ASSESSING POTENTIAL ALTERNATIVES TO THE BAYNHAM BRANCH DAM

June 3, 2021

Thomas Aley, RG and PHG
Senior Hydrogeologist
Ozark Underground Laboratory

Background

Missouri American Water Company (MAWC) is the water supplier for Joplin and some nearby areas. MAWC is currently (May to July, 2021) conducting site work for a dam on Baynham Branch despite evidence that the planned reservoir will not function as planned and will create serious environmental problems. Groundwater tracing and flow rate measurements made by the Ozark Underground Laboratory (OUL) have proven that the impoundment area already experiences major water leakage into karst groundwater with discharge of the leaking water into springs outside of the planned reservoir area.

The flow rate of the largest of the springs fed by leakage out of Baynham Branch peaked at 23 million gallons per day at a time when the water depth in one of the three major losing stream segments was 7 feet. The planned impoundment will inundate this losing stream segment by an average of about 90 feet. Leakage rates over this and other major losing stream segments in the reservoir area will vastly increase if the dam is built. These leakage rates will substantially exceed the rate at which MAWC plans to deliver additional water to Joplin.

In addition, existing data show that the reservoir area provides habitat for the Ozark cavefish, a federally listed species protected under provisions of the federal Endangered Species Act. Data presented by the OUL in a report dated December, 2020 shows that Ozark cavefish will not survive in the cave and spring systems beneath and adjacent to the planned reservoir.

In February 2019 MAWC submitted a document to state and federal agencies outlining their plan for the reservoir. It assume no leakage from the reservoir and considered no alternatives (of which there are several) for supplying water to Joplin. It also gave no mention of a “Water Supply Reservoir Screening Study” for southwest Missouri and nearby portions of Kansas and Oklahoma conducted in 2009 on behalf of the Tri State Coalition and Missouri Department of Natural Resources. Important issues raised in the 2009 study are the topic of the remainder of this assessment.

Information from the 2009 Screening Study

Comment 1. The 2009 study examined water supply issues for an area that included, but was much larger than, the Joplin area served by MAWC. A total of 14 different potential reservoir sites were identified with four of these being off-channel reservoir sites. An off-channel site is one on a tributary stream (such as Baynham Branch) that is not on a major stream or river. Baynham Branch was not one of the 14 identified potential sites since it would not produce enough water to meet anticipated demands. MAWC plans to offset this deficiency by pumping water out of Shoal Creek and into the planned reservoir under high flow conditions on Shoal Creek. MAWC has presented no data to demonstrate that the duration of high flows in Shoal Creek are sufficient to make this feasible under severe and prolonged drought conditions and with high rates of groundwater leakage from the reservoir area.

Comment 2. The 2009 study identified Site 11 on Shoal Creek upstream of the mouth of Baynham Branch as an adequate water supply for Joplin and for some other communities. Site 11 has a drainage basin of 229 square miles and with option B (flow down Shoal Creek) would provide water at the lowest cost per thousand gallons of any of the 14 evaluated impoundments (Table ES.1). In contrast, the Baynham Branch impoundment has a drainage basin of 15.7 square miles and would serve only Joplin and not other communities including Neosho and Monett.

Comment 3. Let's presume that the Baynham Branch dam is built and actually functions adequately. Site 11 in the 2009 report is an important site for a regional water supply and is likely to be constructed even if the Baynham Branch reservoir exists. If so, once constructed there will be little or no economic benefit for Joplin rate payers to maintain the reservoir on Baynham Branch as there will be adequate water in Shoal Creek to supply Joplin even during major and prolonged droughts. From the viewpoint of Joplin, building a pumped water storage reservoir on Baynham Branch that is likely to have a short economically viable life is rather like going into the trucking business with a pickup rather than a semi.

Comment 4. The 2009 study notes that transmitting water from Stockton or Grand Lake would have costs similar to constructing another reservoir. MAWC has not assessed the positive benefits of this approach to rate payers in Joplin, although this approach would undoubtedly yield much less money to MAWC than building an impoundment on Baynham Branch and dealing with its leakage problems.

Comment 5. I have been provided with a photo showing a flood on Shoal Creek in March 2008 that inundated part of the Missouri Southern rail line in the vicinity of the springs that drain Baynham Branch (Harris Family Springs). Earth-fill dams in karst landscapes on losing stream segments have an elevated risk of catastrophic failure. The rail line downstream of the planned dam would almost certainly be damaged or destroyed by a catastrophic failure of the planned Baynham Branch dam. The rail line transports numerous tanker cars, some of which

undoubtedly contain dangerous or hazardous chemicals that must not be permitted to enter drinking water supplies. The water intake for Joplin is on Shoal Creek downstream of the planned dam. A relocation of several miles of rail line to ensure the protection of the Joplin water supply should be included as a cost of the planned Baynham Branch dam. The 2009 report (page 75) briefly discusses rail line locations and notes that they have historically been difficult and time consuming.

Comment 6. The 2009 report (pages 38-39) discusses protected species; this is relevant to Ozark cavefish sites in the Baynham Branch reservoir area. The report further discusses the magnitude of environmental mitigation required for typical water supply reservoirs and notes that they have not been higher than about 1.5:1, but this was in the early 1990s. This means that a 1,000 acre water supply reservoir would require a total mitigation area of 1,500 acres. The planned Baynham Branch impoundment would have a surface area of 1,200 acres plus it would impact karst groundwater in a large area (perhaps another 1,200 acres) surrounding the impoundment. Ozark cavefish would lose habitat in this region and low oxygen conditions would cause mortality of fish present in the area. If the ratio of 1.5:1 is applied, an area of 3,600 acres suitable for cavefish habitat would need to be acquired if the Baynham Branch dam is constructed. Finding suitable land for mitigating impacts on cavefish will be a major challenge. This is an issue that MAWC has yet to address, yet it was important enough to water resource planners to discuss in the 2009 study.

References

Aley, Thomas and David Woods. 2020. Evaluation of a selected site for a proposed Joplin water supply reservoir on Baynham Branch. Ozark Underground Laboratory contract report. 55p. + appendixes.

Freese and Nichols. 2009. Water supply reservoir screening study. Prepared for City of Monett and Missouri Department of Natural Resources in conjunction with Tri-State Coalition. 81p. + appendixes.

S:\tom\baynham-2009.doc