Soap Lake Conservancy™

Bureau of Reclamation Pumping System for Soap Lake & Lake Lenore

Lake Lenore Pumping Plant #3 on the North Shore of Soap Lake

INTRODUCTION

The Soap Lake Conservancy, originally an ad hoc citizens' group known as the Friends of Soap Lake, organized a tour of the Bureau of Reclamation pumping system for Soap Lake and Lake Lenore. The tour took place on Saturday, October 2, 1999, commencing at 10:00 A.M.. John Moody, Irrigation Operations and Technical Services Manager of the Bureau, provided the technical information at each of the three sites visited. Francis Jensen, retired Bureau manager, also participated by providing historical and technical background. Guests included Maynard Hagen and Art Willis of the Soap Lake City Council.

SOAP LAKE WATER LEVEL FACTORS

The Bureau's pumping system was created in the 1950s to control groundwater inflows into Soap Lake. According to Mr. Moody, Soap Lake drains an area of approximately 431 square miles. Until commissioning of the Bureau's irrigation water canal and siphon, natural forces provided all the influences on the level of and percentage of minerals in Soap Lake. Those natural forces influencing the lake level and mineral concentration were:

(1) inflow of surface and subsurface groundwater from the surrounding 431 square mile drainage area,

(2) precipitation (rain and snow)

(3) evaporation

The level of Soap Lake has varied over many (hundreds) years depending on these natural forces. The level of the lake has varied from low to high over many tens of feet. During the late flood events of the Pleistocene glaciation that created the current Soap Lake basin, the lake was connected to current Lake Lenore and was contained on the south by the gravel bank that follows generally the railway to the south. This would have placed the original depth of Soap Lake substantially higher than its current level.

GEOLOGY OF SOAP LAKE

According to Mr. Moody, the geology of the Soap Lake area is characterized by the following:

(1) Soap Lake is like a bowl sitting on a bed of gravel. The bowl consists of layers of clay and mud of various thickness which is impermeable (water will not go through it). Surface water runoff from the surrounding terrain and precipitation add fresh water to the lake water reducing the total dissolved solids. Any fresh water dilutes the mineral concentration, but doesn't decrease the absolute quantity of minerals in the Lake. For thousands of years, the small amounts of surface runoff and precipitation were offset by evaporation. The level of the lake would go up and down, but the volume of minerals in the lake stayed constant.

(2) Underground water flows into the layer of gravel (or "aquifer") beneath the bowl of the Lake. If enough underground water flows into the aquifer, it can spill into the bowl of the Lake around the edges, diluting the mineral concentration. The Irrigation Project caused such underground flows to increase, and eventually saturate the layer of gravel under the lake with water (raising the aquifer). As excess irrigation water continued to flow, it spilled into the lake, causing the lake level to rise faster than evaporation could remove the excess.

HISTORY OF SOAP LAKE PROBLEM CREATED BY IRRIGATION PROJECT

Sometime after the commissioning of the irrigation canal, water inflows into the lake began to increase significantly. The excess inflows were caused by irrigation water flowing underground into the Soap Lake basin. This caused the level of Soap Lake to rise. Houses and the sewer system in the City of Soap Lake were being threatened. It was at this point that the Bureau encouraged local citizens and City of Soap Lake officials to request funding from Congress for a system to control flooding.

Note: The flooding was an unintended consequence of the construction and operation of the Bureau of Reclamation's Columbia Basin irrigation project.

An arbitrary elevation of 1076 feet was selected by the Bureau of Reclamation as an ordinary high water mark. An emergency pumping system was designed to stabilize the Lake's level below this mark.

DESCRIPTION OF SOAP LAKE PUMPING SYSTEM

Congress provided funding for the Soap Lake & Lake Lenore Protective Works. This system consists of groundwater pumping facilities located in three general areas:

Soap Lake Protective Works FMX (South of High School on Highway 20 NW)

These pumps draw water continuously from the underground aquifer. The wells and pumps are located at the corner of Road 20 and Ginkgo Street. Water from the aquifer is piped to the west along Road 20 and discharged into the canal at the North side of Highway 20 NW. [Ref. pumps F, M, X]

Soap Lake Protective Works INY (East of East Beach Park at Highway 17) Soap Lake Pumping Well #Y at East Beach on Soap Lake

These pumps draw water continuously from the underground aquifer that surrounds the lake. This intercepted water is piped up to and discharged into the canal North of the Soap Lake water storage tanks East of Highway 17. [Ref. pumps I, N, Y]

Lake Lenore Pumping Plants #1, #2 and #3 (South End of Lake Lenore & North End of Soap Lake)

Lake Lenore Pumping Plant #1 on the Shore of Lake Lenore

Some of these pumps draw water directly from Lake Lenore (Plant 1) to keep the level of Lake Lenore from becoming too high relative to the level of Soap Lake. If Lake Lenore were allowed to rise too high, a higher volume of groundwater would flow south towards Soap Lake. Additional pumps (Plant 2) inject water drawn from Lake Lenore into the siphon. Another pump (Plant 3) removes ground water from the underground aquifer at the North end of Soap Lake [see cover photo] and injects it into the siphon. Plant 3 was also used to remove surface water from Soap Lake during the period of November 1998 to July 1999 (see Removal of Soap Lake Water, below). [Ref. Lake Lenore Pumping Plants 1, 2 and 3]

RELATED INFORMATION

It is also important to note, whenever lake water (as opposed to groundwater) is pumped from Soap Lake, both water *and minerals* are removed. As

minerals are removed, the concentration of minerals *decreases*. The concentration of minerals in the top layer of Soap Lake was reduced by nearly one half during the period from 1953 to 1959 when pumps were located at the Northeast corner of the lake to draw surface lake water to prevent City of Soap Lake flooding.

It is also important to note that the Bureau of Reclamation's responsibility is to keep the level of the lake below a certain level. This is accomplished by intercepting the groundwater with six interception wells at the south end of Soap Lake and the other pumping plants and drains at the north end. If drainage into the vicinity exceeds the capacity of these measures to control the level of the lake, the option of surface pumping has been used. Surface pumping is triggered by phone calls to the Bureau from residents in the City of Soap Lake who become concerned that their homes, out-buildings or property may be threatened. City officials are also notified. The city has concerns of its own to protect the public beaches and structures that may be at risk by high water. Removal of lake water (including minerals) by Bureau pumping commences after receiving a request from the City Council.

According to Mr. Moody, the only removal of Lake Water since 1959 was from November 1998 through July 1999. The Bureau has no responsibility to protect the mineral content of Soap Lake.

Any removal of lake water (including minerals) must be approved by the WA Dept. of Ecology who issues a permit to the Bureau. The Dept. of Ecology has no responsibility to protect the mineral content of Soap Lake. In fact, no agency or organization appears to have any such responsibility.

REMOVAL OF SOAP LAKE WATER November 1998 through July 1999

There have been two episodes (see chart following this report)of removal of Soap Lake water (including minerals):

Episode 1 commenced in 1953 and ended in 1959. The pumps used for Episode 1 were installed and later removed from the Northeast corner of the lake in the early 60's. During that 72-month period, approximately 20,976 acre feet of water containing roughly 7 billion gallons of mineral water with an estimated million tons of minerals were removed from the lake. The Total Dissolved Solids (TDS), which had been measured at 60 parts per thousand in 1939, were reduced to about 30 by the year 1971. According to the late Dr. W. T. Edmundson of the University of Washington, who measured the TDS from before the construction of the irrigation system through the seventies, the Soap Lake Protective Works "solved the problem" of controlling the level of the lake.

Episode 2 commenced in November 1998 and ended in July of 1999. In order to remove lake water which had again started to rise and threaten property , a

permanent pipe and gate valve were installed at Plant 3 at the North end of Soap Lake. When opened, the valve would allow surface water to flow by gravity into the sump where it was removed and injected into the siphon. During that nine-month period, approximately 1280 acre feet of water containing more than 400 million gallons of water containing roughly 21,000 tons of minerals were removed from the lake. This represents about 1,500 semi trailer truckloads of minerals or a line of trucks stretching bumper to bumper from Soap Lake to Moses Lake. The current measurement of TDS has not yet demonstrated a reduction of dissolved minerals. However, it will be several years until the results of the current pumping can be measured.

According to a City of Soap Lake resolution #531dated July 15, 1998, the Bureau of Reclamation and the Quincy-Columbia Basin Irrigation District were asked to reduce the level of the lake from its then measured level by about a foot or more. The mayor and City Clerk were authorized to sign documents to secure direct pumping from the lake.

Public Hearings were not held by the City of Soap Lake Council on this resolution.

On April 7, 1999, the Dept. of Ecology issued a permit to the Bureau allowing them to construct the water removal pipe and commence pumping. Pumping commenced November 1998 and ended July 1999. It appears that no public hearings or impact assessments were conducted by any agency for this undertaking.

FLOOD CONTROL AND EFFECT ON CITY OF SOAP LAKE PROPERTIES

According to information gleaned from city officials and others, there are several basements that begin to flood when interception pumps around the lake are turned off, or if the lake level approaches the 1076 foot elevation established by the Bureau. These properties include some of the buildings of the Notaras Lodge complex located closest to the lake and some of the buildings on Main Avenue.

If pumping of Soap Lake Water were not allowed in 1953 (Episode 1), it is likely, according to the Bureau, that the level of the lake would have eventually risen to several feet above the ordinary high water mark. This would have caused flooding in many of the downtown buildings and possibly the state highway. If Episode 2 pumping had not been allowed, the Bureau estimated that the Lake level would have risen to elevation 1077.3 ± by July, 1999. This would probably have caused damage to at least two properties. The first, a shop building at 330 Lakeshore Drive and the second, a fifteen year old residence at 436 Lakeshore Drive. The later property was constructed under a building permit issued by the City of Soap Lake.

CONCLUSION

All pumping of Soap Lake water to date has removed close to a million tons of minerals, or about half of the total minerals that were dissolved or suspended in the large upper layer of Soap Lake in 1939 (before construction and commissioning of the Irrigation System). There are no safeguards in place administered by any agency or organization to prevent the removal of additional minerals.

The mineral content of Soap Lake is one of at least two factors that differentiate it from all other bodies of water in the world. The other is a microscopic animal referred to as Hexarthra Soaplakensis, a rotifer identified by a German researcher who named it after the lake .

Soap Lake will endure as a unique resource as long as earnest efforts are undertaken to prevent further loss of minerals.

January 8, 2000 / Gerald Vice and John Glassco - Soap Lake Conservancy