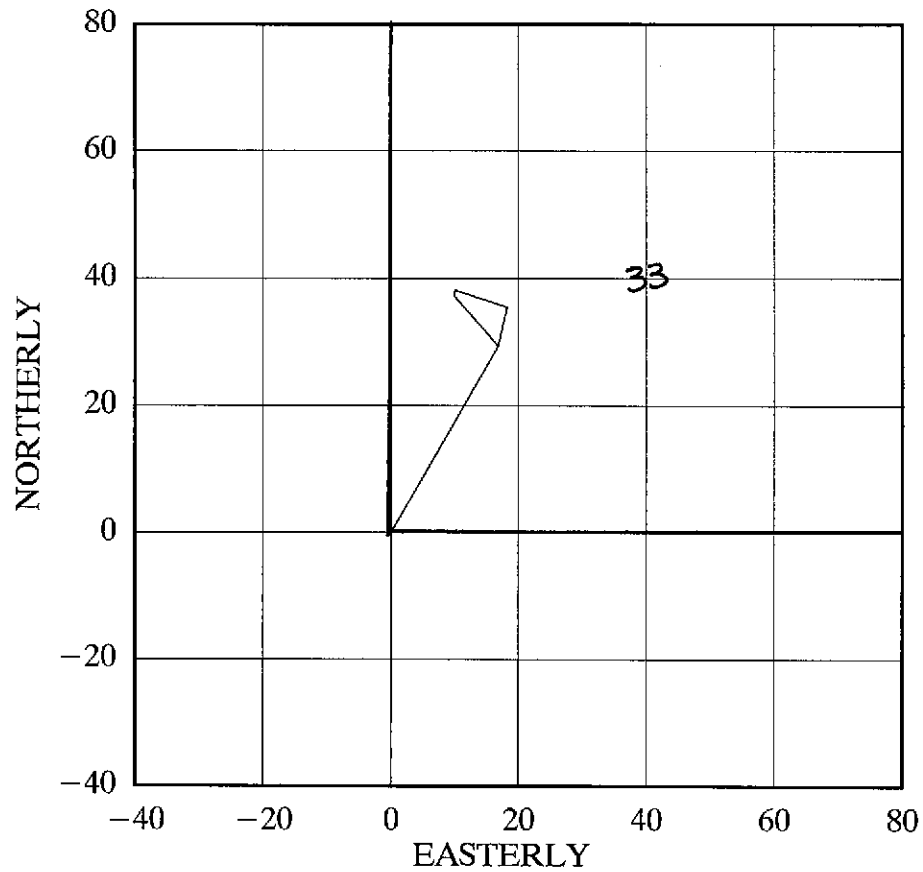
FOR 98-07614

RETURNED TO

NORTHERN REGION

NOVEMBER 7, 1995

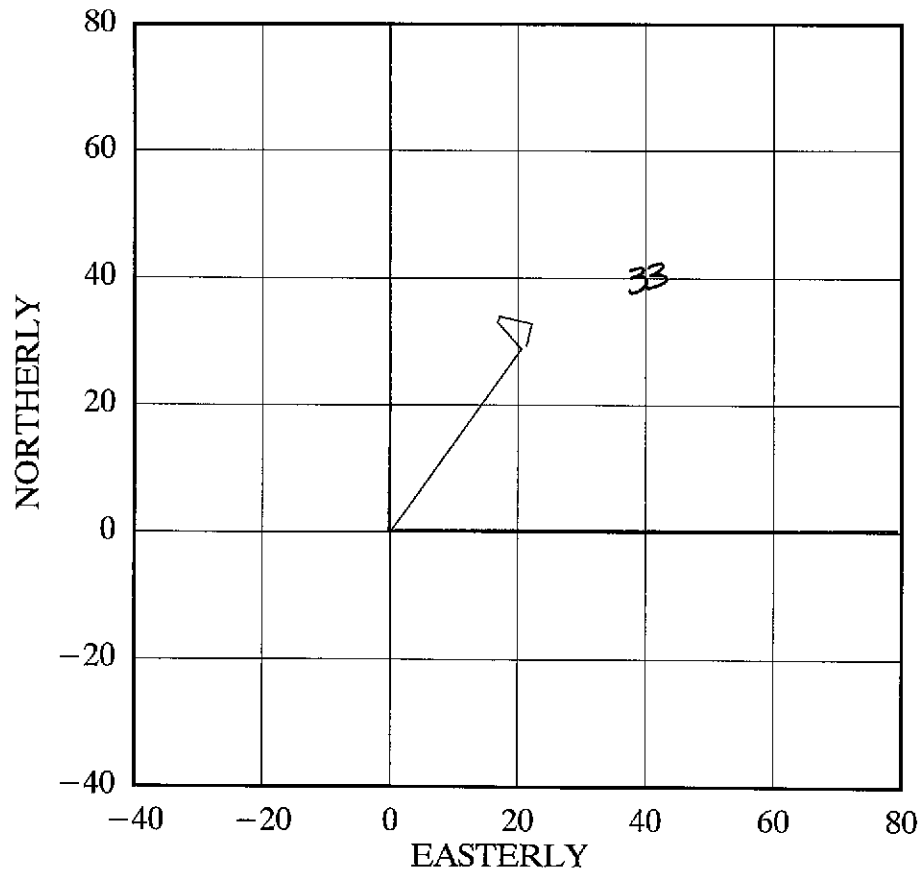
PARCEL PLOT - METES & BOUNDS
DISTANCE IS IN CHAINS



Parcel 47 Description
Approximately 3 acres

62 N
02 E
SEC 33
NWSW $\frac{1}{4}$ $\frac{1}{4}$

PARCEL PLOT - METES & BOUNDS
DISTANCE IS IN CHAINS



Parcel 44 Description
Approximately 1.09 acres

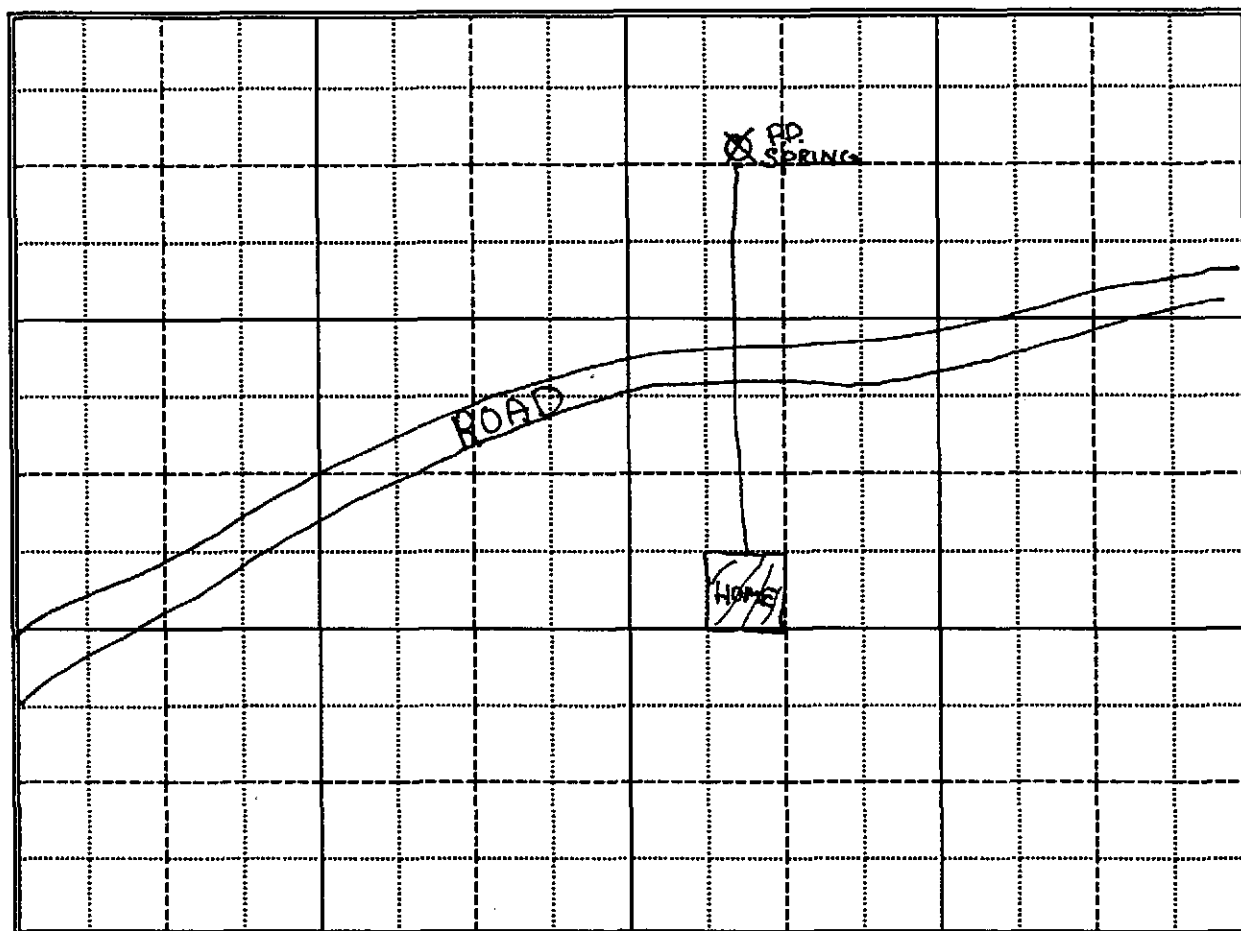
62 N
02 E
SEC 33
NWSW $\frac{1}{4}$ & NESW $\frac{1}{4}$'s

BC

98-07614

[illegible]

3. **Delivery System Diagram:** Indicate all major components and distances between components. Indicate weir size/ditch size/pipe i.d. as applicable.



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

*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
5 gallon BUCKET	BUCKET				5gall	

2. Measurements: 5gall w 40 SEC

E. NARRATIVE/REMARKS/COMMENTS

Spring supplies HOME with water
for HEATING, cooling, DOMESTIC, & IRRIGATION, stock.
IRRIGATION IS WITH GARDEN HOSES AND SPRINKLERS
ONLY.

Have conditions of permit approval been met? ☒ yes ☐ no

F. FLOW CALCULATIONS

____ Additional Computation Sheets Attached

Measured Method:

G. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) = 3 \times 3.5 = 7$$
$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 = .02 \times 245 \times 1.9835 = 9.7$$
$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} = 7$$

2. Volume Calculations for Other Uses:

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use		Rate of Diversion Q (cfs)	Annual Volume V (afa)
	From	To		
Domestic	01-01	12-31	.04	1.2
Cooling	05-01	09-30	.04	9.5
HEATING	10-01	04-30	.04	14.2
STOCKWATER	01-01	12-31	.01	7.2
IRRIGATION	04-01	11-01	.02	9.7
Totals:			.11	9.7

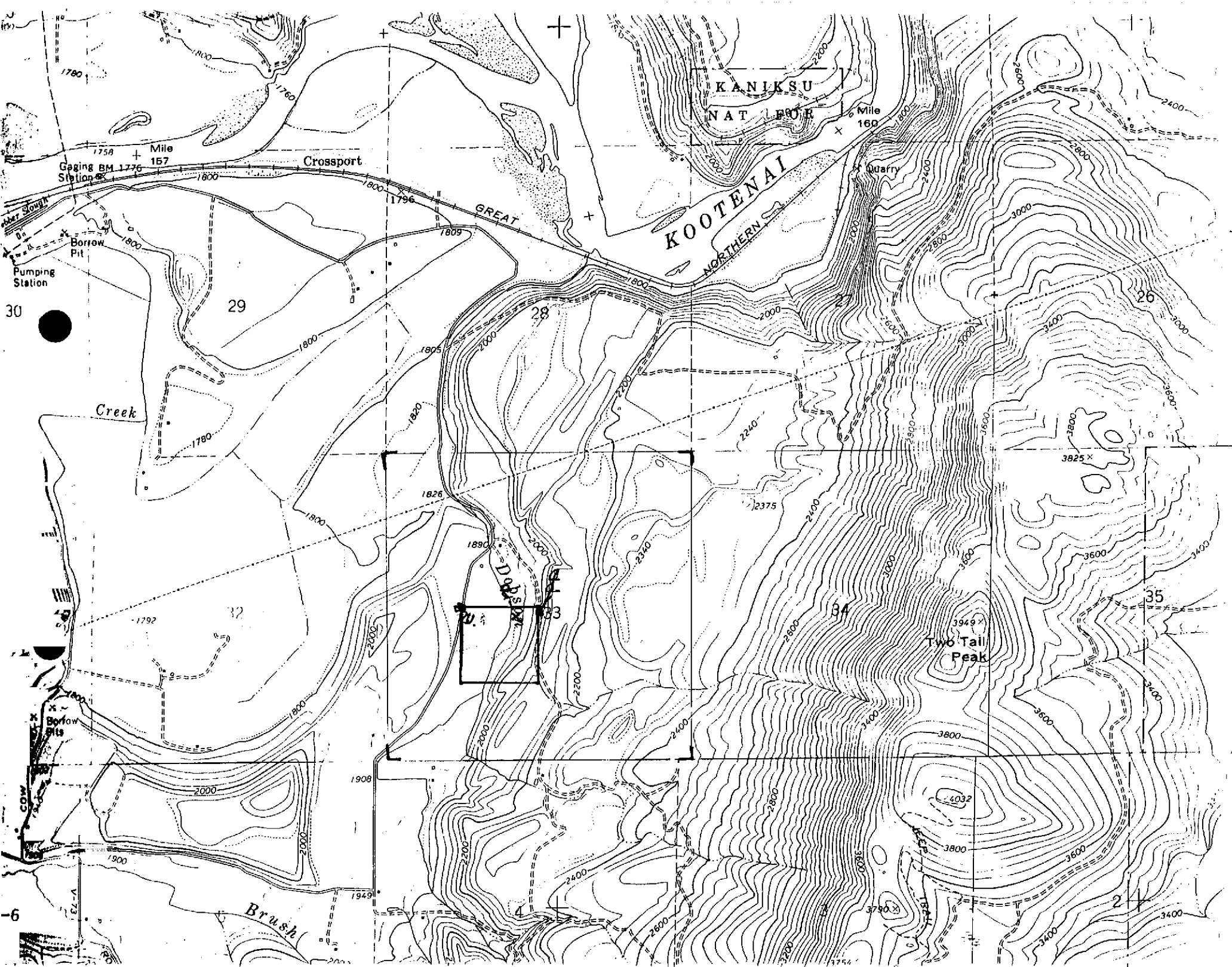
2. Recommended Amendments

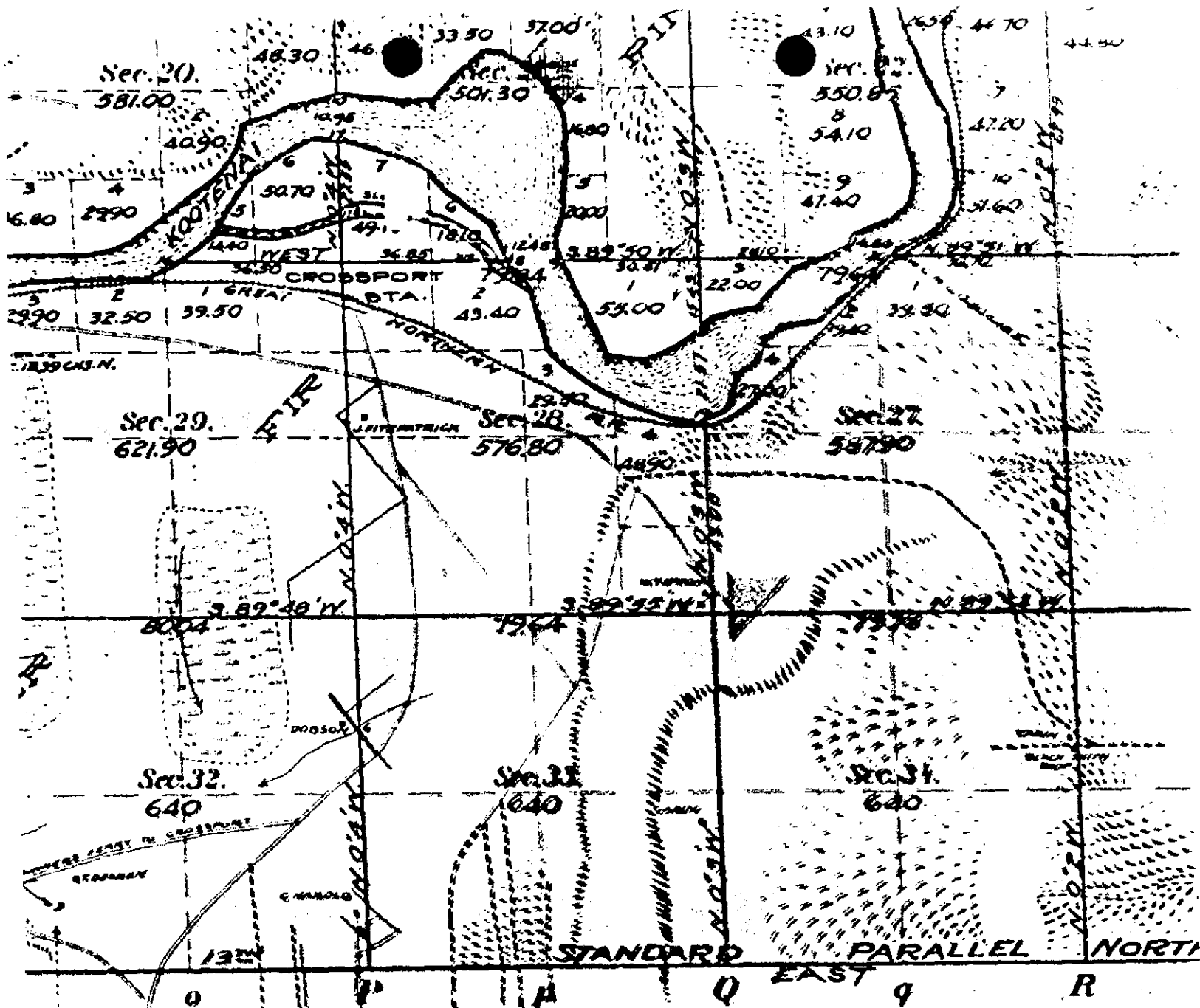
____ Change P.D. as reflected above ____ Add P.D. as reflected above ____ None
____ Change P.U. as reflected above ____ Add P.U. as reflected above ____ Other

I. AUTHENTICATIONField Examiner's Name TED McCracken Date 9-7-94

Reviewer _____ Date _____

SEAL





Published 1926, Sta. Total number of acres 21990.21

Date of Contract	Amount of Survey			When Surveyed	Mean Declination
192	M	Ac	sq		
May 9, 1895	11	75	52	June 22-25, 1895	
	39	20	69	June 28, July 2, 1895	22° 24' E.
	15	61	60	July 3-26, 1895	
	0	02	51	July 23-24, 1895	
	6	00	00	June 20-22, 1895	
Feb 11, 1893	6	00	00	April 27-29, 1893	

The
note

December 21, 1990

SCOT LINDSAY
P.O. BOX 295
BONNERS FERRY, ID 83805

PROOF ACKNOWLEDGMENT LETTER

RE: PERMIT NO. 98-07614

Dear Permit Holder:

The department acknowledges receipt of the proof of beneficial use form submitted for the above referenced permit. The next step in the process of developing a water right is for the department to conduct a field examination to determine and confirm the use being made of the water.

If you have questions concerning this matter, please feel free to contact the NORTHERN Regional Office in Coeur D' Alene at (208)765-4639.

Sincerely,

Rita Fleck
Secretary/Records Manager

c: IDWR - Region

MICROFILMED

FEB 08 1991

138143
July 31, 1990

SCOT LINDSAY
P.O. BOX 295
BONNERS FERRY, ID 83805

PROOF DUE NOTICE

RE: PERMIT NO. 98-07614

Dear Permit Holder:

One of the conditions of approval of the above referenced water permit was that proof of the extent of your beneficial use must be submitted to this office on or before October 1, 1990. (See last page of your approved permit or your last approved extension request.) Enclosed is a form which when accompanied by the license examination fee or a complete field examination report prepared by a certified water right examiner may be used to submit the required proof.

If you have not fully completed your project, and you or a previous owner of this permit have not received a prior extension of time, you may request an extension of time if the delay is for reasonable cause as provided in Section 42-204, Idaho Code. If you have been prevented from proceeding by a governmental agency or by litigation which might bring title to the water in question, more than one extension of time can be granted. An extension of time request form is enclosed for your convenience.

Either an acceptable proof of beneficial use submittal or an acceptable request for an extension of time must be received by this department on or before the above described proof due date. If neither is received, the department will send you a lapse notice. Within sixty (60) days of the mailing of the lapse notice, the permit will no longer be of any force nor effect.

SINCERELY,

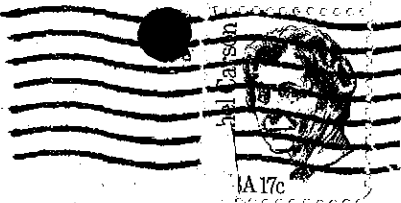
Rita Fleck
Secretary/Records Manager

Enclosures

MICROFILMED

FEB 08 1991

Lindsey
295
8380



RECEIVED

OCT 28 1985



NOT FILMED

FEB 08 1991

IDAHO DEPARTMENT OF WATER RESOURCES
STATEHOUSE

BOISE, IDAHO 83720

Department of Water Resources

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
COMMENCEMENT OF WORKS

Permit No.

98-7614

Name(s) of Permit Holder(s):

Scot Lindsay

Post Office Address:

Box 295
Bonners Ferry, ID.

Tel. No.

83805

☒ I hereby certify that construction of diversion works for the above referenced permit began on Sept 1 (date)

continue to develop the water system with due diligence to maintain a valid permit.

☐ I hereby certify that construction of diverting works on the above referenced project has not yet begun due to the following reason beyond my control*:

*Note: A financing difficulty is not an acceptable reason.

Date

10/23/85

Signature of Permit Holder

[Handwritten Signature]

MICROFILMED
FEB 08 1991

October 18, 1985

RE: Permit No. 98-7614

Scot Lindsay
Box 295
Bonners Ferry, ID 83805

Dear Permit Holder:

Enclosed is a copy of your approved Application for Permit. We direct your attention to the conditions of approval on the fourth page.

Please note the requirement that as a permit holder you must commence the excavation or construction of diverting works within one year of the date the permit was issued, and you must proceed diligently until the project is completed. The enclosed blue card must be completed and returned to this office as soon as you commence construction, no later than one year from the date the permit was approved.

We have enclosed a form entitled "Instructions for Proof of Beneficial Use". Please read the instructions carefully since you must take further action to develop this permit into a license.

Sincerely,

JIM JOHNSON
Water Rights Supervisor

JJ:sc
Enclosure

MICROFILMED

Memo

TO: FILE

FROM: J. W.

10-10-85

RE: APPLICATION 98-7614

AFTER reviewing the information Mr. Lindsay sent in response to my 9-17-85 correspondence it became apparent to me why Mr Lindsay listed 1.93 cfs for heating and cooling on the application.

Mr Lindsay after reviewing Tetco information brochure, see file, knew he would be using a system that used a flow of 8 gpm, however, when he converted the 8 gpm to cfs he used the wrong conversion factor. The amount he used is equivalent to 866 gpm.

Using the guide lines for determining rate of flow required for heating outlined in The Dept. Admin Memo of 5-9-84, revised, I determined a rate required of about 0.04 cfs.

I telephonically informed Mr

Lindsay of this and adjusted his application.

I also informed Mr Lindsay that a refund of \$35.00 would be made.

MICROFILMED

MEMO

10-10-85

TO: FILE

FROM: JIM

RE: FLOW REQUIREMENTS FOR HEATING

Revised Calculations based upon information provided 10-3-1985

Determine: W = Quantity in gpm

Use Formula:

$$W = Q / 500 (\Delta T_s)$$

Solution:

$$Q = [e \cdot \Delta T] A \quad e = \text{house eff.} \\ = 1.11$$

$$\Delta T = t_i - t_o = 70^\circ - 8^\circ = 62$$

$$A = \text{House Area} = 2000 \text{ ft}^2$$

$$\Delta T_s = \text{Heat load} = \text{Temp. drop} = 0.6 (s - t)$$

$$s = \text{wtr temp.} = 42^\circ$$

$$t = \text{temp reg.} = 70^\circ$$

$$\Delta T_s = 0.6 (42^\circ - 70^\circ) = 16.8^\circ$$

$$W = \frac{[e \cdot \Delta T] A}{500 (\Delta T_s)} = \frac{[1.11 \cdot 62] 2000}{500 (16.8)}$$

$$W = 16.4 \text{ gpm} = 0.036 \text{ cfs.}$$

MICROFILMED

Lindsay-Helmer Hardware, Inc.

H. BOYD LINDSAY — DON B. LINDSAY

QUALITY HARDWARE — PLUMBING SUPPLIES — ROOFING MATERIALS

SPORTING GOODS — PAINTS AND OILS — LOGGING SUPPLIES

STOVES AND FURNACES — APPLIANCES

P. O. BOX 359

BONNERS FERRY, IDAHO 83805

RECEIVED

OCT 3 1985

Department of Water Resources

PHONE 267-3755

9/30/85

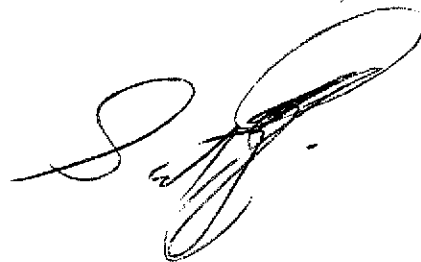
Dear Sir:

In reference to permit # 98-7614,
Here are some photo copies of Tetra brand
heatpumps. There are different brands on the market.

If you want more information, come talk to
me in person and I will show you
my book of information. It is about 2" thick
and I won't copy it for you. Too many \$ involved.

Please inform me as to what is
happening.

Thanks,



208-267-3755 Week#
8 AM - 5 PM

MICROFILMED



State of Idaho

DEPARTMENT OF WATER RESOURCES

STATE OFFICE, 450 W. State Street, Boise, Idaho

JOHN V. EVANS
Governor

A. KENNETH DUNN
Director

Mailing address:
Statehouse
Boise, Idaho 83720
(208) 334-4440

September 17, 1985

RE: Application for Permit No. 98-7614

Scot Lindsay
Box 295
Bonners Ferry, ID 83805

Dear Mr. Lindsay:

We are in the final review processing of the above referenced application and we find that we need more information concerning the amount of water you requested for heating and cooling.

Your application lists 1.93 cfs, however, according to acceptable standards used for designing heating and cooling systems for households, using the little information that we have, this amount appears excessive. Our estimates indicate that only 0.03 cfs would be required, using certain assumptions.

Therefore, rather than approving the application with an amount that appears excessive, we ask that you supply us with information that shows that 1.93 cfs is required. If we do not hear from you in 30 days on this matter, we will assume that our calculations are correct and will reduce the rate from 1.93 cfs to 0.03 cfs.

If you have any questions or if we can provide assistance, please feel free to contact our office.

Sincerely,

A handwritten signature in cursive script, reading "Jim Johnson", is written over a horizontal line.

JIM JOHNSON
Water Rights Supervisor

JJ:sc

MICROFILMED

TETCO

THERMAL ENERGY TRANSFER CORPORATION

Manufacturers of Ground Water Source Heating and Cooling Equipment

378 WEST OLENTANGY • DRAWER C • POWELL, OHIO 43065 • 614-889-6654

DOLLAR & SENSE ENERGY CONSERVATION FOR HEATING & COOLING YOUR HOME

The TETCO Geothermal Heat Extractor is the most exciting innovation to hit the heating and cooling industry in years. Using a readily available, renewable, and free natural resource as energy, the Heat Extractor can heat most homes more efficiently than any other type of system. Rising energy costs will make the initial attractiveness of the Geothermal Heat Extractor continue to increase in the coming years.

Essentially, the TETCO Geothermal Water-to-Air Heat Extractor works like a refrigerator. When a gallon of warm water is placed inside the refrigerator, the heat is removed from the water, dropping its temperature several degrees. The heat removed from the water is expelled into the kitchen. Likewise, the Geothermal Water-to-Air Heat Extractor cools many gallons of water, "expelling" the heat into the entire house. The advantage of the system is that the heat extracted from the well water is free energy — the only energy that you pay for is the energy needed to run the system.

The cost effectiveness of geothermal heat extractors has been proven time and time again. In Ohio, the TETCO Geothermal Water-to-Air Heat Extractors are reducing heating cost by up to 70% or more, without resorting to complex, unproven technology. The TETCO Heat Extractors can provide the simple, low-cost solution that most people are looking for.

The Geothermal Water-to-Air Heat Extractor tremendously out-performs air-to-air heat pump systems. While the air-to-air system labors in extremely cold weather at drastically reduced capacity and efficiency, the Geothermal-to-Air Heat Extractor runs smoothly at constant capacity and efficiency, using as its energy source water as cold as 40°F.

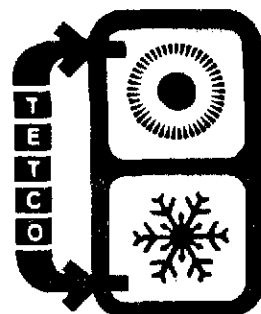
In the summer months when air conditioning is required, the TETCO Geothermal Cooling Coil absorbs the heat from the house, expelling it directly into the cooler well water. This eliminates the energy required to run a compressor and outdoor fan, saving you even more money while keeping your home comfortably cool.

Unfortunately, not all homeowners can take advantage of Geothermal Water-to-Air heating and cooling systems. But if you either have or can obtain an adequate supply of well water, you cannot match the TETCO Geothermal Cooling Coil's or Geothermal Heat Extractor's performance with any other system.

TETCO Geothermal Systems save the homeowner money! In fact, not only do they save homeowners money, but they also make them money because they increase the resale value of their home. In most cases, the TETCO System actually increases the value of the home by more than the cost of the equipment. For most homeowners there is no other system available today that can heat and cool their home as efficiently, and therefore as inexpensively, as the TETCO geothermal heating and cooling equipment.

FOR ADDITIONAL INFORMATION CONTACT:

LINDSAY HELMER HARDWARE INC.
BONNERS FERRY, IDAHO



MICROFILMED

THE GEOTHERMAL HEAT EXTRACTOR ADVANTAGES

SAVINGS — The TETCO Geothermal Heat Extractor has been designed to maximize savings. In central Ohio, the TETCO Heat Extractor can save, annually, up to 70% of the energy required to heat a home with an electric furnace.

SOARING SAVINGS — As energy costs increase, the amount of dollars saved by the TETCO Geothermal Heat Extractor increases. If the Heat Extractor saved \$808 in an average winter at today's rates and the rates increased 10% per year, ten years from now, the savings would be \$2,095 in an average winter.

PAYS FOR ITSELF — The TETCO unit pays in two ways — increased value to the structure to which it is added, and lower purchased energy cost. Prospective homeowners have demonstrated a willingness to spend an additional \$6.00 at the time of purchase of their home for every \$1.00 saved on energy cost per year. During a typical winter in Central Ohio, a typical home with 72,000 B.T.U.H. heat loss can save \$660 @ 4¢ per K.W.H. using a TETCO Geothermal Heat Extractor over an electric furnace. Therefore, the TETCO unit increases the value of the home by \$3,960 which is over the installed cost of the system, if the homeowner has a well. (If energy cost increased 14% per year, the increased value of the home due to the TETCO Geothermal Heat Extractor system would be \$12,800 ten years from now.)

SIZING — TETCO Model HECWE-050 Geothermal Heat Extractor is suitable for most homes. The table below shows its typical performance during a typical winter in Columbus, Ohio.

DESIGN HEATING LOAD (B.T.U.H.)	60,000	90,000	120,000	150,000
% KILOWATTS SAVED	68.1	66.7	62.0	56.2
KILOWATTS SAVED	13,755	20,199	25,059	27,865
DOLLARS SAVED @ 4¢ PER K.W.H.	\$550.20	\$807.96	\$1,002.36	\$1,114.60
DOLLARS SAVED @ 6¢ PER K.W.H.	\$825.30	\$1,211.94	\$1,503.54	\$1,671.60

K.W. DEMAND SAVINGS — Electric utilities, in many areas, bill their customer for two things. The first is total kilowatt hours of power consumed. The second is the quantity of kilowatts used at any one time. Air source heat pumps do reduce the total power consumed, but at low outdoor temperatures do little or nothing to reduce the quantity required (K.W. demand). The TETCO Geothermal Heat Extractor reduces the K.W. demand for heating by up to 70%, providing substantial additional savings.

HOME LOAN APPROVALS — Many bankers are seeing energy-saving devices as the key for qualifying homeowners for mortgage loans. (Each \$15 added to a monthly fuel bill can reduce home buying power by \$1,725 based on a 40-year mortgage at 10¼%.)

SELLING YOUR HOME — The less it costs to live in your home, the more buyers can afford to spend to purchase it. A \$55 reduction in average heating bills means the prospective buyer can pay \$6,330 more for the home (based on a 40-year mortgage at 10¼%) without increasing the combined total of mortgage and utility payments.

EQUIPMENT LIFE — Geothermal Heat Extractors have many advantages over air source heat pumps that extend their years of service. A few are listed below:

1. The Geothermal Heat Extractor's compression ratio is 2.9 to 3.7 — about half as much as air source heat pumps.
2. The Geothermal Heat Extractor provides more heat per hour, so is required to work fewer hours to heat your home.
3. The entire Geothermal Heat Extractor is contained within the home, therefore, is not subjected to temperature extremes which cause refrigeration and lubrication problems for the compressor in most air source heat pumps.

COMFORT — Household comfort is determined by air temperature, cleanness, draftiness, and humidity. The Heat Extractor can add comfort beyond conventional heat pumps by supplying more warmth with less air movement.

DEPENDABLE — The TETCO Geothermal Heat Extractor's singleness of purpose and simplicity of design backed by the individual attention given to each and every unit are setting a new quality standard for vapor-compression heating devices. The troublesome devices required by air source heat pumps (reversing valves, defrost controls, etc.) are not required in the TETCO Geothermal system.

RELIABLE — The TETCO Heat Extractor is manufactured to quality standards that far surpass those of other heating manufacturers.

EQUIPMENT SAVINGS — The TETCO Geothermal Heat Extractor can be added to most existing heating systems, allowing homeowners to continue using their existing air conditioners, humidifiers, and air cleaners.

SERVICEABLE — The TETCO Geothermal Heat Extractor's controls are located in the heated structure, allowing the unit to be comfortably serviced in any type of weather, reducing service time and increasing the quality of service.

GEOHERMAL HEAT EXTRACTOR VERSUS: L.P. GAS, ELECTRIC, OIL, NATURAL GAS and SOLAR

Careful consideration must be given to cost when up-dating your present heating system or selecting a heating system for your new home. Consideration must be given not just to first cost, but both to first cost and operating expense. In this comparison, we are showing the average amount of useful heat obtained for each dollar expended for home heating.

Purchased energy costs vary considerably; therefore, you and your TETCO dealer or architect should calculate an energy cost comparison for your home using energy sources and rates available to you.

The following energy cost comparison is representative for Central Ohio in November of 1979. In this comparison, we are determining the average amount of heat (British Thermal Units) that can be obtained for one dollar during an average winter.

L.P. GAS FURNACE—cost per gal. = \$.65, S.P.F. = .45	USABLE HEAT 63,690 B.T.U.
OIL FURNACE—cost per gal. = \$1.00, S.P.F. = .45	USABLE HEAT 64,800 B.T.U.
ELECTRIC FURNACE—cost per K.W.H. = \$.03, S.P.F. = 1.0	USABLE HEAT 113,770 B.T.U.
NATURAL GAS FURNACE—cost per 100 C.F. = \$.34, S.P.F. = .45	USABLE HEAT 137,650 B.T.U.
SOLAR SYSTEM—cost per K.W.H. = \$.03, S.P.F. = 2.0	USABLE HEAT 227,530 B.T.U.
TETCO GEOHERMAL—cost per K.W.H. = \$.03, S.P.F. = 3.4	USABLE HEAT 386,800 B.T.U.

In the above comparisons, the cost of electric energy to operate blowers and controls has been omitted for gas and oil furnaces, but included in all other systems. S.P.F. = Seasonal Performance Factor.

GEOHERMAL HEAT EXTRACTOR VERSUS: THE HEAT PUMPS, AIR-TO-AIR

Air-to-air heat pumps capacity and efficiency change with the outdoor temperature. When the home requires the most amount of heat, the heat pump provides the least amount of heat at its highest cost.

The following energy comparison is at the Air-Conditioning and Refrigeration Institute's Standard Rating Conditions, low temperature heating, 17°F. In this comparison, we are determining the K.W.H. of energy saved per hour of operation in Central Ohio.

SIZE	BRAND	MODEL	SAVINGS
2 ton	General Electric Company	BWR924C	1.5 KWH
2½ ton	General Electric Company	BWR930A	2.6 KWH
3 ton	General Electric Company	BWR936A	3.1 KWH
3½ ton	General Electric Company	BWR942A	3.8 KWH
4 ton	General Electric Company	BWR948A	4.3 KWH
5 ton	General Electric Company	BWN960A	5.1 KWH
*	Thermal Energy Transfer (TETCO)	HECWE-050	9.0 to 11.0 KWH

*The TETCO Model HECWE-050 Geothermal Heat Extractor replaces all of the above size units.

Data for General Electric Heat Pumps obtained from Air-Conditioning and Refrigeration Institute's Directory of Certified Air-Source Unitary Heat Pumps.

PERFORMANCE DATA

TETCO GEOTHERMAL HEAT EXTRACTOR MODEL HECWE-050

Water Temp °F	Water G.P.M. ¹⁰	Air Flow C.F.M.	HEAT EXTRACTOR			BLOWER ALLOWANCE ³		PUMP ALLOWANCE	TOTAL HEAT EXTRACTOR SYSTEM ⁵					REFRIGERANT		
			Capacity B.T.U.H.	Watts	Amps ²	Capacity B.T.U.H.	Watts	Watts	Capacity B.T.U.H.	Watts	E.E.R. ⁶	C.O.P. ⁷	Temp. Rise °F	Discharge P.S.I.G.	Suction P.S.I.G.	Compression Ratio ⁸
62	5	1,800	53,000	3,630	16.1	2,250	657	314	55,250	4,601	12.00	3.52	28.4	212	63.5	2.90
		1,600	52,500	3,720	16.4	2,000	584	314	54,500	4,618	11.80	3.46	31.5	202	64.2	2.98
		1,400	52,000	3,775	16.8	1,750	511	314	53,750	4,600	11.69	3.42	35.6	228	64.6	3.06
		1,200	51,300	3,863	17.2	1,500	438	314	52,800	4,615	11.44	3.35	40.7	243	65.6	3.21
		1,000	51,000	3,975	17.9	1,250	365	314	52,250	4,654	11.23	3.29	48.4	262	66.7	3.40
57	5	1,800	50,000	3,480	15.6	2,250	657	314	52,250	4,451	11.74	3.44	26.9	207	59.5	2.99
		1,600	49,700	3,555	16.0	2,000	584	314	51,700	4,453	11.61	3.40	29.9	214	59.8	3.07
		1,400	49,200	3,615	16.3	1,750	511	314	50,950	4,440	11.48	3.36	33.7	222	60.4	3.15
		1,200	48,600	3,695	16.7	1,500	438	314	50,100	4,437	11.29	3.31	38.7	235	61.2	3.29
		1,000	47,700	3,805	17.2	1,250	365	314	48,950	4,484	10.92	3.27	45.3	253	62.2	3.48
52	5	1,800	46,600	3,315	15.0	2,250	657	314	48,850	4,286	11.40	3.34	25.1	199	54.3	3.09
		1,600	46,200	3,395	15.3	2,000	584	314	48,200	4,297	11.22	3.29	27.9	206	54.6	3.18
		1,400	45,800	3,458	15.6	1,750	511	314	47,550	4,283	11.10	3.25	31.5	213	54.9	3.27
		1,200	45,200	3,540	16.0	1,500	438	314	46,700	4,292	10.88	3.19	36.0	222	55.6	3.36
		1,000	44,300	3,645	16.4	1,250	365	314	45,550	4,324	10.53	3.09	42.2	241	56.2	3.60
47	5	1,800	43,100	3,150	14.4	2,250	657	314	45,350	4,122	11.00	3.22	23.3	193	50.0	3.21
		1,600	42,800	3,225	14.8	2,000	584	314	44,800	4,123	10.87	3.18	25.9	200	50.6	3.29
		1,400	42,500	3,295	15.0	1,750	511	314	44,250	4,120	10.74	3.15	29.3	203	50.9	3.32
		1,200	42,100	3,372	15.4	1,500	438	314	43,600	4,124	10.57	3.10	33.6	217	51.2	3.52
		1,000	41,500	3,480	15.7	1,250	365	314	42,750	4,159	10.28	3.02	39.6	232	51.8	3.71
42	8	1,800	43,500	3,170	14.6	2,250	657	502	45,750	4,339	10.54	3.09	23.5	195	50.6	3.16
		1,600	43,300	3,245	14.8	2,000	584	502	45,300	4,231	10.46	3.07	26.2	200	51.0	3.27
		1,400	42,900	3,305	15.1	1,750	511	502	44,650	4,318	10.34	3.03	29.5	207	51.3	3.36
		1,200	42,500	3,385	15.5	1,500	438	502	44,000	4,325	10.17	2.98	33.9	218	51.8	3.50
		1,000	41,800	3,490	15.9	1,250	365	502	43,050	4,357	9.88	2.90	39.9	233	52.4	3.69
37	14	1,800	42,900	3,135	14.4	2,250	657	879	45,150	4,671	9.66	2.83	23.2	192	50.0	3.20
		1,600	42,700	3,205	14.7	2,000	584	879	44,700	4,688	9.54	2.80	25.9	197	50.3	3.26
		1,400	42,200	3,270	15.0	1,750	511	879	43,950	4,660	9.43	2.76	29.1	204	50.6	3.35
		1,200	41,750	3,345	15.3	1,500	438	879	43,250	4,662	9.28	2.72	33.4	214	50.9	3.49
		1,000	41,000	3,450	15.6	1,250	365	879	42,250	4,694	9.00	2.64	39.1	228	51.2	3.68

NOTES:

1. All data is based on 70°F air into Heat Extractor (70°F return air) and 230 volt power supply. Factors for other than 70°F return air:

	60°F	80°F
Heat Extractor Capacity	1.03	.96
Heat Extractor Watts	97	1.04

- Heat Extractor amps are for compressor and control circuit. For amp draw at voltages other than 230 volt, use the following multipliers: 250V - 0.92; 240V - 0.96; 220V - 1.05; 208V - 1.11.
- Indoor blower motor watts and motor heat allowance figured at A.R.I. recommended rate of 365 watts and 1250 B.T.U.H. per 1000 C.F.M. of air moved.
- Pump motor allowance is based on 100 feet T.D.H. and 30% wire to water efficiency.
- Total Heat Extractor system capacity includes Heat Extractor and blower allowance. Total Heat Extractor watts includes Heat Extractor, blower allowance, and pumping allowance. If blower and pumping allowance are not included then E.E.R. would be as high as 15.0 and C.O.P. as high as 4.4.
- E.E.R. is Energy Efficient Ratio. A ratio calculated by dividing the heating capacity in B.T.U.H. by power input in watts.
- C.O.P. is Coefficient of Performance. A ratio calculated by dividing capacity in watts by power input in watts.
- Compression ratio equals (Head pressure + 14.7) divided by (Suction pressure + 14.7).
- Seasonal performance factor is the same as the Heat Extractor C.O.P. as long as heat loss of the structure does not exceed Heat Extractor capacity. Use the Bin Energy Estimate Method when Heat Extractor capacity is exceeded by heating load.
- Minimum Values. Slightly higher capacities available at higher water flow.

GEOTHERMAL HEAT EXTRACTOR SEASONAL PERFORMANCE

Job & Location COLUMBUS, OHIO Equipment Data HECWE-050

Design Water Data: TEMP 52° G.P.M. 5 PUMP WATTS 314

Design Air Temperature Data: I.D. 75 O.D. -5 DIFF. 80

Load B.T.U.H. Data: HEATING 90,000 COOLING 30,000 C.F.M. 1,000

Geothermal Extractor C.O.P. = $\frac{\text{B.T.U.H. Heat Capacity (Heat Extractor + Blower)}}{3.413 \times \text{Watts (Heat Extractor + Blower + Pump)}}$

Geothermal Extractor C.O.P. = $\frac{(44,300 + 1,250)}{3.413 \times (3645 + 365 + 314)} = (3.09)$

SUPPLEMENTARY DEGREE HOUR CALCULATIONS

Outdoor Temp. (5° Increments)	BTUH Loss Per 1°F (Heat Loss ÷ TD)	Outdoor Temp. Below 65°F (65 - Column A)	Heat Loss (BTUH) B × C	Heat Extractor Heating Capacity (BTUH) Mfr. Data	Seasonal Heating Hours U.S.W.B.	Supplemental Degree Hours F (D - E) ÷ B	Total Degree Hours C × F	
A	B	C	D	E	F	G	H	
62	1,125	3	3,375	45,550	720		2,160	
57	Constant	8	9,000	Constant	648		5,184	
52		13	14,625		622		8,086	
47		18	20,250		603		10,854	
42		23	25,875		658		15,134	
37		28	31,500		730		20,440	
32		33	37,125		772		25,476	
27		38	42,750		502		19,076	
22		43	48,375		280	703	12,040	
17		48	54,000		169	1,269	8,112	
12		53	59,625		94	1,176	4,982	
7		58	65,250		40	700	2,320	
2		63	70,875		20	450	1,260	
-3		68	76,500		10	275	680	
-8		73	82,125		4	130	292	
-13		78	87,750		1	37	78	
-18		83						
I = Heat Loss vs. Degree Day Interim Factor					TOTALS	4,740	136,174	

Outdoor Design Temp.	°F	-20	-10	0	+10	+20
Interim Factor	I	0.57	0.64	0.71	0.79	0.89

Annual Resistance Heat = [(B) 1,125 x (H) 136,174 x (I) .675] / 3,413 = (J) 30,298 KWH

Annual Supplementary Heat = [(B) 1,125 x (G) 4,740 x (I) .675] / 3,413 = (K) 1,055 KWH

Annual Heat = (J) 30,298 - (K) 1,055 + (K) 1,055 = (L) 10,519 KWH

Extractor System (Equipment C.O.P.) 3.09

Annual Savings = (J) 30,298 - (L) 10,519 = 19,779 KWH @.06 = \$ 1,186.74

CAUTION: This form will provide an accurate comparison between Geothermal Heat Extractor operation and electric furnace operation only.

THE GEOTHERMAL COOLING COIL ADVANTAGES

SAVINGS — The TETCO Geothermal Cooling Coil has been designed to maximize savings. In central Ohio, the TETCO Geothermal Cooling Coil can save, annually, up to 85% of the energy required to cool a home.

SOARING SAVINGS — The TETCO units pay in two ways — increased value to the structure to which it is added, and lower purchased energy cost. Prospective homeowners have demonstrated a willingness to spend an additional \$6.00 at the time of purchase of their home for every \$1.00 saved on energy cost per year. During a typical summer in central Ohio, a typical home with 36,000 B.T.U.H. heat gain can save \$135 @ 4¢ per K.W.H. using a TETCO Geothermal Cooling Coil over an electric air conditioner. Therefore, the TETCO unit increase the value of the home by \$810 which is over the installed cost of the system, if the homeowner has a well. (If energy cost increased 10% per year, the increased value of the home due to the TETCO Geothermal Cooling Coil system would be \$1,910 ten years from now).

SIZING — TETCO Model HEEWA-02 Geothermal Cooling Coil is suitable for most homes. The table on the next page shows its performance.

K.W. DEMAND SAVINGS — Electric utilities, in many areas, bill their customer for two things. The first is the total kilowatt hours of power consumed; the second is the quantity of kilowatts used at any one time. The TETCO Geothermal Cooling Coil reduces the K.W. demand for cooling by up to 80%, providing substantial additional savings.

HOME LOAN APPROVALS — Many bankers are seeing energy saving devices as the key for qualifying homeowners for mortgage loans. (Each \$15 added to a monthly fuel bill can reduce home buying power by \$1,725 based on a 40-year mortgage at 10%.)

SELLING YOUR HOME — The less it costs to live in your home, the more buyers can afford to spend to purchase it. A \$15 reduction in average cooling bills means the prospective can pay \$1,725 more for the home (based on a 40-year mortgage at 10%) without increasing the combined total of mortgage and utility payments.

EQUIPMENT LIFE — Geothermal Cooling Coils have many advantages over air source heat pumps. A few of these advantages are listed below:

1. The Geothermal Cooling Coil has no compressor, no defrost control, no expansion valve, no reversing valve, etc.
2. The Geothermal Cooling Coil has only one moving part, the solenoid valve to turn the water on when cooling is required and off when cooling is not required.

COMFORT — Household comfort is determined by air temperature, cleanness, draftiness, and humidity. The Geothermal Cooling Coil can add comfort beyond conventional heat pumps by supplying more dehumidifying with less air movement.

DEPENDABLE — The TETCO Geothermal Cooling Coil's singleness of purpose and simplicity of design backed by the individual attention given to each and every unit are setting a new quality standard for cooling devices. The troublesome devices required by air source heat pumps (reversing valves, defrost control, expansion valve and compressor) are not required in the TETCO Geothermal Cooling Coil.

EQUIPMENT SAVINGS — The TETCO Geothermal Cooling Coil can be added to most existing heating systems, allowing homeowners to continue using their existing furnaces, humidifiers, and air cleaners.

RELIABLE — The TETCO Heat Extractor is manufactured to quality standards that far surpass those of other heating manufacturers.

WATER CONDITIONS — Geothermal Coils are made of copper tubes inside aluminum fins. If the ground water in your area is too acid to allow the use of copper water tubing, it is too acid for direct ground water air conditioning.

Because the well water isn't heated more than a few degrees and the solenoid valve is located on the leaving side of the unit, Geothermal Cooling Coils are not particularly subject to scaling. In areas of hard water, it is advisable to valve the water inlet and outlet so that chemical cleaning can be performed as needed.

WATER DISPOSAL — The same methods that are used for Geothermal Heat Extractor water disposal are applicable to direct ground water air conditioning. These methods include return wells, disposal to lakes and streams, etc. Naturally, it is always desirable to have the plumbing so arranged to allow for secondary use of the discharge water, such as lawn and garden watering when the ground conditions warrant it and to use other disposal means the rest of the time.

PERFORMANCE DATA

TETCO GEOTHERMAL COOLING COIL MODEL HEEWA-02

CONDITIONS: 80°F DRY BULB; 67°F WET BULB

Water G.P.M.	Air Flow C.F.M.	40°F WATER			45°F WATER			50°F WATER			55°F WATER		
		BTUH	EER	S/T	BTUH	EER	S/T	BTUH	EER	S/T	BTUH	EER	S/T
4	800	37,400	68.9	.643	32,500	59.9	.679	25,700	47.3	.757	18,900	34.8	.899
	1000	39,700	64.5	.681	34,500	56.0	.724	27,200	44.2	.818	20,000	32.5	.987
	1200	41,700	60.5	.717	36,200	52.5	.769	28,600	41.5	.878	21,000	30.5	1.000
	1400	42,900	56.3	.759	37,300	49.0	.816	29,500	38.7	.941	21,600	28.3	1.000
	1600	44,000	52.7	.797	38,200	45.7	.864	30,200	36.2	1.000	22,200	26.6	1.000
	1800	44,900	49.4	.837	39,000	43.0	.910	30,800	33.9	1.000	22,600	24.9	1.000
6	800	43,600	65.2	.613	37,900	56.7	.640	29,900	44.7	.703	22,000	32.8	.822
	1000	47,000	63.3	.638	40,900	55.1	.672	32,300	43.5	.748	23,700	31.9	.886
	1200	50,080	62.1	.661	44,000	54.0	.698	34,800	42.7	.786	25,500	31.3	.941
	1400	53,900	60.7	.681	46,900	52.8	.725	37,000	41.7	.821	27,200	30.6	.990
	1600	56,400	58.7	.704	49,100	51.1	.753	38,700	40.3	.857	28,400	29.6	1.000
	1800	59,000	57.1	.724	51,300	49.6	.777	40,500	39.2	.890	29,700	28.7	1.000
8	800	46,500	58.6	.603	40,400	50.9	.627	31,900	40.2	.684	23,500	29.6	.793
	1000	51,100	58.9	.621	44,400	51.2	.651	35,100	40.5	.717	25,800	29.8	.845
	1200	55,750	59.3	.638	48,500	51.6	.672	38,300	40.7	.744	28,100	29.9	.887
	1400	60,000	59.3	.652	52,200	51.6	.691	41,200	40.7	.774	30,200	29.8	.925
	1600	63,500	58.5	.669	55,200	50.8	.711	43,600	40.1	.801	32,000	29.5	.964
	1800	66,900	57.7	.684	58,100	50.1	.730	45,900	39.6	.826	33,750	29.1	.999
10	800	47,500	51.6	.600	41,300	44.9	.623	32,700	35.5	.678	24,000	26.1	.783
	1000	53,500	53.9	.613	46,600	46.9	.640	36,800	37.1	.704	27,000	27.2	.822
	1200	58,500	54.9	.627	50,800	47.7	.660	40,200	37.7	.731	29,500	27.7	.862
	1400	63,300	55.6	.641	55,000	48.3	.676	43,400	38.1	.753	31,900	28.0	.895
	1600	69,300	57.2	.647	60,300	49.8	.684	47,600	39.3	.765	34,900	28.8	.912
	1800	73,500	57.2	.658	63,900	49.7	.698	50,500	39.3	.784	37,000	28.8	.940
12	800	49,500	47.4	.595	43,000	41.1	.615	34,000	32.5	.667	25,000	23.9	.768
	1000	55,300	49.5	.607	48,100	43.0	.633	38,000	34.0	.693	27,900	25.0	.808
	1200	60,800	51.0	.620	52,800	44.3	.650	41,700	35.0	.717	30,700	25.8	.844
	1400	66,700	52.8	.629	58,000	45.9	.661	45,800	36.2	.734	33,600	26.6	.867
	1600	71,600	53.6	.639	62,200	46.5	.675	49,100	36.7	.752	36,100	27.0	.894
	1800	76,000	53.9	.650	66,100	46.9	.688	52,200	37.0	.770	38,300	27.2	.920
14	800	50,700	43.3	.592	44,100	37.7	.611	34,800	29.7	.661	25,600	21.9	.758
	1000	57,300	46.1	.602	49,900	40.1	.626	39,400	31.7	.683	28,900	23.2	.792
	1200	63,500	48.2	.612	55,250	42.0	.639	43,600	33.1	.703	32,000	24.3	.821
	1400	69,000	49.6	.622	60,000	43.2	.653	47,400	34.1	.722	34,800	25.0	.850
	1600	75,100	51.3	.628	65,300	44.6	.662	51,600	35.3	.735	37,900	25.9	.868
	1800	79,700	51.9	.639	69,300	48.9	.674	54,750	35.6	.752	40,200	26.2	.894

NOTES:

- Columns titled "BTUH" represent the total cooling capacity at the various water temperatures, GPMs, and air flows shown.
- Columns titled "EER" represent the energy efficiency ratio at the various water temperatures, GPMs, and air flows shown. Energy efficiency ratio is defined as total cooling capacity divided by total wattage input. The wattage required is that necessary to run the water pump and blower motor. TETCO has no control over the pumps and blowers used on individual jobs. The figures used here are 365 watts per 1000 CFM of air flow (ARI recommended allowance) and 62.8 watts per GPM. The pumping allowance is based on a 30% wire to water pumping efficiency and 100 feet of total dynamic head.
- Columns titled "S/T" represent the sensible cooling to total cooling ratio. Sensible cooling is the cooling accomplished by decreasing the dry bulb temperature of the air. Total cooling is sensible cooling plus cooling required to remove moisture from the air.

OPERATION OF THE TETCO GEOTHERMAL HEAT EXTRACTOR

The Geothermal Heat Extractor absorbs low-grade energy in the form of heat from well water and changes this low-grade energy into usable high temperature heat for domestic heating purposes.

Step 1 — Water, supplied by a well or other suitable source, flows through tubes located inside a water to refrigerant heat exchanger. Surrounding the water tubes is a second container, filled with extremely cold refrigerant. This cold refrigerant absorbs heat from the water, lowering the water temperature to within several degrees of the freezing point.

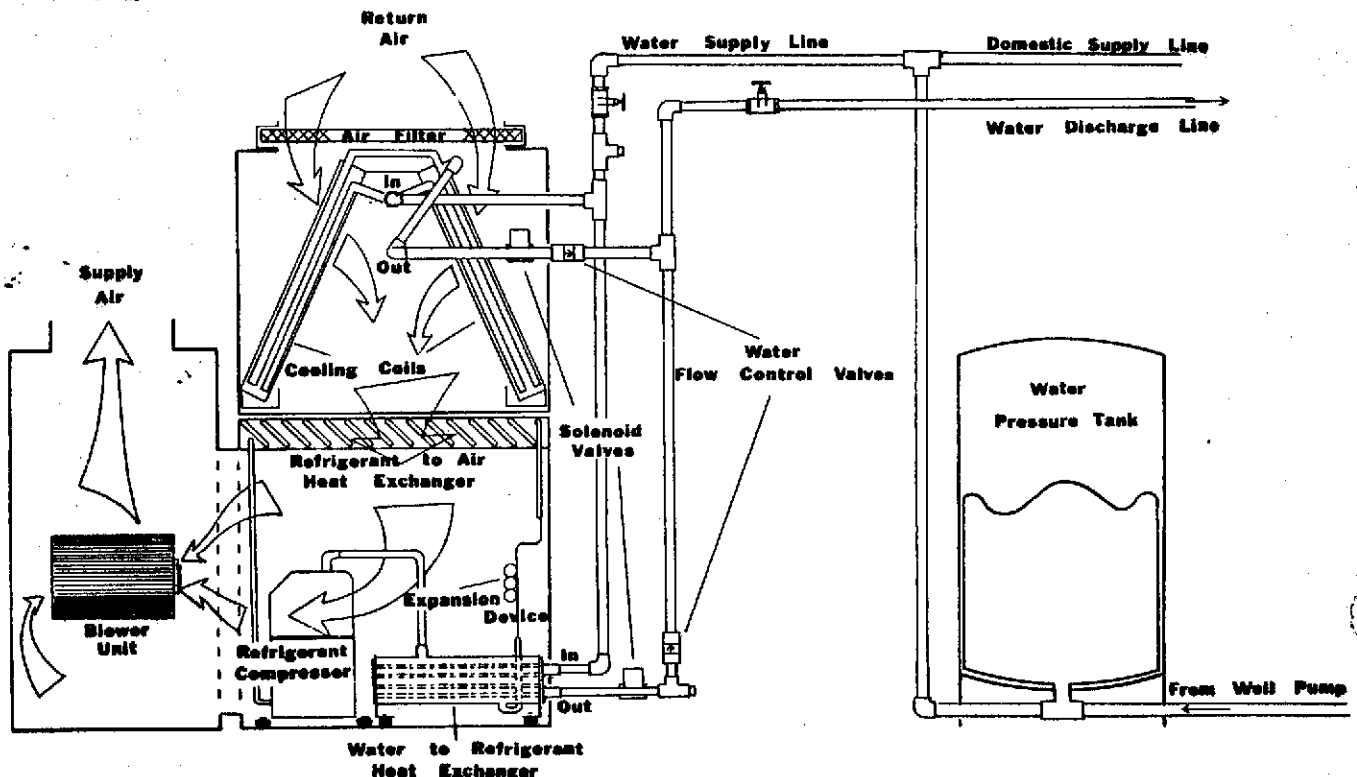
Step 2 — The refrigerant, which has now acquired a considerable amount of heat from the water, enters the compressor where it is pressurized to approximately 245 pounds per square inch, increasing its temperature to approximately 180 degrees Fahrenheit.

Step 3 — The hot refrigerant circulates through a refrigerant to air heat exchanger. Air, circulated by a blower unit, is heated as it flows past the refrigerant to air heat exchanger and is then distributed throughout the home. As the hot refrigerant flows through the refrigerant to air heat exchanger, it cools and condenses to a liquid state.

Step 4 — The expansion device (capillary tube) acts as a refrigerant flow restrictor. As the liquid refrigerant leaves the capillary tube, its temperature and pressure are reduced to approximately 32 degrees Fahrenheit and 57 pounds per square inch. The cold refrigerant now enters the water to refrigerant heat exchanger and the process repeats itself in a continuous cycle.

OPERATION OF THE TETCO GEOTHERMAL COOLING COIL

The Geothermal Cooling Coil air-conditions by circulating cold well water through a large finned coil. Warm air passing across the fins is cooled as it transfers its heat to the colder water. No compressor is used in this direct cooling process and the only electricity consumed is for the operation of a blower unit and a well pump. The TETCO Geothermal Cooling Coil is ideal for use with non corrosive waters throughout the northern United States and Canada, where water temperatures of 55 degrees Fahrenheit and lower provide excellent air-conditioning by both cooling and de-humidifying the air.





State of Idaho
DEPARTMENT OF WATER RESOURCES
STATE OFFICE, 450 W. State Street, Boise, Idaho

JOHN V. EVANS
Governor

A. KENNETH DUNN
Director

Mailing address:
Statehouse
Boise, Idaho 83720
(208) 334-4440

September 17, 1985

RE: Application for Permit No. 98-7614

Scot Lindsay
Box 295
Bonners Ferry, ID 83805

Dear Mr. Lindsay:

We are in the final review processing of the above referenced application and we find that we need more information concerning the amount of water you requested for heating and cooling.

Your application lists 1.93 cfs, however, according to acceptable standards used for designing heating and cooling systems for households, using the little information that we have, this amount appears excessive. Our estimates indicate that only 0.03 cfs would be required, using certain assumptions.

Therefore, rather than approving the application with an amount that appears excessive, we ask that you supply us with information that shows that 1.93 cfs is required. If we do not hear from you in 30 days on this matter, we will assume that our calculations are correct and will reduce the rate from 1.93 cfs to 0.03 cfs.

If you have any questions or if we can provide assistance, please feel free to contact our office.

Sincerely,

JIM JOHNSON
Water Rights Supervisor

JJ:sc

MICROFILMED

TO: FILE Memo
FROM: Jim
RE: Application Review

Determine from available information amount of water necessary to heat one house hold.

Using the guidelines of Admin Memo
dated 9-8-1980 revised 5-9-84g

1. Find Maximum Heat Load;

A. Determine Temp. Drop across system

$$\Delta T_s = (0.6)(S-t)$$

S = Geothermal Temp.
S = 100° (Assume).

$$\Delta T_s = (0.6)(100-70)$$

t = Temp Required

$$\Delta T_s = 18^\circ$$

t = 70° (Assume)

2. Find Flow Rate Required

W = GPM

Q = System Heat Load in $\frac{\text{BTU}}{\text{HR}}$

ΔT_s = Temp Drop.

$$W = \frac{Q}{500(\Delta T_s)} = \text{Flow Rate}$$

A. Find System Heat Load

$$Q = [e \cdot \Delta T] A$$

e = house efficiency

$$Q = [1.11 \cdot 62] 2000$$

$\Delta T = t_i - t_o$

$$Q = 13,764 \text{ BTU/HR}$$

A = house Area

$$W = \frac{13,764}{500(18)} = 15.3 \text{ gpm} = 0.03 \text{ cfs.}$$

MICROFILMED

**NOTICE OF APPLICATION
FOR WATER RIGHT**

The following application(s) have
been filed to appropriate the public
waters of the State of Idaho:

98-7614

LINDSAY, SCOT
P.O. BOX 295, BONNERS FERRY, ID
83805

Source: SPRING trib. to DOBSON
CREEK

Date filed: 06/14/1985

Diversion Pt: NESW Sec 33 T 62N R
02E

Use: IRRIGATION	(0.02 CFS)
STOCKWATER	(0.01 CFS)
HEATING	(1.93 CFS)
COOLING	(1.93 CFS)
DOMESTIC	(0.04 CFS)

In: SWNW SENW NWSW Sec 33 T
62N R 02E NESW Sec 33 T 62N R 02E
FOR 3 ACRES

The permit(s) will be subject to all
prior water rights. Protests must be
filed with the Director, Dept. of Water
Resources, 4055 Gov't. Way, Coeur
d'Alene, Id. 83814 on or before
AUGUST 5, 1985.

KEN DUNN, Dir.

Published July 18 & 25, 1985-#65

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62N R 02E NESW Sec 33 T 62N R 02E
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AFFIDAVIT OF PUBLICATION

STATE OF IDAHO

County of Boundary

ss.

ALICE WINN, BKPR FOR PETE THOMPSON

first duly sworn upon his oath, deposes and says that he is the publisher (or foreman)

PUBLISHER

of The Bonners Ferry Herald, a newspaper of general circulation, published weekly at Bonners Ferry, Boundary County, State of Idaho; that the said Bonners Ferry Herald has been continuously and uninterruptedly published in said Boundary County during a period of 18 months or 78 weeks prior to the first publication of the hereto attached notice; that

the advertisement of APPLICATION FOR WATER RIGHT # 98-7614

a

Notice for Publication, a printed copy of which is attached hereto was published in said newspaper and not in a supplement thereof for 2 consecutive issues, commencing with the issue dated July 18, 1985, and ending with the issue dated July 25, 1985.

Subscribed and sworn to before me this 6th day of August, 1985.

Helen M. [Signature]
Notary Public in and for the County of Boundary, State of Idaho,
residing at Bonners Ferry, Idaho.

RECEIVED
AUG 9 1985
BONNERS FERRY DISTRICT CLERK
MICROFILMED

AFFIDAVIT OF PUBLICATION

STATE OF IDAHO

County of Boundary

ss.

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the advertisement of APPLICATION FOR WATER RIGHT # 98-7614

a _____

Notice for Publication, a printed copy of which is attached hereto was published in said newspaper and not in a supplement thereof for 2 consecutive issues, commencing with the issue dated July 18, 1985, and ending with the issue dated July 25, 1985.

Alice Winn
Subscribed and sworn to before me this _____ day of _____, 19____.

Notary Public in and for the County of Boundary, State of Idaho,
residing at Bonners Ferry, Idaho.

98-2614-

LINDSAY, SCOT

P.O. BOX 295, BONNERS FERRY, ID 83805

Source: SPRING trib. to DOBSON CREEK

Date Filed: 06/14/1985

Diversion Pt: NESW Sec 33 T 62N R 02E

Use: IRRIGATION	(0.02 CFS)
STOCKWATER	(0.01 CFS)
HEATING	(1.93 CFS)
COOLING	(1.93 CFS)
DOMESTIC	(0.04 CFS)

In: S4NW SENW N4SW Sec 33 T 62N R 02E NESW Sec 33 T 62N R 02E
FOR 3 ACRES

MICROFILMED



STATE OF IDAHO

DEPARTMENT OF WATER RESOURCES

NORTHERN REGION

A. Kenneth Dunn
Director

Suite No. 9
4055 Government Way
Coeur d'Alene, Idaho 83814
(208) 765-4639

June 14, 1985

Mr. Scot Lindsay
Box 295
Bonners Ferry, Id. 83805

Dear Mr. Lindsay:

This office is in receipt of your Application for a Permit and Check No. 92-142 in the amount of \$65.00. We are returning same to you because the application cannot be formally receipted until the following information is provided:

Item 2. Source of water and named body of water to which it is tributary, or "sinks".

Item 8a1. Legal description of place of use other than irrigation. Map shows place of use as SWNW & NSW Sec. 33, T62N, R2E. *Read The Description, The map is hard to Draw*

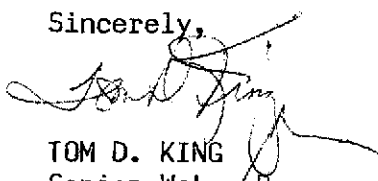
Item 8a4. Number of homes.

Item 8b. Legal description of irrigated acreage. You currently show 2 acres in the SWNE, 2 acres in the SWNW and 2 acres in the NSW with a total of 3 acres.

Please note that your application has been initialed and dated as being received on 6/14/85. If the requested information is provided within 30 days of the date of this letter, your date of priority will be maintained.

Instructions for completing an Application for Permit are included for your information. If you desire assistance, please feel free to contact this office.

Sincerely,


TOM D. KING
Senior Water Resource Agent

TDK/pms
Enc. - Appln.
Check
Instructions

RECEIVED
JUL 5 1985
Department of Water Resources
Northern District Office

MICROFILMED