

Oil and Gas Research Program

North Dakota

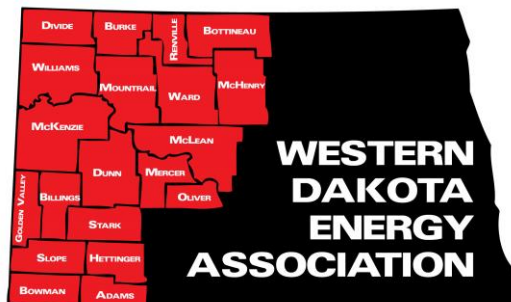
Industrial Commission

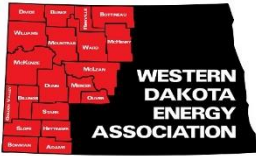
Weather Information System to Effectively Reduce Oilfield Delays and Disruption (Wise Roads)

Submitted by the Western Dakota Energy Association

Geoff Simon and Brent Bogar, Principal Investigators

June 1, 2019





WESTERN DAKOTA ENERGY ASSOCIATION

June 1, 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 an Oil & Gas Research Council grant for a project we believe will significantly improve the timely movement of oil industry truck traffic in North Dakota's oil-producing counties.

Wise Roads – Weather Information System to Effectively Reduce Oilfield Delays and Disruption – 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 truck traffic associated with the oil industry. The project will leverage the research expertise of two outreach centers of North Dakota State University to ensure the data collected is accurate and accessible, and that it is used appropriately by county road managers.

Wise Roads has the full support of the North Dakota Petroleum Council and has been individually endorsed by several of its member companies. Industry comments indicate the weather station project offers the potential to save producers tens of millions of dollars in lost revenue associated with unnecessary road restrictions. An additional benefit of the project is the value of its data to the farming and ranching community. Agricultural producers can use the information to better plan and manage their crop and livestock operations. This mutually beneficial technology can only serve to enhance the relationship between the oil industry and landowners affected by its development.

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)

Applicant: Western Dakota Energy Association

Principal Investigators: Geoff Simon and Brent Bogar

Date of Application: June 1, 2019

Amount of Request: \$250,000

Total Amount of Proposed Project: \$500,000+

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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Affidavit of Tax Liability

Statement of status on Other Project Funding

ABSTRACT

Objective: Consistent with the North Dakota Oil & Gas Research Council's statutory goals, the Western Dakota Energy Association (WDEA) has developed a project that will enhance the efficient development of the state's oil and gas resources, preserve and create jobs, and ensure economic stability and growth in the industry. Oil producers and the service companies that support them depend on the use of county and township gravel roads to move commodities and deliver supplies to and from well pads, tank batteries, disposal wells and other industry facilities. However, when inclement weather strikes, local governments impose road restrictions that effectively prohibit the movement of truck traffic until road conditions improve. Restrictions are necessary to protect the integrity of roads and the safety of the traveling public, but industry truckers have justifiably complained that at times restrictions are imposed more broadly than necessary.

In a project called Weather Information System to Effectively Reduce Oilfield Delays and Disruption (Wise Roads), WDEA, in cooperation with the ND Agricultural Weather Network (NDAWN), plans to deploy up to 50 research-grade weather stations throughout the oil-producing counties. Initial siting emphasis will focus on the top four producers – Dunn, McKenzie, Mountrail and Williams counties – but it is anticipated that subsequent stages of station deployment will saturate all areas of western North Dakota that experience moderate to high oil industry traffic. The goal of the Wise Roads project is to provide real-time weather information, especially precipitation data, to allow county/township road managers to more precisely identify those roads that require temporary restrictions, and more importantly, exclude those that do not.

Expected Results: In conjunction with the deployment of the weather stations, WDEA will collaborate with county/township road managers in the four counties and beyond to make appropriate use of the weather station data in determining if, when, and where road restrictions are necessary. Through this collaborative process, WDEA expects road managers will divide their counties into multiple zones to isolate those areas where restrictions should be imposed. This would eliminate the previous practice of restricting all or most gravel roads in a county even though precipitation did not fall in all parts of the county. Utilizing road restriction notification data generated by the counties through LoadPass Permits (the uniform permitting system that WDEA operates for counties to manage the movement of oversize truck traffic), WDEA expects to identify measurable improvement (reduction) in the scope and duration of road restrictions imposed as a result of inclement weather.

Duration: At the time this application was submitted, WDEA had already placed a purchase order for the first 10 weather stations to be installed in high oilfield traffic locations in Dunn, McKenzie, Mountrail and Williams Counties. Installation of the 10 units was scheduled to be completed by NDAWN staff in late June, 2019. As soon as WDEA and NDAWN are comfortable that the initial units are operating properly and data transmission and upload is occurring according to plan, WDEA will order up to 15 additional units to be installed late summer or early fall, again targeting high traffic locations, some of which may fall outside the four core counties. If WDEA's grant application is successful, we expect to deploy up to 25 additional weather stations throughout the oil-producing region, to be completed by September 30, 2020. There is an obvious learning curve associated with utilization of the data to reduce the extent and duration of road restrictions, so positive results may take some time to be realized. WDEA expects to identify a measurable improvement by the end of the first year after installation, and anticipates that it would be prepared to submit a final report summarizing results by November 30, 2021.

Total Project Cost: The cost of each weather station along with associated hardware/software is approximately \$10,000. Thus, the cost of purchasing and installing 50 such units would total \$500,000. Installation and periodic maintenance of the weather stations would be provided as an in-kind service by NDAWN. WDEA plans to transfer ownership of the stations to NDAWN as part of a working agreement. Ongoing operational expense of 50 weather stations is estimated to total \$30,000/year, an expense for which WDEA will assume full responsibility. The \$30,000 figure assumes a monthly expense for each unit of \$50.00, the vast majority of which is data transmission through the cellular network. The Executive Committee of WDEA, at its February 27, 2019 meeting, unanimously approved an expenditure of up to \$250,000 on the project, anticipating a matching contribution from the oil industry or other source.

Participants: The Wise Roads project received its impetus at a December 2018 county and oil industry roundtable jointly organized by WDEA, the North Dakota Petroleum Council (NDPC) and the Upper Great Plains Transportation Institute (UGPTI). WDEA has a longstanding business relationship with UGPTI through its Local Technical Assistance Program, which provides instruction to WDEA-member county employees. The roundtable provided an opportunity for face-to-face dialogue between county highway managers and industry managers and employees. The discussion brought to light the magnitude of the industry's frustration with overly-broad road restrictions during inclement weather events, and also dramatized the serious economic consequences that can occur as a result. There was general consensus among participants that counties could improve their process of determining the appropriateness of imposing road restrictions. In developing this application, WDEA has collaborated with the four major oil-producing counties, with management from NDAWN and UGPTI, and with the NDPC and numerous individual companies that have oil and gas production or oilfield service operations in western North Dakota.

PROJECT DESCRIPTION

Objectives: As stated in the Abstract, 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.

WDEA expects to realize several ancillary benefits as a result of the success 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. A mutually beneficial project such as this should help to solidify the positive working relationship between and among the counties, the oil industry and the affected landowners. Additionally, UGPTI expects to realize numerous benefits from the Wise Roads project as described in its letter of support.

Methodology: WDEA plans to 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 and county highway managers. It is anticipated most stations will be placed either on land controlled by an oil industry operator, or on private ranch or farmland identified through contacts with the counties. WDEA is partnering with NDAWN to ensure the monitoring equipment complies with meteorological standards and that it is continually maintained in proper working order. WDEA, which provides text message and email notification of county/township road restrictions through its LoadPass Permit system, will be able to use the text/email data to evaluate changes in the extent, frequency and duration of 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. One of the services provided to the counties by LoadPass is a text message and email alert notification service. It allows counties to immediately notify the trucking companies that use their roads that a restriction has been issued. County highway departments simply enter the information in the system, and it will automatically transmit the restriction notification to all who have requested the information. LoadPass currently has more than 13,000 individuals that are signed up to receive email and/or text notifications.

WDEA plans to track the extent and duration of the restrictions that are imposed by oil-producing counties generated through LoadPass. By gathering the 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 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 or no weather data is currently collected. To most effectively utilize the cameras which can be rotated remotely, WDEA plans to 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 the North Dakota Agricultural Weather Network, which currently operates and maintains more than 100 weather stations throughout North Dakota and parts of eastern Montana and western Minnesota. NDAWN has provided guidance in the selection and purchase of weather station equipment, and will supervise its installation and ongoing operation and maintenance. WDEA will also be working closely with the Upper Great Plains Transportation Institute, which we expect will provide technical assistance to participating 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 that will be deployed. The stations are equipped with state-of-the-art sensors and recording apparatus to capture a variety of meteorological data. WDEA will collaborate with counties and the oil industry through NDPC to identify prospective sites for installation. However, the partners will defer to NDAWN to ensure the units are in a location that ensures the accuracy of the weather information they provide. NDAWN will assume ownership of the units, and through a working arrangement with WDEA, will transmit the data to WDEA which will in turn make it publicly accessible through its user-friendly LoadPass routable map.

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. Siting and deployment are in-kind services to be provided by NDAWN. 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. 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. Ultimately 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 moving 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 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

Standards of Success should include: The measurable deliverables of the project that will determine whether it is a success; The method to be utilized in measuring success; The value to North Dakota; An explanation of what parts of the public and private sector will likely make use of the project's results, and when and in what way; The potential that commercial use will be made of the project's results; How the project will enhance the education, research, development and marketing of North Dakota's oil and natural gas resources; How it will preserve existing jobs and create new ones; How it will otherwise satisfy the purposes established in the mission of the Program; How it will be reporting on the success of the project.

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 data will be analyzed 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. WDEA will work closely with the NDPC 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.

WDEA also expects UGPTI will utilize Wise Roads subsurface soil temperature and moisture data to perform roadway analysis. 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. Linking the data with the Geographic Roadway Inventory Tool and the LoadPass Permit System layers will allow UGPTI to leverage the collected data for the roadway owners, industry and the public to better understand roadway conditions.

BACKGROUND/QUALIFICATIONS

Please provide a summary of prior work related to the project conducted by the applicant and other participants as well as by other organizations. This should also include summary of the experience and qualifications pertinent to the project of the applicant, principal investigator, and other participants in the project.

The Western Dakota Energy Association (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 are now occurring that will 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 calendar year 2018, LoadPass staff managed the issuance of more than 96,000 permits for oversize trucks, generating more than \$20 million for member counties and cities.

Partnering with WDEA on this project is the North Dakota Agricultural Weather Network, based at North Dakota State University, which will be responsible for the deployment and ongoing operation of 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.

WDEA will partner with the Upper Great Plains Transportation Institute to help 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. Services provided 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. WDEA expects many of the stations will be deployed on property owned or controlled by oil industry companies.

WDEA will also closely collaborate with 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 each of the four major producing counties – Dunn, McKenzie, Mountrail and Williams – which collectively account for more than 94% of North Dakota's oil production as of March 2019. The counties 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

*A description of **how** the applicant will manage and oversee the project to ensure it is being carried out on schedule and in a manner that best ensures its objectives will be met, **and a description of the evaluation points to be used** during the course of the project.*

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

The Wise Roads project will leverage WDEA's working relationship with UGPTI to assist county road departments in evaluating weather data, and 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.

WDEA staff 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
May 2019	Order equipment for phase 1	May 2019
June 2019	Equipment installation site selection planning with NDAWN, NDPC, counties and WDEA staff	Est. June 2019
June 2019	Equipment installation phase 1	Est. June 2019
June 2019	County planning with WDEA to determine road zones based on installation of weather stations	Est. July 2019
July 2019	Integration of weather stations into map	Est. July 2019
July 2019	County use of data for road restrictions – weather based	Ongoing
August 2019	Order equipment for phase 2	Est. August 2019
August 2019	Equipment installation site selection planning with NDAWN, NDPC, counties and WDEA staff	Est. August 2019
September 2019	Equipment installation phase 2	Est. September 2019
September 2019	Integration of weather stations into map	Est. September 2019
October 2019	LoadPass advisory meeting to discuss best practices for use of weather data, feedback from industry, and development 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
April 2020	Order equipment for phase 3	Est. April 2020
April 2020	Equipment installation site selection planning with NDAWN, NDPC, counties and WDEA staff	Est. April 2020
May 2020	Equipment installation phase 3	Est. May 2020
October 2020	LoadPass advisory meeting to discuss best practices for use of weather data, feedback from industry, and development plans for 2020 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
October 2021	LoadPass advisory meeting to discuss best practices for use of weather data, feedback from industry, and development plans for 2020 implementation	Est. October 2021
November 2021	Final report submitted to OGRC	Est. November 2021

BUDGET

Please use the table below to provide an **itemized list** of the project’s capital costs; direct operating costs, including salaries; and indirect costs; and an explanation of which of these costs will be supported by the grant and in what amount. The budget should identify all other committed and prospective funding sources and the amount of funding from each source, differentiating between cash, indirect costs, and in-kind services. Justification must be provided for operating costs not directly associated to the costs of the project. Higher priority will be given to those projects that have matching private industry investment equal to at least 50% or more of total cost. (Note ineligible activities or uses are listed under OGRP 2.02) **Please feel free to add columns and rows as needed.**

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

Please use the space below to justify project associated expenses, and discuss if less funding is available than that requested, whether the project’s objectives will be unattainable or delayed.

Weather monitoring equipment – The equipment ordered for the project will be selected by NDAWN to ensure compatibility and consistency with existing systems and tools. On average the cost of each weather station is \$10,000. Each station includes a tripod for mounting, data logger, power source, precipitation gauge, wind gauge, air temperature and soil temperature gauges. The project consisting of 50 weather stations would have a total cost of \$500,000.

Equipment installation – The installation of the equipment will be done by NDAWN staff with assistance from WDEA and county staff. The installation is scheduled to take 3 to 5 days for the initial 10 units. 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. The estimated cost is county and WDEA staff time to visit each station a minimum of two times per year to clear any debris, clean sensors and verify operations. This cost will be an ongoing operational cost that WDEA and member counties will assume as part of their operating costs.

Data communications – Each weather station requires a cellular data communication 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. The estimated in-kind cost is the expense associated with hosting and processing the additional information from the stations.

CONFIDENTIAL INFORMATION

*Any information in the application that is entitled to confidentiality and which the applicant wants to be kept confidential should, if possible, be placed in an appendix to allow for administrative ease in protecting the information from public disclosure while allowing public access to the rest of the application. Such information must be clearly labeled as confidential and the applicant must explain why the information is entitled to confidentiality as described in North Dakota Century Code 54-17.6. Oil and gas well data that is a result of financial support of the Council shall be governed by North Dakota Century Code 38-08-04(6). **If there is no confidential information please note that below.***

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)

If the applicant is a recipient of previous funding from the Commission, a statement must be provided regarding the current status of the project.

Reliable Weather Monitoring

Research-Grade Weather Station



Standard Measurements

- Wind speed
- Wind direction
- Air temperature
- Relative humidity
- Barometric pressure
- Precipitation
- Solar radiation
- Soil water content

Overview

The MetPRO™ is a highly accurate, durable, research-grade meteorological monitoring station, designed for a wide-variety of demanding environmental applications. This portable tripod station is suitable for both long-term and temporary deployments on flat or uneven terrain.

This system includes high quality sensors, which are needed for defensible data in environmental research as well as critical operations dependent on continual weather monitoring. The MetPRO's meteorological measurements can be used to calculate evapotranspiration, growing-degree days, wind chill, dew point, and other weather-related parameters.

Benefits and Features

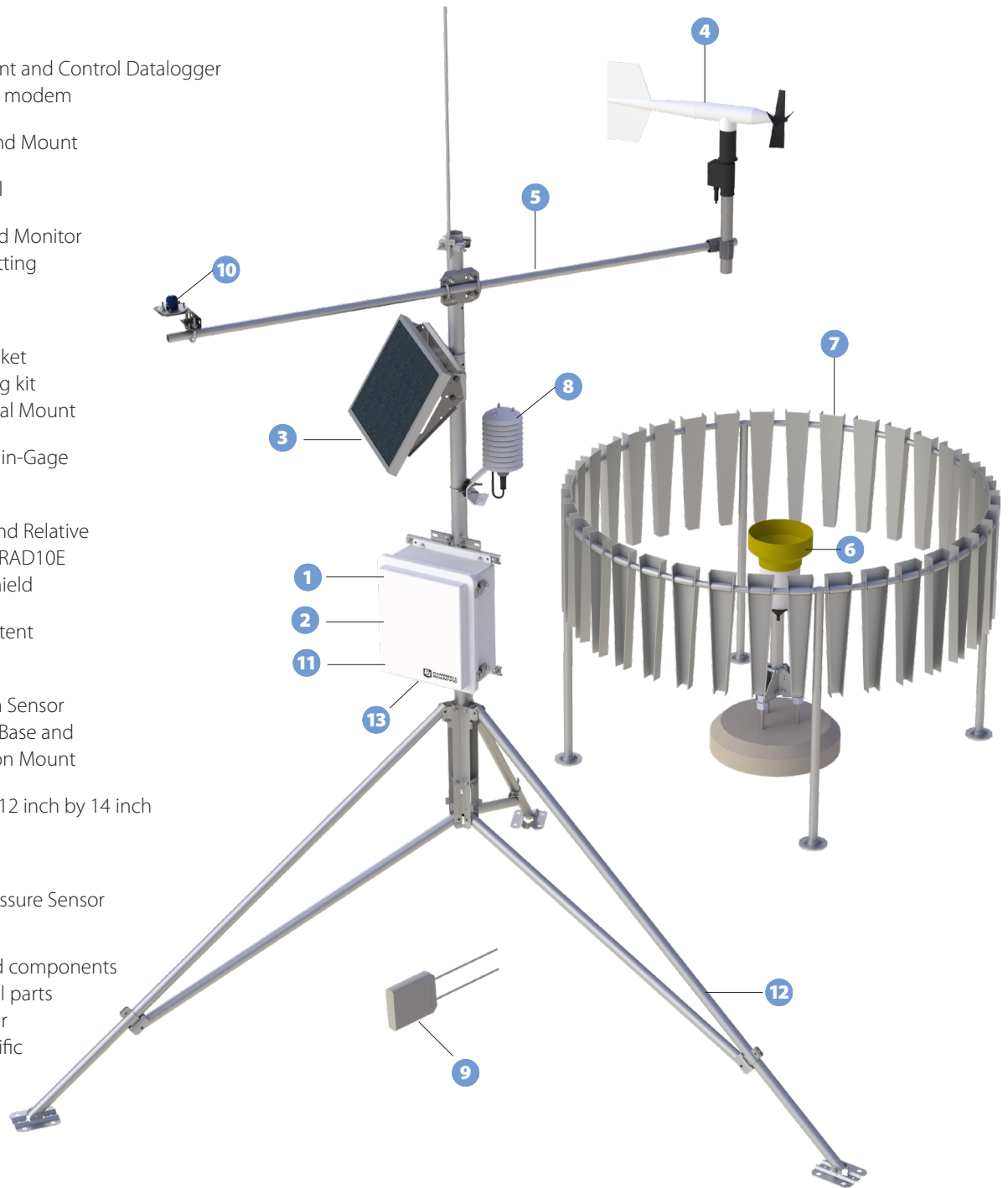
- › Obtain defensible data with high-accuracy instruments
- › Deploy system remotely for unattended long-term monitoring
- › Low-power design—operates on a battery recharged by a solar panel
- › Reduce maintenance overhead with durable system components
- › Connect remotely with IP-based modem communication
- › Customize system for specific application needs



Components

- 1 CR6-WIFI Measurement and Control Datalogger with integrated Wi-Fi modem
- 2 BP12 12 Ah Battery and Mount
- 3 SP20 20 W Solar Panel
- 4 05103 RM Young Wind Monitor with 17953 Nu-Rail Fitting
- 5 CM204 4 ft Crossarm
- 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
- 9 CS655 Soil Water Content Reflectometer
- 10 CS320 Solar Radiation Sensor with 18356 Leveling Base and CM225 Solar Radiation Mount
- 11 ENC12/14 Enclosure, 12 inch by 14 inch
- 12 CM106B 6 ft Tripod
- 13 CS100 Barometric Pressure Sensor

Some system sensors and components may not be available in all parts of the world. Contact your regional Campbell Scientific representative for details.



Customizations

You can order the MetPRO™ with the parts shown above or as a complete pre-wired, pre-programmed, pre-configured system. This system is also fully-customizable. You can add sensors, measurement

peripherals or communications devices to meet the needs of your specific application. Contact a Campbell Scientific sales engineer to design your custom solution.

Letters of Support

Weather Information System to Effectively Reduce Oilfield Delays and Disruption (Wise Roads)

- 1. Continental Resources**
- 2. Hess Corporation**
- 3. Marathon Oil**
- 4. AP Logistics**
- 5. Dunn County**
- 6. McKenzie County**
- 7. Mountrail County**
- 8. Williams County**
- 9. Upper Great Plains Transportation Institute**



May 31, 2019

Mr. Geoff Simon
Western Dakota Energy Association
1661 Capitol Way
Bismarck, ND 58501

Dear Mr. Simon,

Continental Resources, Inc., (Continental) welcomes the opportunity to provide support for the weather station project proposed by the oil producing counties. Continental has over one million acres of minerals under lease in North Dakota and is the largest producer of oil and gas in the state. As such, Continental is positioned to experience significant losses owing to weather related road closures in the counties. We depend upon these roads to transport oil and produced water away from our facilities in order that we might continue producing the high volume wells that are typical of the Bakken. When we cannot transport crude oil and produced water away for our production facilities, we exceed the storage capacity of these facilities and are required to shut the wells in. On most locations, we transport many truckloads per day, as we cannot maintain sufficient storage capacity for several days' production volume.

When we are forced to shut in our wells for road closures, it may take several days to get all of the wells back on production, such that roads that are closed for two days may result in 4-7 days of lost production. Over one four-day weekend during November of 2018, Continental properties alone lost over \$62M in production revenue due to county road closures. In McKenzie County especially, several roads had not received sufficient rainfall to warrant closures, but were closed as a matter of policy. Of this \$62M lost revenue - 10% or \$6.2M was tax revenue lost by the state and \$9M was lost by individual and state royalty income. Shut in wells do not make up all lost production when brought back into operation.

Continental is pleased to learn that weather stations may be placed around the oil producing counties so that the county official can better determine where roads might be at risk due to adverse weather. We support this effort, but caution that the counties need to develop road closure policies that rely on the actual data that they will receive from these stations in order to avoid very costly and un-necessary closures. The weather stations will provide valuable localized information, but the success of these stations will be realized in the use of that data. We encourage the counties to confer with the oil and gas producers when determining the policy for road closure using this information. Continental offers our advice in this process.

Regards,

A handwritten signature in blue ink that reads "Bradley A. Aman".

Brad Aman, Vice President
Northern Region Production



May 30, 2019

Dear Oil & Gas Research Council,

The Hess Corporation wishes to express our support for the Western Dakota Energy Association's (WDEA) application to the Oil & Gas Research Council for additional weather stations throughout the Bakken. There are many reasons for our support, most of which are focused on improving access to the best data possible so that the region's elected officials and county employees can make informed decisions when it comes to considering restrictions on road systems.

Hess agrees that weight restrictions on gravel roads after times of inclement weather or during the spring thaw are necessary to protect the integrity and lifespan of the road, and to ensure the safety of the driving public. Quick, accurate decisions based on good data is a major outcome that can be achieved through the implementation of additional weather stations in western North Dakota. Many weather outcomes can be drastically different across a large county (not to mention a large region like the Bakken). For example, one corner of Williams County, Tioga, could get a downpour of 2 inches of spring rain in an afternoon - while 70 miles away, in Trenton, they only saw a trace amount of rain or nothing at all! The conditions of the roads in these two areas would be drastically different. With more weather stations throughout the Bakken better data would allow for better management of the roads that required temporary weight restrictions and those that didn't.

The Oil and Gas industry relies on reasonable access to county/gravel roads to properly move heavily weighted equipment on and off well pads. This is true during times of the drilling and completion process and after the wells have started producing. Unnecessary restrictions not only impact a company's bottom line, this disruption also means a loss of tax revenue to the state and counties.

It is our understanding that this request from WDEA would deploy up to 50 high-caliber weather stations on heavily traveled county roads throughout the Bakken. Again, we support this program whose goal is to give county staff and officials access to the information generated by these stations, allowing for restrictions only when necessary for only those areas impacted by storms.

A bonus to this program is the tie-in to the North Dakota Agricultural Weather Network - a system used by farmers and ranchers in the state. This will enhance the ag community's ability to better understand which areas of their crop/pasture land received what amount of precipitation.

Sincerely,

A handwritten signature in cursive script that reads "Brent Lohnes". The signature is written in black ink and is positioned below the "Sincerely," text.

Brent Lohnes, Hess General Manager in North Dakota

Jeff Parker
Operations Director
Bakken Project Team



Marathon Oil Company
3172 Hwy 22 N.
Dickinson, ND 58601
701-456-7500
jrparker@marathonoil.com

May 30, 2019

Oil & Gas Research Council
North Dakota Industrial Commission
600 East Boulevard Ave., Dept 405
Bismarck ND 58505-0840

RE: WDEA application for Wise Roads project (weather station placements in the oilfield)

Dear Council Members:

The purpose of this letter is to indicate our company's strong support for the weather station placement project of the Western Dakota Energy Association ("WDEA"). While Marathon Oil Company ("Marathon") understands the desire for local government entities to impose weight restrictions on gravel roads during times of inclement weather, we believe WDEA's project will strategically allow each counties and/or townships to more narrowly define when and where those restrictions should be imposed.

Weight restrictions placed on gravel roads can impact the safety and economics of oil and gas operations. Restricting the ability for workover rigs and maintenance crews to access locations do not only jeopardize well integrity, it also costs our company thousands of dollars in lost time. Limiting well access during flow back and initial production can lead to complications for the life of the well. In addition, road restrictions may prevent the transportation of crude oil and produced water off the well pad, and this may in turn cause wells to be unnecessarily shut in.

We believe the strategic placement of the weather stations will be a helpful tool to guide county decisions, and allow the counties and/or townships to more narrowly impose restrictions only on roads in areas where rain fell or snow melted. This will leave roads that were not impacted by rain or snow melt open to unrestricted travel by the industry and traveling public.

We have the utmost confidence in the ability of WDEA to successfully complete the weather station project and maximize the value of the data it generates. Marathon has a longstanding working relationship with WDEA through its LoadPass Permits system, which allows counties in the oil-producing region to manage the movement of oversize and overweight truck traffic. Because the weather station data will be publicly available as a GIS layer in the LoadPass routable mapping system, as well as the North Dakota Agricultural Weather Network, the project will

benefit more than just the oil industry and the service companies that support it. Western North Dakota farmers and ranchers will also realize the value of the meteorological data, which can only serve to improve the already positive relationship we enjoy with affected landowners.

We strongly urge your favorable consideration of the WDEA grant request.

Sincerely,

A handwritten signature in blue ink that reads "Jeff Parker". The signature is written in a cursive, flowing style.

Jeff Parker

Operations Director

Bakken Asset Team

Marathon Oil Company

AP Logistics LLC.

P.O. Box 10081 Williston, ND 58803

701-575-0780 jason@aplogisticsllc.com

To Whom It May Concern:

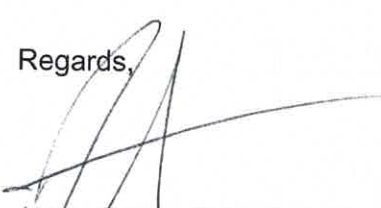
I am writing on behalf of my companies, All Power Trucking, LLC and AP Logistics, LLC, in favor of the WeatherStation Project of Western Dakota Energy Association to increase accuracy of rainfall data in North Dakota. As Trucking and Logistics companies in North Dakota, we see the impact of road restrictions every year and have been directly affected from blanket restrictions based on large areas.

Frost Law creates massive changes in our daily operations and as a result, we have experienced increased turnover from unhappy drivers, delayed project completion, and overall inefficiency when having to halt or slow productivity to accommodate these restrictions. Although I do understand that there are circumstances that are justified by these restrictions, I firmly believe that there needs to be more advanced systems in place to more accurately diagnose the weather patterns in smaller areas.

We have had a number of experiences with improperly closed roads that fell under certain county lines but weren't affected by the weather that caused the restrictions. Please consider this proposal as I feel it will greatly increase efficiencies across the entire State of North Dakota.

Please feel free to contact me with any further questions. Thank you for your consideration.

Regards,



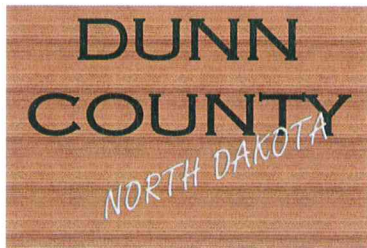
Jason Saran, COO & Partner

(701) 575-0780

jason@aplogisticsllc.com

All Power Trucking, LLC

AP Logistics, LLC



DUNN COUNTY ROAD DEPARTMENT
300 CENTRAL AVE S
KILLDEER, ND 58640
TELEPHONE (701) 764-5546 FAX (701) 764-7259
lori.tabor@dunncountynd.org

5/30/2019

Oil & Gas Research Council
North Dakota Industrial Commission
600 East Boulevard Ave., Dept. 405
Bismarck ND 58505-0840

Dunn County supports the Weather Information System to Effectively Reduce Oilfield Delays and Disruption.

It is occasionally necessary to implement weight restrictions on gravel roads to protect the integrity of the roads due to inclement weather. We have a large county and many times the weather is very different in one part of the county versus another. For that reason, we have implemented zones so that we have the ability to keep part of the county open when there is a rain event in another part. The weather stations will help us to determine which zones need to be restricted. As a result, the impact to the oil and gas industry may be reduced.

We understand the plan for the 50 weather stations throughout the region will help monitor the heavily traveled county roads. This will give the county leaders more visibility to the changing conditions and a better ability to manage roads and impose restrictions only when and where necessary.

The weather stations will also provide a benefit to farmers and ranchers as it will be tied into the ND Agricultural Weather Network. Because the weather data will also be available to the Ag community, it will serve to enhance the relationship between Dunn County, landowners and the oil industry.

A handwritten signature in blue ink, appearing to read "Lori Tabor", is written over the printed name and address.

Lori Tabor
Dunn County
300 Central Ave S
Killdeer, ND 58640
701-764-5546

Oil & Gas Research Council
North Dakota Industrial Commission
600 East Boulevard Ave., Dept 405
Bismarck ND 58505-0840

To the Oil & Gas Research Council:

This letter is to indicate McKenzie County's strong support of the Western Dakota Energy Association's application for grant funds for the weather station project.

We have met with WDEA and been part of numerous conversations regarding the need for allowing for industry movement while maintaining the integrity and safety of the county and township roads. It is our view that the installation of the weather stations and utilization of the data provided will assist in better placement of restrictions during a weather event. This would include the timing of the restrictions as well as more localized restrictions being placed on roads throughout the county.

The County recognizes that the utilization of road restrictions, while necessary, can cause significant impacts to the normal operations of the oil and gas industry. These impacts include additional expenses as well as lost revenue. The lost revenue not only impacts the industry but also the state and county tax revenues.

While the weather stations will not alleviate all road restrictions, the data will provide us the information to make better decisions. By making the investment in the weather stations, it is our intent to utilize the data to better determine the location and duration of restrictions which will provide benefits to the industry and public.

Thank you for your consideration,

Suhail Kanwar

Suhail Kanwar
Public Works Administrator/County Engineer

WAYNE OLSON
District # 1
(701) 497-3898

JOAN M
HOLLEKIM
District #2
(701) 628-3080

TRUDY
RULAND
District #3
(701) 627-3588

DAN URAN
District #4
(701) 627-3511

GARRY A.
JACOBSON
District #5
(701) 453-3315

Mountrail County Commissioners

Mountrail County Courthouse
101 North Main Street - Box 69
Stanley, North Dakota 58784-0069
Tel. (701) 628-2145 Fax (701) 628-2276

Oil & Gas Research Council
North Dakota Industrial Commission
600 East Boulevard Ave., Dept 405
Bismarck ND 58505-0840

To the Oil & Gas Research Council:

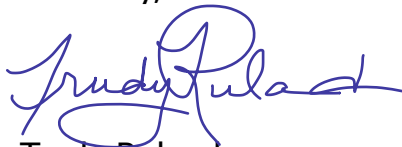
The Board of Commissioner of Mountrail County supports the Western Dakota Energy Association's application for grant funds for the weather station project.

The Board understands that the plan is to deploy up to 50 weather stations to monitor conditions on heavily traveled county roads throughout the Bakken. The project will allow our County Engineer to better manage roads, imposing restrictions only when necessary, thereby improving the efficiency of heavy truck traffic movement in Mountrail County.

The weather stations will also provide an additional benefit to farmers and ranchers in our County because the system will be tied into the ND Agricultural Weather Network. The weather data thus will be available to the ag community, it will serve to enhance the relationship between and among Mountrail County, landowners and the oil industry.

Thank you for your consideration.

Sincerely,



Trudy Ruland
Chairman of Mountrail County



May 31, 2019

Oil & Gas Research Council
North Dakota Industrial Commission
600 East Boulevard Ave., Dept 405
Bismarck ND 58505-0840

Dear Council Members,

Please accept this letter as an indication of support for the Western Dakota Energy Association grant application from the multi-county Weather Station project.

The roadways in Williams County are heavily used by oil and gas industry traffic, but also our growing population, and the agricultural industry. To maintain the integrity of these roads, which is essential for the safety of our citizens and for the success of the oil and gas exploration and production industry, we sometimes need to restrict or close gravel and chip seal roads. Inclement weather and excessive moisture can affect the duration and frequency of these restrictions and/or closures.

Williams County has the flexibility of restricting/closing quadrants or specific sections of roads using our county GIS. In the event of inclement weather, the Williams County Highway Department relies on a network of individuals that are distributed throughout the county to provide insight on road conditions. These individuals aid in the decision-making process for imposing weight or access restrictions on county gravel and chip seal roads for these targeted areas. By installing weather stations on our most heavily traveled roads, we would be able to expand our network of insight by obtaining more specific precipitation information and therefore fine-tune the restriction/closure process.

The weather stations will not only contribute to the decision-making process for road restrictions/closures, but they will also provide an additional benefit to farmers and ranchers. As part of this grant, it is anticipated that the data collected by the weather stations will be provided to the ND Agricultural Weather Network. With Williams County, the agricultural community, and the oil and gas industry connected by this data, we hope that our relationship and understanding of roadway impacts will be enhanced.

We appreciated your consideration of the grant application.

Sincerely,

David Montgomery
Chairman, Williams County Board of County Commissioners

BOARD OF COMMISSIONERS

First District – Beau Anderson | Second District – Steve Kemp | Third District – Cory Hanson
Fourth District – David Montgomery | Fifth District – Barry Ramberg



May 31, 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 project *Weather Information System to Effectively Reduce Oilfield Delay and Disruption (Wise Roads)*.

North Dakota's township and county gravel roadway network is the economic backbone of the state. In our western oil country the demands on gravel roads create some unique challenges. In most areas of the state, industrial and agricultural demands can generally work around periods of roadway structural deficiencies. Oil production efforts are not afforded that luxury as well sites run 365 days per year. Minimizing roadway restrictions and closures to loaded trucks is a goal that is common to both industry and the roadway owners. It is a balancing act between industry trucking demands and roadway preservation. Rainfall events can saturate a gravel surfacing and subgrade to the point that any truck loadings would damage or destroy a roadway in short order. As such, road restrictions are needed to avoid road rebuilding costs, but where should they be placed and how long should they remain in effect? Technology can help. Wise Roads can provide roadway owners with detailed weather conditions and forecasts that will help them make more refined decisions. By more accurately defining the rain event impacted areas, restricted roadway miles could be reduced.

Upper Great Plains (UGPTI) and the North Dakota Local Technical Assistance (NDLTAP) team assist local roadway owners with their infrastructure asset inventory through the Geographic Roadway Inventory Tool (GRIT). GRIT is a fully transparent, Google map based roadway asset inventory system that is available on line at <https://www.ugpti.org/resources/asset-inventory/>. UGPTI recognizes the value of the Wise Road project and looks forward to utilizing some of the data for roadway analysis. Subsurface soil temperature and moisture probes will provide desired data that can be used to predict roadway conditions and evaluate material performances. This data, along with other locally collected weather data, will be used in our research efforts to evaluate gravel road materials. Data linkage between GRIT and the LoadPass Permit System layers is another means for us to leverage the collected data and for the roadway owners, industry and the public to better understand roadway conditions.

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

By tapping into technology, Wise Roads, can be a powerful tool in the decision matrix that local roadway owners use to protect our investment and simultaneously maximize trucking periods. It's a great example of how North Dakota ingenuity and the constant desire to improve yields a stronger economy.

Again, thank you for the opportunity to provide a note of support.

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



NDLTAP - partnering with the NDDOT/FHWA to provide learning opportunities for North Dakota's transportation system leaders.

Safer Roads Save Lives and Vision Zero – Safety Switch