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Economic Impacts of Remote Well Solutions Installation in McKinley County, New Mexico

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Executive Summary

Remote Well Solutions is proposing the installation of an automatic off-grid water pumping control, distribution, and monitoring system technology on Navajo Tribal Cattle Ranches in New Mexico. These ranches are located primarily in McKinley County, but extend into Grant County, San Juan County, Cibola County, and Socorro County. The project scope is to install systems at 88 existing windmill and natural well locations. The systems will replace traditional windmill or natural-well pond distribution systems with propane, natural gas, solar and hybrid systems to pump, store and distribute water only as needed. The systems for this particular project will primarily use solar power.

The purpose of the project is to enhance water availability on these ranches to increase the number of cattle that can be carried on each ranch. Currently, cattle ranches in McKinley County carry about a third as many cattle per section as typical ranches in New Mexico. Increasing the number of cattle on ranches in McKinley County would increase the profitability and economic impact of ranches in the area.

This study provides estimates for the two primary economic impacts of this project: (1) one-time impact of project installation, and (2) the ongoing annual impact of increased revenue for cattle ranching operations due to increased carrying capacity on the land with installed remote wells.

The project installation cost is expected to be $1,275,000. Increases in carrying capacity are estimated in three possible scenarios – conservative, likely, and optimistic – as shown in Table 4. The scenarios are estimated based on projections from NMSU faculty and local cattle ranchers.

The total estimated economic impacts for this project are as follows:

Table 1 – Estimated One-time Impacts for Installation

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	7	$516,011	$800,686	$1,275,000
Indirect Effect	2	$109,125	$174,596	$367,368
Induced Effect	4	$133,448	$257,469	$460,087
Total Effect	**12**	**$758,585**	**$1,232,751**	**$2,102,455**

Table 2 – Estimated Annual Impacts on Output, various scenarios

	Conservative	Likely	Optimistic
Direct Effect Output	$4,125,000	$9,375,000	$18,750,001
Indirect Effect Output	$2,750,828	$6,251,882	$12,503,764
Induced Effect Output	$979,668	$2,226,517	$4,453,035
Total Effect Output	**$7,855,496**	**$17,853,400**	**$35,706,800**

Table 3 – Estimated Annual Job Impacts, various scenarios

	Conservative	Likely	Optimistic
Direct Effect Jobs	58	131	263
Indirect Effect Jobs	29	65	131
Induced Effect Jobs	8	17	35
Total Effect Jobs	**94**	**214**	**428**

Introduction

Remote Well Solutions is proposing the installation of an automatic off-grid water pumping control, distribution, and monitoring system technology on Navajo Tribal Cattle Ranches in New Mexico. These ranches are located primarily in McKinley County, but extend into Grant County, San Juan County, Cibola County, and Socorro County. The project scope is to install systems at 88 existing windmill and natural well locations on Navajo Tribal Ranches. The systems will replace traditional windmill or natural well pond distribution systems with propane, natural gas, solar and/or hybrid systems to pump, store and distribute water only as needed. The systems for this particular project will primarily use solar power.

The new systems will use solar pumping stations and a smart controller to fill elevated water storage tanks (10,000 to 15,000-gallon capacities) and then release water as needed to gravity fed drinkers via buried piping. The drinkers and piping will be dispersed throughout the grazing area. Water flow to drinkers will be computer chip controlled and monitored to identify leaks and prevent overflow, utilizing readings from drinkers.

This technology will maximize well water distribution performance and conserve water wastage due to overspill, wastage from runoff, seepage, erosion, and evaporation. The improved distribution will result in more efficient forage utilization by livestock, leading to a larger ranch carrying capacity and an additional water resource for local wildlife.

The purpose of the project is to enhance water availability on these ranches to increase the number of cattle that can be carried on each ranch. Currently, cattle ranches in McKinley County carry about a third as many cattle per section as typical ranches in New Mexico. Increasing the number of cattle on ranches in McKinley County would increase the profitability and economic impact of ranches in the area. The geographic focus encompasses fee lands managed by the Tribal Ranches Program, exclusive of other Navajo Nation trust lands that have over 2,000 windmill wells.

This study provides estimates for the two primary economic impacts of this project: (1) a one-time impact of project installation, and (2) the ongoing annual impact of increased revenue for cattle ranching operations due to increased carrying capacity on the land with installed remote wells.

Economic impact analysis is an attempt to measure the net change in economic activity in a given geographic area that results from a change in economic activity. Often, the change in economic activity refers to new spending or employment associated with a new business or a business expansion. The main idea behind economic impact analysis is that a new dollar spent in a local area results in more than one dollar in economic activity in the area.[1]

The economic impacts of this project were estimated using IMPLAN PRO Version 3 economic modeling software.[2]

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[1] (James Peach, 2010) (Lynch, Jan 2000) (Osiobe, May 2018)
[2] (Minnesota IMPLAN Group, Inc , n.d.) (Richmond, 2018)

Background

McKinley County, NM

McKinley County is located at the northwestern section of New Mexico, USA. Ranked as the seventh most populated county in New Mexico, it borders Apache County, AZ; Cibola County, NM; Sandoval County, NM; and San Juan County, NM. McKinley County is among 38 county-level census divisions of the United States where the most spoken language is not English and one of only three where it is neither English nor Spanish. About 45.75% of the population speak Navajo at home, followed by English at 38.87%, Zuni at 9.03% and Spanish at 5.72%. McKinley County has a population size of 72,564 comprised of 21,476 households and 16,686 families residing in the county.[3] The county seat is Gallup, NM.

Figure 1 - Map of New Mexico. McKinley County denoted in red.

The per capita income in the area is about $12,932, the median income for a household is $29,272 and the median income for a family was $37,345. The county has a poverty rate of 38%, and the median property value in the area is $68,000. The homeownership rate is 71.7%. Most people in McKinley County commute by driving alone, and the average commute time is 20.1 minutes. In the year 2015 – 2016, employment in McKinley County grew from 22,865 – 22,979, or about 0.5%. The significant employers in McKinley County are the retail trade, healthcare and social assistance, and the educational services.

Cattle Ranching

The U.S. is the leading beef producer in the world. The Beef Cattle Production industry generated $67.6 billion in revenue in 2017, supporting 806,868 businesses.[4] Cow-calf operations are a key driver of the beef industry and are widespread throughout the United States. The beef cow-calf business is well adapted by small-scale business owners and part-time farmers who have land suitable for pasture and hay production. Cow-calf operation primarily produce feeder cattle to be raised by other agricultural enterprises, such as feedlots; they sell their calves after they have been weaned and are under a year in age.

Cattle Ranching in McKinley County

The Cattle Ranching industry in McKinley Country is primarily comprised of cow-calf operations producing feeder cattle. Ranches in McKinley County carry about a third as many cattle as typical ranches in New Mexico. Since 2005, Farm & Ranch Income for McKinley County has been negative every year; years 2012-2016 are shown in Table 4.

Table 4 – Farm & Ranch Income in McKinley County, 2012-2016[5]

	2012	2013	2014	2015	2016
Farm & Ranch Income	-$4,499,000	-$10,189,000	-$6,607,000	-$6,824,000	-$7,876,000

[3] (U.S. Census Bureau, 2017)
[4] (Madigan, 2017)
[5] (U.S. Bureau of Economic Analysis, 2017)

The primary limiting factor for cattle ranches in the county is reliable access to water. Ranches are typically underutilized because of challenges delivering water to remote ranchland in the county.

Impact Analysis

Economic impact analysis is an attempt to measure the net change in economic activity in a given geographic area that results from a change in economic activity. Often, the change in economic activity refers to new spending or employment associated with a new business or a business expansion. The main idea behind economic impact analysis is that a new dollar spent in a local area results in more than one dollar in economic activity in the area.

The economic impacts of this project were estimated using IMPLAN PRO Version 3 economic modeling software. The IMPLAN model was originally developed for the U.S. Forest Service, but for many years has been maintained and sold by the Minnesota Implan Group, Inc. (http://www.implan.com/).

Economic impacts are measured in terms of changes in output, value added, labor income, and employment. The economic impacts presented here include the direct, indirect, and induced impacts for each variable described above. All terms are defined in the Glossary at the end of this document. The impacts are presented for project activity occurring in the State of New Mexico.

Dollar impacts are presented in 2018 dollars. Employment refers to full and part-time jobs. Components may not sum to totals due to rounding.

The project provides two primary economic impacts: (1) a one-time impact of project installation, and (2) the ongoing impact of increased revenue for cattle ranching operations due to increased carrying capacity on the land with installed remote wells.

The project installation cost is expected to be $1,275,000. Increases in carry capacity are estimated in three possible scenarios – conservative, likely, and optimistic – as shown in Table 5. Carrying capacities on ranches in McKinley County are currently 4 animal units per section – roughly a third of typical ranches in New Mexico, which carry 12 or more animal units per sections. The scenarios are estimated based on projections from NMSU faculty and local cattle ranchers. In the conservative scenario, carrying capacities on ranches increase by 44% to 6 animal units per section. In the likely scenario, carry capacities increase 100% to 8 animal units per section. In the optimistic scenario, carrying capacities increase 200% to 12 animal units per section, which is consistent with typical ranches in New Mexico.

Table 5 – Estimated scenarios for increased annual revenue from cattle ranching

	Current	Conservative	Likely	Optimistic
Animal Units/Per Section	4	6	8	12
Total Animal Units	9375	13500	18750	28125
Total Annual Revenue	$9,375,000	$13,500,000	$18,750,000	$28,125,000
Increased Revenue	**-**	**$4,125,000**	**$9,375,000**	**$18,750,000**

The optimistic case shown in Table 5 is representative of a typical carrying capacity for cattle ranching in New Mexico. Table 6 shows the estimated impact of the initial installation of the project. Project installation is estimated to support 12 jobs and $2,102,455 in additional output to the New Mexico economy.

Table 6 – Impact of Project Installation

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	7	$516,011	$800,686	$1,275,000
Indirect Effect	2	$109,125	$174,596	$367,368
Induced Effect	4	$133,448	$257,469	$460,087
Total Effect	**12**	**$758,585**	**$1,232,751**	**$2,102,455**

Table 7-9 show the estimated annual impacts for the three scenarios outlined in Table 5. In the Conservative case, shown in Table 7, the project would support an additional 94 jobs in New Mexico annually for the foreseeable future, contributing an estimated $7,855,496 to the economy in New Mexico annually.

Table 7 – Annual Impacts of increased revenue from Cattle Ranching, Conservative Case, 44% increase in carrying capacity

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	58	$670,342	$833,101	$4,125,000
Indirect Effect	29	$663,466	$1,045,449	$2,750,828
Induced Effect	8	$284,159	$548,579	$979,668
Total Effect	**94**	**$1,617,967**	**$2,427,130**	**$7,855,496**

Table 8 shows the likely case, where carrying capacity is doubled from existing carrying capacity. At this level the ranches would still be operating at a lower capacity than what is typical for New Mexico ranches. In the Likely case, the project would support an additional 214 jobs in New Mexico annually for the foreseeable future, contributing an estimated $17,853,400 to the economy in New Mexico annually.

Table 8 – Annual Impacts of increased revenue from Cattle Ranching, Likely Case, 100% increase in carrying capacity

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	131	$1,523,504	$1,893,412	$9,375,000
Indirect Effect	65	$1,507,878	$2,376,021	$6,251,882
Induced Effect	17	$645,817	$1,246,772	$2,226,517
Total Effect	**214**	**$3,677,198**	**$5,516,205**	**$17,853,400**

Table 9 shows an Optimistic case in which carrying capacity is brought on par with typical ranches in New Mexico. In the Optimistic case, the project would support an additional 428

jobs in New Mexico annually for the foreseeable future, contributing an estimated $35,706,800 to the economy in New Mexico annually.

Table 9 – Annual Impacts of increased revenue from Cattle Ranching, Optimistic Case 200% increase in carrying capacity

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	263	$3,047,008	$3,786,824	$18,750,001
Indirect Effect	131	$3,015,755	$4,752,042	$12,503,764
Induced Effect	35	$1,291,633	$2,493,543	$4,453,035
Total Effect	**428**	**$7,354,396**	**$11,032,409**	**$35,706,800**

Tax Revenue Impact

The increased output resulting from the two impacts measured in this study will generate additional tax revenue for federal, state and local governments. Table 10 shows the estimated additional tax revenue resulting from the initial installation of this project.

Table 10 – Estimated One-time Tax Impacts for Installation

Tax Type	Tax Amount
State and Local Tax	$134,286
Federal Tax	$156,345
Total Tax	**$290,631**

Table 11 shows the estimated annual tax impact of the project for the foreseeable future. These will be annual impacts as they are generated from revenue increases at cattle ranches with increased carrying capacities. The three scenarios shown in Table 11 are described in Table 5.

Table 11 – Estimated Annual Tax Impacts on increased Cattle Ranching revenue, various scenarios

Tax Type	Conservative	Likely	Optimistic
State and Local Tax	$140,969	$320,383	$640,766
Federal Tax	$291,564	$662,646	$1,325,295
Total Tax	**$432,533**	**$983,029**	**$1,966,061**

This project is expected to generate $290K in additional tax revenue during the construction phase and $432K-$2M in additional tax revenue in each year thereafter due to increased carrying capacity on ranches in McKinley County.

Conclusion

This project produces substantial economic impacts relative to the cost because it enhances the profitability of ranches in McKinley County, which are currently struggling. The majority of the impacts are generated by increases in revenue at cattle ranches in McKinley County enabled by Remote Well Solutions technology for increasing water availability in remote locations. Using the model described in this study, we estimate a $2.1M impact on the New Mexico economy during the construction phase and an impact of $7.9M-$35.7M annually in each year thereafter. These impacts are expected to generate an additional 12 jobs in New Mexico and $290K in tax revenue during the construction phase, and an additional 94-428 jobs in New Mexico and $432K-$2M in tax revenue in each year thereafter due increased carrying capacity at ranches in McKinley County.

References

Bureau of Economic Analysis, U.S. Department of Commerce, RIMS Modeling System. (n.d.). Retrieved from www.bea.gv

James Peach, A. V. (2010). *The Potential Economic Impact of the National Broadband Plan on the New Mexico Exchange Carriers Group.* Arrowhead Center.

Lynch, D. T. (Jan 2000). Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN, and REMI.

Madigan, J. (2017). *Beef Cattle Production in the US.* IBISWorld.

Minnesota IMPLAN Group, Inc . (n.d.). Retrieved from www.implan.com

Osiobe, E. (May 2018). *The National Economic Impact from Agriculture.*

REMI, Inc. (n.d.). Retrieved from www.remi.com

Richmond. (2018). *An Overview of IMPLAN.*

Schwer, D. S. (1995). "A comparison of the multiplier of IMPLAN, REMI, and RIMS II: Benchmarking Ready Made Models for Comparison" . *Annal of Regional Science, 29(4), pp. 363-374*.

U.S. Bureau of Economic Analysis. (2017). CA45. Farm Income and Expenses, McKinley County.

U.S. Census Bureau. (2017). *American FactFinder.* U.S. Department of Commerce.

Glossary

Direct effects are the immediate (or first-round) effect(s) of a change in economic activity or policy. For example, if a firm spends $1 million on the construction of a new factory, the direct effect on output (sales) in the construction sector is $1 million. If ten workers are employed in the construction of the building, then those ten workers are also a direct effect.

Employment refers to full and part-time jobs.

Final demand refers to the demand of ultimate consumers for goods and services. Final demand includes the demand of households, governments, inventory accumulation, and exports. See also, intermediate demand.

Gross Domestic Product (GDP) is defined as the market value of the final goods and services produced by labor and property located in the United States. Conceptually, this measure can be arrived at by three separate means: as the sum of goods and services sold to final users, as the sum of income payments and other costs incurred in the production of goods and services, and as the sum of the value added at each stage of production (chart 2.1). (Bureau of Economic Analysis, Concepts and methods of the National Income and Product Accounts, page 2-7. http://www.bea.gov/national/pdf/NIPAhandbookch1-4.pdf

Indirect effects occur because industries purchase inputs from other industries. If a construction project requires steel beams, there will be indirect effects on iron mining and coke producing industries.

Induced effects result from households spending the wage and salary income received by those employed directly or indirectly on the new activity.

Input-output model refers to a type of economic model designed to capture relationships among industries and ultimate consumers.

Intermediate demand refers to the demand of industry for the goods and services produced by other industries that will be used in the production process.

Labor income consists of employee compensation (including benefits), supplements to wages and salaries (such as employer contributions to pension funds), and proprietor's income.

Output refers to gross industry sales or expenditures depending on the consequences.

Total effects refer to the sum of direct, indirect, and induced effects in economic impact analysis.

Value added refers to the change in value of a good or service during each stage of production. Gross Domestic Product is a value-added concept.

RIMS II, REMI, and **IMPLAN** are commonly used modeling system to perform economic impact analysis. The stated modeling systems are based on the national input-output model produced by the Bureau of Economic Analysis (BEA). The national model is scaled to state and county areas by the providers of the models. The U.S. Department of Commerce produces the RIMS II (regional input-output modeling system) system, Bureau of Economic Analysis. The

REMI models are privately constructed and customized to user-specified geography by REMI (Regional Economic Model). The IMPLAN model is privately built by the Minnesota IMPLAN Group (MIG, Inc.) an independent corporation to develop and sell all future iterations of the IMPLAN database and software. (www.implan.com)

Appendix 1 – Limitations of the Study

An input-output model uses the already existing structure of an economy to estimate the economic response of existing industries to a new demand for regional production. An input-output model assumes that prices are fixed, and therefore only quantities respond to the stimulus. If the assumption fails to hold, the actual impact may be different. An input-output model is a linear model. Hence, it assumes a constant return to scale in production. The actual impact of the project will differ under the real production function (increasing or decreasing return to scale.) Our analysis assumes that the construction phase will take only twelve months. Variation in the project start and end date may affect the actual impact due to exogenous variables, not included in the model. This study does not include an environmental assessment – it is beyond the scope of the model and the impact report.

Appendix 2 – IMPLAN Inputs

Table 12 – IMPLAN Inputs, Installation Phase

IMPLAN Code	Sector	Industry Sales
51	Water, sewage, and other systems	$1,275,000.00 (increase)

Table 13 – IMPLAN Inputs, Conservative Case

IMPLAN Code	Sector	Industry Sales
11	Beef cattle ranching and farming	$4,125,000.00 (increase)

Table 14 – IMPLAN Inputs, Likely Case

IMPLAN Code	Sector	Industry Sales
11	Beef cattle ranching and farming	$9,375,000.00 (increase)

Table 15 – IMPLAN Inputs, Optimistic Case

IMPLAN Code	Sector	Industry Sales
11	Beef cattle ranching and farming	$18,750,000.00 (increase)