DOUBLE BAYOU WATERSHED PARTNERSHIP
Stakeholder Meeting 7

October 21, 2014
5:30 – 7:30 PM
Double Bayou Community Building

MEETING SUMMARY

Stakeholders: David Boyd, Linda Broach, Clay Dean, Tom Douglas, Alice Durst, Keith Durst, Mattie Edwards, Leroy Ezer, Becky Fancher, Clint Fancher, Justin Jenkins, Charles Johnson, Scott Jones, David Manthei, Lisa Marshall, Creola Moore, Bob Scherer, Mary Beth Stengler, Bertha White, Kay Wilcox, Pudge Wilcox

Team Members: Ryan Bare (HARC), Abby Ficklin (Shead), Stephanie Glenn (HARC), Brian Koch (TSSWCB), Brandie Minchew, Linda Shead (Shead)

1. Welcome, Introductions, and Agenda Review

Linda thanked everyone for attending and Chambers County for providing meeting support: Precinct 2 for the building, Emergency Management for the screen, and Economic Development Office for the sound system and set up of the tables and chairs.

She then reviewed the agenda. The results of the SELECT computer modeling, which HARC, Stephanie's group, did to predict where bacteria from identified sources might land in the watershed, came through input from the workgroups. The new bacteria monitoring results are from nearly a full year's worth of data, collected by the U.S. Geological Survey and then analyzed by HARC.

She reminded everyone of the availability of refreshments, and started self-introductions. Before turning over the program to Stephanie, she noted the reference materials available and the flyer about an upcoming septic system workshop offered by AgriLife in Dickinson.

2. Review and Stakeholder Comments on SELECT Model Results for Potential Bacteria Contributions

Stephanie noted first that the SELECT model results to be presented are based on input from the workgroups, including recommended changes (in source estimates). Landcover is key, because the model predicts the potential load of bacteria in subwatersheds, based on the land cover and the numbers of bacteria sources that the stakeholders have determined would be there. The model works by subwatershed basins, so these are outlined in black on the model maps. Also based on stakeholder input at the workgroup meetings, different scenarios were run – typically an *upper scenario* and a *lower scenario*, based on the maximum estimate of the number of sources (e.g., deer, cattle, septic systems, etc.) and the minimum estimate of the number of sources.

The first slides represent the potential total bacteria outputs of all the sources, in the *upper* and *lower scenarios*. Stephanie then explained how the information on the slides is displayed. The color scheme shows the relative potential bacteria load in the different subwatersheds, with yellow for the subwatersheds with the highest potential load (larger number on the legend) and dark blue for the subwatersheds with the lowest potential load (smaller number on the legend). The pie chart in each subwatershed shows the ratio of potential load sources in that subwatershed. The units of bacteria are "CFUs," meaning colony forming units, which is how the bacteria are counted. The potential numbers of bacteria are shown in three different ways: 5.4×10^{12}, which is the same as 5,400,000,000,000, or 5.4 trillion.

The power of SELECT is showing the possible locations of the sources and the ratios in comparison to one another. The model will be used as an aid in placement of BMPs (Best Management Practices), since limited funds will require putting the BMPs where they will do the most good.

(For each category of source described below, a flip chart table showed the landcover and density that the workgroups had decided in a previous meeting were best inputs for each scenario. These are presented ahead of the appropriate section.)

Potential Source	***Where Applied***	***Source Factor***		
		Upper Scenario	***Middle Scenario***	***Lower Scenario***
WWTP (Wastewater Treatment Plant)	*(based on levels observed at the plant)*	*(highest rain event)*	*(permit limit)*	*(dry-weather geomean)*
		24,000 CFU / 100 mL	126 CFU /100 mL	3.5 CFU /100 mL
OSSF (Onsite Sewage Facility) (Septic System)	*(based on age of area septics)*	*Upper Failure Rate*		*Lower Failure Rate*
	1-15 yrs	40%		30%
	16-30 yrs	40%		40%
	≥ 31 yrs	50%		50%

Wastewater Treatment Plant

The first source presented was the wastewater treatment plant (WWTP). From the recommendations of the Wastewater Workgroup, three scenarios were run. The *lower scenario* is based on the bacteria levels (concentrations) under dry weather conditions. The "geomean" of those bacteria levels was used, which is an average that emphasizes the middle ground over any more extreme values, and was 3.5 CFU (per 100 mL). The *middle scenario* used the permitted effluent level of bacteria, or 126 CFU (per 100 mL). For the *upper scenario*, the workgroup agreed on using the highest observed bacteria level, which occurred during a rain event, and was 24,000 CFU (per 100/mL). (See table above.) These three different levels of bacteria from the WWTP source resulted in total potential bacteria loads, in that subwatershed, of: 1.8 trillion CFU for the *upper scenario*, 9.5 billion CFU for the *middle scenario*, and 2.7 million CFU for the *lower scenario*. The wastewater treatment plant has a very big difference in potential between the 3 scenarios, which reflects a difference in how the plant operates under "standard" conditions and what happens with a rain event. Some of the other sources don't show nearly such a big difference between scenarios.

<u>Septic</u>

For the septic system loads, the Wastewater Workgroup developed two scenarios, which were tweaked a bit after the second workgroup meeting. As a reminder, the workgroup had mapped out all the septic systems in the area, and then applied age ranges to those septic systems from their local knowledge of the area. They were grouped in age ranges of: 0-15 yrs (newer septics), 16-30 years, and then anything older than 31 years. (The age is represented by the color of the dots on the map.) The age ranges stayed the same for both scenarios, and the difference was the failure rate assigned to each group. The *upper scenario* was assigned a 40% failure rate to the newer ones, 40% to the middle, and 50% failure rate to the older ones. The *lower scenario* assigned 30% failure rate for the newer ones, 40% for the middle and 50% to the bottom. (See table above.) SELECT inputs for septic systems are based on three different factors: type of soil, age of septic system, and the failure rate. Soil type does not vary that much between sub-watersheds: the soil generally just transmits the septic effluent right to the bayou. The *upper scenario* shows a max possible of 4.7 billion CFUs of bacteria in one sub-watershed, which is the highest potential load for any one sub-watershed. For the *lower scenario*, it is 4.6 billion CFU, the lowest potential load for any one sub-watershed.

Potential Source	***Where Applied***		***Source Density***	
	Landcover	***Location***	***Upper Scenario***	***Lower Scenario***
Cattle	*Grassland / Pasture and Scrub / Shrub*	*Upper*	*7 ac / AU*	*8 ac / AU*
		30 ac	1 ac / AU	
		Lower Middle	9 ac / AU	
		Lower (2 sections)	12 ac /AU	15 ac / AU
Horses	*Grassland / Pasture and Scrub / Shrub*	*Liberty Co.*	100 ac / Horse	
		Chambers Co.	125 ac /Horse	
Goats	*Grassland / Pasture and Scrub / Shrub*	*Liberty Co.*	11 Goats(even)	
		Chambers Co.	200 Goats (even)	

<u>Cattle</u>

The Ag Workgroup decided on different stocking rates based on location within the watershed. The total cattle for the watershed calculated this way (by stocking rates per area) ended up being very close to that predicted for the total watershed by Texas Ag Statistics. The different stocking rates match the different hatch colors in the landcover map. The stocking rate densities ranged from as low as 15 acres per animal unit (AU) to as high as 1 acre per AU. (Note: 1 Animal Unit = 1 cow + 1 nursing calf.) Two scenarios were run, with stocking rate differences in some of the areas. The stocking rates are applied only to the designated landcover uses that are in those sub-watersheds – only grassland / pasture and scrub / shrub. For the *upper scenario*, the SELECT output shows the max potential bacteria load for any one sub-watershed as 1.2 trillion CFU, and 21 billion CFU as the lowest potential load for any sub-watershed. Those numbers change slightly for the *lower scenario*: 3.7 trillion CFU for the highest potential load, and 17 billion CFU for the lowest.

<u>Horses</u>

The Ag Workgroup considered the number of horses from the 2012/2013 Census of Agriculture, which was 294, and agreed that was reasonable. They decided to apply them evenly to the land cover for horses, which is the same as for cows (grassland/pasture and scrub/shrub). The model output showed the highest potential load from horses for any one subwatershed as 9.6 billion CFU, and the lowest potential as 87 million CFU for any one subwatershed.

<u>Goats</u>

For goats, 11 goats in the Liberty County portion of the watershed were determined from Texas Ag Statistics. The Ag statistics actually didn't show any goats for Chambers County, but the workgroup said that's not quite right, and suggested 200 goats for the watershed. A total of 211 goats was applied to the same landcover as for cattle and horses – grassland/pasture and scrub/shrub. The model output showed the highest sub-watershed as 31 million CFU for potential load, and the lowest sub watershed as 280 million CFU for potential load.

Potential Source	***Where Applied (landcover)***	***Source Density***	
		Upper Scenario	***Lower Scenario***
Deer	Mixed Forest & Forested Wetlands	1,000 ac / 5.15 Deer	
Feral Hogs	Water areas: Streams +100 m range & Flooded fields	33 ac / Hog	
	Rest of Watershed	50 ac / Hog	70 ac / Hog

<u>Feral Hogs</u>

There are not any Texas Ag statistics on feral hogs, but there have been surveys done by groups out of the Texas Water Resource Institute and Texas A&M. They estimated a high density for hogs as 33.3 acres per hog; median as 50.7 acres per hogs; and the low as 70.1 acres per hog. The land use was decided on in the workgroups (Ag and Recreation). Feral hogs don't have sweat glands, so they tend to congregate where there is water; thus, all waterways are possible congregating areas for the feral hogs. The other landcover category that stakeholders determined where hogs would congregate was rice fields, since they are flooded, and the workgroups suggested there have been a lot of feral hogs in rice fields. For the *upper and lower scenarios,* 33.3 acres per hog was used as input density for rice fields and waterways, with a 100-meter range around all the waterways. The difference between the two scenarios is that 50.7 acres per hog was used for the rest of the watershed in the *upper scenario*, and 70.1 acres per hog in the *lower scenario*. In the *upper scenario,* the highest subwatershed load showed a potential bacterial load of 1.1 trillion CFU and the lowest had a potential bacterial load of 30 million CFU. For the *lower scenario*, 1 trillion CFU was the highest potential subwatershed load, and the lowest potential subwatershed load was 22 million CFU. Thus, there is not a huge difference between the two scenarios.

<u>Deer</u>

Deer are surveyed by TPWD through what they call a Resource Management Unit (RMU). Using the numbers for the RMU for the Double Bayou watershed, the number of deer for the watershed was calculated – 313. The workgroups (Ag and Recreation) decided to apply that number evenly over the landcover associated with deer, which was decided to be the mixed forest/forested wetland category. The potential highest bacteria load for a sub-watershed was 1.9 billion CFU, and the potential lowest bacteria load for a sub-watershed was 3.3 million CFU (only one scenario for deer).

<u>Summary Totals</u>

The Total Watershed Sum Potential Daily CFU table shows the highest potential sum for the entire watershed, per source per day. The SELECT model adds up the loads from each source in each sub-watershed to get this one number.

The take-away from this chart is not that any one thing is good or bad, but what are the differences that can help determine what BMPs (Best Management Practices) would work. For example, the wastewater treatment plant had the biggest difference between the scenarios, and it would be best to choose the BMPs that work in the worst possible situation. Also, again, BMPs are the potential management strategies that can help with the potential load on the ground. With feral hogs, they might have a lower potential load, but they congregate in the water, so it's likely that more of that load is getting in the water than from another source (such as cattle) that might show a higher potential load on the ground. As well, it is going to be two entirely different BMPs used for those sources. Since cattle are very important for the community and will continue to be so, the answer may be thinking of ways to move them away from the stream. The same probably cannot be said for feral hogs, as folks generally will not want to keep the feral hogs.

This was the sum of three workgroup meetings on SELECT, and thanks go to those who participated in those meetings. The results here include workgroup ideas and suggestions for changes in the numbers for the model.

<u>Questions?</u>

Q: On your pasture land, you calculated the cattle on land. What about land that is pasture that has nothing on it? It's just sitting there.

A: Stakeholders at workgroup meetings and at the last general meeting identified where there are cows and where they are not. So, pasture that isn't fenced would be marked, and cows would not be put there in the model. Also, average stocking rates were used to take into consideration that cows may be moved from field to field.

Q: Of the percentage of pasture land, what percent/number did y'all take out that was not being used for cattle?

A: That is a good question. We have those pieces of the map marked off, and we will see if we can figure that number.

Break

3. Results of New Bacteria Monitoring in Double Bayou

As noted, there is now about a year's worth of sampling done now, so some of the initial results of bacteria can be presented, especially since it will apply to the SELECT modeling results.

What's Been Sampled

E. coli is a rod-shaped bacterium, and it is usually found in freshwater samples. For the Double Bayou watershed, that means East Fork Upper. The second type of bacteria that has been sampled is Enterococci (or Entero), which is more of a spherical-shaped bacteria, and it is associated with tidal water samples. For the Double Bayou watershed, that is pretty much everywhere else. Thus, the Upper East Fork is the non-tidal site (for *E. coli*), and the wastewater treatment plant outfall, Lower East Fork, and both West Fork stations are tidal (Entero). As a reminder, both of these types of bacteria indicate a possibility of disease-causing pathogens, and that is why they are monitored by the State.

Regarding units of bacteria, SELECT uses CFU (colony-forming units), but labs count bacteria samples in MPN, which is Most Probable Number, and that is with the culture test. It translates to the same thing as CFU and is just a nomenclature type of thing. When talking about sampling, the units will be MPN per 100 mL, because these are lab test/culture tests, so the results come out in MPNs.

All the results shown are from samples during the time period of October 22, 2013 to August 12, 2014, and this is the full quality assured dataset. It includes two types of sampling. Routine sampling is scheduled. Currently, it includes approximately twice monthly sampling at all 5 stations. Routine sampling is generally used to assess baseline conditions. The second type of sampling is for a targeted rain event, and this is unscheduled sampling. It occurs specifically during a rain event and often shows the worst case scenarios of bacteria loads. That is so the max that could possibly be seen (for applying BMPs) can be known. Also, it can sometimes help identify sources of bacteria that may not be seen in dry weather conditions.

The map shows the sampling stations: two on each fork – East Fork Upper at FM 1663 and East Fork Lower at Carrington Road; West Fork Upper at FM 2936 and West Fork Lower at Eagle Ferry – and one at the Anahuac Wastewater Treatment Plant outfall ditch. The initial sampling results presented today include 17 routine events – the scheduled ones for baseline assessment – and 4 targeted rain events. The 4 targeted rain events occurred on: 10/31/2013, 2/26/2014, 5/13/14 and 5/27/14. Note that the10/31/2014 targeted rain event was measured for 0.53 inches; the day after, 11/1/2013 actually had greater precipitation at 4.4 inches but samples were not taken on the November date. The results are presented from north to south, each station by itself, with two graphs each: one will show just bacteria results and the other will show bacteria and precipitation.

<u>Questions</u>

Q: The one for the wastewater treatment plant is not actually out on the bayou itself, right? It's on its way to the bayou, so if something is coming down from upstream, you wouldn't see it there, right?

A: Yes, it's in the ditch flowing to the bayou. So, it's not upstream of the bayou, it's the ditch from the treatment plant to the bayou.

Q: Why are there only 17 routine samples? Shouldn't there be 100?

A: Our target was twice monthly. That ended up with 17 routine sampling events per station (total of 85 samples for the whole watershed) and 4 rain events per station.

<u>East Fork Upper</u>

East Fork Upper is the first set. For each graph, the date is across the bottom on the x-axis, and on the y-axis, which is the vertical axis, is shown the bacteria in MPN/100 mL. *E. coli* is shown for non-tidal, and Entero for tidal. For the precipitation graphs, rain is on the secondary y-axis in inches.

On the graphs, there is also a reference to a benchmark. When analyzing data like this, it's often helpful to have a reference to know what is high. Before 2012, TCEQ had a single sample criterion for bacteria, but after 2012, TCEQ moved to the geomean instead of a single sample. The geomean will be shown later.   For these graphs, the reference, or benchmark, that is used is the old level, because it indicates there could be a problem for human health. For any single sample of *E. coli,* that would be over 394; and for any single sample criteria of Entero, that would be 89.

For East Fork Upper, there are about 7 samples above the benchmark. Two things can be seen with the precipitation graph for this one. There is initial flushing after a large rain starts, and how much bacteria might be running off to the bayou depends not only on the size of the rain event, but also on how many days it's been since the last rain event (as well as the bacterial load on the ground). That can make a big difference in what is washed off the land.

<u>East Fork Lower</u>

East Fork Lower brings us to tidal, so now the graph is switched to Entero. There are more samples above the benchmark – about 12 or so. There was an observed max of 4,400 MPN/100 mL.

<u>Wastewater Treatment Plant</u>

(Note: There is a break in this graph, with no samples between 4,500 and 6,500 MPN/100 mL.) This station only has about five samples above the benchmark, but the ones that are over are significantly over, and the 7,000 MPN/100 mL sample was one of the highest highs overall for all of the sampling.

West Fork Upper

The West Fork stations have a benchmark for Entero (89 MPN/100 mL). There are five samples *under* the benchmark for West Fork Upper.

West Fork Lower

West Fork Lower follows the same kind of pattern. There are 11 samples above the benchmark. This is one of the areas where tidal interactions will be looked at, as well.

Geomean Graph

The geomean graph shows how the sampling stations compare to the State bacteria criteria, which are what the State would use to assess these waterbodies. The Upper East Fork is blue for *E. coli*, with a geomean criterion of 126 MPN/100 mL, and a geomean of 112.2 for the samples. The rest of the stations are green for Entero, which has a criterion of 35 MPN/100 mL. Geomeans are calculated only for routine samples for State assessment, to represent the waterbody under normal conditions. This graph includes analysis only for the 17 routine samples. The tidal bayou stations all are above the criterion. The wastewater treatment plant outfall ditch for these routine samples comes in well below the criterion.

Seasonal Variation Table

The focus of the Seasonal Variation table is the line for the total percentage above the benchmark by season. For the whole watershed, 65% of the samples exceed the bacteria benchmark number during the fall months (10/22-11/30, in this case), compared to 28% in winter, 27% in spring, and 36% in summer. While the high percentage (65%) is for only 20 samples – not a full set yet – it could help in the discussion for BMPs. This is something that will need to continue to be assessed as more monitoring data come in.

Map/Graph Results of Bacteria by Sampling Station

This first map is of routine sampling – that is, the scheduled sampling. Each pie chart has a segment that shows the total number of samples at each station, and the red pieces of the pie are those samples that came in above the benchmark. How the stations are doing can be compared to one another.

The second map shows the results for the targeted rain event sampling. In blue, is the Anahuac rain gauge, with the size of the column indicating the size of the rain event. The size of the columns at the sampling stations is indicative of the amount of bacteria measured for that water quality sample. One interesting result is that the second rain event was by far the largest, but did not necessarily produce the largest bacteria samples. Whereas, the third rain day had a larger dry period before it, and resulted in higher bacteria samples.

Summary

One takeaway is that the geomean results do have some high numbers for those (mostly) dry weather samples. It shows what is needed, in terms of targeting some of the BMPs.

The targeted rain event results show, so far, some of the highest numbers, and that is what would be expected – those are the highest highs. The bacteria samples showed that not just the size of the rain event, but also the days since the last rain event, can effect results. Sometimes with bacteria, people want to prepare for the possible highest rain event because that might be the highest possible bacteria that could be coming into the bayou. The variation of bacteria over season shows a possible fall pattern, but, it's too early to say for certain. It might be interesting to discuss this in terms of some of BMPs and what might be possibly going on in the watershed during that time frame.

At future meetings, some of the other constituents will be discussed – dissolved oxygen and nutrients, which include chlorophyll-a. Sampling is continuing now, for both routine and targeted rain events. Also, 24-hour dissolved oxygen monitoring has begun. That is where changes in DO during the day can be seen, including any drops or spikes.

4. Questions/Discussion of Bacteria Sampling Results

Q: What is chlorophyll-a?

A: Chlorophyll-a , and another called pheophytin-a, are related. A lot of time, those will be seen with algae blooms. These are difficult to pin down, but sometimes they show relationships between some of the nutrients – it can tell something more about the water quality.

Q: In all of these samplings, they were only looking for bacteria?

A: No, every time they go out and take a sample, it goes to the lab for analysis for a whole suite of constituents: bacteria, the nutrients – which are phosphates, nitrates, phosphorous, chloride, etc. There are about 56 or so constituents. These are being presented to you in 4 or 5 groups. Plus, the focus today on bacteria is because that's one of the main ones for which the bayous are listed. Dissolved oxygen is the other one it is listed for, and another thing about dissolved oxygen is that it can be affected by other things like bacteria or nutrients. Plus, it would be best to show the dissolved oxygen results when the 24-hour data is available.

Q: Since we are talking about bacteria, I heard about red tide, and that it has something to do about our climate and maybe our allergies?

A: The red tide is algae, and it is a bloom of algae, which is a sudden growth. It's red sometimes, depending on the species. That particular algae puts out toxins, so fish might die or have trouble breathing. Algae blooms occur naturally, and when they are tracked, TCEQ tries to let people know. While red tides are naturally occurring, they do seem to be happening more often, but it's not clear whether reducing nutrients helps reduce red tides.

Q: Are the algae freshwater or saltwater?

A: The red tide algae are saltwater, and the bayous are tidal up to the upper part of the East Fork. They may not always have a lot of salt, depending on the tides (and rain).

Q: The Upper East Fork uses *E. coli*, and the rest use Enter?

A: Yes.

Q: But it's not like both bacteria can't be found in both places…

A: Both bacteria are indicative of the potential presence of human waste, and thus risk of pathogens, and both can live in freshwater. However, *E. coli* has been shown in studies to be bit better at indicating human waste in freshwater. So the agencies, wanting to pick the best available, chose Entero as the indicator for saltwater and *E. coli* for freshwater.

Q: I'm use to thinking of bacteria levels coming from sanitary sewer overflows. Can you assume the same thing in this system – from the runoff – and would that relate to your BMP selection at all?

A: Yes, that was part of the example of those days when it's been a long time since the last rainfall. That is why, even though the rain fall wasn't that high, bacteria was way up because it had been a number of days since the last rain, and it's washing everything off the land. Whereas, if there was rain yesterday, and the day before, and so on, then the first day after the rain would get the most bacteria, and after that, not so much.

Q: What is the effect of rainfall on septic systems? Does it flood them?

A: When the ground is saturated, a septic system that has not been properly maintained may not work as well.

5. Wrap-up and Next Steps

The next step will be bringing back the dissolved oxygen and some other water quality test results. Another thing will be to have the workgroups meet, once the results are available from those tests, so that the information presented tonight on what is in the water can be combined with where the bacteria is most likely to land. Examples might be: deciding where to emphasize feral hog control for the biggest impact; whether to emphasize education on septic system maintenance; how to help the wastewater treatment plant that works well under normal conditions but gets overwhelmed with heavy rainfall.

Knowing that next month starts a busy holiday season, there's a question of when to meet next – whether to wait until early next year. Another option would be to meet Tuesday, Nov. 18, to talk about the rest of the water quality results, and then, in January, have the workgroups start working on the issue of what to do where. By show of hands, the group preferred meeting November 18 for the rest of the results. The workgroup meetings in January will be the latter half since Brian will be busy the first half.

Linda thanked everyone again for coming, and reminded about the handouts and the flyer for septic system workshop. She also thanked the Fanchers for their assistance with the field trip for the Riparian Workshop. Later on, some stakeholders will be presenting what they have learned in the feral hog and riparian workshops.

6. Adjourn