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(Leonard and Huntoon, 1974)

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Appendix A

Nebraska Resources Newsletter, Issue 28, July 2008
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Cancelling a Surface Water Right for Nonuse, by Pam Anderson

In Nebraska, **all water appropriations must be for a beneficial or useful purpose.** When an appropriator fails to use the water for the beneficial use specified in the permit for **more than five years, the water right can be cancelled** by the Department. Water rights can only be lost after going through a cancellation procedure with full due process protections. Water rights are not lost by forfeiture or any automatic process in Nebraska.

A cancellation starts with an investigation by the local field office staff. If they determine that there was water available during the last five years and that there was not "sufficient cause" to not use the water, then the appropriator will be sent a "Notice of Preliminary Determination of Nonuse." State law dictates what is "sufficient cause" for not using a water appropriation for five years. **Section 46-229.04** describes the complete list of acceptable excuses for not using the water.

46-229.04.

(2) Sufficient cause for nonuse shall be deemed to exist for up to thirty consecutive years if such nonuse was caused by the unavailability of water for that use. For a river basin, subbasin, or reach that has been designated as overappropriated pursuant to section 46-713 or determined by the department to be fully appropriated pursuant to section 46-714, the period of time within which sufficient cause for nonuse because of the unavailability of water may be deemed to exist may be extended beyond thirty years by the department upon petition therefor by the owner of the appropriation if the department determines that an integrated management plan being implemented in the river basin, subbasin, or reach involved is likely to result in restoration of a usable water supply for the appropriation.

(3) Sufficient cause for nonuse shall be deemed to exist indefinitely if such nonuse was the result of one or more of the following:

(a) For any tract of land under separate ownership, the available supply was used but on only part of the land under the appropriation because of an inadequate water supply;

(b) The appropriation is a storage appropriation and there was an inadequate water supply to provide the water for the storage appropriation or less than the full amount of the storage appropriation was needed to keep the reservoir full; or

(c) The appropriation is a storage-use appropriation and there was an inadequate water supply to provide the water for the appropriation or use of the storage water was unnecessary because of
climatic conditions.

(4) Sufficient cause for nonuse shall be deemed to exist for up to fifteen consecutive years if such nonuse was a result of one or more of the following:

(a) Federal, state, or local laws, rules, or regulations temporarily prevented or restricted such use;

(b) Use of the water was unnecessary because of climatic conditions;

(c) Circumstances were such that a prudent person, following the principles of good husbandry, would not have been expected to use the water;
(d) The works, diversions, or other facilities essential to use the water were destroyed by a cause not within the control of the owner of the appropriation and good faith efforts to repair or replace the works, diversions, or facilities have been and are being made;
(e) The owner of the appropriation was in active involuntary service in the armed forces of the United States or was in active voluntary service during a time of crisis;
(f) Legal proceedings prevented or restricted use of the water; or
(g) The land subject to the appropriation is under an acreage reserve program or production quota or is otherwise withdrawn from use as required for participation in any federal or state program or such land previously was under such a program but currently is not under such a program and there have been not more than five consecutive years of nonuse on that land since that land was last under that program.

The Department may specify by rule and regulation other circumstances that shall be deemed to constitute sufficient cause for nonuse for up to fifteen years.

The water right is cancelled if the appropriator doesn't respond to the notice. However, the appropriator may disagree with the Department's preliminary determination and request a contested case hearing. The hearing resembles a trial but there is a hearing officer instead of a judge or magistrate and the rules of evidence are not followed strictly. If the appropriator cannot prove that he or she had sufficient cause to not use the water, the water right is cancelled.

There is no increase in stream flow when a water right is cancelled for nonuse. This is because the water hadn't been diverted from the stream for at least five years prior to the cancellation. It is in effect "paper water" at that point. **The Department does not rely on "paper water" to determine if there is unappropriated water available for a new water use.** Instead, the historic flow method is used. The Department looks at stream gage data, observation and experience from water administration to decide if there is enough flowing water to issue a permit. The Department does not attempt to add up all of the water rights that have ever been issued and calculate how much "paper water" has been appropriated. It would be impossible to get an accurate picture of available stream flow by adding up all of the permits in a basin. Every year, the amount of water diverted from the stream changes because farmers change crops and each crop has different water needs or a farmer may put his or her land in EQIP or CREP and not irrigate at all for several years. The prior appropriation system is dynamic and rewards the senior irrigators who developed their fields first. Junior irrigators are entitled to take whatever is left.

The fact that an appropriator is not using his or her water right and it hasn't been cancelled yet does not affect whether or not a basin is determined to be fully appropriated. The only appropriations considered are those actually being used. A basin is fully appropriated if a senior appropriator requests junior appropriators that are diverting water to be closed so often that the junior appropriators cannot divert at least 65% of the water needed during the peak irrigation season or 85% during the entire season. **An unused paper water right does not factor into the calculations at all.**

Frenchman River – Natural Flow Water Rights

Frenchman Valley Irrigation District	D-24R	130.86 cfs	05/16/1890	9160.4 ac
H & RW Irrigation District	A-3869AR	16.64 cfs	04/03/1946	1415.0 ac
H & RW Irrigation District	A-6214R	136.80 cfs	04/16/1954	9576.0 ac
H & RW Irrigation District	A-9697R	2.24 cfs	03/04/1959	157.0 ac
Frenchman Valley Irrigation District	A-9802R	1.89 cfs	03/17/1960	132.0 ac
H & RW Irrigation District	A-13016R	9.76 cfs	04/03/1946	683.0 ac
H & RW Irrigation District	A-14249R	.86 cfs	06/04/1976	60.0 ac
H & RW Irrigation District	A-15678R	.34 cfs	07/10/1980	24.0 ac
Riverside Irrigation Company, Inc.	D-10AR	.73 cfs	12/19/1893	51.1 ac
Riverside Irrigation Company, Inc.	D-18	4.16 cfs	07/28/1894	291.0 ac
Riverside Irrigation Company, Inc.	A-1674	2.71 cfs	07/03/1922	190.0 ac
Riverside Irrigation Company, Inc.	A-3477R	2.00 cfs	07/31/1941	140.0 ac

Frenchman River – Storage Water Right

Bureau of Reclamation	A-3899	44,079 AF	05/01/1946

Storage Use Water Rights

Enders, Strunk, Harlan County, and Swanson Reservoirs

Bureau of Reclamation	A-6225HR	04/16/1954
Covers flow rights A-3869AR		
Bureau of Reclamation	A-6225HR	04/16/1954
Covers flow rights A-6214R		

Enders, Strunk, Harlan County, Swanson, and Hugh Butler Lake Reservoirs

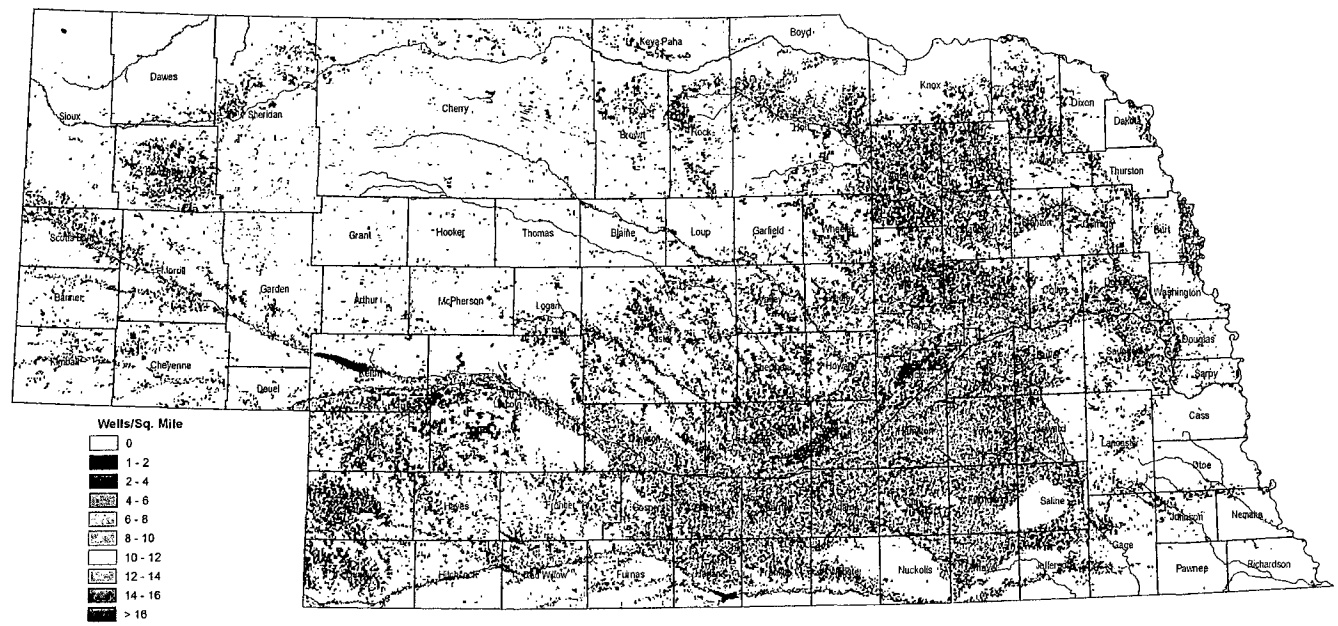
Bureau of Reclamation	A-9782	12/16/1959
Covers flow rights D-24-30, A-6214, A-9697, A-9802		
Bureau of Reclamation	A-15839	04/18/1981
Covers flow rights A-13016R, A-14249R, A-15678R		

Total Natural Flow Rights

Frenchman Valley Irrigation District	132.75 cfs	9,292.4 acres
H & RW Irrigation District	164.40 cfs	11,915 acres
Riverside Irrigation Company	9.60 cfs	672.1 acres

Appendix B

Density of Registered Irrigation Wells in Nebraska
August 2007



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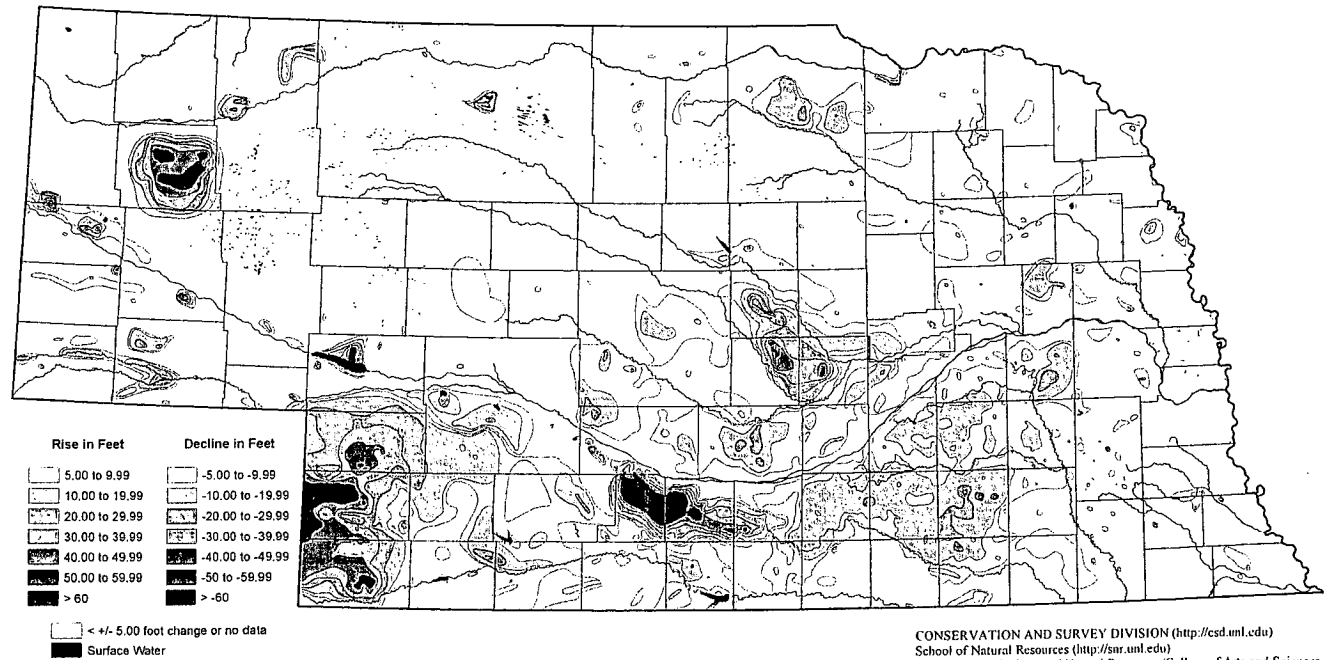
Mark Burbach, Water Levels Coordinator, CSD

Appendix C

Groundwater-level Changes in Nebraska - Predevelopment to Spring 2007



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U.S. Geological Survey
Water Resources Division - Nebraska District

Nebraska Natural Resources Districts

Central Nebraska Public Power and Irrigation District

Mark Burbach, Water Levels Coordinator, CSD

September 2007

Appendix D

Frenchman Valley Appraisal Study
Recreation Analysis

Jonathan Platt
Natural Resource Economist
Bureau of Reclamation

The recreation analysis for this appraisal level assessment of the Frenchman Valley Study alternatives focuses exclusively on effects at Enders Reservoir. Recreation effects of the proposed alternatives at other regional reservoirs or river segments were considered insignificant and were not addressed in the analysis.

Affected Environment:

This section presents estimates of current recreation visitation and economic value at Enders Reservoir. Enders Reservoir generates both water based and land based recreational activity. The reservoir provides approximately 1,707 acres of surface area and 26 miles of shoreline at full pool.

Recreation facilities at Enders Reservoir include two boat ramps, two campgrounds (150+ tent sites, 32 recreational vehicle sites), eight picnic areas, and one designated swimming beach.

Table REC1 presents the most recent five years (2002-2006) of available recreation visitation data by month at Enders State Recreation Area as obtained from the Nebraska Game and Parks Commission (NGPC). Total recreation use across this period averaged approximately 43,000 visits annually and ranged from a low of 39,812 visits to a high of 46,760 visits. The majority of the visits, nearly 80 percent, occurred during the high use season from May to September.

To measure the economic value associated with this visitation, estimates of economic value per visit were applied to the visitation estimates. However, the visitation estimates first needed to be grouped by primary recreation activity because the economic values per visit vary by recreation activity. To provide an estimate of visitation by recreation activity, a recently published study by Holland and Gabelhouse (2006) was used. This 1999 study surveyed recreators at Enders Reservoir. Table REC2 presents the visitation percentages by primary recreation activity at Enders Reservoir across the entire year and for the high use recreation season (May-September) as obtained from the survey. While the data from the survey was for 1999 and not the 2002-2006 period, the assumption is that the visitation percentages by recreation activity typically do not change significantly from one year to the next within the same general time period. The recreation activities identified in the survey from highest to lowest visitation levels were camping, fishing, boating, swimming, wildlife observation, hunting, and other (primarily walking/hiking). Camping was by far the most popular recreational activity accounting for 55.4% of the full year visitation and 63.2% of the high season use followed by fishing at 21.5% of the full year and 18.7% of the high season use.

Economic values per visit by activity were obtained from a meta analysis study conducted by Loomis (2005). This study determined economic value estimates by recreation activity from

hundreds of recreation economic benefit studies conducted from 1967 through 2003. These studies were separated by recreation activity and geographic region. Economic values were selected from the intermountain region (which includes Nebraska) for the recreation activities listed above. The values were then indexed to February 2008 dollars. The economic values per visit were determined to be highest for boating, fishing, and hunting, with the lowest values for swimming and camping.

Applying these values by recreation activity to the average current visitation estimates by recreation activity provides an estimate of average annual recreation economic value for the 2002 through 2006 period. Using the full year visitation and percentage by activity estimates, annual recreation economic value averaged nearly $1.9 million. Focusing purely on the high recreation season visitation estimates and percentages, the annual recreation economic value averaged $1.47 million. The top three activities in terms of economic value proved to be camping, fishing, and boating.

In addition to the visitation and economic value estimates, a simple recreation facility availability analysis was conducted for the years 2002-2006 to be consistent with the timeframe associated with the visitation and value estimates. While Chapter 5 – Potential Effects of the Alternatives will be focusing on differences between facility availability between the proposed alternatives, this same analysis for the 2002-2006 time period is intended to provide some historical perspective. Average and dry/wet (10%/90%) condition end of month (EOM) water levels were compared to high and low end usability thresholds for the two boat ramps and one swimming beach (see the recreation environmental consequences section for more detail on the methodology).

The boat ramps were evaluated from two perspectives, one where two feet were added to the bottom of each ramp to allow for launching and the other where the bottom of the ramp was simply used as the low end threshold. As shown in Table REC3, the boat ramps vary in terms of their availability based on the water condition and the assumptions regarding the low end usability threshold. When the two foot water level cushion is added to the bottom of the ramps, the Center Dam ramp is unavailable across the entire 2002-6 period. The new "low water" ramp is available from January or February through June during average and wet conditions. Considering the absolute low end of the ramps as the usability threshold improves availability, especially for the new low water ramp, which is available in all months except July through September under dry conditions. During the high use recreation season from May through September, Cow Beach boat ramp is available from May through July or August during average and wet conditions, but only May and June during dry conditions.

Table REC1: Average Annual and Monthly Visitation at Enders State Recreation Area (SRA)

Source: Nebraska Game & Parks Commission

Year	Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2002	ENDERS SRA	1,663	1,417	1,575	1,785	6,475	8,750	8,750	4,550	1,925	1,050	1,225	1,575	40,740
2003	ENDERS SRA	1,487	1,400	1,522	1,803	7,000	9,275	9,800	5,250	1,750	1,120	1,050	1,487	42,944
2004	ENDERS SRA	1,400	1,050	1,312	1,750	6,650	8,750	6,300	4,200	5,250	1,400	1,050	700	39,812
2005	ENDERS SRA	1,050	1,225	1,330	1,330	5,250	9,100	9,800	8,750	5,600	1,050	1,225	1,050	46,760
2006	ENDERS SRA	875	700	700	1,225	5,075	8,750	9,450	8,750	5,775	1,137	1,225	1,050	44,712
	Monthly Average:	1,295	1,158	1,288	1,579	6,090	8,925	8,820	6,300	4,060	1,151	1,155	1,172	42,994
	Percent by Month:	3.01	2.69	3.00	3.67	14.16	20.76	20.51	14.65	9.44	2.68	2.69	2.73	
	High Season (May-Sept) Average:	34,195												
	High Season (May-Sept) Percent:	79.54												

Table REC2: Average Annual Recreation Visitation and Economic Value by Activity

Recreation Activities	Full Year Percent (1)	High Season (May-Sept) Percent (1)	Full Year Visitation	High Season (May-Sept) Visitation	(2004 $) Economic Value per Visit (2)	(2008 $) Economic Value per Visit (2)	(2008 $) Full Year Value	(2008 $) High Season (May-Sept) Value
Camping	55.39	63.22	23,814	21,618	34.72	38.39	914,201	829,896
Fishing	21.49	18.72	9,239	6,401	49.57	54.81	506,391	350,844
Boating	8.54	8.79	3,672	3,006	53.68	59.35	217,922	178,398
Swimming	5.22	6.19	2,244	2,117	29.54	32.66	73,301	69,134
Wildlife Observation	4.34	2.19	1,866	749	37.24	41.18	76,830	30,835
Hunting	3.88	0.29	1,668	99	48.55	53.68	89,547	5,323
Other (Walking)	1.14	0.6	490	205	38.53	42.60	20,880	8,741
	100.00	100.00	42,994	34,195			1,899,073	1,473,171

Data Sources: (1) Holland and Gabelhouse (2006), (2) Loomis (2005)

Table REC3: Recreation Facility Availability Years 2002-2006 Note: YES = Available, NO = Unavailable

MM Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3086.7	3087.3	3087.7	3088.1	3088.2	3088.0	3086.2	3085.7	3085.3	3085.4	3085.7	3086.0
10%:	3086.3	3086.6	3086.8	3086.9	3086.7	3086.4	3085.0	3084.8	3084.7	3085.1	3085.3	3085.7
90%:	3087.3	3088.3	3089.1	3089.8	3090.0	3089.6	3087.0	3086.4	3085.8	3085.9	3086.1	3086.3

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3087 High: 3102

Average:	NO	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO

II. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3085 High: 3102

Average:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
10%:	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	YES
10%:	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES

Environmental Consequences:

The focus of the recreation analysis is on a comparison of recreation facility availability at Enders Reservoir for each of the proposed "action" alternatives compared to the No Action Alternative.

Methodology:

The availability of three primary water based recreation facilities found at Enders Reservoir were compared across the alternatives: 1) Center Dam boat ramp, 2) New "Low Water" boat ramp, and 3) Cow beach. The most current usability thresholds for the boat ramps were obtained from NGPC. The Center Dam ramp has a low end threshold of 3089 (bottom of the ramp) and a high end threshold of 3118 (top of the ramp). The New "Low Water" ramp has a low end threshold of 3085 and a high end threshold of 3102. To prevent boat trailers from running off the ends of the ramps, an assumption was made that the ramps would be closed when reservoir water levels dropped within two feet of the end of each ramp. This implies that the low end threshold for the Center Dam ramp increases to 3091 and the New "Low Water" ramp to 3087. While this reflects a "best guess" estimate of facility availability, the analysis was also run using the full length of the ramps from top to bottom. In addition, the Park Manager at Enders estimated Cow Beach to be most usable between elevations 3086 and 3100.

End of Month (EOM) water levels at Enders Reservoir were projected by Reclamation hydrologists for each alternative from 2008 through 2046. From this data, water level estimates were developed for average, dry (10^{th} percentile), median (50% percentile), and wet (90^{th} percentile) conditions by month and alternative.

Finally, the EOM water level estimates by alternative and hydrologic condition were compared to the high and low end usability thresholds by recreation facility to estimate future facility availability by month and alternative. The facility availability for each of the proposed action alternatives was then compared to the facility availability for the No Action Alternative to estimate the change in facility availability for the action alternatives (changes in availability are shown in bold in the tables). Note that the facility availability for each alternative is a rough estimate since it is based on EOM water levels. Obviously water levels can vary across the days in each month and even across the hours in each day, but water levels often tend to trend up or down within a month based on irrigation demands.

Facility Availability Results:

Recreation facility availability is presented for each of the alternatives. For the proposed action alternatives, emphasis is placed on the change in facility availability as compared to the No Action Alternative.

No Action Alternative: As shown in Table REC4 (displayed at the end of this section), the boat ramps vary in terms of their availability based on both the water condition and the assumptions regarding the low end usability threshold. When the two foot water

cushion is added to the bottom of the ramps, the Center Dam ramp shows up as unavailable across all water conditions. The new "low water" ramp only shows up as available during wet conditions, albeit for all months. Using the absolute low end of the ramps as the threshold improves availability. The Center Dam ramp becomes available in wet conditions, but only for January through June. The new low water ramp shows availability in all months during average and wet conditions, but no availability during dry conditions. During the high use recreation season from May through September, Cow Beach shows availability only in May and June during average conditions. The beach shows up as unavailable during dry conditions and available during wet conditions.

Flow Through Alternative: As presented in Table REC5, none of the facilities show up as available under any of the water conditions with the Flow Through Alternative. Compared to the No Action Alternative, this represents a reduction in facility availability as follows –

- Center Dam Ramp: Reduction in availability from January to June under wet conditions (without 2' cushion)

- New "Low Water" Ramp: Reduction in availability across all months under wet conditions (with 2' cushion), and in all months under average and wet conditions (without 2' cushion).

- Cow Beach: Reduction in availability during high use season for May and June during average conditions and May through September during wet conditions.

This alternative would be expected to result in a loss in recreation visitation and economic value as compared to the No Action Alternative.

Groundwater Recharge Alternative: As presented in Table REC6, none of the facilities show up as available under any of the water conditions with the Groundwater Recharge Alternative. Compared to the No Action Alternative, the reduction in facility availability mirrors that of the Flow Through Alternative.

This alternative would be expected to result in a loss in recreation visitation and economic value as compared to the No Action Alternative similar to the Flow Through Alternative.

Recreation Alternative without Deliveries: As presented in Table REC7, all of the facilities show up as available under each of the water conditions with the Recreation Alternative without Deliveries, except for the Center Dam ramp under dry conditions (with the 2' cushion).

Compared to the No Action Alternative, this represents an increase in facility availability as follows -

• Center Dam Ramp: Increase in availability in all months during average and wet conditions and under dry conditions during March and April (with 2' cushion). Without the 2' cushion, the increase in availability occurs in all months during average and dry conditions and from July through December during wet conditions.

• New "Low Water" Ramp: Increase in availability occurs across all months under average and dry conditions (with 2' cushion), and in all months under dry conditions (without 2' cushion).

• Cow Beach: Increase in availability during high use season for July through September during average conditions and May through September during dry conditions.

This alternative would be expected to result in the largest gain in recreation visitation and economic value as compared to the No Action Alternative of all the proposed action alternatives.

Recreation Alternative with Deliveries: As shown in Table REC8, the Center Dam ramp is generally unavailable (except from January through May during wet conditions) with the 2' cushion and generally available (except in August and September during dry conditions) without the 2' cushion. The New "Low Water" ramp and Cow Beach show up as available across all water conditions.

Compared to the No Action Alternative, this represents an increase in facility availability as follows -

• Center Dam Ramp: Increase in availability from January to May under wet conditions with the 2' cushion. Without the 2' cushion, the increase in availability occurs in all months during average and dry conditions (except for August and September in dry conditions), and from July through December during wet conditions.

• New "Low Water" Ramp: Increase in availability occurs across all months under average and dry conditions (with 2' cushion), and in all months under dry conditions (without 2' cushion).

• Cow Beach: Increase in availability during high use season for July through September during average conditions and May through September during dry conditions.

This alternative would be expected to result in a gain in recreation visitation and economic value as compared to the No Action Alternative, but perhaps somewhat less than the Recreation Alternative without Deliveries.

Table REC4: Recreation Facility Availability - No Action Alternative

Note: YES = Available, NO = Unavailable

?M Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3086.5	3086.7	3086.9	3086.9	3086.8	3086.4	3085.5	3085.1	3085.3	3085.5	3085.7	3086
10%:	3083.9	3084.1	3084.3	3084.4	3084.2	3084	3083.7	3082.4	3082.7	3082.9	3083.2	3083.6
90%:	3089.7	3089.9	3090.1	3090.2	3090.1	3089.1	3088.1	3088.1	3088.3	3088.5	3088.7	3088.9

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3087 High: 3102

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

II. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3085 High: 3102

Average:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	YES
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table REC5: Recreation Facility Availability - Flow Through Alternative

Note: YES = Available, NO = Unavailable

EOM Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080
10%:	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080
90%:	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080	3080

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3087 High: 3102

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

II. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3085 High: 3102

Average:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	NO	**NO**
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Note: **Bolded cells** reflect changes from the No Action Alternative.

Table REC6: Recreation Facility Availability - Groundwater Recharge Alternative Note: YES = Available, NO = Unavailable

EOM Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4
10%:	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4
90%:	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4	3082.4

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3087 High: 3102

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

'. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3085 High: 3102

Average:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	NO	**NO**
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Note: **Bolded cells** reflect changes from the No Action Alternative.

Table REC7: Recreation Facility Availability – Recreation Alternative Without Deliveries Note: YES = Available, NO = Unavailable

EOM Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3093.1	3093.2	3093.3	3093.3	3093.1	3092.9	3092.7	3092.5	3092.4	3092.5	3092.7	3092.8
10%:	3090.8	3090.9	3091.1	3091.1	3090.9	3090.6	3090.3	3090.1	3090.0	3090.1	3090.3	3090.5
90%:	3095.0	3095.1	3095.3	3095.2	3095.1	3094.9	3094.7	3094.6	3094.5	3094.5	3094.7	3094.9

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
10%:	NO	NO	**YES**	**YES**	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

New Ramp: Low: 3087 High: 3102

Average:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

II. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

New Ramp: Low: 3085 High: 3102

Average:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	YES	YES	YES	YES	YES	YES	**YES**	**YES**	**YES**	**YES**	**YES**	YES
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: **Bolded cells** reflect changes from the No Action Alternative.

Table REC8: Recreation Facility Availability – Recreation Alternative With Deliveries Note: YES = Available, NO = Unavailable

MSM Water Levels	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg:	3090.3	3090.5	3090.6	3090.6	3090.4	3089.8	3089.6	3089.4	3089.4	3089.6	3089.8	3090.0
10%:	3089.6	3089.8	3089.9	3089.9	3089.7	3089.3	3089.2	3089.0	3088.9	3089.1	3089.3	3089.4
90%:	3091.3	3091.4	3091.6	3091.6	3091.5	3090.7	3090.4	3090.3	3090.2	3090.4	3090.6	3090.8

I. Boat Ramps: 2 feet added to bottom of ramps to allow for launching

Center Dam: Low: 3091 High: 3118

Average:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
10%:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
90%:	**YES**	**YES**	**YES**	**YES**	**YES**	NO	NO	NO	NO	NO	NO	NO

New Ramp: Low: 3087 High: 3102

Average:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

II. Boat Ramps: 2 feet not added to bottom of ramps

Center Dam: Low: 3089 High: 3118

Average:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	NO	NO	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

New Ramp: Low: 3085 High: 3102

Average:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

III. Beaches:

Cow Beach: Low: 3086 High: 3100

Average:	YES	YES	YES	YES	YES	YES	**YES**	**YES**	**YES**	**YES**	**YES**	YES
10%:	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
90%:	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: **Bolded cells** reflect changes from the No Action Alternative.

References

Holland, R. and Z. Gabelhouse. 2006. Characterization of Outdoor Recreationists Using Four Bureau of Reclamation Reservoirs, Park Facilities, and Associated Wildlife Lands in the Republican River Basin. Report submitted to: U. S. Department of Interior, Bureau of Reclamation, Grand Island, NE.

Loomis, J. 2005. Updated Outdoor Recreation Use Values on National Forests and Other Public Lands. General Technical Report PNW-GTR-658. Portland, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

Appendix E

Frenchman Valley Appraisal Study
Agricultural Economic Analysis

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The agricultural assessment of the Frenchman Valley Appraisal Study focuses exclusively on effects to irrigated lands in the Frenchman Valley Irrigation District (FVID). More specifically, this analysis focuses solely upon the changes in pumping costs that will be borne by farmers under each of the selected Alternatives.

Affected Environment -

The Frenchman Valley Irrigation District lands lie along the Frenchman Creek in Hitchcock County. Annual precipitation generally averages about 21 inches per year.

The primary irrigated crops in the district include corn, soybeans, and alfalfa. Primary dryland crops include a wheat-eco fallow corn-fallow rotation.

Data from the 2002 census of agriculture shows that there were 299 farms in Hitchcock County encompassing 433,525 acres of land. The average size of farms was 1,450 acres. There were 119 irrigated farms in Hitchcock County in 2002, with a total of 228,403 acres. The average size of irrigated farms was 1,919 acres. The number of farms in Hitchcock County has generally been on a downward trend over time while the size of the remaining farms has trended upward. For example, the 1992 census of agriculture showed that the number of farms was 399, with the average size of those 1992 farms being 1,097 acres. There were 128 irrigated farms in 1992 with and average size of 1,303 acres.

The 2000 census of population shows that 3,111 people live in Hitchcock County in 1,292 homes. The median income for those households was $28,287 in 2000.

Frenchman Valley Irrigation District -

There are 9,295 acres in the District. Cropping pattern and yield data obtained from a 1998 repayment study showed that the primary irrigated crops in the District were corn, alfalfa, and soybeans. On a percentage basis, corn accounted for 86 percent of the irrigated acres, alfalfa was 7.75 percent, and soybeans were 6 percent.

Crop yields were obtained from the National Agricultural Statistics Service website so that a county average yield could by calculated and presented for informational purposes. The county average yields for Hitchcock County are shown in Table 1.

Table 1. Hitchcock County Average Yields, 2002-2006.

	2002	2003	2004	2005	2006	AVG
Corn	141	164	187	190	187	173.8
Soybeans	44	48	52	57	59	52
Alfalfa	4.5	5	5.1	5.4	4.3	4.9

Even though the crop yield data was obtained, it is used only in a qualitative manner in the analysis. The qualitative caveat on the yields shown in Table 1 is that the analysis assumes that those yields can be consistently attained by applying 12 acre-inches of water. Because of that assumption, the analysis can proceed by focusing only on pumping costs because all the other costs of production will be held constant throughout the period of study. Pumping costs will fluctuate depending on the energy cost. It is assumed that energy costs will increase by 5 percent per year.

Analysis Methodology -

This analysis will proceed based on the following assumptions:

1) Water applications will be a constant 12 acre-inches for all years.
2) Storage water deliveries will come every 5 years, at different rates for the selected Alternatives.
3) In years that storage water is available, pumping will make up the difference between the storage water amount and the 12 acre-inches that is assumed to be the "full" supply.
4) Pumping energy costs will be inflated 5 percent per year over the analysis period.

The basic assumption for this analysis is that 12 acre-inches of irrigation water will result in the county average yields shown in Table 1. In the years where storage water is delivered to District acres, there will be less pumping. For example, in years that no storage water is delivered to farms, 12 acre-inches of water per acre will be pumped. On the year that 4 acre-inches of storage water is delivered, only 8 acre-inches of water will be pumped. Thus, the impacts will be based on a change in pumping energy.

Yield will be held constant over the period of analysis. Pumping energy costs will be inflated 5 percent per year.

After estimating the pumping cost for each year in the period of analysis and for the amount pumped under each Alternative, the costs will be deflated back to current-year (2008) dollars. The current planning rate of 4.875 percent will be used as the deflator. Once the pumping costs have been estimated for each Alternative, they will be compared to the Future Without Alternative. The pumping costs for each Alternative will be shown.

Environmental Consequences -

The focus of the agricultural analysis is on a comparison of pumping costs for each of the proposed "action" alternatives compared to the No Action Alternative.

Future No Action Alternative -

Under this Alternative, the District will receive 3 acre-inches of storage water every 5 years. In those years that no storage water is delivered, each irrigated acre will receive 4 acre-inches of natural flow deliveries and 8 acre-inches of pumped water. In the years that storage water is delivered each acre will receive 4 acre-inches of natural flow water, 5 acre-inches of pumped water, and 3 acre-inches of storage water. Table 2 shows the water delivery schedule, the amount delivered from pumping or storage water, the net present value of the pumping cost per acre-inch, the pumping cost per acre, and the total pumping cost for all acres in the District.

Table 2. Future Without Alternative – Natural Flows, Amount Pumped, Storage Water Deliveries, Total Deliveries per Acre, Pumping Costs per Acre, and the Total Pumping Costs for 9,295 Acres in FVID.

Year	Natural Flow	Pumped	Surface Water Del.	Total Water Del.	Pumping Cost/Acre	NPV of Total Cost
2008	4	5	3	12	$8.34	$77,551
2009	4	8		12	$9.67	$89,918
2010	4	8		12	$10.96	$101,855
2011	4	8		12	$11.37	$105,726
2012	4	8		12	$11.67	$108,430
2013	4	5	3	12	$7.48	$69,509
2014	4	8		12	$12.21	$113,505
2015	4	8		12	$12.35	$114,834
2016	4	8		12	$12.77	$118,702
2017	4	8		12	$13.02	$121,038
2018	4	5	3	12	$8.41	$78,189
2019	4	8		12	$13.56	$126,008
2020	4	8		12	$13.70	$127,359
2021	4	8		12	$13.97	$129,841
2022	4	8		12	$14.18	$131,816
2023	4	5	3	12	$9.08	$84,415
2024	4	8		12	$14.64	$136,069
2025	4	8		12	$14.81	$137,635
2026	4	8		12	$14.99	$139,365
2027	4	8		12	$15.22	$141,497
2028	4	5	3	12	$9.68	$89,969
2029	4	8		12	$15.53	$144,305
2030	4	8		12	$15.69	$145,808
2031	4	8		12	$15.88	$147,571
2032	4	8		12	$16.06	$149,308
2033	4	5	3	12	$10.17	$94,507
2034	4	8		12	$16.29	$151,382
2035	4	8		12	$16.46	$152,974
2036	4	8		12	$16.58	$154,092
2037	4	8		12	$16.69	$155,131
2038	4	5	3	12	$10.54	$97,976

2039	4	8		12	$16.94	$157,418
2040	4	8		12	$17.06	$158,603
2041	4	8		12	$17.14	$159,337
2042	4	8		12	$17.25	$160,364
2043	4	5	3	12	$10.88	$101,096
2044	4	8		12	$17.45	$162,158
2045	4	8		12	$17.54	$163,027
2046	4	8		12	$17.64	$163,930
SUM of Pumping Costs						$2,633,344.00

The net present value of pumping costs ranged from $8.34 per acre in 2008 to an estimated $17.64 per acre in 2046, on a net present value basis. When all the pumping costs for all the years and the 9,295 acres in the District are added up, there will be an outlay of $2.63 million dollars for pumping costs.

Flow Through Alternative -

Under the Flow Through Alternative, there are no storage deliveries to the District. Thus, the irrigated acres in the District will pump 7.4 acre-inches every year of the study period and 4.6 acre-inches of natural flow water will be delivered annually. Pumping costs are based on pumping 7.4 acre-inches annually with an increasing cost for electrical energy. Table 3 shows the natural flow amounts, amount pumped per year, total deliveries per acre per year, pumping costs per year, and the total amount of pumping expenses that will accrue.

Table 3. Flow Through Alternative – Amount Pumped, Storage Water Deliveries, Total Deliveries Per Acre, Pumping Costs per Acre, and the Total Pumping Costs for 9,295 Acres in FVID.

Year	Natural Flow	Pumped	Surface Water Del.	Total Water Del.	Pumping Cost/Acre	NPV of Total Cost
2008	4.6	7.4		12	$9.24	$85,917
2009	4.6	7.4		12	$9.49	$88,177
2010	4.6	7.4		12	$9.94	$92,427
2011	4.6	7.4		12	$10.34	$96,090
2012	4.6	7.4		12	$10.67	$99,214
2013	4.6	7.4		12	$10.90	$101,322
2014	4.6	7.4		12	$11.30	$104,992
2015	4.6	7.4		12	$11.43	$106,222
2016	4.6	7.4		12	$11.86	$110,247
2017	4.6	7.4		12	$12.05	$111,960
2018	4.6	7.4		12	$12.32	$114,497
2019	4.6	7.4		12	$12.54	$116,557
2020	4.6	7.4		12	$12.75	$118,548
2021	4.6	7.4		12	$13.00	$120,809
2022	4.6	7.4		12	$13.19	$122,604
2023	4.6	7.4		12	$13.41	$124,612

2024	4.6	7.4	12	$13.61	$126,476
2025	4.6	7.4	12	$13.76	$127,897
2026	4.6	7.4	12	$13.93	$129,469
2027	4.6	7.4	12	$14.14	$131,416
2028	4.6	7.4	12	$14.30	$132,901
2029	4.6	7.4	12	$14.41	$133,965
2030	4.6	7.4	12	$14.56	$135,333
2031	4.6	7.4	12	$14.73	$136,943
2032	4.6	7.4	12	$14.90	$138,529
2033	4.6	7.4	12	$15.05	$139,871
2034	4.6	7.4	12	$15.13	$140,599
2035	4.6	7.4	12	$15.28	$142,046
2036	4.6	7.4	12	$15.39	$143,054
2037	4.6	7.4	12	$15.49	$143,991
2038	4.6	7.4	12	$15.62	$145,162
2039	4.6	7.4	12	$15.73	$146,212
2040	4.6	7.4	12	$15.85	$147,280
2041	4.6	7.4	12	$15.90	$147,796
2042	4.6	7.4	12	$16.01	$148,856
2043	4.6	7.4	12	$16.11	$149,747
2044	4.6	7.4	12	$16.19	$150,469
2045	4.6	7.4	12	$16.27	$151,251
2046	4.6	7.4	12	$16.37	$152,173
SUM of Pumping Costs					$2,631,652.00

Pumping costs range from $9.24 per acre to $16.37 per acre on a net present value basis. The net present value of pumping costs for all 9,295 acres in the District add up to $2.63 million.

Groundwater Recharge Alternative -

No storage water is delivered under this Alternative. No natural flows are delivered either. Irrigated acres within the District will only receive 12 acre-inches of pumped irrigation water each year of the study period. Table 4 shows the amount pumped per year, total deliveries per year, pumping costs per year, and the total amount of pumping expenses that will accrue.

Table 4. Groundwater Recharge Alternative – Natural Flows, Amount Pumped, Storage Water Deliveries, Total Deliveries, Pumping Costs per Acre, and the Total Pumping Costs for 9,295 Acres in the FVID.

Year	Natural Flow	Pumped	Surface Water Del.	Total Water Del.	Pumping Cost/Acre	NPV of Total Cost
2008	0	12		12	$14.76	$137,198
2009	0	12		12	$15.27	$141,976
2010	0	12		12	$15.92	$147,947
2011	0	12		12	$16.57	$153,978
2012	0	12		12	$17.12	$159,129
2013	0	12		12	$17.59	$163,468

2014	0	12	12	$18.15	$168,659
2015	0	12	12	$18.45	$171,489
2016	0	12	12	$19.08	$177,326
2017	0	12	12	$19.38	$180,171
2018	0	12	12	$19.83	$184,350
2019	0	12	12	$20.27	$188,381
2020	0	12	12	$20.55	$191,039
2021	0	12	12	$20.95	$194,761
2022	0	12	12	$21.21	$197,178
2023	0	12	12	$21.63	$201,033
2024	0	12	12	$21.96	$204,103
2025	0	12	12	$22.16	$205,980
2026	0	12	12	$22.49	$209,047
2027	0	12	12	$22.83	$212,245
2028	0	12	12	$23.10	$214,694
2029	0	12	12	($1.95)	($18,162)
2030	0	12	12	$23.53	$218,712
2031	0	12	12	$23.78	$221,001
2032	0	12	12	$24.09	$223,962
2033	0	12	12	$24.30	$225,847
2034	0	12	12	$24.43	$227,073
2035	0	12	12	$24.69	$229,462
2036	0	12	12	$24.87	$231,138
2037	0	12	12	$25.06	$232,964
2038	0	12	12	$25.24	$234,632
2039	0	12	12	$25.43	$236,371
2040	0	12	12	$25.62	$238,136
2041	0	12	12	$25.71	$239,006
2042	0	12	12	$25.88	$240,545
2043	0	12	12	$26.04	$242,028
2044	0	12	12	$26.19	$243,428
2045	0	12	12	$26.33	$244,724
2046	0	12	12	$26.47	$246,070
SUM of Pumping Costs					$4,004,702.00

Pumping costs range from $14.76 per acre to $26.47 per acre. The net present value of pumping costs for all 9,295 acres in the District add up to $4.0 million.

Recreation Without Storage Deliveries Alternative -

No storage water is assumed to be delivered under this Alternative. Irrigated acres within the District will receive 12 acre-inches of pumped irrigation water each year of the study period. Table 5 shows the amount pumped per year, total deliveries per year, pumping costs per year, and the total amount of pumping expenses that will accrue.

Table 5. Recreation Without Storage Deliveries Alternative – Natural Flows Delivered, Amount Pumped, Storage Water Deliveries, Total Deliveries, Pumping Costs per Acre, and the Total Pumping Costs for 9,295 Acres in the FVID.

Year	Natural Flow	Acre-Inches Pumped	Storage Water Del.	Total Water Del.	Pumping Cost/Acre	NPV of Total Cost
2008	4	8		12	$9.92	$92,174
2009	4	8		12	$9.67	$89,918
2010	4	8		12	$10.96	$101,855
2011	4	8		12	$11.37	$105,726
2012	4	8		12	$11.67	$108,430
2013	4	8		12	$11.72	$108,979
2014	4	8		12	$12.21	$113,505
2015	4	8		12	$12.35	$114,834
2016	4	8		12	$12.77	$118,702
2017	4	8		12	$13.02	$121,038
2018	4	8		12	$13.27	$123,340
2019	4	8		12	$13.56	$126,008
2020	4	8		12	$13.70	$127,359
2021	4	8		12	$13.97	$129,841
2022	4	8		12	$14.18	$131,816
2023	4	8		12	$14.42	$134,022
2024	4	8		12	$14.64	$136,069
2025	4	8		12	$14.81	$137,635
2026	4	8		12	$14.99	$139,365
2027	4	8		12	$15.22	$141,497
2028	4	8		12	$15.40	$143,130
2029	4	8		12	$15.53	$144,305
2030	4	8		12	$15.69	$145,808
2031	4	8		12	$15.88	$147,571
2032	4	8		12	$16.06	$149,308
2033	4	8		12	$16.20	$150,565
2034	4	8		12	$16.29	$151,382
2035	4	8		12	$16.46	$152,974
2036	4	8		12	$16.58	$154,092
2037	4	8		12	$16.69	$155,131
2038	4	8		12	$16.81	$156,251
2039	4	8		12	$16.94	$157,418
2040	4	8		12	$17.06	$158,603
2041	4	8		12	$17.14	$159,337
2042	4	8		12	$17.25	$160,364
2043	4	8		12	$17.36	$161,352
2044	4	8		12	$17.45	$162,158
2045	4	8		12	$17.54	$163,027
2046	4	8		12	$17.64	$163,930
SUM of Pumping Costs						$2,835,356.00

Pumping costs range from $9.92 per acre to $17.64 per acre on a net present value basis. The net present value of pumping costs for all 9,295 acres in the District add up to $2.84 million.

Recreation With Irrigation Deliveries -

Under this Alternative, the District will deliver 2 acre-inches of storage water every 5 years. Irrigated acres will receive 8 acre-inches of pumped water and 4 acre-inches of natural flow in four of every five years. In the fifth year, these acres will receive 5 acre-inches of pumped water, 4 acre-inches of natural flow, and 3 acre-inches of storage water. Table 6 shows the amount pumped per year, total deliveries per year, pumping costs per year, and the total amount of pumping expenses that will accrue.

Table 6. Recreation With Storage Deliveries Alternative – Natural Flows, Amount Pumped, Storage Water Deliveries, Total Deliveries, Pumping Costs per Acre, and the Total Pumping Costs, FVID

Year	Natural Flow	Pumped	Surface Water Del.	Total Water Del.	Pumping Cost/Acre	NPV of Total Cost
2008	4	6	2	12	$7.55	$70,194
2009	4	8		12	$10.26	$95,327
2010	4	8		12	$10.68	$99,276
2011	4	8		12	$11.11	$103,267
2012	4	8		12	$11.48	$106,672
2013	4	6	2	12	$8.93	$82,992
2014	4	8		12	$12.15	$112,972
2015	4	8		12	$12.30	$114,326
2016	4	8		12	$12.72	$118,217
2017	4	8		12	$12.97	$120,576
2018	4	6	2	12	$10.06	$93,497
2019	4	8		12	$13.51	$125,588
2020	4	8		12	$13.70	$127,359
2021	4	8		12	$13.97	$129,841
2022	4	8		12	$14.18	$131,816
2023	4	6	2	12	$10.93	$101,558
2024	4	8		12	$14.64	$136,069
2025	4	8		12	$14.81	$137,635
2026	4	8		12	$14.99	$139,365
2027	4	8		12	$15.22	$141,497
2028	4	6	2	12	$11.64	$108,168
2029	4	8		12	$15.53	$144,305
2030	4	8		12	$15.69	$145,808
2031	4	8		12	$15.88	$147,571
2032	4	8		12	$16.06	$149,308
2033	4	6	2	12	$12.24	$113,733
2034	4	8		12	$16.29	$151,382
2035	4	8		12	$16.46	$152,974
2036	4	8		12	$16.58	$154,092
2037	4	8		12	$16.69	$155,131

2038	4	6	2	12	$12.69	$117,954
2039	4	8		12	$16.94	$157,418
2040	4	8		12	$17.06	$158,603
2041	4	8		12	$17.14	$159,337
2042	4	8		12	$17.25	$160,364
2043	4	6	2	12	$13.08	$121,617
2044	4	8		12	$17.45	$162,158
2045	4	8		12	$17.54	$163,027
2046	4	8		12	$17.64	$163,930
SUM of Pumping Costs						$2,686,325.00

Pumping costs range from $7.55 per acre to $17.64 per acre on a net present value basis. The net present value of pumping costs for all 9,295 acres in the District add up to $2.69 million.

Comparison of Alternatives -

To complete the analysis, the results from each of the Alternatives are compared to the Future Without Alternative. The comparison will focus on the sum of pumping costs from Tables 2-6 above. Table 7 shows the sum of the pumping costs for each of the Alternatives.

Table 7. Sum of Pumping Costs for All Acres in the District, by Alternative.

Alternative	Acre-Inches Pumped	Total Costs	Difference
Future Without	8 or 5	$2,633,344	
Flow Through	7.4	$2,631,652	$1,692
Groundwater Recharge	12	$4,004,702	$1,371,358
Recreation w/o Deliveries	8	$2,835,356	$202,012
Recreation w/ Deliveries	8 or 6	$2,686,325	$52,981

The Future Without Alternative had pumping costs of $2.633 million. In this Alternative, 3 acre-inches of storage water were delivered every 5 years over the period of study. Thus, a repeating cycle of pumping 8 acre-inches for four years was followed by one year of pumping 5 acre-inches of water. Each year, there were 4 acre-inches of natural flow delivered. The sum of pumping costs for the 9,295 acres in the District came to $2.63 million.

The Flow Through Alternative had 4.6 acre-inches of natural flow delivered annually. Thus, for each acre to receive a 12 acre-inch supply of irrigation water, 7.4 acre-inches were pumped. There were no storage water deliveries made in any year. Total pumping costs for the Flow Through Alternative, at $2.631 million were $1,700 higher than the Future Without Alternative pumping costs.

The Groundwater Recharge Alternative had no natural flow deliveries made, nor were there any storage water deliveries. Under this Alternative, the highest pumping costs are

seen, estimated at $4.0 million. Pumping costs for this Alternative are $1.4 million higher than the Future Without Alternative.

The Recreation Without Deliveries Alternatives had no storage water deliveries. However, there were natural flow deliveries of 4 acre-inches annually, so the amount pumped per acre was 8 acre-inches. Total pumping costs came to $2.84 million under this Alternative, $200,000 higher than the Future Without Alternative pumping costs.

The Recreation With Deliveries Alternative pumping costs came to $2.69 million. A repeating cycle of four years of pumping 8 acre-inches of water combined with 4 acre-inches of natural flow deliveries was followed by one year of pumping 6 acre-inches of water combined with 4 acre-inches of natural flow deliveries and 2 acre-inches of storage water deliveries. The Recreation With Deliveries Alternative had pumping costs of $89,000 more than the Future Without Alternative.

Appendix F

Frenchman Valley Meeting

McCook Field Office

May 4, 2005 – 10:30 a.m.

Agency	Name	Phone	Email
Bureau of Reclamation			
	Alice Johns	308-389-5301	ajohns@gp.usbr.gov
	Steve Ronshaugen	308-389-5304	sronshaugen@gp.usbr.gov
	Mike Kube	308-389-5321	mkube@gp.usbr.gov
	Jill Manring	308-389-5328	jmanring@gp.usbr.gov
	Jack Wergin	308-389-5322	jwergin@gp.usbr.gov
	Marv Swanda	308-345-1027	mswanda@gp.usbr.gov
	Bill Peck	308-345-1029	wpeck@gp.usbr.gov
	Craig Scott	308-345-1030	cscott@gp.usbr.gov
Nebraska Department of Natural Resources			
	Roger Patterson	402-471-2366	rpatterson@dnr.state.ne.us
	Steve Gaul	402-471-3955	sgaul@dnr.state.ne.us
	Jeff Shafer	402-471-0586	jshafer@dnr.state.ne.us
	Brad Edgerton	308-697-3730	ndwrcamb@swnebr.net
Frenchman Valley & H & RW Irrigation Districts			
	Don Felker – FV, HRW ID	308-345-5773	
	Jerry Kotschwar - FVID	308-278-2792	
	Kenneth Albert - FVID	308-278-2327	
	Roger Kolbet - H&RW ID	308-278-2239	
	Don Ruggles - H&RW ID	308-364-2750	
Middle Republican NRD			
	Dan Smith	308-367-4281	dsmith@mrnrd.org
Nebraska Game & Parks Commission			
	Larry Hutchinson	402-471-5554	lhutch@ngpc.state.ne.us
	Irvin Long	308-345-6507	ilong@ngpc.state.ne.us
	Bill Christensen	308-394-5118	enderssra@ngpc.state.ne.us
	Hal Walker	308-423-2080	hchatch@ngpc.state.ne.us
	Keith Koupal	308-865-5326	
	Darrol Eichner	308-284-8803	deichner@ngpc.state.ne.us

Flip Chart Notes from the May 4, 2005 Frenchman Valley Meeting

Game and Parks Interest

-Composition of fisheries
    •Chemical renovation
-Future reservoir water supply
-"Quality of Life" – Effects of decreasing population
-Cabin Owner interest
-Higher minimum pool, El. 3089.40 - Approximately 14,000 AF
-Preferred minimum pool, El. 3099.0
-Loss of habitat areas
-Water temps/ algae blooms increase with lower levels
-Fish kill/ human health with lower lake levels
-Capital investments for fisheries/ parks
-Need for creal user surveys (update?)
-Noxious weed problems with lower lake levels
-Off-road vehicle use
-Consistent water levels El. 3090.0? – 5/2002 last time reservoir was at this level
-Boat ramps
-Aesthetics
-Congestion in lake, parks area
    •Boating safety
    •Non-resident use
-Valuation of recreation facilities
-Non-resident economic benefit to local area
-1968 – last time reservoir filled
-Who pays for benefits?

NRD Interest

-No "new" restrictions on groundwater pumping
-Third party impacts from "new" restrictions
-Additional controls & regulations
-Who pays for benefits?
-Stay compliant with Compact

District Objectives/Goals

-Reservoir Water Supply
    •Natural flows cover half the district
    •Water right is 130 cfs. Current supply is 40 cfs.
-Reliability of reservoir supply and natural flow supply
-Financial Reliability of District
-Benefits to non-district area/ beneficiaries pay for benefits

DNR Interest

-Get most benefit of future water supply
-Compact implications (stay in compliance)
-Solvency of Districts
-Share benefits/ burden
-Improve water levels in lake and intentional ground water recharge (in targeted areas)
-"Streamline" study process
-Examine legal/administrative changes to change use to get greatest benefit

Existing Compact Groundwater Model

-"Do nothing"
-Evaluate alternatives
-Future water supplies

Reclamation Interest

-Protect Federal Investment
    •Both irrigation and fish/ recreation benefits
-Existing contracts with the Irrigation Districts
-Solvency of the Districts
-Meet authorized purposes of the project
-Storage and storage use rights are considerably higher than what is available
-Downstream Irrigation Districts Interest
-SOD Evaluation

Nebraska Investigations Program

Frenchman Valley Appraisal Study – A cost-shared study that will examine opportunities for more efficient management of water supplies in the Frenchman River Valley including Reclamation's Enders Reservoir, a feature of the Frenchman-Cambridge Division in Nebraska. The study will focus on problems and opportunities in an area that has experienced dramatically reduced ground and surface water supplies, including reduced reservoir inflows. The study area is covered by the recent Republican River Compact Settlement. More efficient management of Republican River can help extend water supplies and meet interstate compact needs as addressed in the Republican River Compact Settlement.

The study will identify whether there is a Federal interest in intensive management of interrelated groundwater and surface water supplies to meet Compact requirements as well as for meeting other economic and environmental needs. The study will be coordinated with the State, irrigation districts, and natural resources districts.

Draft 4/15/05

FRENCHMAN VALLEY STUDY

Goal

To evaluate alternative program activities, structural measures or incentives that can assist in optimizing existing facilities, providing lake level benefits, and providing recharge facilities for Enders Reservoir and the irrigated area it serves.

Objectives

1. Describe the Study Area
2. Consult with stakeholder groups
3. Evaluate problems and opportunities
4. Evaluate alternative choices for optimizing existing facilities related to Enders Reservoir and the irrigated area it serves
    a) Structural options
    b) Program options and incentives
    c) Other
5. Evaluate alternative choices for providing lake level benefits from Enders Reservoir
    a) Structural options
    b) Program options and incentives
    c) Other
6. Evaluate alternative choices for providing recharge benefits through use of Enders Reservoir
    a) Structural options
    b) Program options and incentives
    c) Other
7. Formulate alternative plans
8. Evaluate overall effects of plans
9. Compare plans
10. Provide recommendations