Citizens Advisory Board (CAB) Meeting
Energy & Environmental Research Center (EERC)
August 26, 2004

CAB Members:
David Burkland
Dave Hagert
Lonnie Leake
Bob Lebacken
Willard Loing
Mary Loyland
John Scott
Dale Stenerson
Don Vellenga
John Younggren

EERC Members:
Beth Bolles
Doug Davidson
Kim Dickman
Lynette de Silva
Heith Dokken
Sheila Hanson
Jim Johnson
Marc Kurz
Corey Maki
Wes Peck
Ed Steadman
Xixi Wang
Kirk Williams

Beth welcomed everyone and started the meeting.

A key activity since the last meeting was hiring a subcontractor to collect detailed light detection and ranging data Light Detection and Ranging (LIDAR), in the Forest River Watershed and all of Walsh County. The LIDAR data has a much higher resolution than the existing, publicly available National Elevation Dataset (NED), formulated by the U.S. Geological Survey (USGS). A disadvantage of NED is that the resolution, the vertical accuracy, is anywhere from 1 to 3 meters and prone to errors especially in flat areas.

Collecting LIDAR data allows for comparison with the NED to determine how those errors affect storage volume determination in our modeling effort. The advantage is the higher resolution, but the drawback is limited data availability here in the Red River Basin. Resolution refers to a grid. A 30 m H 30 m area with one elevation point in it is known as 30-meter data. Features like roads or ditches or rivers might be overlooked if you are averaging land surface

with one elevation value. The higher resolution of LIDAR increases the capability to capture features dramatically.

The LIDAR data were collected for a total of 1627 sq. miles. A key use of this data will be able to conduct and compare storage volume calculations using both NED and LIDAR. The Sandborn Mapping Company is doing the LIDAR for a total cost of $164,000 with $74,000 cost share from the Texas Natural Resources Conservation Service (NRCS). The discounted rate for collection and processing was $101 per sq. mile.

Currently we are developing models for 27 of the 28 watersheds in the Red River Basin and 17 are now complete. The Devils Lake Watershed is excluded since it does not yet contribute to the Red River. The individual models will be integrated into one basinwide model. The models allow us to evaluate small-scale storage for flood mitigation options and the effects utilizing the hydrologic cycle which accounts for precipitation, climate, weather, wind, and solar radiation. In addition, sediment transport, and water quality effects are included.

Many agricultural factors are included in these comprehensive models. The landscape is analyzed based on soil type and land use/land cover and how it influences water run off and ground infiltration. For example, Conservation Reserve Program (CRP) land would have more infiltration then a bare field. Sediment erosion will be lower on CRP. The models we are developing can simulate the processes. The models also have the capability to route runoff through drainage systems and eventually to the Red River.

A benefit of the modeling effort is the multitude of future uses. The models were developed for existing conditions. Later, Waffle storage areas will be designated; then we will run the models to see what the impact and how runoff was reduced as a result of Waffle storage. The models have applications in comparing tilled and untilled farming for runoff and water quality effects. CRP, Wetlands Reserve Program (WRP), and wetland restoration can be studied for flood mitigation potential and water quality benefits. The models can account for weather conditions, both wet and dry, along with effects on specific crops and yields.

Field Trial:

Process:
As the spring melt occurred, water was held for 14 days at “full pool” elevation, and then allowed to exit through the bottom of the standpipe. Full velocity and volume calculations were processed for each culvert with pressure transducers allowing for the measurement of water exiting the culverts. The amount of water stored on this section was calculated to utilize in the models. Based on meteorological data from a weather station on the site, evaporation losses during storage could also be calculated.

Marc displayed images of the field site. The northwest corner of the site held the majority of the water, 60–80 acres. Neighboring the field site was a natural berm and a ditch flowing toward the Red River. A PVC tube with a pressure transducer kept track of the exact elevation of the water in these culverts, so the water from the site to the ditch was measured. In the south side the water didn’t pool up like in the northwest corner; there were more pockets of water, but it was well

drained by channels installed by the landowner. After the gates were opened, the water drained within 42 hours on the south side, while on the north side the water was gone within a day. The existing drainage pattern contributed to the speed of drainage. There was less water in the southwest culvert, since most of the water was in the northwest corner.

At one point after the snowmelt, an ice jam in the judicial ditch north of the site caused water to rise in the ditch and back up in the standpipe into the section. Beth added that there is normally a flap gate there that would prevent the water from coming back up but we needed to remove it to get our water monitoring equipment attached. Once the ice jam broke, the water returned to the elevation of the top of the standpipe within 3–4 hours.

Once the site was draining, the gate was opened enough to allow flows at different levels in the culvert, and to measure water velocity and the amount of water on the site. Due to air cavitation, a culvert with a standpipe extension will not get more than 2/3 full. Smaller culverts were also utilized for water release after the larger one was opened. About 175 acre ft went through the section and approximately 85 ft was held back by storing it at the level of the standpipe. About 90 acre ft of water exited through the standpipe before we started holding it for 14 days. From the meteorological data, 14 to 29 acre ft of evaporation loss was estimated.

Soil and crop analysis:
Water quality sampling and analyses were completed in a preliminary evaluation. Agency Advisory Board Members are now reviewing that evaluation. Soil temperature and moisture data were downloaded from the probes inserted into the ground in November. Soil analysis was conducted for nutrients from ground level down to 42 inches to check for impacts from the standing water. Infiltrometer tests were performed to look for soil compaction and changes in infiltration rates. Soil physical characteristics were analyzed via core samples sent to Interstate Testing.

In November, 42- or 48-inch soil samples were obtained throughout the site and divided into 6-inch increments nutrient analysis and soil classification. The data were consistent, except for the plasticity index, which changed slightly perhaps due to the change in the soil moisture. The soil temperature appears to warm slightly faster on the water-covered areas, as expected. With the water covering some of those sensors, there was less diurnal fluctuation. Different soil types, such as high sand content, and different land use practices will be evaluated in the field trial next spring to see if water consistently draws the frost out faster. From the data gathered, there wasn’t much change in soil nutrients, but there were a few changes in nitrate in the different zones analyzed, which may be due to biological activity between the fall and the spring.

The crops are doing well relative to other land in the area. When the corn matures, crop yields will be evaluated and compared with areas to the east that didn’t store water. Marc noted that the low drainage ditch held water longest, but no impacts to the corn are apparent. That area is the focus of yield estimates followed by locations on higher ground. The south side of the section has sunflowers the look well and will also be analyzed for yield. The landowner didn’t have anything planted on the first 40–50 ft of the field because the ditches needed to be cleaned out and areas of excavated material remained.

Water quality:
Water quality measurements included samples collected up gradient, down gradient, and on the actual site. Based on those comparisons' over a couple hundred different parameters, our conclusion was that the water stored on the land didn't have any negative impact on the soil characteristics. Bill Schuh and Mike Sauer are reviewing the water quality data. The water quality and soil analysis are being considered together for interaction effects. The evaluation will be expanded with data in the Spring of 2005.

Future Activity:
A future activity is signing up land for next year's field trial. The goal is to choose ideal sites of 4–5 parcels in each state, North Dakota and Minnesota. So far, 1 or 2 parcels have been solidified in each state with several others to survey for potential storage. The plan is to evaluate water storage effects on CRP, productive ag land (corn, wheat, and barley), and different soil types, such as areas near the river with heavy clay. The first field trial was one section intended to establish the methodology to apply it on a larger scale for Year 2, which will involve a more rigorous evaluation of water quality and soil characteristics.

Discussion regarding the field trial results:
John asked if evaporation was 29 acre feet. Marc answered that was the calculation over the whole 14 days of water storage. There are a couple different methods with results ranging from 14 to 29 acre ft. It was derived from the surface area, wind speed, and temperatures. The calculated amount, on the high side, was 29 acre ft. John added that it seems like a lot.

Mary asked about the comparisons of the acre-feet numbers. Marc indicated that the amount exiting the culverts was 175 acre ft., so the 29 acre ft is in addition to the 175. There might be some evaporating as its draining out, but the amount exiting that culvert through the ditch and out was 175 acre ft.

Mary asked about the diurnal fluctuation. Marc explained that refers to night and day. At night when it cools down , the land that is not covered with water cools down faster. The part that is covered with water tends to insulate, reducing temperature fluctuations.

Bob asked if it was fall fertilized and Marc answered that it was not. Bob also asked about the data showing the nitrogen and salts. Marc added that the changes are quite small. Bob asked if there is a number where the salt level is of concern, that it is too high for the crop. Beth added there is a sodium adsorption ratio. Bob added it will be interesting to see what the impact is on that crop.

John Scott asked about the sodium on the higher levels. Marc couldn't remember what the depth was there but will check it out and indicated that it was likely done at 2 different levels.

Dave asked whether or not there was a soil temperature difference the day after the water was drained. Marc added that specific dates haven't been analyzed, rather the trends of the water covered and the noncovered sides. The temperature was recorded every six hours from 0–42 inches below ground further broken down into 4-inch horizon H 4-inch horizon on both sides.

Lonnie asked if the nonflooded areas would be an experimental control over the flooded acres since allowing natural flooding in the spring is not a normal seasonal crop practice. The sodium levels could also fluctuate naturally. In the nonflooded area, sodium increased 2.8% and in the flooded areas it was 25%. Lonnie indicated that to know whether the experiment is causing higher sodium levels, it should be compared to field sodium levels that would fluctuate in a flood by an act of God. He also asked whether there would be more tests on this site. Marc answered yes; it is enrolled for next year and we will flood it again.

Dale asked if the 42 inches was the depth for test samples. He noted that for different crops, different levels are used. A trend line would be useful for each crop to understand the economics. Snow depth is a factor; there is a direct relationship to the snow depth. Marc added that we took samples from 0–42 inches.

Corey added that snow depth and water on the section acts like a heat sink. During the day, the soil temperature in the non-frosted soil increases. The frosted section stayed at about 32°F. At night, the air temperature decreases as does the nonfrosted soil temperature. The nonfrosted portion will fluctuate, while the frosted portion stays at 31.9°F. When the water or the snow remains on the section it insulates the ground, keeping the frost on the section longer when it's cold and provides a heat source when it's warm. With a water temperature averaged from 32 to 40°F, the water drew the frost out of the ground faster than the normal air temperature. Monitoring that fluctuation in a section that gets flooded versus a control section would allow for comparison of the water impact on the frost. Bob added it still was 5 days later when the frost left the ground before you could seed.

Corey added that more moisture was infiltrated into the lower part of the soil. Lonnie asked if the amount of water infiltrated into the soil was entered into the calculation of acre feet. Corey answered no. It was assumed that the frost didn't completely come out and determining an infiltration rate in a nonsaturated soil is extremely difficult. Beth and Corey added that we are looking into methods of determining that and that there is an existing method available.

Someone asked if the two fields were the same land owners. Marc answered no it is not the same person. Dave asked if there is a difference, in one being faster or slower. Marc answered that we haven't looked at that and we'll be getting into that. We'll look at what kind of corn they have to qualify the yield.

Outreach Activities

Sheila Hanson gave an update on outreach activities over the past several months. She spoke of various meetings attended by Waffle staff where Waffle presentations were given, including township officer associations, county commissions, service clubs and middle school students. Bethany, Ed, and Sheila attended the Soil & Water Conservation Society National Meeting in St. Paul the end of July, a meeting well attended by NRCS staff. Sheila presented a paper on the landowner survey results and economics subcontractor Andy Manale also presented a paper.

Sheila discussed recent media coverage such as news articles and TV interviews. We also released the Waffle Spring–Summer Newsletter and developments related to the Waffle Web site were made.

Regarding the 4706 landowner surveys mailed to landowners in Wild Rice Watershed, Sheila said that she has received 542 completed surveys, representing an overall response rate of 11.5%. Landowner interest in participating in temporary water storage was found to be related to the following factors: higher perceived risk of another flood, participation in CRP program, younger landowner, and history of holding back water for any reason.

63.3% said they were interested in learning more about the Waffle project. Beth added that the surveys were not sent designated as a Waffle survey, rather the survey was designed to gather opinions about flood management practices in general, and the Waffle was mentioned as one of the last questions.

John suggested that in a future survey, a question be added: "If you are not willing to hold water on your land and if you didn't ditch it, would you be willing to pay someone else to hold your water?"

Landowner Issues/Concerns

Lynette led a brainstorming session on board members issues and concerns. If it is within the scope of this project to address those issues, the Waffle team will do so. We would like to include the issues and concerns in the final report. If the technical and economic feasibility is promising, then other landowner issues may be addressed in a future phase of the project. If the technical and economic feasibility of the study proves successful.

This also serves as a baseline of information. Since the Waffle team frequently meets with and presents to individuals and groups in the Red River Basin, some of the issues and concerns about the Waffle project are known. We would like to take things further and move beyond the barriers that prevent individuals from even considering implementing the water program or, hence we would like to address solutions, given an understanding of the problems. The results of the brainstorming session are encapsulated in the following table:

Concerns related to the Waffle study:
• Application of results to summer floods
• Communication of project results and usefulness of data
• Public perception – change from traditional farming practices
• Skepticism of the Waffle concept
Education:
• General public
• Landowners
• Agencies
Concerns related to potential Waffle implementation: **Economics:**
• Economic feasibility
• Funding reallocation from other agriculture areas to Waffle
• Sufficient size of population to participate with different types of land and demographics in Red River Basin

Farm management and individual landowners:
• Duration of water storage
• Decline in crop values due to later planting dates
• Alkali and salinity effects
• Land reclassification as permanent storage or wetland
• Crop insurance – handling late planting dates
• Differences in farming methods compared to “normal” years
Landowners, counties, townships, etc., working together:
• Drainage issues between landowners and neighbors
• Urban versus rural
• Implementation complexity
• Impacts to roads
Control of potential program:
• Voluntary participation by landowners
• Easements
• Duration of contracts
• Laws and policies
• Organization or agency that might implement a Waffle program

Summary Comments

Beth noted that we plan to include what we learn from outreach in the final product, so that the readers are aware of the problems/concerns in potential implementation. It’s not necessarily our goal to devise solutions, rather to communicate potential solutions and to ensure that those who may implement the Waffle in the future are aware of the key concerns and obstacles. All the input from all our meetings will be compiled into a strategic document summarizing the input and concerns.

Mary asked if there was anyone on your team that is skeptical about the Waffle project. Beth answered that we try to be objective. Though we do not know if the Waffle is economically feasible, it is worth being studied. Implementation would be challenging, but it is useful to first study the feasibility.

Marc added that he does a lot of outreach and has talked to county commissioners. Pennington County originally passed a resolution against the Waffle. They had no idea what the Waffle was; they didn’t have the education about it. He spoke with them 1½ weeks ago and most of them were for the project. It was because they didn’t understand what we were trying to achieve and study in the first place.

Beth added that we welcome your input and review of the project report. Before we make the report public we are waiting for comments back from this board and the Agency Advisory Board (AAB) members. Once we’ve incorporated everyone’s input then we will distribute it to the public if requested.

Bob asked if at some point the survey would be sent out to every landowner in the valley. Beth answered not everyone, rather a sample will be chosen. Also, it's important that we all understand and agree what the key concerns are and what the importance for implementation in the future.

Lonnie asked if Beth could tell about the AAB project feedback. Beth answered that there is some negativity, but the AAB is also an objective group. The majority are waiting to see the study results. We haven't gotten into the outreach/public concerns as much with them as we have with this group.

Beth adjourned the meeting and thanked everyone for coming and that we really appreciate the input.