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MEMORANDUM

To: Mr. Mike Thompson
Nebraska Department of Natural Resources (DNR)

From: Tom Riley
David Kracman
Marc Groff

Date: November 16, 2005

Re: **Requested Information**

On 14 November 2005, DNR requested that The Flatwater Group, Inc. (TFG) provide assistance with the following four tasks:

1. Estimate an average pumping cost associated using the well sets provided by DNR.
2. Estimate associated cost for piping pumped water to stream (labor and materials).
3. Estimate transportation losses through stream network to perennial portion of stream.
4. Irrigation v. Dryland

Please find enclosed attachments A through C which address these tasks. Attachment A contains a response to Task 1, Attachment B responds to tasks 2 and 3, and Attachment C provides a response to Task 4 which deals with the economics of irrigated versus dryland farming.

Should you have any questions or wish to further pursue the preliminary information presented in the Attachments, please contact us at the above number.

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ATTACHMENT A

Three augmentation sites were selected by DNR for evaluation of pumping costs. Those sites are referred to as Farm2will, Spring2rope, and Thom and are shown on Figure 1. These sites are comprised of the following number of wells (wells having a null adjusted flow rate were not included):

Farm2will – 179 wells
Spring2rope – 361 wells
Thom – 154 wells

Table 1 provides a summary of the average adjusted pumping rates, pumping water lifts, and hours of operation based on available power record data. The information on Table 1 compares well with information used in Nebraska Cooperative Extension Publication CC 371 entitled Estimated Irrigation Costs, 2001, authored by Roger Selley and published in August of 2001. Publication CC 371 was used along with Table 1 to develop tables 2 through 5 which provide preliminary pumping cost estimates for a scenario in which the wells in a given augmentation set would be pumped for 60 days. The water would flow through irrigation pipe for a distance of 1,000 feet and would discharge to an open channel. It should be noted that in Attachment B several problems have been identified with this option; however, for the purpose of completeness, Tables 2 through 5 are still presented. Tables 2 and 3 assume an electric motor pumping power plant while tables 4 and 5 assume a diesel engine pumping power plant. Tables 2 and 4 assume a full charge for interest and depreciation, while tables 3 and 5 assume a partial charge (33% as shown). The partial interest and depreciation charge would reflect the potential of the 60 days of pumping occurring during the non-irrigation season. If one assumes a four month "standard" pumping season and as a result of this scenario two additional months are added, taking 2/6 of the full pumping timeframe was represented by the 33% figure. Tables 3 and 5 are only included to show the impact that interest and depreciation charges have on the final outcome. As Tables 2 - 5 show, the cost per acre-foot (AF) pumped ranges from approximately $40/AF to $76/AF for the scenarios evaluated. These estimates again are preliminary. Additional information regarding the specific wells selected for such a scenario should be collected in order to refine the estimates.

FIGURE 1. AUGMENTATION SITES

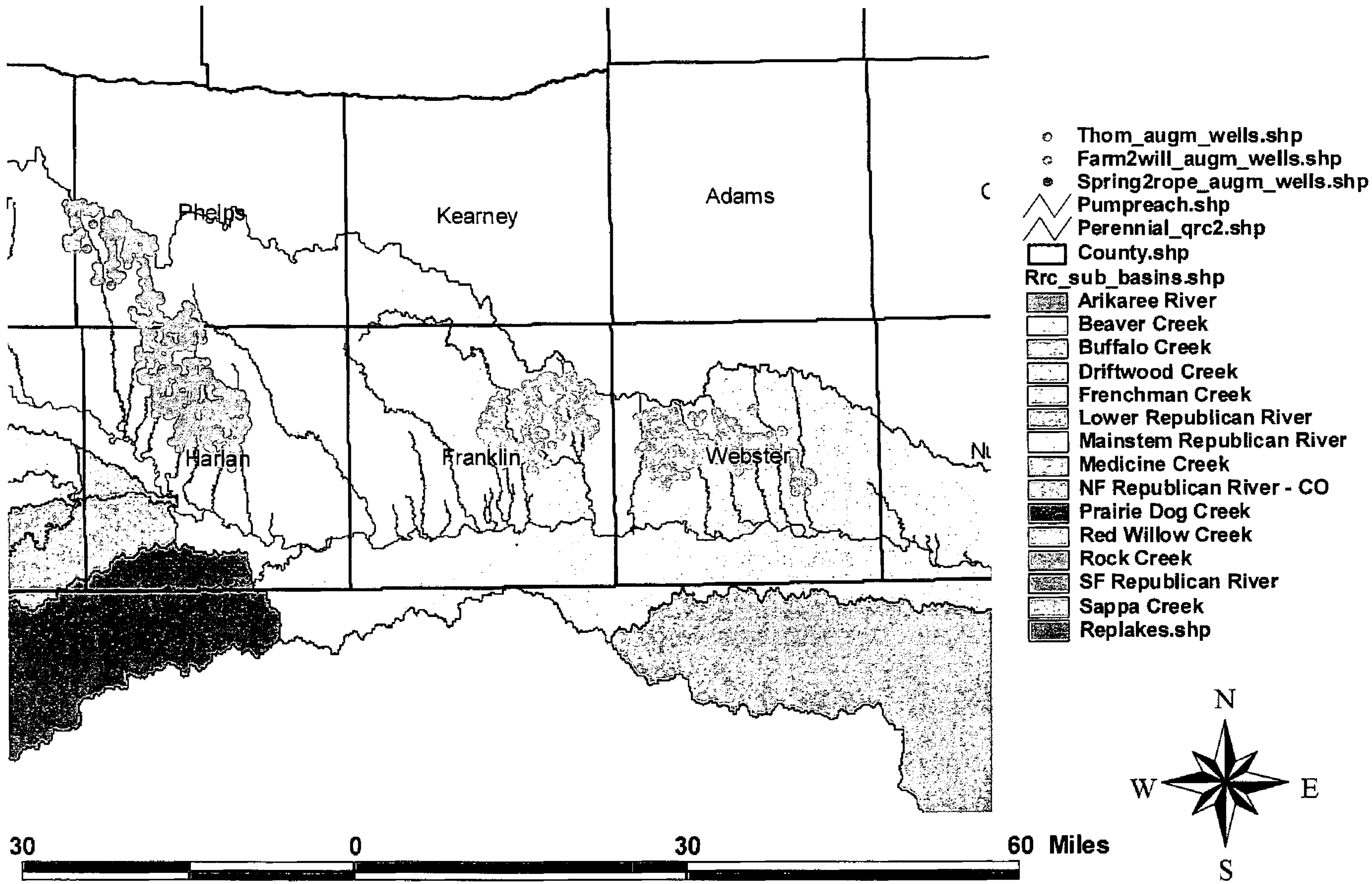


TABLE 1. AUGMENTATION SITE SUMMARY

Augmentation Site	Avg Pump Rate (GPM)	Avg Pump Water Lift (ft)	Predominant Power District	Avg 2001 - 2004 Hours For District	Hours Range
Farm2will	735	137	South Central	830.38	709.01 - 989.41
Spring2rope	802	195	Twin Valley	870.4275	720.59 - 1113.45
Thom	763	165	Southern	847.8425	721.08 - 951.53

TABLE 2. PRELIMINARY 60 DAY PUMPING COST ESTIMATE
ELECTRIC MOTOR POWER PLANT - FULL INTEREST/DEPRECIATION

	Farm2will	Spring2rope	Thom	
Pump Rates (gpm)	735	802	763	From Site Summary
Pumping Lift (ft)	200	200	200	
Pumping Hours	1440	1440	1440	
Repairs/hour	$ 0.55	$ 0.55	$ 0.55	(2001, Selley) - Well #3 values, Table 6
Fuel and Lube/hour	$ 3.67	$ 3.67	$ 3.67	(2001, Selley) - Well #3 values, Table 6
Annualized Cost				
Interest	$ 1,714.00	$ 1,714.00	$ 1,714.00	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Depreciation	$ 2,593.60	$ 2,593.60	$ 2,593.60	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Repairs	$ 792.00	$ 792.00	$ 792.00	
Fuel and lube	$ 5,284.80	$ 5,284.80	$ 5,284.80	
Labor	$ 1,000.00	$ 1,000.00	$ 1,000.00	Reduced labor due to configuration (e.g. no gates to set/maintain)
Total	$ 11,384.40	$ 11,384.40	$ 11,384.40	
Vol pumped AF	195	213	202	
$/AF	**$ 58.42**	**$ 53.54**	**$ 56.28**	

(2001, Selley). Roger Selley. "Estimated Irrigation Costs, 2001." Nebraska Cooperative Extension CC 371. August 2001.

TABLE 3. PRELIMINARY 60 DAY PUMPING COST ESTIMATE
ELECTRIC MOTOR POWER PLANT - PARTIAL INTEREST/DEPRECIATION

Annualized Cost				
Int/Depr Factor	0.33	0.33	0.33	Only charge a portion of the interest/depreciation
Interest	$ 565.62	$ 565.62	$ 565.62	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Depreciation	$ 855.89	$ 855.89	$ 855.89	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Repairs	$ 792.00	$ 792.00	$ 792.00	
Fuel and lube	$ 5,284.80	$ 5,284.80	$ 5,284.80	
Labor	$ 1,000.00	$ 1,000.00	$ 1,000.00	Reduced labor due to configuration (e.g. no gates to set/maintain)
Total	$ 8,498.31	$ 8,498.31	$ 8,498.31	
Vol pumped AF	195	213	202	
$/AF	**$ 43.61**	**$ 39.97**	**$ 42.01**	

(2001, Selley). Roger Selley. "Estimated Irrigation Costs, 2001." Nebraska Cooperative Extension CC 371. August 2001.

TABLE 4. PRELIMINARY 60 DAY PUMPING COST ESTIMATE
DIESEL MOTOR POWER PLANT - FULL INTEREST/DEPRECIATION

	Farm2will	Spring2rope	Thom	
Pump Rates (gpm)	735	802	763	From Site Summary
Pumping Lift (ft)	200	200	200	
Pumping Hours	1440	1440	1440	
Repairs/hour	$ 0.89	$ 0.89	$ 0.89	(2001, Selley) - Well #3 values, Table 6
Fuel and Lube/hour	$ 4.78	$ 4.78	$ 4.78	(2001, Selley) - Well #3 values, Table 6
Annualized Cost				
Interest	$ 1,895.00	$ 1,895.00	$ 1,895.00	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Depreciation	$ 3,796.80	$ 3,796.80	$ 3,796.80	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Repairs	$ 1,281.60	$ 1,281.60	$ 1,281.60	
Fuel and lube	$ 6,883.20	$ 6,883.20	$ 6,883.20	
Labor	$ 1,000.00	$ 1,000.00	$ 1,000.00	Reduced labor due to configuration (e.g. no gates to set/maintain)
Total	$ 14,856.60	$ 14,856.60	$ 14,856.60	
Vol pumped AF	195	213	202	
$/AF	**$ 76.24**	**$ 69.87**	**$ 73.45**	

(2001, Selley). Roger Selley. "Estimated Irrigation Costs, 2001." Nebraska Cooperative Extension CC 371. August 2001.

TABLE 5. PRELIMINARY 60 DAY PUMPING COST ESTIMATE
DIESEL MOTOR POWER PLANT - PARTIAL INTEREST/DEPRECIATION

Annualized Cost				
Int/Depr Factor	0.33	0.33	0.33	Only charge a portion of the interest/depreciation
Interest	$ 625.35	$ 625.35	$ 625.35	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Depreciation	$ 1,252.94	$ 1,252.94	$ 1,252.94	(2001, Selley) - Table 5 using single well, pump, power unit and 1,000 feet of pipe
Repairs	$ 1,281.60	$ 1,281.60	$ 1,281.60	
Fuel and lube	$ 6,883.20	$ 6,883.20	$ 6,883.20	
Labor	$ 1,000.00	$ 1,000.00	$ 1,000.00	Reduced labor due to configuration (e.g. no gates to set/maintain)
Total	$ 11,043.09	$ 11,043.09	$ 11,043.09	
Vol pumped AF	195	213	202	
$/AF	**$ 56.67**	**$ 51.94**	**$ 54.59**	

(2001, Selley). Roger Selley. "Estimated Irrigation Costs, 2001." Nebraska Cooperative Extension CC 371. August 2001.

ATTACHMENT B

Losses of water transported to non-perennial reaches would be significant. The total losses from well head to perennial streams would likely range from 80 to 100 percent. This would be highly variable and difficult to estimate with certainty. A primary concern in the potential areas identified is the number of farm ponds or other stream obstacles that would prevent the free movement of water downstream.

Transporting water for short distances via gravity piping to perennial streams may be possible. Field reconnaissance of potential piping routes would be required; however, wells within a 1 to 1.5 mile radius would be the best candidates.

Transporting water through larger pressure systems is feasible; however there would be many obstacles both physically and administratively. Issues to consider could include:

1. Construction of a piping network. The pipe would need to be buried and would need optimization to minimize piping distances.
2. Size limitations of piping. The number of wells manifolded together would be limited because of the cost of large pipe.
3. Easements and Rights of Way would be required.
4. Installed pressure pipeline costs are on the order of $150,000 - $250,000 per mile depending on pipe material selection. Additional contingency costs for fittings, crossings, etc could be on the order of another 15% to 25%. These costs do not include potentially needed lift stations or additional pumping plants.
5. Would need to protect water transported downstream.

ATTACHMENT C

Attachment C:
Irrigated vs. Dryland Net Returns

Introduction

DNR is considering options to help meet compact obligations for the Republican River basin, including entering into arrangements with groundwater users to reduce consumptive use through the introduction of dryland practices. In order to obtain estimates for the amount that irrigators should be compensated for switching to dryland methods, a preliminary economic evaluation was conducted to compare the difference in net returns between irrigated and dryland operations. The Water Optimizer computer program, developed at the University of Nebraska – Lincoln, was used to complete this task. **The purpose of this document is to describe how this evaluation was conducted, identify the source data, and summarize the results of the preliminary study.**

Water Optimizer

Water Optimizer is a tool for analyzing alternative water management strategies when the available water supply is limited. It is a field-level, single-season program which computes how many acres to irrigate, which crops to produce and how much water to apply to each crop in a normal weather year. Seven crops (corn, soybeans, wheat, grain sorghum, alfalfa, edible beans and sunflowers) may be considered for irrigation levels ranging from dryland to fully watered conditions.

Water optimizer contains typical values, called defaults, for most of the data needed to operate the model, including crop water requirements, grain yields, production costs and crop prices. Users of Water Optimizer who want to evaluate alternative strategies using default prices, costs, water requirements and yields need to input only the following data for their field: county where the field is located, dominant soil type (coarse, medium or fine textured), field size in acres, irrigation system type (center pivot or gravity), irrigation energy source (electric, diesel, propane, gas, or natural gas), and their annual water allocation entered in acre-inches per acre. Users who believe that their situation may differ from the default values by enough to cause different best management strategies can change any of the following parameters: crop prices, fully-watered crop yields, cost items for crops, and cost items for irrigation

The Water Optimizer tool was developed in response to several years of drought across the State to assist farmers facing water restrictions in the region served by the Central Nebraska Public Power and Irrigation District (CNPPID) and within the Republican River Basin. Water Optimizer evaluates single fields for several crop options. Irrigated crops include: corn, soybeans, sorghum, wheat, alfalfa, edible beans and sunflowers. Dryland crops include: corn, soybeans, sorghum, sunflowers, alfalfa and wheat in continuous, summer fallow and eco-fallow rotations. The tool allows users to input information into a Microsoft Excel spreadsheet, including soil type and irrigation system options. Irrigation options include center pivot or gravity irrigation systems, well or canal delivery infrastructure, and systems powered by electricity, diesel or natural gas. After entering this basic information, producers enter their production costs, irrigation costs, crop prices, crop type and available water. Once these parameters are set, the program calculates what crops will be most profitable with the given costs and available water.

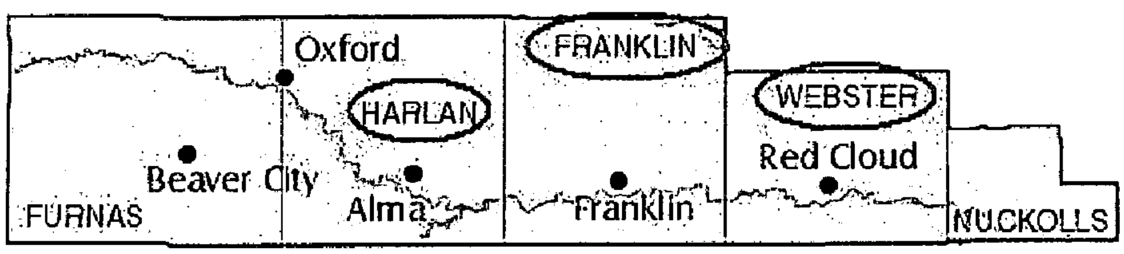
For the purposes of the Republican River evaluation of irrigated versus dryland net returns, the Water Optimizer served as the primary tool. While there are likely many other similar tools available, Water Optimizer was specifically designed for the Republican River region, and includes default settings and parameters representative of that area.

Data Sources

Default settings under Water Optimizer were used for many of the parameters. These default values were compiled from 2004 Nebraska Crop Budgets published by the Nebraska Cooperative Extension, annual crop prices from the National Agricultural Statistics Service, average Loan Deficiency Payments from the Farm Service Agency of the USDA, and other sources. The Nebraska Cooperative Extension circular CC 371, "Estimated Irrigation Costs, 2001", was also used for the Republican River evaluation.

Methodology

Because Water Optimizer evaluates fields on a county-by-county basis, three counties were included which captured the majority of the well locations under consideration: Harlan, Franklin, and Webster Counties, all within the Lower Republican Natural Resources District. Continuous corn was chosen as the crop option for the analysis because of its prevalence in the area and to simplify the modeling process.



In order to compare net returns from dryland and irrigated practices, separate models were constructed for each county to evaluate dryland and irrigated costs and revenues. In addition, two different yield values were considered for each county to represent the "fully watered yield", which represents the maximum yield expected for a crop in a given county if the crop is not water-limited. Water Optimizer calculates yield values for all ranges of applied irrigation water from dryland to "fully watered", and uses the "fully watered yield" number to estimate these additional yields. For the two "fully watered yield" values used for each county, the first value was taken from the Nebraska Agricultural Statistics Service (NASS) average yields for irrigated corn from 1994-2004 in each county. Average yields for this period for Harlan, Franklin, and Webster Counties were 161, 167, and 161 bushels per acre, respectively. Since many of the wells under consideration are in areas with high-quality soils, a second corn yield value of 225 bushels per acre was evaluated for each county.

Water Optimizer uses three primary input worksheets within the Excel spreadsheet program, titled "Basic Info", "Water Costs", and "Cropping Options&Prices". In addition, separate worksheets are included for adjusting inputs for each of the crop options, both for dryland and irrigated operations. A brief discussion of the methodology used to enter values within these worksheets is included below.

First, in the "Basic Info" worksheet, the primary input for the model was entered for each county, as shown in Figure 1. The example shown in this figure is for an irrigated field in Franklin County, assuming a "fully watered yield" of 225 bushels per acre. All model runs were conducted using a 130 acre area as a representative field size. Green cells in all worksheets may be customized by changing the default values to more accurately represent actual conditions. Water allocations used in the evaluation were 11 inches for Franklin and Webster Counties, and 12 inches for Harlan County, since most of the wells under consideration in Harlan County fall west of Highway 183. Default values were used for drying and trucking costs, soil organic matter, soil matter Nitrate, and irrigation water nitrate. Nitrogen costs (dollars per pound) were increased from the default of $0.25 to $0.25 as a compromise between current prices (around $0.30) and more long-term average values (about $0.20).

For the "Water Cost" worksheet, shown in Figure 2, many of the input parameters were taken from Nebraska Cooperative Extension circular CC 371, "Estimated Irrigation Costs, 2001", to compliment and conform with other tasks. An 800 gpm well providing water to a center pivot was chosen, with a corresponding pumping lift of 125 ft, water use efficiency of 90%, 35 psi pump pressure, 75% performance rating, and $0.06/kWh energy cost – with all values derived from Circular CC 371. Default Water Optimizer values were maintained for fixed labor hours (16), labor hours per irrigation (5), and labor costs ($10 per hour). For dryland scenarios, these fixed labor costs were changed to zero. The repair, maintenance and use depreciation value of $6,000 was set approximately equal to the combined depreciation and repair costs included in Circular CC 371. For dryland operations, this value was changed to $3,000 to reflect reduced wear and depreciation on the irrigation equipment. An $8.50/Hp connection charge was included, per CC 371, and no canal service charge was required for the groundwater system.

In the "Cropping Options&Prices" worksheet, shown in Figure 3, the irrigated corn option was checked for all irrigated scenarios (as shown), while only dryland corn was evaluated for the dryland scenarios. Default prices for corn ($2.10 per bushel) and associated LDP payments ($0.17 per bushel), representing 5-year averages, were maintained. The miscellaneous returns, which includes revenues from grazing, hunting, etc., were also left at $5 per acre since they do not impact the comparison between irrigated and dryland operations.

Finally, since only corn was considered for this evaluation, the "Corn" worksheet was also used by the Water Optimizer program. As shown in Figure 4, all values were left at the default levels. These inputs represent crop budgets for both dryland and irrigated cropping methods, and include cultivation, spraying, fertilizer, and other field costs. Yield dependant costs are also included at the bottom of the worksheet, including nitrogen costs and trucking and drying expenses.

Once all inputs were entered into the program, the optimization routine that is part of Water Optimizer was employed. Twelve total model runs were conducted, four for each of the three counties. Once net returns were derived for each scenario, the dryland net returns were subtracted from the net returns obtained through irrigation. This difference was then divided by 130 acres to obtain a value in dollars per acre, as shown in the tables below, and as reproduced in Table 1 at the end of this document.

HARLAN COUNTY		
	161 bu/acre	**225 bu/acre**
Dryland	$6,633	$14,035
Irrigated	$11,523	$26,166
Irrigated - Dryland	$4,890	$12,131
$/acre difference	$38	$93

FRANKLIN COUNTY		
	167 bu/acre	**225 bu/acre**
Dryland	$8,628	$15,787
Irrigated	$13,262	$26,532
Irrigated - Dryland	$4,634	$10,745
$/acre difference	$36	$83

WEBSTER COUNTY		
	161 bu/acre	**225 bu/acre**
Dryland	$9,141	$17,540
Irrigated	$12,781	$27,424
Irrigated - Dryland	$3,640	$9,884
$/acre difference	$28	$76

As shown, depending on whether the lower NASS value for 1994-2004 average irrigated yield or the higher 225 bushel per acre yield is used, the dollar per acre difference between irrigated and dryland net returns ranges from $38/acre to $93/acre in Harlan County, $36/acre to $83/acre in Franklin County, and $28/acre to $76/acre in Webster County.

	A	B	C	D	E
1					
2	***1. Enter the name of the field and a description of the scenaio to help identify the run.***				
3		Field ID:	Franklin County		
4		Scenario Description:	Irrig 225 bu/acre		
5					
6					
7	***2. Enter the size of the field and the water depth per acre.***				
8		Input Parameters:	Value	Units	
9		Size of Irrigated Field	130	acres	
10		Water Allocation Depth	11	inches	
11		Water Available	1430	acre-inches	
12					
13					
14	***3. Select the county in which the field is located.***				
15		County	Franklin		
16					
17					
18	***4. Select the type of soil that most resembles the soil in the field.***				
19		Soil type	Medium		
20					
21					
22	***5. Make changes to fully watered yield in the green cells.***				
23		Crop	Your Fully Watered Yield	Default Fully Watered Yield	Dryland Yield
24		Alfalfa	0	6.0	3.5
25		Corn	225	215	121
26		Sorghum	0	155	87
27		Soybeans	0	65	38
28		Wheat	0	80	52
29		Sunflower	0	2500	1103
30		Edible Beans	0	1800	737
31					
32					
33	***6. Enter the cost for common inputs used in the budgets***				
34		Drying, $/point removed	$0.05		
35		Truck, $/bu	$0.06		
36		Nitrogen Cost, $/lb	$0.25		
37		Soil Organic Matter, %	2.0%		
38		Soil Matter Nitrate-N, ppm	3		
39		Irrigation Water Nitrate-N, ppm	10		

Basic Info / Water Cost / Cropping Options&Prices / Optimizer / Summary Page / Corn / Soyt

Figure 1: Basic Info Worksheet

1. Select the type of energy used for pumping.

Energy Source: ○ Diesel ◉ Electric ○ Gasoline ○ Propane ○ Natural Gas

2. Select the source of water.

Water Source:	Pump/Well	
Pumpage Rate	800	gallons per minute

Time of Operation	809	hours
System Type	Pivot	
Water Use Efficiency	0.9	

Suggested Water Use Efficiencies		
System	Pivot	Gravity
Poor	0.70	0.50
Good	0.75	0.65
Excellent	0.80	0.75

3. Enter values to compute the cost to pump irrigation water.

Quantity	Value	Units
Pumping Lift	125	feet
Pump Pressure	35	psi
Performance Rating	75	%
Energy Cost	0.06	$ / kWh

Performance Rating Calculator	
63	Units per Hour
75	Performance Rating

4. Enter values to compute additional operating expenses for irrigation.

Labor - Fixed, yearly setup	16	hours
Labor Required per Irrigatic	5	hours
Labor Cost	$10.00	$/hour
Repairs, Maint & Use Depr	$6,000.00	$/year

Cost of Water	**6.50**	**$ / acre-inch**

5. Enter the irrigation start-up costs.

Motor Horse Power	61.6
Connect Charge, $/Hp	$8.50
Connect Charge	$523.67
Canal Service Charge, $/Ac	$0.00
Canal Service Charge	$0.00
Labor-Fixed, yearly setup	$160.00
Total Startup Cost	$683.67

Basic Info | **Water Cost** | Cropping Options&Prices | Optimizer | Summary Page | Corn | Soybeans | Wheat | Eco-Fallow | Whi

Figure 2: Water Cost Worksheet

1. Select the crops that areconsidered for production.

Irrigated Crops	Min Acres	Max Acres
☑ Corn	0	130
☐ Soybeans	0	130
☐ Wheat	0	130
☐ Sunflower	0	130
☐ Grain Sorghum	0	130
☐ Edible Beans	0	130
☐ Alfalfa	0	130

Dryland Crops	Min Acres	Max Acres
☐ Corn	0	130
☐ Soybeans	0	130
☐ Wheat	0	130
☐ Sunflower	0	130
☐ G. Sorghum	0	130
☐ Alfalfa	0	130
☐ Wheat/Fallow	0	130
☐ Eco-Fallow	0	130
☐ Corn/SB Rot	0	130

Total Minimum Acres: 0

Set Minimum Acres to Zero

2. Input the price that crops are likely to receive when they are sold.

GRAIN SORGHUM	
5 yr. ave. price, $/bu	$2.01
5 yr ave. LDP pmt, $/bu	$0.22
Total crop value, $/bu	**$2.23**
Misc. returns, $/Ac	$3.00

CORN	
5 yr. ave. price, $/bu	$2.10
5 yr ave. LDP pmt, $/bu	$0.17
Total crop value, $/bu	**$2.27**
Misc. returns, $/Ac	$5.00

DRYLAND CORN/SB ROTATION	
Misc. returns, $/Ac	$2.50

SUNFLOWER	
5 yr. ave. price, $/lb	$0.14
5 yr ave. LDP pmt, $/lb	$0.01
Total crop value, $/lb	**$0.12**
Misc. returns, $/Ac	$0.00

SOYBEANS	
5 yr. ave. price, $/bu	$5.23
5 yr ave. LDP pmt, $/bu	$0.38
Total crop value, $/bu	**$5.61**
Misc. returns, $/Ac	$0.00

ECO-FALLOW	
Misc. returns, $/Ac	$0.00

WHEAT	
5 yr. ave. price, $/bu	$3.08
5 yr ave. LDP pmt, $/bu	$0.19
Total crop value, $/bu	**$3.27**
Misc. returns, $/Ac	$0.00

EDIBLE BEANS	
5 yr. ave. price, $/lb	$0.19
5 yr ave. LDP pmt, $/lb	$0.00
Total crop value, $/lb	**$0.19**
Misc. returns, $/Ac	$0.00

DRYLAND WHEAT-FALLOW	
Misc. returns, $/Ac	$0.00

ALFALFA	
5 yr. ave. price, $/Ton	$66.90
5 yr ave. LDP pmt, $/Ton	$0.00
Total crop value, $/Ton	**$66.90**
Misc. returns, $/Ac	$0.00

Basic Info / Water Cost / **Cropping Options&Prices** / Optimizer / Summary Page / Corn / Soybeans / Wheat / Eco-Fallow / Wheat-Fall

Figure 3: Cropping Options and Prices

IRRIGATED CORN INPUTS			
Production Costs			
Field Operation, $ / Acre	Cost	Passes	Total
Disc	$4.23	1	$4.23
Fertilizer application	$4.57	1	$4.57
Field cultivate	$2.14	1	$2.14
Plant	$6.18	1	$6.18
Row crop cultivate	$3.56	1.25	$4.45
Ridge cultivate	$5.28	0	$0.00
Spray	$1.40	0.25	$0.35
Custom spray	$4.50	1	$4.50
Combine	$21.97	1	$21.97
Chop stalks	$2.82	0	$0.00
Sub-total			**$48.39**
Input Cost, $ / Acre			Cost/Ac
Herbicide			$13.50
Insecticide			$22.10
Seed			$33.00
Starter fertilizer			$8.52
Sub-total			**$77.12**
Miscellaneous Cost $ / Acre			$0.00
TOTAL PRODUCTION COSTS, $ / Acre			**$125.51**
Yield Dependent Costs			
	Cost	Rate/lbs	Cost/bu
Nitrogen	$0.25	0.88	$0.22
Cart			$0.02
Truck			$0.06
Dry	$0.05	4	$0.20
Sub-total			**$0.50**
Miscellaneous Cost, $/bu			$0.00
TOTAL YIELD DEPENDENT COSTS, $ / Bushel			**$0.50**

DRYLAND CORN INPUTS			
Production Costs			
Field Operation, $ / Acre	Cost	Passes	Total
Chisel	$3.88	0	$0.00
Disc	$4.23	0	$0.00
Fertilizer application	$4.57	0	$0.00
Field cultivate	$2.14	0	$0.00
Plant	$6.18	1	$6.18
Row crop cultivate	$3.56	0	$0.00
Ridge cultivate	$5.28	0	$0.00
Spray	$1.40	1.5	$2.10
Custom spray	$4.50	0.2	$0.90
Combine	$17.30	1	$17.30
Chop Stalks	$2.82	1	$2.82
Sub-total			**$29.30**
Input Cost, $ / Acre			Cost/Ac
Herbicide			$13.50
Insecticide			$22.10
Seed			$22.00
Starter fertilizer			$8.52
Sub-total			**$66.12**
Miscellaneous Cost $ / Acre			$0.00
TOTAL PRODUCTION COSTS, $ / Acre			**$95.42**
Yield Dependent Costs			
	Cost	Rate/lbs	Cost/bu
Nitrogen	$0.25	0.85	$0.21
Cart			$0.02
Truck			$0.06
Dry	$0.05	4	$0.20
Sub-total			**$0.49**
Miscellaneous Cost, $/bu			$0.00
TOTAL YIELD DEPENDENT COSTS, $ / Bushel			**$0.49**

example: Est. total cost (exc. irrigation) of production using above worksheet.

Fully Watered Yield = 225   Dryland Yield = 121

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Figure 4: Corn Crop Budgets

Table 1: Differences in net returns for each county

HARLAN COUNTY		
	161 bu/acre	**225 bu/acre**
Dryland	$6,633	$14,035
Irrigated	$11,523	$26,166
Irrigated - Dryland	$4,890	$12,131
$/acre difference	$38	$93

FRANKLIN COUNTY		
	167 bu/acre	**225 bu/acre**
Dryland	$8,628	$15,787
Irrigated	$13,262	$26,532
Irrigated - Dryland	$4,634	$10,745
$/acre difference	$36	$83

WEBSTER COUNTY		
	161 bu/acre	**225 bu/acre**
Dryland	$9,141	$17,540
Irrigated	$12,781	$27,424
Irrigated - Dryland	$3,640	$9,884
$/acre difference	$28	$76