Lake Maumelle Watershed Management Plan
Policy Advisory Council
Meeting Summary
March 16, 2006

Attendees

See Attachment A.

Introduction

Following roll call, Trevor Clements of Tetra Tech began by placing this sixth meeting of the Policy Advisory Council (PAC) in context of the overall planning project. He indicated that the project is "rounding the bend" as we end Phase 2 and begin Phase 3. In Phase 1, the project team and councils reviewed existing information to identify key issues for protecting Lake Maumelle, set goals and objectives for management, and selected indicators and assessment tools for evaluating how well the goals and objectives can be met under any of the proposed management alternatives. During Phase 2, two project tracks have been running simultaneously. Members of the Tetra Tech technical team calibrated and validated watershed and lake models, and conducted a baseline analysis. While that work was being performed, the Technical and Policy Councils reviewed and discussed numerous management options and weighed in on which seemed most promising for application to the Lake Maumelle watershed. Trevor indicated that this meeting would culminate the Phase 2 process as the PAC reviews the baseline modeling results, votes on lake management targets, and discusses preliminary ideas for two different management scenarios to evaluate in Phase 3.

Baseline Analysis

Trevor began his presentation by reminding the group that the purpose of the baseline analysis is to establish a point of reference with which to compare future conditions to targets and to help in selecting management options. This is accomplished by comparing existing conditions (and targets) to future conditions assuming no new management, using the calibrated and validated modeling framework developed by Tetra Tech. The analysis helps us to answer a couple of key questions: 1) Do we need a management plan?, and 2) If so, what sources and parameters should that plan focus on. The analysis helps us to see the magnitude of problems that may need to be addressed, and the relative sensitivity of lake response to changes in future pollutant loads. While there are more than one set of possible future conditions that could be analyzed, Trevor stated that we can all learn from these results with regard to where to target management.

As discussed with the PAC at previous meetings, the baseline analysis had two main watershed zones: near lake and remainder of the watershed. Two future baseline scenarios were modeled. The first was characterized by large lot development throughout the watershed. The second was characterized by denser development near the lake.

Key Findings of Watershed Loading

Sediment loading increased by 58 percent in Baseline Scenario 1 and by 68 percent in Baseline Scenario 2, with an annual load of approximately 7,400 tons and 7,800 tons, respectively. Most of the additional sediment load is generated by nonpoint source pollution (erosion from the land surface), as there is relatively little sediment in wastewater. Trevor indicated that this rate of sediment loading was not a significant threat to overall lake storage capacity, as the analysis indicated that over a 100-yr period this level of loading would take up about one-tenth of one percent of the lake volume. However, there could

be local sedimentation problems in the tributary coves to the lake that might require periodic dredging. Also, sediment can carry other types of contaminants and turbidity can impact water treatment.

Phosphorus is a concern because it is a controlling factor for the growth of algae in the lake. Predicted increases in annual phosphorus load are very large, moving from about 6.6 tons/yr to over 40 tons/yr and 70 tons/yr for Scenarios 1 and 2, respectively. These correspond to an annual phosphorus load increase of 531 percent in baseline Scenario 1, with a 482 percent increase coming from point sources alone. Baseline Scenario 2 shows a 979 percent increase in annual phosphorus loading, with a 920 percent increase from point sources.

Trevor acknowledged that Tetra Tech conservatively assumed that no phosphorus limits would be applied to permitted point sources. He indicated that it is likely that Arkansas DEQ would use this study to justify adding phosphorus limits, but that would be a new management decision. Thus, for the purpose of this baseline study (which assumes no new management), Tetra Tech assumed no phosphorus limits. This analysis supports testing the sensitivity of the lake response to potential point source discharges that are not regulated for phosphorus.

Trevor also indicated that the nonpoint source phosphorus load could be higher than what is shown in the graphs. The assumptions for the amount of forest disturbed by clearing could be higher and this would increase the nonpoint source loading percentages. However, they would still be well below unmanaged point source contributions of phosphorus. This tells us that it will be very important to manage point sources in the management plan.

Although annual nitrogen loading does not increase as much as phosphorus (about a 200 percent increase and a 380 percent increase for the two scenarios), the additional loading is also highly dominated by point source discharges. Additionally, the ratio of nitrogen to phosphorus in both point and nonpoint (development) sources is lower than natural loads running off primarily forested lands. Therefore, under future conditions, phosphorus load is predicted to increase at a higher rate than nitrogen. This change in loading ratio is not good for the lake, as it is so dramatic that it shifts the lake to a nitrogen limited state. This increases the chances of blue-green algae and cyanobacteria which can pose threats to health from toxins, clog water treatment filters, and/or cause taste and odor problems in the treated water supply. This reemphasizes the need for point source management.

The annual total organic carbon (TOC) load does not increase as significantly as the nutrients, with an 11 percent and an 18 percent increase for Scenarios 1 and 2, respectively. These increases are lower than for the other parameters because there is already a significant TOC load under existing conditions. Because the watershed is 91 percent forested, there is a significant amount of TOC from the decay of wood. Contributions for future increases are about equal from point and nonpoint sources. However, point source contributions are more likely to be in the dissolved form of TOC which is harder to treat in the water supply. This is another reason for managing point sources carefully.

Annual fecal coliform exhibits approximately a 250 percent increase and about a 300 percent increase for Scenarios 1 and 2, respectively. Nonpoint sources strongly dominate the increase in predicted loading. Bacteria is regulated in point sources through fecal coliform limitations, so point source levels are lower than nonpoint sources. Studies show higher concentrations of bacteria running off of developed areas. Much of the fecal coliform loading dies off before reaching the lake. However, the increase in fecal loading is a "red flag" indicator for potential increases in other pathogens that persist rather than die off.

Key Findings of the Lake Responses

Trevor next reviewed the lake response to this additional loading. Lake response was analyzed by three zones: lower lake; mid-lake; and upper lake.

The chlorophyll *a* response was compared to the eutrophic and mesotrophic thresholds, indicating a high risk and medium risk of nuisance algal bloom conditions. We want to keep the middle and lower lake in

an oligotrophic state (low level of algal growth). For the upper lake, the existing condition is already at the mesotrophic condition during normal conditions, and borders on eutrophic conditions at times. The future baseline scenarios result in a high exceedance of the eutrophic threshold during normal conditions. The mid-lake area currently has mesotrophic conditions, and increases to eutrophic conditions for both baseline scenarios. However, the increase is not as large as for the upper lake: chlorophyll *a* increases to above 30 µg/L and above 40 µg/L in the upper lake for the two scenarios, and only up to 10 µg/L and 20 µg/L in the mid-lake from the existing median of 2.5 µg/L. For the lower lake zone around the intake, Baseline Scenario 1 borders the eutrophic threshold, while Scenario 2 exceeds the threshold. This would clearly cause a problem for the water supply. The nutrient levels are affecting the lake too severely and require substantial management.

Secchi depth, or water clarity, would decrease significantly in both scenarios. In the upper lake, depth of clarity would decrease from the existing 2.1 meters (m) to a depth of 1.3 to 1.1 m in Scenarios 1 and 2, respectively. Due to the settling out of sediment as it moves down lake, the decrease in clarity is not as marked at the intake area (an existing Secchi depth of 2.5 m changes to 2.2 and 2.1 m in Scenarios 1 and 2, respectively). The USEPA recommended ecoregional criteria is 1.53 meters in the Arkansas Valley Lakes and 2.86 m in the Ouachita Lakes (Lake Maumelle watershed comprises both ecoregions, so would likely have a criterion near the middle of this range). The existing Secchi depth appears to represent what is recommended in the eco-regional criteria. Turbidity is another measure of water clarity related to Secchi depth. The change of Secchi depth up to 1 m decrease is about equivalent to an increase in turbidity of 5 nephelometric turbidity units (NTU).

Existing levels of Total Organic Carbon (TOC) are fairly uniform throughout the lake, ranging from about 3.4 mg/L in the upper lake to 3.2 mg/L in the lower lake. The future baseline predictions about double that level in the upper lake and constitute about a 50 percent increase near the intake. The existing TOC levels near the intake already approximate the concentrations in the raw water necessary to meet Safe Drinking Water Act requirements for treated drinking water. The predicted increases in TOC for Scenarios 1 and 2 would significantly increase the raw water concentrations and could necessitate costly operational and treatment technology changes to meet the TOC requirements.

Fecal coliform concentrations are low now and future increases are predicted to remain below the water quality standards for primary contact. However, the increases are a magnitude of order or more. This magnitude of increase in fecal coliform concentrations is a "red flag" indicator for potential increases in other pathogens that persist rather than die off, such as giardia and cryptosporidium.

The last lake response discussed was for time-of-travel for evaluating the risk of spills. Tetra Tech assumed a case where a 2-year storm washes a spill into the lake during a period when the lake is below the spillway such that water does not flow over the spillway. The analysis was to determine how long it would take for the spill to travel overland, instream, and through the lake from anywhere in the watershed. The analysis revealed that under a storm event of this magnitude, the overland and instream time of travel would be short: ranging up to 17 hours, but averaging about 2 to 3 hours for most locations and subwatersheds. The inlake travel times, however, were predicted to be much longer. Travel from the upper lake zone was estimated at about 37 days, and travel from most mid lake points was upward of 20 days. Only in the lower lake zone where the watershed and lake narrow did travel time decrease to below 5 days. Although absolute travel times are expected to vary depending on precipitation and lake elevation conditions, as well as water supply withdrawal rates, the analysis provides relative break points that helped establish recommended management zones based on these differences in risk.

Discussion/Questions

One member asked what would be the impact of a phosphate detergent ban? Trevor indicated that North Carolina enacted a statewide phosphate detergent ban in the 1980s, and that the TP concentrations in the wastewater effluent decreased by about 50 percent. However, for it to be successful, it would likely need

to be a statewide rather than a countywide ban or else folks might simply buy their detergent in the next county.

One member said that we need to underscore the buildout time zone for this analysis. He said it might take 100 to 200 years to see the consequences predicted by the baseline scenarios.

One member asked how many people would be living in the watershed at buildout, and what this implied for development in the rest of Pulaski and Perry counties. Trevor indicated that we assumed 2.5 people per household per census figures. Given the estimate of approximately 4,400 houses in the near lake zone, that translates to about 11,000 people, and then double that for the remainder of the watershed. Tetra Tech's original population estimates corresponded very closely to the Metroplan's 30-year projections. However, after discussion with local realtors, engineers and planners indicated that higher densities should be assumed, we increased the estimate of buildout to more like 30 – 50 years for the near lake zone and longer for the Perry County portion.

Another member pointed to the quick change in quality that the Beaver Lake water supply is experiencing due to rapid growth around the lake. She indicated that we would not want to see that happen in Lake Maumelle.

A member said that we are assuming the same technology is being used 50 or 100 years from now, when clearly there will be advances in wastewater treatment and operations, etc. [The baseline assumes no additional management, or business as usual, as a worst case. The management options that will be tested will assume higher levels of treatment. This however, will be based on technology that is available today, because that is what we have to rely on at this point. In the future, the management plan can be adapted as needed as new technologies are proven effective.]

One member said that we need to take a prudent approach, including using what we know today and assuming things will go wrong. We need to have a plan that will last for 15 or 20 years, and revisit it at that time to incorporate new technologies, new findings, etc.

Targets

Next Trevor reviewed the recommended targets, as follows:

INDICATOR: Chlorophyll *a*		
Location: Mid-Lake	**Target:** 3.5 µg/L summer median	**Existing:** 2.8 µg/L summer med.
Location: Lower Lake	**Target:** 3.0 – 3.5 µg/L sum. med.	**Existing:** 2.8 µg/L summer med.
Explanation: Welch and Jacoby, renowned limnologists, indicate that the boundary between oligotrophy and mesotrophy occurs at 3.5 µg/L. To protect the water supply to oligotrophic conditions, it is recommended that a target of 3.5 µg/L chlorophyll *a* be applied at the mid-lake evaluation point, and that 3.0 to 3.5 µg/L be used as a safety factor at the lower lake evaluation point near the water supply intake (i.e., achieve as close as possible to 3.0 µg/L but do not exceed 3.5 µg/L).		

INDICATOR: Total Organic Carbon (TOC)		
Location: Lower Lake (Intake area)	**Target:** As close to existing concentrations as possible.	**Existing:** 3.2 mg/L annual median
Explanation: New disinfection byproducts regulations under the Safe Drinking Water Act require that Central Arkansas Water keep its annual running average (calculated quarterly) concentration of TOC under 2 mg/L in the finished drinking water. The CAW treatment system conservatively removes 35 percent of TOC from the raw water intake concentrations. Back-calculating from the finished target to the intake using the 35 percent removal rate produces an approximate target at the intake of 3.1 mg/L. Between February 2002 and January 2006, Arkansas Department of Health quarterly monitoring data indicate raw water concentrations ranged from 2.4 to 3.75 mg/L. During that timeframe, the highest finished water TOC concentration was 1.93 mg/L. Because the existing levels are right at the boundary, the recommended target is to remain as close to existing levels as possible. The model-predicted annual median for existing conditions is 3.2 mg/L at the lower lake evaluation point. Since future evaluations will be done using the model, the 3.2 mg/L value will be used for scenario performance comparisons.		

INDICATOR: Turbidity (use modeled Secchi depth as surrogate)		
Location: Lower Lake (Intake area)	**Target:** $\leq$ 0.2 m Secchi depth reduction in annual median	**Existing:** 2.5 m annual median
Explanation: The Enhanced Surface Water Treatment Rule requires that turbidity in finished filtered water be $\leq$ 0.3 NTU. The intent of the Enhanced Surface Water Treatment Rule is to reduce the risk of specific microbial pathogens such as *Cryptosporidium*. Current raw water turbidity ranges from 1 to 5 NTU, with an average of 2.6 NTU over the past 15 years (personal communication, Gary Hum, CAW). Increases in turbidity result in increased treatment cost (e.g., estimated increase in alum dosage = 30 percent to treat water with 9 NTU, per Gary Hum) and increased risk of other contaminants. The lake model does not directly estimate turbidity, but does predict Secchi depth which can be used as a surrogate for turbidity. The empirical relationship between Secchi depth and turbidity for the USGS data is relatively strong (0.77 r-square). Establishing a target of $\leq$ 0.2 m Secchi depth reduction in annual median should maintain turbidity levels within 1 NTU of existing levels.		

INDICATOR: Fecal Coliform Bacteria		
Location: Lower Lake (Intake area)	**Target:** < one order of magnitude increase from existing annual median concentration (interpreted as < 0.065 #/100ml)	**Existing:** 0.0065 #/100ml annual median
Explanation: The concentrations of fecal coliform bacteria being predicted for the future are not in and of themselves considered to be a threat. However, fecal coliform is being used as a surrogate indicator for the potential increase of other microbial pathogens such as *Cryptosporidium* and *Giardia*. These pathogens are likely present in minute amounts under current conditions, but have not been detected in CAW sampling. Health authorities typically examine risk in terms of the orders of magnitude of reduction in pathogen concentration between sources and water supply lines. By keeping the fecal coliform bacteria indicator concentration changes for future scenarios below one order of magnitude (factor of 10), the increase in risk of other microbial pathogens should also be minimized.		

Questions/Discussion

One member asked if there should be seasonal limits or targets for chlorophyll *a*, since wastewater permits have seasonal limits. Trevor indicated that while algae growth was highest in the summer, the algae respond to nutrients that are loaded on a year round basis. Highest nonpoint source loads typically occur in the winter and spring due to rainfall patterns, and those loads influence the summer growing season response. Note that the chlorophyll *a* target is expressed as a summer median concentration, but corresponding nutrient loading allocations will be on an annual basis.

One member asked if we should have a TOC target. If we set the target more stringently than what we are seeing now in the raw water, is it a realistic target? And didn't the baseline predictions show that the future does not change much from existing conditions? Trevor indicated that these are soft targets for TOC, essentially "stay as close to existing as possible." The existing raw water conditions have not caused drinking water standards violations for treated water, but at times the treated water approached the limit of the standards. Some things could be done operationally to create a bit of a buffer before needing to go to different treatment technologies. Therefore, the TAC and Tetra Tech recommend a soft target.

One member asked what it would cost to provide different forms of treatment to meet the regulatory requirement. Trevor indicated that Tetra Tech will be presenting the cost evaluation at the June meeting.

One member asked Tetra Tech to clarify, for the purposes of the vote, what is the definition of target. Trevor responded that a target is the value of the indicator that reflects meeting the goals and objectives.

A member asked if these targets will be translated into actionable limits. Trevor indicated that we will be looking at management options and evaluating across the multiple targets. The PAC can vote on the targets tonight, and weight them in importance when deciding which management options to choose.

One member asked if we would look at plant optimization for meeting the SDWA guidelines and standards. Trevor answered "Yes," and asked Bruno Kirsch to elaborate. Bruno summarized how CAW was optimizing operations, but noted that there were limitations to what could be done operationally.

One member asked how TOC levels in Lake Maumelle compared to levels in other lakes. Trevor indicated that we had not studied levels in other lakes in the area since the issue for Lake Maumelle is how its levels are related to meeting the Safe Drinking Water Act requirements.

A member said that from what she had read, more treatment is less healthy.

Another member asked if these are strict targets. Trevor answered, "Yes." Since you have a high quality lake, maintaining the quality (per the adopted goals and objectives) will require stringent targets.

A member asked about the fecal coliform standard that was referenced, is that a drinking water standard? Trevor answered, "No." It is a primary and secondary recreation standard. However, the target is linked to minimizing the presence of microbial pathogens for safe drinking water and for recreation.

Action

Trevor asked if the group would adopt these targets to guide development of the management plan. He said to vote for the targets means that you can live with it, not necessarily that the targets are your first choice or preference.

The Council unanimously voted to adopt the targets as presented.

Draft Management Scenarios

Kimberly Brewer of Tetra Tech next reviewed the two draft management scenarios that Tetra Tech proposes to test in the models to determine if they meet the water quality targets.

She said the draft scenarios were crafted based on feedback received from the PAC. At the last meeting, most members indicated that they had not ruled any management option out; however, in reviewing each

member's completed survey, it was clear that several management options for managing new development were considered most promising (i.e., ranked as "very promising"). These options were:

- Large lot residential development with impervious limits.
- Cluster development.
- Conservation design with BMPs.

Two management options were ranked "Very Promising" to "Somewhat Promising" (study with caution):

- Performance Standards.
- Stream Buffers.

Kimberly said that these were also the options that received the highest rankings in surveys completed by the watershed landowners and those citizens attending the North Little Rock public meeting.

Another theme emerged at the PAC meeting and the public meeting: Don't take a one size fits all approach. Recommendations included:

- Let the land/lake determine the needs and requirements.
- Establish different zones with differing requirements.
- Provide flexibility.

Based on this feedback, Tetra Tech developed two different management scenarios: a conservation/non-engineering approach and a performance standards approach. Kimberly discussed the underlying strategy for these management scenarios. The first part of the strategy was to develop three management areas based on travel time within the lake to the intake area. Critical Area A includes the three subwatersheds closest to the intake that have a travel time of less than 5 days. Critical Area B has a travel time of 20-29 days and extends up to the Hwy 10 bridge. The Upper Watershed Area is the lake area above Hwy 10 extending to the headwaters of the Maumelle watershed. The Hwy 10 bridge makes the upper lake behave differently. The Upper Watershed Area has a travel time of 37 days to the intake area.

The second part of the strategy was to link the targets to the management areas. First, the mid-lake targets would be tied to nonpoint source (or stormwater) runoff and wastewater from the Upper Watershed Area and Critical Area B. These are the areas that influence the mid-lake water quality. As a special safeguard, the mid-lake targets will have to be met first in modeling the scenarios. Then we will test meeting the intake targets. This is influenced by loading from all three management areas, i.e., contributions from the Upper Watershed Area, Critical Area B, and Critical Area A.

The third part of the strategy is to develop allocations for the management areas for developable land. We will determine new development and wastewater allocations, then determine the requirements needed to meet those allocations.

Kimberly then reviewed the two proposed scenarios for meeting the allocations.

Conservation/Non-engineering Scenario

For the Upper Watershed Area and Critical Area B, we will test large lots and cluster development design options that have density, undisturbed open space, and impervious limit requirements. There will also be wastewater requirements, including individual units for large lots and cluster units for cluster developments. For Critical Area A, we will be testing conservation design to meet the allocation. Stormwater BMPs would be required as a safety factor (for added pollutant removal and spill containment). Wastewater would be pumped out of the watershed.

Performance Standards Scenario

This Scenario has the same requirements for Critical Area A as the Conservation/Non-engineering Scenario. In the Critical Area B and Upper Watershed Area, the load allocations for these areas would be divided by the developable land and would become the performance standard for new development. (The wastewater allocations would remain the same as in the previous scenario.) The same allocations and targets are being met in the two scenarios, however the Performance Standards approach would give developers/landowners the greatest flexibility in how the allocations are met.

Kimberly noted that many of the details of the scenarios had yet to be worked out. For the wastewater, which is the dominant source of pollutant loads, Tetra Tech will determine areas where it is feasible to pump it out of the watershed. For the remaining wastewater, we will work with the state to determine the treatment technology and effluents limit assumptions. For new development, we will refine the site development assumptions based on feedback from the PAC and working with TAC members. We will test the relative effectiveness of different management options, then, through an iterative process, Tetra Tech will test which optimal combinations of wastewater and nonpoint source loadings meet the allocations. Then we will test the scenarios in the watershed and lake models to determine if they meet the mid-lake and intake targets.

Kimberly reviewed Table 2, Nonpoint Source Relative Management Effectiveness Examples.

Nonpoint Source Relative Management Effectiveness Examples [1]

Net Loading Rates from Residential Development

(TP, TN, and TOC in lbs/ac/yr; TSS in tons/ac/yr; FC in #/ac/yr)

Forest	**TP**	**TN**	**TSS**	**FC**	**TOC**
	0.12	1.93	0.033	1.00E+10	24.0
Large Lot Development [2]					
	TP	**TN**	**TSS**	**FC**	**TOC**
3-acre average	0.36	3.70	0.154	6.25E+10	33.7
5-acre average	0.28	3.13	0.119	4.34E+10	31.0
10-acre average	0.20	2.50	0.070	2.73E+10	27.3
Cluster Development [3]					
	TP	**TN**	**TSS**	**FC**	**TOC**
5-acre net density	0.25	2.86	0.084	4.22E+10	28.8

[1] The management effectiveness for point source (wastewater) treatment is not included in this table and would vary by development type and intensity. These examples were generated using example conditions in the Tt SET.

[2] Large Lot Development assumes the following: 12.6 percent impervious area and 62 percent undisturbed forest for 3-acre lot development; 8.8 percent impervious area and 76 percent undisturbed forest for 5-acre lot development; 4 percent impervious area and 88 percent undisturbed forest for 10-acre lot development.

[3] This option assumes the same number of housing units as 5-acre Large Lot Development design, clustered into 1.5 ac lots. This design results in a 33 percent reduction in impervious area.

Alternatively, cluster design can be implemented as meeting the same impervious and open space requirements as large lot design, providing flexibility in the type and intensity of development.

Conservation Design w/ BMPs [4]

	TP	TN	TSS	FC	TOC
5-acre net density	0.15	2.13	0.044	0.90E+10	22.6

Assumed BMPs and Removal Efficiencies

	TP	TN	TSS	FC	TOC
Bioretention	70%	45%	85%	90%	55%
Dry Ext. Detention	20%	25%	45%	80%	25%

This table shows the relative effectiveness of large lot, cluster, and conservation design developments in terms of net nonpoint source loading rates for TP, TN, TSS, Fecal Coliform, and TOC. These are examples only for illustration. For the large lot development, Kimberly explained that we assumed only one acre of disturbance. Of that one area, about 8,700 sq.ft. would be built upon area (driveway, roof, patio, outbuilding, etc.) For the 3-acre lot development, this translates to 12.6 percent impervious area (including built upon area on lot and streets) and 62 percent undisturbed forest; 8.8 percent impervious area and 76 percent undisturbed forest for 5-acre lot development; and 4 percent impervious area and 88 percent undisturbed forest for 10-acre lot development. The cluster design allows for a reduction of imperviousness (by approximately 33 percent), and thereby reductions in loading. The conservation design with BMPs further reduces imperviousness and loading with BMPs, and approximates the loading from an undisturbed forest area.

Kimberly said there are other management options that will be modeled as well. These include the continued high implementation of forest harvest BMPs and enhanced use of unpaved road BMPs. Other management options that will be modeled as needed include land acquisition, landscape management contracts, and streamside management zones.

Other measures that will be included in the management plan but that are not conducive to modeling include:

- providing limited water service to encourage plan implementation.
- requiring centralized, professional management of wastewater facilities.
- implementing boat marina BMPs.
- sponsoring trash pickup days.
- providing household hazardous waste drop off locations, etc.

[4] This option begins with the 5-acre net density Cluster Development design, then targets sensitive environmental areas for conservation and requires specific best management practices (BMPs). Impervious area is reduced 43 percent versus the original 5-acre Large Lot Development design. BMPs are implemented as a treatment train that includes on-lot bioretention followed by Dry Extended Detention in common areas.

Discussion/Questions

One member asked why we treated the land in the far west the same as that adjacent to the entry of the lake. Kimberly answered that it was based on travel time within the lake to the intake. The "Upper Watershed Area" had an average travel time of 37 hours. We could base it on travel time to the lake and within the lake.

One member asked if there is not a storm event, would the travel time be much longer. Kimberly answered, "Yes," for episodic events like spills. However, the lake also responds to annual loads which are affected by the entire watershed.

Another member asked how we would determine allocations/differences for each of the zones. How is this related to time of travel? Kimberly indicated that we will optimize the loads per zone to meet the targets.

A member asked us to explain the option, "Provide limited water to encourage plan implementation." CAW would provide water to development applicants that meet all the relevant provisions of the management plan. This would be under a development agreement between CAW and the developer. CAW could also provide water to existing residents in the watershed who need a more reliable source.

One member asked us to provide lake visualizations when presenting the management scenario comparisons.

One member asked if boats are having an impact on the lake now. Kimberly stated that the water quality data do not indicate any impacts from the boats on the lake. However, as more people move into the watershed and there is more demand for boating/fishing, the plan will call for considering a limit on the number of boats allowed on the lake if it appears to cause a problem or risk in the future.

One member asked if the options listed on the management effectiveness table could meet the targets. Tetra Tech believes the conservation design with BMPs option would meet the targets, but is not sure if the large lot and cluster options will meet them. The latter depends on guidance from the PAC on how large a lot and how much open space preservation could be required of developers/landowners and therefore what could be assumed in the scenario.

In terms of new development, Kimberly asked the PAC for guidance on the large lot and undisturbed open space issue. Specifically what does the group perceive would be the most that could be required in a local ordinance or development agreement. She said there is a tradeoff—the smaller the lots and smaller the open space required means more land would need to be acquired by CAW to meet the targets.

One member said that open space is needed for horse pasture—that's not undisturbed open space.

Another member suggested that farm BMPs be included to allow for horses in the open space (offset the impact).

One member said that 5- and 10-acre lots would be subdivided in the future. (A permanent conservation easement would be mandatory for the required undisturbed open space area. Therefore it could not be subdivided.) She said there would have to be monetary compensation for the landowner for the conservation easement. (The compensation is in the form of a reduced tax on the land. The easement is not purchased; it is required as a part of getting the development permit. So the group needs to take very seriously the "open space" requirement proposals. It is envisioned that these will become part of an ordinance and/or development agreements.)

The group agreed that requiring 9 acres of undisturbed area on a 10-acre lot was unrealistic.

One member suggested that it be 5-acre lot minimums with a minimum 50 percent open space (which could be open meadow for view, not just forest).

Another member said it should be site specific, e.g. it should depend on slope. People who want horses will go for the flat land. Steep sloped areas are tough to find one acre to build on.

Another member agreed and said the market would take care of the issue: horse owners are not going to buy land on steep slopes.

A member said that Perry County would not pass this in an ordinance so there would have to be a lot of land acquisition.

One member who is a resident in the watershed said that residents in Perry County prefer large lots (10 acres or greater) because they like the rural feel of the watershed.

One member asked if he bought pasture now and wanted to keep it, could he? Would it be considered land disturbance. Kimberly responded that existing uses could continue. The requirements of the plan would be for new development (after the time of plan or ordinance adoption). If he was proposing to disturb land for a pasture as a part of a future development, then it would be considered disturbance.

One member suggested requiring that all land over a certain slope be preserved in forest.

Another member suggested linking the open space requirements to different size lots and lot characteristics.

A member suggested looking at smaller lots in some zones like Critical Area B.

A member asked if commercial impact will be included—we will need to have some commercial development. Kimberly stated "Yes," limited commercial development will be included in the scenarios.

Kimberly also asked for guidance on the wastewater issue. She said that allowing no discharges in the watershed would be the most protective option for the lake. This would mean that individual homes would need to use a septic tank or capped system discharging to the soil and that a subdivision or commercial development would need to use a nondischarging unit such as septic plus a trickling filter unit. Where feasible, the developer could pump the wastewater out of the watershed. The key is that no discharges to surface waters would be allowed.

She asked the group if they would support – and if they thought the communities would support—a non-discharge requirement.

One member said that he supports the nondischarge requirement.

Another member said she thought Perry County would not pass and enforce such an ordinance. (It would be the state's jurisdiction to enact new wastewater rules and enforce them.) She continued by saying that she did not think we should plan on the state enacting new wastewater rules for the watershed. (State officials to date have been open to third party rule making or even rule making initiated by the state if the watershed plan shows the need for stricter requirements to protect the lake.)

Kimberly said that Tetra Tech would first proceed by assuming wastewater discharges with the highest limits that could be achieved without additional rulemaking. We will see if we are able to meet the targets under those limits.

Next Steps

Tetra Tech will work with the state officials to determine the wastewater limit assumptions, and with large landowners to determine where it is feasible to pump wastewater out of the watershed. Based on that, we will develop wastewater and nonpoint source allocations for each management area and subwatershed. Based on comments received from the PAC and working with TAC members, we will refine the development assumptions for large lot, cluster, and conservation design development, and test to see if they meet the nonpoint source allocations for new residential development. Once we have scenarios that appear to meet the allocations, we will test them in the watershed and lake models to see if they meet the mid-lake and intake area targets. We will be reporting the results of this work at our next meeting, the third Thursday in May.

Attachment A

Lake Maumelle Policy Advisory Council Meeting Sign-In Meeting Date: March 16, 2006

Present	Member Name	Designation	Representing
P	Herb Dicker	**PRIMARY**	Ratepayers (Little Rock Neighborhoods)
P	Kathy Wells	Alternate	Ratepayers (Little Rock Neighborhoods)
P	Sue Corker	**PRIMARY**	Ratepayers (North Little Rock Neighborhoods)
NP	Jack Finnegan	Alternate	Ratepayers (North Little Rock Neighborhoods)
P	Mike Simpson	**PRIMARY**	Ratepayers – Jacksonville Water Works (Master-Metered Customers)
P	Robert Stout	Alternate	Ratepayers – North Pulaski Water Works (Master-Metered Customers)
P	Jane Dickey	**PRIMARY**	Central Arkansas Water Commission (Member)
P	Tony Kendall	Alternate	Central Arkansas Water Commission (Vice Chair)
P	Ruth Bell	**PRIMARY**	Community (League of Women Voters of Pulaski County)
NP	Kathleen Oleson	Alternate	Community (League of Women Voters of Pulaski County)
NP	Steve Owen	**PRIMARY**	Community (North Little Rock Chamber of Commerce)
NP	James Dietz	Alternate	Community (North Little Rock Chamber of Commerce)
P	Randy Wilbourn	**PRIMARY**	Community (Little Rock Regional Chamber of Commerce)
P	Jay Chesshir	Alternate	Community (Little Rock Regional Chamber of Commerce)
P	Kate Althoff	**PRIMARY**	Community (Citizens Protecting Maumelle Watershed)
P	Barry Haas	Alternate	Community (Citizens Protecting Maumelle Watershed)
NP	Alderman Neil Bryant	**PRIMARY**	Elected Official (North Little Rock City Council)
P	Vice Mayor Barbara Graves	**PRIMARY**	Elected Official (Little Rock Board of Directors)
NP	City Director Stacy Hurst	Alternate	Elected Official (City Director, City of Little Rock)
P	Justice Pat Dicker	**PRIMARY**	Elected Official (Pulaski County Quorum Count)
P	Justice Harrison Jones	**PRIMARY**	Elected Official (Perry County Quorum Court)

Present	Member Name	Designation	Representing
NP	Justice Charlie Clements	Alternate	Elected Official (Perry County Quorum Court)
P	Glen Hooks	**PRIMARY**	Environmental (Sierra Club)
NP	Dale Ingram	Alternate	Environmental (Sierra Club)
P	Kevin Pierson	**PRIMARY**	Environmental (Audubon Arkansas)
NP	Stephanie Hymel	Alternate	Environmental (Audubon Arkansas)
P	Charles Nestrud	**PRIMARY**	Property Owners (Deltic Timber Corporation)
P	Larry Hedrick	Alternate	Property Owners (U.S. Forest Service)
NP	Jeff D. Allison	**PRIMARY**	Property Owners – Water Association within Watershed
P	John M. Bentley, III	**PRIMARY**	Property Owners within Watershed – Western Watershed
P	Ray Vogelpohl	Alternate	Property Owners within Watershed – Western Watershed
P	Marge Brewster, Ph.D.	**PRIMARY**	Property Owners within Watershed – Northern Watershed
P	Earl Hillard	Alternate	Property Owners within Watershed – Northern Watershed
P	Wally Loveless	**PRIMARY**	Realtors (Member of Arkansas Realtors Association
N	Kenneth Gill	Alternate	Realtors (Coldwell Banker Advantage)
NP	John Bryant	**PRIMARY**	Recreationists (Grand Maumelle Sailing Club)
NP	Nicole Claas	Alternate	Recreationists (Grand Maumelle Sailing Club)
P	Randy Day	**PRIMARY**	Recreationists – Fishermen (President of Maumelle Bass Club)

NON-POLICY ADVISORY COUNCIL MEMBERS IN ATTENDANCE

Name	Representing
Trevor Clements	Tetra Tech, Inc.
Kimberly Brewer	Tetra Tech, Inc.
Marie A. Crawford	Central Arkansas Water
Bruno Kirsch, Jr., P.E.	Central Arkansas Water

Name	Representing
Jim Harvey	Central Arkansas Water
Dr. Roby Robertson	Central Arkansas Water Commission
Roger Miller	Arkansas Department of Health and Human Services
Scott King	AV Arkansas
Jim McKenzie	Technical Advisory Council Member
Lee Bodenhamer	Property Owner
Norvell Plowman	Attorney for Property Owner
Tim Daters, P.E.	White-Daters & Associates, Inc.
Gary Heathcott	Heathcott Associates