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INFORMATION MEMORANDUM NO. 93-16

From: Mayor Stein

Date: April 7, 1993

Subject: Lake Lucille Clean Lakes Project

We expect Dr. Joe Eilers, our consultant on Lake Lucille, to visit Wasilla this summer to complete the Clean Lakes Project. The attached Council Memorandum No. 93-28 discusses an abbreviated bottom sediment study proposed as an alternative to the paleolimnology project which has been rejected by E.P.A.

In preparation for Dr. Eilers visit, the Mayor's office is beginning to assemble a Friends of Lake Lucille group to be active participants in review of Dr. Eilers' work and to advise Council on any remedial projects to improve the lake quality. Part of the public information effort will be the distribution of a series of four written articles by Dr. Eilers describing Lake Lucille, this project and possible solutions to lake problems. An advertisement appeared April 9 asking for participants in the Friends of Lake Lucille group.

John C. Stein, Mayor

LAKE LUCILLE
CLEAN LAKES STUDY

Note: This is the first in a series of articles to be published over the next several weeks in the local newspaper. The purpose of the articles is to inform the readers regarding a project that has been taking place in Wasilla and to solicit comments from the public regarding options for improving the lake. Letters from the public can be addressed to City Hall c/o Mayor John Stein or to the local manager with Gilfillan Engineering, Mr. Peter Curtis, 1800 E. Parks Hwy., Suite D-100, |Wasilla, AK 99654.

History of the Project

The Lake Lucille Clean Lakes Project was officially begun in August 1991 although some of the field work actually began in June of that year. The project will terminate on June 30, 1993. The project has two fundamentally distinct purposes: (1) to diagnose water quality problems in the lake based on a results of a designed monitoring program, and (2) to evaluate feasible solutions for dealing with the problems in the lake. The City of Wasilla was awarded a grant from the Environmental Protection Agency (EPA) through the Alaska Department of Environmental Conservation (ADEC) to conduct the two year project. Under the Clean Lakes Program, EPA provides 70% of the funding and the City provided 30%. The total cost of the two-year project was slightly less than $57,000. The work associated with the project was awarded to a team of scientists and engineers with Gilfillan Engineering here in Wasilla and E&S Environmental Chemistry, Inc. in Corvallis, Oregon.

Lake Lucille: Background

Before we can diagnose the problems in any lake, we need to have some idea how the lake came to be and its environs. Lake Lucille was formed as a consequence of glacial activity in the area, perhaps scoured out of the till or as a depression formed from an ice block breaking off from a retreating glacier. The last glacial retreat in the region occurred some 10,000 years ago which is the probable age of the lake. Because Lake Lucille has no real surface streams draining into the lake, most of the sediment that has been accumulating from decaying vegetation produced within the lake and from wind-blown soil called loess that is blown into the lake during the summer months. The rate that this material accumulates affects the longevity of the lake and the decreasing depth affects everything from fish habitat to water quality. We'll discuss the amount of sediment accumulated in the lake in a future article.

Another critical aspect of any lake is the source of water entering the lake and how long the water remains in the lake. Most of the water entering Lake Lucille enters from groundwater sources on the east end of the lake and from precipitation directly on the lake surface. Because these sources are relatively modest, the average drop of water remains in Lake Lucille for several months. This is important, because it means that any unwanted substances that might be added to the lake will remain for a considerable time. Although much of the inputs eventually leave the lake through the outlet, some material settles to the lake bottom and can recirculate back into the lake many times. A lake such as Lucille is far more sensitive to problems than its neighboring lake, Lake Wasilla, which is flushed more frequently by inflowing streams.

Another problem apparent in lakes such as Lucille is its shallow depth. The deepest spot is only 22 feet and the average depth is only 5.5 feet. A shallow lake in a northerly climate is prone to problems related to loss of dissolved oxygen in the water during the winter. Microorganisms continue to consume oxygen in the lake throughout the year and the onset of ice cover prevents oxygen from entering the lake. If oxygen loss is too great, fish kills result and hydrogen sulfide gas (smells like rotten eggs) can be emitted. This rate of oxygen loss during the winter can become especially acute if the lake becomes more highly enriched. The other problem associated with shallow lakes is that the fertile, shallow sediment provides an excellent place for aquatic weeds to become rooted and proliferate. Both the dissolved oxygen concentrations and excessive weed growth are problems in Lake Lucille.

What Did We Measure on Lake Lucille ?

For the past two years water samples have been collected from the lake, the outlet, and several selected wells in the area on roughly a monthly basis. The samples have been measured on-site for some parameters and then have been shipped to a laboratory at Oregon State University for further analyses. The samples have been analyzed for nutrients, dissolved minerals, pH (a measure of the acidity), chlorine, solids, and certain metals. To check the performance of the laboratory, duplicate samples and blank samples (distilled water) are included among the actual lake and groundwater samples. Other samples are occasionally sent to other laboratories as further checks. The field crews also make measurements of dissolved oxygen, pH, temperature, and conductivity (a measure of the dissolved minerals) at three-foot intervals down through the deepest location in the lake. Samples have also been collected of the microscopic algae, aquatic weeds, and the organisms living in the sediment.

These measurements provide us with detailed information on the current conditions in the lake and the seasonal variations in chemistry. The rates of change in some of the chemical parameters give us important clues regarding how the lake processes nutrients and minerals. But measurements of water quality provides only one aspect of understanding a lake. Other sources of information that must be gathered include watershed hydrology (how much water enters the lake and from what sources), watershed features (land use, soils, geology, vegetation, and topography), and lake bathymetry. Information on the history of the lake and watershed has also been compiled including fish stocking records and changes associated with development. The lake project team is especially grateful to lakeshore residents who provided oral histories of the lake, waterfowl counts, and participated in the survey of sediment depth in the lake.

What Do We Do With This Information?

The magnitude of the data collection effort required that we organize this information in computer files. After we have reviewed the entries to ensure a high quality data base, we plot the water quality data through time to observe patterns in lake chemistry. Next, we use the water quantity data to calculate the average duration that water resides in the lake. The information on water quality and water quality is then merged to create a mathematical "model" that reproduces the conditions we monitored over the last two years. With this calibrated working model of the lake, we can then change various input conditions such as the nutrient inputs or the amount of water flowing into the lake to simulate the response of the lake under hypothetical conditions. In this way we can test the efficacy of various lake restoration techniques without the expense of implementing all the possible approaches. We then review the options for improving conditions in the lake, develop cost estimates for the options, and present the alternatives to the City and the public.

What Happens Next?

In this first article, we have attempted to describe the objectives of the ongoing study of Lake Lucille and some of the specifics of the project. As the project winds to a close this spring, we need to present the findings of the study to the public and to explain the options for dealing with the problems. In upcoming issues we will present summaries of the data that has been collected, show some of the modeling results that guided us in the feasibility study, and a range of options (and costs) for improving conditions in the lake. We hope that this information will generate some interest and response from the lakeshore residents and citizens of Wasilla.