

**Citizens' Advisory Board (CAB) Meeting  
Energy & Environmental Research Center (EERC)  
February 3, 2005**

CAB Members Present:

David Burkland  
Dave Hagert  
Lonnie Leake  
Bob Lebacken  
Willard Loing  
Sam Martinson  
Dale Stenerson

EERC Members Present:

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

*We regret that because of a computer malfunction, the minutes of this meeting were lost. As such, while the contents of the presentations were reassembled, we were unable to reconstruct the discussions that ensued.*

Beth called the meeting to order and welcomed everyone. She proceeded to give an update of Waffle® related activities.

**Update**

We are nearing the final stretch of the Waffle project. Our last round of funding is set to come in June of this year, with the project completion date in June 2006. We plan on having our last board meeting in the spring of 2006. At that meeting, we will provide documents along with input we have received from the boards. All of your comments will be incorporated into this research. We will need your concluding comments which we will incorporate into our final report.

We are talking about possibly pursuing funding for Phase II – Implementation, which would focus on a subwatershed. We would work toward Waffle implementation, work with the county water boards and the Soil and Water Conservation Districts, and work with the entities to pursue future sources of funding for implementation of the Waffle. Our role would be to actually establish landowners who would like to implement the Waffle on their land and work with county authorities to establish the Waffle approach. We are looking right now at Antelope Creek, which is southwest of Fargo, North Dakota. There have been some studies done, and it does not appear to have much in the way of conventional storage. Topographically, it looks like an ideal place to do Waffle implementation. It has also been mentioned that since we have the light detection and ranging (Lidar) and elevation data collected for the Forest River Watershed, maybe we should consider doing it there. Another potential watershed is Roseau, Minnesota; it has recently been associated with lots of flooding problems. In upcoming meetings, we hope to have more information on this topic.

Our key focus for 2005 is going to be modeling Waffle storage sections. The last 2 years have been focused on developing the base hydrological models that will allow us to evaluate Waffle storage, and now it is time to do it. Another vital component is going to be the economic evaluation effort. We just received a proposal from North Dakota State University (NDSU) to do the entire economic evaluation. Andy Manale has been doing some economic work and also researching existing policies we could use to implement the Waffle. He sent some preliminary economic analyses, but NDSU will complete this effort. Also for 2005, additional field trials are going to be a focus, as well as conducting a basinwide landowner survey. We did one previously in the Minnesota Wild Rice Watershed. This time, the landowner survey will be extended to the entire Red River Basin.

Another focus will be to develop a strategic document that can be used for implementation among its contents will be the information that we collected from the advisory boards and agencies that we have met with. It will have the key recommendations; among them, what needs to be addressed to implement the Waffle, the laws that need to be changed, and other issues of concern.

All of the proposed hydrologic models for the Red River Basin are developed, and most are calibrated. The next step is to work on the mainstem model; toward this end, we have been working on coordinating our efforts with the U.S. Army Corps of Engineers (USACE). USACE will be developing the mainstem model from upstream, and we will be developing it downstream, of Halstad, Minnesota. We will be working with USACE to ensure that we are using the same approach in addressing some of the issues such as breakout flows. There were some areas in 1997 where the flow was quite wide. How do you address those issues in the mainstem model? Also how do you deal with ungauged flow areas? There are a couple of techniques we are using. One is to use nonboundary conditions; the other approach is to add the ungauged flow areas.

The model will be hydrodynamic, and will incorporate key bridges, culverts, major breakout flows and tributaries. Initially, we will use the geometric data from the USACE steady-state Hydrologic Engineering Centers River Analysis System (HEC-RAS) model. Cross sections will be extended if necessary.

In the past 6 months, our outreach has focused on meeting with county commissions; this is now complete. An interesting meeting occurred when we approached the Minnesota Farm Service Agency's (FSA's) head office to get state approval to conduct field trials on Conservation Reserve Program (CRP) land later this year. The county initially gave us approval and suggested we get approval at the state level. We got approval for the field trials, and the Executive Director of the state FSA office was excited about coupling the Waffle with CRP. Jim Johnson has been giving presentations to Future Farmers of America groups at different high schools. This was a recommendation made by this board. Our next focus is going to be on meeting with city councils and revisiting water boards and Soil and Water Conservation Districts.

### **Field Trial Progress Update**

Marc said that since the last meeting, we have done the crop estimation at the field trial site close to Shelly, Minnesota. Our newsletter has some of the results regarding the sunflower and corn

yields. The sunflowers showed identical yield estimates; the corn yields fall within the 5% potential error. There were no adverse effects to yields from the storage of water. However, we did have a very wet spring; therefore, in a year of drought or of average moisture content, the results might be different. The second-year field trial is going on, and we will have different weather conditions to work with. The draft summary will contain the details of every aspect of the field trial from testing of water quality to infiltration rates, evaporation, and crop yields.

With reference to the flood reduction potential, Marc indicated that we measured water elevations in the judicial ditch adjacent to our field trial site. Based on these data as well as the flow measurements that we collected throughout the spring thaw, Xixi estimated the reduction in water depth in the ditch as a result of storage. Coming up with an actual flow number was impeded because we had an ice jam in the ditch during the peak flow period which interfered with our flow measurements. It was determined that there was a 12% estimated reduction in the ditch water elevations. Besides the flow, soil temperature and moisture data were used to determine what the frost depth was at each date. From these data, it was evident that the frost came out significantly faster where there was water storage.

The 2005 field trial locations are near Shelly, Minnesota; Gilby, North Dakota; Lake Bronson, Minnesota; and Lake Agassiz, Minnesota. The Shelly, Minnesota, site is the same as last year. This will allow us to do extended monitoring and take a look at potentially different weather conditions this year to see if we get the same sort of results as we did this past year. We did some modifications on the trash racks.

The Lake Bronson site is CRP land; it has a significant coulee running through it. There is a 52-inch culvert that we are modifying. It is surrounded by a larger county road that is paved that we will hold water up against. Corey Maki is doing a road stability evaluation. Also, we worked with the county to place instruments in the road, so we should be able to assess the impact of water storage on the road when the water is being stored up against it. The site storage is about 150-acre feet; we will probably be flooding 60–70 acres. Corey added that with the trash rack design, we are hoping that we will not experience any of the clogging problems that we had last year. The design is based on one that was provided by the Natural Resources Conservation Service.

Marc continued that the Agassiz site is in the U.S. Department of Agriculture (USDA) southwest corner of the Agassiz National Wildlife Refuge. This site includes about 400 acres of CRP, with the entire site contained within a constructed berm. In the past, the judicial ditch would flood every spring, so a berm was built up to keep the water from going into the section from the refuge. We are looking at 200-acre feet of storage with about a 1.5-ft freeboard. The soil is tight clay that is underlaid by peat. There are four culverts that drain into the judicial ditch; two of the culverts will have standpipes on them and two will only have gates.

The site near Gilby is about 440 acres and is also contained within a berm. There is about 140 acre-feet of potential storage; we estimate that we will be holding 60–70 acre-feet. This section is in the salt flats. Extra soil samples were taken, so we can see how the water impacts salt concentrations. We will be looking at the flood reduction potential and will conduct more site-specific models. Also planned is an evaluation of the impact of water storage on CRP grasses. At the Shelly site, the Waffle team will be looking at crop yields, water quality, impact on the soils, infiltration, evaporation, and road stability.

Marc discussed the permitting issues that were encountered with the watershed districts, ditch authorities, county and state FSA offices, and also the county/state highway engineers. This was all documented as part of the implementation procedure. We are going to complete the instrumentation of these four field sites and anticipate storage in the March–April time frame. We will be preparing the summary and final report from these results.

### **Road Stability of Waffle Affected Sections**

Corey touched on the primary and secondary factors of road stability. The primary concerns are washouts, where moisture content causes the road to fail on top or the whole road structure to shear off. There is also variable surface instability, that is, where the moisture content gets the road so wet that the road surface is affected when traffic drives over it.

The secondary concern is slope stability; once the water is contained in the ditch, the water could infiltrate the slope and weaken its shear strength. Because of the reduced strength, the water, once released, may actually cause the slope to slide off. The other secondary concern is wave action when water is in the ditch. If water were backed up across the entire section, the potential exists for waves to be transmitted across the surface of the water and interact with the slope of the road.

The reason why these are secondary concerns is that they are easier to cope with. With road stability, our contributing factors are steep slopes, moisture content, and proximity to the road. The contributing factors for wave action are wind and moisture content. Wind is an obvious cause, otherwise waves would not exist. We had high moisture content in shoulder material and granular material along the shoulder slope. Prevention methods for wave action would be vegetative cover, geotextiles or fabrics—placing something down, such as riprap.

As for the primary concerns, one of the initial assumptions was that the road would be frozen. A frozen road would be expected to experience little or no weakening as a result of the retained water. To prove this hypothesis for the frozen road, we used data from the Shelly field trial site. These data provided us with frost and moisture information. Corey indicated that we were able to approximate a frost profile. Our region is in a relatively hard-frost area. We expect to see frost at least 4 ft deep. During our retention period, we saw the frost come out of the road from the asphalt surface down to a depth of approximately 14 in. The upper foot to 2 ft of soil can only actually absorb water during infiltration. It also means that while the road is being used as a retaining wall, the core area of the frozen ground itself will be hard. Since it will be frozen, the impact of the water there will be limited. To prove this, the Waffle team will record temperature and moisture throughout the frost zone from the surface to 6 ft deep.

Corey indicated that surface stability was one of the things we wanted to look at; asphalt roads have a tendency to be damaged more as a result of surface instability. The asphalt actually breaks up because the underlying layers are too soft to support the road. For that reason, we chose to monitor the asphalt road at Lake Bronson. We have two locations along County Road 19, a study site and control site. To instrument the road, we used Yellow Springs thermistor probes, dielectric aquameter probes, and moisture sensors.

Eight probes were placed in a cross-sectional configuration at the test and control sites. The probes do not quite extend to the bottom of the ditch; they are actually a little further up on the

slope because it is a paved, two-lane county road. This is carried out on both sides of the road. The temperature probes go 6 ft deep; the moisture sensors were set at 6-in. intervals.

Corey explained that the asphalt was cut to run the sensors below the road. We expect to get the temperature data, moisture data, and retention dates. Using those together, we can develop the actual frost profile. We then can show how far the frost has receded from the surface during our retention period; also, because we have moisture sensors in that range, we will be able to tell how much infiltrated. One will also be able to tell how deep the frost goes into the road. Corey indicated that the data will be available after the field trial runs next year.

## **Lidar**

Wes explained the challenges of trying to determine potential storage basinwide. Wes explained that the best available data sets were utilized; the 30-meter-resolution National Elevation Dataset was integrated with scanned quadrangle maps and a digital version of the public land survey system. These were the key pieces used in the method to look at storage. Each watershed was analyzed individually. Twenty random sections on a watershed basis were evaluated to determine the variation of storage across the watershed. A statistical formula was used to determine how many additional sections should be evaluated. Based on those results, we estimated total volume for that watershed.

Wes mentioned that the Forest River Watershed will be evaluated a little differently since we are collecting Lidar data for that region. We also wanted to look at the topographic expression from the old lake bottom up through the intermediate and upland areas.

Wes commented on the Lidar data delivery. The contractor, Sandborn Mapping, has been responsive to all of our questions. Sandborn is well-known and respected in the industry. This is the largest area that they have done. We are getting the data in areas equivalent to 1/16th of a quarter section. These smaller file sizes make the data more manageable. Sandborn delivered close to 300 gigabytes of data for this analysis.

Wes stated that Kirk Williams collected 105 QA/QC GPS (quality assurance/quality control global positioning system) points across the landscape in different land use categories. The Lidar contract specifies an overall accuracy of 18 cm. This accuracy was confirmed through the QA/QC check. We are also using 2003 USDA photography for QA/QC. Dense cattail, CRP, and wetlands contributed to the largest differences between the LIDAR data and the GPS data.

The price of Lidar has come down from May–September. Beth added that the Lidar was \$100 per sq mi. It would have cost \$500–600 per sq mi to have photography flown at the same time. Beth added that before we distribute the data, we have to provide it to the NRCS and it will do its own QA/QC.

## **Landowner Concerns**

Lynette discussed the results of a survey used to gauge the concerns of this board. The purpose was to identify both individual and social apprehensions about the Waffle study and enhance understanding between the Waffle staff and this board. The results of this evaluation would be used as a means to prioritize concerns and determine where additional resources are needed. The

board identified 25 issues, which included the Waffle concept; outreach; potential Waffle implementation; economics; farm management and individual landowners; landowners, counties, townships, etc., working together; and control of potential program. This was followed by the board ranking these apprehensions to prioritize the degree of concern and relative importance.

Lynette indicated that 15 of the 18 board members responded. The board's most significant concerns (according to the actual tally) were the education of landowners (13); drainage issues between landowners and neighbors (12); the fact that the Waffle study does not apply to summer floods (11); the possibility of land reclassification to permanent storage or wetland (11); the economic feasibility of the Waffle concept and its implementation (10); duration of water storage on fields (10); crop insurance issues related to handling late planting dates (10); and whether there will be sufficient voluntary participation by landowners (10).

It was indicated that all of the concerns would be addressed to varying degrees. Lynette presented a listing of the concerns separated into short-term and long-term project goals. This phase of the project would constitute short-term goals which can be categorized as education/outreach, the economical feasibility of the Waffle, and the effects of the Waffle approach on the soil and roads. Apprehensions that will only be documented, but not acted on, at this time would constitute long-term goals; these will be addressed at a later date should implementation be considered. For a complete overview of landowner concerns, please see attachment.

Beth thanked everyone for coming and adjourned the meeting.

## Summary of Landowner Concerns

To evaluate the Waffle<sup>®</sup> concept fairly, the Waffle staff adopted several approaches to gauge the concerns that landowners have with respect to the concept and the work that has occurred to date. One approach involved consulting with the Waffle's Citizens' Advisory Board (CAB). The purpose of this evaluation was to identify both individual and social apprehensions about the Waffle study and enhance understanding between the Waffle staff and the 18-member board, which consists of representatives from local communities and the region, including farmers and landowners. This evaluation prioritized these concerns to determine where additional work is required and what resources are needed in terms of time, effort, and funds and also helped to document this information in the Strategic Report.

The concerns listed by the CAB on behalf of individual board members and their communities amounted to 25 issues that could be broadly grouped into the following categories: the Waffle concept; outreach; potential Waffle implementation; economics; farm management and individual landowners; landowners, counties, townships, etc., working together; and control of potential program (Table 1).

At a later date, the board members ranked the listed concerns as either low, moderate, or significant. No ranking on a returned form implied that a particular issue was of "no concern." In the case of members responding twice, only the second, later, response was tallied.

Fifteen of the 18 board members responded. At least ten CAB members ranked all concerns as significant and/or moderate. Members were 100% in accord with the following concerns, deeming them significant and/or moderate: the education of landowners; whether there will be sufficient voluntary participation by landowners; duration of water storage on fields; crop insurance issues related to the handling of late planting dates; and drainage issues between landowners and neighbors (Table 2).

The CAB's most significant concerns (according to the actual tally) were the education of landowners (13); drainage issues between landowners and neighbors (12); the fact that the Waffle study does not apply to summer floods (11); the possibility of land reclassification to permanent storage or wetland (11); the economic feasibility of the Waffle concept and its implementation (10); duration of water storage on fields (10); crop insurance issues related to handling late planting dates (10); and whether there will be sufficient voluntary participation by landowners (10).

While the entire list represents legitimate concerns of the community as determined by the CAB, concerns that received a high tally among the board served to prioritize the degree of concern. This ranking provides a level of relative importance of the concerns and should allow the Waffle staff to focus resources to address these specific needs and, by so doing, maximize the benefits.

The board has indicated that among its major concerns is the fact that more education needs to be geared to landowners and that there is a general perception among the public that

**Table 1. Citizens' Advisory Board Member Concerns Form**

	<b>Significant Concern</b>	<b>Moderate Concern</b>	<b>Low Concern</b>
<b>Concerns Related to the Waffle7 Study:</b>			
Application of Results to Summer Floods	G	G	G
Communication of Project Results and Usefulness of Data	G	G	G
Public Perception – Change from Traditional Farming Practices	G	G	G
Skepticism of the Waffle Concept	G	G	G
<b>Education:</b>			
General Public	G	G	G
Landowners	G	G	G
Agencies	G	G	G
<b>Concerns Related to Potential Waffle Implementation:</b>			
<b>Economics:</b>			
Economic Feasibility	G	G	G
Funding Reallocation from Other Agriculture Areas to Waffle	G	G	G
Sufficient Size of Population to Participate with Different Types of Land and Demographics in Red River Basin	G	G	G
Decline in Crop Values Due to Later Planting Dates	G	G	G
<b>Farm Management and Individual Landowners:</b>			
Duration of Water Storage	G	G	G
Alkalinity and Salinity Effects	G	G	G
Land Reclassification as Permanent Storage or Wetland	G	G	G
Crop Insurance – Handling Late Planting Dates	G	G	G
Differences in Farming Methods Compared to “Normal” Years	G	G	G
<b>Landowners, Counties, Townships, etc., Working Together:</b>			
Drainage Issues Between Landowners and Neighbors	G	G	G
Urban Versus Rural	G	G	G
Implementation Complexity	G	G	G
Impacts to Roads	G	G	G
<b>Control of Potential Program:</b>			
Voluntary Participation by Landowners	G	G	G
Easements	G	G	G
Duration of Contracts	G	G	G
Laws and Policies	G	G	G
Organization or Agency that Might Implement a Waffle Program	G	G	G

changes from traditional farming practices will need to occur if the Waffle were implemented. A prominent concern is that the Waffle study is not addressing summer floods. The board places great emphasis on the drainage issues that would ensue between landowners and neighbors if the Waffle concept were implemented. Also, there is great apprehension about the length of time water would be stored on fields, how crop insurance would be addressed in the case of late planting dates, and whether this would prompt reclassification of land to wetlands or permanent storage. Furthermore, the board showed considerable concern as to whether enough voluntary participation by landowners would occur, and in the event that it does not, how that would affect

**Table 2. Waffle® Citizens' Advisory Board (CAB) Member Concerns by Percentage**

Concerns	Table 2. Waffle® Citizens' Advisory Board (CAB) Member Concerns by Percentage						CAB Member Concerns by Tally					
	Significant Concern	Moderate Concern	Significant to Moderate Concerns	Low Concern	No Concern	Total	Significant Concern	Moderate Concern	Significant to Moderate Concerns	Low Concern	No Concern	Total
<b>Concerns Related to the Waffle Study:</b>												
Application of Results to Summer Floods	73	7	80	13	7	100	11	1	12	2	1	15
Communication of Project Results and Usefulness of Data	40	27	67	20	13	100	6	4	10	3	2	15
Public Perception – Change from Traditional Farming Practices	53	40	93	0	7	100	8	6	14	0	1	15
Skepticism of the Waffle Concept	47	40	87	13	0	100	7	6	13	2	0	15
<b>Education:</b>												
General Public	33	53	87	13	0	100	5	8	13	2	0	15
Landowners	87	13	100	0	0	100	13	2	15	0	0	15
Agencies	33	53	87	13	0	100	5	8	13	2	0	15
<b>Concerns Related to Potential Waffle Implementation:</b>												
<b>Economics:</b>												
Economic Feasibility	67	27	93	7	0	100	10	4	14	1	0	15
Funding Reallocation from Other Agriculture Areas to Waffle	60	27	87	13	0	100	9	4	13	2	0	15
Sufficient Size of Population to Participate with Different Types of Land and Demographics in Red River Basin	53	47	100	0	0	100	8	7	15	0	0	15
Decline in Crop Values Due to Later Planting Dates	60	33	93	7	0	100	9	5	14	1	0	15
<b>Farm Management and Individual Landowners:</b>												
Duration of Water Storage	67	33	100	0	0	100	10	5	15	0	0	15
Alkalinity and Salinity Effects	47	27	73	27	0	100	7	4	11	4	0	15
Land Reclassification as Permanent Storage or Wetland	73	7	80	20	0	100	11	1	12	3	0	15
Crop Insurance – Handling Late Planting Dates	67	33	100	0	0	100	10	5	15	0	0	15
Differences in Farming Methods Compared to “Normal” Years	33	40	73	20	7	100	5	6	11	3	1	15
<b>Landowners, Counties, Townships, etc., Working Together:</b>												
Drainage Issues Between Landowners and Neighbors	80	20	100	0	0	100	12	3	15	0	0	15
Urban Versus Rural	33	40	73	27	0	100	5	6	11	4	0	15
Implementation Complexity	40	47	87	13	0	100	6	7	13	2	0	15
Impacts to Roads	47	33	80	20	0	100	7	5	12	3	0	15
<b>Control of Potential Program:</b>												
Voluntary Participation by Landowners	67	20	87	13	0	100	10	3	13	2	0	15
Easements	47	40	87	13	0	100	7	6	13	2	0	15
Duration of Contracts	47	40	87	13	0	100	7	6	13	2	0	15
Laws and Policies	47	47	93	7	0	100	7	7	14	1	0	15
Organization or Agency that Might Implement a Waffle Program	60	33	93	7	0	100	9	5	14	1	0	15

the program if it is implemented. The economic feasibility, legal aspects in terms of laws and policies that would need to be in effect and/or modified, and the organization that would implement the Waffle program are important considerations of the board.

All of the concerns must and will be addressed to varying degrees, governed by the board's prioritization, along with other resources, such as time and funds. Within the present time frame, not all concerns can be addressed. Table 3 lists concerns that will be continued in this phase of the project (short-term goals) and concerns that will be documented, but not acted on, at this time (long-term goals). The latter concerns will be addressed at a later date should implementation be considered. These concerns will only be documented in this Strategic Report, a final deliverable of the Waffle study.

The remainder of the concerns listed in Table 3 will continue to be addressed because they are within the scope and limit of this phase of the study. Also, these efforts may need to be continued should implementation be considered. These apprehensions can be categorized as education/outreach, the economical feasibility of the Waffle, and the effects of the Waffle approach on the soil and roads. The next step is to work with the board to develop solutions to these apprehensions by determining what is needed to alleviate a concern and developing an action plan for each item.

**Table 3. Time Line for Addressing Waffle® CAB List of Landowner Concerns**

<b>Concerns</b>	<b>Continue to Address</b>	<b>Only Documented in Final Report</b>
<b>Concerns Related to the Waffle Study:</b>		
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	√	
<b>Education:</b>		
General Public	√	
Landowners	√	
Agencies	√	
<b>Concerns Related to Potential Waffle Implementation:</b>		
<b>Economics:</b>		
Economic Feasibility	√	
Funding Reallocation from Other Agriculture Areas to Waffle		√
Sufficient Size of Population to Participate with Different Types of Land and Demographics in the Red River Basin	√	
Decline in Crop Values Due to Later Planting Dates	√	
<b>Farm Management and Individual Landowners:</b>		
Duration of Water Storage	√	
Alkalinity and Salinity Effects	√	
Land Reclassification as Permanent Storage or Wetland		√
Crop Insurance – Handling Late Planting Dates		√
Differences in Farming Methods Compared to “Normal” Years		√
<b>Landowners, Counties, Townships, etc., Working Together:</b>		
Drainage Issues Between Landowners and Neighbors		√
Urban Versus Rural		√
Implementation Complexity		√
Impacts to Roads	√	
<b>Control of Potential Program:</b>		
Voluntary Participation by Landowners		√
Easements		√
Duration of Contracts		√
Laws and Policies		√
Organization or Agency that Might Implement a Waffle Program		√