

WESTERN DAKOTA ENERGY ASSOCIATION

September 16, 2019

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Karlene Fine, Executive Director
North Dakota Industrial Commission
State Capitol – 14th Floor
600 East Boulevard Ave Dept 405
Bismarck, ND 58505-0840

Dear Ms. Fine:

Please find attached our association's application for a supplemental grant to a previously approved Oil & Gas Research Council project. At its August 28 meeting the North Dakota Industrial Commission approved a grant of up to \$250,000 for Wise Roads – Weather Information System to Effectively Reduce Oilfield Delays and Disruption. The project will use research-grade weather monitoring equipment to accurately record weather data, which will in turn be used as a management tool to reduce the scope and duration of weather-related road restrictions that impede the movement of oilfield truck traffic.

It became apparent in recent weeks that the ongoing operation and maintenance of the weather stations, managing and disseminating the volume of data to be generated, and ensuring county personnel are trained in the appropriate use of the data, presented a workload beyond our existing capabilities. As the application notes, we were concerned the project would be "data rich and information poor." In retrospect, we underestimated the amount of work that would be required, and overestimated the ability of our partner, the North Dakota Agricultural Weather Network, to assist in project development with its limited human resources. Through our collaboration with NDAWN, we were able to identify a specific individual – Jonathan Rosencrans – who will provide meteorological and technological support services to properly develop the project.

This application has the full support of our partners and the endorsement of the North Dakota Petroleum Council. WDEA, its members and partners remain committed to the Wise Roads project, and are excited about the many benefits this experiment will provide.

We look forward to sharing additional details about this exciting project with the council.

Sincerely,

Geoff Simon
Executive Director

attach

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"The Western Dakota Energy Association is the trusted and unified voice for the betterment of the citizens of North Dakota and the WDEA membership."

Oil and Gas Research Program

North Dakota

Industrial Commission

Application

Project Title: Weather Information System to Effectively Reduce Oilfield Delays and Disruption (Wise Roads) – Supplemental to Secure Meteorological Services

Applicant: Western Dakota Energy Association

Principal Investigator: Geoff Simon and Brent Bogar

Date of Application: September 16, 2019

Amount of Request: \$60,000

Total Amount of Proposed Project: \$125,000

Duration of Project: 24 months

Point of Contact (POC): Geoff Simon

POC Telephone: 701-527-1832

POC E-Mail Address: geoff@ndenergy.org

POC Address: 1661 Capitol Way, Bismarck ND
58501

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ABSTRACT

Objective: The Oil and Gas Research Council (OGRC) previously reviewed and recommended approval of the Wise Roads Project (Weather Information System to Effectively Reduce Oilfield Delays and Disruption). Partnering with the Western Dakota Energy Association (WDEA) on this project are the North Dakota Agricultural Weather Network (NDAWN) and the Upper Great Plains Transportation Institute (UGPTI). WDEA, in collaboration with its partners, completed Phase I of the project in June with the deployment of 10 research-grade weather stations in areas of western North Dakota that experience moderate to heavy oil industry traffic (see map on p. 15). WDEA is currently developing Phase II of the project which will involve the placement of 15 additional weather stations. This second phase will bring to 25 the total number of stations deployed, enhancing the availability of real-time weather information, especially precipitation data, to allow county/township road managers to more precisely identify those roads that require temporary restrictions and exclude those that do not.

The ND Industrial Commission's approval on August 28 of a \$250,000 matching OGRC grant will enable WDEA to install up to 25 additional weather stations (for a total of 50) in high traffic areas throughout the oil-producing region, making available even more weather data to guide road management policies. The stations collectively will generate an immense amount of data, the proper utilization of which will deliver multiple identifiable benefits. Therein lies the problem and the motivation for this application. As described in UGPTI's letter of support, we are at risk of being "data rich and information poor." To fully realize the benefits the data can provide, WDEA determined in consultation with NDAWN, that it was necessary to secure the services of a full-time professional meteorologist. This application is, in effect, a supplement to the previous Wise Roads application. WDEA is seeking a matching contribution of an additional \$60,000 from OGRC to support this meteorologist position.

Expected Results: The meteorologist will collaborate with county/township road managers in the oil-producing counties to make appropriate use of the weather station data in determining if, when, and where road restrictions are necessary. The meteorologist, under the guidance of NDAWN, will play a vital role in communicating the information, ensuring its accuracy, and providing training to local road personnel. WDEA expects the value of this position will go well beyond enhancing road management practices. Through analysis of data from Wise Roads' stations and observation of data from the soon-to-be-installed weather radar tower at Williston's new XWA Airport, it is expected that the meteorologist will have the ability to provide precise weather forecasts to the oilfield trucking industry. Such a forecast could identify areas with the highest probability for heavy rain bands to develop. By communicating the information through WDEA's LoadPass Permits notification system, industry truckers would be provided valuable lead time to move equipment or commodities out of areas where gravel roads will likely be subject to weather-related weight restrictions. With Wise Roads data incorporated as a GIS layer into the LoadPass map of restricted roads, the meteorologist will also be able to provide direction regarding options for alternative routing to avoid restricted areas.

In addition to guiding road management policy and enhancing the movement of oilfield traffic, WDEA's collaboration with UGPTI research efforts offers additional potential benefits. The meteorologist will assist UGPTI's acquisition and analysis of data aimed at identifying the potential development of new construction materials, improving road-building techniques, analyzing the efficacy of seasonal road restriction policies (frost laws), and other road-related research endeavors.

Duration: Based on the original Wise Roads grant application, WDEA will deliver a final report summarizing results by November 30, 2021. The meteorologist will play an integral role in ensuring the success of the project. WDEA has contracted for meteorological services through June 30, 2021. The contractual agreement details numerous responsibilities including, but not limited to:

- Installation and maintenance of Wise Roads weather stations.
- Test and analyze new weather equipment (additional sensors to WISE Roads stations)
- Provide training of cloud services and the NDAWN website to stakeholders in the project
- Perform data mapping services utilizing GIS software
- Provide detailed forecasts for potential rain events using LoadPass notifications
- Collaborate with counties to provide LoadPass notifications of roads impacted by heavy rain
- Provide analysis of soil/road temperatures and melting snow impacts in the winter months
- Collaborate with Upper Great Plains Transportation Institute on its road research endeavors

Total Project Cost: The cost of equipment (weather stations and sensors) associated with the Wise Roads project is estimated at \$500,000, plus ongoing operational cost (approximately \$600 annually per weather station) as well as various in-kind services associated with installation and maintenance. The additional services provided by the meteorologist for the 21.5-month duration of the contract will add approximately \$125,000 in cost to the project (\$107,500 salary plus \$17,500 expenses).

Participants: WDEA is continuing to work collaboratively with its primary partners – the North Dakota Agricultural Weather Network (NDAWN) and the Upper Great Plains Transportation Institute (UGPTI). NDAWN has provided its considerable technical expertise to the placement and installation of the weather stations, and continues to provide operational guidance for quality assurance purposes. WDEA has a longstanding business relationship with UGPTI through its Local Technical Assistance Program, which provides instruction to WDEA-member county employees. In developing the original Wise Roads application, WDEA collaborated with the four major oil-producing counties, with NDAWN and UGPTI management, with the North Dakota Petroleum Council, and with numerous individual companies that have oil and gas production or oilfield service operations in western North Dakota. WDEA expects the addition of the meteorologist will build on this collaborative process to enhance communication among the participants, to ensure data is accessible and properly utilized, and to identify and develop additional opportunities to maximize the value of the data the project generates.

PROJECT DESCRIPTION

Objectives: The primary objective of the Wise Roads project is to reduce the imposition of unnecessary road restrictions on the movement of oilfield traffic in North Dakota. Oil producers have informed WDEA that restrictions on truck traffic can force companies to shut down wells, resulting in loss of production and associated revenue, as well as lost time and expense associated with re-starting a well. Companies have advised the combination of these negative consequences can in some instances cost the company tens of millions of dollars. The Wise Roads project will help to minimize the expense to industry players, and consequently reduce the amount of tax revenue lost to the state as a result of the disruption. The addition of a full-time meteorologist to manage the data will help to ensure a successful result.

With assistance from the meteorologist, WDEA expects to realize several ancillary benefits as a result of the Wise Roads project. First and foremost, farmers and ranchers will benefit from the widespread availability of more accurate weather information. In addition to temperature, precipitation and wind speed data, the weather stations also measure soil temperature which will aid in spring planting decisions. The meteorologist's primary responsibility will be ensuring the accuracy of the data, and that it is publicly accessible, easily understood and properly utilized. The meteorologist will also work closely with UGPTI's engineers on their research efforts that will analyze road building materials and their performance, construction techniques, the efficacy of current seasonal load restriction policies and other potential research opportunities. The collaboration and benefits to be accrued among interested parties will help to solidify the positive working relationship between and among the WDEA, NDAWN, UGPTI, the oil-producing counties, the oil industry and the affected landowners.

Methodology: WDEA will site the Wise Roads weather stations near heavily-traveled gravel roads in the oil-producing counties. Identifying the sites is a collaborative process with NDPC, NDAWN, county highway managers and local landowners. The meteorologist will be actively engaged in this process to obtain permission to locate stations on land controlled by an oil industry operator or on private ranch or farmland identified through contacts with the counties. The meteorologist, with guidance from NDAWN, will ensure the monitoring equipment complies with meteorological standards and that it is continually maintained in proper working order. The meteorologist will work with affected counties to ensure the weather data is available and properly evaluated to guide road management decisions. WDEA, which provides text message and email notification of county/township road restrictions through its LoadPass Permit system, will use the text/email data to evaluate changes in the extent, frequency and duration of county-imposed road restrictions over the life of the project.

Anticipated Results: All the oil-producing counties (and several non-oil counties) participate in the LoadPass Permit System operated by WDEA to manage the movement of oversize truck traffic. LoadPass currently has more than 14,000 individuals who receive email and/or text notifications. WDEA will track the extent and duration of road restrictions generated through LoadPass. The meteorologist will analyze the restriction data in relation to the weather phenomena experienced at the time the restrictions were issued. WDEA expects to identify a downward trend in the amount and duration of restrictions. Most importantly, WDEA expects counties will utilize Wise Road data to reduce the size of the area and road miles covered by weather-related restrictions.

Facilities: The bulk of the equipment deployed in the Wise Roads project will be purchased through Campbell Scientific which manufactures research-grade weather stations. The standard unit is capable of measuring air temperature; wind speed and direction; precipitation; relative humidity; barometric pressure, soil temperature and moisture content; and solar radiation. The units are completely self-contained and can be deployed in remote locations. They are equipped with solar panels and batteries to supply power, along with a modem to transmit data via the internet or cellular network. Stations can also be equipped with high definition cameras to monitor weather conditions or passing traffic.

Stations will be sited in areas with heavy truck traffic where little weather data is currently collected. To most effectively utilize the cameras which can be rotated remotely, WDEA will assign highest priority to locations near heavily-traveled intersections to monitor traffic on more than one roadway.

Resources: WDEA has operated the LoadPass Permit System since the 1980s, so has decades of experience working with the oilfield trucking industry. The association is partnering with NDAWN, which operates and maintains more than 100 weather stations throughout North Dakota and parts of eastern Montana and western Minnesota. NDAWN provides guidance in the selection and purchase of weather station equipment. The meteorologist will supervise its installation and ongoing operation and maintenance. The meteorologist will also work closely with the UGPTI to provide training and technical assistance to counties to effectively utilize the weather information the Wise Roads project will deliver.

Techniques to Be Used, Their Availability and Capability: Attached to this application are spec sheets for MetPRO™, manufactured by Campbell Scientific, which is the type of research-grade weather station being deployed. The stations are equipped with state-of-the-art sensors and recording apparatus to capture a variety of meteorological data. The meteorologist and WDEA will collaborate with counties and the oil industry to identify prospective sites for installation. The meteorologist will utilize nationally recognized siting standards to ensure the units are in a location that guarantees the accuracy of the weather information they provide. NDAWN will assume ownership of the units, and through a working arrangement transmit the weather station data to WDEA. The meteorologist will utilize state-of-the-art computer technology to make the data publicly accessible through WDEA's user-friendly LoadPass routable map, as well as county websites, agriculture organizations or other interested parties.

Environmental and Economic Impacts while Project is Underway: WDEA anticipates no environmental impact associated with siting and deployment of the weather stations. The units are relatively small, are mounted on a tripod and stand approximately 10 feet tall. All economic impacts are associated with the cost of purchasing the weather stations, costs associated with transmitting data, and managing ongoing operation of the stations. Routine administrative tasks will be managed at no cost through WDEA, working collaboratively with partners NDAWN, UGPTI and NDPC.

Ultimate Technological and Economic Impacts: WDEA expects the Wise Roads project will ultimately reduce the negative economic consequences of overly-broad road restrictions to North Dakota oil producers, resulting in greater production, profitability and investment by the industry, which will also translate to additional income and oil tax revenue for the state of North Dakota. With the assistance and leadership of the meteorologist, WDEA expects that its demonstration of the technological value and effectiveness of utilizing highly-detailed weather data to minimize oilfield traffic disruption may be emulated in other locales with a similar volume of heavy truck traffic. It is conceivable that lessons learned by using detailed weather information to minimize oilpatch disruptions can be transferred and used to improve the efficient movement of trucks hauling agricultural commodities in other parts of North Dakota and throughout the United States.

Why the Project is Needed: The Wise Roads project is needed to reduce/eliminate what amounts to millions of dollars in lost productivity and oil industry profitability due to overly restrictive road management practices. The widespread deployment of weather stations will provide county road managers the tool they need to more precisely identify areas in their jurisdiction where road restrictions are necessary. The meteorologist position is needed to manage, analyze and disseminate the enormous volume of data that will be generated by up to 50 weather stations in oil-producing counties. The true value of the project will be realized when road managers effectively use the Wise Roads information to reduce the scope of a restriction that would have otherwise unnecessarily affected a larger area.

STANDARDS OF SUCCESS

The primary measure of success of the Wise Roads project will be determined by analyzing road restriction notification data from the LoadPass Permit System operated by WDEA. The meteorologist will be responsible for analyzing the data to track the number, extent and duration of road restrictions imposed by the oil-producing counties. By examining this road restriction data and making an appropriate cross reference to weather phenomena experienced at the time restrictions were issued, WDEA expects to identify a downward trend in the number and duration of restrictions. WDEA believes counties will use Wise Roads data to reduce the size of the area and road miles covered by weather-related restrictions, and will develop additional road zones that narrow the scope of the area where restrictions are imposed.

The reduction in the duration and scope of road restrictions will translate to fewer disruptions in oilfield activity, leading to greater efficiency, productivity and profitability of North Dakota oil producers and the service companies that support them. The meteorologist will work closely with the ND Petroleum Council and oil producers to identify lingering concerns about excessive road restrictions, and in turn collaborate with county road managers to continually improve their efforts to minimize and eliminate unnecessary disruptions.

Wise Roads will provide additional benefits to agricultural producers in the oil-producing region. Because the weather station data will be available to the ag community through the NDAWN network, western North Dakota producers will be better able to determine crop planting and management needs. The weather data may also prove to be a valuable source of documentation for weather-related claims for crop and livestock losses. The meteorologist, with guidance from NDAWN, will work to ensure these ancillary benefits are realized.

WDEA also expects the Upper Great Plains Transportation Institute will utilize Wise Roads subsurface soil temperature and moisture data to perform roadway analysis. The meteorologist will collaborate with UGPTI engineers to ensure they are able to access and properly analyze the data this is available. The information will allow highway engineers to predict roadway conditions and evaluate material performances. UGPTI's transportation professionals anticipate using their research efforts to evaluate gravel road materials. The meteorologist will assist UGPTI to link the weather station data with its Geographic Roadway Inventory Tool. Combined with GIS layers from WDEA's LoadPass Permit system, the meteorologist will help UGPTI leverage the collected data for the benefit of roadway owners, the oil industry and the public to better understand road conditions and improve road management policies.

BACKGROUND/QUALIFICATIONS

The meteorologist with whom the Western Dakota Energy Association has contracted to assist with the Wise Roads project is a graduate of the meteorology program at North Dakota State University. The individual has two years of experience working part-time with the ND Agricultural Weather Network.

WDEA (previously known as the North Dakota Association of Oil and Gas Producing Counties) was established through a joint powers agreement in 1978 in part to engage in “activities that will help achieve more efficient handling of the impact caused by oil and gas development.” In response to increasing oilfield activity, the association established a uniform truck permitting system in the mid-1980s. It provided member counties a tool to track and manage the movement of heavy truck traffic on county roads. The permit system expanded and evolved with technology over the years, converting to an on-line e-permit operation in 2010. The system was further enhanced in 2012 with the addition of a road restriction notification system that allowed counties to post their load restrictions, road closings, etc., and have the information emailed or texted in real time to anyone signed up to receive the notifications. In 2015 an electronic map was added to the system that allowed users to see at a glance all posted road restrictions in the oil-producing counties. Further enhancements were recently deployed to provide a “Google maps” type routing system for trucking companies that automatically selects the appropriate county/township roads to reach their destination, avoiding any restricted roads, narrow bridges, etc. The name of the uniform permitting system was officially changed to LoadPass Permits in 2017. In the fiscal year ending June 30, 2019, LoadPass staff managed the issuance of nearly 107,000 permits for oversize trucks, generating nearly \$23 million in revenue for member counties and cities.

Partnering with WDEA on this project is the North Dakota Agricultural Weather Network, based at North Dakota State University. Working in collaboration with NDAWN, the meteorologist will be responsible for the deployment, ongoing operation and dissemination of data from the weather stations. NDAWN currently operates more than 100 stations across North Dakota and border regions of neighboring states. Stations provide five-minute averages, hourly averages or totals for all variables, and hourly maximum wind speed. They also provide daily summaries consisting of maximum and minimum air temperature, maximum wind speed, times of occurrence, and various totals or averages for all other variables in English or metric units. Data are retrieved via wireless modem every five minutes, with hourly and daily data being sent to the High Plains Regional Climate Center shortly after midnight each day for automated quality control. A computer program identifies any missing or erroneous values for hourly and daily data, which are replaced by estimates calculated from data at surrounding stations. Following this initial quality control, data are loaded into the NDAWN database and made available to the general public via the NDAWN web site free of charge. Since its inception in 1989, all NDAWN equipment, non-labor operational costs, and some labor costs have been funded through gifts and grants from various federal and state government agencies, commodity organizations, agricultural clubs, businesses and individuals. NDAWN database/web site restructuring, which allows dissemination of the valuable data, was funded through a federal agency grant.

The meteorologist, working in partnership with the Upper Great Plains Transportation Institute, will train county/township personnel in the effective use of the data generated by the Wise Roads project. UGPTI is a research, education, and outreach center at North Dakota State University, which is guided, in part, by an advisory council composed of representatives of various organizations, industries and agencies affecting or affected by transportation. Its mission is to provide innovative transportation research, education and outreach that promote the safe and efficient movement of people and goods. The North Dakota Local Technical Assistance Program (NDLTAP) based in Bismarck is administered by UGPTI. WDEA has an ongoing contractual relationship with NDLTAP to provide funding support for the training programs it delivers to units of local government, an arrangement which will be embellished by the addition of the technical expertise of the meteorologist. Services provided by NDLTAP encourage and enhance the exchange of highway transportation related technology and information. Local units of government utilize the center as a source for technical assistance and information, educational resources and workforce development. The center is actively involved in research implementation through progressive and cost-effective transfer of technology and technical assistance within North Dakota's transportation community.

WDEA has received assistance in the development of the Wise Roads project from the North Dakota Petroleum Council. NDPC's purpose is to provide governmental relations support to the more than 490 companies it represents which are involved in all aspects of the industry including oil and gas production, refining, pipeline, mineral leasing, consulting, legal work and oilfield service activities. The association has a long history of legislative and regulatory success in North Dakota, which has led to a favorable business climate for the oil and gas industry in the Williston Basin. NDPC, through contacts with its member companies, has generated numerous suggestions and possible locations for the placement of weather stations in the oil-producing counties. All of the Phase I stations were deployed on property owned or leased by oil industry companies.

The meteorologist will continue to closely collaborate with WDEA member counties and cities which participate in its LoadPass Permits system. All oil-producing counties participate in the system, as well as the cities of Dickinson and Watford City. WDEA management and staff have met individually with key commissioners and staff from Dunn, McKenzie, Mountrail and Williams, and all are on board with the Wise Roads project and WDEA's effort to improve the efficiency and productivity of truck traffic movement in North Dakota's oil-producing counties.

MANAGEMENT

WDEA and the meteorologist will collaborate with the counties, area landowners and the ND Petroleum Council and its members to identify sites for the weather stations in close proximity to heavily-traveled gravel roads. The meteorologist will work collaboratively with NDAWN to ensure the timely and proper acquisition and installation of the equipment, and the subsequent development of communication channels to transfer, upload and share data.

The Wise Roads project will leverage WDEA's working relationship with UGPTI to assist county road departments in evaluating weather data. The meteorologist will ensure that personnel are properly trained to interpret and evaluate its applicability to road restriction policies. This process will leverage the expertise of UGPTI engineers to determine the most effective use of the weather information that is available.

The meteorologist will develop a record-keeping system to track the incidence of inclement weather events and associated road restrictions that are imposed. Periodic progress reports that detail the nature of the weather events and corresponding action by the counties will be produced and shared with all partners in the Wise Roads project.

WDEA will continually seek input and feedback from the industry regarding the project as it relates to successfully reducing the scope, frequency and duration of road restrictions.

TIMETABLE

Please provide a project schedule setting forth the starting and completion dates, dates for completing major project activities, and proposed dates upon which the interim reports will be submitted.

Start Date	Activity Description	Completion Date
June 2019	Equipment installation Phase I	June 24-27, 2019
June 2019	County planning with WDEA to determine road zones based on installation of weather stations	Ongoing
July 2019	Integration of weather stations into maps	Ongoing
July 2019	County use of data for road restrictions – weather based	Ongoing
September 2019	Order equipment for Phase II	September 3, 2019
September 2019	Contract with meteorologist for Wise Roads project	September 16, 2019
September 2019	Equipment installation site selection planning with meteorologist, NDAWN, NDPC, counties & WDEA staff	September 2019
Sept. 17-19, 2019	Present project report to ND Petroleum Conference	Est. Sept. 2019
October 2019	Equipment installation Phase II	Est. October 2019
October 2019	Integration of weather stations into maps	Est. October 2019
October 8, 2019	LoadPass advisory meeting to discuss best practices for use of weather data, feedback from industry, and development of plans for 2020 implementation	Est. October 2019
November 2019	Interim report submitted to OGRC	Est. November 2019
January 2020	Present project report to County Engineers	Est. January 2020
March 2020	Order equipment for Phase III	Est. March 2020
April 2020	Equipment installation site selection planning with meteorologist, NDAWN, NDPC, counties & WDEA staff	Est. April 2020
May 2020	Equipment installation Phase III	Est. May 2020
May 19-21, 2020	Present project report to Williston Basin Petroleum Conference	Est. May 2020
May 2020	Integration of weather stations into maps	Est. May 2020
September 2020	Present project report to ND Petroleum Conference	Est. Sept. 2020
October 2020	LoadPass advisory meeting to discuss best practices for use of weather data, feedback from industry, and development plans for 2021 implementation	Est. October 2020
November 2020	Interim report submitted to OGRC	Est. November 2020
January 2021	Present project report to County Engineers	Est. January 2021
January 2021	Present report and funding request to 2021 Legislature	Est. January 2021
July 1, 2021	Meteorologist transfer to NDAWN as full-time employee	Est. July 2021
October 2021	LoadPass advisory meeting to discuss best practices for use of weather data, and feedback from industry	Est. October 2021
November 2021	Final report submitted to OGRC	Est. November 2021

BUDGET

Current application:

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share (In-Kind)
Meteorologist	\$60,000	\$65,000	\$0	\$3,500 (est.)

Meteorologist – The Western Dakota Energy Association has contracted with Jonathan Rosencrans, a recent NDSU Meteorology graduate who has previous work experience with the North Dakota Agricultural Weather Network. The contract begins today, September 16, and will expire June 30, 2021. The agreement outlines the meteorologist's scope of work for which he will be compensated \$5,000 per month. The contract also anticipates \$1,000 per month in travel, lodging meal and other expenses. The \$3,500 in-kind estimate reflects WDEA's verbal agreement with the meteorologist to provide essential computer equipment and software, plus minor tools and other miscellaneous items. It is the intention of WDEA to work with state policy leaders to negotiate an arrangement through which the meteorologist will become a full-time employee of NDAWN at the conclusion of the contract.

Previous Wise Roads grant request:

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share (In-Kind)
Weather equipment	\$250,000	\$250,000		
Equipment installation			\$10,000	\$20,000
Equipment maintenance			\$10,000 /year	
Data Communications	\$0	\$30,000 /year		
Data Hosting				\$5,000/year

Weather monitoring equipment – The weather stations cost approximately \$10,000. Each unit includes a tripod for mounting, data logger, power source, precipitation gauge, wind gauge, air temperature and soil temperature gauges. Fifty weather stations would have a total cost of \$500,000.

Equipment installation – Installation will be managed by the meteorologist with assistance from WDEA and county staff. The in-kind cost estimate includes staff time, travel expenses and equipment usage.

Equipment maintenance – Each weather station will require ongoing maintenance to ensure its operation, which will be the responsibility of the meteorologist. The estimated in-kind cost is occasional county and/or WDEA staff time to visit stations to clear any dust and debris, clean sensors, etc.

Data communications – Each weather station requires a cellular data plan to transmit to the NDAWN network. For 50 stations with a \$50 per month data plan the annual cost will be \$30,000. This ongoing expense will be part of LoadPass Permits' annual operating expenses. As the project is being installed in phases, the full expense will not be realized until installation of all 50 stations is completed.

Data hosting – NDAWN will own the equipment and integrate it into its existing network of weather stations. In addition, WDEA expects the meteorologist will collaborate with NDAWN to develop a "micro-net" for the stations located in the oil-producing counties.

CONFIDENTIAL INFORMATION

None of the information associated with the Wise Roads project will be confidential. All information will be publicly available.

PATENTS/RIGHTS TO TECHNICAL DATA

*Any patents or rights that the applicant wishes to reserve must be identified in the application. **If this does not apply to your proposal, please note that below.***

Not applicable.

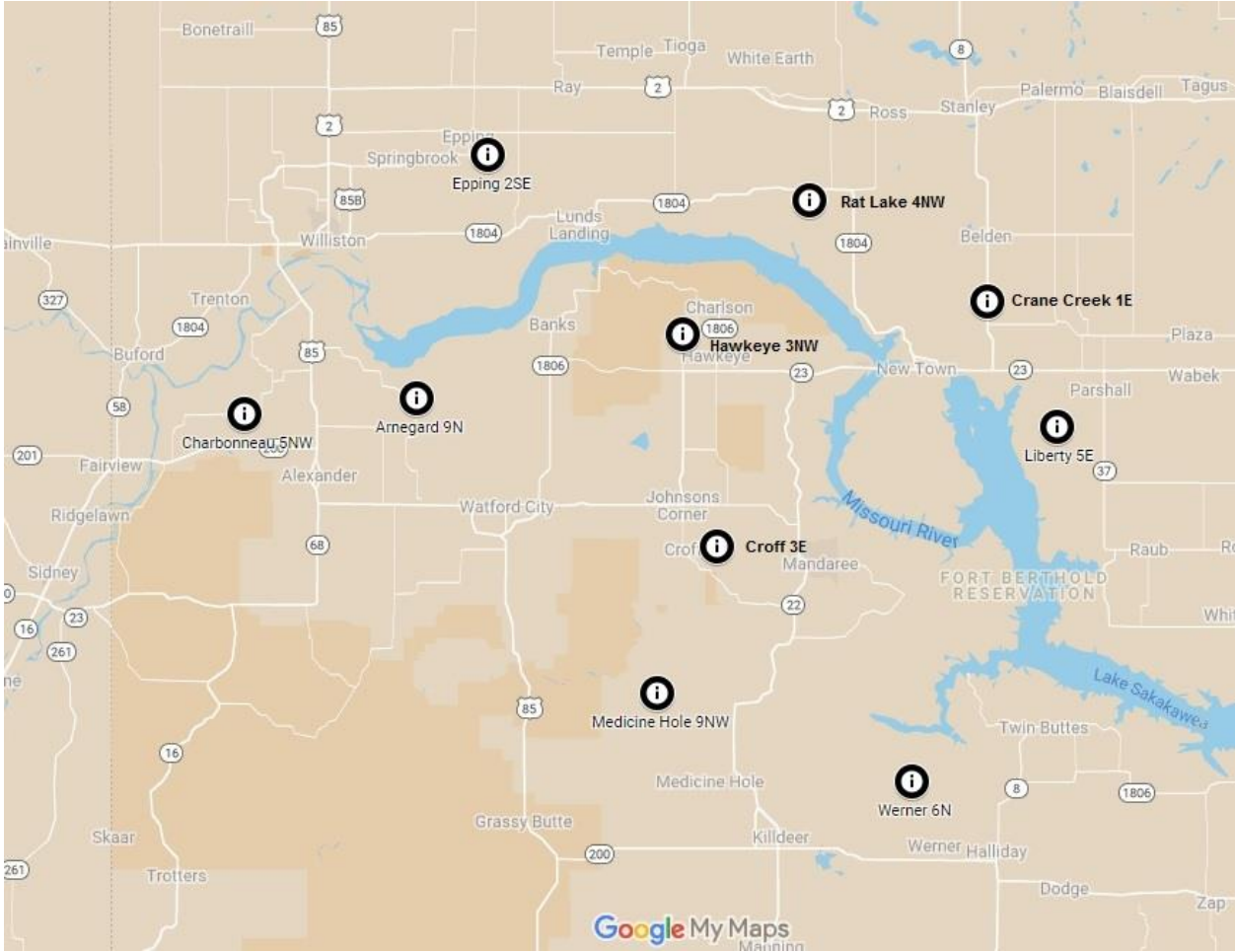
STATUS OF ONGOING PROJECTS (IF ANY)

The Oil and Gas Research Council (OGRC) previously reviewed and recommended approval of the Wise Roads Project (Weather Information System to Effectively Reduce Oilfield Delays and Disruption). Partnering with the Western Dakota Energy Association (WDEA) on this project are the North Dakota Agricultural Weather Network (NDAWN) and the Upper Great Plains Transportation Institute (UGPTI). In collaboration with its partners, WDEA installed the first 10 weather stations in late June and all are operating according to plan (see map on p. 15). WDEA is currently developing Phase II of the project which will involve the placement of 15 additional research-grade weather stations in areas of western North Dakota that experience moderate to heavy oil industry traffic. The second phase will bring to 25 the total number of stations deployed, enhancing the availability of real-time weather information, especially precipitation data, to allow county/township road managers to more precisely identify those roads that require temporary restrictions and exclude those that do not.

The ND Industrial Commission's approval on August 28 of a \$250,000 matching OGRC grant will enable WDEA to install up to 25 additional weather stations (for a total of 50) in high traffic areas throughout the oil-producing region, making available even more weather data to guide road management policies. The stations collectively will generate an immense amount of data, the proper utilization of which will deliver multiple identifiable benefits.

To fully realize the benefits the data can provide, WDEA determined in consultation with NDAWN, that it was necessary to secure the services of a full-time professional meteorologist. This application is, in effect, a supplement to the previous Wise Roads application. WDEA is seeking a matching contribution of an additional \$60,000 from OGRC to support this meteorologist position.

The First 10 Wise Roads Weather Stations



To Whom It May Concern:

The North Dakota Agricultural Weather Network, often referenced as NDAWN, or the NDAWN mesonet, is a network of 131 stations that provide weather information every 5 minutes, 24 hours a day, every day of the year. Although agricultural has historically been the focus of the tools provided by NDAWN, through the years other decision makers, including the National Weather Service, emergency managers, insurance agencies and transportation services, among others, have discovered the usefulness and risk management resources available in using the data supplied by these stations.

Weather presents opportunities but also risks. North Dakota, with a strong continental climate has some of the most varying weather conditions on earth. These risks can be lowered and managed with the proper weather information and data management. In this light, currently 10 of the 131 stations in the NDAWN mesonet are part of the Wise Roads Project (Weather Information System to Effectively Reduce Oilfield Delays and Disruption). The original 10 stations were a test bed to determine the usefulness of these stations in determining if having higher resolution weather data would enhance the decision making process in road restriction policies.

Within the first week of operation, those 10 stations, in combination with NDAWN stations already in place, allowed for the quick analysis of a narrow band of heavy rain through northern McKenzie and southern Mountrail Counties. Had policies been in place, a very detailed restriction map could have been designed around this information, in real time. Plus, the stations have cameras for analysis of the roads, also in real time. With the expansion of this network to 25 or even more stations, what in meteorological terms would be described as a "micronet", a tightly configured weather network would be created. This will bring enhanced analysis capabilities of rain/road/soil conditions that can be analyzed with 5 minute accuracy with the ability to manage the risk presented with differing weather conditions in all seasons. Plus, once the data can be analyzed by a professional meteorologist who will also have access to radar data with the ability to make short term as well as longer term projections on potential weather impacts in both time frames, even greater risk management will be possible.

It is this weather risk management solution, with large return on investment opportunities that describes what NDAWN does and has experience in, that made me want to recommend and help with this project.



Daryl Ritchison
Director of the North Dakota Agricultural Weather Network

September 14, 2019

Geoff Simon, Executive Director
Western Dakota Energy Association

RE: Wise Roads (Weather Information System to Effectively Reduce Oilfield Delay and Disruption)

Geoff,

Thank you for the opportunity to provide a note of support for the planned enhancements to the Wise Roads project.

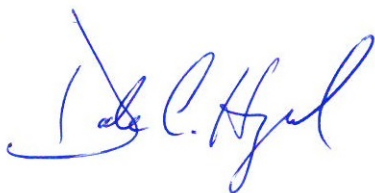
Wise Roads in its initial concept form was reminiscent of the adage, 'data rich and information poor'. In other words, the initial project launch built the foundation, with the hope of finding a method to tap into the full potential of the collected data. Adding a meteorologist to the project is a logical and beneficial step that allows us to better utilize the Wise Roads technology that is now populating the western rural landscape. By expanding professional oversight, we can tap into the data's potential at an elevated level that will provide additional benefits to roadway owners and users. Better weather data, meshed with road condition ratings and assessments can feed research efforts to provide roadway owners with the tools needed to better manage the local roadway network. The data interpretations will provide enhanced real time condition info, weather forecasting and the road condition forecasted assessments.

Research efforts by the Upper Great Plains (UGPTI) and the North Dakota Local Technical Assistance (NDLTAP) team can be expanded to utilize the meteorological outputs. The newest layer of Wise Roads will also include subsurface soil temperature and moisture probes, key data that can be used to predict roadway conditions and evaluate material performances. Combined with the enhanced weather data, the subsurface data can be used to evaluate gravel road materials and predict their performance.

NDLTAP can also provide field support to assist county and township leaders in the data interpretation and application of Wise Roads.

Wise Road's technology, combined with sound analysis create an opportunity to improve our state's local roadway network. The planned improvements in this grant application are impressive.

Respectfully,

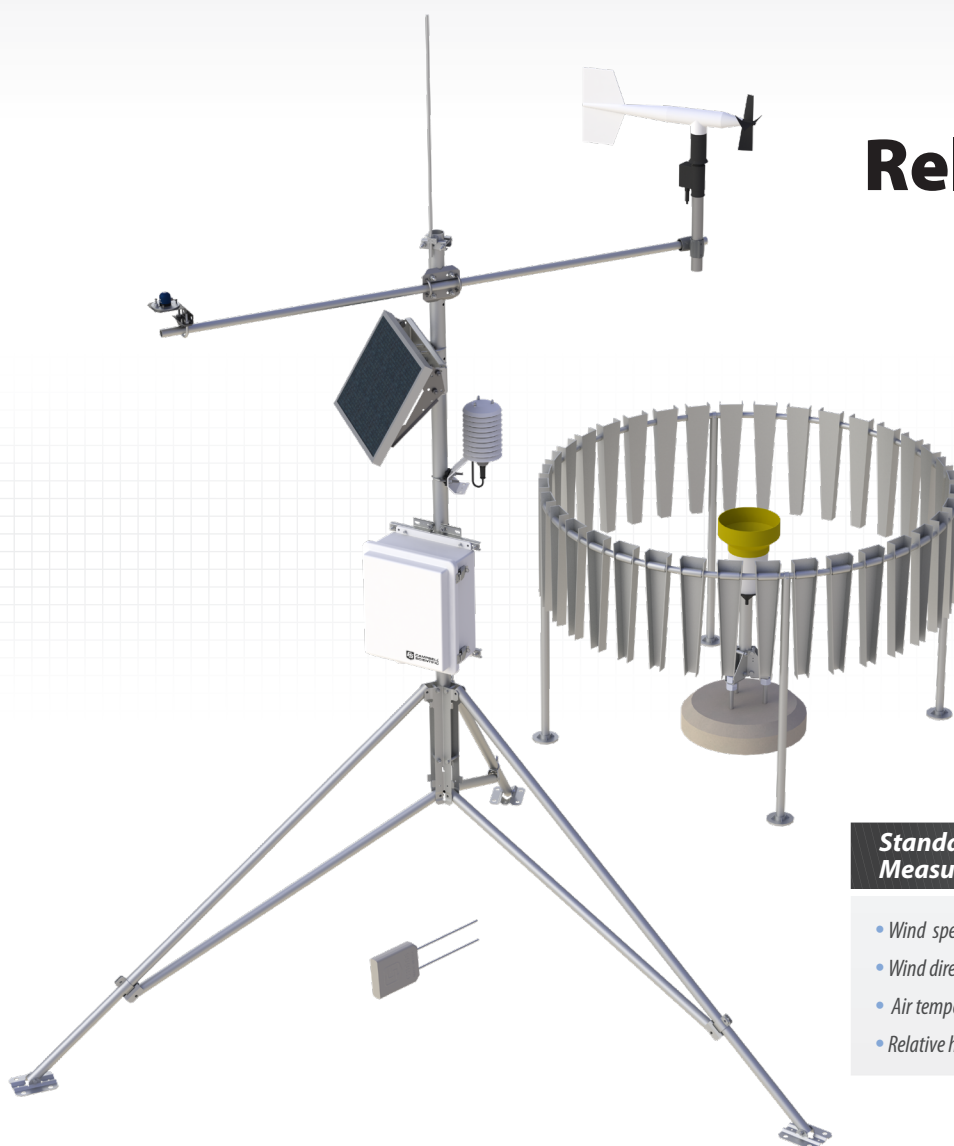


Dale C. Heglund, PE/PLS, Program Director

NDLTAP/UGPTI - 515 ½ E Broadway, Suite 101, Bismarck, ND 58501 - 701-318-6893(cell) - ndltap.org

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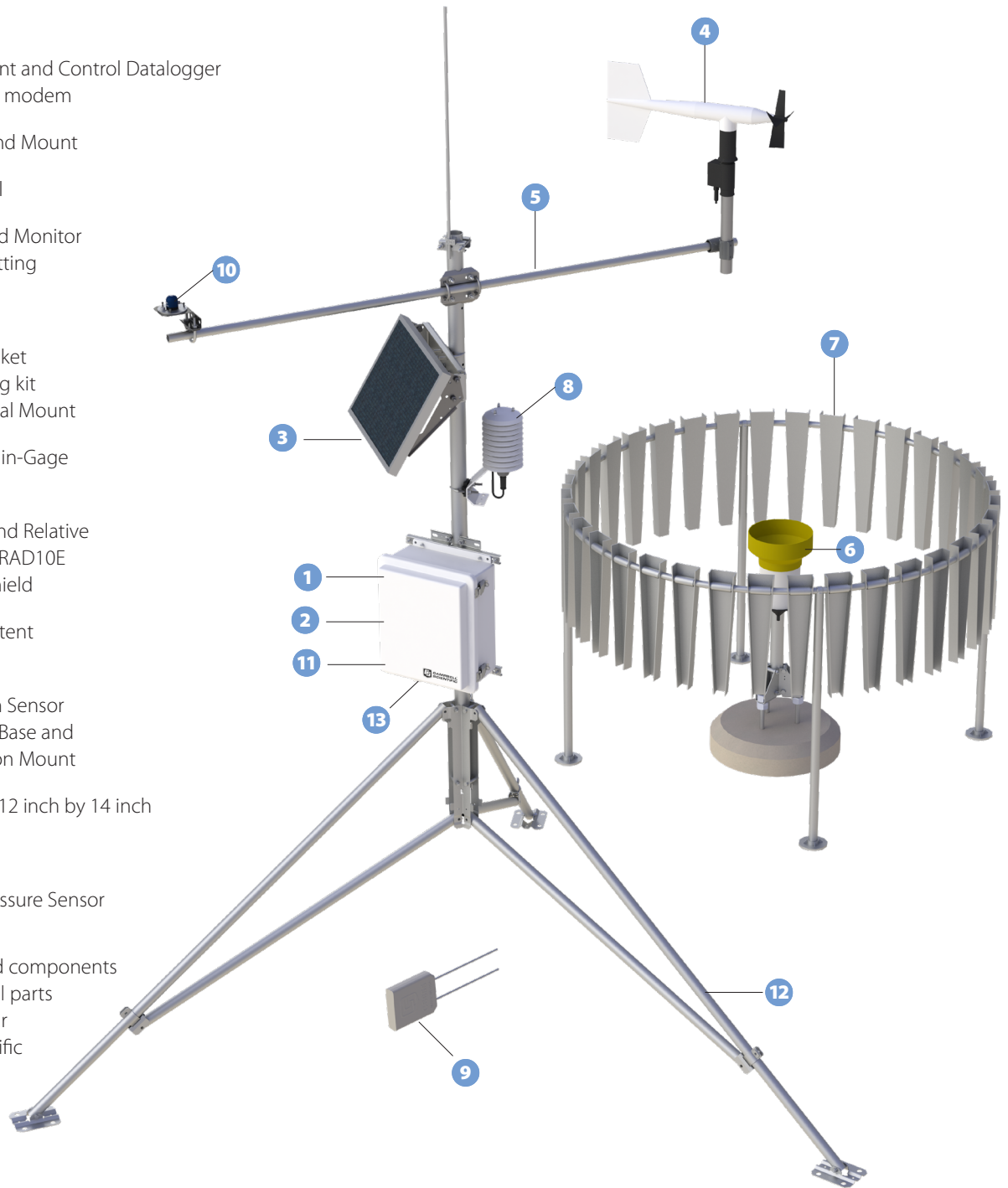
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- 4 05103 RM Young Wind Monitor with 17953 Nu-Rail Fitting
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- 6 TE525WS Tipping Bucket with CM270 mounting kit and CM300-PJ Pedestal Mount
- 7 260-953 Alter-type Rain-Gage Wind Screen
- 8 EE181 Temperature and Relative Humidity Probe and RAD10E 10-Plate Radiation Shield
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