MINUTES - NORTH DAKOTA ATMOSPHERIC RESOURCE BOARD

NOVEMBER 16, 2016

Chairman Henry Bodmer called a meeting of the Atmospheric Resource Board to order at 1:30 p.m., November 16, 2016.

ROLL CALL

Roll call was taken. Members present were Henry Bodmer, David Monson, Paul Myrdal via conference call, Casey Veil, Tom Tupa, Garland Erbele, Benjamin West for Kyle Wanner, and Rob White.

Others present were Darin Langerud, Director; Kelli Schroeder, Business Manager; Mark Schneider, Chief Meteorologist; Daniel Brothers, Meteorologist; Hans Ahlness, Weather Modification, Inc. (WMI); and Mike Dwyer, ND Weather Modification Association.

MINUTES

IT WAS MOVED BY MR. ERBELE, SECONDED BY MR. TUPA, AND CARRIED ON A VOICE VOTE TO APPROVE THE MINUTES OF THE APRIL 13, 2016 MEETING AS DISTRIBUTED.

FINANCIAL STATUS REPORT

Ms. Schroeder reviewed the financial status report for the period ending September 30, 2016.

In response to a question from Mr. Bodmer, Ms. Schroeder noted that the federal funds listed are appropriated (authority for acceptance) should we receive grant dollars from the federal government. However, it doesn't look like we will receive any federal funds this biennium.

2016 NORTH DAKOTA CLOUD MODIFICATION PROJECT (NDCMP)

Cost Summary

Ms. Schroeder reviewed the cost report for the 2016 NDCMP. Both districts were under budget in total. District I was slightly over budget on cloud-base flight hours; however, it was under budget in approximately the same amount for hybrid top seeding flight hours. District I flew and seeded clouds slightly more than average this year, which caused us to be slightly over budget on chemicals as well. District II was slightly over budget on buildings & equipment / utilities / insurance due to a new chemical shed and tie downs for Williston and a new air conditioning unit and installation in Stanley.

In response to a question from Mr. Tupa, Ms. Schroeder noted that the budget amounts in these categories are spending targets. An individual category being over budget isn't an issue as long as the project total is under budget.

In response to a question from Mr. Erbele, Mr. Langerud noted that the state has always paid for the intern co-pilot costs. Currently, Resource Trust Funds are the funding source for our agency. At one point, General Funds were used for the pilot internship.

Seeding Agent Usage / Inventory

Mr. Schneider reviewed the ending chemical inventory and usage for the 2016 NDCMP.

In response to questions from Mr. Veil and Mr. Erbele, Mr. Schneider noted that Ice Crystal Engineering replaces our dud units with a 100% guarantee. Older flares and other chemicals that were purchased from other vendors many years ago cannot be returned.

Mr. Langerud noted that we disposed of some dry chemical in a formulation that was no longer being used. We should go through the older unused chemicals and do the same thing.

Generator Performance

Mr. Schneider reviewed generator performance. In 2016, generator performance came in at a record low of 0.97%. This is attributed to the staff who performed a good deal of maintenance on them. Mr. Ahlness indicated that they also put a good deal of effort into getting them ready before the start of the season.

In response to a question from Mr. Bodmer, Mr. Langerud noted that burn-in-place flares are fired after the pilots and radar meteorologist consult each other. The top seeding aircraft drops ejectable flares at his discretion, dependent on finding the right conditions.

Mr. Ahlness noted that the burners put out about 160-180 grams per hour where a flare puts out 75 grams in about 1.5 minutes, a lot more concentrated level of chemical for a shorter time period. Mr. Langerud noted that the guidance provided to staff is to light flares at the start of seeding if the cell is maturing or producing hail. If it's extremely severe or not responding as hoped, they will light flares then as well. They are considered the secondary method for seeding.

Intern Programs

Ms. Schroeder reviewed the internship final report and activities for the 2016 NDCMP. As of the end of the 2016 project, we have trained 361 intern co-pilots and 53 intern meteorologists.

Discussion was held regarding suggestions for financial assistance, however due to the economic status of the state, we did not ask for additional funding in our budget request.

Mr. Ahlness discussed reworking contracts for his pilots due to Fair Labor Standards Act (FLSA) changes. Mr. Langerud noted that we will also be dealing with this issue for our radar meteorologists. We will be increasing the starting salary by about 6% to meet the new FLSA level to keep them exempt employees.

UND Weather Research and Forecasting (WRF) Numerical Modeling

Mr. Langerud reviewed the Weather Research and Forecasting numerical modeling project we are working on with the University of North Dakota (UND). A new contract for $24,000 was signed in May 2016, which is a continuation of the work we've been doing with them for a few years. UND is running 3 instances of the mesoscale numerical weather forecast model on the domain in western North Dakota, specifically focused on forecasting for the operational summer cloud seeding project. There have been improvements of the modeling over this time.

Mr. Brothers believes this project has helped a lot in forecasting over the last few years.

Project overview and aircraft operations

Mr. Langerud provided the board with a map of all flight tracks for all aircraft over the entire summer project.

In response to a question from Mr. Tupa, Mr. Ahlness indicated that the tracks that are black and well outside of the county are often from situations where the storm location causes the aircraft to have to land elsewhere for safety purposes. Mr. Langerud noted that the flight over Rolette County was done for filming purposes. 60 Minutes Australia was doing a piece on our project. The storms were just east of the district. The aircraft flew there to demonstrate what seeding would be like without actually conducting seeding. This flight was funded entirely by Weather Modification Inc.

Mr. Langerud reviewed his memo to the board regarding liquidated damages recommendations.

In response to a question from Mr. Tupa, Mr. Langerud noted that the difference in penalty cost levels are set in the contract and are based on each aircraft type. It is calculated as 2% of the total cost of having that aircraft on station for the 92-day project. The penalty of $1,447.08 is 2% of the on-station cost of the Seneca base seeding aircraft and $3,598.58 is 2%of the on-station cost of the King Air top seeding aircraft.

IT WAS MOVED BY MR. TUPA AND SECONDED BY MR. MONSON TO APPLY THE DIRECTOR'S RECOMMENDATION OF THREE PENALTIES ($1,447.08 + 1,447.08 +

3,598.58 = $6,492.74) TO THE FINAL CONTRACT PAYMENT. THE MOTION CARRIED UNANIMOUSLY.

Contractor's Final Report

Mr. Ahlness reviewed the contractor's Final Operations Report for the 2016 project.

Mr. Langerud commented that he thought having Ground School in Fargo this year was advantageous to our employees. WMI gave them a tour of their facilities including their aircraft and mechanics shop.

In response to a question from Mr. Tupa, Mr. Ahlness noted that flight simulators just aren't that much like actual flying. Even the full-motion simulators do not get close enough to reality. In addition, cost is prohibitive and therefore not a training option for us.

Mr. Ahlness commended the ARB staff for the quality work they perform during the project.

In response to a question from Mr. Bodmer, Mr. Langerud noted that the study that indicates our cloud seeding project provides a 45% reduction in crop-hail losses was done by looking at crop-hail losses for a 13-year period and comparing those years to upwind counties in eastern Montana that had never had cloud seeding activities. In comparing the areas, they found that the loss ratios were essentially the same before cloud seeding began in North Dakota. During the 13-year period, the crop-hail losses were 45% lower than they were in the area prior to seeding being done.

In response to a question from Mr. Bodmer, Mr. Ahlness indicated that WMI has never been in trouble with the Federal Aviation Administration for maintenance. Mr. Bodmer feels that reflects highly on the program.

IT WAS MOVED BY MR. TUPA AND SECONDED BY MR. MONSON TO APPROVE THE CONTRACTOR'S FINAL REPORT AND FINAL CONTRACT PAYMENT TO WEATHER MODIFICATION INC. THE MOTION CARRIED UNANIMOUSLY.

ISSUES FOR NDCMP 2017

Status of District 1 operations area

Mr. Langerud updated the board regarding the measure to abolish the weather modification authority in Bowman County on the general election ballot. A number of letters to the editor were written in their local paper. The ND Weather Modification Association sent out information about the facts of the program to voters before the election. Mr. Langerud was interviewed on KPOK a few times and he also spoke at a public meeting regarding the measure on October 19th. When votes were tallied, the decision of the voters was to retain the weather modification authority by 70.13% of votes.

The plan to move forward is to continue as we have been doing. We'll meet with the county authorities in January to begin planning the 2017 project.

Mr. Langerud noted that the Bowman radar has been running year-round for a number of years. There is a lot of support for this due to lack of National Weather Service coverage and this helped support retaining the authority as well.

County Weather Modification Authority funding

Mr. Langerud noted that the Ward County Weather Modification Authority met with the Ward County Commission in August where the Commission agreed to the authority's budget request. Then, at a public hearing about the budget in September, the Commission voted 3-2 to remove funding for the 2017 weather modification program due largely to the budget situation. However, there was a local farmer who opposed the project and suggested the Commission cut funding. The following Tuesday, through efforts of the Ward County Weather Modification Authorities, the Commission reconsidered their motion and reversed their decision 4-1.

Mr. Bodmer discussed issues with the tax reform changes made by the 2015 Legislature that lead to this problem.

In response to a question from Mr. Monson, Mr. Bodmer doesn't think we will ask for legislative changes to be put forth. He feels the issue will come about more from other areas that were similarly affected but have more "skin in the game."

Mr. Langerud asked Mr. Monson what he thought would be the prospects for changing this considering the large number of similar levies that were changed at the same time. Mr. Monson noted it was a lot simpler when only schools were involved in the tax reform bill. When they extended it to these little boards, he wasn't happy with the way it turned out. It was take it or leave it at that point in the session.

Mr. Myrdal left the conference call at approximately 3:35pm. Mr. Monson left the meeting at approximately 3:45pm.

Radar technician services

Mr. Langerud noted that our contracted radar technician is retiring. Starting in January, there will be a new technical services team. The IFB will likely go out later this week. We expect a couple of bids on it.

Powder River MOA

Kyle Wanner is at a meeting at Ellsworth AFB regarding the Powder River MOA expansion. This summer the MOA was active in our District I area, but only at their high-level area with a floor of 12,000 feet AGL. Sometime next spring or early summer, the MOA's lower area down to 500 ft AGL will be activated.

In response to a question from Mr. Tupa, Mr. Ahlness replied that the biggest impact the lower area will have is that you cannot file an IFR flight plan, which we typically use for top seeding.

In response to a question from Mr. Langerud, Mr. Ahlness replied that they are working on equipping his fleet of aircraft with ADS-B, but he's not sure the military will be using that.

ARB RESEARCH & EVALUATION PROGRAM

Polarimetric Cloud Analysis and Seeding Test (POLCAST)

Mr. Langerud reported that we have reports back from the National Center for Atmospheric Research (NCAR) on the POLCAST data field projects. Final results are that: (1) the dual-polarimetric radar could see signatures in the hydrometeorological identification fields and also looking at mean diameter of droplets in the clouds, and (2) that they could see a difference in those parameters in the seeded vs unseeded clouds, indicating the seeding flares were producing the intended impact in those small clouds. Indications are that this tool is useful for operationally identifying a possible seeding signature but also identifying where hail would be growing or the types of hydrometers in the clouds that would be conducive to that type of growth. This has implications not only for research but potentially for use of hygroscopic flares operationally at some point in the future. Also, the use of dual polarization radar on a project would help improve operations.

We've had discussions with our vendor regarding the possibility of upgrading our radars to dual-polarimetric ability. There is some question as to whether or not we can get that technology from them because they have a possible patent infringement issue. They've outfitted some radars in other countries where the patent issue isn't a problem. At some point down the road, they may or may not be an option.

Another thing we're looking at doing is having the same principle investigator that did the radar analysis for POLCAST look at putting together a methodology that we can use each year after the cloud seeding program. It would utilize the radar from the Minot NexRad radar, east of the Minot AFB, to look at the dual-polarimetric signatures of hail and heavy rainfall and the spatial and areal extent of that in the seeded areas in Ward County and part of Mountrail County, where the radar signal reaches far enough, and the area downwind where we're not doing any seeding. We would do an evaluation of the effectiveness or the change or the differences in the seeded clouds versus the non-seeded clouds on a year to year basis and try to start building up a caseload of examples that we can start to look at changes in those fields in seeded vs nonseeded clouds. Mr. Langerud has asked the principal investigator to submit a proposal on that topic and met with him in Grand Forks a couple of weeks ago to discuss it. We're hoping to have something delivered by the end of the biennium, June 30, 2017.

The University of North Dakota (UND) was doing airborne measurements and analysis for this project. Final results indicate clouds we have in ND are suitable for hygroscopic

seeding. You need warm enough cloud bases, which we qualify for most days, and cloud condensation nuclei numbers that are high enough that putting these hygroscopic materials in would help to make that cloud more efficient in increasing raindrops.

Currently, there is other ongoing work with UND. Three students are doing work over the next few months and we expect to receive their final reports in the spring.

Collaboration with University of Wyoming proposal to UAE Rain Enhancement Science Program

The United Arab Emirates (UAE) started a $5 million per year annual grant program for rain enhancement science. The first awards were given in January 2016. The University of Wyoming has submitted a proposal. They asked us to partner. Initially they were going to look at glaciogenic seeding. But then after discussion, they decided on hygroscopic seeding as that is more likely to be used by UAE. The proposal was essentially an extension of POLCAST to include the Wyoming King Air aircraft. A modeling group at the University of Wyoming would deploy a Doppler On Wheels (DOW) in eastern ND. Our part would be providing a seeding airplane to seed clouds with hygroscopic materials. They would then be doing all the data collection and analysis. They are expecting a decision around the middle of December. If funded, their budget would be about $1.5 million. We wouldn't be the direct recipient of any of the money but we would benefit from the work being done in ND. If funded, the plan is to go into the field in May 2017 for a 5-week campaign.

RADAR OPERATIONS

Integration of Bowman data into NOAA radar network

We have been running the Bowman radar year-round since 2011. Outside of the four months it's running for NDCMP, eight counties are funding its operations and maintenance the other 8 months of the year. Contracts for 2017 will be worked on with the 8 counties in the next few weeks.

We've had discussion with folks at the National Severe Storms Lab (NSSL) in Norman OK. They have a program called MRMS (multi-radar, multiple sensor). NOAA recognizes there are gaps in their data. So, they put together a way to incorporate other data sets and other instrumentation. They've identified Bowman and Stanley as data sources they would like to access. They've been doing some evaluation of the data. They wish to incorporate the data into MRMS to fill the gap in coverage. They will be incorporating that data into the national radar mosaic.

NOAA NWS surplus WSR-74C spare parts

We finally were able to access NWS surplus radar spare parts. We received the shipment late in the summer. The value was worth $100,000 based on original cost. Our costs were only $400-500 shipping to get the parts to ND.

2016 ARB COOPERATIVE OBSERVER NETWORK REPORT

Status Report and Growing Season Rainfall Totals and Grid Maps

Mr. Brothers reported on growing season (April through Sept) percent of normal rainfall. We have 526 rainfall observers and 231 snow observers. Online reporting increased by 5, now at 175.

In response to a question from Mr. Tupa, Mr. Brothers indicated that he felt the spread (coverage) of the network is fairly even. There are a few trouble spots where it's difficult to find observers simply because there are fewer people out there. He feels the distribution is better than it was 10 years ago.

In response to a question from Mr. Erbele, Mr. Brothers indicated that our observers do snowpack measurements in the same manner that the NWS observers do them. There is inherent error in snowpack measurements though. He feels it highlights the importance of having as many observations as possible to average it out.

There has been discussion with the CoCoRAHS group about incorporating our data into their network in the future.

GPS-Based Snow Reporting

Mr. Langerud reported on work being done with a scientist from the University of Colorado who has been doing measurements of snowpack using GPS base stations and taking the reflected signal to determine the depth of snow. We did a trial with her at 2 sites in eastern ND -- Absaraka and Casselton. We didn't have enough snow to do any real measurements. The goal was to get the snow measurements from her, then go out and do ground truth measurements during the year to see how accurate those results are. She will be doing it again this winter, so we've already setup the data stream. She needs more than 4-5 inches on the ground for it to be enough to discern if it's useful. We could potentially have around 100 remote data sites with this tower system. It will give you snow depth but not snow water content.

2017 MEETING SCHEDULE

The Board directed the staff to set a tentative schedule for 2017 Board meetings. The spring meeting will be tentatively scheduled for April 12th via conference call. The fall meeting will be tentatively scheduled for October 25th in Bismarck.

ELECTION OF OFFICERS

The current officers include Mr. Bodmer as Chair, Mr. Brewer as Vice Chair and Mr. Myrdal as Secretary. Mr. Bodmer called for nominations for offices.

IT WAS MOVED BY MR. TUPA AND SECONDED BY MR. ERBELE TO NOMINATE UNANIMOUSLY THE EXISTING SLATE OF OFFICERS (MR. BODMER AS CHAIR;

MR. BREWER AS VICE CHAIR; AND MR. MYRDAL AS SECRETARY). THE MOTION CARRIED UNANIMOUSLY.

Being no further business the meeting adjourned at approximately 4:30 p.m.

HENRY BODMER
CHAIRMAN

PAUL MYRDAL
SECRETARY

Transcribed by Kelli Schroeder