(This document is a simplified description of the WENCK engineering report by page)
page 1

Paragraph 1
States the papers goal: Stable water levels.

Paragraph 2
Declares the water coming into the Bayou from Elk river a reality. This data needed to disprove the 2015 Elk river watershed TMDL study (Which representatives to the watershed group from BLCA failed to point out when written, a costly error since it took hundreds of miles and hours to prove wrong). The paragraph goes on to describe area between Elk lake and upper lakes a "soup bowl" where water finds its way back into the upper lakes.
The difference between Elk and Briggs lake levels is not much more than a foot and the report list their studies based on the "soup bowl scenario:

Figure 1:
This is a picture areas studied are highlighted.
Next to the figure shows a short outline of what the memo will cover.

Page 2
2019 Monitoring Data: Describes the Excel chart Mike made in 2019 of bridge measurements stating the 2019 data showed the ELK river flowed into Briggs all year long and there was not enough data to show when it is disconnected. (low water river bank is less than 3 feet high at bayou curve) it also should be noted that 2019 represents 1/2 foot more than the 10 year scenario of 3.5 feet.

XPSWMM Model Updates- Explains the model started with the existing model at Elk lake from the DNR. The DNR model considers the entire upper 3 lakes as a backwater and the areas surveyed by Sherburne Soil and water were added in order to predict levels and flow at those key locations.

Page 3:
Summary of Scenarios:
Describes the model of existing flows vs depth of rainfall.
Figure 3: Represents the flow into Briggs (+) and back-flow (-) but based on the area under the curve it implies the negative outflow from Briggs (-) follows the same path which cannot be true.
The bulk (if not all) of the water exits out Rush lake into Lilly creek. It should also be noted that the area of the Rush outflow is smaller than the area of the Briggs

inflow. This accounts for the longer period of time need to drain the high water compared to how fast it comes in.

Next (page 4) The statement is made that 1 inch of rainfall produces a 1 foot rise in lake level.

Next on page 4 a graph shows the discharge of Elk river going under the county 6 bridge and says it is to compare with the bayou data. A numerical comparison shows that the flow is directly proportional to the lake level for all but the 1 inch rainfall. By extrapolation that means flow rates of less than 1 thousand cubic feet per second do not enter the upper lakes. The percentage of flow from the river that enters Briggs increases rapidly with the river flow rate.
This agrees with the inlet trapezoid shape allowing more water to enter as the water level increases.

sheet pile weir: Page 5,6

The purpose of adding this structure is not to change any conditions in the lake chain area, but stabilization of the Bayou channel current condition. This prevents change in the channel shape due to scouring and erosion of the sand delta. This has a positive effect on the Briggs Lake Chain water quality as the reduce amount of TSS will also decrease the amount of TP going into the lakes.

The reason for locating the weir is not very clear. It seems to be where they judged an access road could be built easiest.
Most of the banks are already built up from a project in the 1980's that could be extended which could prove to need more material. But the county 16 bridge crossing of the bayou is also easier to access and would require less material. Why is that not an option? Other points for the bridge location would be to change the shape/size of the opening to be the same size as the Rush outlet and having less buildup of the lake height during high water. Locating at the bridge area would also help protect the bridge itself. The height of the weir is set at the high water ordinance value. Why that level? Why not just set at the 1 foot level and only overflow into Briggs an inch before Lilly creek starts to back up. Can the area of the weir be made to match the rush outlet? This would allow the weir to store more water in those areas without the added expense of pages 14-15.

Upstream Wetland B: Impoundment: Page 7-9

Worthwhile project to improve river flow and storage would benefit upper lakes and Elk as well as local farmland. The downside is the small amount of level

control on the lakes.

Cover Crops: Page 10,11

Improved drainage is not clearly defined but total phosphorus improvement is also good. This is not a single project that can be managed but a best management practices that should be promoted. The website modelmywatershed gives specific information about the area for rainfall and runoff that is worth exploring for ideas. The slope of 2% or less in the Bayou helps understand the “soup bowl” effects.

Upstream Wetland A: Excavation Page 12,13

Another small benefit project not recommended due to large amount of excavation will be expensive and DNR unlikely to approve? Should ask the status of that question..

Bayou and Lily Creek Storage: Page 14,15

Feasible to impound up to 2 ft of water. Would require a similar impoundment at Bayou channel bridge so that water does not simply back into the system through Bayou channel. A back-flow preventer is needed at both weirs to allow discharge from the lake chain. Since the height of the standing wave at a weir is proportional to the flow, the location and shape of a weir become significant in both water storage and lake levels. (Observed > 8-9 inches at Rush outlet during high water.) The storage area highlighted in the report does not show the large area to the south of the Bayou which has been observed to hold water as well. Does this mean the storage estimate of 302 ac-ft is underestimated?

I would like to better understand this option since it should also relate to the sheet pile recommendation.

County Land Purchase: Page 16

For impoundment, it will likely only provide water quality benefit. Excavation is close to 10 feet, making it impractical. Access to river to clear common tree blockages should be planned to better maintain the flow

Additional Wetland Storage: Page 17

Highlighted immediate upstream is a good wetland and should not be altered.

This report also implies the control of the river level/flow can be improved at many different places in the watershed. from observation during bridge measurements it can be said when measuring at the county 62 bridge near the airport when the water starts flowing from the east of section 2 the river quickly rises to no wake levels. Can we assume that impoundments even as far north as the airport can benefit the water stabilization in the lakes? Options near airport may include other partners.

Elk Lake Outlet: Page 18

Cross sections of Elk outlet shows good potential flow at that point indicating it is not a restriction that will raise the water level. It fails to point out the cross section of the river just past the bayou restricts the flow going into Elk and potentially increases the flow into Briggs lake. (Was pointed this out in the blockage presentation last year.) Tree blockages are common in this part of the river and keeping the channel clear helps prevent direction of flow changes which carry away more soil and prevents the channel from becoming deep enough to handle higher water levels.

Summary of Next steps:

Sheet Pile Weir - Survey? - Get answers to questions above!

Wetland B - Start DNR discussion.

Cover Crop - Start discussions with landowners.

Estimate From WENCK:

- Review and compile new data including lake level, survey, water quality
- Update XPSWMM model based on the new channel and outlet information, build fish barrier into the model
- Run model scenarios including: existing, fish barrier removal, 3 alternative design options for Bayou
- Draft up report to summarize hydraulic impact of each scenario and include qualitative discussion on water quality

XPSWMM doesn't address water quality. To do so, we will need to look at lake models. Jeff put together this table for potential future steps. Jeff will also give you a call regarding the graphs.

Modeling/ Analysis

(3 lakes)
$7,250
Update lake model and
TMDL allocations using historic data,
newly collected data,
hydraulic model,
HSPF model,
and internal load assessments
Memo/Report (3 lakes)
$4,250
Meeting (1)
$1,600