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Department of Water Resources

Jeff,

Enclosed are two transfer applic from Robert Bybee and the work-up by Jim Rush of Rocky Mt Environmental. When I started to review the Analysis provided I noticed that the conclusion on pg 8 states that there is no negative effect on any reach when you go to the TO well. I questioned Jim on this and he stated that he factored in the 6 acres on the second transfer as a mitigating entity.

He feels that by taking the 6 acres out of the ESPA for use in a pond of 3.75 surface acres that the 2.25 acres left without irrigation is sufficient. He states that the graph on pg 11 of the Analysis shows that the post transfer depletion is less than the pre-transfer depletion.

I ask that you submit this concept to someone who is a lot better at this than we are in Eastern and determine if Jim Rush's concept can fly. I thank you in advance.

Skip

JUN 19 2003

Department of Water Resources

HYDROLOGIC ANALYSIS

COPY

SUMMARY

Rocky Mountain EnvironmentalSM (RMEA) has prepared this Hydrologic Analysis for an application to transfer Right Number 31-11443-A. This license authorizes the irrigation of 33 acres at 0.66 cfs; the consumptive use is 99 acre-ft/year [afa]. The Place of Use [P/U], from which Right Number 31-11443-A will be transferred, will be removed from irrigated agriculture and "dried up."

The proposal involves two [2] transfers and mitigation:

- a. 27 acres will be moved to a new P/U and new Point of Diversion [P/D]. At 3 acre-ft/acre, 81 acre-ft/annum at 0.54 cfs will be transferred to SW, Section 7, T 7 N, R 37 E. The nature of use will continue to be irrigated agriculture.
- b. 3.75 acres will be moved to a new P/U and P/D in SW, SW, Section 24, T 13 N, R 42 E, and the nature of use will be changed to recreation. 13 acre-ft/annum at 0.12 cfs will be transferred.
- c. 2.25 acres of irrigated farmland at the original P/U will be surrendered as mitigation.

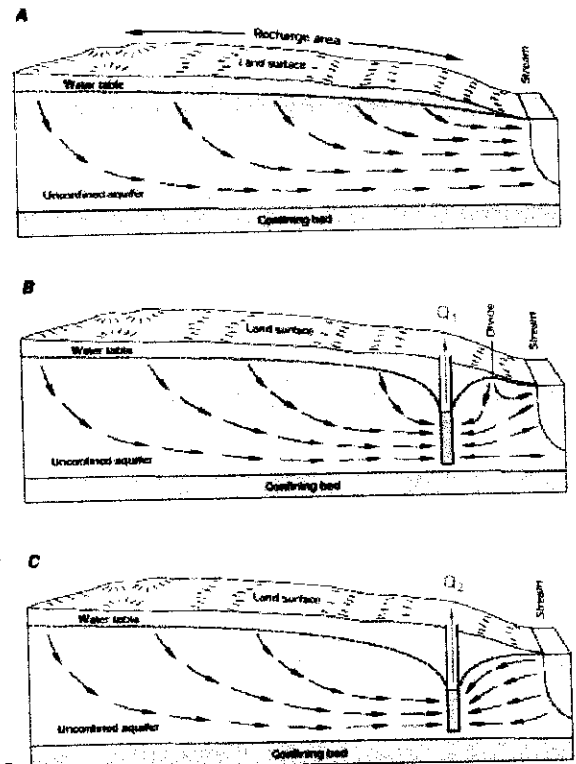
Based on the analysis presented below, it is Rocky Mountain EnvironmentalSM's opinion, not a guarantee or warranty, that, over the duration of the simulations and within the precision of *effects.xls*, the proposed transfer does not result in impacts to surface waters greater than impacts from use of the existing water right.

BACKGROUND

Idaho Department of Water Resources [IDWR] requires a hydrologic analysis of the pumping effects that arise when groundwater appropriators change the point of diversion of their wells. Below is a broad explanation of the effects of groundwater pumping on surface streams and reservoirs. This background information forms part of the basis for the attached charts and figures and Rocky Mountain EnvironmentalSM's opinions rendered herein.

¹ Rocky Mountain Environmental is a registered service mark of Rocky Mountain Environmental Associates, Inc.

The figure on the right illustrates the effect of consumptive use of groundwater on nearby surface waters. Before a well is pumped, groundwater flows through the aquifer and discharges into streams and reservoirs. When a well is first pumped, water is extracted from aquifer storage. As the duration of pumping continues, consumptive use of groundwater depletes stream flow through two mechanisms. Water can be induced to flow out the bottom of a stream under the gradient caused by pumping. Additionally, the pumping well intercepts groundwater before it discharges into the stream.



The effect of a pumping well on surface water is a function of distance from the stream and aquifer properties [transmissivity and storativity]. A well located closer to a stream has a greater effect sooner than a well located farther from a stream.

A less obvious, but more important, is the *residual* effect of groundwater pumping. After pumping ceases and a well is abandoned, a stream will continue to lose water to the well [assuming there is no capture of water from other sources].

Stream depletion from groundwater withdrawal. Obtained from USGS Circular 1186.

Because this residual effect is not intuitive, the analogy to welding illustrates the phenomenon. A welder heat steel with a torch, but when finished, the steel is still too hot to touch. The heat will eventually dissipate, but the total heat dissipated equals the total heat added to the steel. Likewise, the *residual* effects of pumping remain in the aquifer, even after the well is abandoned. The stream will continue to lose water until the total volume of stream depletion equals the total volume of water pumped².

Because of the effects of pumping on stream flow and declining discharge at springs in southern Idaho, Idaho Department of Water Resources [IDWR]

²

Jenkins, C. T., 1968, Techniques for computing rate and volume of stream depletion from wells: *Ground Water*, v. 6, no. 2., p. 37-46.

implemented a new transfer and mitigation procedure³ in the Eastern Snake Plain Aquifer [ESPA]. In additions, proposed transfers of rights to appropriate water into or out of the ESPA must demonstrate the relationship between aquifers, and, if connected, must show that injury and enlargement will not occur.

Applicants who wish to transfer right(s) to divert groundwater must mitigate the geographic and residual effects discussed above. Specifically, the depletion at the end of the simulation [e.g., 2125 A.D.] in any reach of the Snake River must not increase more than $\pm 5\%$ ⁴. For example, if depletion in the Ashton-Heise-Lewisville reach is 100 acre-feet/annum [afa] before the change in P/D, then the depletion after the transfer may be no greater than 105 afa. At this time, IDWR has no method to credit an appropriator for decreases in depletion [i.e., accretion] in any reach of the Snake River.

Under IDWR guidelines, changes in projected depletion may be mitigated by [a] reducing irrigated acreage [i.e., "drying up" some acreage] at either the original P/U or proposed P/U, or [b] delaying the commencement of pumping at the new P/D or other location.

IDWR has specified use of the *effects.xls* spreadsheet⁵ to estimate the geographic and residual effects of consumptive use at the original and proposed P/D. The spreadsheet is based on Idaho Water Resources Research Institute's computer model of the Snake River Plain Aquifer^{6, 7}. Inputs to the spreadsheet include location of the FROM Well(s) and the TO Well, consumptive use [pumping] in acre-feet/trimester at both the FROM Well(s) and the TO Well, and date of first diversion at the FROM Well(s).

³ Dreher, K. J., and Young, N. C., 2002, Administrator's Memorandum: Interim policies and procedures currently applicable for applications to transfer groundwater in the Eastern Snake River Plain only: Transfer Processing No. 24, Idaho Department of Water Resources.

⁴ Telephone guidance provided by Jeff Peppersack, PE, Idaho Department of Water Resources in early March 2003.

⁵ Cosgrove, D. M., and Johnson, G. S., 2003, Eastern Snake River Plain Aquifer Ground-water rights transfer spreadsheet: User's Manual, ver. 1.1. Obtained from <http://www.if.uidaho.edu/~johnson/ifiwrrri/effects.html>.

⁶ Cosgrove, D.M., G.S. Johnson, S. Laney and J. Lindgren, 1999, Description of the Snake River Plain aquifer model (SRPAM): Idaho Water Resources Research Institute, University of Idaho, Moscow, ID, 60 p.

⁷ Johnson, G.S. and D.M. Cosgrove, 1999, Application of Steady State Response Ratios to the Snake River Plain Aquifer: Idaho Water Resources Research Institute, University of Idaho, Moscow, ID, 27 p.

HYDROGEOLOGY

Eastern Snake River Plain Aquifer [ESRP]

The Eastern Snake River Plain [ESRP] is a flat depression that cuts an arcuate swath across southern Idaho. Ranging from 20 to 50 mi wide, it extends from Payette, Idaho, near the Oregon border, 120 mi southeast to Twin Falls and thence 150 mi northeast to Ashton, Idaho (located about 60 mi south of West Yellowstone). The Snake River Plain is bounded on the southeast by mountains of the Basin and Range province. These mountains consist of upper Precambrian through lower Mesozoic sedimentary rocks uplifted along normal faults during Neogene and Quaternary tectonism. Southwest of the Snake River Plain are mid-Pliocene rhyolitic and basaltic rocks of the Owyhee Plateau. On the northeast end of the Snake River Plain are Quaternary rhyolitic and basaltic rocks of the Yellowstone Plateau⁸

Between Milner Dam and King Hill, the ESRP is an area of low topographic relief, dotted by scattered volcanic cones that rise above the plain. The plain is covered by Middle to Late Cenozoic basalt interbedded with lacustrine and fluvial sediments. During extrusion, basalt filled and dammed the ancestral Snake River, forming temporary lakes. Basalt deposited downstream of these dams are dense subaerial lavas. Basalt flowing into the lakes formed pillow lavas and basaltic sands, filling the lake with subaqueous deposits. Then, subsequent lava again diverted the river, and the process of filling the ancestral canyons and of subaerial and subaqueous deposition was repeated.

The pillow basalts and basaltic sands are unsorted, coarse grained, and poorly indurated. They have very high porosity and hydraulic conductivity. The dam-and-fill process produced intercalated dense basalt, pillow lavas, sand, and sediments, and it created an aquifer with very high storativity and zones of very high transmissivity⁹.

⁸ Kuntz, M. A., Covington, H. R., and Schorr, L. J., 1992, An overview of basaltic volcanism of the eastern Snake River Plain, Idaho *in* Regional Geology of Eastern Idaho and Western Wyoming, Link, P. K. et. al., ed., Geol. Soc. Am. Memoir 179, p. 227-267.

⁹ Covington, H. R., and Weaver, J. N., 1990, Geologic map and profile of the north wall of the Snake River canyon, Bliss, Hagerman, and Tuttle Quadrangles, Idaho: U.S. Geol. Survey, Miscellaneous Investigation Series, Map I-1947 A-E.

The ESRP aquifer contains between 200 and 300 million acre-feet [MAF] of water. It discharges 10 MAF per year through spring flow, underflow, groundwater pumping, and evapotranspiration. Groundwater discharges from the ESRP aquifer in the Thousand Springs region, located from Milner Dam to King Hill in southern Idaho. Spring discharge provides most of the annual flow of the Snake River downstream of King Hill.

Island Park Area

The proposed P/D and P/U is located less than 1 mile west of Island Park Reservoir in the Yellowstone Volcanic field¹⁰ of WY, ID, and MT. The Pliocene and Quaternary field represents the successive emplacement of granite batholiths from southwestern Idaho to northeast Idaho. In each emplacement, granitic magma rose to form one or more plutons. The rhyolite volcanism degassed each major intrusion. With cooling and consolidation, the upper parts of each pluton were successively reintruded by magma from lower levels until the body crystallized. Whereas Eastern Snake River Plain [ESRP] southwest of Island Park is completely covered by basalts, it overlies granitic batholiths. The long history of rhyolitic and basaltic magmatism demonstrate continued intrusion of magma from the lithosphere¹¹.

In the proposal, a portion of Right Number 31-11443-A will be moved to SW, SW, Section 24, T 13 N, R 42 E. The nature of use will be changed to recreation. The Point of Diversion [P/D] is the Centennial Mountain Properties well installed in 2001. Andrew Well Drilling Services, Inc. installed the Centennial Mountain Properties well as a public water system¹².

Examination of the Well Driller's Report [Appendix 2] obtained from Eastern Regional Office, IDWR reveals:

1. The aquifer beneath the proposed P/D is confined.
 - a. The driller reported mixed layers of basalt, cinders, and clay.

¹⁰ Christiansen, R. L., 2001, The Quaternary and Pliocene Yellowstone plateau volcanic field of Wyoming, Idaho, and Montana: U.S. Geol. Survey Prof. Paper 729-G, 145pp.

¹¹ Kuntz, M. A., Covington, H. R., and Schorr, L. J., 1992, An overview of basaltic volcanism of the eastern Snake River Plain, Idaho in *Regional Geology of Eastern Idaho and Western Wyoming*, Link, P. K. *et. al.*, ed., Geol. Soc. Am. Memoir 179, p. 227-267..

¹² Andrew Well Drilling Services, Inc., Centennial Mountain Properties, IDWR Tag No. D0014672, 767291.

- b. The shallowest water is 45 ft below land surface [bls].
 - c. The well is cased and cemented to 229 ft bls.
 - d. Perforations were made only between 229 and 330 ft bls.
 - e. Static water is 20 ft bls.
2. Although located less than 1 mi from the Island Park Reservoir, the Centennial Mountain Properties well does not withdraw water from this surface water body.
 - a. The elevation from which water is obtained [i.e., the perforated interval] is located 229 ft bls.
 - b. This elevation is below the elevation of the Snake River at the spillway of the Island Park Reservoir.
3. Andrews' performed an constant-rate pumping test on the aquifer. Drawdown was 47 ft, and discharge was 900 gpm.

Rocky Mountain EnvironmentalSM applied the Jacob's equation to estimate aquifer transmissivity. The Jacob's equation is a modification of the non-equilibrium (Jacob) equation to transmissivity based on specific capacity of a well¹³.

$$\frac{Q}{s} = \frac{T}{2000}$$

Q is pumping rate [gpm]	900
s is drawdown [ft]	47
T for confined aquifer	38,298

For this evaluation, an estimate of aquifer storativity was obtained from published literature. Because the aquifer is composed of fractured basalt and rhyolite, it is assumed that water discharged from the pumping well is released only from expansion of the water itself [i.e., the matrix is incompressible]. Therefore, S was assumed to be 1×10^{-6} .

Island Park - ESRP Relationship

The aquifer beneath Island Park is hydrologically connected to the ESRP aquifer. Tributary underflow from Island Park into the ESRP aquifer was specifically

¹³ Driscoll, F.G., 1986, Groundwater and Wells: Johnson Screens, Minneapolis MN.

identified as a constant-flux boundary¹⁴. This means that consumptive use [CU] in Island Park would reduce tributary underflow at the northern boundary of the ESRP model. As time of pumping reaches long duration, CU at the proposed P/D in Island Park would reduce stream discharge in the Snake River system.

Proposed Transfer #1: Move 27 irrigated acres [81 afa] to to irrigate crops at new P/U.

Transfer #1 moves 27 acres [81 afa] to an irrigated field in Section 7, T 7 N, R. 37 E. Below is a summary of information about the water right(s) proposed for transfer, information about the current and proposed P/D and P/U, and consumptive use incorporated into the *effects.xls* spreadsheet.

<i>Summary of Inputs for Transfer #1</i>	
<i>P/D From Well</i>	NW SW S 36, T7N, R35E
<i>From Rights</i>	31-11443 Donna and Robert Bybee, 2014 E 1800 N, Terreton, ID
<i>Grid Row and Column:</i>	35, 49
<i>Priority</i>	5/14/1976
<i>Diversion Scenario</i>	99 acre-ft /annum, or 33 acre-ft/trimester from 1976 through fall 2003.
<i>Source of Water</i>	Groundwater ESRP
<i>TO Well</i>	Margarite and Irwin Ball Box 67, Sugar City, ID
<i>Legal Description of P/D</i>	NW NW NE 7, T 7 N, R. 37 E.
<i>Diversion Scenario</i>	81 acre-ft /annum, or 27 acre-ft/trimester commencing spring 2004.
<i>Grid Row and Column:</i>	36, 51

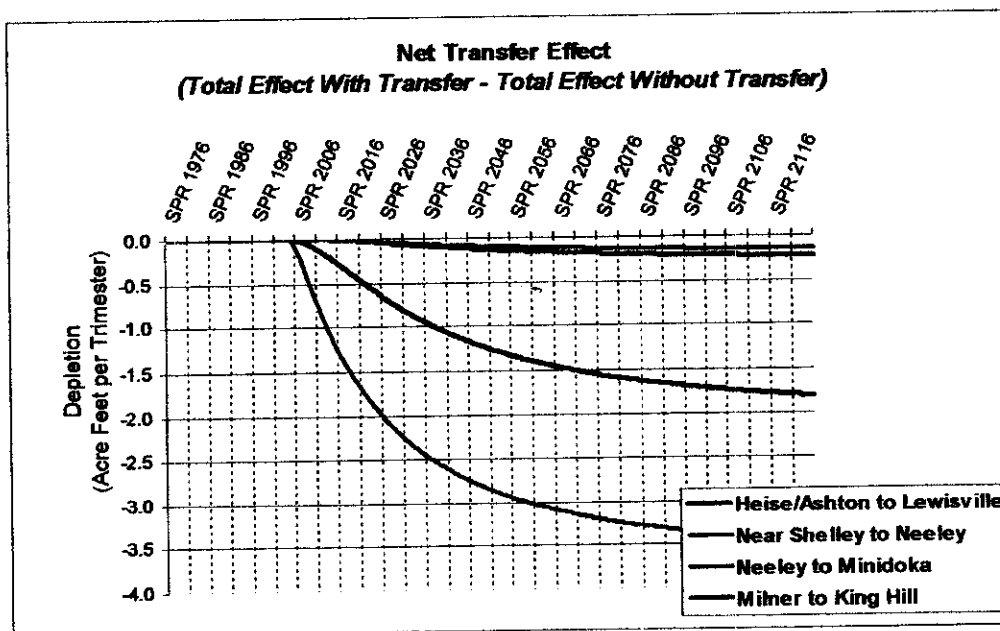
Rocky Mountain EnvironmentalSM applied the *effects.xls* spreadsheet to compare stream depletion [or accretion] with and without the proposed transfer. In this scenario, the FROM Well diverts 33 acre-ft/trimester. The TO Well diverts 27

¹⁴ Garabedian, S. P. , 1992, Hydrology and digital simulation of the regional aquifer system, Eastern Snake Plain, Idaho: U.S. Geol. Survey, Professional Paper 1048-F.

acre-ft/trimester. In Appendix 1 are copies of part of the *effects.xls* spreadsheet. To summarize:

There is a positive impact to each of the four reaches of the Snake River. Specifically, the transfer of 81 acre-ft/annum to the new P/D and P/U results in stream *accretion* in all reaches, clearly a results that is not an adverse impact to senior appropriators [figure immediately below]:

- a. The hydrologic response in both the Sheeley and Ashton reaches is about 2 acre-ft/trimester accretion in stream discharge.
- b. The hydrologic response in the Neeley-Minidoka and King Hill reaches is accretion, but an insignificant amount .



There is accretion [or reduction in stream depletion] in all reaches of the Snake River.

Proposed Transfer #2: Move 3.75 irrigated acres [13 afa] to a recreational pond in Island Park.

Transfer #2 moves 3.75 acres [13.04 afa] to SW/4 SW/4, Sec 24, T 13 N, R. 42 E and changes the nature of use to a recreational/wildlife pond. The water would fill the recreational pond, and consumptive use is limited to surface evaporation. The hydrologic impacts of this part of the proposed transfer requires estimating the amount and timing of stream depletion caused by diversion from the new P/D and P/U.

Jenkins (1968) provides perhaps the simplest equations to estimate the effects of pumping on stream discharge¹⁵:

$$q / Q = \operatorname{erfc}\left(\frac{a}{\sqrt{4tT / S}}\right),$$

where

a the distance from the pumping well to the stream

t is the time since pumping commenced

T is aquifer transmissivity

S is aquifer storativity, specific yield or porosity.

erfc is the complimentary error function.

In the Jenkins' equation, there are only four variables important to estimate the effects of pumping on stream or spring discharge. These are the distance (a) from the stream to the discharging well, the duration of pumping (t), and aquifer properties, T and S . The effects on stream flow (q) is estimated as a percentage of the pumping well's discharge (Q).

In Appendix 2 is a spreadsheet summarizing inputs to the Jenkins' equation, a table of estimated stream depletion [AF/trimester], and a graph illustrating anticipated stream depletion from consumptive use at the proposed P/U.

Important input variables used to calculate q/Q are summarized below:

1. Consumptive use at the proposed P/U is estimated at 13.04 acre-ft/annum. This estimate is based on the following:
 - a. Area of the pond is 3.75 acres¹⁶;
 - b. The only consumptive use is evaporation, and the evaporation rate is 3.48 ft per surface acre per year¹⁷;
 - c. T and S from application of the Jacob's equation above.

¹⁵ Jenkins, C. T., 1968, Techniques for computing rate and volume of stream depletion by wells: Ground Water, p. 37-46.

¹⁶ Surface Area from Richard Byrem, PLS, in Appendix 2.

¹⁷ Evaporation rate from Allen and Brockway data for Island Park Dam quadrangle obtained from <http://www.kimberly.uidaho.edu/water/appndxet/index.shtml>

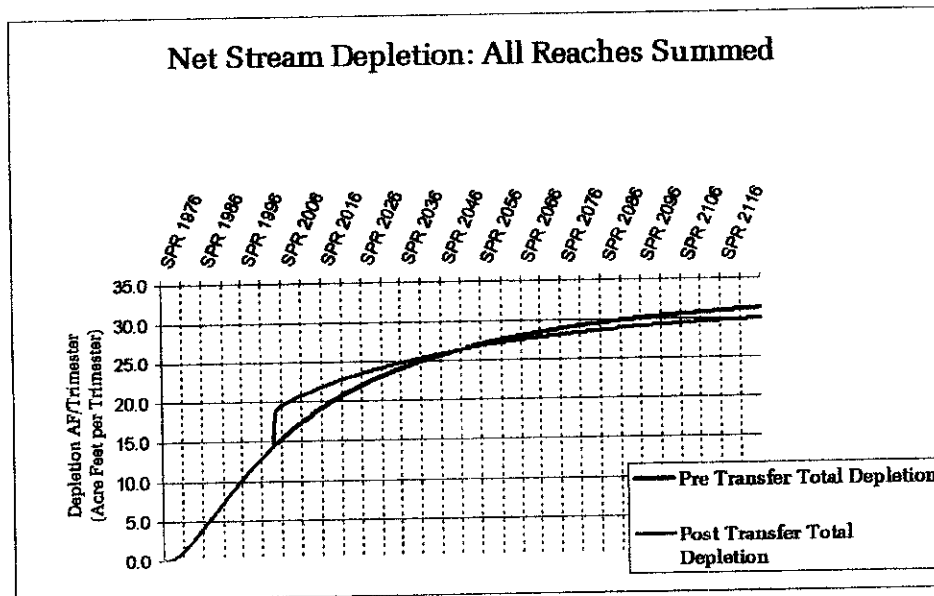
2. a is estimated at 25 mi. A cursory examination of Island Park suggests that the elevation of Henry's Fork does not descend to the elevation of the producing interval in the Centennial well until near Ashton. Regardless, application of the Jenkin's technique allows an approximation of the timing of depletion caused by CU at the proposed P/D and P/U.
3. Given the uncertainty in a , it is assumed that stream depletion caused by CU at the proposed P/U in Island Park is distributed to all reaches of the Snake River.
4. Because the P/U and P/D of Transfer #2 lie outside the *effects.xls* boundary, the following technique was used to compare pre-transfer and post-transfer depletion. In the *effects.xls* spreadsheet, depletion in individual reaches was summed for each trimester, i.e., in each trimester, the depletion at Heise, Shelley, Minidoka, and King Hill was added. This summation is an estimate of total impact to the Snake River system. Finally, post-transfer depletion is the sum of depletion in individual reaches [Transfer #1] plus the stream depletion estimated using Jenkin's equation [Transfer #2].

The chart below illustrates the pre-transfer and post-transfer depletion in the entire Snake River system.

Mitigation

The impacts to surface waters described above include the "drying up" of 2.25 acres of irrigated farmland at the original P/U. The transfers described herein do not enlarge the original water right.

Specifically, Right Number 31-11443-A authorizes the irrigation of 33 acres at 0.66 cfs; the consumptive use is 99 acre-ft/year [afa]. After IDWR approval of the transfer, 27 acres [81 acre-ft/annum] will be moved to a P/U in Section 7, T 7 N, R 37 E. 3.75 acres will be moved to a new P/U Section 24, T 13 N, R 42 E. The balance, 2.25 acres, will be dried up.

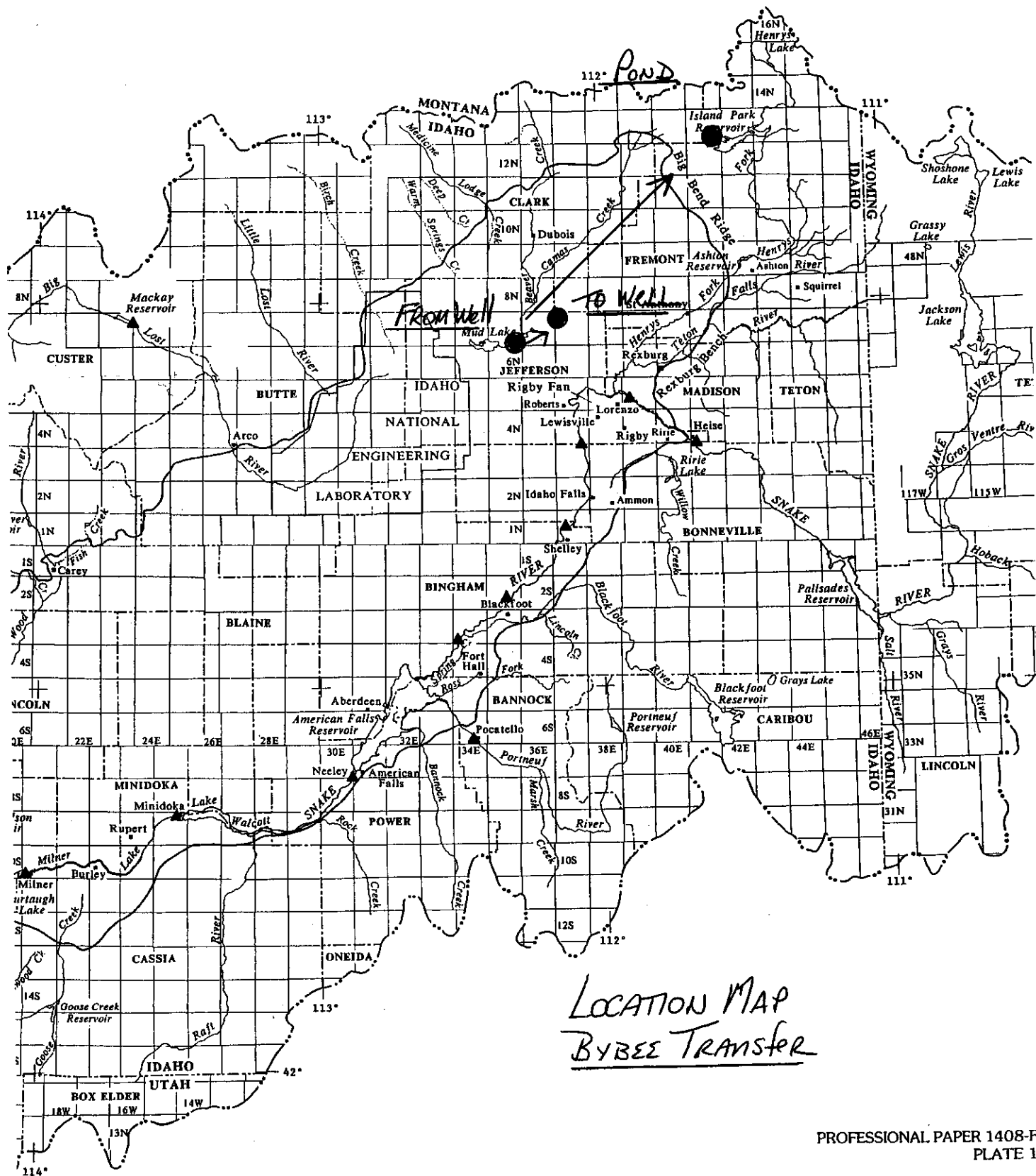


This chart compares pre-transfer total stream depletion to total stream depletion after transfer to the two new P/D. Depletion in each stream reach for each trimester is summed to produce total stream depletion in the Snake River System.

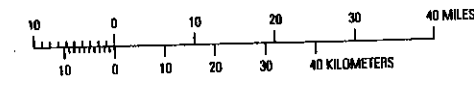
Synthesis and Conclusions

Based on the analysis presented herein, it is Rocky Mountain EnvironmentalSM's opinion, not a guarantee or warranty, that, over the duration of the simulations, the proposed transfer(s) do not result in impacts to stream flow greater than impacts resulting from diversion and consumptive use at the current P/D and P/U. This opinion on two observations:

- 1: In the short term, increases in depletion is less than about 5 acre-ft/trimester. When compared to the 10,000,000 acre-ft/year discharge of the Snake River system, this is a *de minimus* volume.
- 2: Considering the entire Snake River hydrologic system, post-transfer depletion at the end of the simulation is less than pre-transfer depletion, obviously a *no impact* effect.



PROFESSIONAL PAPER 1408-F
PLATE 1



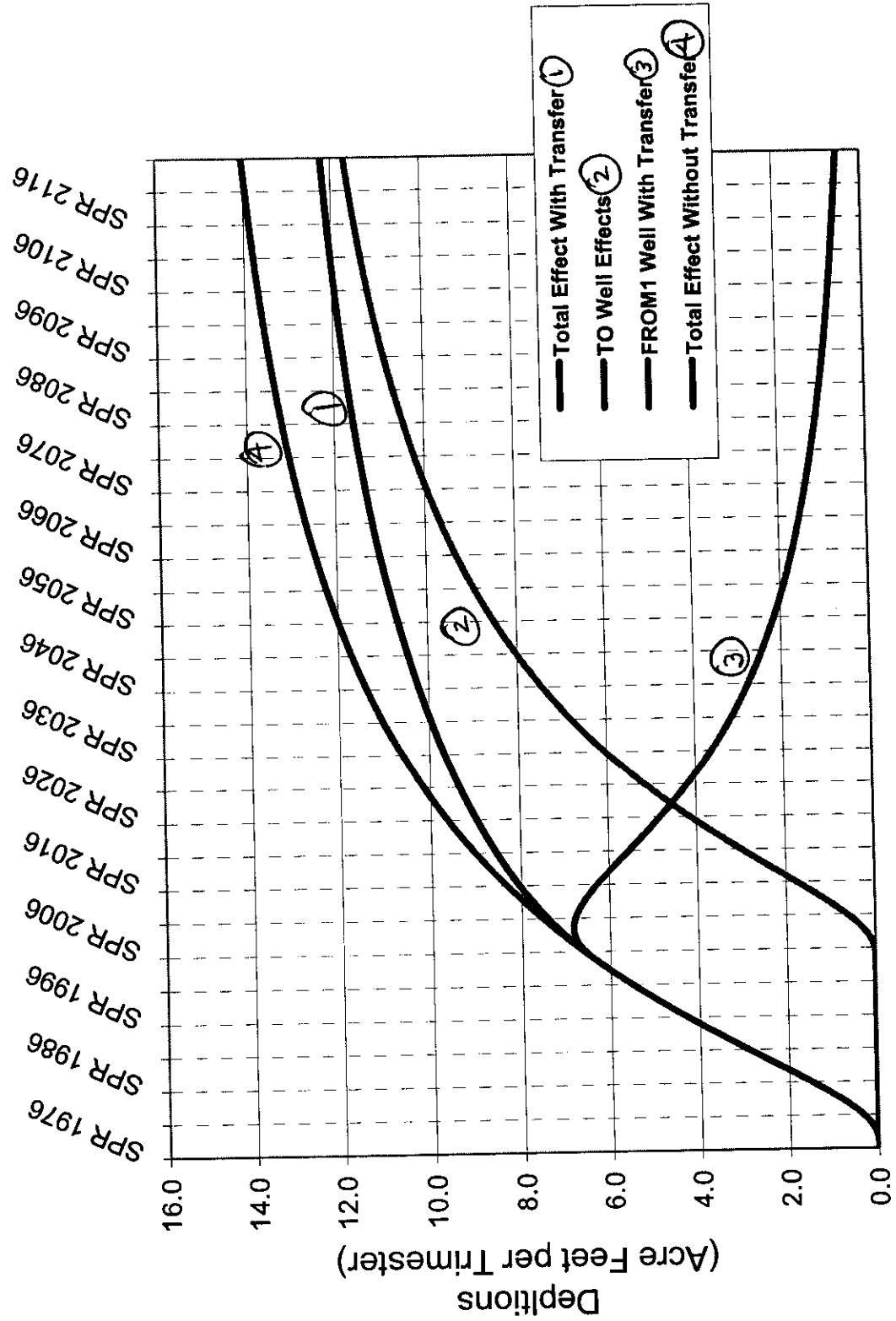
APPENDIX 1

***effects.xls* OUTPUT FOR
PROPOSED TRANSFER TO NW NW
NE 7, T 7 N, R. 37 E.**

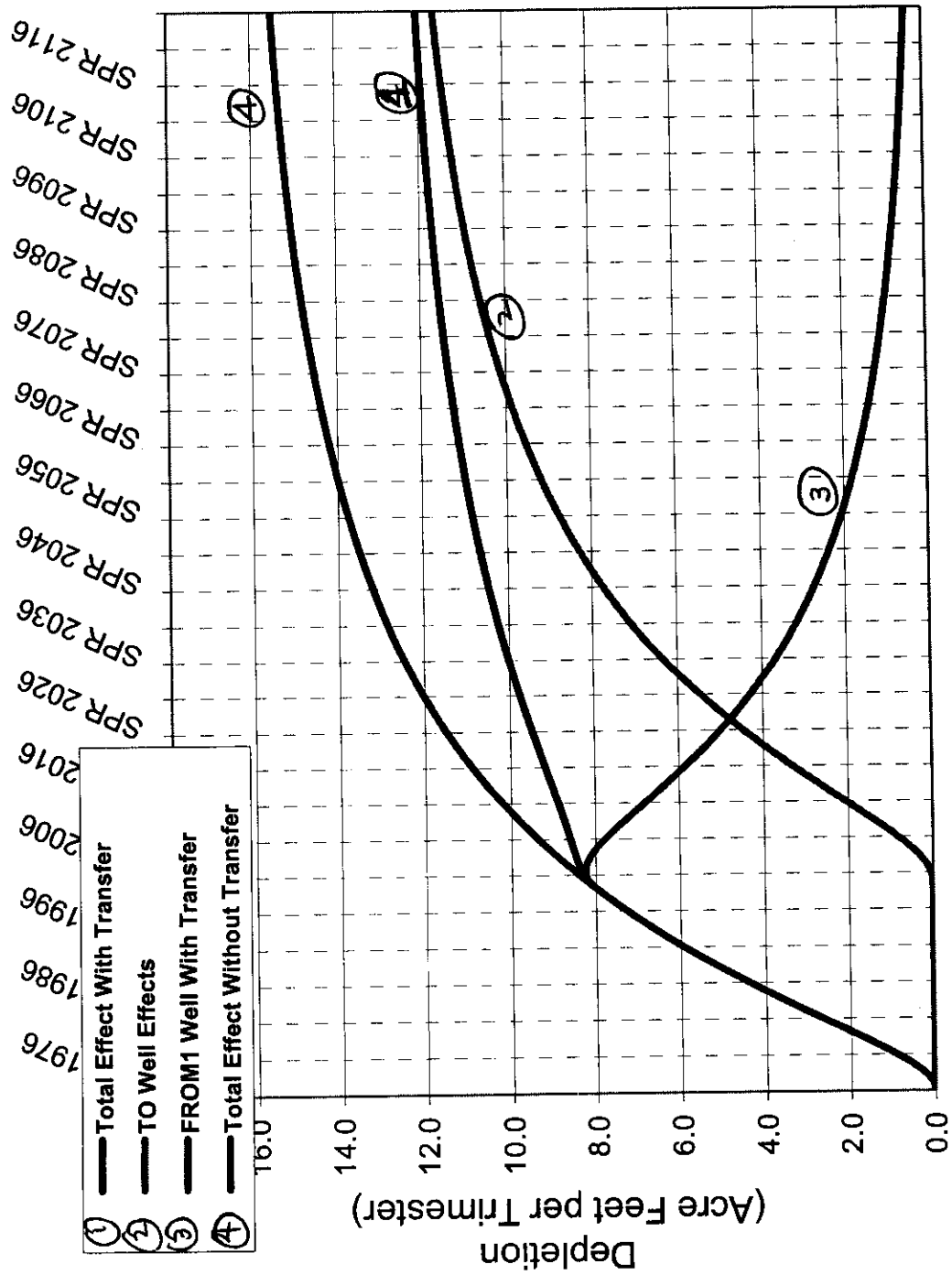


MOVE 81 AFA

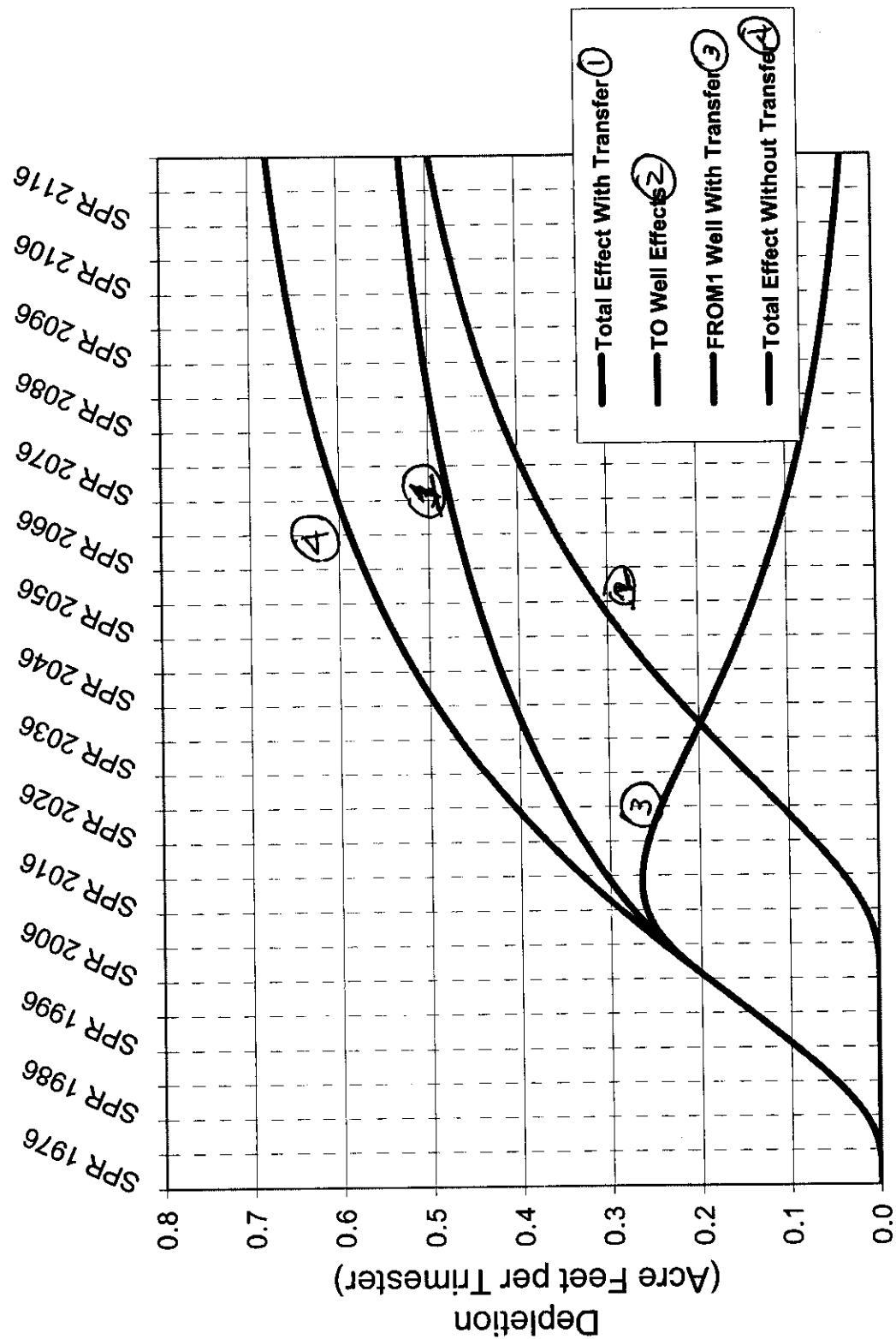
Hydrologic Response--Heise/Ashton to Lewisville



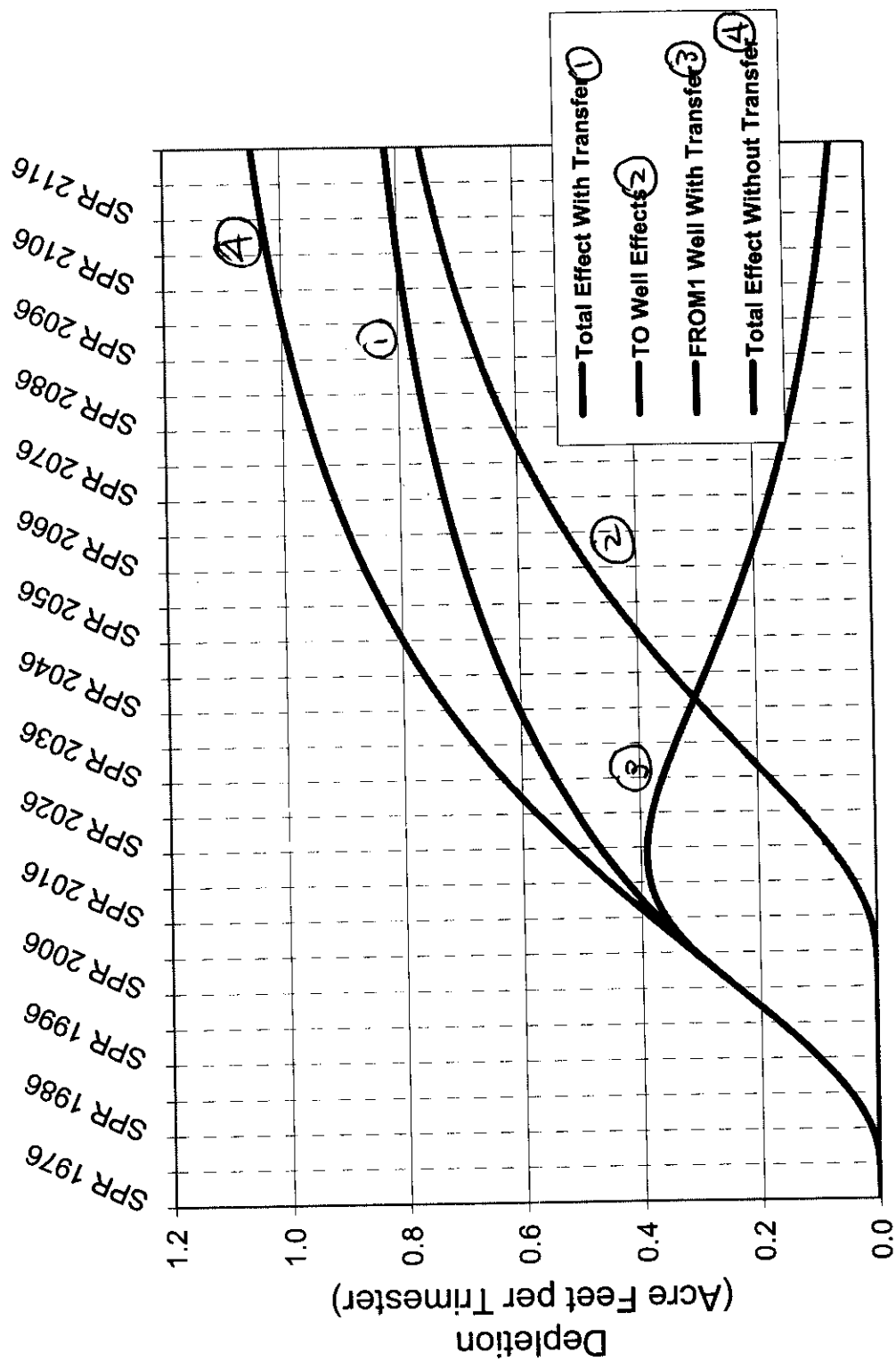
Hydrologic Response--Near Shelley to Neeley Reach

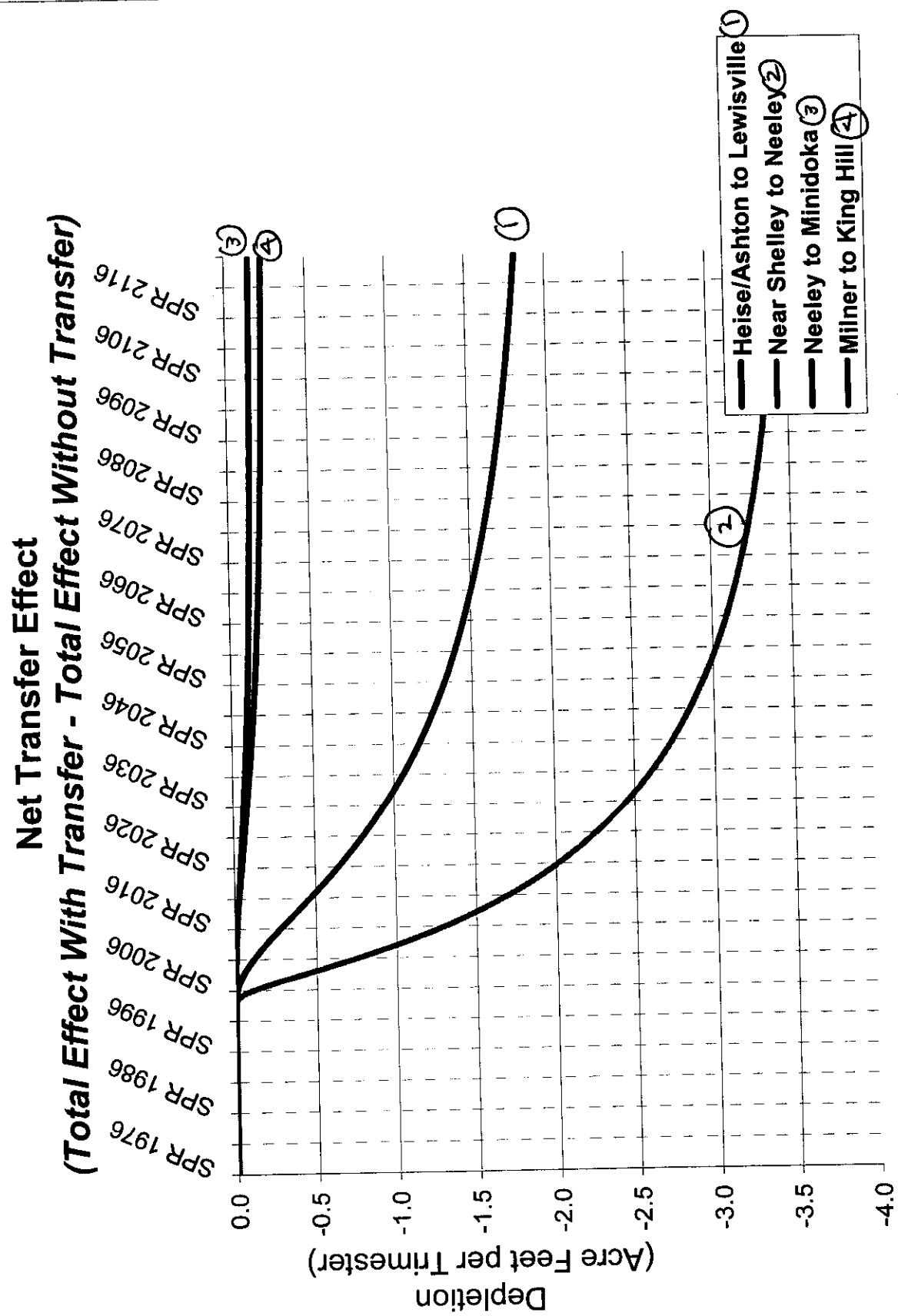


Hydrologic Response--Neeley to Minidoka Reach

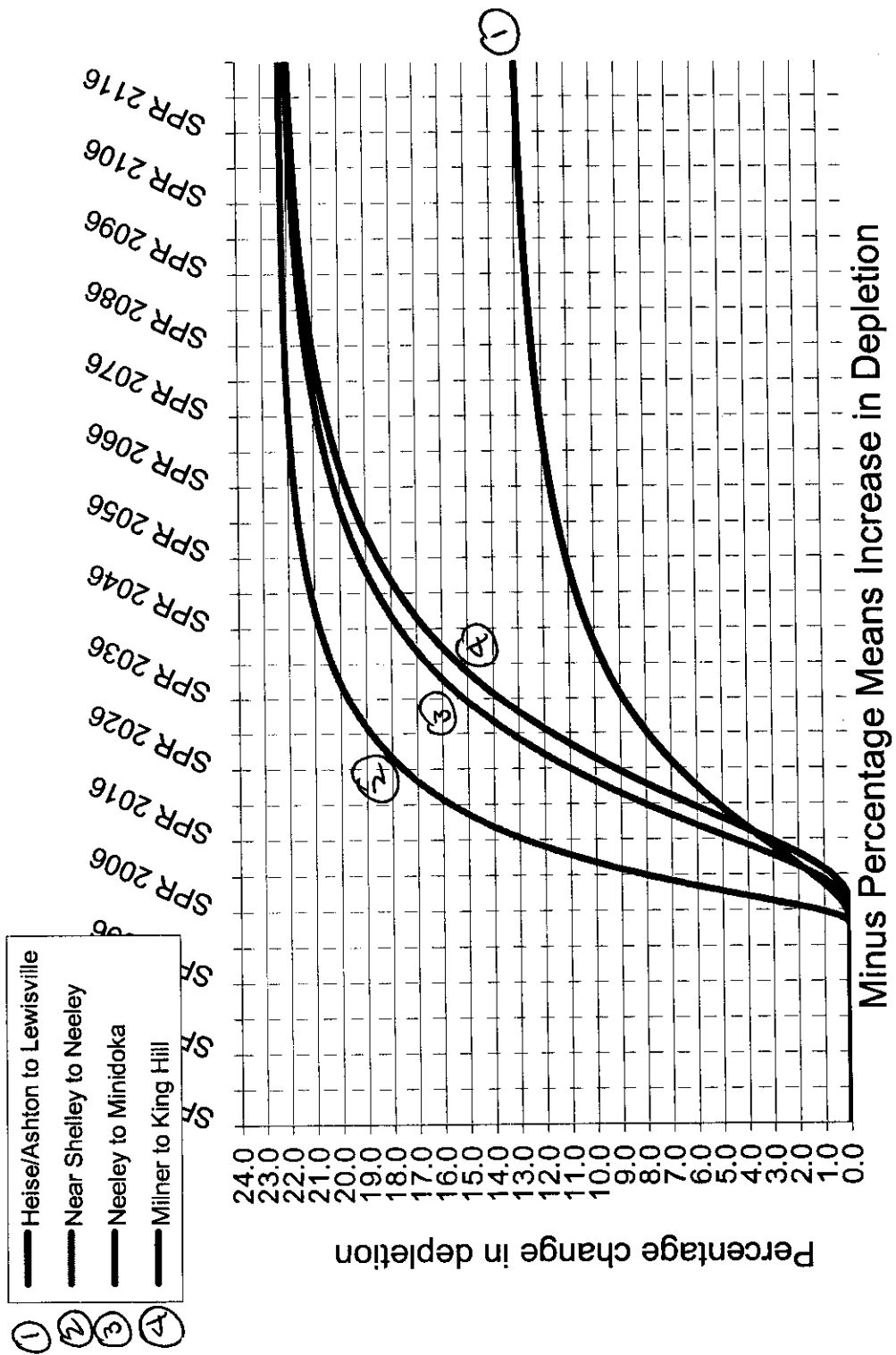


Hydrologic Response-- Milner to King Hill Reach





Net Transfer Effect Percentage (Total Effect With Transfer - Total Effect Without Transfer)



**APPENDIX 2 DRILLERS REPORT & JENKINS
OUTPUT FOR PROPOSED
TRANSFER TO SW/4 SW/4, Sec 24,
T 13 N, R. 42 E**

Form 238-7
11/97
11/01
Andrew

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Department of Water Resources
Eastern Region

IDAHO DEPARTMENT OF WATER RESOURCES
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Inspected by: _____
Twp _____ Rge _____ Sec _____
1/4 _____ 1/4 _____ 1/4 _____
Lat: _____ Long: _____

21
Page 1 of 2

WELL TAG NO.
DRILLING PERMIT N #D0014672
Other IDWR NO. 7672 91
OWNER:
Name: Centennial Mountain Properties
Address: 2496 N 2375 E
City: Hamer State: ID Zip 83425

LOCATION OF WELL by legal description.
N
S
Twp 13 North South
Rge 42 East West
Sec 24 1/4 SW 1/4 SW 1/4
10 Acres 40 Acres 160 Acres
Gov't Lot County Fremont
Lat: Long:
Address of Well Site: Located adjacent to lot 3
City: Island Park
(Give at least name of Road + Distance to Road or Landmark)
Lot No. Blk No Subd. Name: Centennial Shores

4 USE:
☐ Domestic ☐ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☒ Other: Subdivision Well

5 TYPE OF WORK:
☒ New Well ☐ Modify ☐ Abandonment ☐ Other:

6 DRILL METHOD:
☒ Air Rotary ☐ Cable ☐ Mud Rotary ☐ Other:

7 SEALING PROCEDURES:

SEAL/FILTER PACK			AMOUNT		Method
Material	From	To	Sacks/Pounds		
Cement	0	244	20.1 Yrds		Overbore

Was drive shoe used? ☐ Yes ☒ No Shoe Depth(s) _____
Was drive shoe seal tested? ☐ Yes ☒ No How? _____

8 CASING/LINER:

Dia.	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
12"	+2	130	0.25	Steel	☒	☐	☒	☐
10"	+2	244	0.25	Steel	☒	☐	☒	☐
8"	229	330	0.25	Steel	☐	☒	☒	☐

Length of Headpipe: _____ Length of Tailpipe: _____

9 PERFORATIONS/SCREENS:

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
229	320	1/4"x2	1820	8"	Steel	☐	☒
		1/2"				☐	☐
						☐	☐

STATIC WATER LEVEL OR ARTESIAN PRESSURE:
20 ft below ground Artesian Pressure: _____ lb
Depth flow encountered: _____ ft
Describe access port or control devices: Sanitary Well Cap

11 WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Flowing Artesian

Yield	Drawdown	Pumping Level	Time
900GPM	47'	71'	8 Hrs

Water Temp _____ Bottom hole temp _____
Water Quality test or comments: _____
Depth first water encountered: _____

12 LITHOLOGIC LOG:

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Y	N
18"	0	5	Soil		X
	5	15	Gummy clay		X
	15	18	Sand & clay		X
	18	28	Broken basalt		X
	28	45	Clay & silt		X
	45	61	Firm basalt	X	
	61	67	Cinders		X
	67	77	Broken basalt	X	
	77	89	Broken cinders	X	
	89	96	Broken cinders & tan clay	X	
	96	110	Fractured black basalt	X	
	110	114	fractured black basalt & tan clay	X	
	114	130	Hard black basalt		X
16"	130	145	Red Cinders	X	
	145	175	Gray Rock		X
	175	190	Broken gray rock & orange clay	X	
			CONTINUED ON PG 2		

Completed Depth: 333 ft
Date Started: 11/7/00
Date Completed: 6/30/01

13 DRILLER'S CERTIFICATION:
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.
Firm: ANDREW WELL DRILLING SERVICES, INC. Firm: #5
Firm Official: _____ Date: 11/13/01
and _____
Supervisor/Operator: _____ Date: 11/13/01

Andrew

WELL DRILLER'S REPORT

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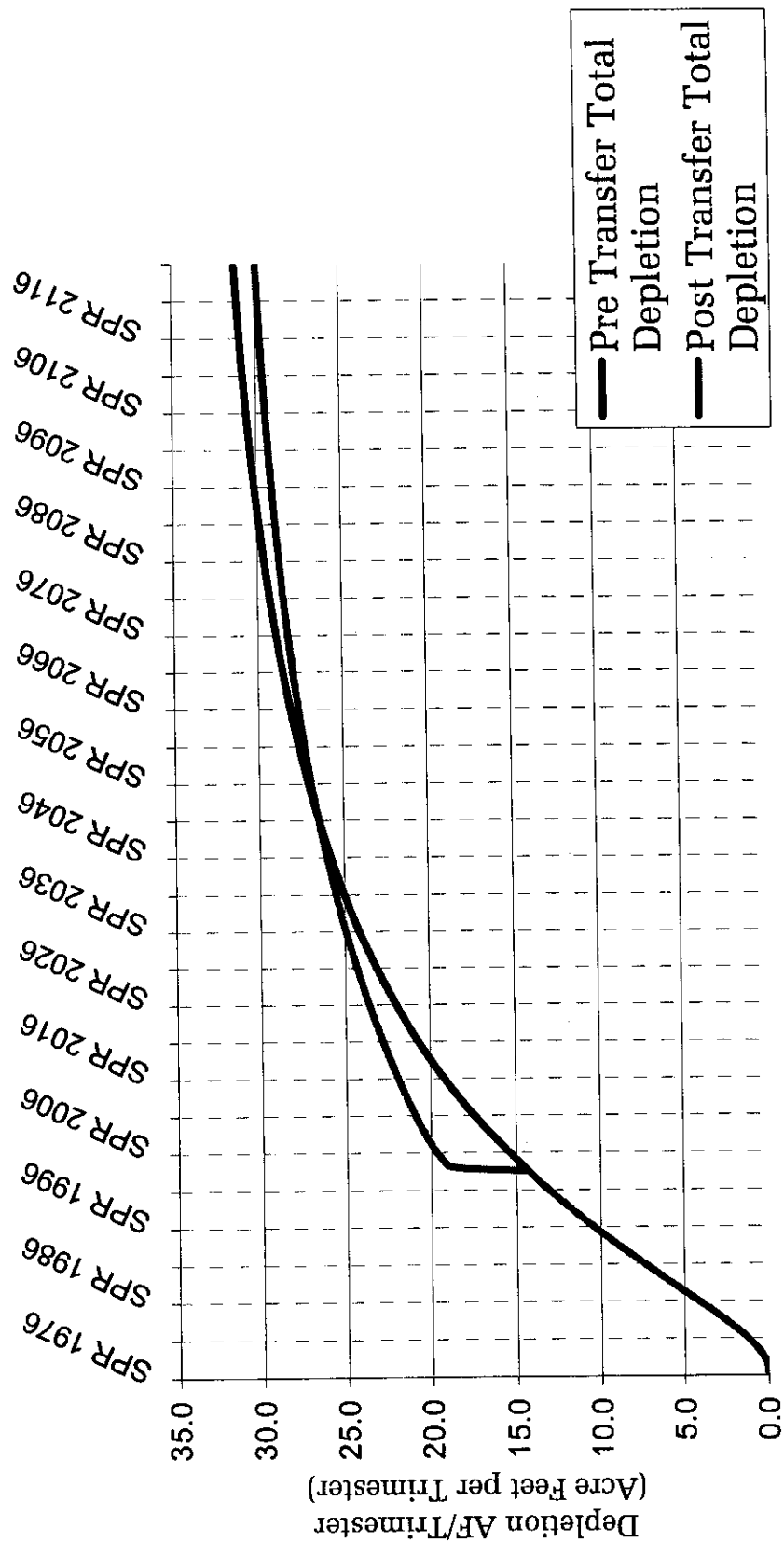
1 DRILLING PERMIT NO. #D0014672
Other IDWR NO. _____

12 LITHOLOGIC LOG:

[illegible]

Completed Depth: 333 ft
Date Started: 11/7/00
Date Completed: 6/30/01

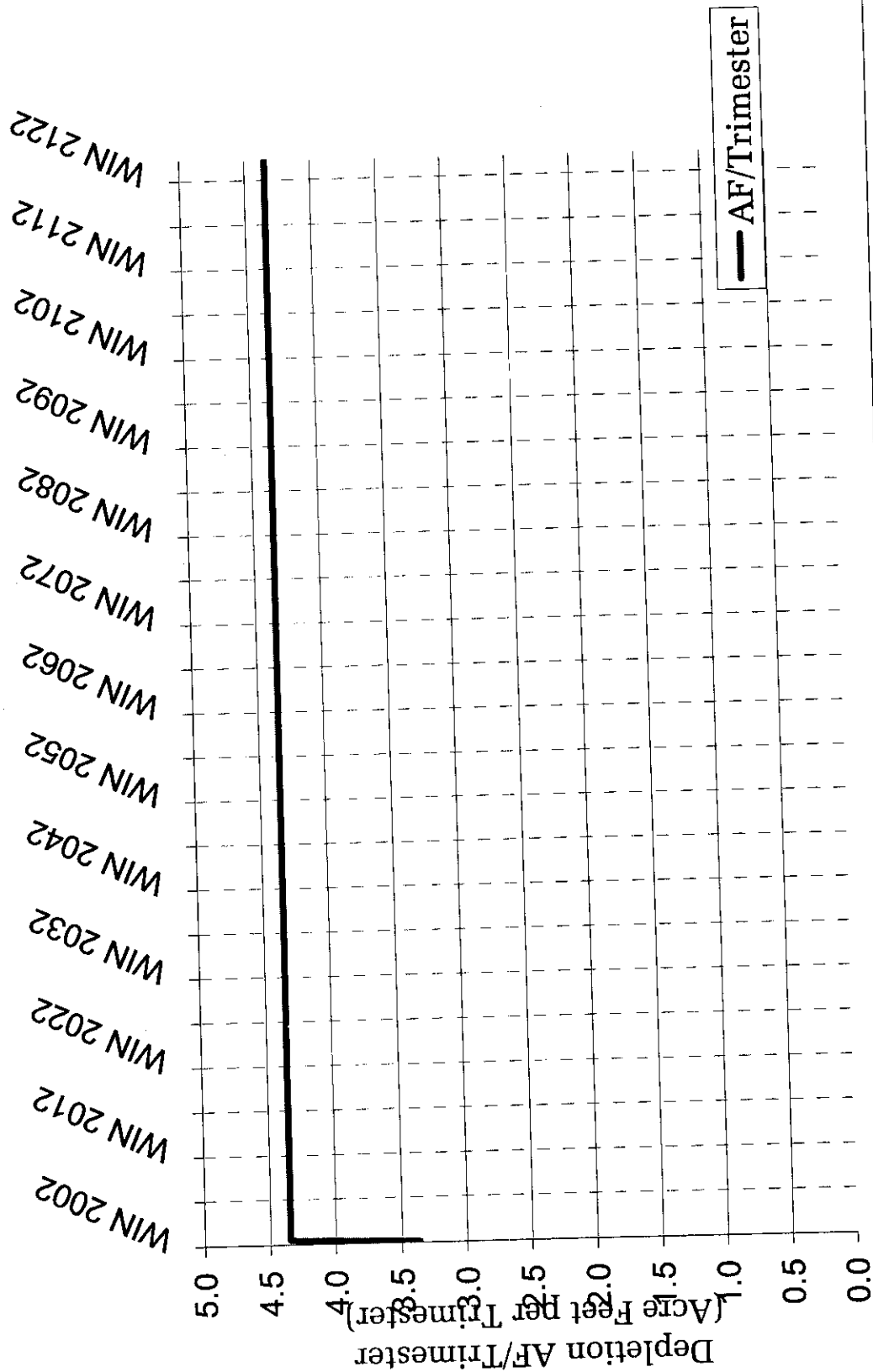
Net Stream Depletion: All Reaches Summed



WIN 1998
SPR 1999
SUM 1999
WIN 1999
SPR 2000
SUM 2000
WIN 2000
SPR 2001
SUM 2001
WIN 2001
SPR 2002
SUM 2002
WIN 2002
SPR 2003
SUM 2003
WIN 2003
SPR 2004
SUM 2004
WIN 2004
SPR 2005
SUM 2005
WIN 2005
SPR 2006
SUM 2006
WIN 2006
SPR 2007

Centennial Mountain Subdivision						
	Time days	Years	t/sdf	q/Q	AF/Trimester	
WIN 1999						
SPR 2000						
SUM 2000						
WIN 2000						
SPR 2001						
SUM 2001						
WIN 2001						
SPR 2002						
SUM 2002						
WIN 2002						
SPR 2003						
SUM 2003						
WIN 2003						
SPR 2004						
SUM 2004						
WIN 2004						
SPR 2005						
SUM 2005						
WIN 2005						
SPR 2006						
SUM 2006						
WIN 2006						
SPR 2007						

Jenkins Stream Depletion





RICHARD B. BYREM

Professional Land Surveyor

Licensed in Idaho, Montana, Wyoming, Colorado & Utah

11 March 2003

Mr. Jim Rush
ROCKY MOUNTAIN ENVIRONMENTAL
via FAX @ 524-1795

RE: Centennial Mountain Shores
Proposed Pond Development

Dear Mr. Rush:

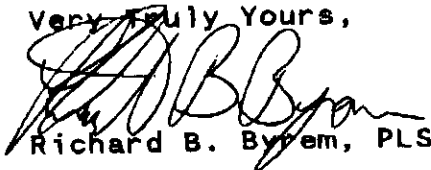
Following are two exhibits which depict the approximate surface area of a pond to be constructed by Centennial Mountain Properties, LLC, on their property in Fremont County, Idaho. You have already received a legal description of the boundary of the land in which the pond is to be located.

The approximate area of the pond to be constructed is 3.75 acres.

The point of diversion for the pond is an existing well located in the SW1/4 SW 1/4 of Section 24, T13N, R42E at N 07°19'17"E 583.52 feet from the SW corner of said section.

If you need any additional information on this subject, or if you have any questions, please don't hesitate to call.

Very Truly Yours,



Richard B. Byrem, PLS

Att/2 pages
cc: Kirk Jacobs

Richard B. Byrem-PLS, Chartered
14060 North 45th East • Idaho Falls, Idaho 83401 • (208) 535-0612

From Other Locations in ID, UT, MT, & WY Call (888) 535-0612



RICHARD B. BYREM

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BOUNDARY DESCRIPTION

POND PARCEL WITHIN FUTURE FILING OF CENTENNIAL MOUNTAIN SHORES

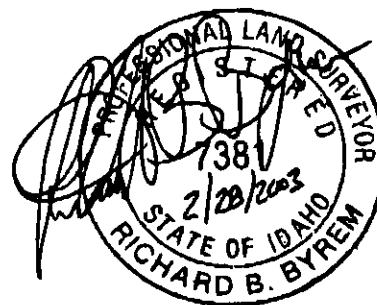
A TRACT OF LAND BEING A PORTION OF THE SOUTHEAST ONE-QUARTER OF SECTION 23 AND A PORTION OF THE NORTHEAST ONE-QUARTER OF SECTION 26, TOWNSHIP 13 NORTH, RANGE 42 EAST OF THE BOISE MERIDAN, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NE CORNER OF SAID SECTION 26; THENCE
S 77°58'03"W A DISTANCE OF 700.31 FEET TO THE POINT OF BEGINNING;
THENCE ALONG THE FOLLOWING ELEVEN COURSES:

- 1.) N 76°00'00"W A DISTANCE OF 265.00 FEET;
- 2.) N 14°00'00"E A DISTANCE OF 275.00 FEET;
- 3.) N 54°12'00"W A DISTANCE OF 494.26 FEET;
- 4.) N 49°47'00"E A DISTANCE OF 218.04 FEET;
- 5.) N 75°52'00"E A DISTANCE OF 373.89 FEET;
- 6.) N 46°32'00"E A DISTANCE OF 378.10 FEET;
- 7.) S 57°39'45"E A DISTANCE OF 185.24 FEET;
- 8.) S 17°42'40"W A DISTANCE OF 220.24 FEET;
- 9.) S 33°31'00"W A DISTANCE OF 324.37 FEET;
- 10.) S 11°38'30"W A DISTANCE OF 246.88 FEET;
- 11.) S 14°00'00"W A DISTANCE OF 300.03 FEET TO THE POINT OF

BEGINNING;

CONTAINING 10.24 ACRES.



Richard B. Byrem-PLS, Chartered
14060 North 45th East • Idaho Falls, Idaho 83401 • (208) 535-0612

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03-11-2003

10:48 AM

Page 1

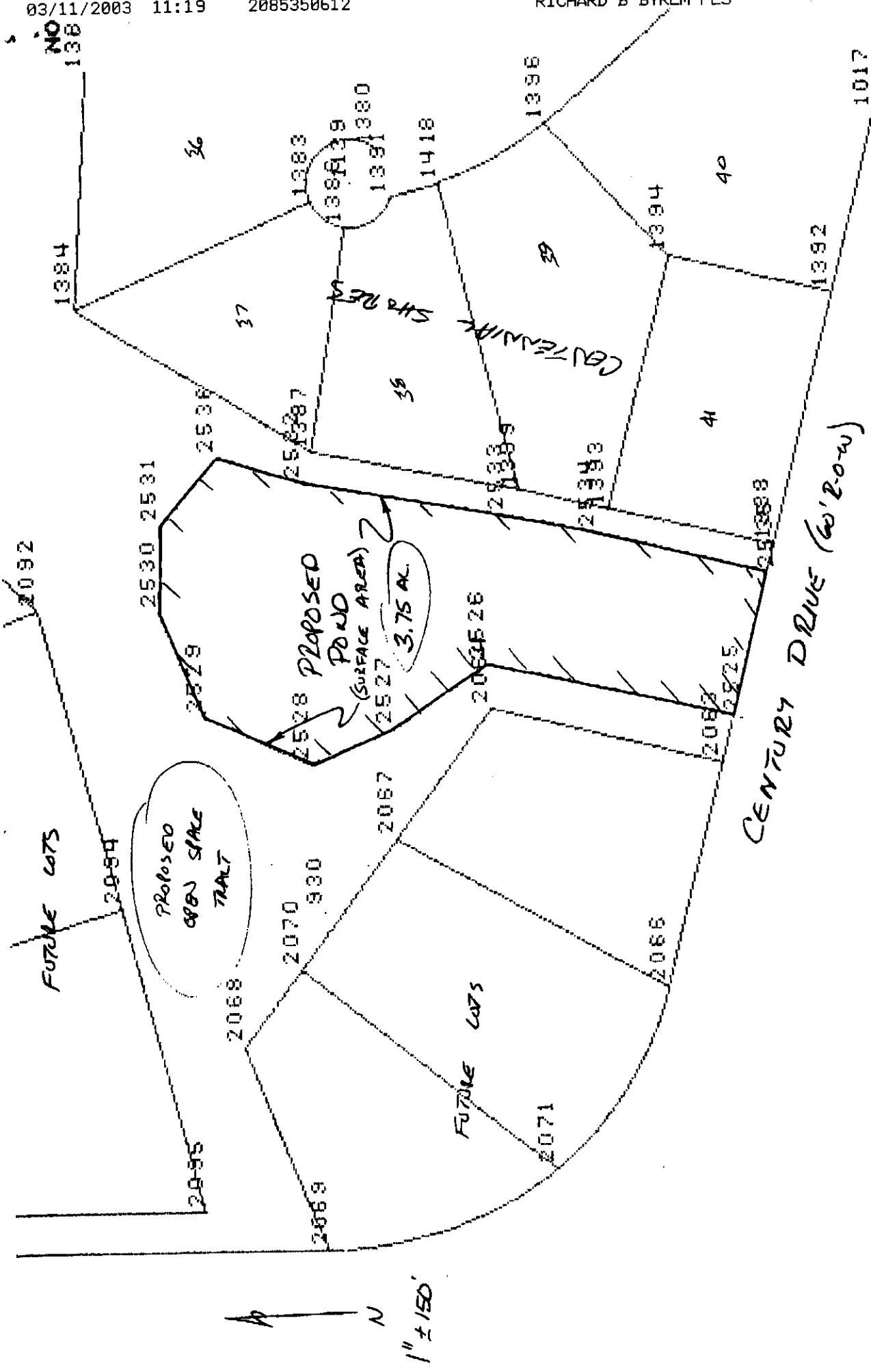
Program: SURVEY 3.03
 Filename: JACOBS

Job: JACOBS' ISLAND PARK RANCH
 By: RBB

Point	Quad	Direction	Distance	Northing	Easting	Elevation
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APPROXIMATE BOUNDARY OF PROPOSED POND
 AT CENTENNIAL MOUNTAIN SHORES
 IN SECTIONS 23 & 26, T13N, R42E, FREMONT COUNTY, IDAHO

Start				9620.5569	16721.2341	0.00
2525						0.00
IN	NE	13 13 20	300.523	9913.1129	16789.9723	0.00
2526						0.00
IN	NW	34 12 54	133.429	10023.4496	16714.9451	0.00
2527						0.00
IN	NW	22 29 48	104.840	10120.3114	16674.8305	0.00
2528						0.00
IN	NE	25 21 41	135.702	10242.9348	16732.9550	0.00
2529						0.00
IN	NE	68 36 07	135.702	10292.4447	16859.3027	0.00
2530						6362.72
IN	SE	88 46 50	104.362	10290.2239	16963.6407	6362.72
2531						-6362.72
IN	SE	51 34 37	105.081	10224.9199	17045.9659	0.00
2536						0.00
IN	SW	18 03 40	105.081	10125.0165	17013.3872	0.00
2532						0.00
IN	SW	10 41 36	241.067	9888.1357	16968.6563	0.00
2533						0.00
IN	SW	11 19 58	107.086	9783.1377	16947.6130	0.00
2534						0.00
IN	SW	14 54 37	212.544	9577.7497	16892.9240	0.00
2535						0.00
IN	NW	76 00 00	176.946	9620.5569	16721.2341	0.00
2525						
Area =			163211.520 Sq. Feet or	3.747 Acres		



10:47 AM

JACOBS 03-11-2003
SKETCH PREPARED BY: RICHARD B BYREM-PLS
(206) 535-0412