



Technical Committee Meeting
Monday, May 19, 2008, 9:30 A.M.
Historic Utah County Courthouse
51 South University Avenue, Suite 212
Provo, Utah

ATTENDEES:

Greg Beckstrom, Provo, Vice-Chair
H. Barry Tripp, Forestry, Fire & State Lands
Chris Keleher, Dept. of Natural Resources
Deon Giles, Pleasant Grove
Michael Mills, JSRIP
Ann Merrill, DNR-Div. of Water Resources
Douglas Sakaguchi, DNR-Div. of Wildlife Resources
Lee Hansen, Saratoga Springs
Nathan Lunstad, Highland
Dave Wham, Dept. of Environmental Quality

Gene Shawcroft, Central Ut Water Conservancy District
Jeff Niermeyer, Utah Lake Water Users
Bob Fisher, Woodland Hills
Lawrence Burton, Orem
LaVeré Merritt, Private Consultant
Jim Hewitson, Lehi
Rick Cox, URS, Master Plan Consultant
Ed Belliston, Property Reserve Inc.
Carol Mausser, Executive Assistant

ABSENT: American Fork, Genola, Lindon, Mapleton, Santaquin, Springville, U.S. Army Corps of Engineers, Utah County, DNR-Div. of Parks & Recreation, Vineyard

1. Welcome and Introductions.

The meeting was called to order by Vice-Chair Greg Beckstrom. He explained that Bruce Chesnut, Chairman, asked to be excused due to a family funeral. Reed Price, Executive Director, Utah Lake Commission, was not able to be in attendance as he was with his wife at the hospital having a baby. Mr. Beckstrom acknowledged that there were a few new faces at the meeting and asked everyone to introduce themselves.

2. Review and approve the Utah Lake Technical Committee minutes from March 24, 2008.

Mr. Beckstrom asked everyone to review the minutes and asked if there were any additions or corrections to the minutes from the meeting held on March 24, 2008. There was not a Technical Committee meeting held in April. Chris Keleher asked that on page three it be corrected to say "Mr. Keleher suggested that it might be best if the stakeholder groups requesting Ex-Officio membership could elect one representative to serve all stakeholders of similar interests." Dr. Lee Hansen moved to approve the minutes as corrected which was seconded by Mr. H. Barry Tripp. The minutes were approved as corrected.

3. Master Plan

Mr. Beckstrom invited Mr. Rick Cox, Project Manager of the Master Plan, to report.

Mr. Cox said that he had received all the copies of suggestions and corrections that had been forwarded on the Current Conditions Report. There will be subcommittee meetings within the next few weeks to discuss the vision statements for the report. In those subcommittee meetings there will be the following agendas:

- 1) To answer if the information was accurate of what occurred at the Visioning Workshop in representing the subcommittee's input,

- 2) To finalize the statement of Current Conditions Report,
- 3) To develop and review the opportunities and constraints.

The subcommittees will discuss the financial and practical hurdles that need to be overcome to achieve the objectives. Mr. Cox stated that prior to the Opportunities and Constraint Workshops the subcommittee members will be given examples of opportunities and constraints. Those meetings are anticipated to be scheduled between ninety minutes and three hours.

Mr. Beckstrom commented that the committees are now entering the main portion of the Master Plan process. Considering the opportunities and constraints and adapting those to the Vision of Utah Lake will be the foundation for the future. Mr. Beckstrom commented that it can be a time consuming project, but necessary to get the final project done right.

Mr. Doug Sakaguchi inquired how comments or suggestions should be submitted. Mr. Beckstrom said that those can be made at the upcoming subcommittee meetings and through each division's chairman. He also said anyone should feel free to send other concerns with the Current Conditions Report to Mr. Reed Price, Executive Director.

Mr. Cox added that the maps have not yet been revised but can be viewed on the website. URS will be adding the golf courses to the Recreation Map. They will also be adding Provo City lands to the ownership map and revising the location of the solid waste transfer station. Mr. Jim Hewitson asked if these will also be added to the Current Conditions Report. Mr. Cox affirmed that they would and that they would be revised on the website.

Mr. Sakaguchi expressed some concerns with the Utah Lake Access map. Mr. Cox stated that the division of Forestry, Fire and State Lands had given URS a list of those to put on the maps. URS has responded to other written comments and Mr. Cox will be forwarding those comments to those authors.

4. Presentation by Dr. LaVere Merritt—Utah Lake: A Few Considerations

Mr. Beckstrom turned the time over to Dr. LaVere Merritt. Dr. Merritt introduced his presentation by explaining he had made the presentation in St. George at the Waste Water Management annual conference. He also expressed thanks to those who had helped him with pictures of Utah Lake for his presentation. Utah Lake is a child of Lake Bonneville which has come and gone several times throughout the centuries. Geologists have tried to piece the history together for years but have only been able to go back a few hundred years. Lake Bonneville covered a huge area and it could return again however, it would require significant changes. In looking at the major elevation stages over the years one can see that at one time the elevation was up to approximately 5100 ft. and then later it had dropped down to 4600 ft. At the northern end of Lake Bonneville which passed through Preston, Idaho there was at one time a huge flood which essentially dropped the lake elevation a few hundred feet and then it came back. In the years that are referred to as the Provo Substage the elevation was at 4500 ft and that essentially built the terracing that is seen now on the mountain side and in the benches. In the last thousand years or so, Utah Lake has stayed at an elevation around at 4480 ft. Dr. Merritt reviewed several different maps to illustrate what has happened over thousands of years. The major water imports into Utah Lake are from Strawberry Reservoir, Weber-Provo Canal and Duchesne River.

The bench area's need for irrigation was paramount. Thus, in the 1860's there was much building of canals and reservoirs. In researching the hydrology of the lake, over fifty drains and return inflows have been identified. There are numerous branches on the Wasatch fault that crisscross the area. Dr. Brimhall from BYU did some sonar work and found that the last major fault that occurred was 8,000 years ago which is essentially when Lake Bonneville disappeared and left Utah Lake.

The bottom sedimentation is down about eight meters over the last 10,000 years. Fifteen to twenty feet of sediments have been deposited on the Lake bottom in that amount of time. Dr. Brimhall found lots of small

faults appeared to have dropped the Lake by between one and eight meters with the common average at about three. The dropped sediment is relative to both shore lines.

There were some studies for some exploratory drilling for gas. Dr. Merritt said he had heard that they drilled in excess of 10,000 ft. and did not hit unconsolidated rock. However, going a mile or two in either direction they were able to drill down to 10,000 ft. of rock.

The calcite concentrations in the lake are of calcium carbonate compounds and dominate at 75% in the center of the lake and then it drops off closer to the shores. At some of the shoreline it is as little as less than 40%. Utah Lake can be unpredictable. It can be a calm day and an hour so later it can be quite rough. The waves can get to three or four feet high.

There are masses of algae blooms in Provo Bay. These blooms are of different types. Dr. Merritt showed how different the algae blooms look under a microscope. The shoreline vegetation overall has a wide range from being quite beautiful to being overrun with phragmites.

The average water and salt quantities for the lake are currently derived from a fifty year model produced by the Central Utah Water Conservancy District (CUWCD) that covers the years 1950-1999. This is the basis to study surface inflow, fresh groundwater, thermal/mineral groundwater and precipitation of the different inflow. Jordan River is the major source of outflow with 51.2%. The rest of the percentage of outflow is due to evaporation. Over the years there has been numerous ways discussed to reduce the evaporation. The ratio of inflowing salts to outflowing salts is at about 76%. The rest of the salts make up the bottom sediments. By using simulations CUWCD has been able to make these and other calculations.

A. What is Utah Lake's natural setting?

Utah Lake is a shallow, basin-bottom lake in a semi-arid area. It exists because of geologic fault movements which cause earthquakes. It is estimated one of these about 10,000 years ago deepened the Lake and made it 20 feet deeper in some areas, but only 3-10 feet deeper in most areas. It is naturally turbid, slightly saline and eutrophic. The water quality is probably about the same as it was 150 years ago.

B. Why does the Lake level vary so much?

It has a restricted outlet as do most natural lakes. Under natural conditions the level can vary between 4 to 6 feet within a year. Four feet represents about 300,000 acre feet of water, or about 1/3 of the lake's volume. Over several-year-long, wet and dry cycles a 15 foot or so depth change occurs and in a major drought the water level can diminish to only 3 or 4 feet.

C. What aren't there additional developed boat launch and recreation areas?

Much of the near-shore bottom slope is 1 to 2 feet per 1000 feet. So the shoreline moves large distances with relatively small changes in depth. A facility might face a mile or more to launch boats during a dry cycle and then face water 5 or 6 feet higher than wanted during a wet cycle. These cycles will continue and so it makes it extremely difficult to provide boat launches and recreation areas with these varying conditions.

D. Is Utah Lake polluted?

Utah Lake has good overall water quality, given its basin-bottom location. It is rich biologically, but it can never be a clear mountain lake due to its shallow, wave-stirred nature. It is good to remember that just fifty years ago most sewage and industrial wastes flowed untreated into the Lake. That has since been corrected; however, some of its tributaries are used as "convenient" dumps for unwanted chemicals and other trash and some of that is carried into the Lake. The Lake does have an excellent natural capacity for stabilizing both natural and man-caused "pollutants." Many discharges have been cleaned up through better treatment management. The population surrounding the Lake has tripled in the past fifty years and

the problem with the PCB's rapidly grew as well. The question then becomes where the economic limit is as the balance is weighed between the costs and the benefits of improving the water quality.

E. Why is Utah Lake so dirty, muddy and sometimes stinky?

Utah Lake is naturally turbid (opaque/cloudy) as the bottom sediments are frequently stirred up by wind-driven waves. Because Utah Lake is shallow this gives it a milky grey-brown-green appearance much of the time. On the average sedimentation fills the Lake about two inches every 100 years. The growth and decay of all of its plant and animal life sometimes results in "swampy" conditions.

F. Why is Utah Lake slightly salty at times-is this a problem?

TDS levels in the Lake make its waters unacceptable for drinking without treatment. Advanced treatment would most likely cost 2-3 times higher than the current treatment plants using higher quality source waters. The Jordan Valley regional water agency is currently conducting a pilot study to see if there might be groundwater available in Jordan River. For traditional irrigation, most Utah soils and crops don't experience significant salt damage from irrigation water until its TDS is above about 1,500 mg/l and Utah Lake's standard level is at 1,200 mg/l unless there is a prolonged drought.

G. Are algae in Utah Lake bad?

Algae are a natural and vital part in aquatic food chains and are not bad in Utah Lake. However, the cyanobacteria algae (blue-green) which comes around in the late summer can be toxic. Diatom algae shells are an indicator of past conditions in the Lake and through studies it has been determined these types have not changed substantially over the last few hundred years.

H. Is Phosphorus a pollution problem in the Lake?

The high levels of phosphorous, nitrogen and other nutrients are natural and even if the percent of man-caused sources were removed the high nutrient levels would still be present in the Lake. Very high levels of phosphorus and nitrogen occur naturally. Overall algal growth appears to be largely limited by natural turbidity. Therefore, the high levels of phosphorus and nitrogen are of less concern. Many lakes in Utah are nitrogen-limited rather than phosphorus- limited. Phosphorous and nitrogen are not directly toxic or poisonous to man or higher animals until they are much higher than the concentration of concern relative to the stimulation of algae growth. Practices to control nutrients coming from agriculture, land erosion, storm run-off, etc. commonly concurrently reduce levels of both nitrogen and phosphorous. To remove both phosphorous and nitrogen puts the cost of treatment significantly higher.

I. Why aren't trout abundant in Utah Lake anymore?

Over-fishing, competition from introduced fish species (specifically the carp), and interferences with stream spawning and migration cycles caused by dams and diversions for irrigation, has resulted in low trout numbers. The carp have changed the ecosystem in Utah Lake and devastated the rooted aquatic vegetation. Once the carp are removed it is possible trout may return. The Department of Natural Resources currently is in a RFP process to eliminate the carp.

J. If the Lake were deeper would it be clearer?

The Lake would be clearer if it were deeper in early spring and late fall but it wouldn't be during the summer and early fall. The wave energy would be less to stir up the bottom sediments. However, if the Lake was clearer then the problem would be more algae blooms.

Seasonal stratification would likely occur where the Lake was deeper than about 15 feet. In this climatic region, more turbid lakes, and persistent summer stratification might occur in water as shallow as 10 to 15 feet deep.

K. What maximum dredged depth might work for Utah Lake?

Large scale dredging may not be feasible for a variety of ecological, engineering and economic reasons. For example, dredged bottom sediments are a very clay-type material and when they are exposed to the air they shrink or crack and become very hard when dry or they become swollen when they are wet. A few feet of dredging probably would be all that is possible. Dredging machines can be efficient to do deep dredging but to skim off 4-5 feet would be very difficult in the lake.

L. Could a road causeway or bridge be built across Utah Lake?

This can be done but there are many issues to be resolved. The bottom sediments have been very unstable and any solution will be expensive. The bottom of Utah Lake is a very poor foundation. The engineering costs could be very high and it will be a tremendous challenge if it's done. The best solution may be a low bridge-type roadway built on pilings driven into the Lake bottom. If a spanning bridge were to be built it would have to allow for boat passage. The pilings may not be capable to support the required load.

M. Is there a possibility of a Residential/Recreational island being built?

This concept of constructing residential and recreational islands in the Lake is appealing to many people. The land would be extremely valuable. The Lake-bottom sediments adjacent to the islands could be dredged from the Lake to provide the needed land fill but a few years of settlement would be necessary before utility or building construction could begin.

N. Why not dike or fill in the Lake and use for agricultural or wildlife habitat?

Lake and marshland areas are too valuable to allow further significant destruction of them. Beyond that, the only possible area that this could happen would be the Provo Bay area as it has the only fertility that would possibly allow it. The rest of the lake wouldn't be productive as farmland or fertile.

Major environmental issues would be faced with large scale diking including periodic flooding. The most likely forecast for the future is probably a causeway.

Mr. Beckstrom thanked Dr. Merritt for his presentation and suggested that considering time constraints that discussion of the presentation be tabled until the other items on the agenda are addressed. Everyone was in support of the decision.

5. Other Business

Dr. Lee Hansen reported that his study was finished on Friday in regard to looking at the phosphate chemistry in the Lake. The conclusion from the study was that there is no apatite (calcium phosphate) in the Lake. The Lake is supersaturated by 6 orders of magnitude with respect to apatite, but the high concentration of organic matter in the water apparently prevents nucleation and precipitation of apatite. Phosphate is distributed throughout the mineral phases in lake bottom sediments which are mostly clays and calcium carbonate. Phosphate may be accessible to solubilization by biological processes and is certainly incorporated into fish. No detectable phosphate was extracted from the sediments by distilled water. Reducing phosphate input into the lake will probably not make any difference in water quality.

Mr. Michael Mills from JSRIP gave an update on the carp situation. The JSRIP program is working with the Department of Natural Resources and has secured \$500,000 towards carp removal. They issued an RFP a few weeks ago for removal, outtake and disposal or marketing all the carp in the Lake. Last Friday they held a meeting to disseminate information to all interested parties. The Department of Natural Resources and the JSRIP were very pleased with the response which included some people from out of state. The proposals will

be due the first part of June and they anticipate awarding a contract by mid- June. The goal is to remove one million carp a year which is equivalent to about 5 million pounds of carp. This year will be the pilot program with the \$500,000 fund. The goal at the meeting was to get the fishermen to communicate with the marketers so they can work together to accomplish the objective for carp removal. The meeting was very successful. Mr. Chris Keleher stated that a PCB study is being initiated with the Division of Water Quality. It will be a sediment analysis for total PCBs and the Division will work with the Department of Natural Resources. Mr. Beckstrom asked if the collections will be lake wide. Mr. Keleher said that they are still working on the specifics but that it will be lake wide. The primary intent is to get an overview look at the Lake to determine what areas have higher concentrations and to see if it is feasible to clean up PCBs in specific areas. There was question regarding whether the specific source of the PCBs in Utah Lake is known. Historically PCBs were used in coolants, in electrical transformers and as lubricants, but the specific source is not known at this time. This study is designed to help make that determination.

Having concluded this agenda item Mr. Beckstrom requested that the agenda return to discussion of Dr. Merritt's presentation.

4a. Discussion.

Mr. Bob Fisher asked Dr. Merritt if he was against putting in a transportation structure. He wondered if the Gulf Coast was able to construct a structure, why it couldn't be done here. Dr. Merritt replied that he isn't against a structure but is aware of the cost of such a structure. He knows some estimate that it could cost ten million dollars per mile or substantially more per mile. If there is enough money to pay for a transportation solution then one could put any type of causeway or bridge across the lake that was wanted. He said the economic issue will be the question. Mr. Jim Hewitson inquired what the difference was with the Great Salt Lake putting in their causeway. Dr. Merritt said he didn't know the sediment situation of the Great Salt Lake but thinks it may be more stable than Utah Lake.

Mr. Keleher stated that some of the statements made in the presentation seemed to conflict with literature he had read on shallow lakes. He wondered if Dr. Merritt would allow him to let some shallow lake ecologists review the presentation and get their perspective. He stated that in his experience in researching shallow lakes there are three drivers which are lake level fluctuation, portion of bottom feeding fish, and nutrient loading that comes into the system. He acknowledged that there are unique systems and wondered what would make Utah Lake unique. Dr. Merritt said he would encourage that kind of feedback. He hasn't had a discussion with a shallow lake ecologist and has tried to piece things together from the information that is already published. He acknowledged the complexity of the lake.

Mr. Beckstrom asked what would be the two extremes of the Lake's ecosystem. Mr. Keleher replied that on the one extreme is driven by algae production and is turbid and the other extreme is driven by rooted aquatic plants which provide a complexity habitat and clearer water. The changes would at first be gradual until it gets beyond the threshold and then it would be dramatic.

Mr. Dave Wham said that once carp are removed there are a lot of positive feedback loops in the system that can help move the lake to a macrophyte dominated clear water state. Dr. Merritt said that if the macrophytes were on a higher level than the lake parameters would change. Mr. Keleher stated that Dr. Sam Rushforth has reviewed diatoms and feels there has been a shift over time in regard to the types of algae since the prehistoric state of the lake. He continued that he has read a newspaper article from 1906 from the Commissioner of Fisheries that said the carp had eaten all the vegetation which provides habitat for insects that the trout feed on.

Mr. Douglas Sakaguchi asked if the lake level fluctuations are more now. Mr. Keleher said the JSRIP analyzed how the lake functioned naturally long-term and speculated to the future in regard to water rights. The study is available to the public.

Mr. Beckstrom questioned whether the important lake level fluctuation is the annual variation or over a period of many years. Mr. Keleher said that it is both. As far as the lake level fluctuation affecting the aquatic plants, there is speculation that removing the carp would also promote more algae growth.

Mr. Beckstrom asked if turbidity is due to the precipitation and the calcium carbonate. He thought it was more because of the wave action.

Dr. Merritt said that calcium carbonate is a fine crystal when first formed but then it becomes a buoyant flock and it doesn't take much energy or wave action to bring it back into suspension. However, Provo Bay is different and needs to be viewed as a different system. Calcium carbonate is not appearing there because there's a flush of fresh water.

Mr. Rick Cox asked about the TDS levels and questioned the phosphorous measurement. Dr. Merritt said that there aren't any sources of measurement prior to 1970. In evaluating whether the TDS affects the increase of calcium carbonate it appears because the calcium carbonate is in the fresh water coming into Provo Bay that there is not an overwhelming change. Dr. Hansen asked if Dr. Merritt had any idea why the TDS levels went up and Dr. Merritt said it was largely due to the return flow water from irrigation. It was asked if there was any information on the natural sources of nitrogen and phosphorous in the lake. Mr. Wham answered that in general about 75% of them have been manmade from the treatment plant.

Dr. Hansen asked from where the other 25% comes. Dr. Merritt responded that probably that per cent is coming from natural erosion of the water, agricultural, grazing, and/or recreational. Dr. Hansen commented that most of the shoreline vegetation has been converted to phragmites and stressed the important of the need to focus on that problem. He asked if there would be any benefit to diverting some of the mineral springs in Saratoga Springs. Dr. Merritt referred to the table that showed that the mineral springs bring in about 25% of the salt level and so it probably wouldn't make any difference. Mr. Beckstrom summarized that in his perception from Dr. Merritt's presentation there are two choices; 1) continue to have the existing condition of the turbid, shallow lake which may not be visually appealing or, 2) to make portions of the Lake cleared by dredging and other modifications which would then increase algae blooms and present other problems.

Mr. Keleher added that he agrees with Dr. Merritt that cost is the main factor. There are lots of options to clear up the lake but it's important to try to maintain the natural integrity of the lake and try to manage the eco-drivers that would take the state of the lake in another direction.

Dr. Merritt stated that the phragmites and carp are the first steps that need controlling and then that would lead to the natural vegetation becoming re-established. The ecosystem would then become more resilient. The phragmites, beyond the appearance, are effectively pushing out other vegetation just as the carp has effectively removed the other native fish. Provo Bay is a different body of the lake and the biggest factor is because it has a continual flush of fresh water. Provo Bay has always had major algae bloom as the Provo treatment plant pipe goes into Provo Bay and so the nutrient loading in that area has increased. Mr. Keleher in discussion with the author, Robert Carter, learned that at one time Provo Bay used to be called Clear Lake and was isolated by a sand bar. Many residents now refer to Provo Bay as Mud Lake.

Mr. Wham added that Dr. Rushforth showed that the Provo Bay diatoms were distinct from the rest of the lake as well as those from Goshen Bay. He also noted that the algal communities are very variable year to year. Regarding the issue of limiting nutrients, Mr. Wham said that the general consensus is that if nitrogen limitation is occurring, it is usually driven by excess phosphorous causing high biological production. Excess phosphorous also results in lower nitrogen-phosphorous ratios which are commonly associated with eutrophic systems. Low nitrogen-phosphorous ratios also result in shifts to more blue-green algae.

Mr. Cox asked that since the algae are light limiting if there have been any attempts at roping off an area where there's growth. Mr. Keleher said the JSRIP has conducted research with cages to exclude carp in some locations around the Lake and in some areas the water got clearer and vegetation grew back, but in other areas it didn't.

Mr. Beckstrom suggested that if the carp are reduced the trout may be able to return to the Lake.

Mr. Sakaguchi added that another issue is the water temperature and spawning cycles. Once dams are removed the trout that used to go past Deer Creek may stay down in Utah Lake. Mr. Sakaguchi was asked how this will overlap with the June sucker's increase in population and he answered that the June suckers reproduce faster than trout. Mr. Keleher will update the Committee on the progress of the CUWCD and JSRIP project of removing dams up to Provo Canyon. Its possible trout could be introduced as the process goes on. Dr. Merritt clarified that his background is in water resources and water treatment. He thinks ecological issues can be quite different.

Mr. Keleher stated that this is something that should be one of the questions answered by the Vision statements. Some of these things have been under-researched. Mr. Cox said that he was surprised in conducting the research for the Master Plan that so many areas had not had adequate research done yet. One of the things he noticed was a lack of information on the plants that are virtually becoming extinct. Dr. Merritt concluded that Utah Lake has so many sub areas to be researched and the amount of resources needed for expenditures is very large. Just to establish some of them will take millions of dollars and much effort.

6. Confirm that the next Technical Committee meeting will be held on Monday, June 23, 2008, 9:30 AM

Mr. Beckstrom reminded the Committee members of the next meeting to be held on June 23, 2008 and emphasized the importance of the subcommittee members to read and review carefully the Current Conditions Report.

7. Adjourn.

The meeting was adjourned by Vice Chair Beckstrom at 11:41 A.M.