A Bureau of Business Research Report
From the University of Nebraska—Lincoln

Final Report

Economic and Property Tax Impact of the NCORPE Augmentation Project in the Republican Basin and Twin Platte Natural Resources Districts

Prepared for NCORPE

January 10, 2018

Bureau of Business Research
Department of Economics
College of Business
University of Nebraska—Lincoln
Dr. Eric Thompson, Director

University of Nebraska Lincoln

Executive Summary

The need to regulate consumptive groundwater use has implications for property values and economic activity in southwest and southern Nebraska. Regulation often means curtailing irrigation and agricultural output in order to improve streamflow, with implications for both land values and productive economic activity. The approach to complying with regulation, however, can impact the ultimate economic outcome. In particular, strategies which involve pumping groundwater directly into tributaries and canals which add to streamflow can be effective. While groundwater is often hydrologically connected with surface flow, groundwater migrates slowly. As a result, for an extended period, reallocating and pumping groundwater from just a few thousand irrigated acres often can be as effective in rebuilding streamflow as shutting down irrigation on tens of thousands of acres. Pumping water can be especially advantageous when streamflow is weakened by drought conditions. One implication is that pumping projects can bear the expense of ***purchasing*** land, moving it out of irrigated production, and installing and operating wells and pipelines, all for less cost to the economy and property value than the alternative of shutting down irrigation (on a larger number of acres), typically without compensation to landowners.

This report considers the economic and property tax impact of one such project, the Nebraska Cooperative Republican-Platte Enhancement Project (NCORPE) jointly operated by the Lower Republican, Middle Republic, Upper Republican and Twin Platte Natural Resources Districts in southwest and southern Nebraska. The report compares the property value and property tax revenue lost from transforming irrigated acres to grassland at the NCORPE property with the value maintained because the NCORPE project keeps other farmland in irrigated production. The NCORPE property helps keep 177,000 rapid response acres in irrigation via groundwater in the 3 Republican River NRDs during "call years" and 50,000 acres in irrigation each year in the Twin Platte NRD. Analysis also adjusts for the presence of acres irrigated by surface water and the impact of occupation taxes on property values and property tax revenue. The report further estimates the economic impact from both lost and maintained economic activity resulting from the NCORPE project.

Table ES.1 reports the estimated net change in annual property tax revenue across the 4 Natural Resources Districts due to the NCORPE project. Estimates vary depending how much "credit" the NCORPE project receives for keeping rapid response acres in irrigated production. The Districts often have multiple projects which aid streamflow and help avoid shutting down irrigation, and there is uncertainty about the precise share of credit the NCORPE project should receive.

Table ES.1
Net Annual Property Tax Revenue

Percentage Credit	Net Annual Property Tax Revenue
30%	-$311,839
50%	$876,332
70%	$2,064,504

Source: BBR calculations

Table ES.1 presents three scenarios where NCORPE is given 30%, 50% and 70% credit for avoiding the shutdown of irrigated rapid response acres in the 4 Districts. This range of 30% to 70% arguably represents a conservative estimate of future conditions. For example, data provided by NCORPE shows that the NCORPE project provided augmentations for 65% of the forecast deficit in the 3 Republican River NRDs from the 2012-2013 period through the 2016-2017 period, preventing the shutdown of irrigated acres. Further, the Rock Creek Project provided augmentations for another 25% of the forecast deficit, but the Rock Creek project only benefits the Upper Republican Natural Resources District.

When the NCORPE project only receives 30% of the credit, lost property tax revenue exceeds maintained revenue and the net impact is negative. But, the net impact on annual property tax revenue turns positive if NCORPE is given 50% of the credit and there is a large net annual impact at the 70% credit level.

Table ES.2 summarizes the net economic impact. Once again, the net impact depends on the degree to which the NCORPE project is credited for maintaining acres in irrigated production. Economic impact is presented for four concepts. Output is the broadest concept and equates to total business sales. Value-added is a component of sales, and income in turn is part of value-added. Net economic impacts are positive across all three scenarios. There is a net gain of 20 jobs even under the 30% credit scenario and the net impact rises to 78 jobs under the 70% scenario. The annual output impact rises to $34.93 million under the 70% scenario, with $10.99 million in value-added and $6.68 million in income, which includes employee compensation and proprietor income.

Table ES.2
Net Annual Economic Impact

Net Impact	Output (Millions $)	Value-Added (Millions $)	Income (Millions $)	Employment
30%	$8.37	$2.76	$1.68	20
50%	$21.63	$6.88	$4.19	49
70%	$34.90	$11.00	$6.70	78

Source: BBR calculations

Tables ES.1 and ES.2 report aggregate impacts across all four Natural Resources Districts. Impact varies within individual Districts for two reasons. First, the NCORPE property is located in both the Middle Republican and Twin Platte NRDs, implying that both Districts experience an additional loss of economic activity and property values. Second, the four NRDs vary in terms of the number of acres of irrigation preserved by the NCORPE project. Table ES.3 shows the property value and economic impact of the NCORPE project within each of the four NRDs. To save space, the economic impact is presented only in terms of output and employment. Note that economic impacts across the four NRDs do not sum to the aggregate impacts presented in Table ES.2. This is because local economic multipliers for each District are smaller than the aggregate multiplier across all four Natural Resources Districts. The largest economic impact occurs in the Twin Platte NRD. There are positive impacts in the Lower Republican and Upper Republic Districts. Finally, there are negative impacts in the Middle Republican Natural Resources

District, with the exception of a slightly positive employment impact under the 70% scenario. Two-thirds of the NCORPE property is located in the Middle Republican NRD so lost irrigated production takes a direct toll on that District. Net annual property tax revenue is positive in the Middle Republican NRD under the 70% scenario, positive in the Lower Republican NRD and neutral or positive in the other two Districts as long as NCORPE receives at least 50% of the credit for maintaining rapid response acres in irrigated production.

Table ES.3
Net Annual Property Tax Revenue and Economic Impact
By Natural Resources District

	Natural Resources District			
Total Economic Impact	**Lower Republican**	**Middle Republican**	**Upper Republican**	**Twin Platte**
Output (Millions $)				
30%	$4.95	-$4.54	$2.10	$5.78
50%	$8.25	-$2.35	$3.51	$11.90
70%	$11.55	-$0.15	$4.91	$18.02
Employment				
30%	9	-7	4	14
50%	15	-2	7	28
70%	22	2	10	43
Property Tax Revenue (Millions $)				
30%	$0.28	-$0.38	-$0.07	-$0.15
50%	$0.71	-$0.10	$0.13	$0.00
70%	$1.14	$0.19	$0.32	$0.41

Source: BBR calculations

This study also estimated economic impact under an alternative regulatory approach which utilizes a 60% reduction in total irrigation volumes in the Upper, Middle and Lower Platte Natural Resources Districts. This alternative was another of the possible regulatory options which the Nebraska Department of Natural Resources provided to these Districts during 2009. Estimated annual economic and tax revenue impacts for the NCORPE project grew in all 3 Republic River NRDs under this alternative scenario. The largest economic and tax revenue impact occurred in the Upper Republican NRD and the smallest impact occurred in the Middle Republican NRD.

Table of Contents

List of Tables

I. Introduction

The Nebraska Cooperative Republican-Platte Enhancement Project (NCORPE) was created and is operated by four Natural Resources Districts (NRDs) to ensure compliance with interstate agreements and water management plans developed cooperatively by NRDs and the State of Nebraska. An approximately 20,000 acre property located within the Sandhills of Lincoln County was purchased by NCORPE in 2012, and 14,800 irrigated acres on that property have been retired from irrigation to offset groundwater that can be pumped and piped into tributaries or canals connected with the Republican River and the Platte River. Water is pumped and piped into Medicine Creek, a tributary of the Republican River, when action is necessary to comply with the Republican River Compact and associated settlement agreement between the compact states of Nebraska, Kansas and Colorado. A pipeline will deposit water into the Platte River annually to meet Twin Platte Natural Resources District's obligations. The NCORPE project was operated in 2014, 2015, 2016 and 2017, and kept the State of Nebraska in compliance with the Republican River Compact without the use of widespread irrigation shutdowns within the Republican Basin.

This report by the University of Nebraska-Lincoln Bureau of Business Research (UNL-BBR) provides a local and regional economic and tax analysis of the NCORPE project. The report compares the property tax revenue and economic implications of the NCORPE project with the economic and tax revenue impact of widespread irrigation shutdowns which would be required over time in the absence of the NCORPE project. Analysis is conducted for the "full impact" region which includes the four natural resources districts that comprise NCORPE, the Upper Republican, Middle Republican, Lower Republican and Twin Platte NRDs. The analysis is conducted to assess the impact in each individual NRD. The report also provides an estimate the potential economic impact of a windfarm that may be developed on NCORPE property.

II. Property Tax and Economic Impact across The Four NRDs

A variety of local governments entities draw on the property tax base which includes the 14,800 acres of NCORPE properties in Lincoln County, Nebraska, including county government, a school district, and other local entities, such as fire districts. The tax base of these districts is impacted when land is taken out of irrigated production, as is the case with the NCORPE property, and further impacted when the land becomes part of a public project as may occur in the case of NCORPE. At the same time, the value of other properties in the tax base of the 4 Natural Resources Districts may be maintained as a result of the NCORPE project, which helps avoid regulatory actions to restrict irrigation locally. This section will consider the net influence of the NCORPE project on taxable property values in aggregate in the 4 Natural Resources Districts. The section also will consider the economic impact of the NCORPE project due to the change in agricultural production on the NCORPE properties and the agricultural production which is maintained in the Districts due to NCORPE. The direct property tax impact is examined first and the total economic and local tax revenue impact is examined second.

A. Direct Property Tax Impact

The direct property tax impact reflects both the loss in local property tax revenue as a result of the NCORPE project and the property tax revenue that is maintained by the project. The direct property tax impact is therefore a net measure, subtracting what is lost from what is maintained. Specifically, three factors will be measured:

- The impact that the NCORPE project has on property values and the property tax revenue of government entities with a tax jurisdiction which includes the NCORPE property,
- The impact of occupation taxes used to established and operate the NCORPE project on property value and property tax revenue within the 4 NRDs, and
- The impact on property values and property tax revenue within the 4 NRDs from avoiding regulatory actions which would be necessary in the absence NCORPE (i.e., acres maintained in irrigation). These regulatory actions are spelled out in the water management plans of many individual NRDs.

Changes in property tax revenue result from changes in assessed property values. For the NCORPE property, there are two changes in property value which are of interest. The first is the decline in average property value and therefore tax base as agricultural land in Lincoln County changes from irrigated production to rangeland. Current land values (after ending irrigation) are provided by NCORPE and property values if the land had remained in irrigated production are estimated based on information developed by the University of Nebraska-Lincoln.[1] The second is the further decline in tax base when land is converted from private to public use.

The NCORPE project also maintains the value of other irrigated acres within the 4 Natural Resources Districts. In particular, regulatory actions such as a requirement to "shut down" irrigated acres during "call years" would be necessary within the Lower Republican, Middle Republican and Upper Republican NRDs without access to water provided by the NCORPE project. "Call years" are those years when the 3 Districts would be expected to be out of compliance without taking additional actions to improve streamflow; we assume in our model that in the future that 3 out of 10 years will be "call years." This is a conservative assumption regarding the frequency of call years. For example, 2014 through 2017 were all call years. Water pumped from the NCORPE project will be needed every year for the Twin Platte Natural Resources District.

A review of Integrated Managements Plans from each Natural Resources District, along with follow-up discussions with NRD leadership, lead to the expectation that 177,000 acres in the 3 Republic River NRDs would need to be shut down during call years. The expectation is that 50,000 acres would need to be shut down in the Twin Platte NRED each year.

The individual Natural Resources Districts were found to have multiple sources of water which could be added to stream flow in the Republican or Platte River (for example, the Upper Republican Natural Resources District has the Rock Creek project). The NCORPE project as a

[1] Jansen, Jim, 2017. "2017 Trends in Nebraska Farmland Markets: Declining Agricultural Land Values and Rental Rates," *Cornhusker Economics* (March 15). Available at http://agecon.unl.edu/cornhusker-economics/2017/2017-trends-nebraska-farmland-markets

result can be viewed as part of portfolio of projects which would allow each District to avoid the shutdown of irrigated acres. How much credit should the NCORPE project receive for the portfolio as a whole? It is difficult to say with precision and as a result analysis is conducted under 3 scenarios: 1) the NCORPE project is given 30% of the credited for avoiding the shutdown of irrigated acres, 2) the NCORPE project is given 50% of the credit, and 3) the NCORPE project is given 70% of the credit. This range of 30% to 70% arguably represents a conservative estimate of future conditions. For example, data provided by NCORPE shows that NCORPE provided augmentations for 65% of the forecast deficit in the 3 Republican River NRDs from the 2012-2013 period through the 2016-2017 period, preventing the shutdown of irrigated acres. Further, the Rock Creek Project provided augmentations for another 25% of the forecast deficit, but the Rock Creek project only benefits the Upper Republican Natural Resources District.

Table 1 provides an estimate of the lost property value and property tax revenue impact from the conversion of 14,800 NCORPE acres in Lincoln County to rangeland and from the occupation tax payments required to support the NCORPE project. Table 1 also shows the additional loss of property tax revenue which would result if the NCORPE project is considered to be public land, and rangeland acres are removed from the property tax roll. The average taxable value per acre and effective property tax rate for agricultural land held by NCORPE was gathered based on the organization's 2016 property tax payments.[2] Current property values after ending irrigation rights (approximately $655/acre) were compared with the average value of cropland with pivot irrigation in the region. Specifically, the University of Nebraska-Lincoln estimates that cropland served by pivot irrigation is worth $4,510/acre in February 2017 in Southwest Nebraska, a region which includes Lincoln County.[3] Table 1 shows the estimated decline in property values and annual property tax revenue in the 14,800 NCORPE acres resulting from the sale of irrigation rights. There is approximately $57 million in lost property value and $593,000 in annual lost property tax revenue in Lincoln County.

Table 1 also shows the lost property value across the 4 Natural Resources Districts due to the occupation tax assessments required to pay for establishing and operating the NCORPE project. Discussion with knowledgeable individuals within the 4 NRDs indicated that the cost of the NCORPE project including purchasing the land (2/3 of cost) and installing well and pipeline capacity (1/3 of cost) is approximately $120 million. This will necessitate an occupation tax on irrigated acres in the Districts sufficient to pay a bond equivalent to this cost. Those annual payments will be capitalized into the value of irrigated acres, effectively lowering the value of irrigated farmland in the region. Under full capitalization, the decline in the (present) value of irrigated farmland will be equivalent to the present value of annual occupation tax payments, approximately $120 million (i.e, the capital cost of the project). In addition, occupation tax revenue also must be sufficient to cover the cost of operating the NCORPE project, including the annual pumping costs for the wells on the NCORPE property and costs for salaries for NCORPE

[2] Information on property value, property tax payments and acres of land were gathered for all parcels owned by NCORPE. Values were summed for all but four parcels (with unusually high property values and property tax rates) Property value was divided by acres of land to yield average land value while tax payments were divided by property value to estimate the property tax rate.

[3] Jansen, Jim, 2017. *Nebraska Farm Real Estate Market Highlights 2016-2017*, Department of Agricultural Economics, University of Nebraska-Lincoln.

personnel and any other operating costs (which are not covered by revenue from grazing or other property rental). These annual costs are capitalized using a 3.5% interest rate and lead to an additional $30.1 million in property value subject to occupation taxes. The total lost property value estimated at $150.1 million also is reflected in Table 1, along with the implied loss of annual property tax revenue. The property tax rate is set at the regional average of 1% on agricultural lands. The annual loss of property tax revenue due to the occupation tax is $1.50 million. The total annual loss of property tax revenue from all sources is $2.09 million.

Table 1 also shows the additional taxable property value and annual property tax revenue which would be lost if the NCORPE properties are declared public lands and removed from the tax rolls. The annual loss in property tax revenue would be $2.19 million in this case.

Table 1
Lost Property Value and Annual Property Tax Revenue Due to the NCORPE Project

Category	Value Per Acre	Acres	Property Value	Property Tax Rate	Property Tax Generated
Irrigated Cropland	$4,510	14,800	$66,748,000	1.04%	$694,372
Rangeland	$655	14,800	$9,687,340	1.04%	$100,776
Public Land	$0	14,800	$0	1.04%	$0
Loss Due to Occupation Tax			$150,050,000	1.00%	$1,500,500
Change in Property Value and Tax					
Irrigated Cropland to Grassland			-$207,110,660		-$2,094,096
Irrigated Cropland to Public Land			-$216,798,000		-$2,194,872

Source: BBR calculations utilized NCORPE tax records.

Table 2 shows the estimate of property value and annual property tax revenue saved by the NCORPE project. The estimate is based on an assumption of 3 call years in 10. In other words, the NCORPE project helps allow the 3 Republican River NRDs to avoid shutting down irrigation in the 177,000 "rapid response" groundwater acres 3 out of each 10 years. Recall that this is a conservative assumption regarding the frequency of call years, and that 2014 through 2017 were each call years. That figure rises to 214,000 if "rapid response" acres irrigated by surface water also are considered.[4] The NCORPE project helps the Twin Platte NRD avoid shutting down irrigation in 50,000 acres each year.

[4] According to the Nebraska Department of Natural Resources, there are an additional 41,200 rapid response acres which only have access to surface water irrigation and another 33,400 "comingled" acres which have access to both ground and surface water irrigation. Both groups are relevant; however, there are differing regulatory mechanisms for groundwater and surface water use. In particular, surface water use may not be curtailed during some call years when groundwater use is shut down. This implies that in some years irrigated production may be feasible on some of the 74,600 acres irrigated by surface water even when acres irrigated by groundwater are

To estimate savings in the 3 Republican River NRDs, average yields and share of acres harvested were examined for irrigated and non-irrigated corn acres in the Southwest Nebraska region during recent "dry" (2012, 2013) and "wet" years (2010, 2011, 2014, 2015, 2016). Estimates indicated that there was no decline in yields or share of acres harvested on irrigated acres during the two dry years of 2012 and 2013. However, during the two dry-years, the share of non-irrigated acres harvested dropped by 23.5% and the yield per acre dropped by 61.8%. The result was an estimated drop in revenue of $649/acre for acres removed from irrigation during a dry-year and a $305/acre drop in net revenue given that dryland acres have lower input costs.[5] The estimated drop in revenue from an acre removed from irrigation during a wet-year was $266/acre and a drop in net revenue of $39/acre. At a rate of 3 years of lost irrigation in 10, and assuming half of these are dry-years (and the remaining are wet years which follow a dry year), this led to an estimated 47.0% drop in net revenue over a 10-year period. The scenario implies that the removal of irrigation rights during the call years would cause producers to lose 47.0% of their net revenue on each acre.[6]

This expected loss in annual revenue would be capitalized into the price of the 214,000 irrigated acres in the "rapid response" region of the 3 Republican River NRDs. Table 2 applies this 47.0% loss in net revenue to average value for pivot irrigated acres in Southwest Nebraska of $4,510 yielding a loss of $2,119 per acre. This change in land value is multiplied by the 214,000 potentially impacted acres to yield a loss of $454 million in property value.

Table 2
Maintained Property Value and Annual Property Tax Revenue in the 4 Natural Resources Districts

Maintained Property Value	Current Value Per Acre	Percent Loss in Revenue	Estimated Loss in Value Per Acre	Impacted Acres	Lost Property Value	Lost Annual Property Tax Revenue
3 Republican River NRDs	$4,510	47.0%	$2,119	214,300	$454,085,578	$4,540,856
Twin Platte NRD			$2,800	50,000	$140,000,000	$1,400,000
Total					$594,085,578	$5,940,856
Share Credited to NCORPE Project						
30%					$178,225,673	$1,782,257
50%					$297,042,789	$2,970,428
70%					$415,859,905	$4,158,599

Source: BBR calculations as described in the text

"shut down." In other years, the surface water acres also will be shut down. A simple average of these two scenarios implies that in call years 214,000 acres (rather than 177,000) will be shut down.

[5] Total Operating and Use Related Ownership Costs for pivot-irrigated (Table 30) and dryland (Table 15) corn production with yields similar to those in Southwest Nebraska were subtracted from revenue. The source for the costs was the *2017 Nebraska Crop Budgets* publication of the University of Nebraska-Lincoln Extension Service.

[6] Similar losses are obtained when simulation other crop rotation patterns on Irrigated and non-irrigated acres.

In the case of Twin Platte NRD, the NCORPE project is meeting an annual need to increase streamflow in the Platte River. Therefore, irrigation rights are maintained every year on an estimated 50,000 acres of property. Table 2 highlights the difference between the property value of for irrigated and non-irrigated acres. That difference is $2,800 in Southwest Nebraska, given an average value of $4,510 for pivot irrigated acres versus $1,710 for dryland acres, according to the University of Nebraska-Lincoln. The annual property tax revenue maintained given this decline in farmland value would $140 million. The total property value maintained across all 4 Natural Resources Districts would be $594 million. The maintained property value would generate an estimated $5.94 million in annual property tax revenue.

The loss in property value is then adjusted to reflect the three alternative scenarios for NCORPE's contribution to allowing these acres to remain in irrigated production: 30%, 50% and 70%. This range of 30% to 70% arguably represents a conservative estimate of future conditions. For example, data provided by the Upper Republican Natural Resources District shows that NCORPE provided augmentations for 65% of the forecast deficit in the 3 Republican River NRDs from the 2012-2013 period through the 2016-2017 period, preventing the shutdown of irrigated acres. Further, the Rock Creek Project provided augmentations for another 25% of the forecast deficit, but Rock Creek only benefits the Upper Republican Natural Resources District.

Under the 30%, 50% and 70% scenarios, the gain ranges from $178 to $416 million in property value. This translates into an estimated gain of between $1.78 and $4.16 million in annual property tax revenue, depending on the scenario and given a prevailing property tax rate of 1% on agricultural land in the region. In other words, the NCORPE projects helps save an estimated $1.78 to $4.16 million in property tax revenue each year across the 4 Natural Resources Districts. Table 3 compares the annual property tax revenue lost due to the NCORPE project with the property tax revenue maintained, under the 30%, 50% and 70% scenarios.

Table 3
Net Annual Property Tax Revenue Maintained by the NCORPE Project in the 4 Natural Resources Districts

Case	Net Annual Property Tax Revenue Private Property	Public Property
Lost at NCORPE Property	-$2,094,096	-$2,194,872
Maintained in 4 NRDs		
30%	$1,782,257	$1,782,257
50%	$2,970,428	$2,970,428
70%	$4,158,599	$4,158,599
Net Revenue		
30%	-$311,839	-$412,615
50%	$876,332	$775,556
70%	$2,064,504	$1,963,727

Source: BBR calculations as described in the text

Results in Table 3 are presented assuming that irrigated acres on the NCORPE property continues to be taxed as private property, and assuming that irrigated acres on the property are treated as public property (and not subject to property tax). Focusing on current conditions that NCORPE is taxed as private property, the net annual tax revenue maintained by the NCORPE project ranges from an estimated annual loss of 312,000 under the 30% scenario to a gain of $876,000 under the 50% scenario and a larger gain of $2.06 million under the 70% scenario.

B. Total Annual Economic and Tax Revenue Impact

The NCORPE projects also generates an economic impact in the 4 NRD region. As was discussed in the 2007 UNL Bureau of Business Research report *The Economic Impact of Reduced Irrigation in the Republic River Basin*, the removal of land from irrigated production has a direct economic impact on the economy, with that direct impact occurring in Lincoln County where the NCORPE property is located. At the same time, there is a direct economic impact in the 4 NRD region as acres are maintained in irrigated production. The direct economic impact occurs because irrigated production utilizes more inputs and is often more profitable than dryland production.

This report examines these direct economic impacts. The report also examines the multiplier impact on the economy, that is, the additional change in business activity and employment resulting from the direct economic impact. The multiplier impact occurs for two reasons. First, the reduction of irrigated production is associated with reduced use of other farm inputs and less need for crop hauling and storage services, implying a reduction in sales and employment for businesses which support agricultural production. Second, there is also a loss of income for farmers and their employees, leading to a reduction of household spending at businesses throughout the local economy. These multiplier impacts are estimated using the IMPLAN model, the leading model for calculating multiplier impacts. The IMPLAN model calculates the multiplier impact based on the unique industrial structure of the region. The sum of the direct economic impact and the multiplier impact is the total economic impact.

Table 4 below shows the estimated economic impact from taking 14,800 acres out of irrigated production on the NCORPE property, and renting out much of that property for grazing. The direct impact is the lost irrigated production plus the additional grazing activity. NCORPE operations also are added to the direct impact. Operations include spending for pumping water at NCORPE wells and personnel, office and other annual operating costs. The lost value of annual grain production using average irrigated yields is $11.3 million. The increase in grazing is expected to yield an average of $200,000 in grazing income over the next 5 years which will support approximately $750,000 in ranching activity. Pumping costs are expected at $696,000 per year and other operating costs $1.39 million per year. Pumping cost estimates are based on a 12’ allocation on 14,800 acres and a pumping cost of $47/acre. Operating costs are based on the 2018 NCORPE budget, excluding demand and usage charges for wells and other well costs. Lost crop production significantly exceeds increased ranching, pumping and operations activity and the net loss of direct economic activity is shown in the first column of Table 4. Table 4 also shows the multiplier impact and the total economic impact. The total annual loss of economic activity in the counties of the 4 Natural Resources Districts is $11.53 million. This impact includes $2.09 million in income, either employee compensation or proprietor income to farmers or other business owners. The employment impact is a loss of 23 jobs.

Table 4
Net Annual Loss in Economic Activity and Additional State and Local Tax Revenue Due to the End of Irrigated Production and Operations at 14,800 Acres at NCORPE Property

Impact Measure	Direct Impact	Multiplier Impact	Total Impact
Output (Millions $)	-8.49	-3.04	-11.53
Value-Added (Millions $)	-1.91	-1.51	-3.41
Income (Millions $)	-1.25	-0.84	-2.09
Employment	-1	-22	-23
Local Property and Sales Tax (Millions $)			-0.04
State Income and Sales Tax (Millions $)			-0.10

Source: BBR calculations using IMPLAN

Table 4 further shows the lost tax revenue associated with this economic activity. Revenue is estimated only for the principal sources of state and local tax revenue: state income tax, state and local sales tax, and local property tax. The income tax base is estimated utilizing the annual employee compensation impact and a 2.7 percent effective state income tax rate. The sales tax base is approximately two-fifths of income, since this is the proportion of Nebraska income spent on purchases subject to the sales tax and a 7 percent state and local sales tax rate is applied.[7] [8] Property tax is only estimated for the multiplier impact, given that the direct property tax impacts were estimated in the previous section. For property tax revenue, the statewide ratio of 1.62 dollars of taxable property for each 1.0 dollar of income is applied. Table 4 shows the total additional loss of local property and sales tax revenue of $40,000 per year. The loss of state income and sales tax revenue is $100,000 per year.

Table 5 shows the annual economic impact from economic activity maintained due to the NCORPE project. In the 3 Republican River Natural Resources Districts, there is no impact in 7 of 10 years and an impact during 3 years. During those 3 years there is a positive economic impact since irrigated production is maintained. The direct impact occurs because there are more input purchases with irrigated production and higher labor and proprietor income. For the Twin Platte Natural Resources District, the data show the average annual impact from maintaining irrigated production every year. All estimates in Table 5 also net out annual occupation tax payments to pay for building infrastructure at the NCORPE site as well as annual pumping and other operations costs. Occupation tax payments cannot be used for other purchases. The economic impact from maintained economic activity is $66.33 million across the 4 Natural Resources Districts. This impact includes $12.55 million in income, either employee compensation or proprietor income to farmers or other business owners. The employment impact is 145 maintained jobs. Maintained economic activity supports $220,000 in local property and sales tax revenue and $610,000 in state income and sales tax revenue.

[7] The relevant rate for North Platte is used since most spending would occur in Lincoln County.

[8] Taxable sales are calculated as income times the percentage of income going toward taxable items – 39.6 percent. Taxable property is calculated as income times the ratio of $1.62 in taxable property for each $1 of income.

Table 5
Average Annual Gain in Economic Activity and Additional State and Local Tax Revenue from Irrigated Production Maintained in the 4 NRDs

Impact Measure	Direct Impact	Multiplier Impact	Total Impact
Output (Millions $)	49.78	16.55	66.33
Value-Added (Millions $)	12.32	8.27	20.59
Income (Millions $)	8.03	4.52	12.55
Employment	30	115	145
Local Property and Sales Tax (Millions $)			0.22
State Income and Sales Tax (Millions $)			0.61

Source: BBR calculations using IMPLAN

Table 6 shows the net economic impact, which is calculated by subtracting the net loss of economic activity in Table 4 from the net maintenance of economic activity in Table 5. Results are again presented under the 30%, 50% and 70% scenarios. Results indicate that the net economic impact of the NCORPE project is positive under all three scenarios, with impacts significantly larger under the 70% scenario than the 30% scenario. For example, in the 70% scenario, there is a $6.70 million annual impact on income in the 4 NRD region.

Table 7 shows the net economic and tax revenue impacts from Table 6 added to the direct property tax impacts from Table 3. The economic impact results do not change, but there is a change in the impact on local property taxes. The NCORPE project yields a negative local tax revenue impact (primarily a negative property tax impact) under the 30% scenario but the local tax revenue impact is positive under the 50% scenario and even larger under the 70% scenario. For example, under the 70% scenario, the annual local tax revenue impact is $2.18 million.

III: Annual Impact on the Republican River Basin and Twin Platte NRDs

As is shown in Tables 6 and 7, the NCORPE project has a significant, positive impact on the 4-NRD region of Southwest Nebraska. That impact, however, varies within each of the 4 individual Districts. For example, the Twin Platte Natural Resources District plans to utilize water from the NCORPE project on an annual basis while other Districts will do so during only during "call years." The Twin Platte NRD also is home to nearly 4,400 of the 14,800 acres at the NCORPE site which have been taken out of irrigated production. This will yield a loss of property value and reduce the economic impact in the Twin Platte NRD. Another 10,400 of those NCORPE acres are located in the Middle Republican Natural Resources District, suggesting that the net impact of the NCORPE project may vary between the Middle Republican NRD and the Lower Republican and Upper Republican NRDs.

These distinctions invite further analysis of the annual property tax revenue and economic impacts of the NCORPE project. Impacts must be estimated at the level of individual Natural Resources Districts. This section provides such an individual analysis for the Lower Republican, Middle Republican, Upper Republican and Twin Platte NRDs.

Table 6
Net Annual Change in Economic Activity and Additional State and Local Tax Revenue from Irrigated Production Maintained in the 4 NRDs

Case	Output (Millions $)	Value-Added (Millions $)	Income (Millions $)	Employment	Local Taxes	State Taxes
Lost at NCORPE Property	-$11.53	-$3.41	-$2.09	-23.2	-$0.04	-$0.10
Maintained in 4 NRDs						
30%	$19.90	$6.18	$3.77	43.4	$0.07	$0.18
50%	$33.16	$10.29	$6.28	72.3	$0.11	$0.31
70%	$46.43	$14.41	$8.79	101.3	$0.15	$0.43
Net Impact						
30%	$8.37	$2.76	$1.68	20.2	$0.03	$0.08
50%	$21.63	$6.88	$4.19	49.1	$0.07	$0.20
70%	$34.90	$11.00	$6.70	78.0	$0.12	$0.33

Source: BBR calculations using IMPLAN

Table 7
Net Annual Change in Economic Activity and Total State and Local Tax Revenue from Irrigated Production Maintained in the 4 NRDs

Case	Output (Millions $)	Value-Added (Millions $)	Income (Millions $)	Employment	Local Taxes	State Taxes
Lost Due to NCORPE Property	-$11.53	-$3.41	-$2.09	-23.2	-$2.13	-$0.10
Maintained in 4 NRDs						
30%	$19.90	$6.18	$3.77	43.4	$1.85	$0.18
50%	$33.16	$10.29	$6.28	72.3	$3.08	$0.31
70%	$46.43	$14.41	$8.79	101.3	$4.31	$0.43
Net Impact						
30%	$8.37	$2.76	$1.68	20.2	-$0.29	$0.08
50%	$21.63	$6.88	$4.19	49.1	$0.95	$0.20
70%	$34.90	$11.00	$6.70	78.0	$2.18	$0.33

Source: BBR calculations using IMPLAN

A. Direct Property Tax Impact

Table 8 shows the direct property value loss for each of the 4 NRDs from the NCORPE project. Essentially, Table 8 divides the lost property value and annual tax revenue for the entire region in Table 1 into the loss in each individual NRD. Specifically, the loss of property value at the NCORPE project site is divided between the Middle Republican and Twin Platte NRDs, with 29 percent (4,363.4 out of 14,800 acres) allocated to the Twin Platte NRD and 71 percent (10,433.6 out of 14,800 acres) allocated to the Middle Republican NRD. The lost property value due to the occupation tax is split almost evenly among the 4 Natural Resources Districts, as each is paying approximately one-quarter of the cost for developing and operating the project.[9] Lost property value is used to estimate the annual loss in property tax revenue.

Table 8
Direct Loss in Property Value and Annual Property Tax Revenue Due to NCORPE Project By Natural Resources District

	Loss at NCORPE Site		Loss Due to Occupation Tax		Total
Natural Resources District	Property Value	Annual Property Tax Revenue	Property Value	Annual Property Tax Revenue	Annual Property Tax Revenue
Lower Republican	$0	$0	-$36,270,415	-$362,704	-$362,704
Middle Republican	-$40,226,223	-$418,469	-$38,196,746	-$381,967	-$800,436
Upper Republican	$0	$0	-$36,220,415	-$362,204	-$362,204
Twin Platte	-$16,822,870	-$175,006	-$39,362,425	-$393,624	-$568,631

Source: BBR calculations

The lost property value and annual property tax revenue is greatest in the Middle Republican Natural Resources District. This is because 10,433.6 of the 14,800 acres transitioned from irrigated crop production to non-irrigated rangeland are located in the Middle Republican NRD. The annual loss of property tax revenue due to the NCORPE project is $800,000 in the Middle Republican. The annual loss in the Twin Platte NRD is nearly $569,000 and the annual loss is approximately $360,000 in the other two Districts.

These gross losses, however, are mitigated because the NCORPE project also helps maintain farmland in irrigated production in each of the 4 Natural Resources Districts. Table 9 shows an estimate of the maintained property value and annual property tax revenue in each of the Districts. Maintained property value estimates for the 3 Republican River Natural Resources Districts are allocated to each District based on their share of the 177,000 impacted acres, with 44,000 in the Upper Republican NRD, 55,000 in the Middle Republican NRD and 78,000 in the Lower Republican NRD. Maintained property value and annual property tax revenue are again presented under the 30%, 50% and 70% scenarios. The Lower Republican NRD has the largest maintained property value and annual property tax revenue, followed by the Middle Republican NRD and Twin Platte NRDs and then the Upper Republican NRD.

[9] Shares are assigned according to the size of annual bond payments. A share of 23.9% to 26.5% is assigned to each NRD.

Table 9
Maintained Property Value and Annual Property Tax Revenue Due to NCORPE Project

Scenario	Natural Resources District			
	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Maintained Property Value				
30%	$64,610,419	$42,236,911	$29,378,343	$42,000,000
50%	$107,684,032	$70,394,852	$48,963,905	$70,000,000
70%	$150,757,645	$98,552,793	$68,549,467	$98,000,000
Maintained Annual Property Tax Revenue				
30%	$646,104	$422,369	$293,783	$420,000
50%	$1,076,840	$703,949	$489,639	$700,000
70%	$1,507,576	$985,528	$685,495	$980,000

By Natural Resources District
Source: BBR Calculations

Table 10 shows the net change in direct property value and property tax revenue in the 4 Natural Resources Districts due to the NCORPE project.

Table 10
Direct Change in Annual Property Tax Revenue Due to NCORPE Project
By Natural Resources District

Property Tax Revenue	Natural Resources District			
	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Lost Due to NCORPE	-$362,704	-$800,436	-$362,204	-$568,631
Maintained Due to NCORPE				
30%	$646,104	$422,369	$293,783	$420,000
50%	$1,076,840	$703,949	$489,639	$700,000
70%	$1,507,576	$985,528	$685,495	$980,000
Net Change Due to NCORPE				
30%	$283,400	-$378,067	-$68,421	-$148,631
50%	$714,136	-$96,488	$127,435	$131,369
70%	$1,144,872	$185,092	$323,291	$411,369

Source: BBR Calculations

Values reported in Table 10 are estimated by combining Tables 8 and 9. The largest increase in annual property tax revenue occurs in the Lower Republican Natural Resources District. There is a positive change in annual property tax revenue under the 30%, 50% and 70% scenarios. Under the 70% scenario the direct annual property tax revenue rises by $1.14 million in the Lower Republican Natural Resources District.

The second largest increase is found in the Twin Platte Natural Resources District. There is an increase in annual property tax revenue under both the 50% and the 70% scenario. The change under the 70% scenario is an estimated $411,000 per year. The net change in property tax revenue is also positive under the 50% and 70% scenario for the Upper Republican Natural Resources District. Under the 70% scenario, the estimated change in annual property tax revenue is $323,000. In the Middle Republican Natural Resources District, the net change in annual property tax revenue is negative under the 30% and 50% scenarios. However, there is a net gain of $185,000 under the 70% scenario.

B. Annual Economic and Tax Revenue Impact

Annual economic impacts also are felt within the boundaries of individual Natural Resources Districts. In this section, the annual output, value-added, income and employment impact is estimated for each District. Direct economic impacts listed in Tables 4 and 5 are allocated to the four NRDs based on the share of NCORPE property in each District and the share of maintained irrigated acres found in each District. Once the direct economic impact has been estimated for each District, District-level multiplier impacts are calculated using the IMPLAN model. Note that the multiplier impacts for individual Natural Resources Districts are smaller than the aggregate economic multipliers utilized in Tables 4 and 5. As a result, the sum of the economic impacts across all 4 NRDs will be somewhat less than the aggregate economic impacts presented in Tables 6 and 7.

Table 11 shows the negative annual economic impact that results from reduced irrigated crop production on the NCORPE property. The largest negative impact is in the Middle Republican Natural Resources District with a $7.88 million annual loss in output, including $1.38 million in lost labor income, which includes employee compensation and proprietor income. Fourteen full-year equivalent jobs were lost. The impact is largest in the Middle Republican NRD because 10,400 of 14,800 NCORPE acres are located in this District. Approximately 4,400 of the converted NCORPE acres are located in the Twin Platte Natural Resources District, with a resulting annual loss of $3.42 million in output, including $0.65 million in employee compensation and farm income. There is a loss of 9 full-time equivalent jobs. No part of the NCORPE property is located in the Upper Republican or Middle Republican Natural Resources Districts.

Table 12 shows the average annual economic impact from maintaining irrigated production in each of the 4 Natural Resources Districts. The largest annual impact occurs in the Twin Platte Natural Resources District, as expected since the NCORPE project is designed to keep acres in irrigated production every year in the Twin Platte NRD. The average annual impact is $5.02 million in income, whether employee compensation or proprietor income. There is also an impact of 73 jobs in the NRD. There are also significant annual economic impacts in the Lower Republican, Middle Republican and Upper Republican Natural Resources Districts.

Table 11
Net Annual Loss in Economic Activity and Additional State and Local Tax Revenue Due to the End of Irrigated Production at 14,800 Acres at NCORPE Property By Natural Resources District

	Natural Resources District			
Economic Impact	**Lower Republican**	**Middle Republican**	**Upper Republican**	**Twin Platte**
Output (Millions $)				
Direct	$0.00	-$5.98	$0.00	-$2.50
Multiplier Impact	$0.00	-$1.90	$0.00	-$0.92
Total Impact	$0.00	-$7.88	$0.00	-$3.42
Value-Added (Millions $)				
Direct	$0	-$1.34	$0	-$0.56
Multiplier Impact	$0.00	-$0.91	$0.00	-$0.49
Total Impact	$0.00	-$2.26	$0.00	-$1.06
Income (Millions $)				
Direct	$0.00	-$0.86	$0.00	-$0.39
Multiplier Impact	$0.00	-$0.52	$0.00	-$0.26
Total Impact	$0.00	-$1.38	$0.00	-$0.65
Employment				
Direct	0.0	-1	0.0	-1
Multiplier Impact	0.0	-13	0.0	-8
Total Impact	0.0	-14	0.0	-9
Local Taxes (Millions $)	$0.00	-$0.03	$0.00	-$0.01
State Taxes (Millions $)	$0.00	-$0.07	$0.00	-$0.03

Source: BBR calculations using IMPLAN

Table 12
Average Annual Gain in Economic Activity and Additional State and Local Tax Revenue from Maintained Irrigated Production by Natural Resources District

Economic Impact	Natural Resources District			
	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Output (Millions $)				
Direct	$13.20	$8.29	$5.52	$22.77
Multiplier Impact	$3.31	$2.70	$1.51	$7.84
Total Impact	$16.51	$10.98	$7.03	$30.62
Value-Added (Millions $)				
Direct	$3.93	$2.27	$1.31	$4.80
Multiplier Impact	$1.61	$1.28	$0.79	$4.11
Total Impact	$5.54	$3.55	$2.11	$8.92
Income (Millions $)				
Direct	$2.72	$1.53	$0.99	$2.79
Multiplier Impact	$0.88	$0.73	$0.46	$2.23
Total Impact	$3.61	$2.26	$1.45	$5.02
Employment				
Direct	8	5	4	13
Multiplier Impact	23	18	10	60
Total Impact	31	23	14	73
Local Taxes (Millions $)	$0.05	$0.04	$0.02	$0.10
State Taxes (Millions $)	$0.18	$0.11	$0.07	$0.24

Source: BBR calculations using IMPLAN

Table 13 shows the net economic and tax revenue impacts depending on the share of maintained economic activity credited to the NCORPE project, whether 30%, 50% or 70%. To make this calculation, the total economic impact results in Table 11 are added to either 30%, 50% or 70% of the total economic impact results in Table 12.

Net impact improves as the share of credit to NCORPE rises from 30% to 50% to 70%. The net impact is largest in the Twin Platte NRD and there are positive net impacts in the Lower and Upper Republican NRDs. There is a negative impact in the Middle Republican NRD under the 30% and 50% scenario. The net impact is near 0 in the Middle Republican NRD when the share of credit rises to 70%.

Table 13
Net Change in Economic Activity and Additional State and Local Tax Revenue from Maintained Irrigated Production by Natural Resources District

Total Economic Impact	Natural Resources District			
	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Output (Millions $)				
30%	$4.95	-$4.58	$2.11	$5.76
50%	$8.25	-$2.39	$3.51	$11.89
70%	$11.56	-$0.19	$4.92	$18.01
Value-Added (Millions $)				
30%	$1.66	-$1.19	$0.63	$1.62
50%	$2.77	-$0.48	$1.05	$3.40
70%	$3.88	$0.23	$1.47	$5.18
Income (Millions $)				
30%	$1.08	-$0.71	$0.43	$0.85
50%	$1.80	-$0.25	$0.72	$1.86
70%	$2.53	$0.20	$1.01	$2.86
Employment				
30%	9.3	-7.2	4.1	13.7
50%	15.5	-2.5	6.8	28.2
70%	21.7	2.1	9.5	42.8
Local Taxes (Millions $)				
30%	$0.02	-$0.01	$0.01	$0.02
50%	$0.03	-$0.01	$0.01	$0.04
70%	$0.04	$0.00	$0.02	$0.06
State Taxes (Millions $)				
30%	$0.05	-$0.03	$0.02	$0.04
50%	$0.09	-$0.01	$0.04	$0.09
70%	$0.12	$0.01	$0.05	$0.14

Source: BBR calculations using IMPLAN

Table 14 shows the aggregate change in annual local tax revenue after adding in the direct property tax revenue impacts from Table 10 to the additional local property tax impacts in Table 13. Annual local tax revenue is positive for the Lower Republican NRD under all three scenarios. Aggregate annual local tax revenue is positive under the 50% and 70% scenarios in Upper Republican and Twin Platte Natural Resources Districts. The annual local tax revenue impact is negative in the Middle Republican NRD under the 30% and 50% scenarios, but is positive under the 70% scenario.

Table 14
Aggregate Change in Annual Local Tax Revenue Due to the NCORPE Project
by Natural Resources District

Amount (Millions $)	Natural Resources District			
	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Local Tax Revenue Impact				
30%	$0.30	-$0.39	-$0.06	-$0.13
50%	$0.74	-$0.10	$0.14	$0.17
70%	$1.18	$0.19	$0.34	$0.47

Source: BBR calculations using IMPLAN

IV: An Alternative Regulation Scenario

Economic impacts presented in the previous section were based on regulations described in the Integrated Management Plans of Natural Resource Districts located in the Republican River basin. Those plans typically refer to options to "shut down" rapid response acres within Natural Resources Districts in response to a call year. This section considers the economic impact during call years from an alternative regulatory approach which utilizes a 60% reduction in total groundwater irrigation volumes in the Upper, Middle and Lower Republican Natural Resources Districts (Nebraska Department of Natural Resources, 2009).[10] Note that this alternative scenario applies to the 3 Republican River NRDs and would not apply to the Twin Platte NRD.

Such a 60% reduction could be implemented in a variety of ways including reducing the allocation for all irrigated acres, the shutting down of a significant share (up to 60%) of all irrigated acres in a NRD, or a combination of both. The key point is that all irrigated acres in a District could be impacted, not just the rapid response acres.

As noted above, the implementation of reduced allocations is one way to curtail the irrigation volume within a Natural Resources District. Marginal reductions in allocations may even be a less economically impactful method to reduce irrigation compared to the "shut down" of irrigated acres (Thompson, 2007).[11] This is because irrigated producers may invest in and utilize "precision agricultural" technologies which reduces the need for irrigation, fertilizer and other select inputs into crop production. However, such mitigating activities would not be as effective in the case of a drastic reduction in allocations such as a 60% reduction. Producers would likely choose to remove a significant share of their acreage from irrigated production so that remaining acres could receive a sufficient allocation to meaningfully benefit from irrigation. This report therefore assumes that the response of producers to a 60% reduction in total irrigation would be equivalent a 60% reduction in the number of irrigated acres in the Lower, Middle and Upper Platte Natural Resources Distract. The Nebraska Department of Natural Resources (2009) estimates that there are 432,000 groundwater irrigated acres in the Upper Republican NRD,

[10] Nebraska Department of Natural Resources, 2009. Integrated Management Planning in the Republican River Natural Resources Districts. (October).

[11] Thompson, Eric. 2007. *The Economic Impact of Reduced Irrigation in the Republic River Basin*, Bureau of Business Research Report.

260,000 in the Middle Republican NRD and 282,000 in the Lower Republican NRD.[12] Table 15 shows the estimated economic impact resulting from a 60% reduction in all irrigated acres in the three Republic River NRDs for a year.

Table 15
Net Change in Economic Activity and Additional State and Local Tax Revenue from Maintained Irrigated Production under Alternative Scenario by Natural Resources District

	Natural Resources District			
Total Economic Impact	**Lower Republican**	**Middle Republican**	**Upper Republican**	**Twin Platte**
Output (Millions $)				
30%	$9.90	$1.83	$14.39	$5.76
50%	$16.50	$8.30	$23.99	$11.89
70%	$23.10	$14.77	$33.59	$18.01
Value-Added (Millions $)				
30%	$3.49	$1.25	$5.30	$1.62
50%	$5.82	$3.59	$8.83	$3.40
70%	$8.15	$5.93	$12.37	$5.18
Income (Millions $)				
30%	$2.36	$1.01	$4.04	$0.85
50%	$3.93	$2.60	$6.74	$1.86
70%	$5.50	$4.20	$9.43	$2.86
Employment				
30%	19	7	26	14
50%	32	22	44	28
70%	45	36	61	43
Local Taxes (Millions $)				
30%	$0.03	$0.01	$0.05	$0.02
50%	$0.05	$0.03	$0.09	$0.04
70%	$0.07	$0.06	$0.12	$0.06
State Taxes (Millions $)				
30%	$0.12	$0.05	$0.20	$0.04
50%	$0.19	$0.13	$0.33	$0.09
70%	$0.27	$0.20	$0.46	$0.14

Source: BBR calculations using IMPLAN

[12] Analysis also reflects the potential for lost surface water irrigation, following the approach utilized in Sections II and III.

Impact estimates presented in Table 15 are larger in the Upper, Middle and Lower Republican NRDs. Note, however, that estimates are very similar in the case of the Twin Platte NRD since the alternative irrigation scenario does not apply to that District. There are only minor differences which result because a portion of the multiplier impact from irrigated production in the 3 Republican Rivers NRDs spills over to businesses within the Twin Platte NRD.

Under the alternative scenario, the largest annual economic and tax revenue impact occurs in the Upper Republican Natural Resources District. Under the 70% scenario, the annual economic impact in the Upper Republican NRD reaches $33.59 million. The smallest impacts are in the Middle Republican NRD, although the estimated impact is positive in the Middle Republican District under this alternative scenario.

Table 16 shows the aggregate change in annual local tax revenue after adding in the direct property tax revenue impacts from Table 10 to the additional local property tax impacts in Table 15. The largest local tax revenue impact is in the Upper Republican NRD, followed by the Lower Republican NRD, the Middle Republican NRD and the Twin Platte NRD.

Table 16
Aggregate Change in Annual Local Tax Revenue Due to the NCORPE Project
Under Alternative Scenario by Natural Resources District

	Natural Resources District			
Amount (Millions $)	Lower Republican	Middle Republican	Upper Republican	Twin Platte
Local Tax Revenue Impact				
30%	$0.92	$0.36	$1.35	-$0.13
50%	$1.78	$1.15	$2.49	$0.17
70%	$2.64	$1.94	$3.63	$0.47

Source: BBR calculations using IMPLAN

V: Economic Impact of a Windfarm

The NCORPE project makes a number of contributions to the environment, beyond facilitating regulatory compliance. For example, NCORPE has already taken steps to facilitate the growth of prairie grasses on its property. This benefits the environment and provides a source of revenue for NCORPE. Another potential project that would benefit the environment and provide a source of revenue for NCORPE is wind and solar power development.

This section examines the potential economic impact from locating a renewable energy project at the NCORPE site. In particular, the potential economic impact of a wind power development is considered, given that wind power development is currently more common in Nebraska than solar development. Further, the Bureau of Business Research has experience conducting economic analysis of wind projects, including in its 2014 report *The Economic and Tax Revenue Impact of the Nebraska Wind Power Industry* developed with the support of the Nebraska Power Association.

The exact size and cost of potential wind power developments at the NCORPE site is not known at this time so a representative project is chosen and analyzed. In particular, the economic impact is estimated for a hypothetical 100 MW project. Analysis considers the statewide economic during the construction of the windfarm and the annual impact from operating the windfarm. On average, wind farm construction has had an economic impact of $16.6 million for each 100 MW of construction, according to the report *The Economic and Tax Revenue Impact of the Nebraska Wind Power Industry*. This $16.6 million impact includes $6.8 million of labor income spread over 120 job-years. In-state construction jobs would include building roads and cement for placing the wind turbines, which is inherently local and regional employment. The estimated construction impact is limited since wind turbine components are not generally manufactured in Nebraska and workers specializing in erecting wind turbines often come from out of state. There would be enough local work, however, to generate $6.8 million in labor income from building a 100 MW wind farm. That labor income impact would include earnings at the construction site and at businesses throughout the community.

Construction period impacts would occur during the period when wind turbines are added to the site. The impacts, therefore, may be divided up over a series of years as turbines are often installed over a period time. The $6.8 million labor income, therefore, might be earned over a period of years and the 120 job-years also would be spread out over multiple years. For example, if wind turbines are assembled at the site over a 3-year period, there would be an impact of 40 jobs over 3 years.

Unlike construction-period impacts, operating impacts are permanent, occurring year after year for the decades during which the wind turbines are in operation. Impacts during operation years also were estimated in the 2014 report *The Economic and Tax Revenue Impact of the Nebraska Wind Power Industry.* Operating impacts include employment and labor income for technicians to monitor and maintain wind turbines as well as office workers such as managers, bookkeepers and administrative assistants. There are also operating impacts from purchasing local services and supplies such as utilities, insurance, fuel, vehicles and replacement parts. Annual payments to landowners are another component of the annual operating impact. Such payments would provide a potential new source of revenue for NCORPE.

On average, the annual economic impact from operating a 100 MW windfarm would be $2.7 million, including $1.0 million in labor income spread over 17 jobs. This impact would include direct jobs at the windfarm as well as the multiplier impact as the windfarm purchases supplies and services and as windfarm workers spend their paychecks. While smaller than the construction period impact, these operating impacts would be permanent in nature, occurring year after year.

VI: Summary

This report considered the annual economic and property tax revenue impact of the Nebraska Cooperative Republican-Platte Enhancement Project (NCORPE) project. Impact estimates reflect that the NCORPE project both removes some farmland acres from irrigated production but also maintains many acres in irrigated production. The report estimates the net economic and

property tax revenue impact. Table 17 reports the estimated net change in annual property tax revenue across the 4 Natural Resources Districts which own and operate NCORPE.

Table 17
Net Annual Property Tax Revenue

Percentage Credit	Net Annual Property Tax Revenue
30%	-$311,839
50%	$876,332
70%	$2,064,504

Source: BBR calculations

When the NCORPE project receives 30% of the credit for maintaining acres in irrigated production, the net annual property tax revenue is negative. In other words, lost property tax revenue exceeds maintained revenue. However, net annual property tax revenue turns positive if NCORPE is given 50% of the credit for maintaining rapid response irrigated acres in production within the 4 NRDs. There is a large annual gain in property tax impact if NCORPE is given 70% of the credit. Note that this range of 30% to 70% arguably represents a conservative estimate of future conditions. For example, data provided by NCORPE shows that NCORPE provided augmentations for 65% of the forecast deficit in the 3 Republican River NRDs from the 2012-2013 period through the 2016-2017 period, preventing the shutdown of irrigated acres. Further, the Rock Creek Project provided augmentations for another 25% of the forecast deficit, but the Rock Creek project only benefits the Upper Republican Natural Resources District.

Table 18 summarizes net economic impacts. Once again, the net impact depends on the degree to which the NCORPE project is credited for maintaining acres. Economic impact is presented for four concepts. Output is the broadest concept and equates to total business sales. Value-added is a component of sales, and income in turn is part of value-added. Net economic impacts are positive across all three scenarios. There is a net gain of 20 jobs even under the 30% scenario and the net impact rises to 78 jobs under the 70% credit scenario. Under the 70% scenario, the annual impact rises to $34.90 million in terms of output, with $11.00 million in value-added and $6.70 million in income, which includes employee compensation and proprietor income.

Table 18
Net Annual Economic Impact

Net Impact	Output (Millions $)	Value-Added (Millions $)	Income (Millions $)	Employment
30%	$8.37	$2.76	$1.68	20
50%	$21.63	$6.88	$4.19	49
70%	$34.90	$11.00	$6.70	78

Source: BBR calculations

Table 19 shows the annual impact in individual Natural Resources Districts. The largest annual economic impact occurs in the Twin Platte NRD. The annual economic impact is $18.01 million in output and 43 jobs under the 70% credit scenario. Annual economic impact also is positive in the Lower Republican and Upper Republic Natural Resources Districts. Annual economic impacts are negative under the 30% and 50% scenario in the Middle Republican Natural Resources District but are near 0 in the 70% scenario. Two-thirds of the NCORPE property is located in the Middle Republican NRD so lost irrigated crop production takes a direct toll on that District.

Annual property tax revenue impacts also are negative in the Middle Republican Natural Resources District under the 30% and 50% scenarios. In the Upper Republican and Twin Platte NRDs the impact on annual property tax revenue is neutral or positive as long as NCORPE receives at least 50% of the credit for maintaining acres in irrigated production. The impact on annual property tax revenue is positive in the Lower Republican NRD under the 30%, 50% and 70% scenario.

Table 19
Net Annual Property Tax Revenue and Economic Impact
By Natural Resources District

	Natural Resources District			
Total Economic Impact	**Lower Republican**	**Middle Republican**	**Upper Republican**	**Twin Platte**
Output (Millions $)				
30%	$4.95	-$4.58	$2.11	$5.76
50%	$8.25	-$2.39	$3.51	$11.89
70%	$11.56	-$0.19	$4.92	$18.01
Employment				
30%	9	-7	4	14
50%	16	-3	7	28
70%	22	2	10	43
Property Tax Revenue (Millions $)				
30%	$0.28	-$0.38	-$0.07	-$0.15
50%	$0.71	-$0.10	$0.13	$0.00
70%	$1.14	$0.19	$0.32	$0.41

Source: BBR calculations

This study also estimated economic impact under an alternative regulatory approach which utilizes a 60% reduction in total groundwater irrigation volumes in the Upper, Middle and Lower Platte Natural Resources Districts. This alternative was another of the possible regulatory options which the Nebraska Department of Natural Resources provided to these Districts during 2009. Estimated annual economic and tax revenue impacts for the NCORPE project grew in all 3 Republic River NRDs under this alternative scenario. The largest economic and tax revenue impact occurred in the Upper Republican NRD, and the smallest impact occurred in the Middle Republican NRD.

Appendix 1: About the UNL Bureau of Business Research and Key Personnel

A. The Bureau of Business Research

The Bureau of Business Research is a leading source for analysis and information on the Nebraska economy. The Bureau conducts both contract and sponsored research on the economy of the United States as well as Nebraska and its communities including: 1) economic and fiscal impact analysis; 2) models of the structure and comparative advantage of the current economy; 3) economic, fiscal, and demographic outlooks, and 4) assessments of how economic policy affects industry, labor markets, infrastructure, and the standard of living. The Bureau also competes for research funding from federal government agencies and private foundations from around the nation and contributes to the academic mission of the University of Nebraska-Lincoln through scholarly publication and the education of students.

B. Key Personnel

Dr. Eric Thompson – Principal Investigator

Dr. Eric Thompson will be the principal investigator on this project. Dr. Thompson is the Director of the Bureau of Business Research and an Associate Professor of Economics at the University of Nebraska-Lincoln. Dr. Thompson has conducted a broad group of economic impact studies including impact studies of Nebraska agriculture, irrigation and regulation of irrigation, Sandhill Cranes migration, the Nebraska child care industry, the Omaha Zoo, the Nebraska horseracing industry, Husker Harvest Days, and the UNL Athletic Department. Dr. Thompson also works on demographic projections, and analyses of economic development programs for Nebraska and cities in Nebraska. He also has conducted numerous economic impact studies for the Lincoln Department of Economic Development, the Greater Omaha Chamber, the Nebraska Department of Economic Development, various Nebraska industries and Nebraska tourism attractions. Dr. Thompson's research has received support from the United States Department of Labor, the United States Department of Agriculture, the Robert Wood Johnson Foundation, the Nebraska Health and Human Services System, as well as Lincoln, Omaha, and Nebraska organizations and agencies. In his previous employment, Dr. Thompson served as the Director of the Center for Business and Economic Research and a Research Associate Professor of Economics at the University of Kentucky. Dr. Thompson received his Ph.D. in agricultural economics from the University of Wisconsin-Madison in 1992. His research fields include regional economics, economic forecasting, and state and local economic development. His research has been published in Regional Science and Urban Economics, the Journal of Regional Science, the American Journal of Agricultural Economics, the Journal of Cultural Economics, and the Economic Review of the Federal Reserve Bank of Cleveland.