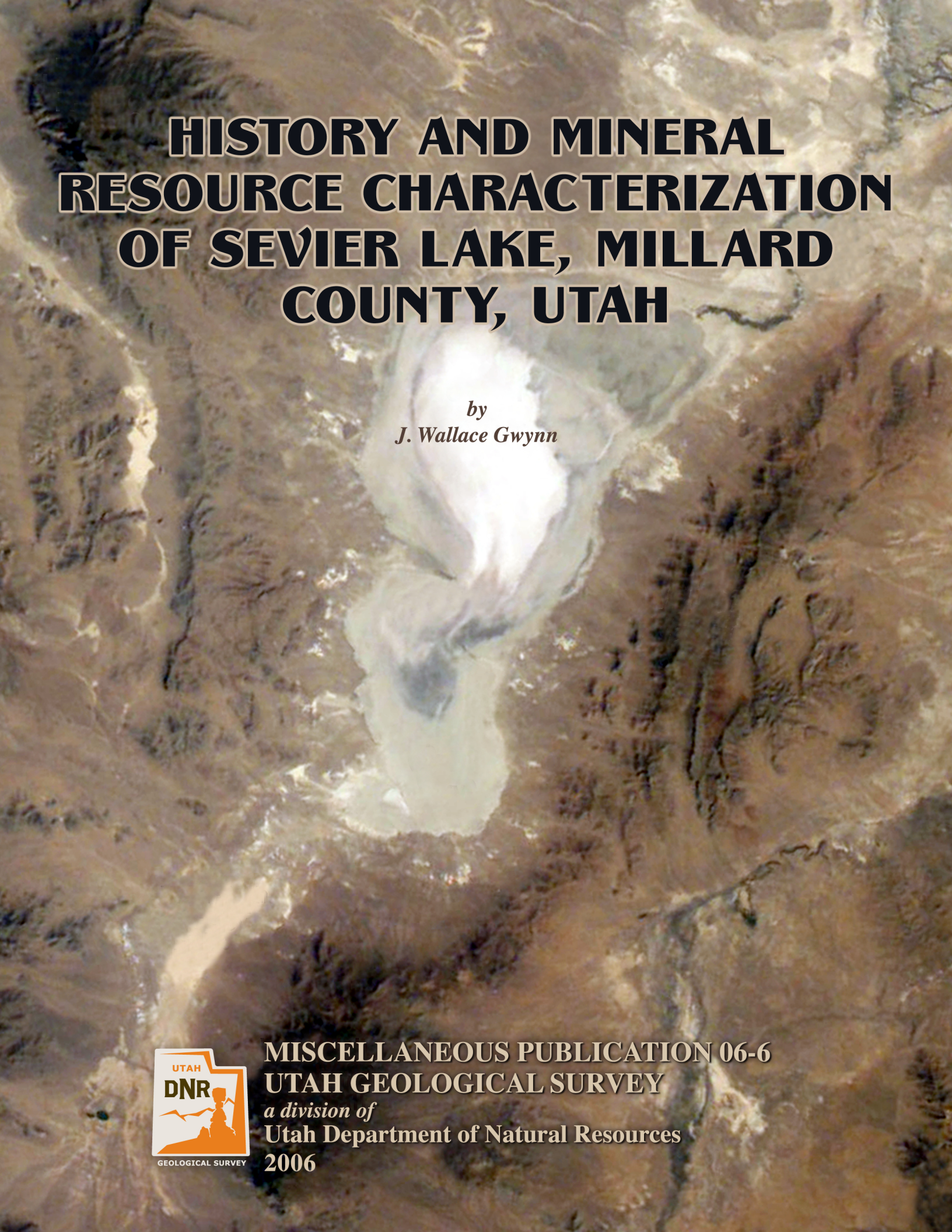

HISTORY AND MINERAL RESOURCE CHARACTERIZATION OF SEVIER LAKE, MILLARD COUNTY, UTAH

by
J. Wallace Gwynn

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Utah Department of Natural Resources
2006

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Cover photo: View of Sevier Lake and nearby geographic features from space. Source: Image Science and Analysis Laboratory, NASA-Johnson Space Center 2003

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J. Wallace Gwynn

ABSTRACT

In 1979, M.C. Godbe III, representing Crystal Peak Minerals Corporation (CPMC), first assembled a 133,000-acre leasehold position on Sevier Lake, and then began an exploration program to study the lake's mineral potential. Initially, the goal was to produce uranium and lithium, but after it became apparent that the recovery of these elements was not practical, the focus of the program turned to the extraction of the lake's saline resources. The main purpose of this report is to make the data that were obtained during CPMC's 14-year exploration program available to the public. I have provided introductory and supplementary information, and included work done by other researchers.

Sevier Lake, a remnant of Pleistocene Lake Bonneville, is located in the south-central part of Millard County, Utah. Sevier Lake is an ephemeral body, normally appearing as a dry playa, but partially covered with water during the spring runoff, and completely covered during years of high precipitation. Inflow to Sevier Lake comes mainly from the Sevier River, whose chemistry changes from calcium-magnesium-bicarbonate type water near its headwaters at Hatch, Utah, to a sodium-magnesium-chloride-sulfate type as it enters the lake. Dissolution of salts from the Arapien Shale and the precipitation of carbonate minerals appear to account for much of this change.

A major component of CPMC's 1979-83 exploration program was drilling over 700 20-foot-deep auger holes located in nearly every quarter section across the playa's surface. The brines and 5-foot composite samples of sediment collected from the auger holes were analyzed to determine their chemical, physical, and mineralogical properties. Similar properties were also determined for material obtained from five deep holes (705 to 975 feet deep), four in Sevier Lake, and one on the Wah Wah Hardpan.

Analyses of the brines collected from the 20-foot-deep auger holes and the four deep holes show all of the brines to be of the sodium-chloride-sulfate type. In the 20-foot-deep holes, water accounts for an average of just over 29 weight percent of the sediment. Over 200 million tons of dissolved salts are estimated to be contained in the upper 20 feet of lake sediments. I believe that from these dissolved salts, substantial quantities of chloride-and sulfate-based minerals of sodium, magnesium, and potassium can be produced.

During the 1979-83 augering program, a 37-square-mile salt crust, consisting mainly of mirabilite and halite, covered the lower-elevation portion of the northern half of the lake. The crust ranged from a thin film to 18 inches thick, with an average thickness of 3 inches, and contained 11 to 13 million tons of these salts. The lake sediments below the salt crust show some chemical zonation, with carbonates around the outside of the lake, followed inwards by sulfates, and finally chlorides. X-ray fluorescence analysis of bulk samples taken from throughout the lake show high sodium, chloride, and sulfate concentrations coinciding with the area of the salt crust. Clays, halite, gypsum, calcite, aragonite, and dolomite make up the bulk of the Sevier Lake sediments.

Two Class-A evaporation pans were set up in 1979 to determine the fresh-water evaporation rate at Sevier Lake. The data obtained showed that the averaged, total daily evaporation during the June through August period ranged from 0.569 to 0.654 inches per day. Wind data from the two weather stations measured from July through October 1979, and in March 1983, showed that the wind blows from the south most of the time.

Brine-salt phase relationships, determined through pan-evaporation tests, show that halite, schoenite, hexahydrite, and kainite precipitate from the brine in that order. Simulated evaporation of Sevier Lake brine using the Tequil® program shows results similar to the pan-evaporation experiments.

Prior to the termination of the Sevier Lake Project in 1993, CPMC constructed a six-mile-long brine-collection canal and a 3,000-acre solar pond complex. The final phases of the project, including the precipitation of salt floors in the evaporation ponds, and the engineering design of the salt washing, drying, bagging, and load-out facilities, were completed prior to the project's loss of funding. In 1993, Crystal Peak Minerals relinquished its leases on Sevier Lake.

INTRODUCTION

Sevier Lake is normally a dry playa in a terminal-lake basin, and is a remnant of Pleistocene Lake Bonneville, as are Great Salt Lake, the Great Salt Lake Desert (including the Pilot Valley Playa), and Utah Lake. Beneath the dry surface of the lake there are from one thousand to four thousand feet

of brine-saturated lacustrine sediments. The brine contained in the sediments represents a substantial saline resource from which chloride and sulfate-based salts of sodium, potassium, and magnesium can be produced.

The lake was first reported by the Dominguez-Escalante expedition in 1776. G.K. Gilbert was the first person to scientifically describe the lake in about 1883 during the Wheeler Surveys conducted west of the 100th meridian. A number of scientific studies were made on Sevier Lake by Güven and Kerr (1966), Baer and others (1968), Whelan (1969), Hintze and his students (Hintze, 1974a, 1974b, 1984), Glanzman (1977), Hampton (1978), Case and Cook (1979), Oviatt (1989), Gwynn (1990), Wilberg (1991), and Hintze and Davis (2003).

In 1977, Crystal Peak Minerals Corporation (CPMC) began an exploration program with the intent, first, of extracting uranium and lithium, and, ultimately, of developing the saline resources of the lake. Over 700 20-foot-deep auger holes and five deep test holes, ranging from 705 to 975 feet deep, were completed. Four of the deep holes were drilled at Sevier Lake, and one at the Wah Wah Valley Hardpan. Brine and mud samples collected during the auguring and drilling were subjected to a number of physical and chemical tests. Weather data were collected from three weather stations, fresh-water evaporation rates were determined from Class-A evaporation pans, pilot-scale evaporation ponds were constructed and operated, and the U.S. Geological Survey assessed the hydrology of the area. At the conclusion of the exploration program, CPMC began to develop the brine resources by excavating a brine-collection canal, constructing approximately 3,000 acres of evaporation ponds, and building other facilities. However, funding for the project ended and development was terminated before the production stage of the project was reached. This report compiles and presents much of the information generated during CPMC's exploration and early development work, along with pertinent information by other researchers on the lake and its tributaries.

Early Exploration

Gilbert (1890) identified six individuals or groups who explored the Sevier River/Lake region before he wrote his monumental monograph on Lake Bonneville. A brief description of these explorations follows:

The Dominguez- Escalante expedition left Santa Fe, New Mexico on July 29, 1776, in search of a route to the recently-established settlement in Monterey, California. This expedition went through western Colorado, down the Uncompahgre River to its junction with the Gunnison River, which they followed to the Colorado River. They crossed the Green River in eastern Utah, then travelled up the Duchesne and down the Spanish Fork Rivers to Utah Lake. From Utah Lake the expedition turned south and finally followed the Sevier River to Sevier Lake (Gibson, 2000).

In 1845, John C. Fremont made his third of five expeditions during which he explored the Great Basin, including the Salt Lake Desert, and the Pacific coast. During these expeditions, he was involved in the struggle to wrest California from Mexico. He was also tried in a court-martial that ended his government-sponsored explorations (Spence, 2002). Gilbert (1890) indicates that it was during Fremont's third expedition that he learned of, or neared Sevier Lake.

In 1853, John W. Gunnison received orders to take charge of one of the expeditions for the survey of a Pacific railroad route. He was to direct his party across the Rocky Mountains by way of the Herfano River, through Cochetopa Pass, all in Colorado, and down the Gunnison River to the Green and Sevier Rivers in Utah. During their exploration of the area, Captain Gunnison and 11 of his party were camped near the Sevier River when they were attacked by a band of Pahvant Indians on October 26, 1853. Captain Gunnison and seven others were killed. Lieutenant E.J. Beckwith, the assistant commander who survived the attack, completed the survey that Captain Gunnison had begun (Madsen, 2003).

In the summer of 1858, J.H. Simpson, one of the U.S. Army's most accomplished topographical engineers, explored a route across the Great Basin from Camp Floyd in western Utah to Carson Valley, Nevada. Preliminary explorations took him as far as the Dugway Mountains, and in the spring of 1859 he traveled the rest of the way to Carson Valley. Returning to Utah, he examined a southern route, which was shorter, but dryer and therefore less useful. Gilbert (1890) suggested that it was likely during the latter examination that Simpson was in the vicinity of Sevier Lake. Simpson's outbound trail towards Nevada was largely adopted by the Pony Express that began carrying the weekly overland mail on April 3, 1860 (Utah History, 2003).

The geographical surveys west of the 100th meridian of the United States operated under a general plan issued by the Chief of Engineers of the U.S. Army Corps of Engineers, and were under the supervision of First Lieutenant George M. Wheeler. The first Wheeler expedition took place in 1869, and the last in 1879 (University of Nevada, 2003). Gilbert (1890) stated, "In 1869, Wheeler, approaching from the west, visited the south end of the lake [Sevier] and determined its true position."

G.K. Gilbert worked for a period of time on the Wheeler Surveys, and was then promoted to head the Great Basin Division of the U.S. Geological Survey (USGS). In 1883, the Division was abolished. The last publication issued by the Great Basin Division was Gilbert's Lake Bonneville Monograph, which includes a section on Sevier Lake (Gilbert, 1890).

Post 1900 and Recent Scientific Work

Previous work that has been done in the area surrounding Sevier Lake is as follows: Güven and Kerr (1966) described the particle-size distribution, the main non-silicate minerals, and the clay mineralogy of a crustal sample from Sevier Lake as part of a study of Great Basin playa clays. Baer and others (1968) described the sediments and micro flora encountered in a 7-foot 10-inch-deep pit dug near the northwestern edge of the lake (section 4, T. 21 S., R. 12 W.). Whelan (1969) described the subsurface brines and soluble salts of Sevier Lake. Hintze and students (Hintze, 1974a, 1974b, 1984) mapped the pre-Quaternary rocks of the House Range and the Cricket Range, both adjacent to Sevier Lake. Glanzman (1977) sampled the near-surface sediments of the playa to determine the lake's potential as a source of lithium. Hampton (1978) described the geochemistry of sulfate and carbonate minerals from the playa's surface. Case and Cook

(1979) took and interpreted gravity measurements from within the Sevier Lake Basin, located faults flanking the basin, and calculated a basin depth of 4,000 feet. Lemmon and Morris (1984) mapped the geologic units in the Beaver Lake Mountains to the southeast of the lake. Lindsay (1986) completed an archeological survey of the Cricket Mountain resource areas for Sevier Lake diking. Oviatt (1989) described the Sevier Desert's Pleistocene/Holocene geology, including the northern third of the playa. Gwynn (1990) summarized the development of Sevier Lake's brine resources by CPMC. Wilberg (1991) presented a reconnaissance of the hydrology of the Sevier Lake area. A recent publication (Hintze and Davis, 2003) titled "Geology of Millard County, Utah" includes a detailed discussion of the geology of the Sevier Lake area.

Geographic Setting and Access

Sevier Lake is located in western Utah's Sevier Desert (figure 1) in a broad valley 10 to 15 miles wide, bounded on the east by the Cricket Mountains and on the west by the House and Confusion Ranges. The San Francisco Mountains lie just south of the lake and the Wah Wah Mountains are to the southwest with the Wah Wah Valley (and hardpan) between them. To the north of Sevier Lake is the gently south-sloping surface of the Sevier Desert. Sevier Lake lies at an elevation of about 4,517 to 4,520 feet above mean sea level. Sevier Lake, in Millard County, is about 30 miles southwest of Delta and 25 miles north-northwest of Milford (figure 1). Access to the lake's northern end is by U.S. Highway 6-50, a distance of about 37 miles southwest from Delta. Access to the lake's southern end is by State Road 257 for a distance of about 48 miles south from Delta to the Black Rock railroad siding, and then about 13 miles west from the siding to the lake. A secondary north-south-trending road runs west of the lake, and connects Highway 6-50 and State Road 257. The Union Pacific Railroad, located about 10 to 11 miles east of the lake, parallels State Road 257.

STRUCTURAL AND GEOLOGIC SETTING

Sevier Lake is in the Basin and Range Physiographic Province, a large area covering more than a tenth of the continental United States, including all of Nevada, and parts of Idaho, eastern Oregon, Utah, Arizona, and southeastern California. The formation of the Basin and Range Province began during the Miocene, approximately 17 million years ago (Hintze and Davis, 2003). During this formative period, east-west extension or stretching of the continental crust caused normal faulting that resulted in uplifted, north-trending mountains (horsts), and intervening, down-dropped, sediment-filled valleys (grabens). The Basin and Range-type topography in eastern Nevada and western Utah resulting from this stretching and faulting is illustrated in figure 2.

A gravity survey of the Sevier Lake area (Case and Cook, 1979) explains the structure of the Sevier Lake area. Between Sevier Lake and the Cricket Mountains to the east is the major north-south trending normal-fault, the east Sevier Lake fault zone (figure 3a). The fault zone has a total vertical displacement of approximately 4,000 feet down to the west, and forms the east margin of the east-tilted Sevier Lake graben, and the west margin of the east-tilted Cricket Mountains horst. The Sevier Lake graben is bordered on the west by the west Sevier Lake fault zone (figure 3a). The Sevier Lake graben that underlies Sevier Lake reportedly consists of two separate fault blocks, designated the northern and southern blocks. These two blocks have been faulted differentially with respect to each other and with respect to the adjacent mountain blocks. A bounding fault zone, with en echelon type faults, is located on the east side of the Cricket Mountains (Case and Cook, 1979). Figures 3a and 3b show the structural configuration in the Sevier Lake area (Case and Cook, 1979), including the three east-trending gravity profiles A-A′, B-B′, C-C′ as figure 3b.

As the Sevier Lake graben subsided, a closed sedimentary basin formed and filled with alluvium. Case and Cook (1979) suggested that the depth to bedrock may be as much as 4,000 feet. Four wells drilled by CPMC show the lake-basin fill to be a minimum of 975 feet thick. Lithologic logs of the four CPMC holes (SDL-2, SDL-3, SDL-3A, and SDL-4) show the valley fill from surface to total depth to consist mainly of fine-grained, gray-green to brown clays with minor amounts of gypsum, sand, silt, salt, and carbonaceous plant material. No Paleozoic bedrock was encountered in the four holes. In the Wah Wah Valley Hardpan hole (W-5), located about 6 miles southwest of Sevier Lake, fine-grained sediments similar to those encountered at Sevier Lake were encountered in the upper 435 feet, with coarser-grained material to the well's total depth of 720 feet (CPMC data). Again, no Paleozoic bedrock was encountered. The locations of the five drill holes, their depths, and the types of sediments encountered are given in table 1. The five lithologic logs, drawn by M.C. Godbe, are shown in appendix A. Wilberg (1991) includes drillers' logs for an additional 27 wells in the Sevier Lake area, ranging from 100 to 699 feet in depth, which also bottom in unconsolidated sediments.

Table 1. *Hole designation, location, total depth (TD), and types of sediments for five holes drilled at Sevier Lake and on the Wah Wah Hardpan. Lithologic logs for the five drill holes are found in appendix A. Source: CPMC.*

Hole Designation	Hole Location	Total Depth (ft)	Types of Sediments
SDL-2	C sec. 36, T.22S., R.12W.	840	Fine-grained to TD
SDL-3	NE¼ sec. 31, T.23S., R.11W.	705	Fine-grained to TD
SDL-3A	NE¼ sec. 31, T.23S., R.11W.	920	Fine-grained to TD
SDL-4	NE¼ sec. 14, T.22S., R.12W.	975	Fine-grained to TD
W-5	CC sec. 17, 18, 19, 20, T.25S., R.13W.	720	Fine-grained to 435 feet, coarse grained to TD

TD = total depth

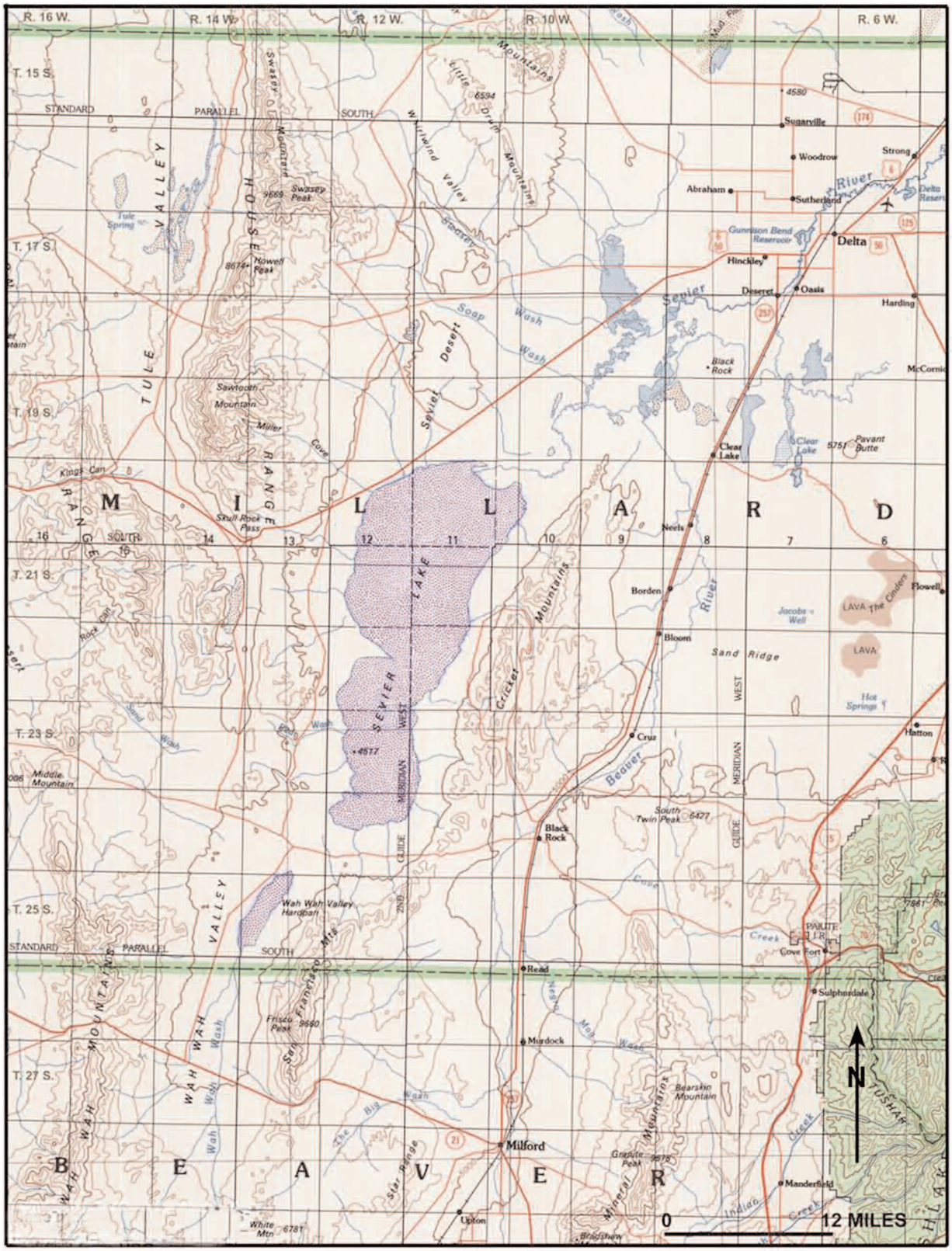


Figure 1. *Location of Sevier Lake, the Wah Wah Valley Hardpan, rivers, mountains, and cultural features in portions of Millard and Beaver Counties, Utah. Base from U.S. Geological Survey, State of Utah map, 1988, scale 1:500,000.*

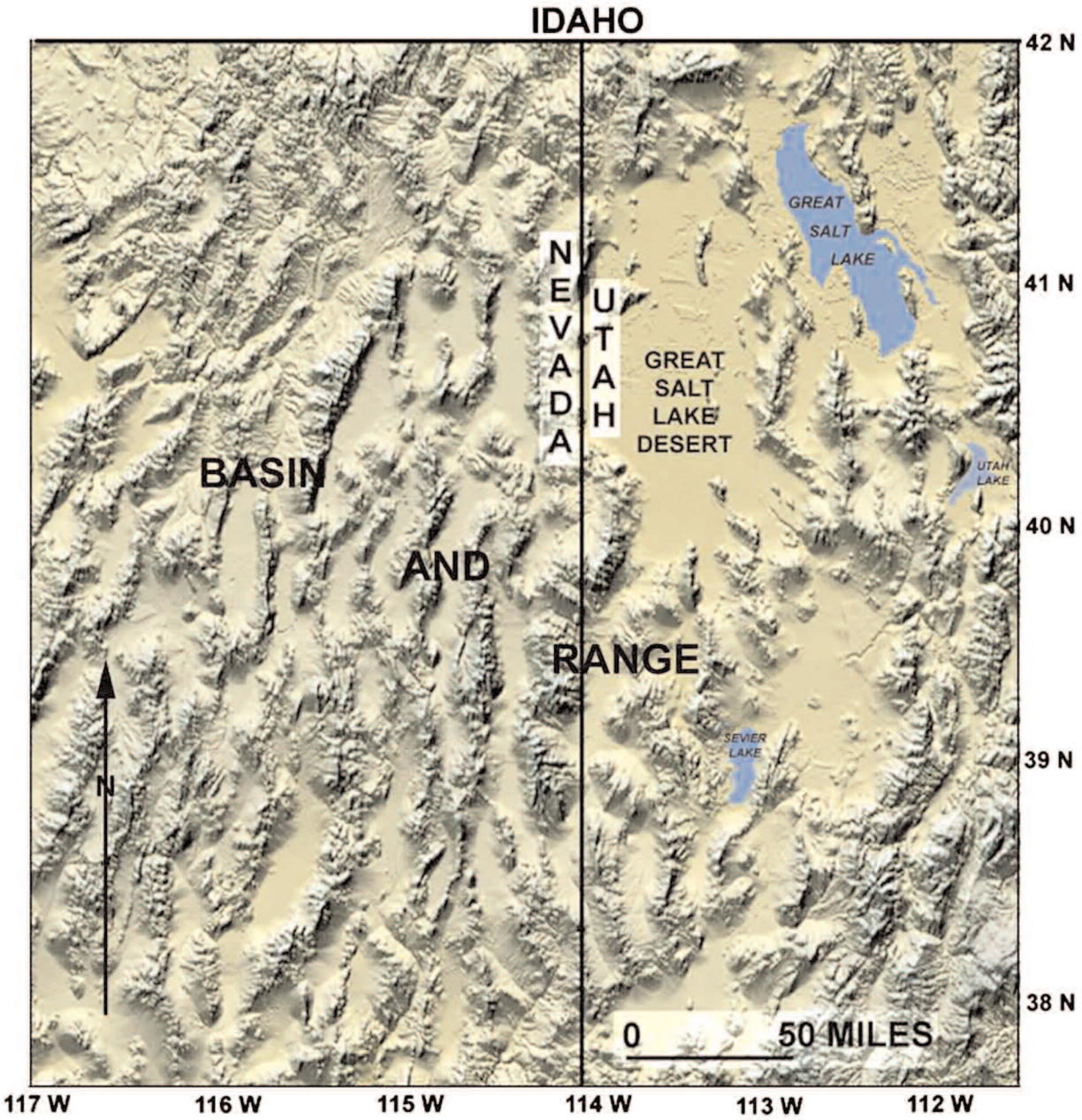


Figure 2. *Relief map of parts of eastern Nevada and western Utah showing Basin and Range-type mountains and valleys. Source: Jet Propulsion Laboratory, California Institute of Technology, Shuttle Radar Topography Mission. Online, http://www2.jpl.nasa.gov/strm/northAmerica.ht., accessed May 2003.*

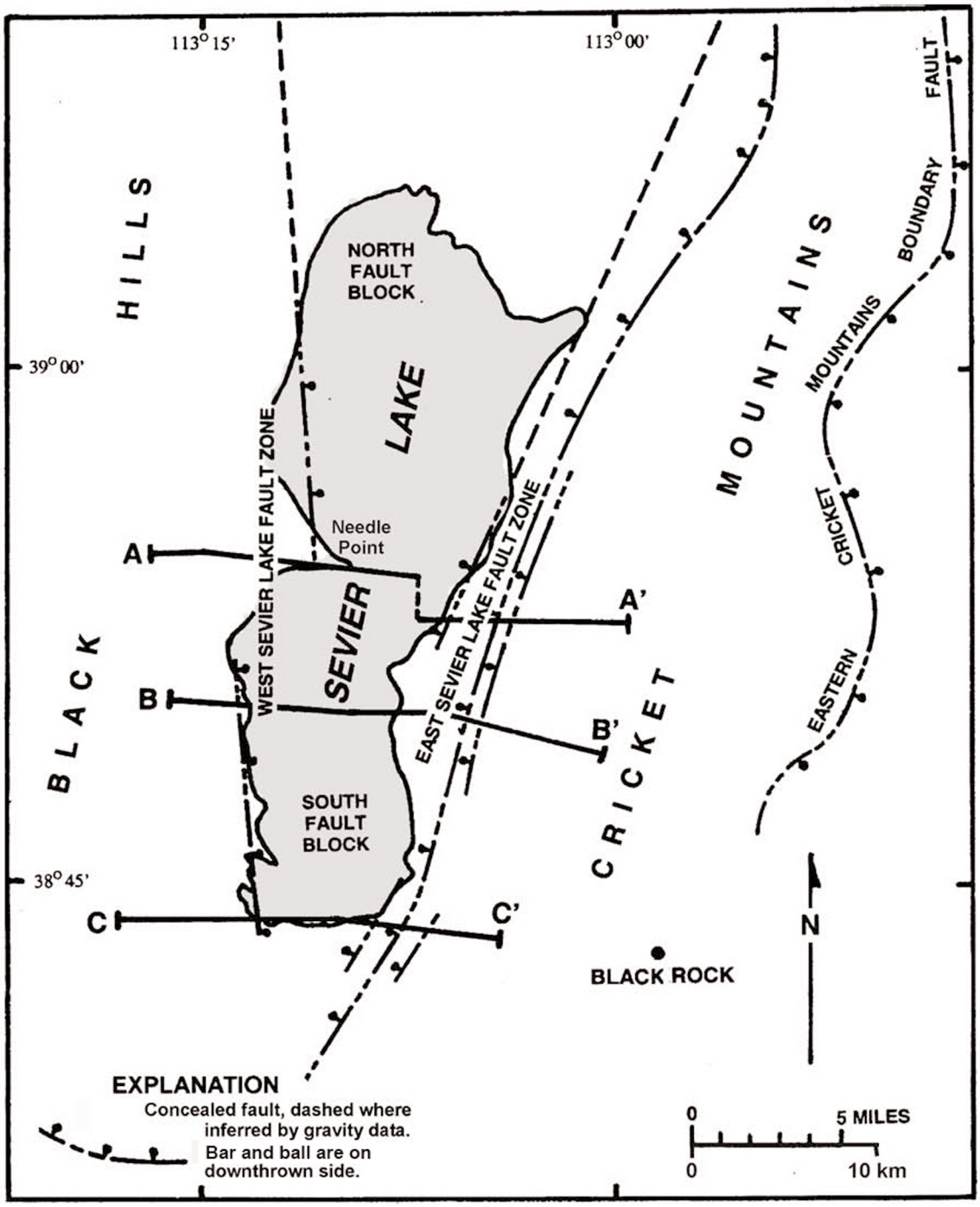


Figure 3a. *Mountains, gravity-profile lines, and fault zones in the vicinity of Sevier Lake. Modified from Case and Cook (1979).*

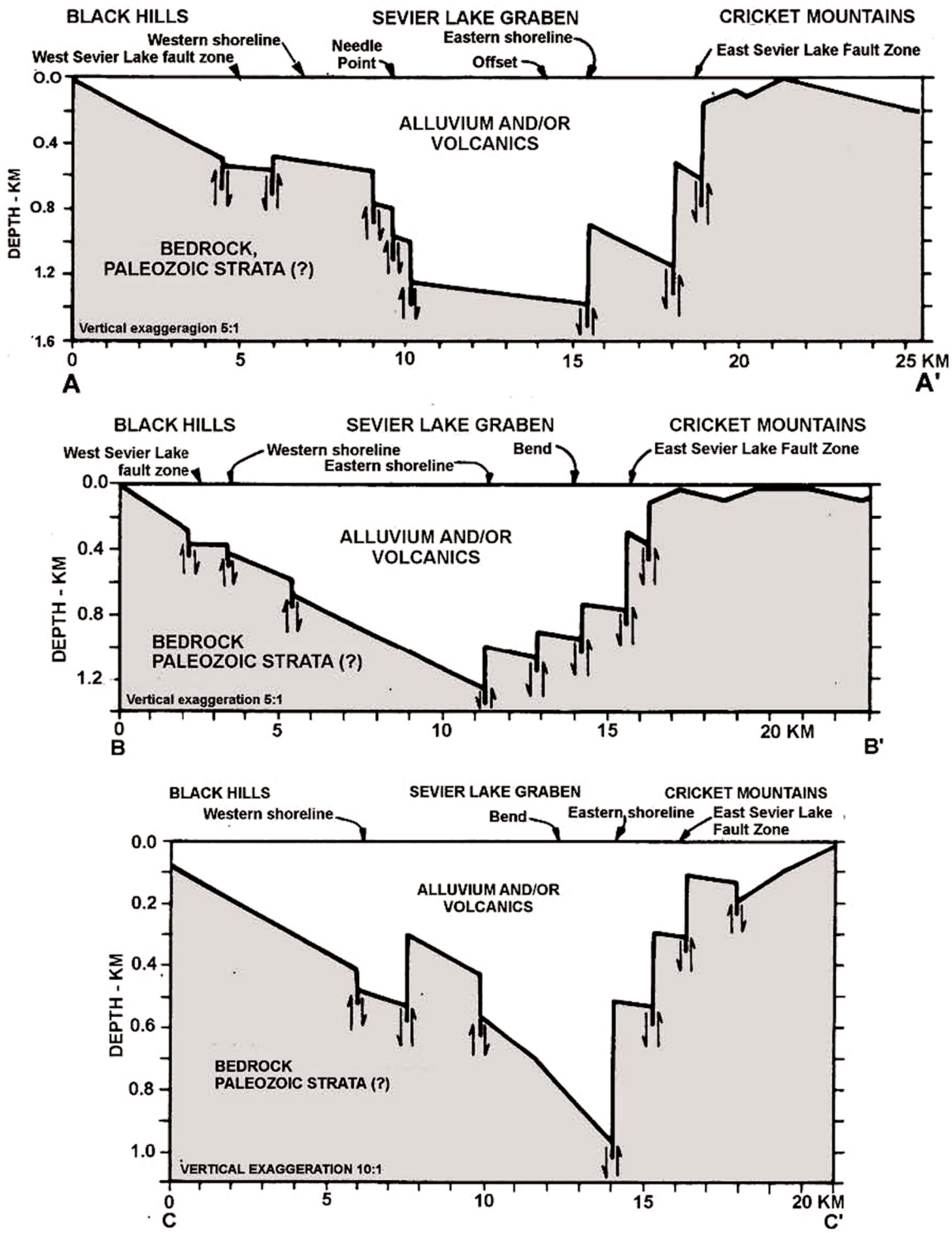


Figure 3b. *Interpretations of the gravity data for profiles A-A', B-B', and C-C'. Profiles from Case and Cook (1979).*

HYDROLOGIC SETTING

The Great Basin, an area of internal drainage within the Basin and Range Province, covers approximately 200,000 square miles, and includes most of Nevada, a large part of Utah, and portions of other states (figure 4). Within the Utah and eastern Nevada portions of the Great Basin are two separate interior-drainage basins, the Great Salt Lake basin to the north, and the Sevier Lake basin to the south. The Sevier Lake basin (figure 5) covers approximately 16,200 square miles, and is made up of the Sevier River basin (10,575 mi^2) and the Cedar/Beaver basin (5,625 mi^2) (Utah Division of Water Resources, 1995, 1999). Sevier Lake occupies the lowest point within the Sevier Lake drainage basin and receives its water from the Sevier and Beaver Rivers, and several smaller tributaries. Wilberg (1991) discussed the hydrology of the Sevier Lake basin, including its surface-water resources, its ground-water resources, and an approximation of its ground-water budget components.

INFLOW TO SEVIER LAKE

The Sevier River is the main source of water that flows into Sevier Lake, when water is available. Upstream from Sevier Lake, the Sevier River receives inflows from the Beaver River, San Pitch River, Salina Creek, Clear Creek, East Fork of Sevier River, Otter Creek, Panguitch Creek, and other minor tributaries. Much of Sevier River's flow is used to fill and maintain the water levels in eight reservoirs (table 2), or is diverted into 20 irrigation canals (table 3) (Sevier River Water Users Association, 2003). Because of the heavy demand for irrigation water, the inflow to Sevier Lake from the Sevier River and its tributaries is minimal, if any, during most years.

A graph illustrating the flow rate of Sevier River (figure 6), as measured near Lynndyl (16 miles northeast of Delta), shows that the average flow rate is about 253 cubic feet per second. Below this point, however, diversions to four irrigation canals, and water to fill and maintain the levels in the Delta, Melville, Abraham, and Deseret Companies (commonly referred to as the DMAD dam) and Gunnison Bend reservoirs consume most, if not all, of this flow (Sevier River Water Users Association, 2003). Graphs showing the flow rates of the San Pitch and Beaver Rivers, both major tributaries to the Sevier River, are shown as figures 7 and 8 respectively. There is normally no flow from the Beaver River into the Sevier River as most of its flow is diverted at or below the Minersville Reservoir (Dale Dodson, Minersville Reservoir water master, verbal communication, 2003). Data used to construct the Sevier, Beaver, and San Pitch River graphs were downloaded from U.S. Geological Survey (2003a).

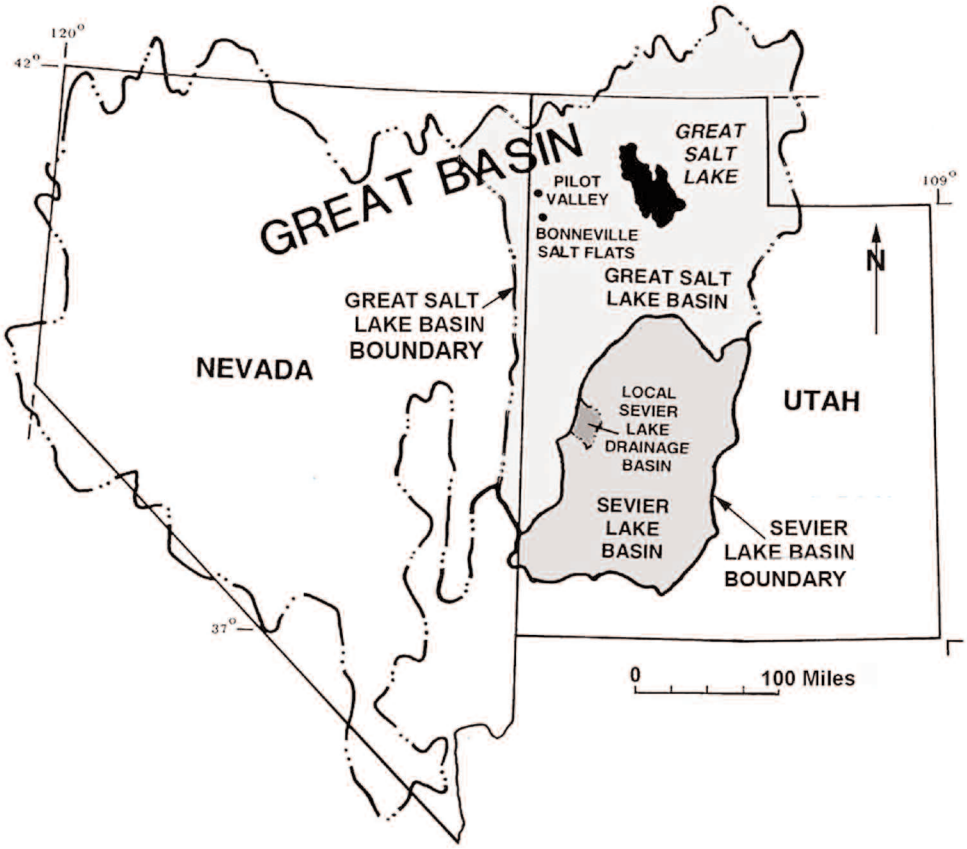


Figure 4. Locations of the Sevier Lake basin, the Great Salt Lake basin, and other features within the Great Basin interior drainage. Modified from Wilberg (1991).

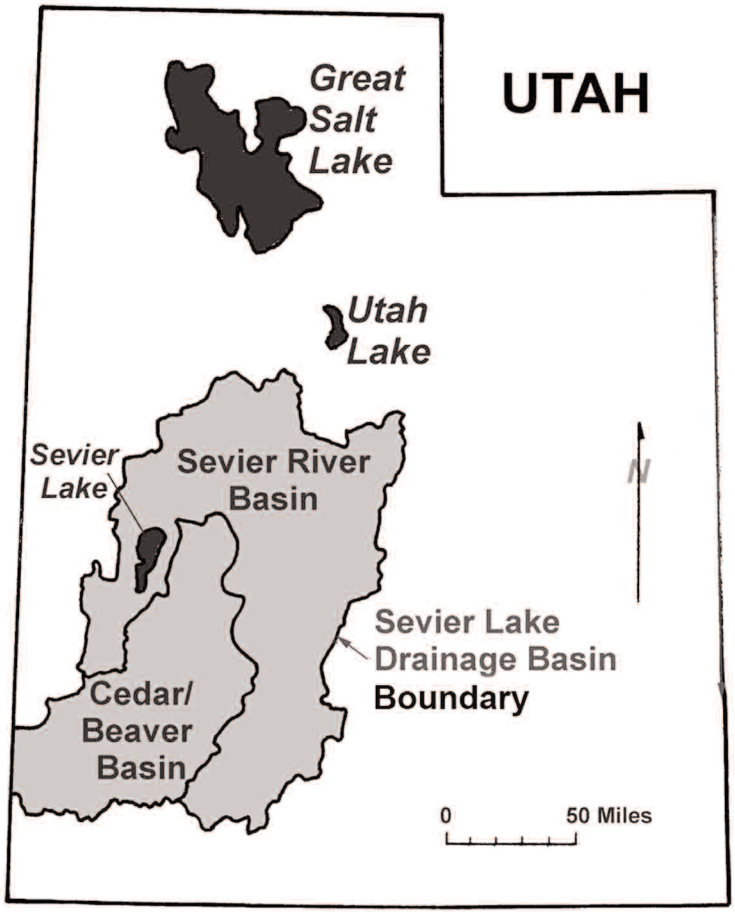


Figure 5. *Locations of the Sevier River and Cedar-Beaver basins within the Sevier Lake Basin. Modified from Wilberg (1991).*

Table 2. *Name and capacity of reservoirs associated with the Sevier River System. Source: Utah Division of Water Rights (2003).*

Reservoir Name	Reservoir Capacity* (acre-feet)
Panguitch	23,730
Otter Creek	52,660
Piute	71,826
Rocky Ford (Sevier)	1,700
Yuba	236,145
DMAD	7,500
Gunnison Bend	5,000
Minersville Reservoir**	14,129

* Capacity at spillway crest
** Located on the Beaver River (also known as Rocky Ford [Beaver] Reservoir)

Table 3. *Canals diverting water from the Sevier River for irrigation. Source: Sevier River Water Users Association (2003).*

Abraham	Deseret Low	Monroe	Vincent
Annabella	Dover	Monroe/South Bend	Westview
Brooklyn	Elsinore	Richfield	
Canal A	Gunnison Fayette	Rocky Ford/Willow Bend	
Central Utah	Joseph	Sevier Valley/Piute	
Deseret High	Leamington	Vermillion	

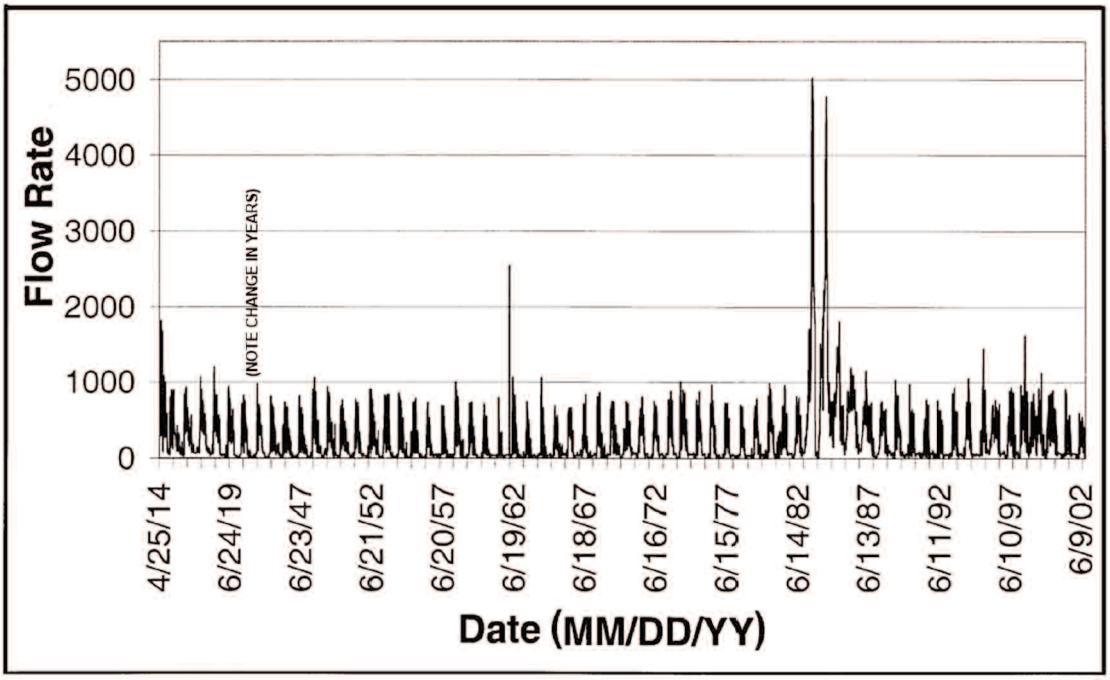


Figure 6. *Flow rates of the Sevier River, as measured near Lynndyl, Utah. Note the above-normal rates during the 1982-85 flooding period. Source: U.S. Geological Survey. Average rate of flow rate is 253.29 cubic feet per second.*

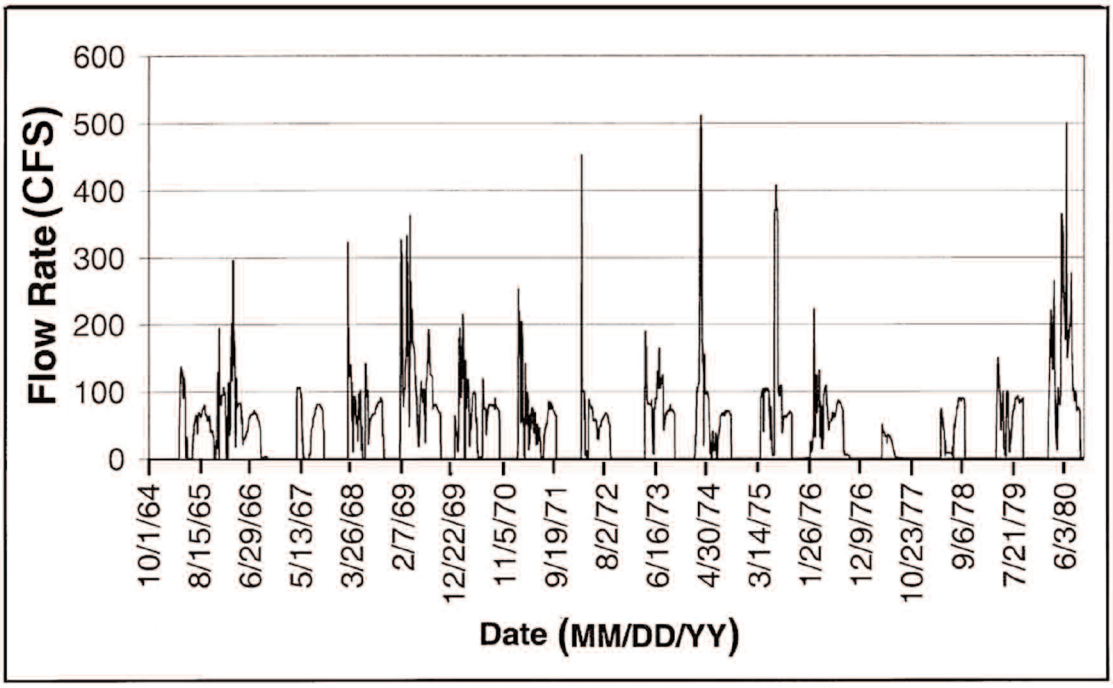


Figure 7. *Flow rates of the San Pitch River measured near Sterling, Utah, 1964-80. Source: U.S. Geological Survey. Average flow rate is 44.95 cubic feet per second.*

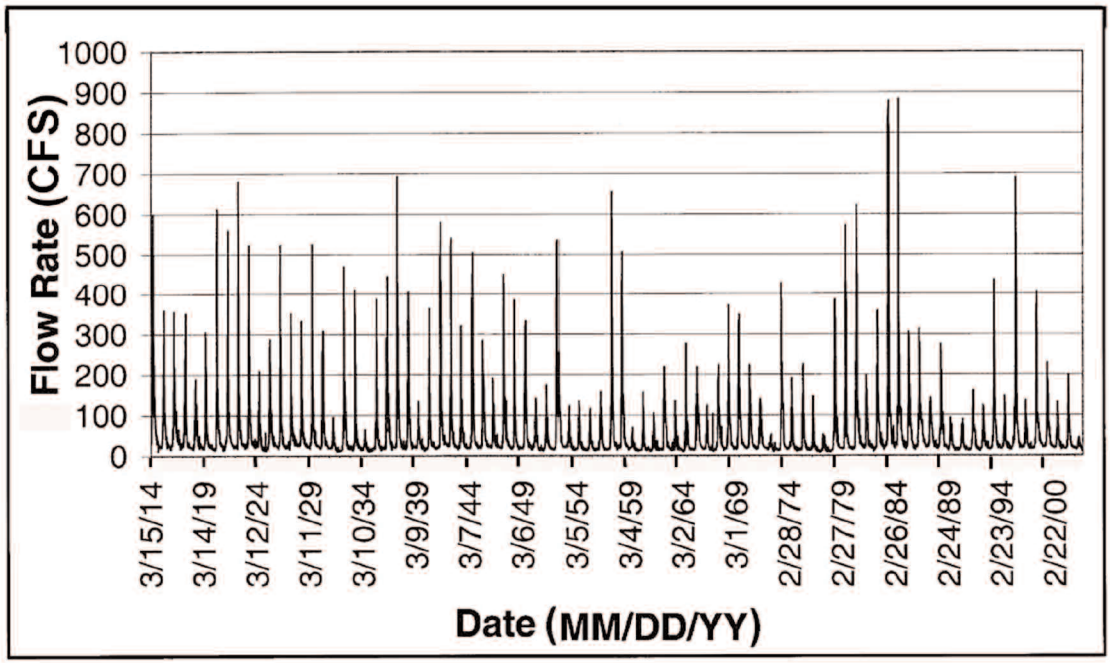


Figure 8. *Flow rates of the Beaver River near Beaver, Utah, 1914-2000. Source: U.S. Geological Survey. Average flow rate is 52.26 cubic feet per second.*

During the winter and early spring months, some tributary water usually reaches Sevier Lake. This, and precipitation that falls directly into the lake, evaporate in a relatively short period of time. Satellite imagery acquired from August 1999 through August 2002 (appendix B) shows the presence of water on the surface of Sevier Lake typically from November through April. During the remainder of the year, May through October, the lake's surface is dry. Early and sustained-peak flows through the year 2000 resulted in the lake's surface being covered with water to a greater extent, and for a longer period of time, than during years 2001 and 2002. The source of the water during the winter months is probably precipitation (snow) falling directly onto the lake's surface.

From 1984 through 1987, Sevier Lake was completely filled with water, as shown on satellite imagery (appendix C). This abnormal condition was due to the above-average flow of the Sevier River. At its peak, the depth of the water in the lake was nearly 13 feet (figure 9), as estimated and/or measured by Larry Sower of CPMC (Hemphill, 1998, and Wilberg, 1991). Note the flooding along the course of Sevier River to the northeast of Sevier Lake during these years, even into March 1986 (appendix C). From 1986 through 1988, inflow to the lake was reduced significantly and the depth of the water declined. Of historical interest, Gilbert (1890) reported a maximum depth of water on Sevier Lake of about 15 feet in 1872. He reported that the northern portion was deeper than the southern portion. Water of above-average depth was likely present on the lake from 1913 to 1915, and from 1922 to 1923 (Hemphill, 1998).

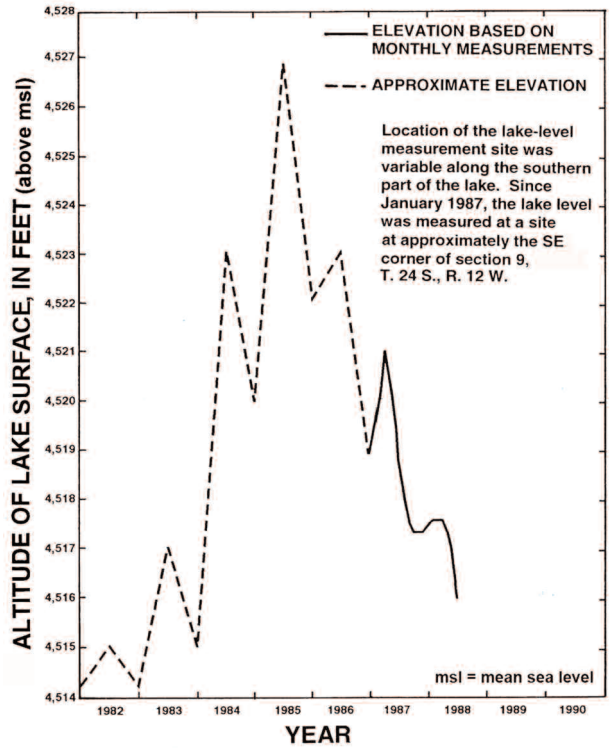


Figure 9. *Altitude of Sevier Lake surface, 1982-88. Graph taken from Hemphill (1989), and Wilberg (1991), with data provided by Larry Sower of Crystal Peak Minerals.*

ROUTE AND HISTORY OF SEVIER RIVER

The Sevier River begins its northward journey in Kane County, just south of the town of Hatch, Utah. From there, it travels northward about 180 miles through Garfield, Piute, Sevier, and Sanpete Counties, and into Juab County to a point just northeast of Leamington where it turns westward, and then southwestward, traveling another 70 miles within Millard County to Sevier Lake.

The Sevier River has been Sevier Lake's main source of water for many thousands of years. The Sevier River even flowed into fresh-water Pleistocene Lake Gunnison, the predecessor of Sevier Lake, some 12,000 to 10,000 years BP, during the time that Lake Bonneville dropped to, and below, the Provo shoreline (Oviatt, 1989). My interpretation of the spatial relationship of Sevier Lake, Lake Gunnison, and their tributaries is shown in figure 10. For a period of time, water flowed northward from the north end of Lake Gunnison into the Great Salt Lake basin through the Old River Channel. Because Sevier River supplied water for such a long time, first to Lake Gunnison, and then to Sevier Lake, its chemistry influenced the overall chemistry of Sevier Lake brines, both near the surface and at depth.

SEVIER RIVER WATER CHEMISTRY

The following section discusses the river's changing chemistry as it flows from Hatch, over 200 miles northward to the lake. Figures 11a and 12 show how the chemistry of the river water's change during the course of its journey from Hatch to Sevier Lake. Figure 11b shows the locations and a site description of the U.S. Geological Survey's sampling sites. Appendix D gives the chemistry of Sevier River at numerous locations along its path, and for most of the river's tributaries.

From Hatch to about Annabella, the river water is a calcium-magnesium-bicarbonate type, and its total dissolved solids (TDS) content increases slightly along the way. From Annabella to Salina, the TDS, sodium, chloride, and sulfate contents increase significantly (figure 11a). Calcium and magnesium in the river water also increase, but to a lesser extent. The large jump in these ions downstream of Annabella is attributed to the dissolution of salts from the Jurassic Arapien Shale that crops out just east of Sevier River (figure 12 - green areas) through this interval. Arapien salts are also present on the west side of the Sevier River in the vicinity of Redmond where they have been mined since about 1870 (Clark, 1971).

Additional salt is added to the Sevier River as it is joined by the San Pitch River near Gunnison. The San Pitch River, initially magnesium-calcium-bicarbonate-type water in the vicinity of Wales and Moroni, picks up salt from the Arapien Shale in the vicinity of the Gunnison Reservoir. By the time the San Pitch River reaches the town of Gunnison, it has changed from magnesium-calcium-bicarbonate-type water to sodium-chloride-type water with significant amounts of magnesium, sulfate, and bicarbonate (figure 12).

The chemistry of the Sevier River from Gunnison to just west of Delta (before the Gunnison Bend Reservoir - figure 13) does not change greatly, but the TDS decreases through this interval. This decrease is attributed to the influx of relatively fresh water to the Sevier River from springs within the high-water-table area extending from Fayette through the Sevier Bridge/Yuba Reservoir area.

Within and below the Gunnison Bend Reservoir (figure 11a), ion concentrations abruptly increase. The reason for the abrupt change may be due to a concentration of the dissolved salts through evaporation within the relatively shallow Gunnison Bend Reservoir (figure 13). Another possible reason for the increase in ion concentrations is an influx of high-TDS ground water (U.S. Geological Survey, 2003b) into the river and/or reservoir. Appendix E gives the water chemistry for 83 wells within the northern Sevier River area that are representative of the ground water. Finally, the sodium-chloride-magnesium-sulfate-type water exiting from, and flowing beyond the Gunnison Bend Reservoir, is characteristic of the small quantities of water that enter Sevier Lake.

SEVIER LAKE - A POTENTIAL SOURCE OF MINERAL WEALTH

Beginning in 1977 or 1978, Murray C. Godbe III (figure 14) operated the Crystal Peak Minerals Corporation, a subsidiary of the W.D. Haden Co. of Houston, Texas, and evaluated Sevier Lake as a potential source of minerals. Initially, Godbe's interest was focused on the potential recovery of lithium and uranium from the lake's sediments. His interest in lithium was most likely stimulated by the anticipated need for the light metal in the United States as projected by the U.S. Geological Survey and industry representatives in two successive symposiums (Vine, 1976; Penner, 1977). At the same time, his interest in uranium was probably fueled by the fact that both uranium production and demand were high, and its price was attractive. After extensive chemical-extraction testing of the lake's sediments, however, Godbe felt that the very low concentrations of these two elements in the sediments, based on hundreds of unpublished analyses by Chemical and Mineralogical Services, would make their extraction very difficult and probably uneconomical.

Upon further study, Godbe determined that the lake's dissolved salts, contained in the lake's subsurface brines, proved to be more promising targets. Based on the chemistry and abundance of the brines, encouraging results of laboratory-scale brine-evaporation tests, favorable climatic and geographic conditions, and encouraging consultation with Mr. Larry Sower (a former process engineer with Great Salt Lake Minerals Corporation, and now an employee with CPMC), it was determined that large quantities of salt (sodium chloride) could initially be produced. Once a cash flow was established through the sale of salt, Mr. Godbe and Mr. Sower envisioned that the production of potassium sulfate and possibly other minerals and/or brine products would follow.

CPMC assembled a 133,000-acre leasehold position that encompassed the entire bed of Sevier Lake. In 1978, four deep holes were drilled to depths ranging from 705 to 975 feet to test the chemical composition of the deep sediments and brines. From 1979 through 1982, over 700 20-foot-deep holes were augered throughout the lake to test the extent and composition of the brine, the thickness of the salt crust, and to characterize the mineralogy and brine content of the lake sediments. Weather stations were established to measure cli-

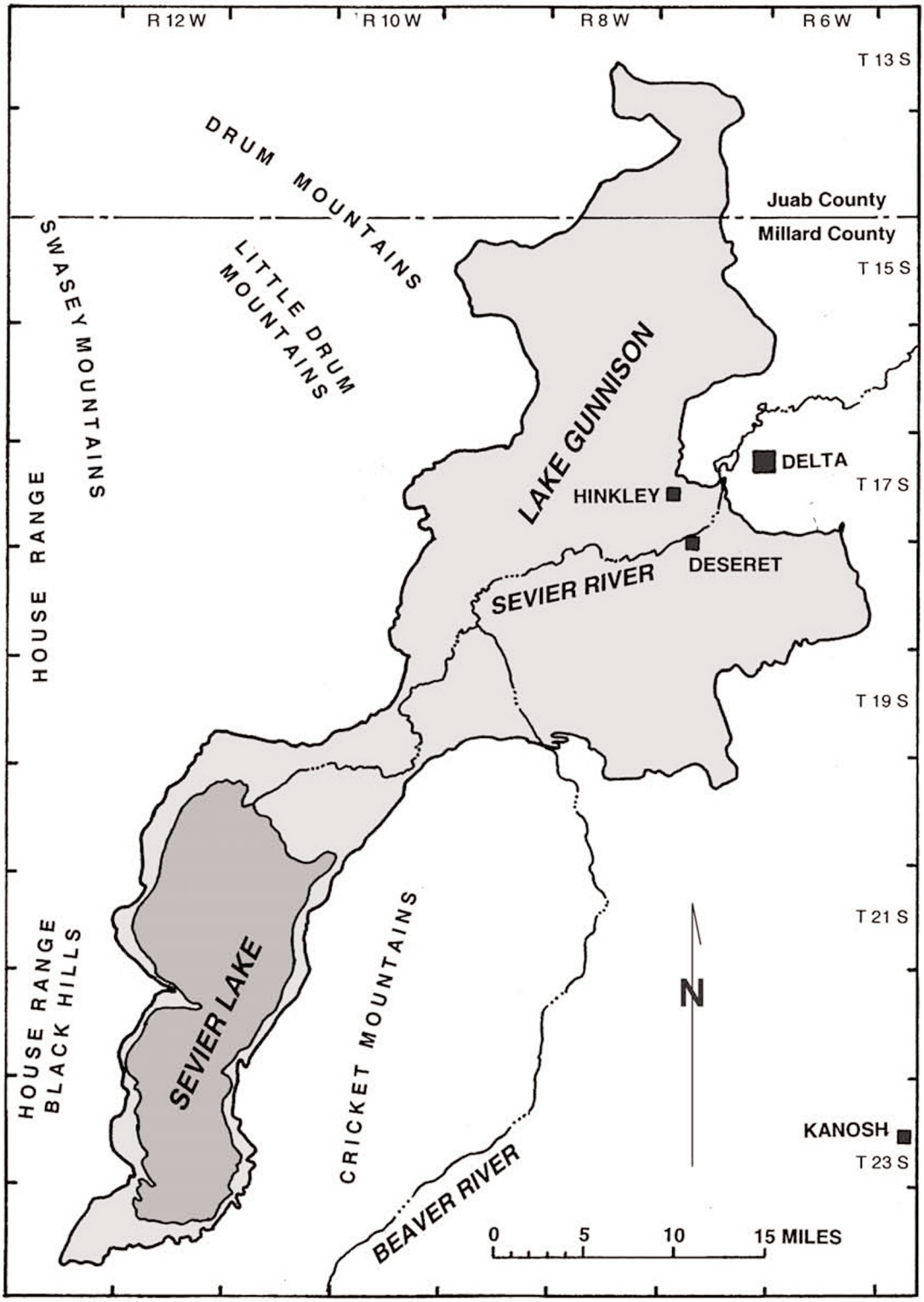


Figure 10. *Geographic relationships between Sevier Lake, Lake Gunnison, and the Sevier and Beaver Rivers.*

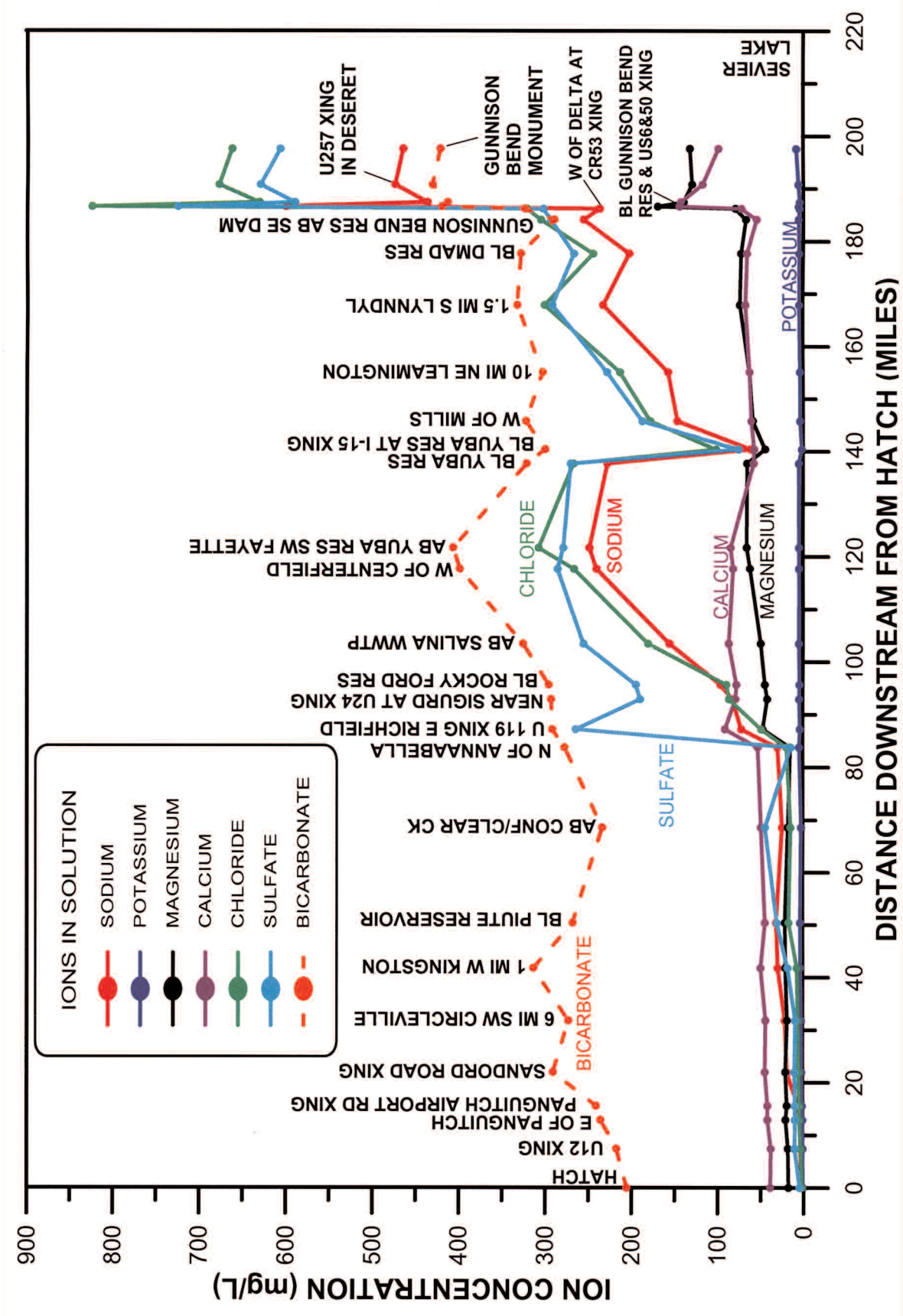
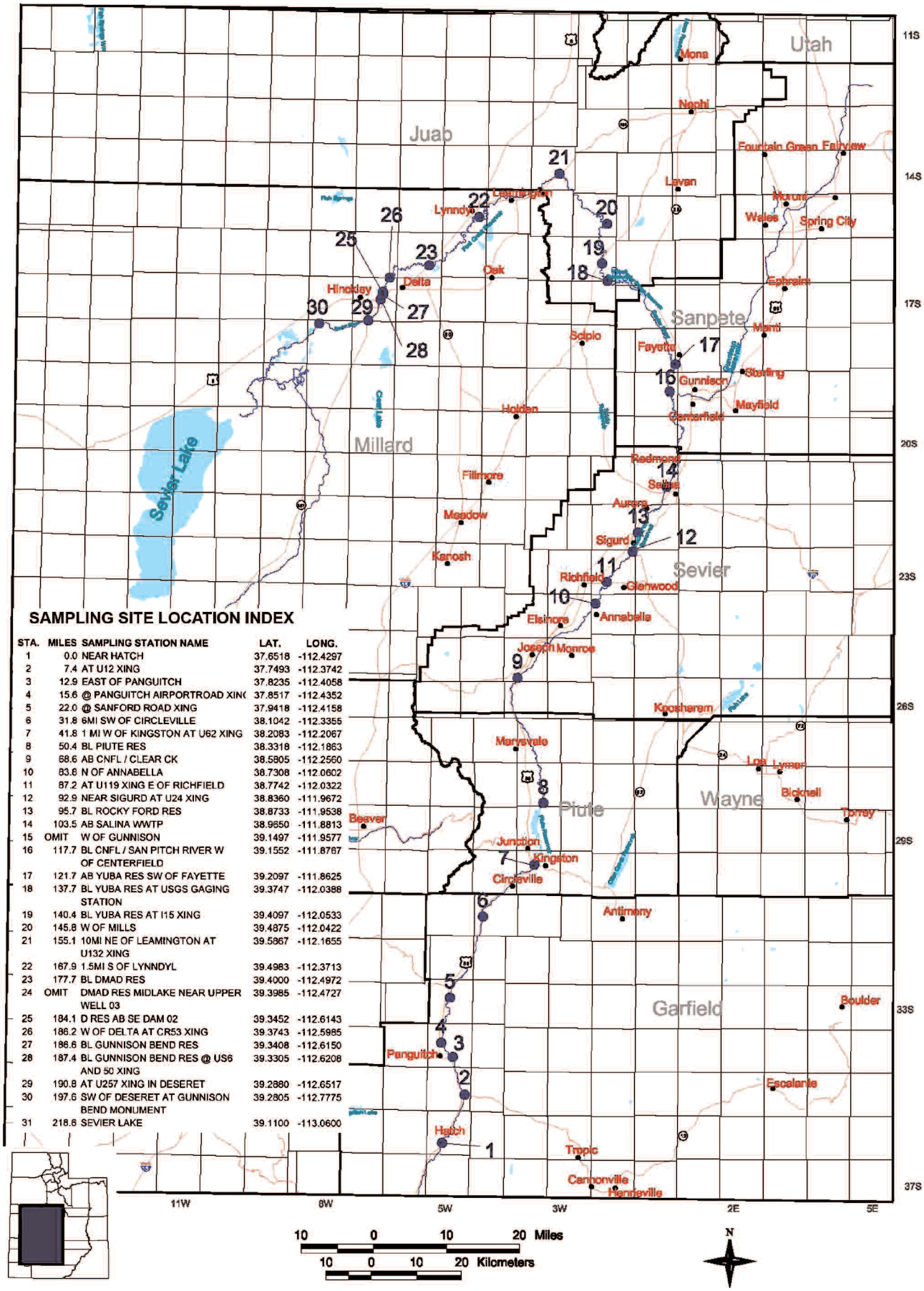


Figure 11a. *Changes in Sevier River ion concentrations from Hatch, northward downstream toward Sevier Lake with reference towns and other locations designated. Source of chemical data: Environmental Protection Agency's Storet Database (see Appendix D).*



SAMPLING SITE LOCATION INDEX

STA.	MILES	SAMPLING STATION NAME	LAT.	LONG.
1	0.0	NEAR HATCH	37.6518	-112.4297
2	7.4	AT U12 XING	37.7493	-112.3742
3	12.9	EAST OF PANGUITCH	37.8235	-112.4058
4	15.6	@ PANGUITCH AIRPORTROAD XING	37.8517	-112.4352
5	22.0	@ SANFORD ROAD XING	37.9418	-112.4158
6	31.8	6MI SW OF CIRCLEVILLE	38.1042	-112.3355
7	41.8	1 MI W OF KINGSTON AT U62 XING	38.2083	-112.2067
8	50.4	BL PIUTE RES	38.3318	-112.1863
9	68.6	AB CNFL / CLEAR CK	38.5805	-112.2560
10	83.8	N OF ANNABELLA	38.7308	-112.0602
11	87.2	AT U119 XING E OF RICHFIELD	38.7742	-112.0322
12	92.9	NEAR SIGURD AT U24 XING	38.8360	-111.9672
13	95.7	BL ROCKY FORD RES	38.8733	-111.9538
14	103.5	AB SALINA WWTP	38.9650	-111.8813
15	OMIT	W OF GUNNISON	39.1497	-111.9577
16	117.7	BL CNFL / SAN PITCH RIVER W OF CENTERFIELD	39.1552	-111.8767
17	121.7	AB YUBA RES SW OF FAYETTE	39.2097	-111.8625
18	137.7	BL YUBA RES AT USGS GAGING STATION	39.3747	-112.0388
19	140.4	BL YUBA RES AT I15 XING	39.4097	-112.0533
20	145.8	W OF MILLS	39.4875	-112.0422
21	155.1	10MI NE OF LEAMINGTON AT U132 XING	39.5867	-112.1655
22	167.9	1.5MI S OF LYNNDYL	39.4983	-112.3713
23	177.7	BL DMAD RES	39.4000	-112.4972
24	OMIT	DMAD RES MIDLAKE NEAR UPPER WELL 03	39.3985	-112.4727
25	184.1	D RES AB SE DAM 02	39.3452	-112.6143
26	186.2	W OF DELTA AT CR53 XING	39.3743	-112.5985
27	186.6	BL GUNNISON BEND RES	39.3408	-112.6150
28	187.4	BL GUNNISON BEND RES @ US6 AND 50 XING	39.3305	-112.6208
29	190.8	AT U257 XING IN DESERET	39.2880	-112.6517
30	197.6	SW OF DESERET AT GUNNISON BEND MONUMENT	39.2805	-112.7775
31	218.6	SEVIER LAKE	39.1100	-113.0600

Figure 11b. *Sampling-site locations and descriptions for figure 11a. Base map compiled by Sharon Wakefield.*

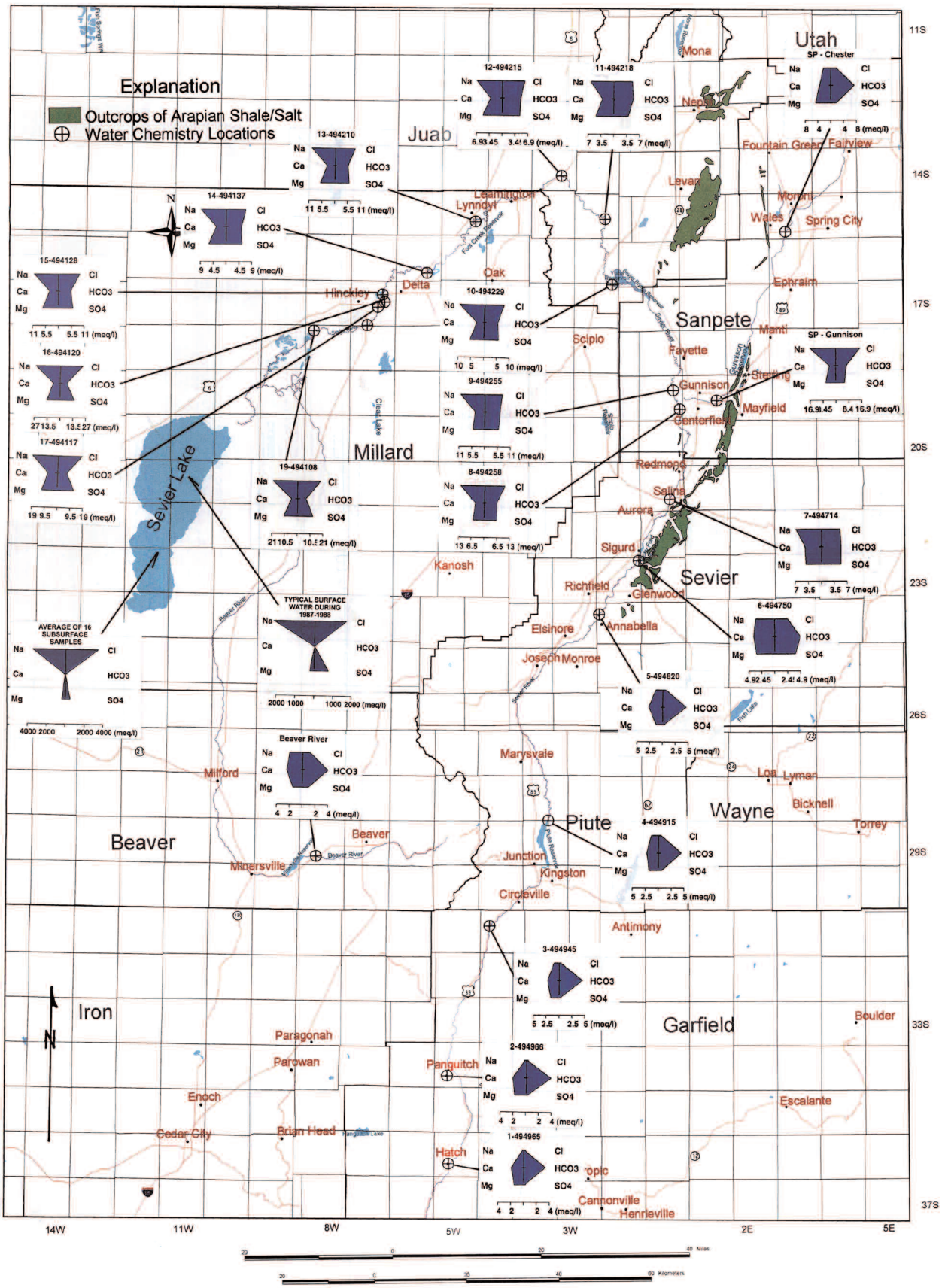


Figure 12. Stiff diagrams representing the changing Sevier River water chemistry from Hatch, downstream to Sevier Lake, and showing the outcrops of the Jurassic, salt-containing Arapien Shale (green). Base map compiled by Sharon Wakefield; source of chemical data: Environmental Protection Agency[s Storet Database (2003).

Figure 13. *View of the Gunnison Bend Reservoir looking southeast. Source: Sevier River Water Users Association (no date given).*

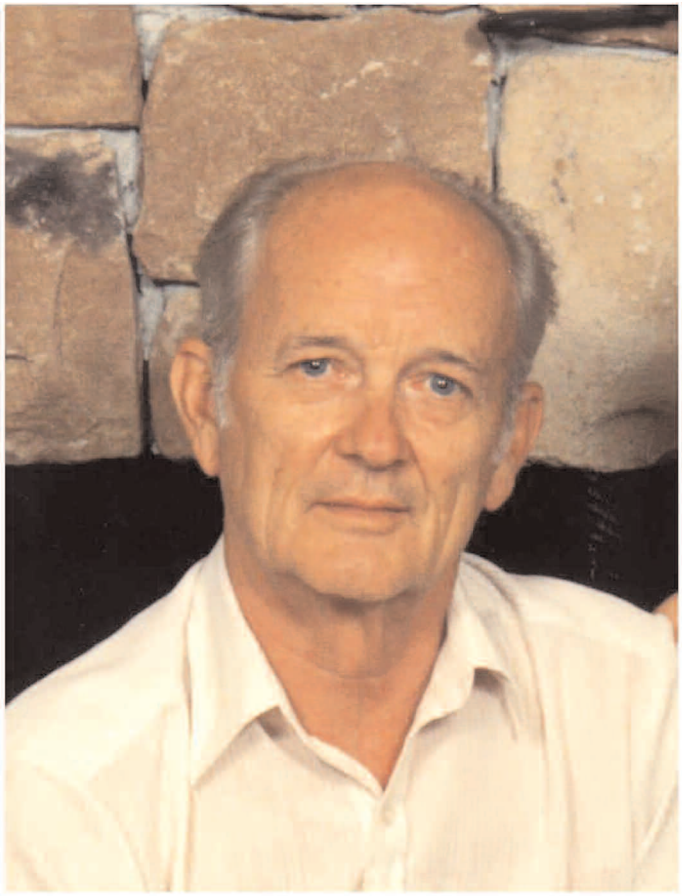


Figure 14. *M.C. Godbe III (1926-2001) – The man with patience, determination, and a vision. Photo courtesy of Mrs. Kathy Godbe.*

matic conditions, and Class-A evaporation pans were erected to determine fresh-water evaporation rates. Small-scale evaporation ponds were constructed on the floor of the lake to determine brine-evaporation rates, and to study the phase chemistry of evaporating brines and precipitated salts. From 1983 through 1988, the flooding of Sevier Lake was a major setback to the project as up to 13 feet of water covered the lake's surface, destroying the weather stations and experimental ponds, and stopping work on the project.

After the flooding period, CPMC resumed its work on the lake. The 3.5-mile-long, protective Needle Point dike and the interior dikes of a 3,000-acre solar-evaporation pond system were constructed; a north-trending, six-mile-long brine-collection canal was dredged and roads and a camp site were constructed. The solar-evaporation pond system was completed in 1987, and more than 1 million tons of salt was precipitated from the brine to create permanent salt floors in the ponds of sufficient thickness to support heavy salt-harvesting equipment. In 1989 and 1990, some salt and high-magnesium chloride brine were produced, and test ponds operated to produce low-grade potash salts. In addition, engineering designs for salt washing, drying, bagging, and load-out facilities were completed, and CPMC developed a flow sheet for the future production of potassium sulfate.

The demise of the Sevier Lake project came with the death of Mr. W.D. Haden, the project's Houston, Texas, financier. Mr. Haden was a man who shared Mr. Godbe's vision, and believed in its successful completion. Upon Mr. Haden's death, funding for the project was terminated by his successors who were not enthusiastic about the project. In May 1993, representatives of CPMC met with U.S. Bureau of Land Management officials and filed the "Relinquishments on Federal Potassium Leases" papers. After CPMC performed the required reclamation work, the Sevier Lake Project was abandoned. Although others have attempted to revive the project, as of 2006 there is no mineral activity on Sevier Lake.

DEVELOPMENT OF SEVIER LAKE DATA

From the beginning of the Sevier Lake Project in 1979, to its abandonment in 1993, CPMC spent approximately $7.5 million (M.C. Godbe, CPMC, verbal communication, 1992) to (1) test and characterize the lake's mineral resources, (2) develop the resource database necessary for the economical recovery of these resources, and (3) build some of the infrastructure necessary for the extraction of these resources. The following sections present many of the data sets that were developed during this 15-year period.

Evaporation and Climatological Information

The rate at which brine will evaporate is one of the key elements in the successful development of a salt-extraction project. Garrett (1966) stated the following:

> Considerable meteorological and evaporation data are required to determine the expected evaporation rates. This can be estimated reasonably well by formulas based upon wind velocity, air temperature, and relative humidity, but is much better obtained by direct measurement in small test pans. The evaporating pans need to be carefully designed and maintained, but they are basically very simple, inexpensive, and comparatively reliable devices.

Early in the Sevier Lake project work, one fresh-water, Class-A evaporation pan was set up on the playa surface to determine the evaporation rate and water temperature of fresh water near the south end of the lake, and a second was placed at the project camp, just south of the lake. In the mornings, evenings, and sometimes at noon, measurements were made to determine how much water had been evaporated in inches and the temperature in degrees F of the water. Appendix F shows the nighttime, daytime, and total evaporation rates, and maximum temperatures that were recorded at the lake and camp locations during June-September 1979, and figure 15 shows a plot of the data gathered from the station located on the playa surface.

While there is normally a basic relationship between water temperature and evaporation rate, the wide scatter in figure 15 suggests that factors other than temperature affect the evaporation rate. These factors include wind speed, humidity, precipitation, and the location of the evaporation pans. By comparing the data from the lake to that of the camp, one can see the effect of location. The camp pan-evaporation rates are lower than those of the lake pan, even though the camp water temperatures appear to be somewhat higher. The lower camp evaporation rates may be due to less wind volume blowing over the pan. The temperature of the water at the surface and the bottom of the pans was determined by maximum-minimum thermometers.

The evaporation rate recorded in fresh-water Class-A pans is not the rate at which the lake's brine evaporates as the evaporation rate of brine is lower than that of fresh water. This necessitates the determination of an evaporation factor, or the relationship between the fresh-water pan evaporation rate and the actual evaporation rate of a brine of a given concentration. Wayne Sherman (Great Salt Lake Minerals and Chemicals Corporation, verbal communication, August 13, 1975) stated that the evaporation rate of Great Salt Lake brines, as a percentage of the fresh-water evaporation rate, ranged from 75 percent down to 40 percent, depending on the concentration of the brine. As examples, the last four columns of appendix F show the extrapolated evaporation rate of Sevier Lake brine at 45, 55, 65, and 75 percent of the fresh-water pan-evaporation rates.

Two Campbell Scientific, Inc.® weather stations (figure 16) were installed by CPMC in 1979 to monitor the weather conditions on Sevier Lake. One station was set up at the north end of the lake and the other at the south end. Exact locations of the stations are no longer available. Data obtained from the two stations during 1979 (appendix G), include the following parameters: air temperature (maximum, minimum, and mean), relative humidity, average solar radiation, precipitation, wind direction, and wind speed. Unfortunately, flooding that started in 1983 destroyed both of the stations. Figures 17a and 17b are rose diagrams of average wind speed in each of the 12 sectors (units are assumed but not documented), and average percent of time in each of the 12 sectors, respectively, for the south weather station.

In October 1987, CPMC, in cooperation with the National Weather Service, established a new weather station that operated until April 1993 when the Sevier Lake project was

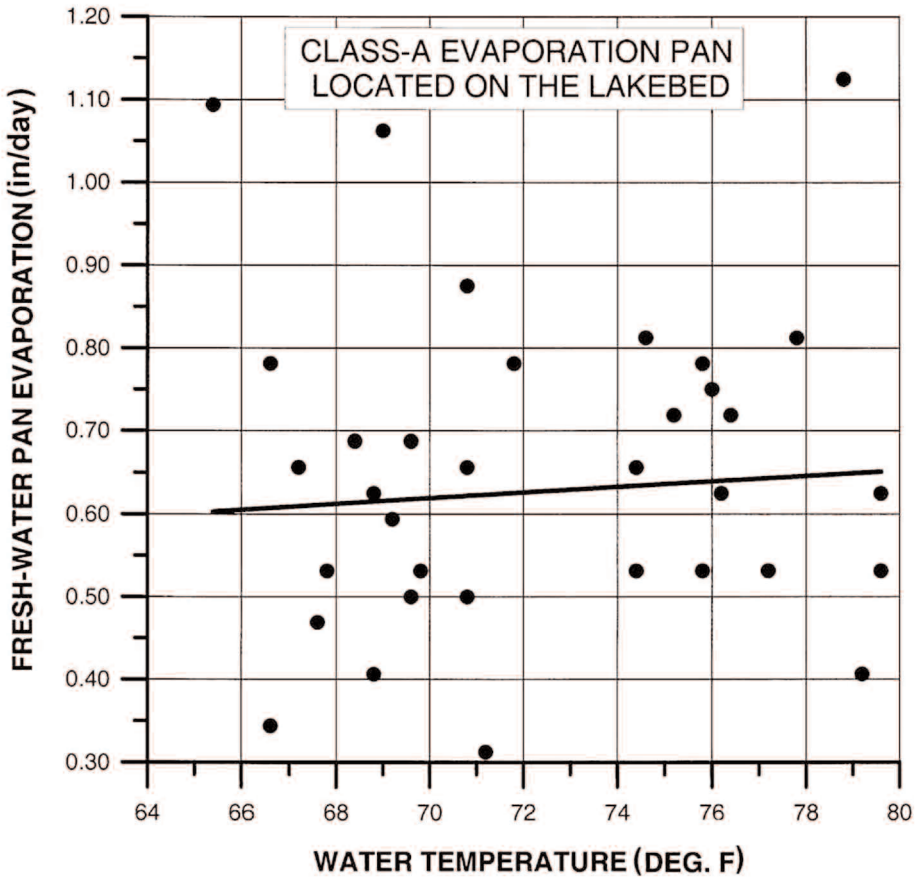


Figure 15. *Plot of Class-A pan evaporation rates versus the average pan-water temperature, with a linear, best-fit line superimposed on the data points.*

Figure 16. *View of one of the two Sevier Lake weather station setups (1978). Photo courtesy of Larry Sower.*

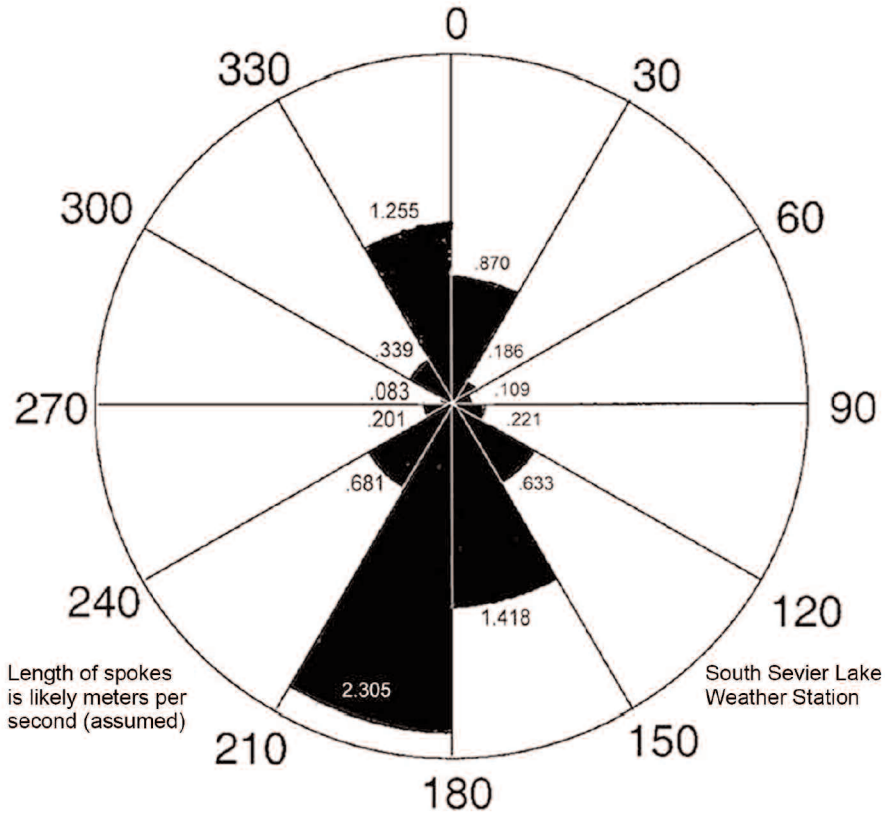


Figure 17a. *Rose diagram showing wind velocity and direction at the south Sevier Lake weather station (from July through November 1979, and March 1983). Values are the average of south-tower sector columns, taken from the first half of appendix G. Data are courtesy of Crystal Peak Minerals Corporation.*

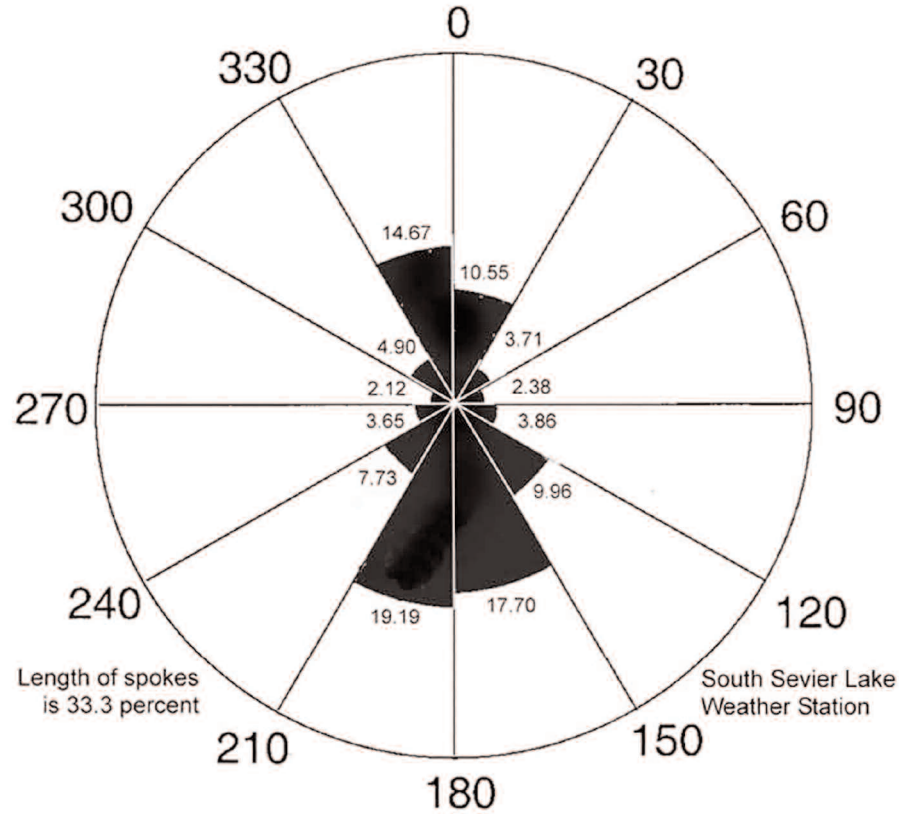


Figure 17b. *Rose diagram showing percent of time the wind blows from each direction at the south Sevier Lake weather station (from July through November 1979, and March 1983). Values are the average of south-tower sector columns, taken from the second hlf of appendix G. Data are courtesy of Crystal Peak Minerals Corporation.*

abandoned. The station was located at latitude 38.7333 degrees north and -113.217 degrees west near the southern end of the lake. The parameters measured by this station included daily air temperatures (maximum, minimum, and observation), precipitation, and total transevaporation. These data are presented in appendix H. Additional station data, not included in the appendix, include: snowfall, snow depth, heating-degree days, cooling-degree days, and growing-degree days.

Wind velocity, air temperature, and relative humidity can be used to calculate evaporation rates if actual measurements are not available. Wind direction is often factored into the layout of solar ponds; the short dimension of the ponds is usually aligned with the dominant wind direction to achieve maximum evaporation. This alignment also reduces wave damage to dikes as the size and violence of waves is directly proportional to the distance they have traveled (Garrett, 1966).

Western Regional Climate Center Data

Average monthly high and low temperatures, and total precipitation data for the Black Rock, Delta, Deseret, Milford, and Wah Wah Ranch stations, all in the vicinity of Sevier Lake, are given in table 4. These data show that neither temperature nor precipitation varies greatly from one station to another and may be representative of conditions at Sevier Lake. The yearly average high daily temperature for all five stations was 66.4 degrees F., and the average low daily temperature was 33.5 degrees F. An average of 8.03 inches of annual precipitation was recorded at the five stations.

Table 4. *Average maximum and minimum, monthly and annual temperatures, and total monthly and annual precipitation for five stations in the vicinity of Sevier Lake.*[1]

Average Max Temp (°F)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Monthly Avg.**
Black Rock	41.7	48.2	57.1	66.1	75.7	85.8	92.8	90.2	81.4	68.9	53.4	42.4	67.0
Delta	38.5	45.3	54.7	64.1	74.2	84.8	93.6	91.5	81.4	67.9	51.1	40.2	65.6
Deseret	38.6	45.5	55.7	64.8	74.2	84.8	92.9	90.6	81.1	68.1	52.5	40.1	65.7
Milford	39.1	45.6	54.4	63.8	73.8	84.5	92.0	89.7	80.7	67.6	52.4	41.1	65.4
Wah Wah Ranch	42.9	49.7	58.0	66.1	76.3	87.2	94.5	92.0	83.3	70.6	54.9	44.3	68.3
Average	40.2	46.9	56.0	65.0	74.8	85.4	93.2	90.8	81.6	68.6	52.9	41.6	**66.4**

Average Min Temp (°F)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Monthly Avg.**
Black Rock	14.5	19.0	24.7	30.7	38.0	45.2	53.2	52.1	42.3	31.2	21.9	14.8	32.3
Delta	13.7	19.5	26.0	33.1	41.7	49.5	57.6	55.8	45.8	34.5	23.1	15.5	34.6
Deseret	13.1	18.9	25.2	31.7	39.7	47.1	54.9	53.3	42.8	31.7	21.7	14.4	32.9
Milford	13.4	19.6	25.2	31.5	39.2	46.8	55.7	54.0	43.7	32.4	22.1	14.7	33.2
Wah Wah Ranch	14.3	20.6	26.0	32.1	40.7	49.4	58.0	56.3	45.8	34.0	23.2	14.8	34.6
Average	13.8	19.5	25.4	31.8	39.9	47.6	55.9	54.3	44.1	32.8	22.4	14.8	**33.5**

Average Total Precip. (in.)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Monthly Average**	**Yearly Total**
Black Rock	0.58	0.57	1.03	0.96	0.86	0.51	0.78	0.85	0.74	0.82	0.72	0.50	0.74	8.92
Delta	0.56	0.60	0.83	0.82	0.89	0.49	0.41	0.54	0.64	0.85	0.59	0.57	0.65	7.79
Deseret	0.56	0.59	0.75	0.86	0.93	0.43	0.46	0.61	0.61	0.76	0.60	0.55	0.64	7.71
Milford	0.64	0.75	1.05	0.83	0.71	0.45	0.72	0.87	0.72	0.86	0.65	0.69	0.75	8.94
Wah Wah Ranch	0.32	0.37	0.60	0.62	0.67	0.40	0.60	0.96	0.73	0.73	0.50	0.26	0.56	6.76
Average	0.53	0.58	0.85	0.82	0.81	0.46	0.59	0.77	0.69	0.80	0.61	0.51	**0.67**	**8.02**

[1]*Data are from the Western Regional Climate Center, downloaded from http://www.wrcc.dri.edu on 6/03/03.*
Black Rock data collected from 4/19/51 to 12/31/02, and station location is 38° 43′ latitude, -112° 58′ longitude.
Delta Period data collected from 6/1/38 to 12/31/02, and station location is 39° 23′ latitude, -112° 31′ longitude.
Deseret data collected from 8/3/1891 to 12/31/02, and station location is 38° 18′ latitude, -112° 38′ longitude.
Milford data collected from 11/01/1906 to 12/31/02, and station location is 38° 25′ latitude, -113° 01′ longitude.
Wah Wah Ranch data collected from 8/13/55 to 11/30/02, and station location is 38° 29′ latitude, -113° 25′ longitude.

Salt Crust, Sediment, and Brine Chemistry Data

Early Chemical Analyses and Salt Examinations

In 1872, the USGS chemist, Oscar Loew, analyzed a sample of brine collected from Sevier Lake (Clarke, 1924). The analysis (in weight percent) follows:

CO^3	—	SO_4	10.88
Cl	52.66	Ca	0.12
Sr	—	Mg	3.01
Li	—	Na	33.33
K	—	SiO_2	—
		Total	100.00

Salinity, parts per million 86,400
Ions not included in the analyses are indicated by —

Gilbert (1890) reported two of the earliest descriptions and analyses of Sevier Lake's surface salt crusts and brines by Johnson and Russell. In January 1880, Johnson examined a vertical profile of the salt crust near the center of the lake and reported the following:

1. (Top). Sodium sulphate: 2 inches
2. Sodium sulphate with some sodium chloride, coherent to no. 1: 1 inch.
3. Sodium sulphate, tinged with pink: 2 inches.
4. Gray clay containing woody fiber: 2 inches.
5. Fine sand containing fresh water shells: 6 inches.
6. Gray Clay.

Russell collected another series of samples on August 20, 1880 at the margin of the area, and reported his findings as follows:

1. (Top). Sodium chloride, forming a coherent crust: 1/2 inch.
2. Sodium chloride, with sodium sulphate and magnesium sulphate; free crystals mingled with water: 1-1/4 inches.
3. Sodium sulphate, with sodium chloride; a crust of coherent crystals: 1/2 inch.
4. Sodium chloride, with magnesium sulphate; incoherent crystals mingled with water: 1-1/4 inches.
5. Sodium chloride, with sodium sulphate, chemically identical with no. 3 but fine-grained and with the consistence of ooze; color white above with occasional passages of pink, green beneath: 1/2 inch.
6. Dark gray mud: 2 feet.

The chemical analyses of the different layers examined by Johnson and Russell are shown here as table 5 (as reported in Gilbert, 1890). When the central-lake samples were taken, the bed of the lake was nearly dry. Johnson was able to travel on foot across a bed of salt where the water had before been the deepest. When Russell collected his samples from the lake's margin, the salt crust was too soft to walk across. Gilbert (1890) reported that during the time between the two samplings, the salt had probably been partially or wholly redissolved and redeposited, and was in a less compact state.

Table 5. *Sevier Lake desiccation products and brine analyses in percent (Gilbert, 1890).*

Constituents	**Composition of salt crust at Center**				**Composition of salt crust at Margin**						**Salts In Dried Brine**
	Upper Layer	Second Layer	Third Layer	Total	Upper Layer	Second Layer	Third Layer	Fourth Layer	Fifth Layer	Total	
Sodium Sulfate	87.65	71.23	89.10	84.60	4.78	5.51	83.79	2.71	5.04	14.30	15.50
Sodium Carbonate	1.08	—	—	0.40	—	—	—	—	—	—	—
Sodium Chloride	2.34	23.85	2.65	7.00	91.39	79.86	13.84	88.49	80.62	75.80	72.10
Calcium Sulfate	Trace	Trace	—	—	Trace	—	Trace	—	0.39	—	0.50
Magnesium Sulfate	Trace	Trace	—	—	1.83	7.83	1.33	5.29	8.32	5.50	—
Magnesium Chloride	—	—	—	—	—	—	—	—	—	—	11.90
Potassium Sulfate	—	—	—	—	Trace	0.34	0.26	0.11	4.03	0.70	—
Lithium	—	—	—	—	—	—	—	—	Trace	—	—
Boric Acid	—	—	—	—	—	—	—	—	Trace	—	—
Water	8.90	4.90	8.20	8.00	2.00	6.46	0.78	3.40	0.92	3.60	—
Insoluble	Trace	Trace	Trace	—	—	—	—	—	0.68	0.10	—
Total	**99.97**	**99.98**	**99.95**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Brine Analyses Reported by Whelan

In August 1966, the Utah Geological and Mineralogical Survey drilled three shallow holes on the west side of Sevier Lake (figure 18). Hole one (50 feet deep) was approximately located in the NE¼ NE¼ section 15, T. 22 S., R. 12 W.; hole two (48 feet deep) in approximately the NE¼ NW¼ section 8, T. 23 S., R. 12 W.; and hole three (20 feet deep) in the approximate center of section 7, T. 24 S., R. 12 W. Whelan (1969) collected brines from the three holes and noted that they contained slightly fewer than 200 grams-per-liter dissolved solids. Analyses of these brines and the soluble salts of the sediments are shown in tables 6 and 7, respectively (Whelan, 1969). During the drilling, Whelan (1969) noted the following:

> The three holes drilled by the Utah Geological and Mineralogical Survey gave brines with slightly different contents of dissolved salts. Brine from hole no. 3, which was located on the long or north-south axis of the lake, had the highest dissolved-salt content. As holes no. 1 and no. 2 were deepened, the brines from them contained fewer dissolved solids. This was not true of hole no. 3, which had a total depth of only 20 feet. The fact that with the exception of those of hole no. 3, the brines became fresher as the holes were deepened may indicate they were formed by fresh groundwater percolating through closed-basin lake sediments. If so, brine reserves may be small. Additional drilling, especially deep drilling, is needed before the potential of the basin as a source of salines can be estimated.

Brine Analyses Reported by Hampton

Donald Hampton (1978) sampled the surface and shallow subsurface brines of the Sevier Lake playa during the summers of 1975 and 1976 (figure 18). Hampton determined the pH and bicarbonate (HCO_3) values of the brines both in the field and in the laboratory (table 8). Chemical and Mineralogical Services (CMS) of Salt Lake City performed the following brine analyses: chloride (Cl), magnesium (Mg), calcium (Ca), sodium (Na), potassium (K), sulfate (SO_4), density (reported in g/ml), and bromine (Br), lithium (Li), and boron (B) (reported in parts per million (table 9).

Analyses and Conditions Reported by Crystal Peak Minerals Corporation

From 1979 through 1983, CPMC augered 20-foot-deep holes near the center of each quarter section throughout the lake as shown in figure 19. During the augering, the presence or absence of a salt crust was recorded in the field notes, and when present, its thickness was noted. Also included in the field notes were the presence or absence of brine, its level in the hole, if the water was artesian, and if a sample was collected. Other notations were the surface conditions (soft or hard), and items of special interest including the presence of unusual sediment types, hydrogen sulfide odor, and plant remains. Composite mud samples were collected from each five-foot interval of the holes. Each hole was then cased with a 20-foot length of PVC pipe and the exposed end capped when the hole was completed. Four deep holes were also drilled in Sevier Lake and one in the Wah Wah Valley Hardpan. The locations and depths of the five deep holes are shown within the shaded oval areas on figure 19, and their locations are given in table 1.

Brines from shallow holes: Chemical analyses were made of brines collected from 118, 20-foot-deep auger holes distributed across the lake (appendix I). The average composition of the brines, reported in terms of milligrams per liter, is as follows: Na = 83,217, K = 3,308, Mg = 3,734, Ca = 576, Cl = 114,129, SO_4 = 27,775, total dissolved solids or sum of ions (TDS) = 228,339, and density = 1.146 g/ml. HCO_3 was not included in the analysis, but is given a value of one to make the data compatible with the AquaChem® chemistry program for calculation purposes. During the augering of the 20-foot-deep holes, the presence or absence of brine, the depth at which samples were taken, and presence or absence of artesian conditions were noted, and are represented by symbols as shown on figure 19. These observations provided important information that was used in planning the alignment and depth of the brine-collection ditch during the Sevier Lake Project's post-1980s-flooding development stage.

Brines from deep holes: Chemical analyses were made on 37 brines from the five deep holes (appendix J). Holes SDL-2, SDL-3, SDL-3A, and SDL-4 were drilled in Sevier Lake, and hole W-5 in the Wah Wah Valley Hardpan area. The

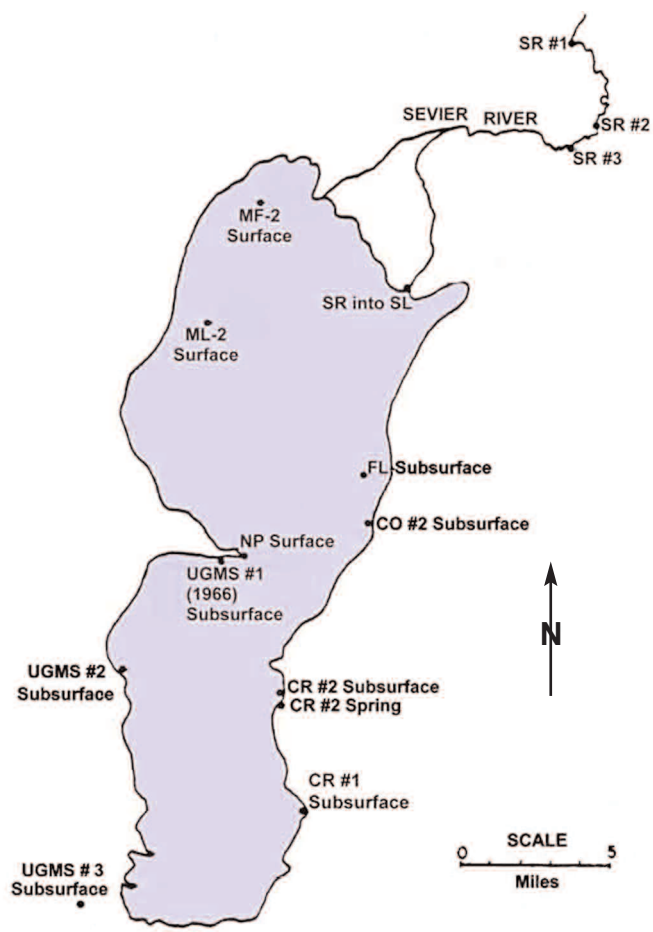


Figure 18. Index map of 1966 Utah Geological and Mineralogical Survey water-sample sites (Whelan, 1969), and 1975-76 water-sample sites (Hampton, 1978), Sevier Lake Playa, Millard County, Utah.

Table 6. Composition of subsurface brines, Sevier Lake drill holes drilled by Utah Geological and Mineralogical Surevey, August 1966 (Whelan, 1969).

Sample Number	Date[1]	Lab Number	Depth to Water Table (feet)	Hole Depth (feet)	Sample Depth (feet)	Gm/Liter						ppm		Lab		Total Solids of Analysis Gm/Liter
						Chlorine	Magnesium	Calcium	Sodium	Potassium	Sulfate	Bromine	Lithium	S.G.	°C	
SB1-35	23	1705	3	35	4	74.76	2.15	.60	78.5	2.48	30.0	46.7	25.0	1.109	26.0	188.49
SB1-48	23	1706	3	48	4	64.08	1.45	.64	53.5	2.81	19.3	41.4	21.0	1.080	26.0	141.79
SB2-10	24	1707	2	10	3	81.88	2.75	.68	79.0	1.98	20.78	50.7	27.0	1.098	26.0	187.07
SB2-20	24	1708	2	20	3	92.56	2.50	.76	64.0	1.98	20.87	41.4	27.0	1.109	25.5	182.67
SB2-30	24	1709	2	30	3	89.00	2.65	.76	63.5	2.23	20.78	45.4	25.0	1.109	25.0	178.92
SB2-40	24	1710	2	40	3	86.44	2.60	.71	61.0	2.23	20.87	48.0	28.0	1.110	25.0	173.85
SB2-50	24	1711	2	50	3	81.88	2.65	.72	61.5	1.98	20.78	34.7	28.0	1.106	25.0	169.51
SB3-10	25	1712	4	10	5	106.80	1.95	.94	75.5	2.64	13.71	64.0	34.0	1.177	24.5	202.54
SB3-20	25	1713	4	20	5	110.36	2.00	.94	76.5	2.64	14.65	69.4	36.0	1.127	24.5	207.09

1. August 1966.

Table 7. Composition of soluble salts of sediments (Whelan 1969).

Sample Number	Date[1]	Lab Number	Sample Depth	Gm Soluble Ion in 50 Gm Sediment								Total Solubles in 50 gm	Percent Soluble Salts
				Chlorine	Magnesium	Calcium	Sodium	Potassium	Sulfate	Bromine ppm	Lithium ppm		
SS1- 1	23	1616	1.0	1.67	.110	.114	1.020	.094	.712	.2	1.35	3.70	7.40
SS1- 5	23	1617	5.0	.85	.096	.025	.560	.095	.333	.2	1.00	1.459	2.918
SS1-30[2]	23	1618	30.0	3.03	.112	.570	1.090	.172	2.790	.2	1.85	7.764	15.528
SS1-48[2]	23	1619	48.0	2.67	.072	.545	1.840	.166	3.060	.2	1.70	8.353	16.706
SS2- 1	24	1620	1.0	.93	.072	.012	.600	.048	.300	.2	1.00	1.962	3.924
SS2- 5	24	1621	5.0	3.56	.096	.785	2.560	.118	2.490	.2	1.75	9.609	19.218
SS2-10	24	1622	10.0	3.35	.098	.740	2.350	.118	3.130	.2	1.60	9.786	19.572
SS2-20	24	1623	20.0	1.71	.022	.070	1.060	.086	.757	.2	1.55	3.705	7.410
SS2-30	24	1624	30.0	1.67	.096	.560	1.220	.070	2.370	.2	1.55	5.986	11.972
SS2-40	24	1625	40.0	1.42	.072	.795	1.240	.100	2.100	.2	1.55	5.727	11.454
SS2-50[2]	24	1626	50.0	1.50	.036	.013	1.020	.062	.370	.2	1.55	3.001	6.002
SS3- 1	25	1627	1.0	5.06	.014	.670	3.240	.176	1.720	.2	3.00	10.880	21.760
SS3- 5	25	1628	5.0	4.73	.016	.670	2.980	.148	2.290	.2	2.80	10.834	21.668
SS3-10	25	1629	10.0	3.10	.008	.085	9.720[3]	.100	.510	.2	1.60	4.775	9.550
SS3-20	25	1630	20.0	1.85	.004	.067	6.080[4]	.072	.329	.2	1.80	2.930	5.860

1. August 1966.
2. May be contaminated.
3. In averages calculated as 0.972.
4. In averages calculated as 0.608.

Table 8. *Comparison of field and laboratory-determined pH values and bicarbonate contents of water samples from Sevier Lake playa and Sevier River (Hampton, 1978).*

Sample	Field pH	Lab pH	Field HCO_3 (g/L)	Lab HCO_3 (g/L)
MF-2	6.85	6.94	0.372	0.456
FL	7.15	7.27	0.598	0.615
SR #1-B	8.15	8.09	0.261	0.245
SR #2	8.30	8.17	0.247	0.221
SR #3	8.20	8.29	0.241	0.229
SR into SL	8.55	8.27	0.136	0.124

Table 9. Chemical analyses of water samples from Sevier Lake playa and Sevier River (Hampton, 1978). See figure 18 for sample locations.

Sample	Cl (g/L)	Mg (g/L)	Ca (g/L)	Na (g/L)	K (g/L)	SO4 (g/L)	Br (ppm)	Li (ppm)	B (ppm)	Density (g/ml)
MF-2	183.68	7.50	0.27	116.50	6.18	37.67	110	40	40	1.224
Ml-2	184.36	7.68	0.13	120.00	6.50	37.92	127	36	55	1.235
NP	174.43	4.37	0.08	111.00	3.85	21.48	80	23	39	1.220
UGMS #31	108.58	1.98	0.94	76.00	2.64	14.18	66.7	35	ND	1.152
UGMS #21	86.35	2.63	0.73	65.80	2.08	20.81	44	27	ND	1.106
UGMS #11	69.42	1.81	0.62	66.00	2.64	24.65	44.23	23	ND	1.095
CR #1-A2	44.73	2.38	0.79	30.16	1.30	15.86	30	13	34	1.065
CR #1-B2	58.85	3.30	0.78	40.50	1.80	17.82	27	16	26	1.085
CR #2 Spr.	50.34	3.69	0.67	36.40	1.20	21.18	25	14	42	1.083
CR #2	54.67	3.13	0.70	32.40	1.60	19.83	25	15	29	1.084
CO #1	113.30	3.47	0.60	74.76	3.55	23.34	75	23	18	1.145
FL	157.44	6.30	0.30	99.70	6.65	32.56	85	32	35	1.193
SR #1-A3	4.25	0.65	0.44	2.55	0.03	2.88	5	0.5	<1	1.021
SR #1-B3	3.44	0.765	0.22	2.75	0.073	2.59	3	0.6	3	1.004
SR #2	3.596	0.795	0.23	2.10	0.031	2.61	4	0.5	2	1.004
SR #3	3.298	0.731	0.20	1.92	0.029	2.45	1	0.5	2	1.003
SR into SL	4.15	0.935	0.27	2.35	1.050	3.24	1	0.6	3	1.005

[1] Source: Whelan (1969). Collected by the Utah Geological and Mineralogical Survey in 1966
[2] CR #1-A, collected in July 1975, and CR 1-B, collected in September 1975, by Hampton (1978)
[3] SR #1A. collected in September 1975., and SR #1-B, collected in June 1976, by Hampton (1978)
ND = Not determined

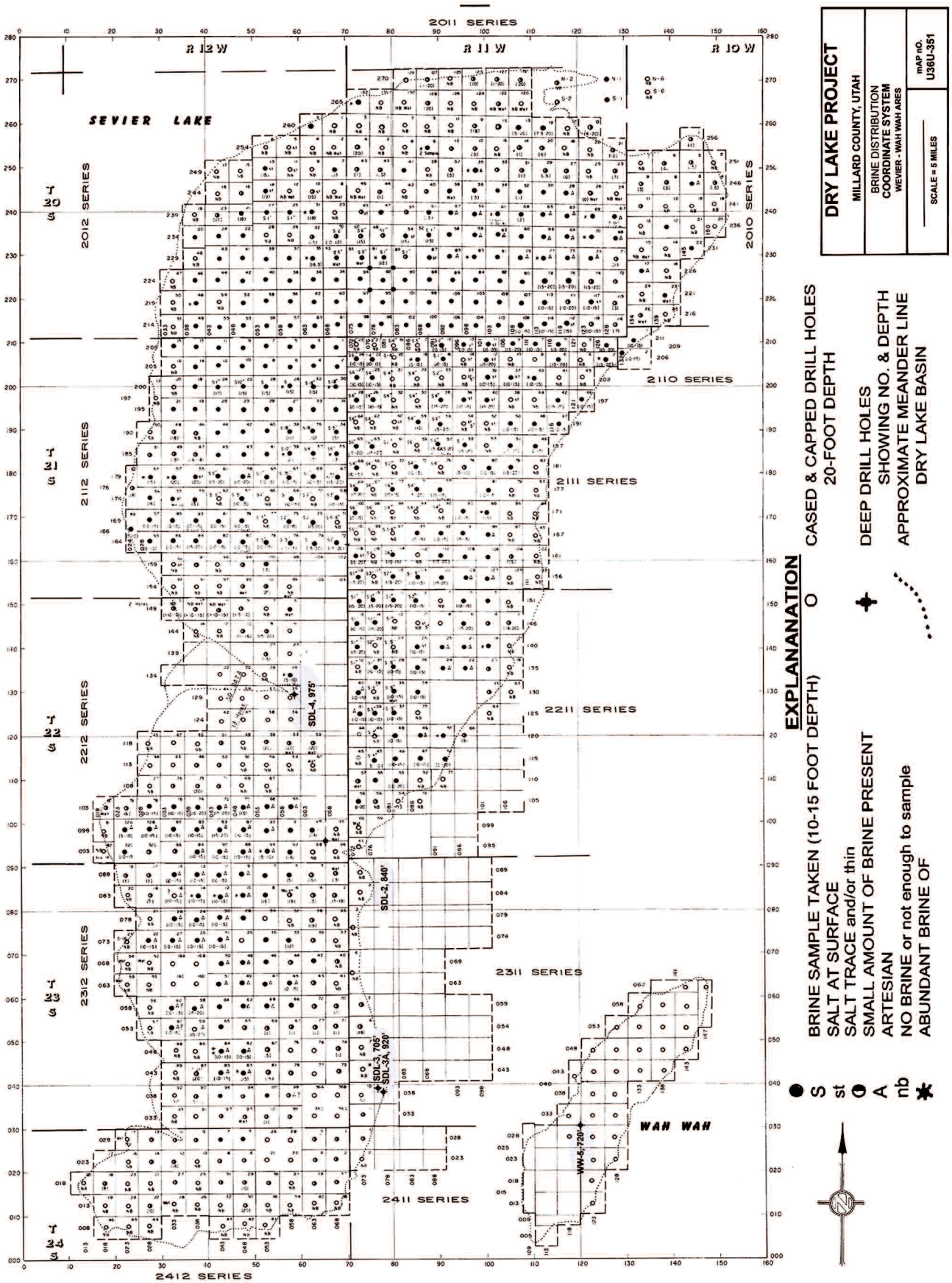


Figure 19. *Map of Sevier Lake showing northing and easting grid, the locations of the five deep drill holes (shaded areas), the locations of the 20-foot-deep auger holes, and the status or property of the salts and brines at each hole. Map produced by Crystal Peak Minerals Corporation.*

locations of the five holes are shown on figure 19 within the shaded oval areas, and are also given in table 1.

Deep-shallow brine comparison: A comparison of the average brine analyses from the 20-foot-deep auger holes and the deep-hole samples, on a dry-weight-percent basis, suggests that the two brine regimes are relatively similar (table 10). Notable differences are that Na (sodium) and K (potassium) are lower in the deep brines, while the other ions are somewhat higher. This pattern might suggest the incorporation of sodium and potassium into clays over a long period of time.

Potential Sevier Lake resource: Godbe calculated 975.74 million tons of brine present in the upper 20 feet of Sevier Lake sediments (unpublished memo, May 23, 1984). This amount was based on the assumption that the area of the lake was 140,000 acres, the brine-filled porosity was 25 percent, and the brine specific gravity was 1.032. Based on the average chemistry of the brine, this equated to 70.25 million tons of sodium, 109.77 million tons of chloride, 4.24 million tons of magnesium, 3.51 million tons of potassium, and 21.08 million tons of sulfate. If a brine density of 1.146 g/ml (a more typical brine specific gravity as shown in table 10) is substituted for the specific gravity of 1.032 used in the calculations, the amount of each ion is increased by about 11 percent.

Table 10. *Comparison of the average, dry-weight-percent analyses of the brines from 20-foot-deep auger-hole samples and the deep-hole samples.*

Samples	Na	K	Mg	Ca	Cl	SO_4	Density g/ml
20′ deep holes	36.00	1.44	1.63	0.252	49.48	12.16	1.146
Deep holes	32.27	0.645	2.93	1.36	50.15	12.62	ND
ND = Not determined							

1979-1982 salt crust and brine conditions: During the 1979-82 augering operations, the physical presence and thickness of the salt crust was noted. The approximate area covered by the salt crust is noted in figure 20, and the presence or even a trace of salt is indicated on figure 19. The thickness of the salt crust ranged from 18 inches near its center to less than one-half inch around the perimeter of the crust. A trace of salt was found on the lake's surface in many areas outside the main salt-crust area. The chemical composition of the crust was not determined during CPMCs' investigation, but salt-crust samples I received from Mr. Godbe were determined to be a white to gray mixture of mirabilite ($Na_2SO_4.10\ H_2O$), halite (NaCl), and some sediment. The mirabilite turned into a white powdery material, thenardite (Na_2SO_4), upon being exposed to the air for a few weeks.

I ran semi-quantitative analyses of the two samples of salt crust on the Utah Geological Survey's Rigaku ZSX Mini® x-ray fluorescence (XRF) spectrometer unit. These analyses showed the following average (of the two samples) mass-percent composition: Na = 38.5, K = 0.63, Mg = 0.87, Ca = 2.1, Cl = 5.24, and S = 51.2. Also detected were Al, Si, Cr, Fe, and Sr. The average analysis indicates that the salt crust is composed mainly of mirabilite and/or thenardite with some halite.

Elemental distribution in near-surface and deep sediments: Ten sediment samples from Sevier Lake were analyzed by Inductively Coupled Plasma analysis by the University of Utah's Earth Science Laboratory (now the Energy & Geoscience Institute) to determine the major and trace elements present (appendix K). Analyses were done on (1) the original samples, (2) the samples after they had been washed about six times in deionized water, and (3) the first-wash water. The first-wash water was derived from slurry made by mixing 50 grams of dried sediment with 510 ml of deionized water. The slurry was allowed to stand for six days with daily agitation before the first-wash water was separated from the solids (sample preparation procedure from my Sevier Lake project experiment no. 12 notes, dated July 30, 1981).

The major elements present in the original samples are Na, K, Ca, Mg, Fe, Al, Ti, and P. Si is a major constituent, but was not analyzed in the unwashed and washed sediment samples, as the analysis required an additional digestion of the sediments. Si is reported, however, in the first-wash water where Na, K, Ca, and Mg are the most soluble cations. Other ions contained in the first-wash water are Fe, Sr, Li, and B. In general, all other ions, if present in the first-wash water, were in concentrations below the limits of detection of the ICP analyzer. Elements present in the unwashed and washed muds that were not dissolved in the first-wash water include Sr, Ca, Ni, Cu, Zn, Be, Zr, La, and Ce.

A total of 82 composite samples obtained during the augering of the 20-foot holes, representative of the top five feet of lake sediments, were analyzed using the Utah Geological Survey's Rigaku ZSX Mini® XRF spectrometer. Raw elemental analyses were refined using Rigaku's $CaCO_3$ balance calculation (Rigaku, 2002) and matching libraries. The seven matching libraries were based on Sevier Lake samples with known compositions. Appendix L gives the mass percents of the 18 elements (as oxides), and figures 21a-c give contour-plot representations of twelve of the most abundant elements. These contour plots show that concentrations of sodium, chlorine, and sulfur are highest in the area of the thick salt crust is shown in figure 20. The area covered by the salt crust is the lowest part of the lake, and is where the last stages of evaporation occurred and precipitation of halite and mirabilite (or thenardite) took place. As sodium, chlorine, and sulfur are the most abundant elements in the salt-crust area, the relative abundances of other elements in the area show a dramatic relative decrease.

At this writing, the elemental distributions in the 5 to 10, 10 to 15, and 15 to 20-foot-deep sediment intervals have not been determined. If these samples are run, and they show the same elemental distribution as is shown in figures 21a-c, this would suggest that the low area of the lake has been in the same location for many thousands of years. No near-surface, incremental-depth sampling was done on the Wah Wah Valley Hardpan area south of Sevier Lake.

Sediment samples taken at incremental 5-foot depths in Sevier Lake holes SDL-2, SDL-3A, SDL-4, and in the Wah Wah Valley Hardpan W-5 (see locations in figure 19) were semi-quantitatively analyzed using the Survey's Rigaku ZSX Mini® XRF spectrometer to determine their elemental com-

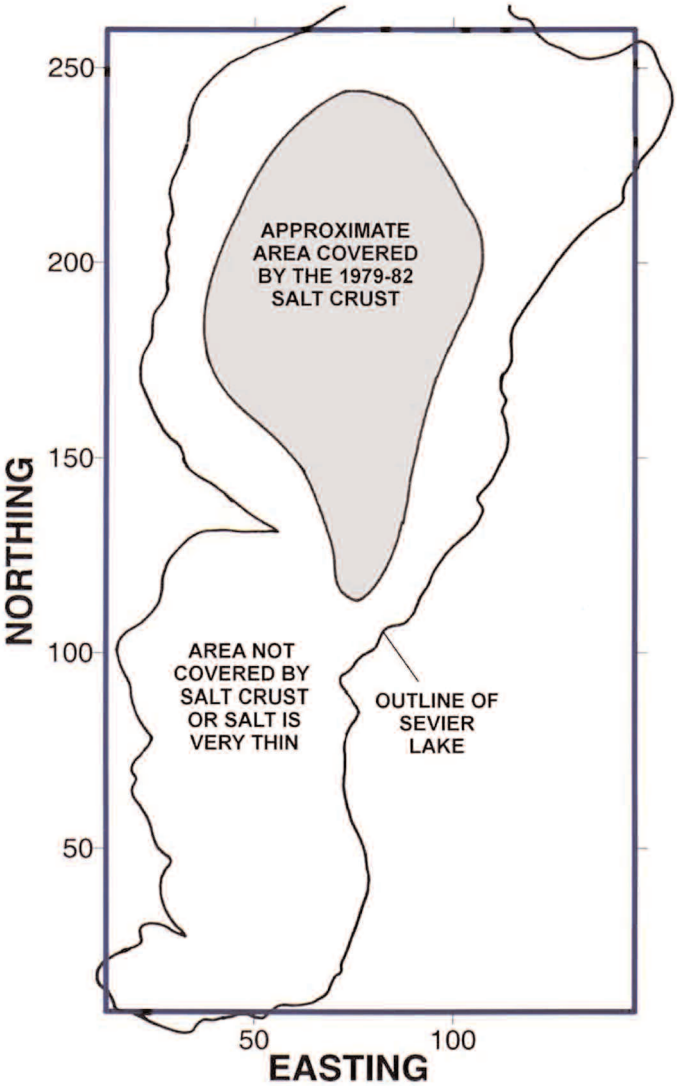


Figure 20. *Area of Sevier Lake covered by salt crust from 1979-82. See figure 19 for coordinate system.*

position. Figures 22a-d show the results of these analyses for the nine most abundant oxides and chlorine, and appendix Ma-d gives the full analytical results from the four deep wells. The high values for SiO_2 and CaO are probably due to the presence of quartz (SiO_2) and calcite ($CaCO_3$) that make up the bulk of Sevier Lake sediments, though some of the calcium is attributable to gypsum ($CaSO_4.2H_2O$). The Al_2O_3 is indicative of the aluminum present in all of the clay minerals. The majority of the MgO is probably tied up as dolomite ($CaMg(CO_3)_2$) and/or magnesite ($MgCO_3$) as reported by Hampton (1978), with a minor portion coming from the interstitial brine. The relatively high amount of K_2O probably derives from the clay mineral illite with a minor portion from the brine. The SO_3 comes from both the mineral gypsum, and from the brine, and both the Na_2O and Cl values mainly from the interstitial brine.

The SDL-4 hole was spudded in sediments at an elevation of 4,528 feet, some eight feet above the lakebed. The greater relative abundance of SiO_2 and CaO suggest that it was spudded in material composed mostly of quartz and calcium carbonate (figure 22c). Other element concentrations were low at the surface, but increased as drilling reached depths of 5 to 10 feet, which is the approximate elevation of the lakebed. With the exception of Cl, SO_3, and to a lesser degree Na_2O, the elemental concentrations of the other elements remain within a relatively narrow range, suggesting a consistency in the silicate and carbonate mineral composition from top to bottom. Conversely, Cl, SO_3, and to a lesser degree Na_2O show a marked decline beginning at a depth of about 350 to 400 feet. This decline is attributed to lower concentrations of salt in the interstitial fluids, or smaller amounts of brine.

The SDL-2 hole was spudded at an elevation of 4,520 feet, (the playa's surface elevation). With the exception of Cl, SO_3, and to a lesser degree Na_2O, the elemental concentrations remain within a relatively narrow range, suggesting consistency in the silicate and carbonate mineral composition from top to bottom (figure 22a). The jump in concentration of Cl, SO_3, and to a lesser degree Na_2O, from the surface to a depth of about 50 feet is probably due to the presence of a persistent salt crust in that portion of the playa. Because these increased values extend through a considerable thickness of sediments, the salt crust was likely present in this area over a long period of time. The increase in Cl, SO_3, and to a lesser degree Na_2O, starting at a depth of 350 to 400 feet and peaking between 550 to 600 feet, and then declining, is attributed to higher concentrations of salt in the interstitial fluids, possibly due to dissolution of old salt/mirabilite beds.

The SDL-3A hole was spudded at an elevation of 4,520 feet (the playa's surface elevation). All of the elemental constituents show a very constant concentration range, from top to bottom of the hole (figure 22b). This suggests that conditions remained fairly stable at this location through many thousands of years.

The W-5 hole was drilled in the Wah Wah Valley Hardpan, to the south of Sevier Lake. The hole was spudded at an elevation of 4,637 feet. From the surface to a depth of about 350 feet, all of the constituents, with the exception of Cl, SO_3, and Na_2O, remain within a relatively narrow concentration range. From about 350 feet to a depth of about 500 feet, CaO, probably as calcium carbonate, increases while all the other constituents decrease. From about 500 feet to the well's total depth of 720 feet, SiO_2 (as quartz sand) increases at the expense of the other constituents. Cl and SO_4 show a general decline in concentration from the surface downward, and Na_2O shows a decline from about 350 feet to 500 feet, after which it increases. The last increase in Na_2O between 450 and 600 feet may be attributed to a slight increase in salt content in the interstitial brine, as there is a slight leveling off of both the Cl and SO_3 through the same depth interval.

Chemical analyses of four composite samples from the top 200 feet of the deep holes SDL-2, SDL-4, and W-5, and the bottom 200 feet of W-5 are given in table 11. Also given are the analyses (in ***bold italics***) of the two splits of a composite sample representing the 82 surface samples. Actlabs® performed the six analyses. The analytical results of SiO_2 through "Tot" of the first six rows, and S* from the ninth column of the last seven rows are given in terms of percent. The remainder of the analyses are given in terms of parts-per-million (ppm). Analyses given under W-5T /r* are repeat analyses.

Lithology and U_3O_8 distribution in deep-well sediments: During the drilling of the five deep wells, a visual examina-

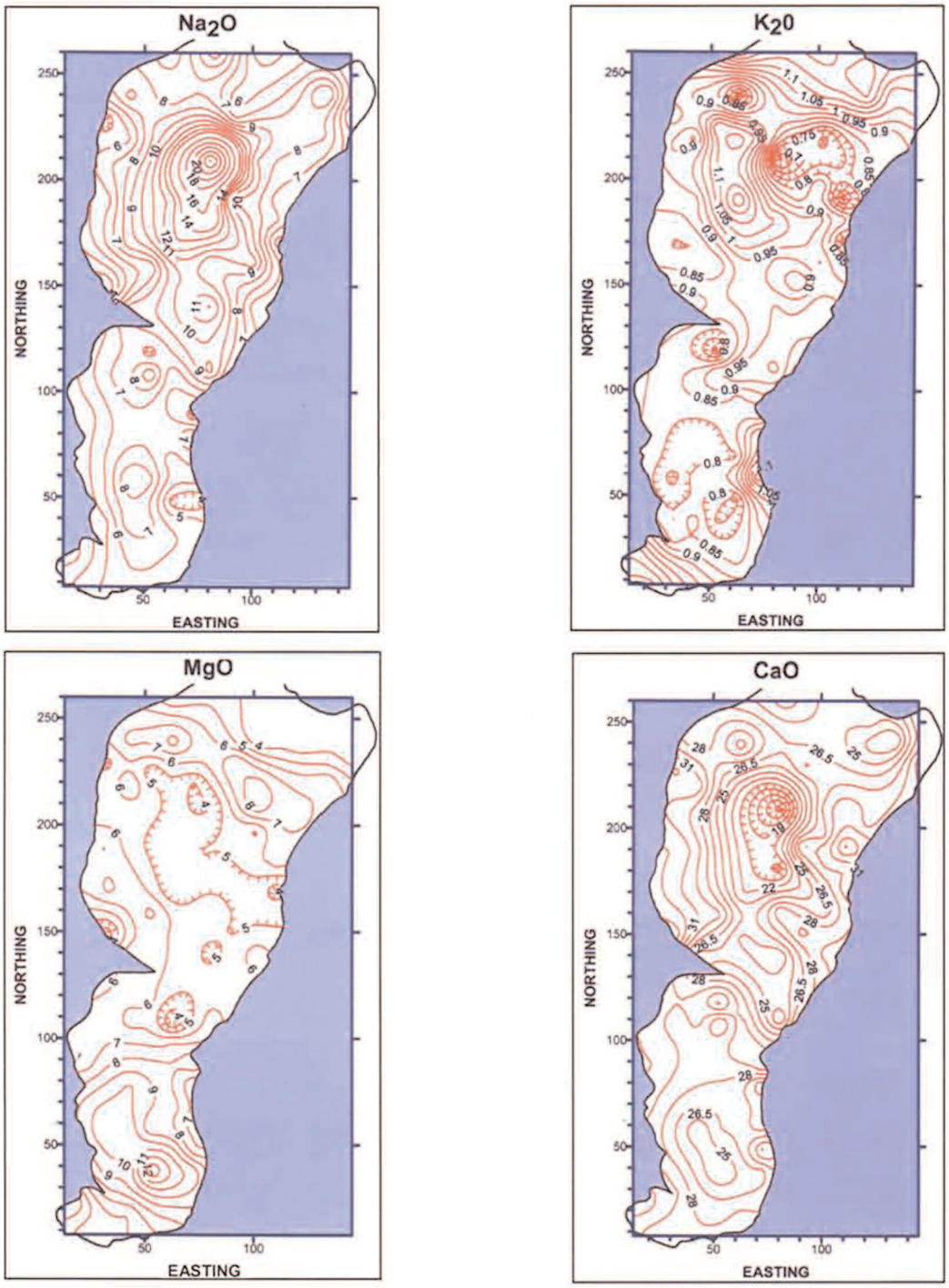


Figure 21a. *Contour plots of Na_2O, K_2O, MgO, and CaO concentration (in mass percent) in the top five-foot interval of Sevier Lake sediments as determined by semi-quantitive XRF spectroscopy. See figure 19 for coordinate system. Samples were run for the Utah Geological Survey by Bountiful High School student, Emily Toone.*

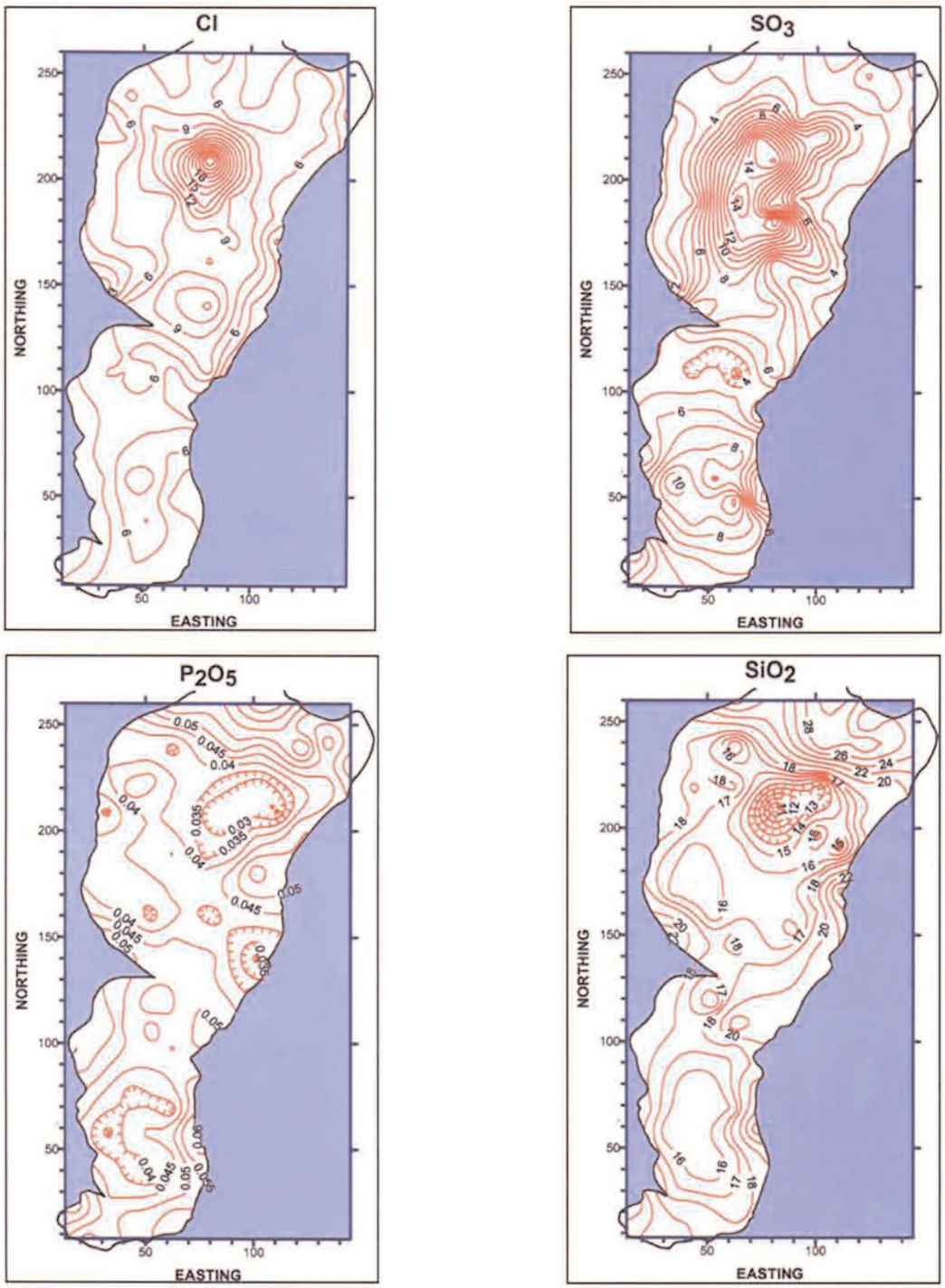


Figure 21b. *Contour plots of Cl, SO_3, P_2O_5, and SiO_2 concentration (in mass percent) in the top five-foot interval of Sevier Lake sediments as determined by semi-quantitive XRF spectroscopy. See figure 19 for coordinate system. Samples were run for the Utah Geological Survey by Bountiful High School student, Emily Toone.*

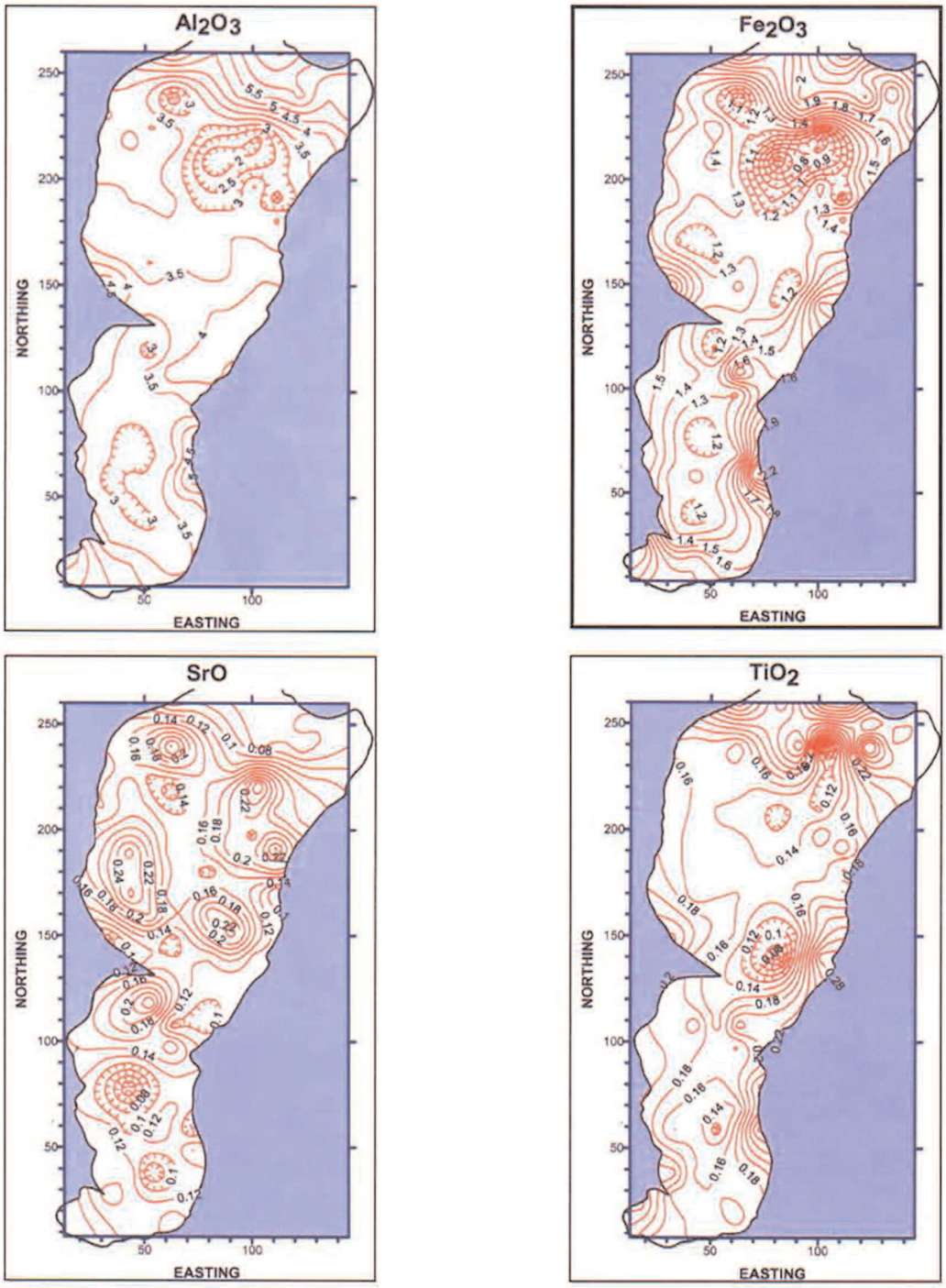


Figure 21c. *Contour plots of Al_2O_3, Fe_2O_3, SrO, and TiO_2 concentration (in mass percent) in the top five-foot interval of Sevier Lake sediments as determined by semi-quantitive XRF spectroscopy. See figure 19 for coordinate system. Samples were run for the Utah Geological Survey by Bountiful High School student, Emily Toone.*

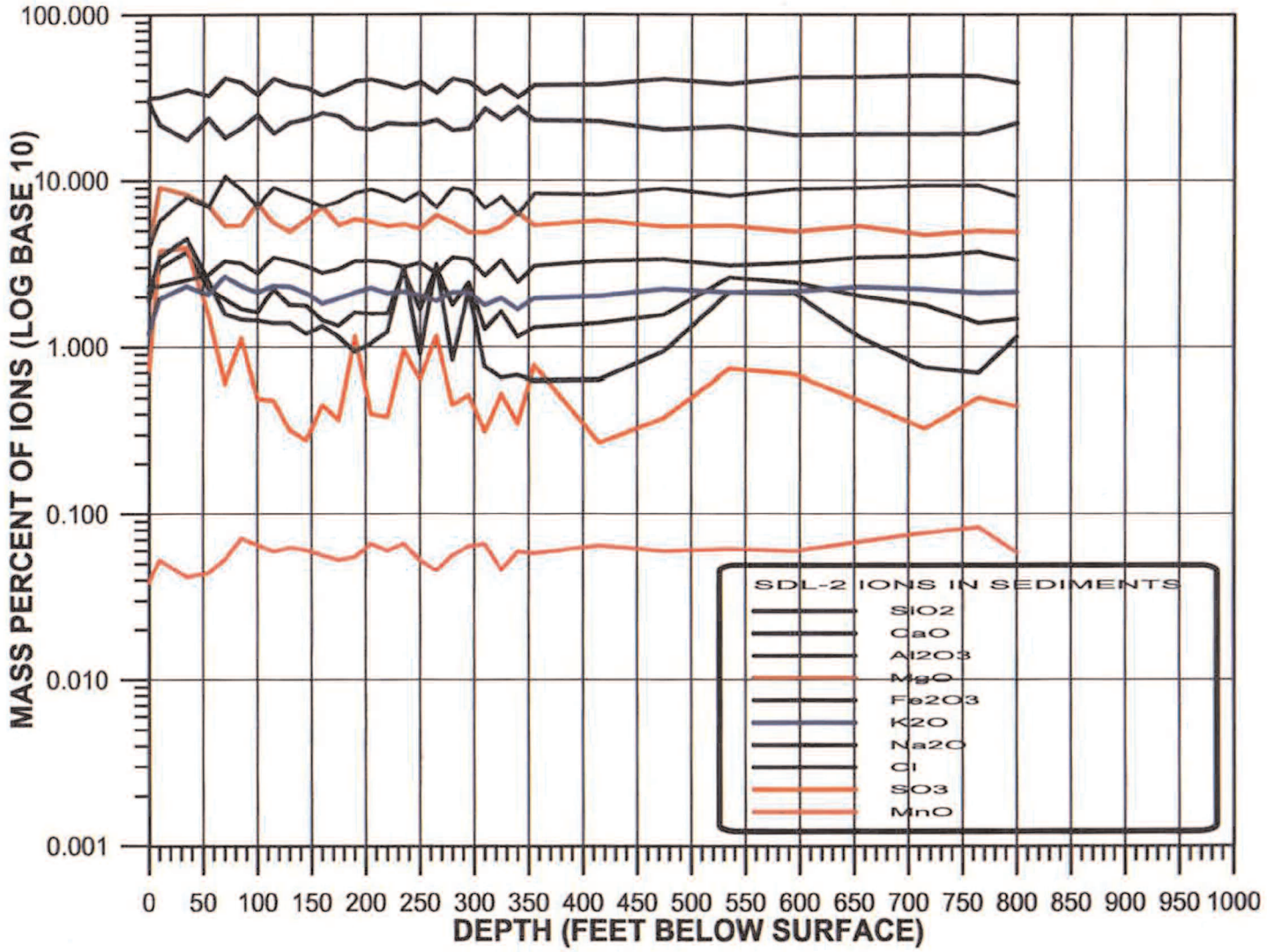


Figure 22a. *Chemistry of the SDL-2 well sediments.*

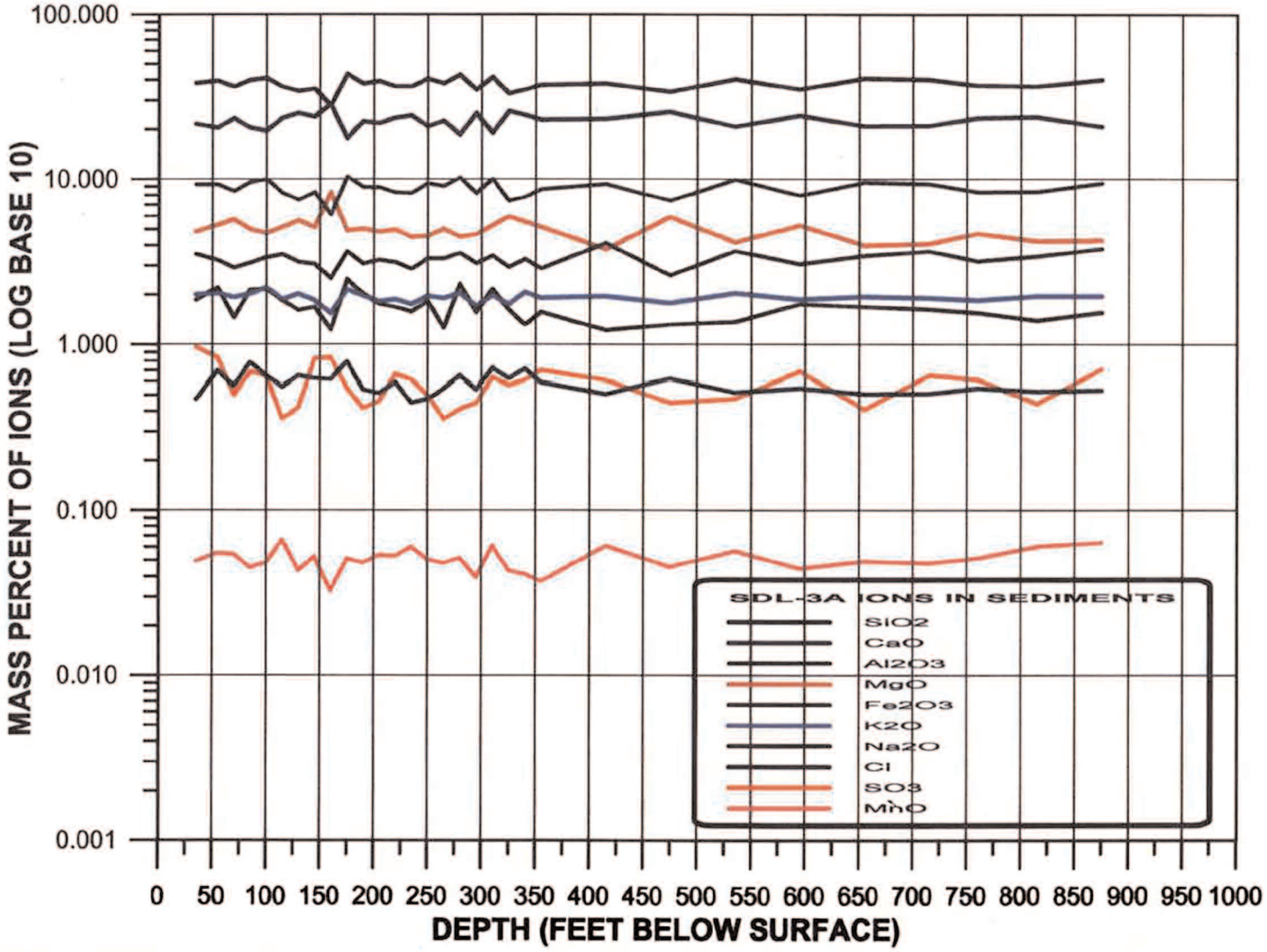


Figure 22b. *Chemistry of the SDL-3A well sediments.*

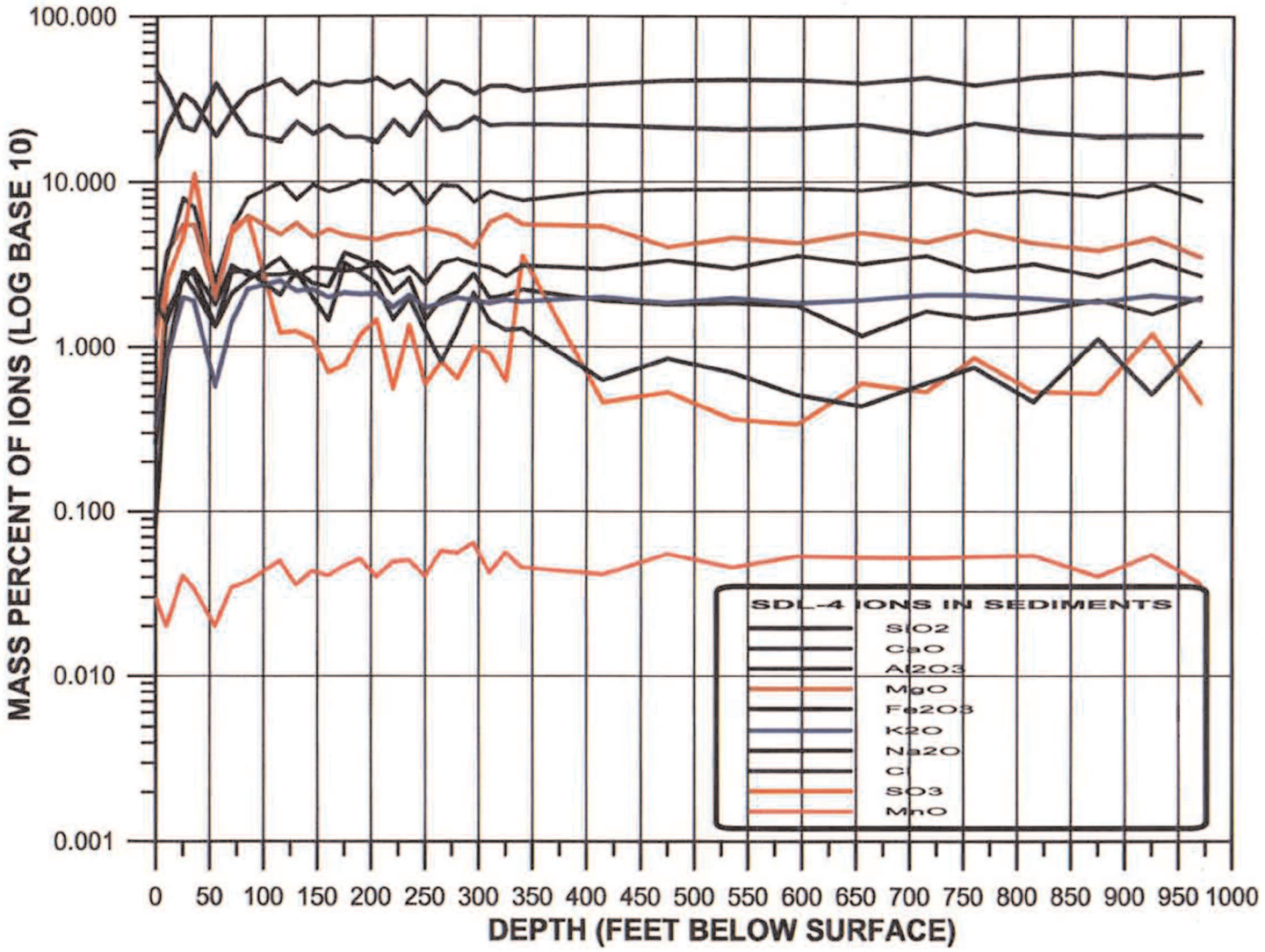


Figure 22c. *Chemistry of the SDL-4 well sediments.*

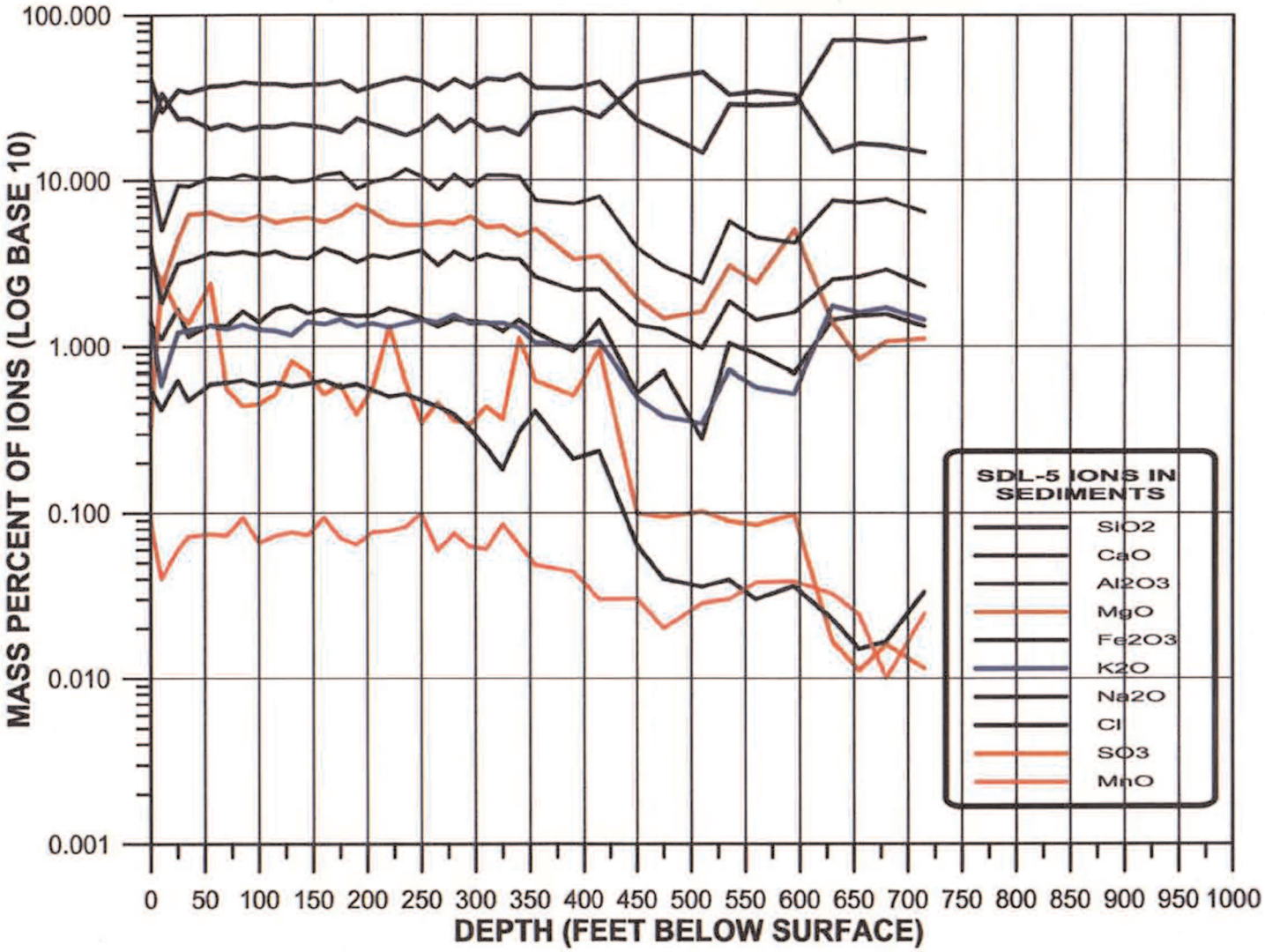


Figure 22d. *Chemistry of the W-5 well sediments.*

Table 11. *Chemical analyses of composite samples from surface and deep-well sediments.*

Hole No	SiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	LOI	Tot
SDL-2T	36.94	7.62	2.75	0.043	5.25	18.27	1.93	1.92	0.297	0.14	24.69	99.85
SDL-4T	33.62	7.63	2.49	0.042	4.92	19.75	2.72	1.93	0.277	0.14	26.25	99.77
W-5T	34.92	9.30	3.28	0.056	6.05	17.45	1.26	2.26	0.347	0.14	24.31	100.00
W-5B	52.70	6.25	2.30	0.029	1.88	18.37	1.21	1.35	0.232	0.08	15.60	100.00
SDL-A	***23.39***	***4.58***	***1.54***	***0.030***	***7.64***	***16.91***	***8.07***	***1.30***	***0.211***	***0.08***	***36.49***	***100.24***
SDL-B	***23.06***	***4.59***	***1.57***	***0.029***	***7.84***	***17.01***	***8.36***	***1.35***	***0.193***	***0.04***	***36.41***	***100.45***
	Ba	**Sr**	**Y**	**Zr**	**Be**	**V**	**Au**	**As**	**Br**	**Co**	**Cr**	**Cs**
SDL-2T	425	530	13	85	2	43	-5	19	7	7	31	8.8
SDL-4T	520	651	11	89	2	44	-5	17	8	6	28	7.4
W-5T	457	529	15	88	2	59	-5	20	3	9	36	10.9
W-5B	401	352	9	82	1	35	-5	6	1	5	21	2.3
SDL-A	***349***	***927***	***9***	***141***	***1***	***34***	***-5***	***15***	***29***	***4***	***12***	***27***
SDL-B	***342***	***911***	***8***	***84***	***1***	***34***	***31***	***11***	***27***	***4***	***12***	***37***
	Hf	**Ir**	**Mo**	**Rb**	**Sb**	**Sc**	**Se**	**Ta**	**Th**	**U**	**W**	**La**
SDL-2T	2.5	-5	6	75	1.2	6.9	-3	-1	15.2	4.2	-3	24.4
SDL-4T	2.5	-5	-5	64	0.9	6.0	-3	-1	7.5	3.7	-3	23.6
W-5T	2.7	-5	-5	91	1.5	8.1	-3	-1	9.8	51.	-3	27.3
W-5B	2.4	-5	-5	49	0.5	3.4	-3	-1	6.5	1.4	6	24.0
SDL-A	***1***	***-5***	***-5***	***-20***	***0.6***	***3.2***	***-3***	***-1***	***3.3***	***3.6***	***-3***	***10.0***
SDL-B	***-0.5***	***-5***	***-5***	***-20***	***024***	***3.0***	***-3***	***-1***	***2.9***	***3.8***	***-3***	***10.5***
	Ce	**Nd**	**Sm**	**Eu**	**Tb**	**Yb**	**Lu**	**Nb**	**Sn**	**Pb**	**Ga**	**Mass***
SDL-2T	45	16	3.3	0.8	-0.5	1.5	0.24	9	-5	15	12	1.038
SDL-4T	39	14	2.9	0.7	-0.5	1.3	0.20	8	-5	14	12	1.209
W-5T	48	18	3.7	0.8	-0.5	1.7	0.26	11	-5	15	13	1.188
W-5B	39	14	2.6	0.8	-0.5	1.0	0.16	7	-5	13	9	1.424
SDL-A	***15***	***9***	***1.5***	***-0.1***	***-0.5***	***0.6***	***0.07***	***ND***	***ND***	***ND***	***ND***	***1.208***
SDL-B	***17***	***9***	***1.5***	***-0.1***	***-0.5***	***0.5***	***0.06***	***ND***	***ND***	***ND***	***ND***	***1.304***
	Ag	**Cd**	**Cu**	**Ni**	**Pb**	**Zn**	**Bi**	**S***				
SDL-2T	-0.3	0.7	18	24	3	772	-2	0.293				
SDL-4T	-0.3	0.9	14	24	13	79	-2	1.255				
W-5T	-0.3	0.9	24	30	14	102	-2	0.368				
W-5T/r*	-0.3	1.0	24	27	10	94	-2	0.343				
W-5B	-0.3	0.4	12	19	11	26	-2	0.020				
SDL-A	***-0.3***	***0.3***	***9***	***5***	***22***	***24***	***4***	***3.276***				
SDL-B	***-0.3***	***-0.3***	***6***	***5***	***7***	***21***	***-2***	***2.963***				

Negative numbers (-5) indicate value is less than the detection limit of the analytical method used.
** Mass is the weight of analyzed sample in grams.*

tion was made by CPMC's personnel of each 5-foot composite sample. Lithologic logs were compiled on the basis of these observations (appendix A). U_3O_8 values, in parts per million as determined by a fluorometric procedure (Fran Broadhead, Chemical and Mineralogical Services, verbal communication, December 2005), for each 5-foot interval were determined and plotted on the logs. Also, during the drilling of deep holes SDL-2, SDL-3, SDL-3A, and SDL-4, shown in appendix A, salt crystals were encountered at various depths (see appendices A-2, A-3, A-3A and A-4). "Due to access problems, all of these holes were drilled at the edges of the lake. The presence of salt crystals at at least two horizons in each of these holes may indicate the existence of substantial salt beds at depth near the center of either the north and/or south basins. The presence of bedded salts may create conditions favorable to higher yields of more concentrated brines. This presence of bedded salts could be explored by seismic methods or by drilling" (Larry Sower, formerly CPMC, written communication, August 9, 2004).

Previous mineralogical studies of Sevier Lake sediments: Güven and Kerr (1966) studied sediment samples from Deep Springs playa, California; Mud Lake and Humboldt playas, Nevada; Sevier playa, Utah; and the Animas playa, New Mexico. Their studies indicate that the mica-type clay minerals illite, vermiculite, and montmorillonite are prominent in the playa crusts. Other minerals identified through x-ray diffraction analysis of the Sevier Lake sediments included

halite, gypsum, calcite, aragonite, and dolomite, and in the Wah Wah Valley Hardpan sediments, halite, calcite, aragonite (CaCO3), and dolomite (Güven and Kerr, 1966). The composition of the saline minerals (in percent) in the Sevier Lake sediments, as calculated from the partial chemical analysis, was, halite = 4.6, gypsum 5.41, calcite 27.69, aragonite 6.92, and dolomite 11.06 (Güven and Kerr, 1966).

Glanzman (1977) compared the surface materials in the Great Salt Lake Desert, Pilot Valley, and Sevier Lake, and made the following observations:

> The Great Salt Lake Desert material is generally very pale greenish-white to light gray and laminated. . . . In both Pilot Valley and Sevier Lake, most of the material is darker. Pilot Valley material ranges from brown near the surface to dark bluish-green and black at depth, and the color is mottled rather than laminar. . . . Sevier Lake material ranges from brown to black also, but contains, at varying depths, large areas of white, sticky, plastic material, which surrounds the west-central part of the playa.
> In general, the mean concentration of most elements increases from Pilot Valley (lowest), to GSL Desert (intermediate), to Sevier Lake (highest) [table 12]. As a standard against which to compare these samples, the work of Shacklette and others (1971) on surficial materials in the conterminous United States was used, which utilized the same analytical technique.

Glanzman also performed x-ray diffraction analyses on sediment samples from the Great Salt Lake Desert, Pilot Valley, and Sevier Lake to determine their mineral content. Figure 23 compares the mineralogy in the three basins in which hemihydrate rather than gypsum is shown to be present in Sevier Lake. The fact that other researchers report gypsum from Sevier Lake suggests that hemihydrate and/or gypsum may be identified incorrectly, or the two terms may be used interchangeably.

Hampton (1978) described the geochemistry of the saline and carbonate minerals of the Sevier Lake playa. In his discussion of saline minerals present in the playa, he listed halite, gypsum, glauberite ($CaSO_4.Na_2SO_4$), and thenardite. Halite was observed on the playa surface as hopper-shaped crystals, and was identified with a petrographic microscope as small cubes within the playa sediments, and through x-ray diffraction analysis. Gypsum was identified by x-ray diffraction and microscopic examination. Glauberite was determined only from x-ray diffraction patterns. Other than the possible existence of thenardite at the surface of CR#1-1 (figure 18), thenardite was not detected in the bulk x-ray patterns of any other sediments of Sevier Lake playa. Hampton (1978) did not mention finding mirabilite during his investigation, but I have seen mirabilite from Sevier Lake's salt crust, with thenardite forming as a white powder on its surface after exposure to the air.

Table 12. *Summary of the semi-quantitative spectrochemical analytical data for Great Salt Lake Desert, Pilot Valley, Sevier Lake, and surficial material in the conterminous United States.*

[----------In percent ----------]					[---------- In ppm ----------]				
	GSLD	**PV**	**SL**	**SM**		**GSLD**	**PV**	**SL**	**SM**
Element	(32)	(21)	(6)	(863)	**Element**	(32)	(21)	(6)	(863)
Si	>10	>10	>10	--	**B**	53	34	250	34
Al	6	6	6	6.6	**Ba**	680	510	1,100	554
Na	7	8	--	1.2	**Co**	<1	<1	<1	1
K	3	3	--	2.3	**Cr**	8	4	12	10
Ca	>10	>10	>10	2.4	**Cu**	17	18	17	25
Mg	4.2	2.2	10	0.9	**La**	26	12	40	41
Fe	1.6	1.4	2.3	2.5	**Li**	100	130	100	--
					Mn	370	280	470	560
					Mo	8	7	5	--
					Ni	<221	14	27	20
					Pb	18	13	22	20
					Sc	10	5	17	10
					Sr	2,600	1,300	1,200	240
					Ti	2,000	1,000	2,000	3,000
					V	54	54	80	76
					Y	27	21	25	29
					Zr	120	67	210	240

GSLD = Great Salt Lake Desert; PV = Pilot Valley; SL = Sevier Lake; and SM = surficial material. Data for GSLD, PV, and SL from Glanzman (1977). Data on surficial material from Shacklette and others (1971). Numbers in parentheses are number of samples analyzed. Dashes (--) in-dicate no value.

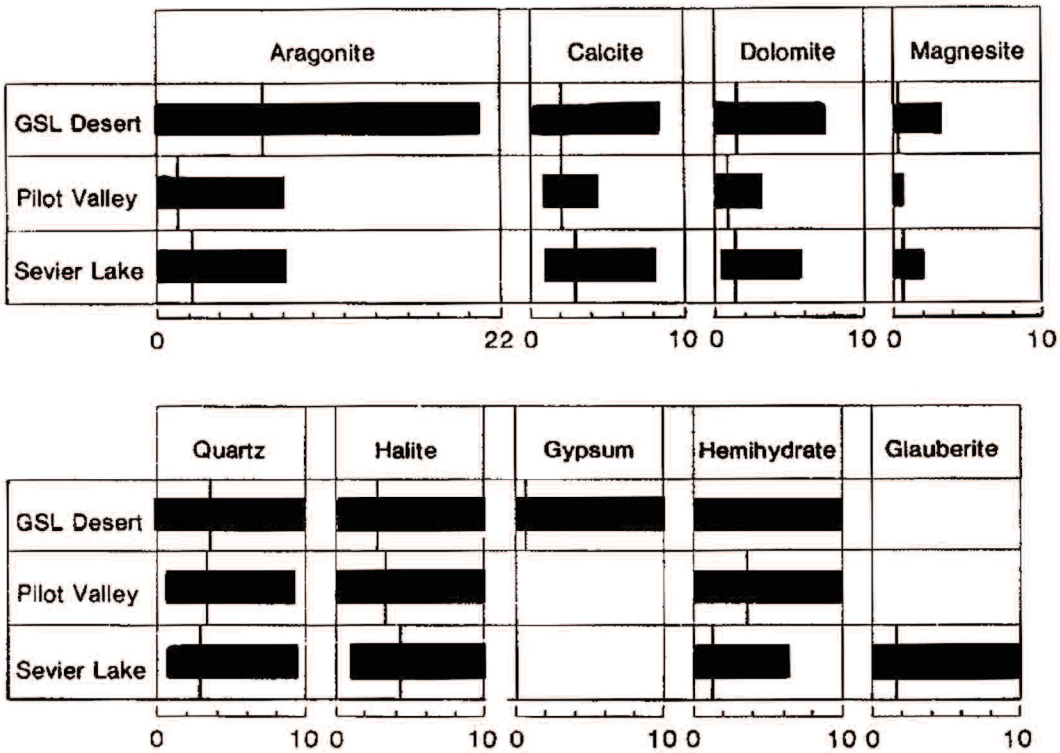


Figure 23. *Comparison of the range and mean peak abundance of selected minerals in the Great Salt Lake Desert, Pilot Valley, and Sevier Lake (in percent). The horizontal scale for aragonite is zero to 22, and for all other minerals, zero to 10. The vertical line represents the mean. From Glanzman (1977).*

Hampton (1978) also discussed the carbonate and silicate mineralogy of Sevier Lake. Aragonite, calcite, dolomite, and magnesite are all found in the lake sediments. Examination of bulk x-ray patterns from three samples from site CR#1 (figure 18) indicates that aragonite occurs only within the samples taken at a depth of approximately 9 inches. Microscopic examination shows that the aragonite corresponds to a layer of brine-shrimp fecal pellets. Calcite and dolomite occur in the playa sediments irrespective of sample location or depth. The presence of calcite, dolomite, and magnesite could be detected only by x-ray diffraction. Magnesite is more sporadic in occurrence than calcite. Magnesite was found in samples at the playa's edge (site CR#1), and in all of the inner-basin sample sites; however, its occurrence within an individual sample site was sporadic. Based upon the intensity of the (112) x-ray diffraction peak height, magnesite appears to increase with depth within the sediments of the interior of the playa.

Quartz is the dominant silicate mineral in the Sevier Lake playa sediments. Small peaks that could be attributed to feldspar were noted in many of the bulk x-ray diffraction patterns. No other silicate minerals produced definable x-ray peaks. Hampton (1978) cited Güven and Kerr (1966), who stated that the clay mineralogy of Sevier Lake playa consists of illite, vermiculite, and montmorillonite.

In 1981, I prepared and analyzed 10 clay samples from Sevier lake (unpublished test results) using the procedures set out by Hedberg and Parry (1971), and Carroll (1974). From this work, I determined that montmorillonite, illite or K-mica, and kaolin were present. I made no attempt to quantify the percentage of each of the mineral species present.

Mineral and biological content of lake sediments: From 1979 to 1982, I directed the wet sieving of representative cuts of the five-foot-interval sediment samples, obtained during the augering of the 20-foot holes. This work was done for CPMC by students from the University of Utah. The samples were wet-sieved to determine the percentage and types of minerals contained in the plus 40, 60, 100, 200, and 270 mesh-size fractions. Two hundred grams of dried mud were blended into a slurry and seived through the five mesh sizes. Visual estimates were made of each size fraction to determine the percent of aragonite, brine shrimp eggs and pellets, gypsum, quartz, limestone, organic material, and other constituents. For each five-foot interval (0-5, 5-10, 10-15, and 15-20 foot), the percentage of brine shrimp eggs and pellets, the weight of gypsum, and the weight of clastic material from each auger hole were marked on separate base maps. The clastic-material category includes aragonite, quartz, chert, limestone, and other types of fragments. The detailed sieving instructions that were followed appear in appendix N.

The students prepared four maps showing the lateral distribution of brine shrimp eggs and pellets. These map show that the eggs and pellets are present in all four intervals (0 to 20 feet in depth), and throughout the entire area of the lake. This wide vertical and horizontal distribution suggests that brine shrimp have inhabited Sevier Lake during wet cycles for thousands of years.

The amount of clastic material in Sevier Lake sediments is highest around the perimeter of the lake, particularly around the north end where the Sevier River enters the lake, and along the west side. The amount of clastic material

diminishes inwards toward the center of the lake. Sieving was not done for many of the sites along the east side of the lake, but it is assumed that clastic material is abundant in this area as well. The same clastic material distribution pattern generally holds true for sediments taken at all four depth intervals.

Within all four of the five-foot sediment intervals, the amount of gypsum was found to be the highest at the north and south ends, and along the western edge of the lake, but diminishes towards the central portion of the basin. Data for the east shore of the lake are missing. This distribution appears to support the mineral zonation model described by Hampton (1978) for Sevier Lake, and that of Lines (1979) for the Bonneville Salt Flats and Pilot Valley, both located in western Utah's Great Salt Lake Desert. Within these mineral-zonation models, carbonates form an outer zone, as they are the first to precipitate from an evaporating saline body. Sulfates form next inside the carbonate zone, and finally, chlorides form the interior zone. In Sevier Lake, there is a continual gradation from one zone to the next as shown in figure 21a.

Salt crust and brine measurements made during shallow-well augering: During the 1979-1983 augering of the 20-foot-deep holes, the depth to brine or the interval in which it was found was measured, as was the thickness of the salt crust, when present. The measurements made for 560 holes are given in appendix O. The average thickness of the salt crust (not including the locations where just a trace (T) was indicated) was three inches, covering an area of about 37 square miles. Assuming a bulk density of about 100 pounds per ft^3, this volume of mirabilite and halite mixture would equal 11 to 13 million tons of material. Figures 24a and 24b illustrate the typical vuggy nature of the crust.

Water content of Sevier Lake sediments: Percent-water data are necessary to determine the brine and salt reserves of Sevier Lake. After the augering had been completed, a small amount of the wet mud was taken from the closed plastic bags and weighed. The mud was dried completely in the oven in an aluminum dish and reweighed. The percent water was determined as the difference in weight (wet minus dry) divided by the wet-mud weight. A summary of the percent of water in the Sevier Lake muds is given in table 13, and

Figure 24a. *Top view of Sevier Lake salt crust (collected about 1979 by M.C. Godbe). Photograph by J.W. Gwynn.*

Figure 24b. *Bottom view of Sevier Lake salt crust (collected about 1979 by M.C. Godbe). Photograph by J.W. Gwynn.*

Table 13. *Average percent of water in the sediments for each township/range at the four depth intervals.*

	[----------Township/Range Designations----------]					
LEVEL	**T. 20 S. R. 11 W.**	**T. 20 S. R. 12 W.**	**T. 21 S. R. 12 W.**	**T. 22 S. R. 12 W.**	**T. 23 S. R. 12 W.**	**T. 24 S. R. 12 W.**
0-5 ft	33.83	30.91	32.24	29.13	29.97	25.63
5-10 ft	34.69	33.93	32.01	28.91	28.78	21.82
10-15 ft	33.26	31.48	32.76	28.98	29.61	22.17
15-20 ft	30.06	28.99	30.05	27.70	26.20	18.17
Average	32.96	31.33	31.76	28.68	28.64	21.954

appendix P gives the complete data. The water content of the sediments below the 20-foot level (sediments from the deep wells) was not determined.

Brine Evaporation Tests by Gwynn

During the summer of 1980, CPMC field personnel collected three carboys of Sevier Lake brine by pumping it from the 20-foot-deep auger holes on an east-west line crossing the lake within T. 20 S., R. 11 W. and R. 12 W. I performed evaporation tests on two of the carboys to determine first, the chemical changes in the brine as it evaporates and salts precipitate, and second, the mineralogy of the precipitated salts. Additionally, the tests determined the density and index of refraction of the brine as it concentrated, how lithium and uranium values change as the brine is concentrated, and what trace elements may be concentrated in the evaporating brine. Three tests were set up, but test number one was aborted due to brine spillage.

As the brine evaporated during test number two, halite, schoenite ($K_2Mg(SO_4)_2 \cdot 6H_2O$), hexahydrite ($MgSO_4 \cdot 6H_2O$), and kainite ($Mg(SO_4) \cdot KCl \cdot 3H_2O$) precipitated in that order. In test number three, halite, bloedite ($Na_2SO_4 \cdot MgSO_4 \cdot 4H_2O$), schoenite, and kainite precipitated in that order. Appendix Q gives the details of the two brine-evaporation experiments.

PROPOSED PRODUCTS AND PROCESSES BY CPMC

Sodium Chloride Production

In the first production phase of the CPMC project, sodium chloride was to be produced at Sevier Lake. Before the project was terminated, CPMC constructed a 3,000-acre solar evaporation pond complex in which up to 18 inches of salt was deposited on the harvest-pond floors to provide support for the heavy harvesting equipment. In addition, the engineering for the construction of salt washing, drying and bagging, and load-out facilities had been completed. Figure 25 shows the proposed flow chart (Edmonds, 1987) for salt production.

Potassium Sulfate

In the second production phase of the project, which was never reached, additional facilities would be constructed to produce potassium sulfate (a commercial fertilizer), and possibly other products such as magnesium chloride and sodium sulfate. The pond area to produce feedstock for the potassium sulfate would have required an additional 12,000 acres of land divided into approximately 40 ponds (Merrill Lynch, 1991). Figure 26 shows CPMC's most recent flow diagram for potassium sulfate production. During actual production, the lake brines would be chilled during the winter. This would bring about the precipitation of mirabilite, and would enhance both the quality and usable quantities of halite and potash salts precipitated from the desulfated brine as it is concentrated during the following evaporation season(s) (Larry Sower, formerly CPMC, written communication, August 6, 2004).

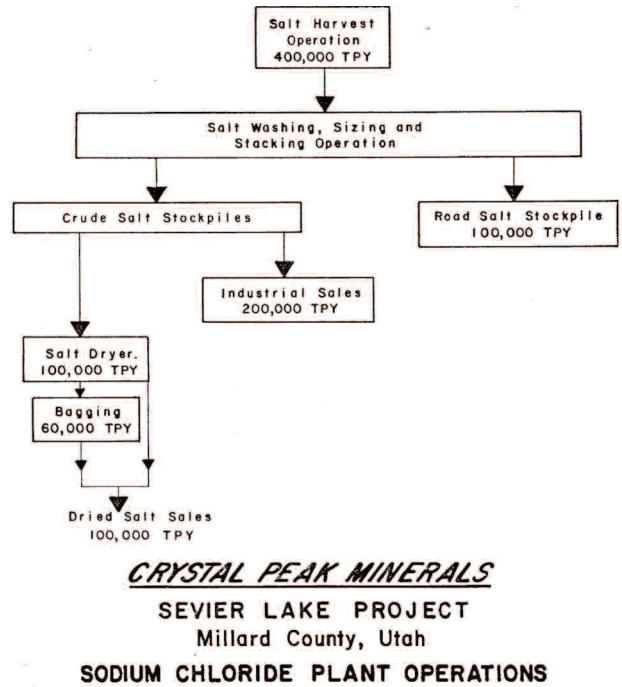


Figure 25. *Flow diagram for the proposed Crystal Peak Minerals Corporation's sodium chloride plant (from Edmonds, 1987). TPY is equal to short tons per year.*

SIMULATED EVAPORATION OF SEVIER LAKE BRINE

CPMC proposed producing salt and concentrated brines from Sevier Lake using the brine contained within the top 20 feet of sediments. As planned, the subsurface brines would seep laterally through the sediments into one or more 20-foot-deep canals (figure 27). From a pump station at the south end of the canal, the brine would be transferred into a series of evaporation ponds covering about 3,000 acres. Brine would first be pumped into a series of salt ponds where large quantities of halite would precipitate. A number of undesirable salts, including gypsum and calcium/magnesium carbonates, would precipitate in early-stage salt or settling ponds. Then, from latter-stage salt ponds, high-purity halite would be harvested for processing and sale. The bitterns or residual brines from the salt ponds would then be pumped into a series of buffer ponds where undesirable sodium-bearing salts would be precipitated. The residual brines from the buffer ponds would then be moved into a third series of potash ponds where magnesium- and potassium-bearing minerals would be precipitated. These salts would be used in the production of K_2SO_4 [sulfate of potash or SOP] and possibly other minerals. Brine chemistry and salt mineralogy would be monitored carefully in order to precipitate the desired minerals in the proper ponds. At the end of the potash-pond sequence, the final liquor, high magnesium chloride brine, would be transferred into the $MgCl_2$ pond for further processing or sale as solid and/or liquid products.

The Tequil® computer program (Moller, and Weare, 1984) was used to help predict the chemistry and mineralogy of Sevier Lake brines and salts during evaporation. The Tequil program consists of thermodynamic models to char-

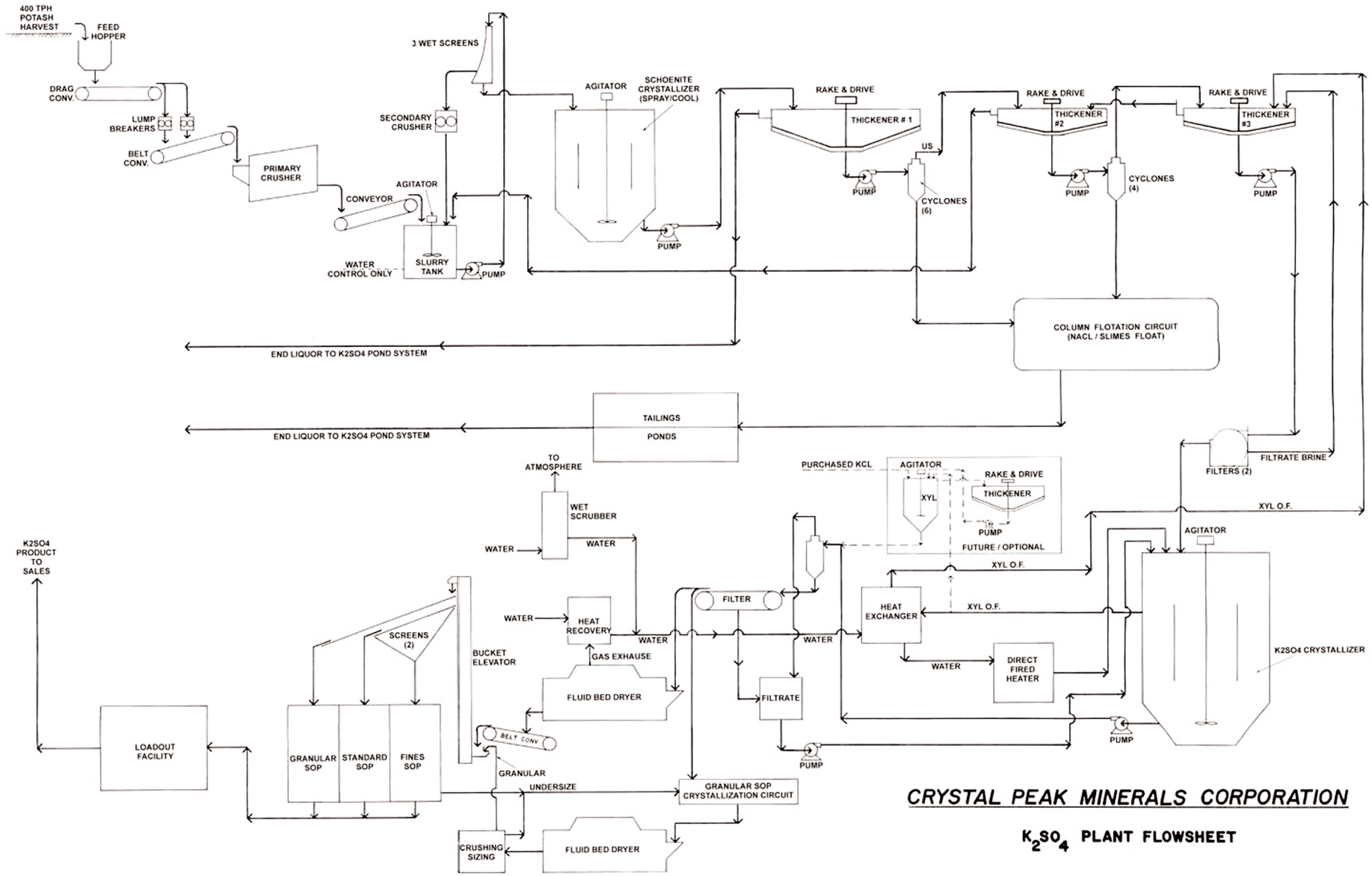


Figure 26. *Flow diagram for the proposed Crystal Peak Minerals Corporation's K_2SO_4 plant.*

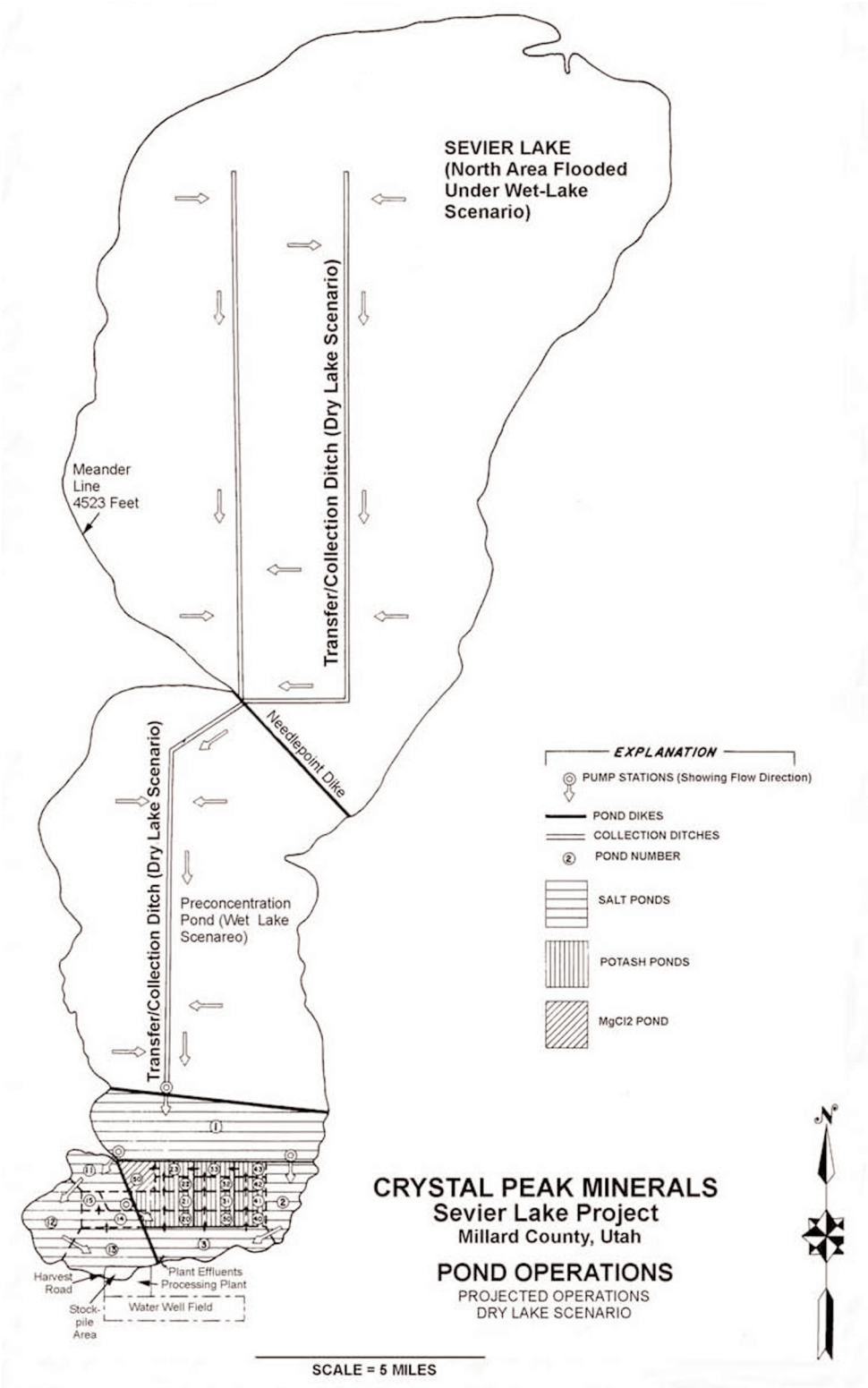


Figure 27. *Crystal Peak Minerals' proposed layout of dikes, ponds, collection ditches, and other areas within Sevier Lake. Map is re-labeled from original Crystal Peak Minerals map by M.C. Godbe III.*

acterize multi-component aqueous solutions for conditions where temperature is equal to or less than 250°C, pressure is approximately 1 atmosphere, and where the principal variation of the liquid density phase free energy is due to solute concentration changes.

The simulated evaporation of the brine and precipitation of salts is run in three stages. The first stage (figure 28) represents the evaporation and precipitation that takes place in the series of halite ponds. The second stage (figure 29) represents the evaporation and precipitation that take place in the series of buffer ponds where more undesirable salts are removed. The third and final stage (figure 30) represents the evaporative process where desirable potassium and magnesium salts are precipitated. High $MgCl_2$ brines remain after the end of the third stage of evaporation. Table 14 gives the chemical composition of the brine, as moles of each constituent, at the start and end of each stage.

First Stage Simulation - Salt Ponds

To simulate the evaporation in the first stage or salt ponds, the initial brine chemistry (the average of all samples in appendix I, given as moles of each constituent), is entered into the Tequil® program. The program reduces the amount of water in the system by 0.1 moles per program iteration and determines the minerals that will be precipitated. Figure 28 shows both the moles of the minerals that are precipitated, and of the moles of ions in the remaining brine. If the brine were allowed to evaporate to dryness, a multitude of salts would be precipitated, including magnesium and finally potassium salts. As a result, an impure halite product would be produced. To maintain the purity of the halite in the salt ponds, the brine or bittern is transferred into the sequence of buffer ponds when it has concentrated to the "end of stage one" point. Salts precipitated through stage one would include over 73 percent of the halite, with lesser amounts of gypsum ($CaSO_4 \cdot 2H_2O$), glauberite ($CaSO_4$, Na_2SO_4), magnesite ($MgCO_3$), and epsomite ($MgSO_4 \cdot 7H_2O$).

Second Stage Simulation - Buffer Ponds

The brine transferred from the salt ponds into the buffer ponds at the "end of stage one," plus one iteration (one of the successive steps the program goes through), becomes the starting brine for stage two. This chemistry is entered into the program and the simulation is run (figure 29). Additionally, the program is instructed not to precipitate any more of the salts precipitated in stage one except for halite. This exclusion prevents the dissolution of any of these salts as evaporation progresses. If this brine is allowed to evaporate to dryness, a multitude of salts is again precipitated, though the quantity of halite is greatly reduced. To further eliminate undesirable sodium-bearing salts from the final salt mix in the potash ponds (stage 3), the brine or bittern is transferred from the buffer ponds into the sequence of potash ponds when it reaches the "end of stage 2" point (figure 29). Undesirable salts that precipitate from the brine in the buffer ponds, in addition to halite, include bloedite ($Na_2SO_4 \cdot MgSO_4 \cdot 4H_2O$), and aphthitalite or glaserite $(K,Na)_3 \cdot Na(SO_4)_2$.

Third Stage Simulation - Potash Ponds

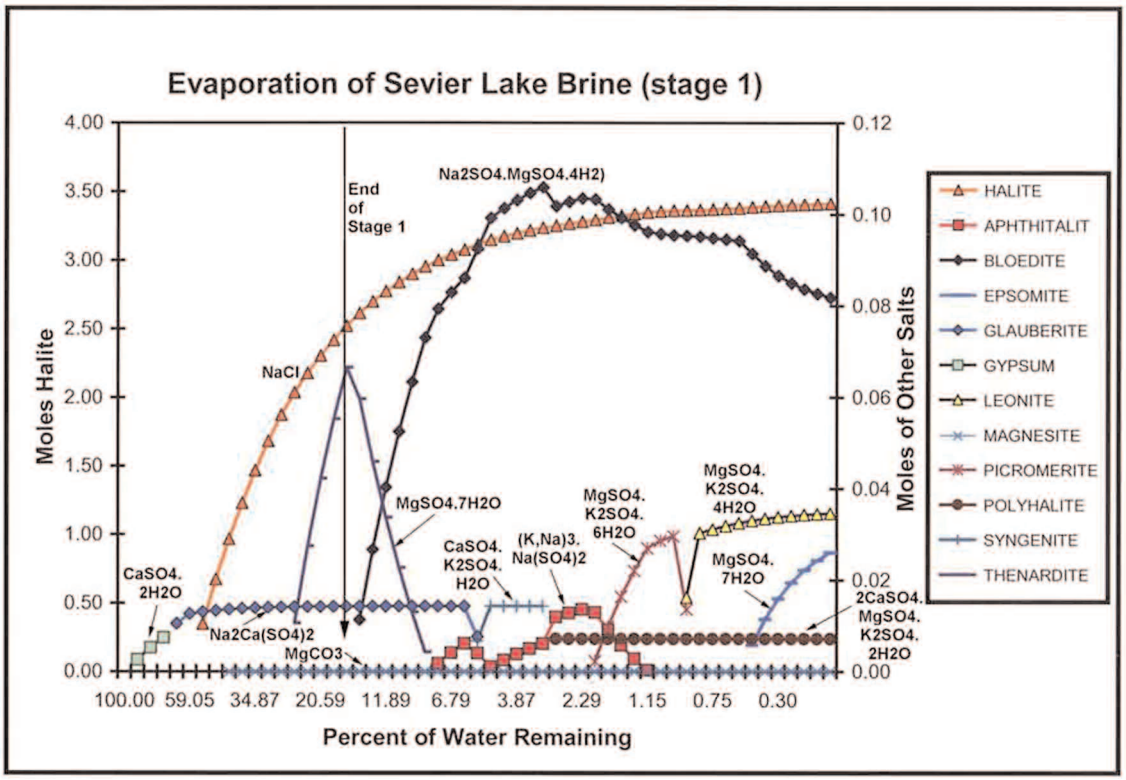
The brine transferred from the buffer ponds into the potash ponds at the "end of stage two," plus one iteration, becomes the starting brine for stage three. This chemistry is entered into the program and the simulation is run with instructions not to precipitate any of the salts precipitated in stage two except for halite. As this brine is evaporated, potassium, magnesium, sulfate, and chloride salts are precipitated along with very small amounts of halite (figure 30). In the production of sulfate of potash, the smaller the amount of halite in the final salt mix, the more efficient the process becomes. If mainly sulfate-bearing salts are desired, the residual brine can be removed from the ponds at the "potential termination point" and moved into the $MgCl_2$ pond. Or, if chloride-bearing salts are preferred, evaporation can be continued. The mineralogy of the harvest salts that are used to produce potassium sulfate is critical during flotation, if it is used to remove excess sodium chloride, and in a successful chemical-conversion process that converts harvest salts into potassium sulfate.

Magnesium Chloride Brines

Beyond the "potential termination point" shown in figure 30, the composition of the brine consists mainly of magnesium and chloride ions. The amount of this brine that is available will depend on whether sulfate-based or chloride-based salts are desired. More magnesium chloride brine is

Table 14. *Moles of ions and water at the start and end of each of the three Tequil® simulation stages. Note: The ending value for one stage differs from the starting value of the next stage because the program advances one iteration between stages.*

Ion or compounds	Start of Stage 1	End of Stage 1	Start of Stage 2	End of Stage 2	Start of Stage 3	End of Stage 3
Na	3.5762	1.020	0.894	.0161	0.146	0.001
K	0.0846	0.085	.085	0.063	0.061	0.001
Mg	0.1536	0.154	0.154	0.092	0.092	0.014
Ca	0.0166	0.000	0.000	0.000	0.000	0.000
Cl	3.2192	1.001	0.898	0.297	0.284	0.028
SO4	0.2891	0.205	0.194	0.056	0.053	0.001
HCO3	0.0002	0.000	0.000	0.000	0.000	0.000
H2O	55.5080	10.287	9.258	2.720	2.582	0.168



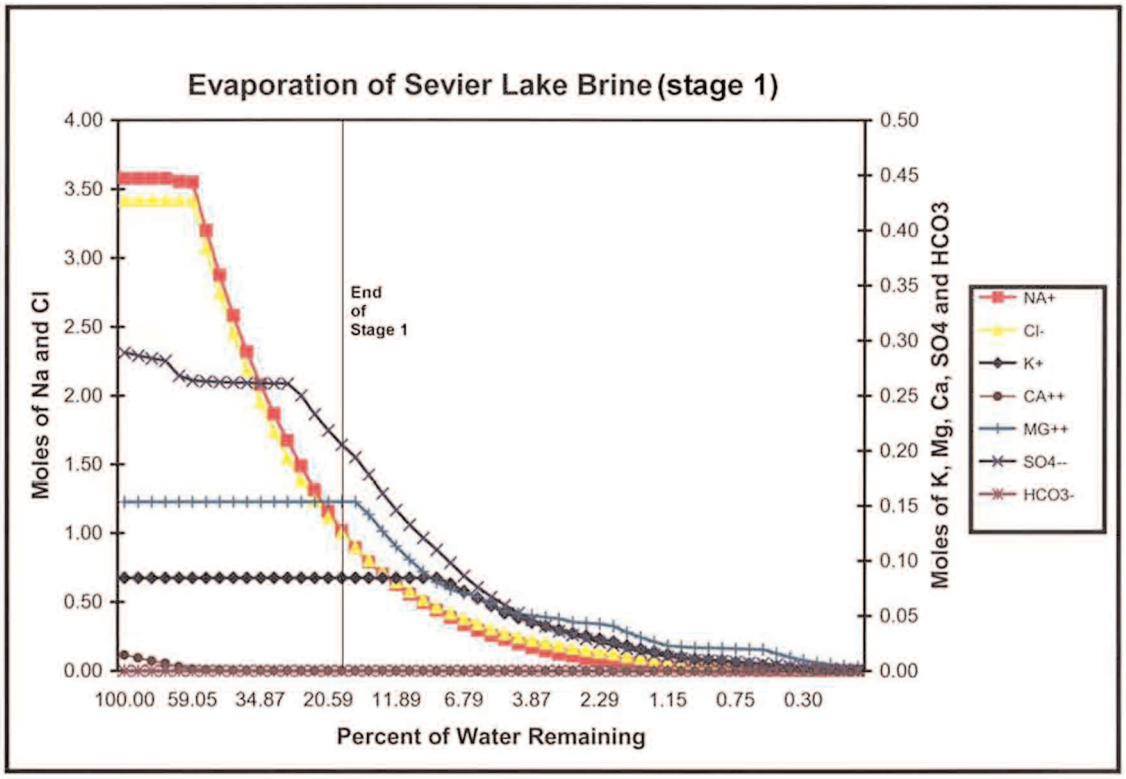
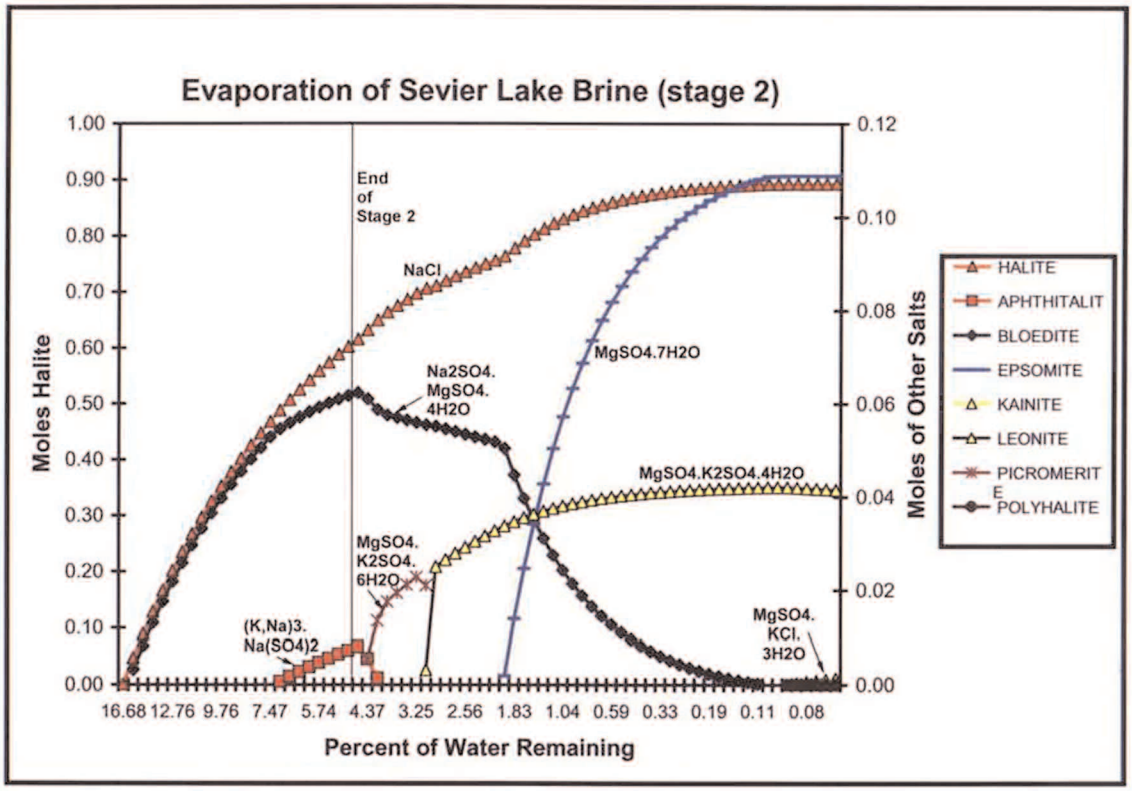


Figure 28. *Graphs of the theoretical moles of minerals precipitated from brines during stage 1 (top), and moles of individual ions (bottom), as Sevier Lake brine is concentrated through solar evaporation.*



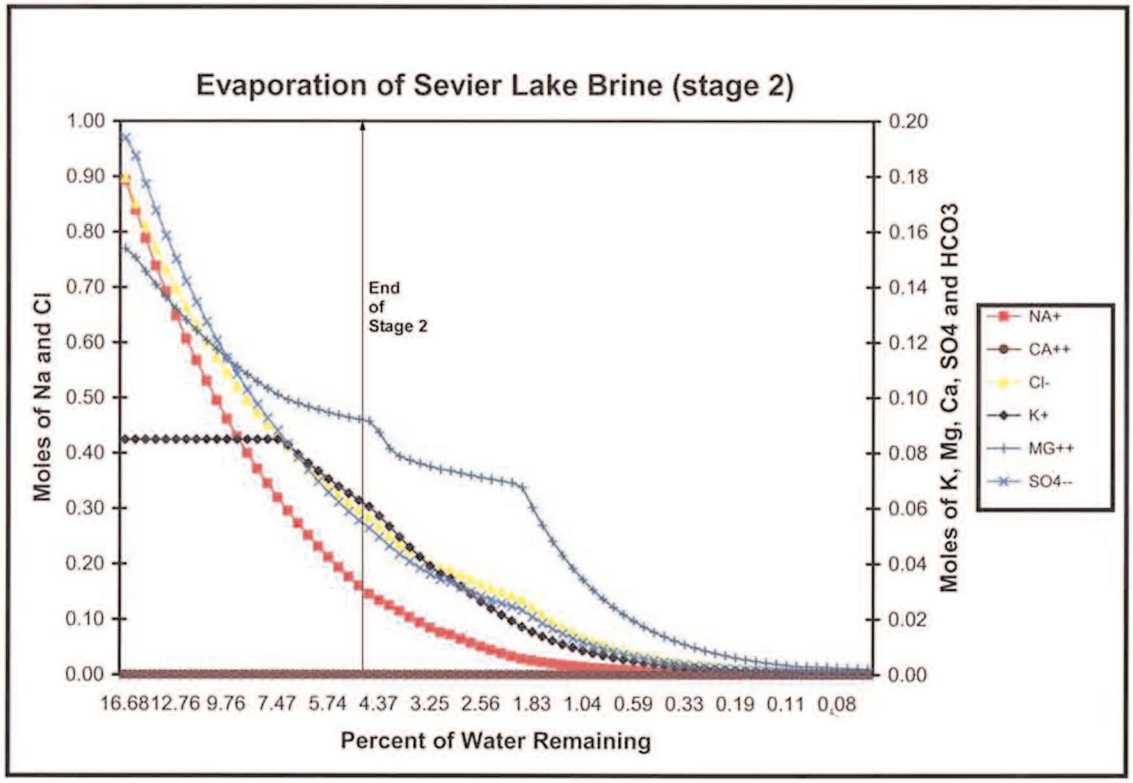


Figure 29. *Graphs of the theoretical moles of minerals precipitated from brines during stage 2 (top), and moles of individual ions (bottom), as Sevier Lake brine is concentrated through solar evaporation.*

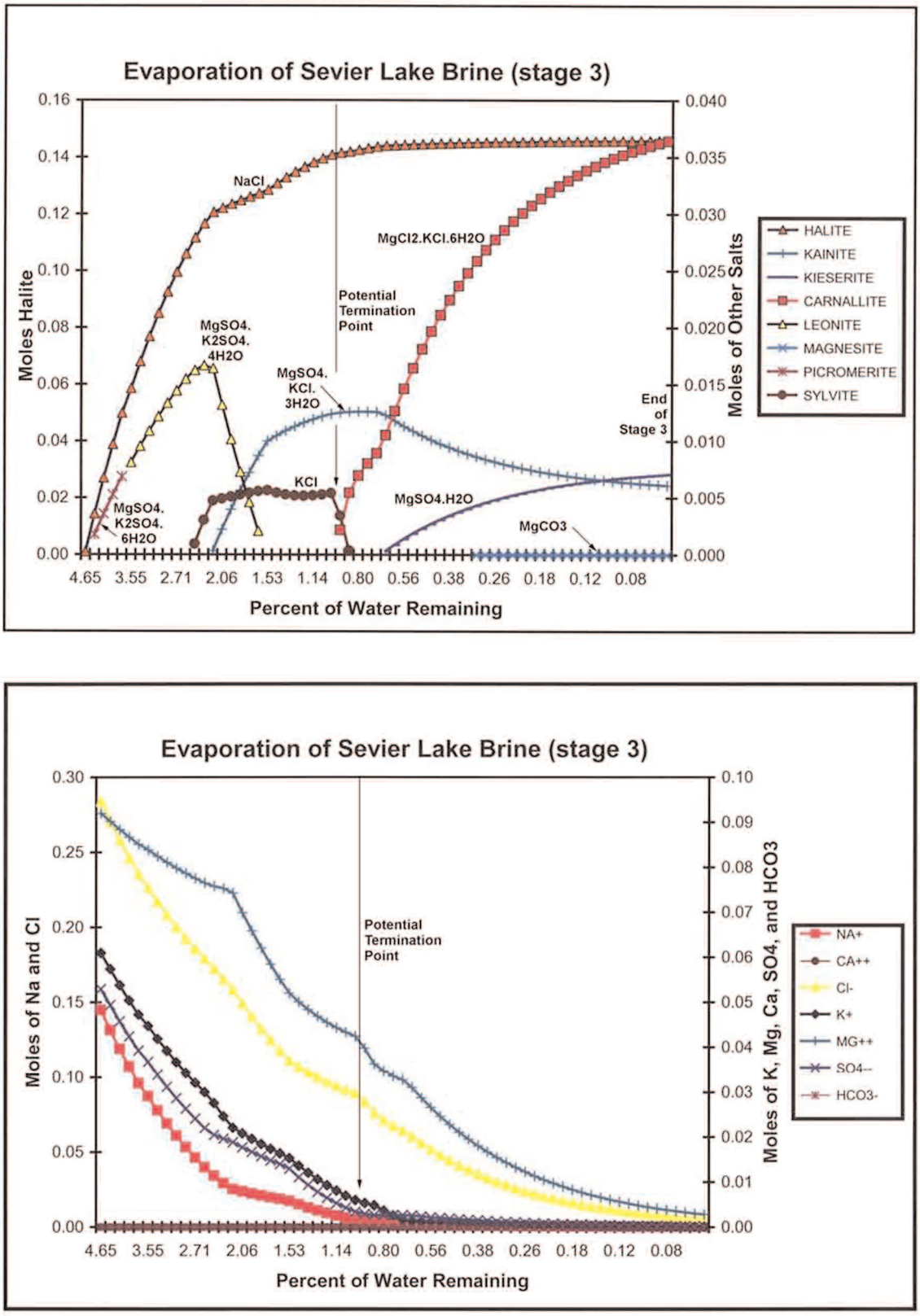


Figure 30. *Graphs of the theoretical moles of minerals precipitated from brines during stage 3 (top), and moles of individual ions (bottom), as Sevier Lake brine is concentrated through solar evaporation.*

available if evaporation is stopped at the "potential termination point" than if it is allowed to proceed towards total dryness.

Simulated Versus Actual Chemistry and Evaporation Products

The Tequil® program simulation may not accurately predict actual brine compositions and minerals precipitated under solar-pond conditions, and chemical and mineralogical data collected under field conditions can substantiate or refute the simulations. The general trends predicted for brine chemistry and for the types of salts precipitated, however, are thought to be reasonable based on my knowledge of the salt-brine phase chemistry of other solar-pond operations.

SUMMARY

This report is a compilation of historical information and data that characterize the inflow to Sevier Lake and the nature of the brines and sediments found within its basin. These data, supplemented by the work of other researchers, represent the results of approximately 14 years of work by CPMC, under the direction of M.C. Godbe III. CPMC's work included shallow augering and deep drilling, chemical analyses and physical testing of the brines and sediments, gathering climatological and evaporation data, and performing bench-scale and pilot-scale brine-evaporation tests. Development work has included dredging a brine-collection canal, building roads, constructing a solar pond complex and laying down salt floors, developing process flow sheets for both salt and sulfate-of-potash production, and running evaporation-pond simulations. Although the Sevier Lake project ended when funding was terminated, the information contained within this report should be of value to others venturing to develop the lake's saline resources. It is my opinion, based on the work done by CPMC, that the subsurface brine in Sevier Lake represents a significant saline resource. From this resource, chloride- and sulfate-based salts of sodium, magnesium, and potassium can be produced, and the work done by CPMC provides much of the background information needed for the successful exploitation of this resource.

ACKNOWLEDGMENTS

I thank Mr. Paul Sturm (formerly Utah Geological Survey) for his assistance over the years in helping to develop and gather the information contained within this report; Mr. Larry Sower for supplying information generated during the final years of the project, and for his helpful review of the document; Mr. Godbe for his willingness to share the information that was generated at significant cost to CPMC; and especially his wife, Kathy Godbe, for giving the Utah Geological Survey final permission, after Mr. Godbe's untimely death, to use that information in the compiling of this report.

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APPENDICES

APPENDIX A

APPENDIX A. Lithologic logs of drill holes SDL-2, SDL-3, SDL-3A, SDL-4, and W-5.

A1 - Lithologic log of drill hole SDL-2

A2 - Lithologic log of drill hole SDL-3

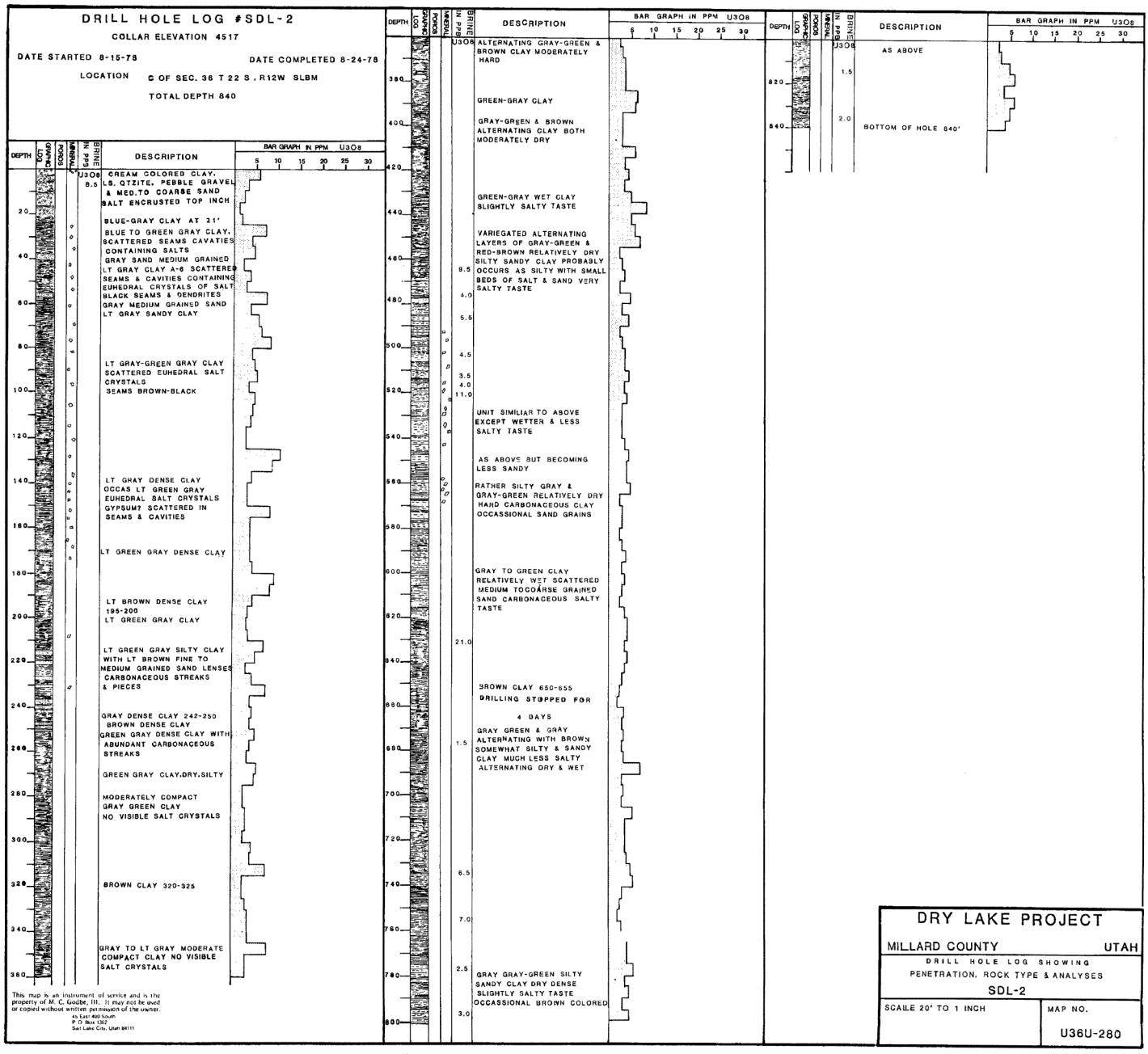
A3 - Lithologic log of drill hole SDL-3A

A4 - Lithologic log of drill hole SDL-4

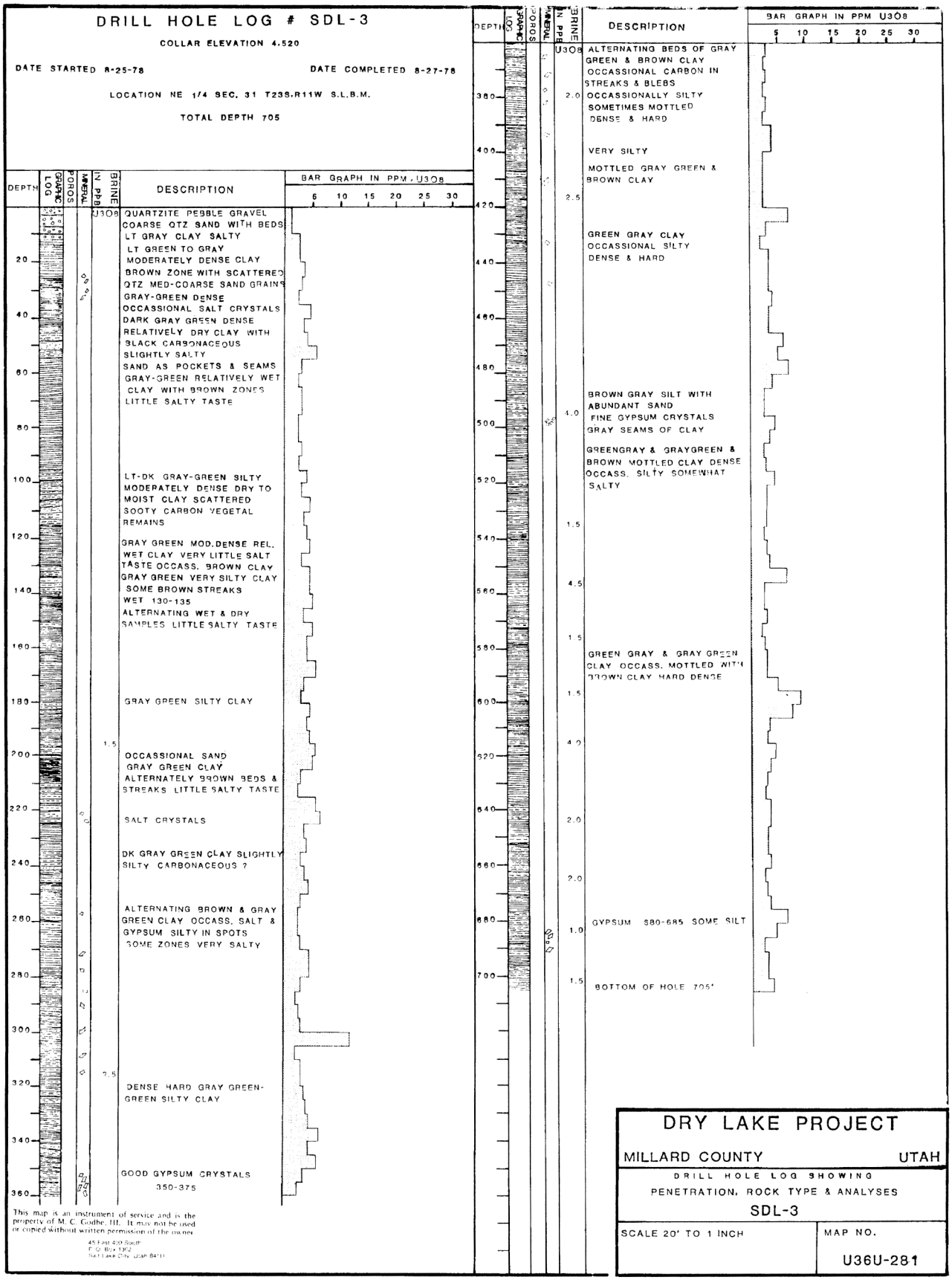
A5 - Lithologic log of drill hole W-5

Logs showing lithology and U_3O_8 concentrations in five-foot intervals were drawn by M.C. Godbe, Crystal Peak Minerals, and reproduced with permission from Mrs. Kathy Godbe. Logs A1-A4 represent holes drilled at Sevier Lake, and log A5 the hole drilled at the Wah Wah Valley Hardpan.

Note: Scales on logs, as reduced, are not valid.



APPENDIX A-1
HOLE SDL-2



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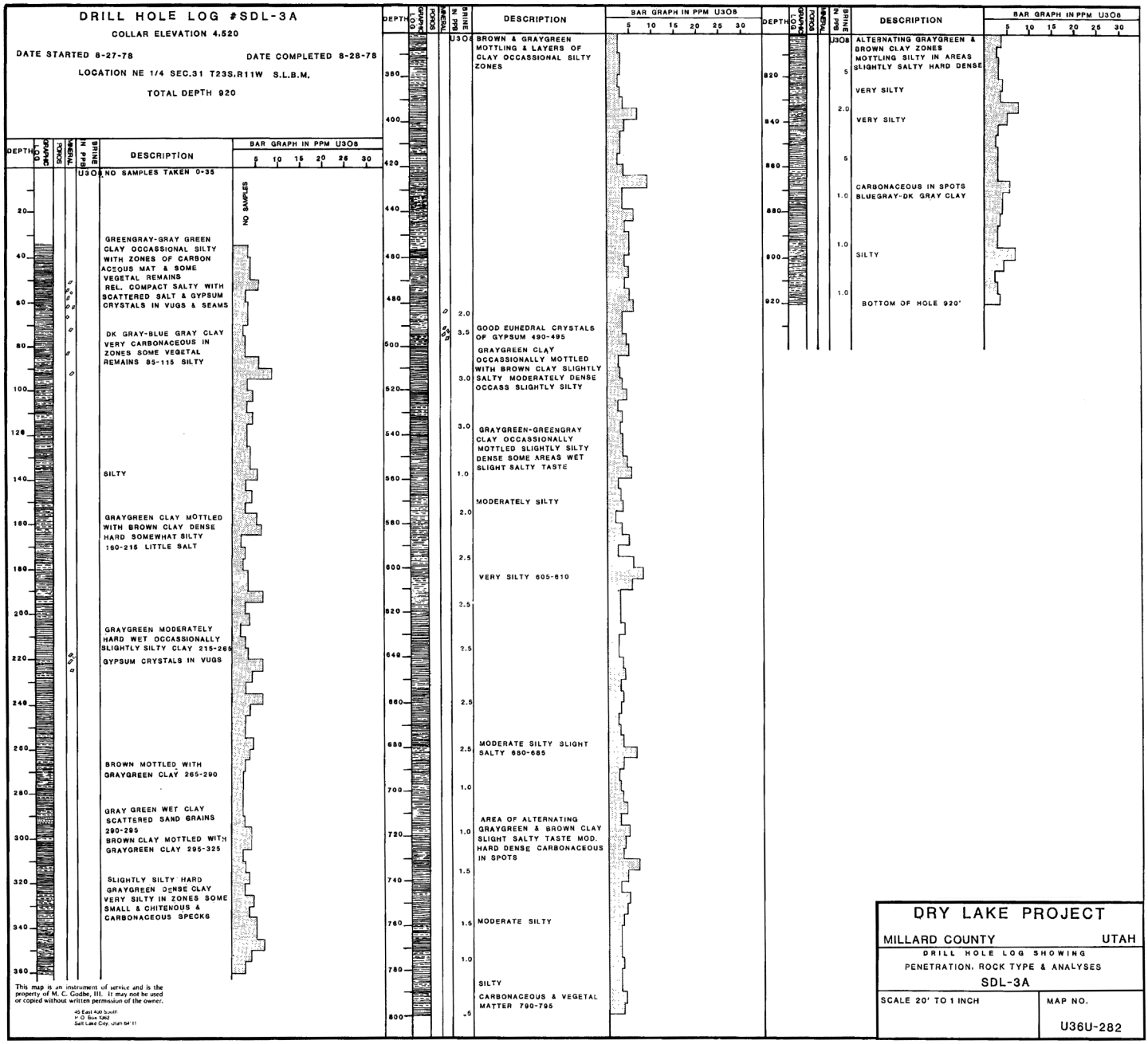
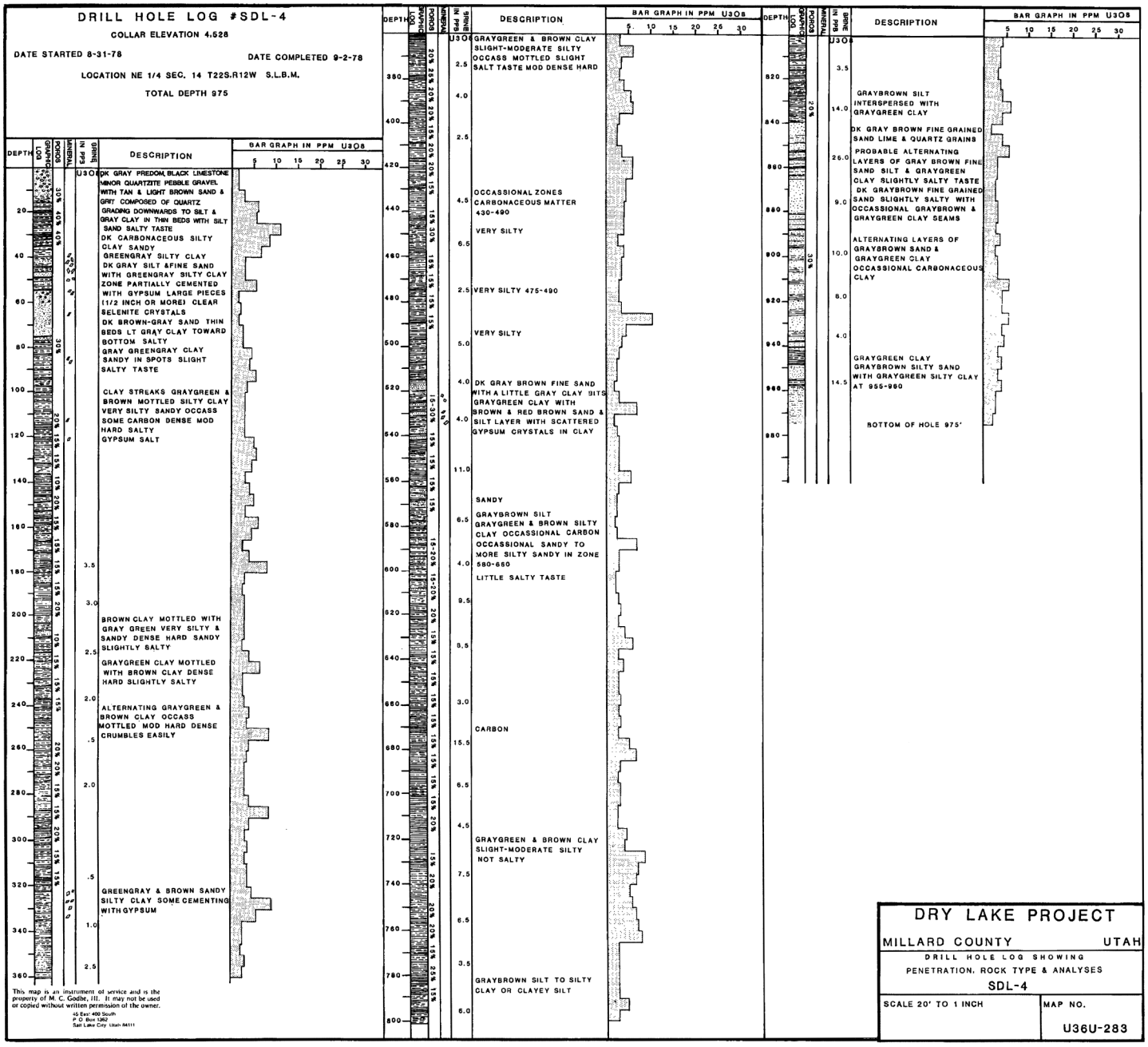
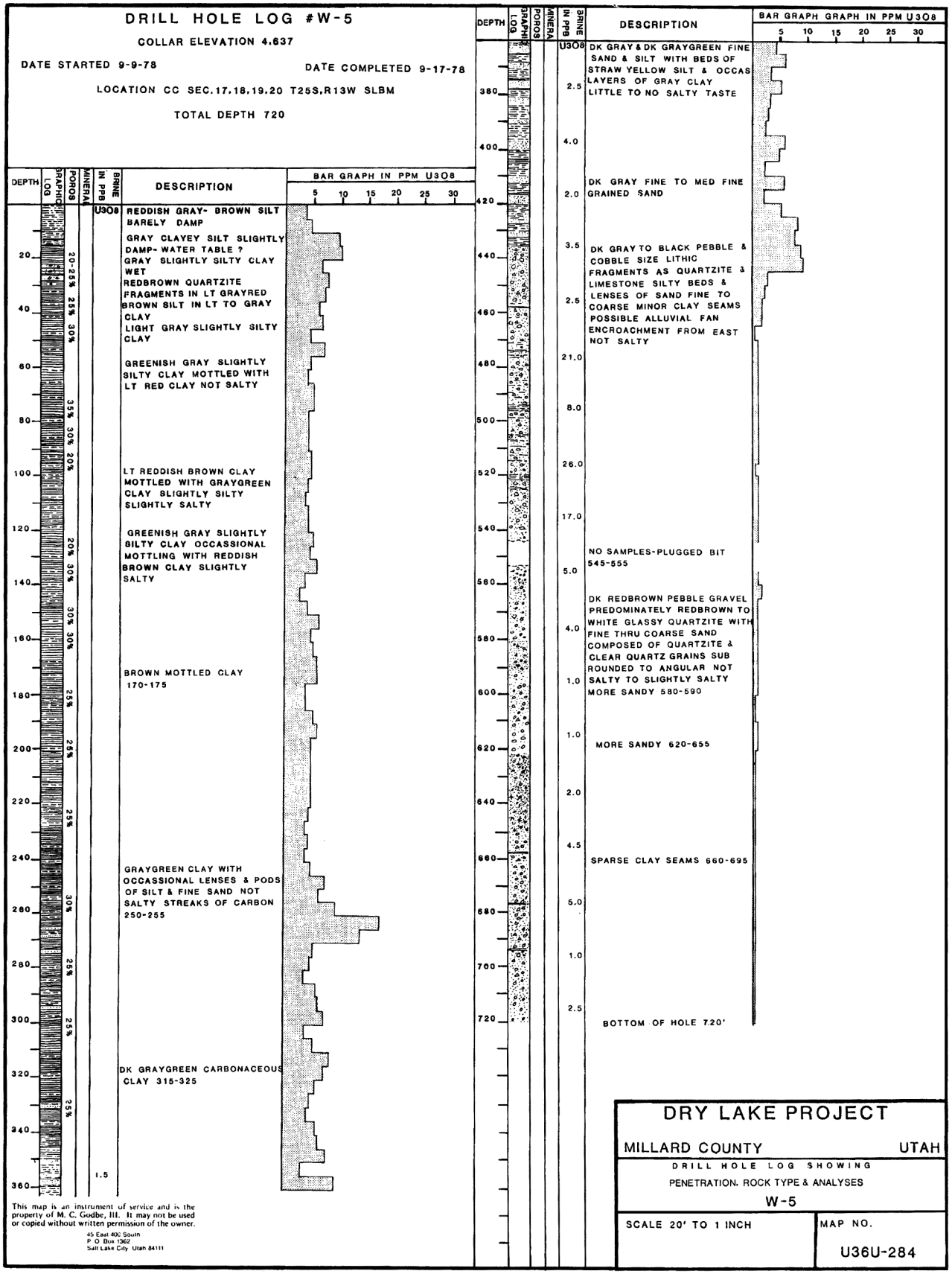
HOLE SDL-3



APPENDIX A-3
HOLE SDL-3A



APPENDIX A-4
HOLE SDL-4



APPENDIX A-5
HOLE W-5

APPENDIX B

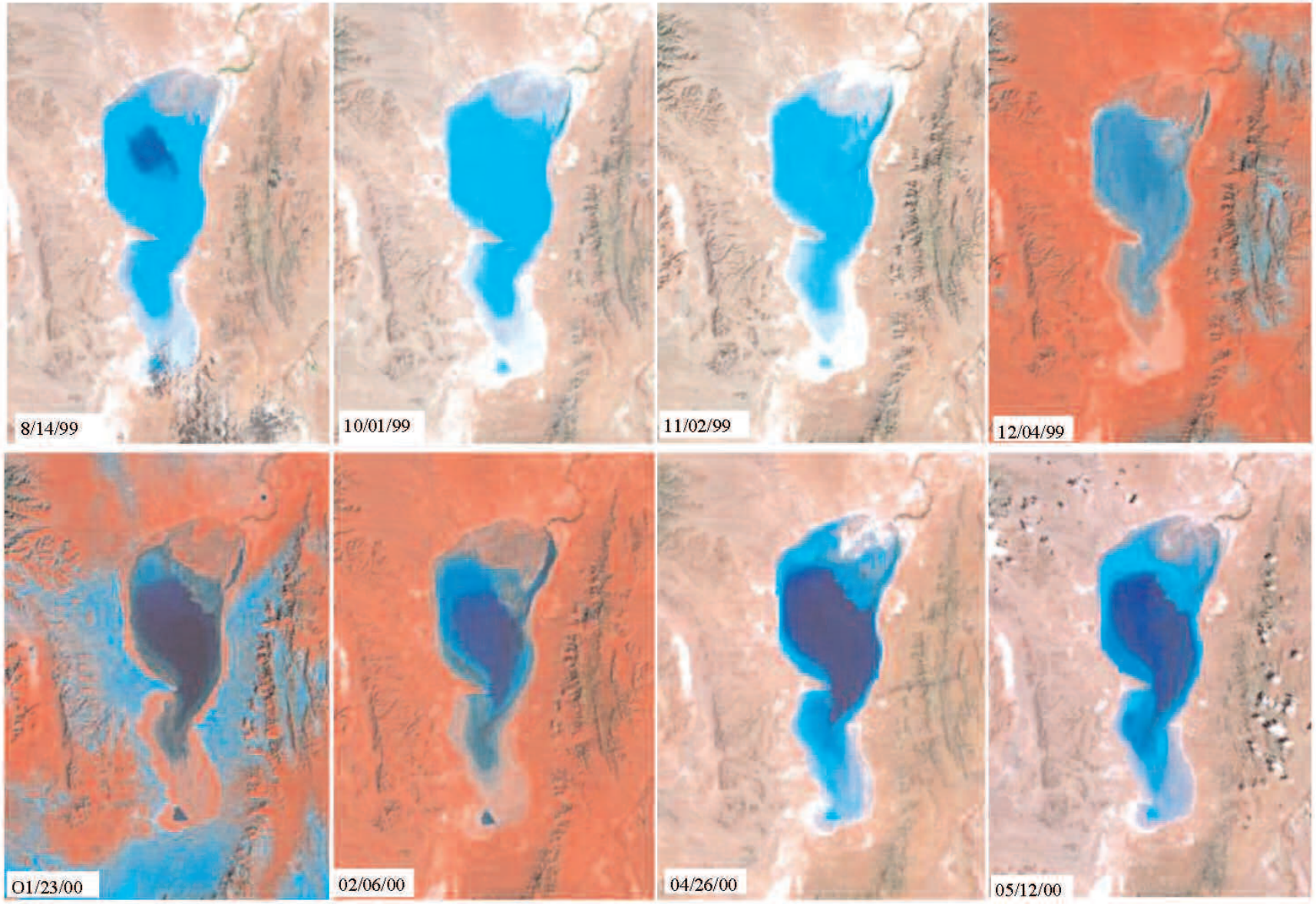
APPENDIX B. Landsat 7 images of the Sevier Lake area from 8/14/99 through 8/22/02 showing annual influx of water and subsequent drying.

Images were downloaded from: http://edcsns17.cr.usgs.gov/Earthexplorer. Downloaded in September, 2003.

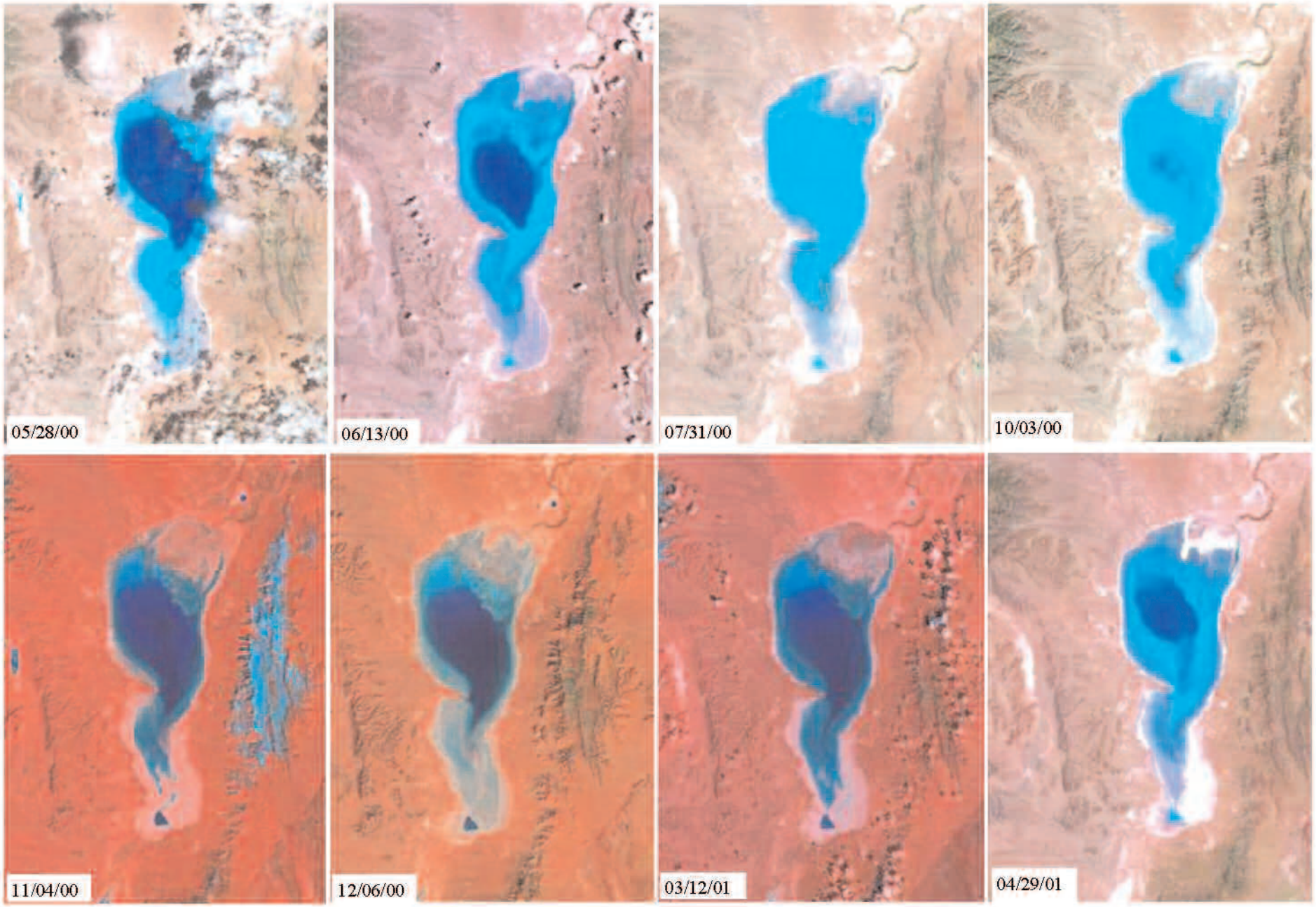
Color key for Sevier Lake:

Light blue is reflectance off from the dry or damp playa surface.

Dark blue is standing water.



Scale = 25 miles



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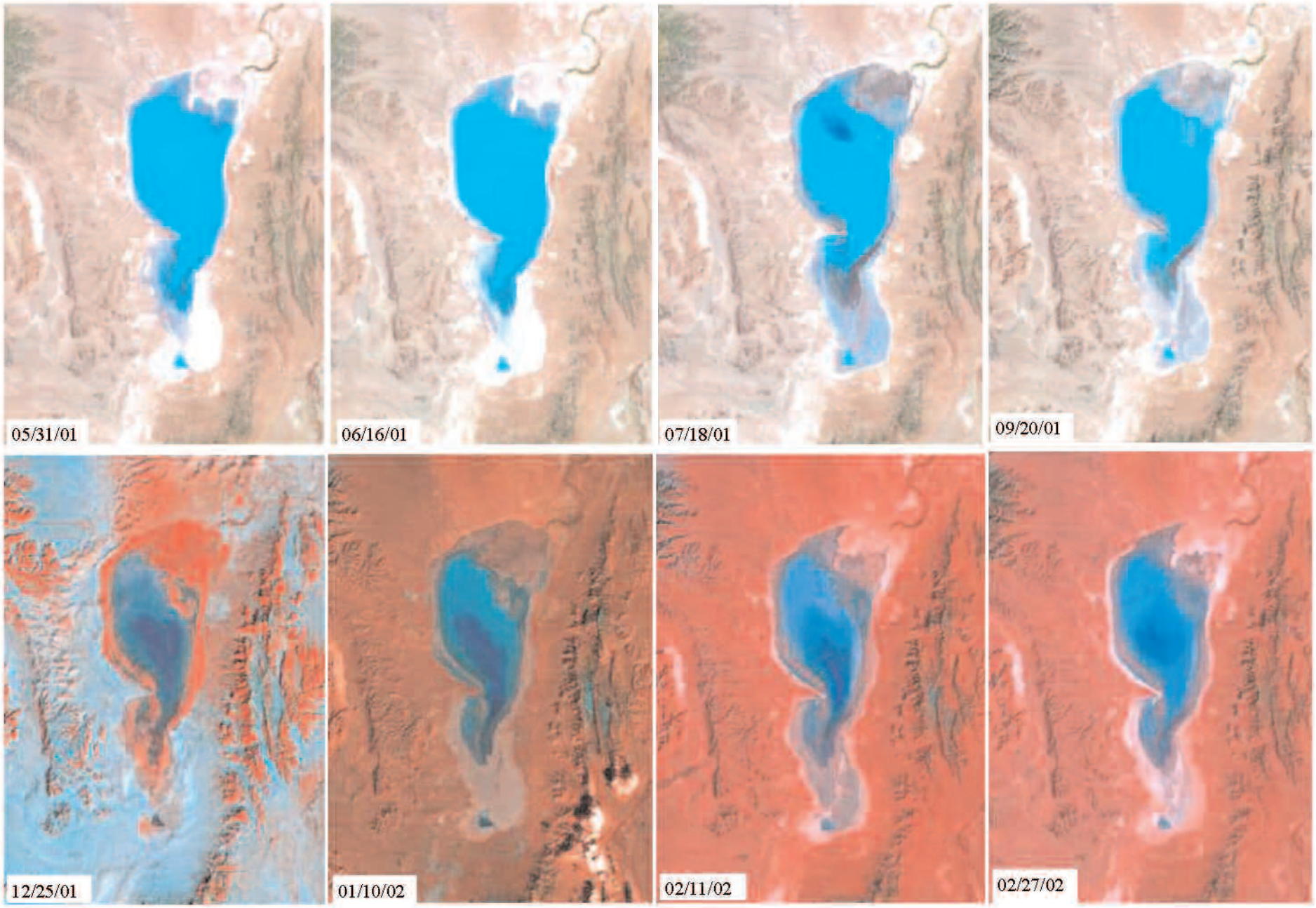
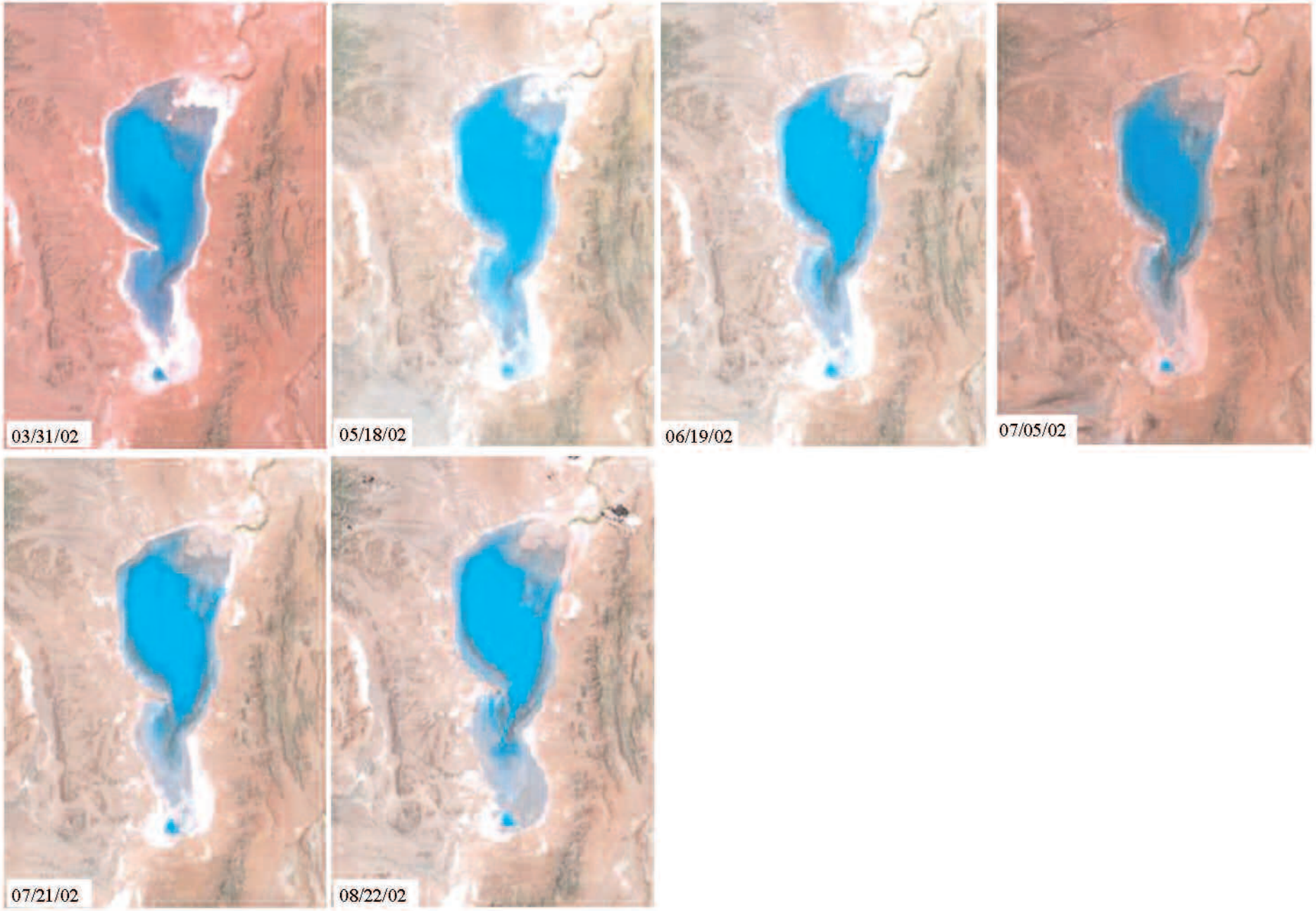


Scale = 25 Miles

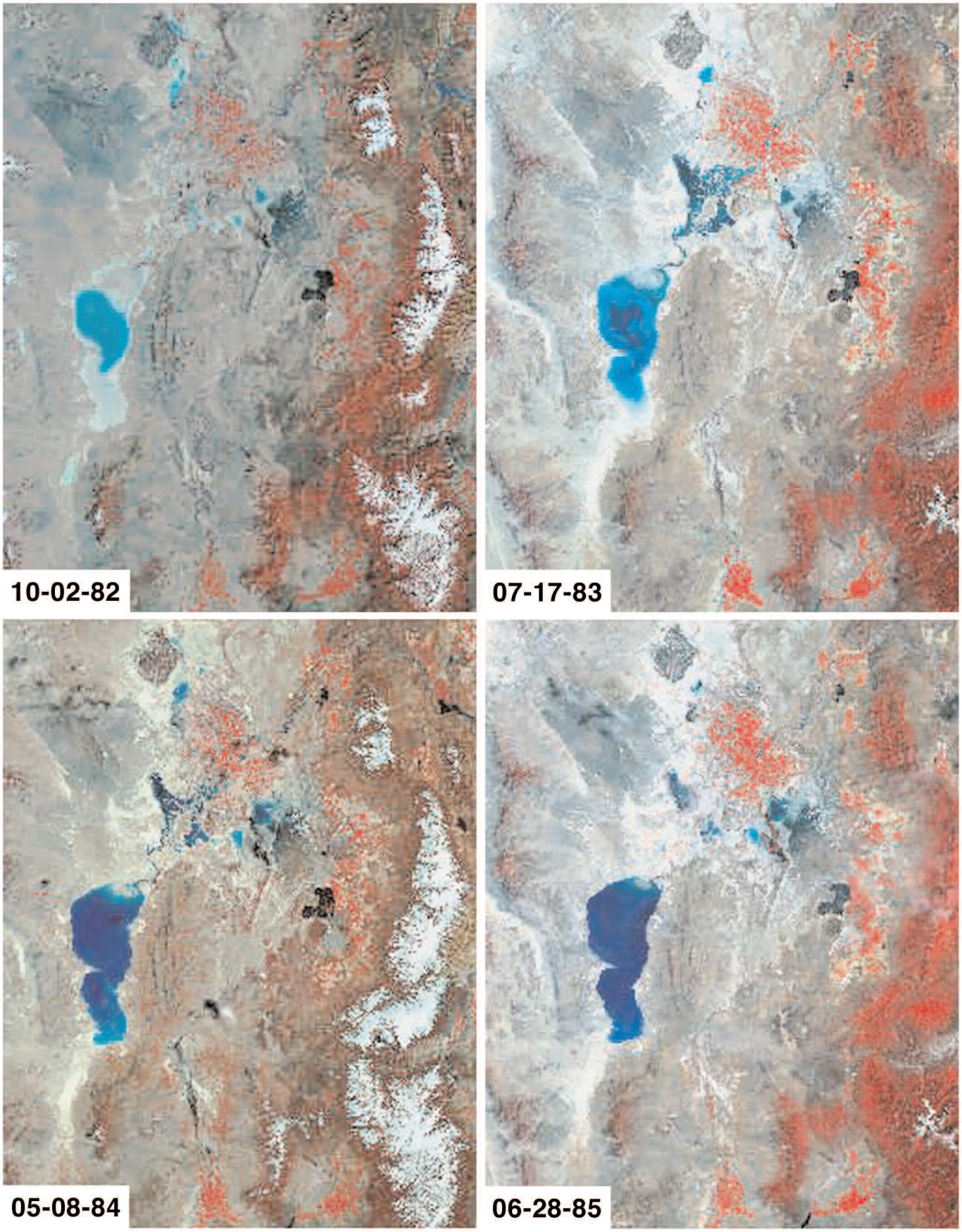


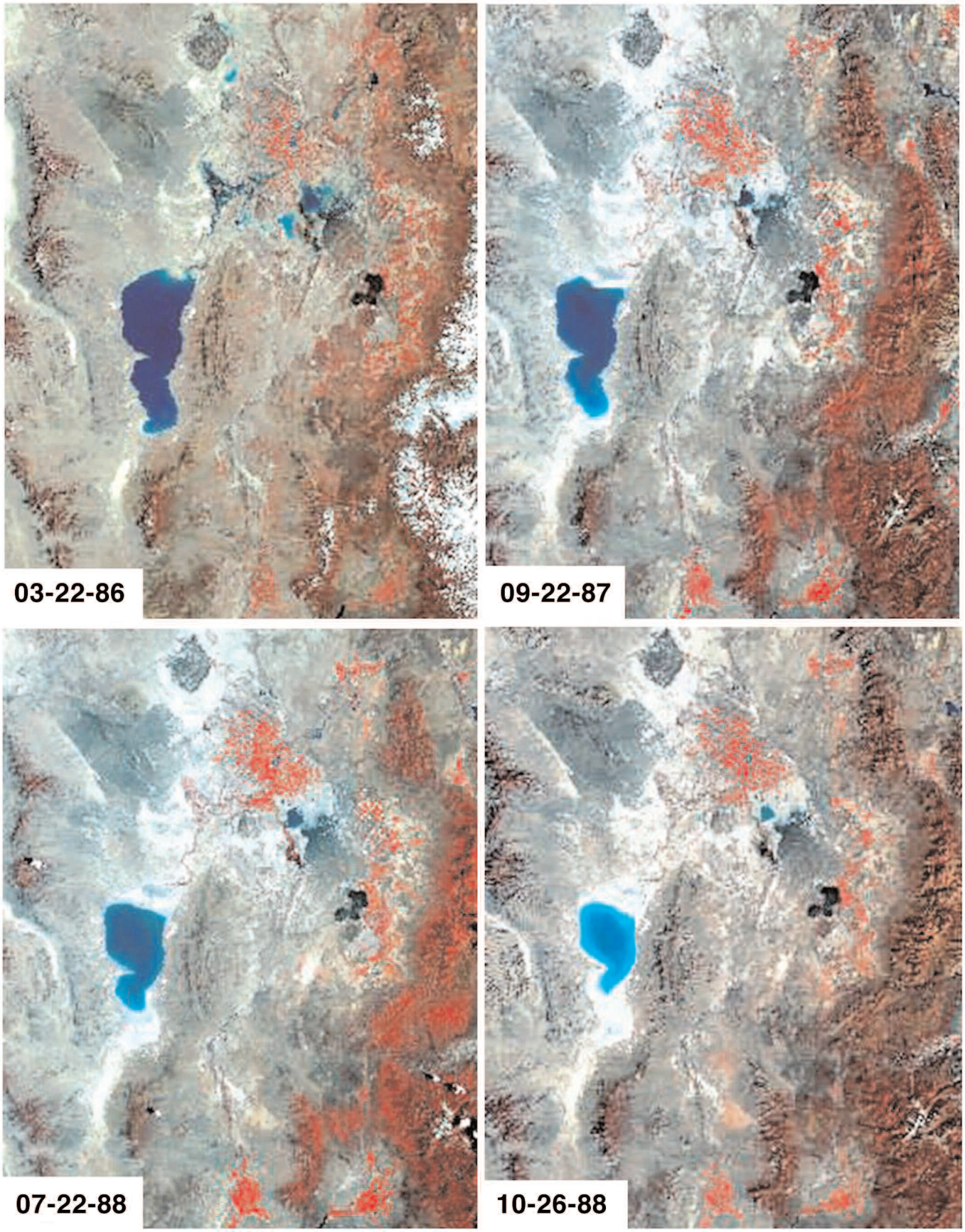
Scale = 25 Miles

APPENDIX C

APPENDIX C. Landsat 5 images of the Sevier Lake area from 10/02/82 through 10/26/88 and showing 1980s complete filling and emptying.

Images were downloaded from: http://edcsns17.cr.usgs.gov/Earthexplorer. Downloaded in September, 2003.


10-02-82
07-17-83
05-08-84
06-28-85
Scale = 25 miles



Scale = 25 miles

APPENDIX D

Appendix D. Water chemistry data for the Sevier River, associated reservoirs, and the Sevier River's major tributaries.

The first and third pages of appendix D data provide the location of each sampling site, followed by the chemical data for each site on the second and fourth pages. The station-identification number (Sta.-ID) ties the location information and the chemical data together. Data are from US Environmental Protection Agency's Storet database, and downloaded from the following web site: <http://www.epa.gov/storet/> Downloaded in August, 2003.

Na, K, Mg, Ca, Cl, SO_4, HCO_3, TDS, Hardness as $CaCO_3$ (Hard), Alkalinity as $CaCO_3$, and CO_2 are all given in terms of mg/L. pH is a dimensionless unit, and Ba and Fe are given in terms of Ug/L.

County	Sta.- ID	TYPE	Station Name	Latitude	Longitude	UTM_N	UTM_E
Garfield	494943	River	EAST FORK SEVIER RIVER BL CNFL / BLUBBER CREEK	37.548500	-112.275167	4156281.50	387355.64
Garfield	494939	River	E FK SEVIER RIVER AB TROPIC RES	37.575833	-112.266333	4159303.50	388176.90
Garfield	494940	River	EAST FORK SEVIER RIVER AT USGS STA. (10183900) AB TROPIC RES	37.575833	-112.265000	4159301.92	388294.62
Garfield	494932	River	E FK SEVIER RIVER BL TROPIC RES	37.612667	-112.248333	4163368.91	389820.78
Garfield	494965	River	SEVIER RIVER NEAR HATCH	37.651833	-112.429667	4167942.77	373881.47
Garfield	494956	River	E FK SEVIER RIVER @ U-12 XING	37.699333	-112.188000	4172915.33	395267.86
Garfield	494963	River	SEVIER RIVER AT U12 XING	37.749333	-112.374167	4178687.41	378936.36
Garfield	494958	River	E FK SEVIER RIVER @ TOM BESTROAD XING	37.811833	-112.054167	4185255.98	407207.35
Garfield	494966	River	SEVIER RIVER EAST OF PANGUITCH	37.823500	-112.405833	4186957.98	376270.19
Garfield	494967	River	SEVIER RIVER @ PANGUITCH AIRPORTROAD XING	37.851667	-112.435167	4190122.52	373736.36
Garfield	494957	River	E FK SEVIER RIVER @ COUNTYROAD XING N OF WIDSTOE JNCT	37.918000	-112.002167	4196984.99	411911.22
Garfield	494964	River	SEVIER RIVER @ SANFORD ROAD XING	37.941833	-112.415833	4200101.01	375589.30
Garfield	494997	River	E FK SEVIER RIVER AB CNFL/ DEER CK	38.010833	-111.964667	4207250.30	415314.18
Garfield	494927	River	E FK SEVIER RIVER ON MARTINEZ PROP. NR HOME (DWR)	38.031667	-111.976000	4209572.30	414343.52
Garfield	494945	River	SEVIER RIVER 6MI SW OF CIRCLEVILLE	38.104167	-112.335500	4218008.95	382907.23
Garfield	494926	River	EAST FK SEVIER RIVER AB DIV @ ANTIMONY	38.114667	-112.008000	4218811.54	411634.96
Piute	494942	River	SEVIER RIVER 1 MI W OF KINGSTON AT U62 XING	38.208333	-112.206667	4229412.39	394353.76
Beaver	594005	River	BEAVER RIVER AB MINERSVILLE CITY	38.217500	-112.900167	4231448.17	333652.94
Beaver	594004	River	BEAVER RIVER IN MINERSVILLE @ U130 XING	38.217667	-112.923000	4231507.98	331654.27
Beaver	594023	River	BEAVER RIVER AB CNFL / DRY CREEK SOUTH OF GREENVILLE	38.250500	-112.711833	4234788.41	350209.29
Beaver	594016	River	BEAVER RIVER AB MINERSVILLE RES AT COUNTYROAD XING	38.251333	-112.791833	4235013.40	343210.31
Beaver	594021	River	BEAVER RIVER AB RES AT U21 XING	38.253500	-112.766000	4235210.40	345475.52
Beaver	594033	River	BEAVER RIVER ABOVE CNFL / SOUTH CREEK	38.254333	-112.685500	4235171.43	352521.42
Beaver	594073	River	BEAVER RIVER AB COUNTY LANDFILL	38.261667	-112.976833	4236489.93	327045.43
Beaver	594037	River	BEAVER RIVER NEAR I-15 XING	38.264167	-112.655500	4236215.27	355166.07
Beaver	594056	River	BEAVER RIVER @ US 91 XING	38.264333	-112.643500	4236214.96	356216.31
Beaver	594044	River	BEAVER RIVER E OF BEAVER AT USFS BOUNDRY	38.278500	-112.558833	4237658.76	363650.45
Beaver	594079	River	BEAVER RIVER BL COUNTY LANDFILL	38.280167	-112.995167	4238577.33	325485.52
Beaver	594076	River	BEAVER RIVER ON RICHARD ROLLINS	38.314167	-113.008333	4242375.30	324415.79
Piute	494915	River	SEVIER RIVER BL PIUTE RES	38.331833	-112.186333	4243093.00	396309.87
Beaver	594077	River	BEAVER RIVER @ MILFORD FLATROAD XING	38.338500	-113.010167	4245079.06	324314.21
Beaver	594078	River	BEAVER RIVER N OF RON WALKER	38.368000	-113.019333	4248370.23	323584.66
Beaver	594003	River	BEAVER RIVER SE MILFORD @U21 XING	38.386333	-113.006333	4250379.92	324764.73
Sevier	494895	River	SEVIER RIVER AB CNFL / CLEAR CK	38.580500	-112.256000	4270766.73	390596.73
Sevier	494820	River	SEVIER RIVER N OF ANNABELLA	38.730833	-112.060167	4287233.60	407847.98
Sevier	494805	River	SEVIER RIVER AT U119 XING E OF RICHFIELD	38.774167	-112.032167	4292014.49	410336.09
Sevier	494750	River	SEVIER RIVER NEAR SIGURD AT U24 XING	38.836000	-111.967167	4298814.30	416055.32
Sevier	494760	River	SEVIER RIVER BL ROCKY FORD RES	38.873333	-111.953833	4302944.96	417255.93
Sevier	494714	River	SEVIER RIVER AB SALINA WWTP	38.965000	-111.881333	4313054.03	423643.65
Sanpete	494615	River	SAN PITCH RIVER 2MI E OF GUNNISON AT U137 XING	39.138333	-111.777667	4332207.37	432789.62

County	Sta.- ID	TYPE	Station Name	Latitude	Longitude	UTM_N	UTM_E
Sanpete	494258	River	SEVIER RIVER W OF GUNNISON	39.149667	-111.957667	4333613.88	417246.00
Sanpete	494255	River	SEVIER RIVER BL CNFL / SAN PITCH RIVER W OF CENTERFIELD	39.155167	-111.876667	4334153.49	424251.40
Sanpete	494247	River	SEVIER RIVER AB YUBA RES SW OF FAYETTE	39.209667	-111.862500	4340189.90	425533.04
Sanpete	494645	River	SAN PITCH RIVER W OF MANTI AB GUNNISON RES AT CR XING	39.278500	-111.677500	4347692.94	441562.98
Millard	494108	River	SEVIER RIVER SW OF DESERET AT GUNNISON BEND MONUMENT	39.280500	-112.777500	4349202.09	346683.83
Millard	494110	River	SEVIER RIVER AT U257 XING IN DESERET	39.288000	-112.651667	4349828.76	357553.23
Millard	494117	River	SEVIER RIVER BL GUNNISON BEND RES @ US6 AND 50 XING	39.330500	-112.620833	4354497.46	360297.19
Millard	494120	River	SEVIER RIVER BL GUNNISON BEND RES	39.340833	-112.615000	4355635.26	360820.46
Sanpete	494654	River	SAN PITCH RIVER NW OF MANTI	39.344333	-111.663333	4354989.80	442838.54
Millard	494123	Lake	GUNNISON BEND RES AB SW DAM 01	39.345167	-112.625000	4356131.72	359967.28
Millard	494124	Lake	GUNNISON BEND RES AB SE DAM 02	39.345167	-112.614333	4356115.24	360886.54
Millard	494125	Lake	GUNNISON BEND RES AB SW DAM 03	39.370500	-112.610500	4358920.92	361267.00
Millard	494128	River	SEVIER RIVER W OF DELTA AT CR53 XING	39.374333	-112.598500	4359327.95	362308.29
Juab	494229	River	SEVIER RIVER BL YUBA RES AT USGS GAGING STATION	39.374667	-112.038833	4358661.00	410518.68
Millard	494141	Lake	DMAD RES N OF CUT IN MTN MIDWAY UP LAKE 02	39.393500	-112.481833	4361283.75	372393.14
Millard	494140	Lake	DMAD RES AB DAM 01	39.396667	-112.488333	4361644.45	371839.17
Millard	494142	Lake	DMAD RES MIDLAKE NEAR UPPER WELL 03	39.398500	-112.472667	4361825.75	373191.55
Millard	494137	River	SEVIER RIVER BL DMAD RES	39.400000	-112.497167	4362026.94	371084.57
Juab	494219	River	SEVIER RIVER BL YUBA RES AT I15 XING	39.409667	-112.053333	4362559.78	409315.00
Sanpete	494665	River	SAN PITCH RIVER 1MI W OF CHESTER ON U-117	39.475500	-111.598000	4369507.16	448564.99
Juab	494218	River	SEVIER RIVER W OF MILLS	39.487500	-112.042167	4371186.61	410376.18
Millard	494210	River	SEVIER RIVER 1.5MI S OF LYNNDYL	39.498333	-112.371333	4372768.11	382086.09
Sanpete	494696	River	SAN PITCH RIVER AB MORONI WWTP	39.514333	-111.585500	4373809.77	449668.15
Sanpete	494675	River	SAN PITCH RIVER 2.5MI W OF MT PLEASANT AT U116 XING	39.546667	-111.513833	4377360.59	455849.44
Juab	494215	River	SEVIER RIVER 10MI NE OF LEAMINGTON AT U132 XING	39.586667	-112.165500	4382322.49	399912.11
Sanpete	494679	River	SAN PITCH RIVER @ US 89 XING N OF FAIRVIEW	39.638333	-111.445833	4387502.62	461742.75

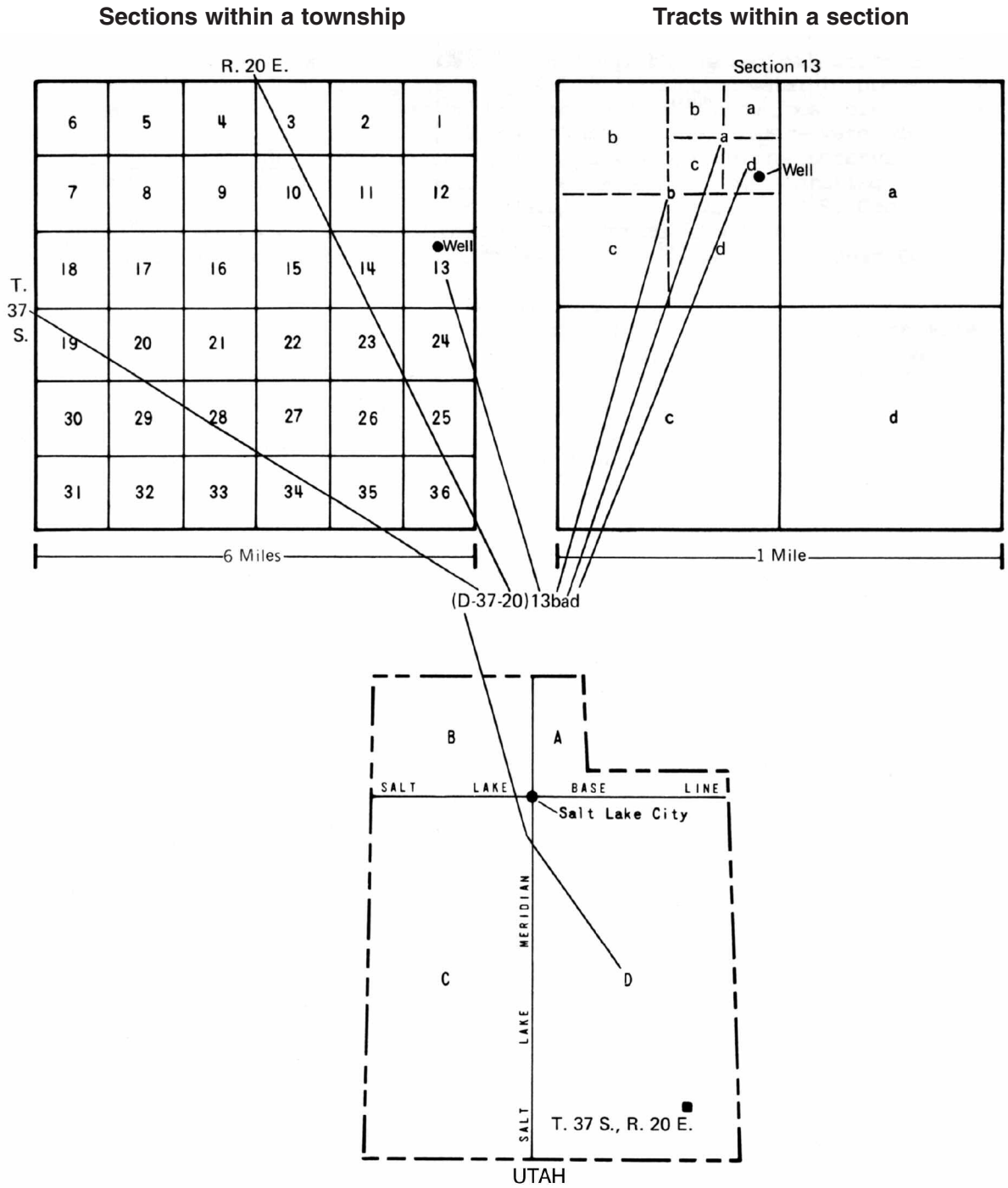
Sta.- ID	Na	K	Mg	Ca	Cl	SO_4	HCO_3	TDS	Hard.	Alk.	pH	CO_2	Ba	Fe
494943	2.00	1.00	33.33	42.33	2.10	5.33	289.00	233.33	242.80	238.33	8.23	2.33	0.00	7.07
494939	2.41	1.00	33.30	37.32	3.83	5.00	273.20	209.93	230.12	226.40	8.25	2.00	140.14	7.57
494940	2.09	1.21	31.63	42.26	2.56	5.22	282.68	227.26	235.58	232.16	8.34	2.26	168.12	8.84
494932	7.33	8.00	38.67	36.67	58.17	4.67	210.00	283.33	250.57	197.00	8.70	5.00	55.06	9.80
494965	3.59	1.13	17.84	38.95	2.18	4.83	205.75	180.00	170.65	170.40	8.21	1.63	0.16	0.31
494956	6.89	2.14	33.51	42.89	6.57	15.28	302.55	253.54	244.88	242.25	8.30	2.36	250.00	89.80
494963	4.24	1.47	18.37	38.37	4.02	10.60	217.42	618.21	171.34	178.26	8.33	1.63	164.00	37.55
494958	5.14	2.16	24.08	34.98	3.00	0.00	223.00	202.40	186.34	183.20	8.29	1.80	190.00	34.00
494966	5.07	1.77	21.28	42.51	5.46	10.49	235.88	207.76	193.63	193.47	8.25	2.24	174.00	77.05
494967	6.71	2.13	19.61	42.39	5.51	10.42	241.24	220.12	186.44	197.88	8.19	2.53	160.00	104.15
494957	5.55	2.09	21.31	34.38	2.44	0.00	218.50	203.67	173.45	179.00	8.18	2.17	169.00	54.80
494964	19.88	2.96	21.58	45.59	6.03	11.00	291.00	273.89	202.56	238.67	8.22	2.89	100.40	105.13
494997	12.33	2.04	32.48	41.49	9.88	14.75	280.19	271.53	237.14	229.63	8.47	1.67	142.92	49.50
494927	12.00	2.00	32.50	42.00	0.00	15.50	277.50	247.43	0.00	227.50	8.25	1.50	0.00	0.00
494945	22.11	3.09	19.47	44.60	6.97	10.05	273.06	262.07	191.37	224.39	8.24	2.52	38.38	15.57
494926	10.45	2.46	19.13	43.14	7.55	17.56	218.08	234.90	186.01	180.54	8.33	1.56	43.92	14.75
494942	30.35	4.11	21.38	50.45	8.23	18.96	313.54	321.24	213.91	258.46	8.18	2.78	14.26	6.87
594005	46.91	6.72	18.19	49.57	40.59	43.98	239.13	332.86	198.52	199.34	8.42	1.54	43.29	29.30
594004	40.43	6.85	16.43	52.63	31.17	33.97	230.67	319.33	198.93	189.33	8.42	1.33	40.33	0.00
594023	22.72	7.97	16.45	59.33	20.17	24.45	227.33	0.00	215.69	212.53	8.13	2.00	30.00	48.00
594016	65.28	8.09	23.44	69.73	52.45	69.78	278.00	467.62	270.39	275.16	8.12	2.75	33.00	40.65
594021	51.08	7.18	16.52	57.59	38.61	54.68	249.04	369.14	211.59	215.07	8.09	4.95	14.99	10.04
594033	13.85	4.63	10.91	44.48	13.62	16.29	158.91	204.25	155.86	150.16	8.10	2.00	43.59	33.29
594073	38.80	6.76	16.40	52.70	30.00	30.00	236.00	304.00	199.00	194.00	8.14	3.00	40.00	0.00
594037	9.04	3.97	7.38	32.67	8.54	10.80	130.33	147.33	111.86	110.22	7.73	3.00	0.00	0.00
594056	9.10	4.20	8.80	38.00	6.50	10.88	154.00	128.15	131.00	126.00	7.90	3.00	8.90	0.00
594044	4.64	1.55	3.30	14.59	3.82	6.66	63.67	95.31	49.85	52.08	7.78	1.65	6.06	19.52
594079	38.50	6.78	15.80	53.30	30.00	30.00	246.00	318.00	198.00	202.00	7.93	5.00	61.00	41.90
594076	38.50	6.70	16.20	52.40	30.50	29.50	236.00	306.00	197.40	194.00	8.21	2.00	39.00	28.60
494915	32.53	4.18	21.89	45.56	17.67	31.44	268.33	314.31	203.58	220.83	8.10	12.69	13.01	2.39
594077	39.10	6.82	16.60	53.50	30.50	28.50	228.00	308.00	201.80	187.00	8.35	2.00	41.00	0.00
594078	38.80	6.88	16.50	52.80	30.00	28.40	236.00	306.00	199.60	194.00	8.36	2.00	40.00	0.00
594003	39.20	6.76	16.30	52.90	30.50	29.80	238.00	306.00	199.10	195.00	8.29	2.00	39.00	0.00
494895	25.67	3.53	18.75	50.23	15.65	45.37	234.19	296.83	202.48	193.11	8.32	1.68	21.46	15.66
494820	31.00	5.60	16.00	54.00	20.50	15.54	278.00	320.00	200.60	228.00	7.50	14.00	48.00	0.00
494805	72.98	4.73	47.98	91.81	49.66	264.98	292.16	738.63	426.46	239.58	8.19	3.11	48.80	24.75
494750	83.38	5.69	42.75	79.75	87.27	190.19	293.31	684.38	374.20	240.19	8.18	2.75	5.15	0.52
494760	97.05	5.17	45.44	78.73	90.28	195.14	296.19	686.42	383.39	242.84	8.12	3.37	15.14	3.03
494714	156.18	6.13	50.37	87.69	180.95	255.81	326.00	936.93	425.83	267.47	7.89	4.13	0.07	0.80
494615	386.57	4.75	80.80	85.67	564.22	273.27	418.03	1667.32	547.65	343.74	8.17	4.77	44.49	18.53

Sta.- ID	Na	K	Mg	Ca	Cl	SO_4	HCO_3	TDS	Hard.	Alk.	pH	CO_2	Ba	Fe
494258	284.05	5.90	70.38	90.87	364.52	298.09	381.43	1370.86	516.30	312.81	7.97	8.81	66.93	31.20
494255	241.00	6.00	63.10	82.88	266.90	285.77	399.28	1209.50	466.45	327.58	8.05	4.84	10.56	3.49
494247	249.15	5.98	66.88	85.74	307.82	279.46	407.04	1242.13	489.07	334.03	8.14	5.11	63.91	32.53
494645	148.64	4.70	118.44	71.36	157.59	337.15	529.71	1133.18	665.39	434.35	8.32	4.29	114.11	51.84
494108	465.00	9.42	133.00	99.90	662.50	607.00	422.00	2236.00	796.50	346.00	8.29	3.00	0.00	0.00
494110	474.41	7.10	130.19	118.20	677.61	629.96	431.12	2338.05	828.91	350.45	8.02	6.78	31.99	7.62
494117	436.67	5.67	140.00	143.33	630.93	590.00	413.67	2270.67	933.67	339.00	7.97	6.33	0.04	0.20
494120	600.00	7.00	170.00	145.00	824.90	725.00	420.00	2768.00	1061.25	344.00	7.90	8.00	0.06	0.20
494654	111.09	4.68	93.69	64.63	117.17	214.73	498.93	861.73	546.77	409.20	8.44	3.00	119.20	30.78
494123	241.59	6.58	71.12	55.87	303.34	283.58	315.71	1115.67	432.01	249.58	8.36	2.14	57.03	10.37
494124	256.00	6.80	67.83	55.67	305.27	294.00	290.00	1149.33	418.00	237.67	8.10	3.00	0.09	0.77
494125	265.00	7.00	71.00	57.75	318.40	310.00	298.00	1224.00	436.18	244.50	8.15	2.50	0.08	0.54
494128	237.57	5.95	79.91	73.09	321.46	302.60	323.75	1222.13	511.07	265.35	8.19	3.10	17.81	2.16
494229	228.47	6.34	66.51	58.83	267.61	270.89	321.81	1103.40	420.50	266.13	8.20	2.61	17.97	1.02
494141	243.33	6.33	65.25	57.50	287.40	280.00	295.50	1125.00	411.93	242.50	8.15	2.50	0.09	0.71
494140	220.72	6.39	64.77	53.32	273.16	265.99	313.71	1016.50	399.54	243.67	8.36	2.00	54.63	10.98
494142	250.00	6.00	65.00	61.50	294.90	285.00	307.00	1142.00	420.85	252.00	8.20	2.00	0.08	0.53
494137	203.18	6.00	73.59	66.94	244.96	267.06	328.59	1059.29	469.76	270.82	8.12	3.12	5.37	10.22
494219	62.00	3.00	45.50	58.50	102.45	76.50	300.50	514.00	333.20	246.50	8.00	4.00	0.13	0.06
494665	47.04	4.90	57.73	69.95	60.26	80.97	445.00	538.22	412.08	364.89	8.30	3.89	160.00	25.77
494218	147.33	5.00	59.67	61.72	178.70	188.00	322.56	839.67	399.33	265.72	8.16	2.59	6.52	0.16
494210	233.29	5.80	74.89	68.58	301.34	292.45	332.88	1175.97	478.82	273.83	8.25	4.03	35.35	5.90
494696	29.99	3.25	53.64	64.02	29.03	73.53	415.05	479.56	380.58	340.45	8.12	4.30	41.00	11.68
494675	22.30	2.91	49.82	69.04	24.34	63.28	413.72	454.75	377.23	337.06	8.14	4.95	110.63	17.16
494215	158.27	5.06	63.75	63.73	213.95	228.87	303.48	905.88	421.31	248.68	8.21	2.61	34.11	2.21
494679	11.70	1.67	39.01	60.44	12.46	26.95	368.89	353.89	311.32	302.44	8.26	3.11	131.67	26.50

Na, K, Mg, Ca, Cl, SO_4, HCO_3, TDS, Hardness as $CaCO_3$ (Hard), Alkalinity as $CaCO_3$ (Alk), and CO_2 are all given in terms of mg/L
pH is a dimensionless unit
Ba and Fe are given in terms of ug/L

APPENDIX E

Appendix E. USGS well-numbering system and water chemistry for 83 water wells within the general area around Lynndyl.



USGS well-numbering system used in this report

The area wells are located within an area that extends from T. 13 S. to T. 17 S., and R. 1 W. to R. 9 W., Salt Lake Base and Meridian. Source of data: U.S. Geological Survey, 2003b.

No	Site ID	Depth	pH	HCO_3	Ca	Mg	Na+K	Na	K	Cl	SO_4	TDS
1	(C-13-2)18cbb-S1	?	7	nd	170	38	82.5	77	5.5	290	140	nd
2	(C-13-2)19cdc-S1	?	8.1	nd	150	27	53.8	48	5.8	100	63	nd
3	(C-13-2)5cbd-S1	?	7.7	230	63	8.8	8.9	nd	nd	8.2	8.6	213
4	(C-13-4)23dcb-1	150	7.6	280	102	89	190	nd	nd	285	345	1260
5	(C-13-6)26bac-1	150	7.9	nd	91	130	425.7	420	5.7	720	540	2080
6	(C-13-6)35add-1	202	7.9	nd	140	130	339.8	330	9.8	650	540	1970
7	(C-13-6)9bcc-1	150	7.2	nd	98	52	88	75	13	220	63	709
8	(C-13-7)12cdb-1	160	8	nd	52	46	63.5	59	4.5	230	36	545
9	(C-13-7)9cbc-1	150	7.3	190	32	26	100	nd	nd	144	47	484
10	(C-14-7)19ddd-1	194	8.1	nd	74	44	325.6	320	5.6	560	250	1310
11	(C-14-7)20ccc-1	?	7	90	82	51	320	nd	nd	540	268	1330
12	(C-14-8)10dca-1Sa	?	7.8	150	361	56	879	812	67	1550	733	3710
13	(C-14-8)10dca-1Sb	?	6.3	nd	360	54	873.3	870	3.3	1500	670	3590
14	(C-14-8)13dcc-1	553	8.2	140	11	7.3	247.4	239	8.4	280	78	713
15	(C-14-9)27bdb-1	160		nd	24	14	188.2	180	8.2	92	110	617
16	(C-15-13)18cdd-S1	?	7.2	nd	120	82	424.9	420	4.9	810	190	nd
17	(C-15-4)11add-1	485	7.4	240	164	66	100	nd	nd	320	249	1130
18	(C-15-4)18daa-1a	406	7.7	220	134	68	75	nd	nd	308	144	878
19	(C-15-4)18daa-1b	406	7.6	250	176	94	100	nd	nd	395	263	1180
20	(C-15-4)18daa-1c	406	7.9	260	198	97	86	nd	nd	410	278	1200
21	(C-15-4)19ccc-1	875	9	170	39	16	20.4	18	2.4	27	16	223
22	(C-15-4)19ccc-2	63.1	7.2	nd	420	300	294	280	14	1000	1200	3340
23	(C-15-4)20caa-1	1000	7.5	210	42	20	21	nd	nd	27	25	250
24	(C-15-4)26dcc-1a	660	7.5	200	52.6	14	27	nd	nd	28.5	34.4	356
25	(C-15-4)26dcc-1b	660	7.7	190	97	25	21	nd	nd	81	76	516
26	(C-15-4)26dcc-1c	660	7.9	200	102	102	28	nd	nd	92	95	507
27	(C-15-4)26dcc-1d	660	6.5	200	103	31	42	nd	nd	106	106	564
28	(C-15-4)8cba-1a	203	7.5	300	240	129	88	nd	nd	505	347	1490
29	(C-15-4)8cba-1b	203	7.5	300	248	122	170	nd	nd	610	359	1690
30	(C-15-4)8cba-1c	203	7.6	310	260	114	182.6	176	6.6	608	369	1720
31	(C-15-4)8cba-1d	203	7.6	330	244	139	240	nd	nd	665	469	1950
32	(C-15-5)13bbc-1a	310	7.7	230	66	41	67	nd	nd	164	58	536
33	(C-15-5)13bbc-1b	310	7.7	220	84	63	75	nd	nd	256	89	700
34	(C-15-5)13bbc-1c	310	7.5	220	80	62	88	nd	nd	280	71	716
35	(C-15-5)13bbc-1d	310	7.5	210	110	66	89.1	84	5.1	330	98	823
36	(C-15-5)14cab-1	528	8.2	nd	39.8	28.7	54	nd	nd	66.5	49	388
37	(C-15-5)15dba-1	?	nd	nd	34.2	28.9	53	nd	nd	72	54.6	375
38	(C-15-5)26baa-1a	1150	7.9	180	34	19	26	nd	nd	31	26	252
39	(C-15-5)26baa-1b	1150	8	170	32	19	22	nd	nd	30	25	210
40	(C-15-5)26baa-1c	1150	7.2	160	32	18	25.1	23	2.1	31	27	244
41	(C-15-5)26baa-1d	1150	7.7	160	40	22	38.3	36	2.3	59	49	315
42	(C-15-5)26baa-2	158	7.1	nd	50	31	53.4	50	3.4	85	56	420
43	(C-15-5)27dcc-1	1196	7.5	180	19	19	38	nd	nd	28	24	232
44	(C-15-5)27dcc-2	144	8.2	nd	41	26	39.8	37	2.8	38	39	317
45	(C-15-5)29dda-1	132	7.8	250	43	26	58	nd	nd	56	57	376
46	(C-15-5)32cda-1	1197	7.6	170	32	28	57	41	16	60	78	388
47	(C-15-5)33dcb-1a	1280	7.8	170	31	16	41	nd	nd	39	37	275
48	(C-15-5)33dcb-1b	1280	8.1	nd	29	16	36.1	34	2.1	35	33	265
49	(C-15-5)33dcb-2	177	nd	nd	32	28	36.1	33	3.1	41	47	314
50	(C-15-6)19bcc-1	1180	8.2	nd	19	11	58	54	4	47	37	281

No.	SiteID	Depth	pH	HCO_3	Ca	Mg	Na+K	Na	K	Cl	SO_4	TDS
51	(C-15-6)19cac-1	235	7.8	200	30	22	98	nd	nd	105	62	435
52	(C-15-7)18caa-1	795	nd	120	32	34	160	nd	nd	165	230	nd
53	(C-15-7)30bdd-1	170	nd	140	11.7		120	nd	nd	91	76.5	396
54	(C-15-7)32dcd-1	15	nd	nd	330	690	7171	7100	71	6300	9500	24300
55	(C-15-7)33bcd-1	900	7.4	120	18	7.5	76	nd	nd	59	55	300
56	(C-15-7)35-abb-1	85	8.2	nd	19	21	87	82	5.1	76	61	390
57	(C-15-7)36bcc-1a	80	8.2	150	30	13	62	nd	nd	58	55	322
58	(C-15-7)36bcc-1b	80	nd	nd	24	15	60.2	56	4.2	64	59	315
59	(C-15-8)23bba-1	117	8.4	170	6.4	5.8	280	nd	nd	248	149	822
60	(C-15-8)29ccc-1a	285	7.7	220	8	1.9	180	nd	nd	102	100	521
61	(C-15-8)29ccc-1b	285	8.6	nd	5	2.3	192.1	190	2.1	110	92	536
62	(C-15-8)8cac-1a	150	7.4	140	12	5.4	320	nd	nd	292	199	919
63	(C-15-8)8cac-1b	150	8.2	nd	10	4.9	321.3	320	1.3	300	190	924
64	(C-16-14)30ddb-1a	637	7.6	250	116	53	94	nd	nd	194	174	841
65	(C-16-14)30ddb-1b	637	7.4	280	104	54	87	nd	nd	168	155	777
66	(C-16-14)30ddb-1c	637	7.5	280	113	46	99	nd	nd	174	159	802
67	(C-16-4)18bda-1	375	6.8	210	103	45	89	nd	nd	227	129	849
68	(C-16-4)19dbd-1	344	7.6	nd	210	85	90.8	87	3.8	290	440	1330
69	(C-16-4)30cac-1a	446	7.8	nd	68	26	55.5	54	1.5	66	51	412
70	(C-16-4)30cac-1b	446	8	nd	75	28	59.3	58	1.3	79	62	476
71	(C-16-4)31bca-1	?	7.8	nd	58	21	33.9	33	0.9	26	22	330
72	(C-16-5)9aaa-1a	637	7.6	220	40	20	18.2	16	2.2	21	9.7	236
73	(C-16-5)9aaa-1b	637	7.2	nd	29	18	31	29	2	45	25	255
74	(C-16-6)27aaa-1	1200	nd	nd	21	15	41	39	2.3	28	27	248
75	(C-16-6)34bad-1a	302	7.8	nd	19	20	20.4	18	2.4	15	10	198
76	(C-16-6)34bad-1b	302	8.1	nd	22	18	19	nd	nd	17	7.4	196
77	(C-16-6)34bad-2	377	8.1	nd	19	18	19.5	17	2.5	16	4.8	197
78	(C-17-6)29ccc-1	910	8.2	nd	10	4.6	75.1	73	2.1	30	20	258
79	(C-17-6)29ccc-2	221	nd	nd	14	13	41.4	38	3.4	32	17	211
80	(C-17-7)26cac-2	390	nd	nd	5.5	2.3	190	200	1.4	140	53	581
81	(C-17-7)34cbd-2	598	8.6	36	6.5	5	171	171	nd	30	27	312
82	(C-18-5)6bba-1	?	7.7	330	60	22	220	nd	nd	280	57	853
83	(C-18-6)2bbb-2	246	7.9	nd	25	21	83	67	16	30	43	407

Depth = well depth in feet
Ion values are given in terms of mg/L
pH is a non-dimensional unit

APPENDIX F

Appendix F. Nighttime, daytime, and average temperatures and evaporation rates at Sevier Lake for both the lake weather station and the camp weather station.

Brine evaporation rates, based on 45, 55, 65, and 75 percent of the total evaporation rate, are given. The average brine temperature is a weighted average of 40 percent nighttime temperature and 60 percent daytime temperature.

Appendix F. Nighttime, daytime and average temperatures and evaporation rates at Sevier Lake

Station	Date	N-Evap[1]	N-Temp[1]	D-Evap[2]	D-Temp[2]	T-Evap[3]	Avg-Temp[4]	B-Evap-45%[5]	B-Evap-55%[5]	B-Evap-65%[5]	B-Evap-75%[5]
Lake	06/26/79	0.1563	50.00	0.5625	92.00	0.7188	75.20	0.3234	0.3953	0.4672	0.5391
Lake	06/27/79	0.1563	51.00	0.5000	90.00	0.6563	74.40	0.2953	0.3609	0.4266	0.4922
Lake	06/28/79	0.2500	54.00	0.3750	91.00	0.6250	76.20	0.2813	0.3438	0.4063	0.4688
Lake	06/30/79	0.2500	55.00	0.0625	82.00	0.3125	71.20	0.1406	0.1719	0.2031	0.2344
Lake	07/01/79	0.5000	52.00	0.2813	85.00	0.7813	71.80	0.3516	0.4297	0.5078	0.5859
Lake	07/02/79	0.4375	51.00	0.6250	81.00	1.0625	69.00	0.4781	0.5844	0.6906	0.7969
Lake	07/03/79	0.4063	45.00	0.3750	79.00	1.0938	65.40	0.4922	0.6016	0.7109	0.8203
Lake	07/04/79	0.1250	48.00	0.5313	86.00	0.6563	70.80	0.2953	0.3609	0.4266	0.4922
Lake	07/13/79	0.2813	61.00	0.3438	92.00	0.6250	79.60	0.2813	0.3438	0.4063	0.4688
Lake	07/14/79	0.1250	55.00	0.4063	92.00	0.5313	77.20	0.2391	0.2922	0.3453	0.3984
Lake	07/15/79	0.4063	58.00	0.4063	91.00	0.8125	77.80	0.3656	0.4469	0.5281	0.6094
Lake	07/23/79	0.1250	60.00	0.2813	92.00	0.4063	79.20	0.1828	0.2234	0.2641	0.3047
Lake	07/24/79	0.1250	56.00	0.4063	89.00	0.5313	75.80	0.2391	0.2922	0.3453	0.3984
Lake	07/25/79	0.0938	57.00	0.4375	86.00	0.5313	74.40	0.2391	0.2922	0.3453	0.3984
Lake	07/26/79	0.1250	59.00	0.5938	88.00	0.7188	76.40	0.3234	0.3953	0.4672	0.5391
Lake	08/03/79	0.2500	53.00	0.5625	89.00	0.8125	74.60	0.3656	0.4469	0.5281	0.6094
Lake	08/04/79	0.1250	56.00	0.6563	89.00	0.7813	75.80	0.3516	0.4297	0.5078	0.5859
Lake	08/05/79	0.4688	56.00	0.6563	94.00	1.1250	78.80	0.5063	0.6188	0.7313	0.8438
Lake	08/08/79	0.1875	58.00	0.5625	88.00	0.7500	76.00	0.3375	0.4125	0.4875	0.5625
Lake	08/09/79	0.2500	58.00	0.2813	94.00	0.5313	79.60	0.2391	0.2922	0.3453	0.3984
Lake	08/17/79	0.1563	54.00	0.7188	82.00	0.8750	70.80	0.3938	0.4813	0.5688	0.6563
Lake	08/18/79	0.1875	52.00	0.2813	78.00	0.4688	67.60	0.2109	0.2578	0.3047	0.3516
Lake	08/19/79	0.0938	52.00	0.3125	80.00	0.4063	68.80	0.1828	0.2234	0.2641	0.3047
Lake	08/20/79	0.1875	54.00	0.1563	75.00	0.3438	66.60	0.1547	0.1891	0.2234	0.2578
Lake	08/21/79	0.2188	52.00	0.4063	80.00	0.6250	68.80	0.2813	0.3438	0.4063	0.4688
Lake	08/22/79	0.1563	48.00	0.3750	81.00	0.5313	67.80	0.2391	0.2922	0.3453	0.3984
Lake	08/23/79	0.2813	51.00	0.4063	82.00	0.6875	69.60	0.3094	0.3781	0.4469	0.5156
Lake	08/31/79	0.1875	50.00	0.3438	83.00	0.5313	69.80	0.2391	0.2922	0.3453	0.3984
Lake	09/01/79	0.1563	51.00	0.5313	80.00	0.6875	68.40	0.3094	0.3781	0.4469	0.5156
Lake	09/02/79	0.2813	48.00	0.5000	79.00	0.7813	66.60	0.3516	0.4297	0.5078	0.5859
Lake	09/03/79	0.1875	48.00	0.4688	80.00	0.6563	67.20	0.2953	0.3609	0.4266	0.4922
Lake	09/04/79	0.1875	50.00	0.4063	82.00	0.5938	69.20	0.2672	0.3266	0.3859	0.4453
Lake	09/05/79	0.2188	51.00	0.2813	84.00	0.5000	70.80	0.2250	0.2750	0.3250	0.3750
Lake	09/06/79	0.1563	51.00	0.3438	82.00	0.5000	69.60	0.2250	0.2750	0.3250	0.3750
	Average	**0.2206**	**53.09**	**0.4246**	**85.24**	**0.6544**	**72.38**	**0.29**	**0.3599**	**0.4254**	**0.4908**

Station	Date	N-Evap[1]	N-Temp[1]	D-Evap[2]	D-Temp[2]	T-Evap[3]	Avg-Temp[4]	B-Evap-45%[5]	B-Evap-55%[5]	B-Evap-65%[5]	B-Evap-75%[5]
Camp	06/26/79	0.1250	50.00	0.6250	92.00	0.7500	75.20	0.3375	0.4125	0.4875	0.5625
Camp	07/01/79	0.3438	59.00	0.4063	85.00	0.7500	74.60	0.3375	0.4125	0.4875	0.5625
Camp	07/02/79	0.1250	52.00	0.7188	82.00	0.8438	70.00	0.3797	0.4641	0.5484	0.6328
Camp	07/03/79	0.3125	47.00	0.3750	82.00	0.6875	68.00	0.3094	0.3781	0.4469	0.5156
Camp	07/12/79	0.2188	58.00	0.3438	96.00	0.5625	80.80	0.2531	0.3094	0.3656	0.4219
Camp	07/13/79	0.0625	60.00	0.4375	92.00	0.5000	79.20	0.2250	0.2750	0.3250	0.3750
Camp	07/14/79	0.1875	58.00	0.3750	92.00	0.5625	78.40	0.2531	0.3094	0.3656	0.4219
Camp	07/15/79	0.5000	58.00	0.3750	91.00	0.9063	77.80	0.4078	0.4984	0.5891	0.6797
Camp	07/23/79	0.1875	60.00	0.2813	92.00	0.4688	79.20	0.2109	0.2578	0.3047	0.3516
Camp	07/24/79	0.0625	56.00	0.4375	83.00	0.2500	72.20	0.1125	0.1375	0.1625	0.1875
Camp	07/25/79	0.2188	56.00	0.2500	92.00	0.4688	77.60	0.2109	0.2578	0.3047	0.3516
Camp	07/26/79	0.1563	59.00	0.5000	92.00	0.6563	78.80	0.2953	0.3609	0.4266	0.4922
Camp	08/02/79	0.1875	57.00	0.4063	94.00	0.5000	79.20	0.2250	0.2750	0.3250	0.3750
Camp	08/03/79	0.1875	57.00	0.4375	89.00	0.6250	76.20	0.2813	0.3438	0.4063	0.4688
Camp	08/04/79	0.1875	56.00	0.5938	89.00	0.7813	75.80	0.3516	0.4297	0.5078	0.5859
Camp	08/05/79	0.3438	59.00	0.2813	92.00	0.6250	78.80	0.2813	0.3438	0.4063	0.4688
Camp	08/06/79	0.1250	56.00	0.2188	87.00	0.3438	74.60	0.1547	0.1891	0.2234	0.2578
Camp	08/07/79	0.0938	57.00	0.4375	83.00	0.5313	72.60	0.2391	0.2922	0.3453	0.3984
Camp	08/08/79	0.1875	58.00	0.3125	87.00	0.5000	75.40	0.2250	0.2750	0.3250	0.3750
Camp	08/17/79	0.0938	54.00	0.3125	87.00	0.4063	73.80	0.1828	0.2234	0.2641	0.3047
Camp	08/18/79	0.0625	53.00	0.3125	81.00	0.3750	69.80	0.1688	0.2063	0.2438	0.2813
Camp	08/19/79	0.1563	52.00	0.2500	83.00	0.4063	70.60	0.1828	0.2234	0.2641	0.3047
Camp	08/20/79	0.0625	54.00	0.1250	76.00	0.1875	67.20	0.0844	0.1031	0.1219	0.1406
Camp	08/21/79	0.1563	52.00	0.4063	84.00	0.5625	71.20	0.2531	0.3094	0.3656	0.4219
Camp	08/22/79	0.1875	46.00	0.3438	85.00	0.5313	69.40	0.2391	0.2922	0.3453	0.3984
Camp	08/23/79	0.2813	50.00	0.3750	86.00	0.6563	71.60	0.2953	0.3609	0.4266	0.4922
Camp	08/31/79	0.1875	52.00	0.5313	86.00	0.7188	72.40	0.3234	0.3953	0.4672	0.5391
Camp	09/01/79	0.0938	50.00	0.5313	84.00	0.6250	70.40	0.2813	0.3438	0.4063	0.4688
Camp	09/02/79	0.1563	46.00	0.4688	85.00	0.6250	69.40	0.2813	0.3438	0.4063	0.4688
Camp	09/03/79	0.0625	47.00	0.7500	84.00	0.8125	69.20	0.3656	0.4469	0.5281	0.6094
Camp	09/04/79	0.1250	50.00	0.3750	86.00	0.5000	71.60	0.2250	0.2750	0.3250	0.3750
Camp	09/05/79	0.1563	50.00	0.3438	88.00	0.5000	72.80	0.2250	0.2750	0.3250	0.3750
	Average	**0.1748**	**54.03**	**0.4043**	**87.09**	**0.5693**	**73.87**	**0.2562**	**0.3131**	**0.3701**	**0.4270**

[1]N-Evap and N-Temp are nighttime, fresh-water pan evaporation (in/day) and water temperature (deg F) values.
[2]D-Evap and D-Temp are daytime, fresh-water pan evaporation (in/day) and water temperature (deg F) values.
[3]T-Evap is total, fresh-water pan evaporation (in/day).
[4]Avg-Temp is weighted average of 40% nighttime water temperature and 60% daytime water temperature during June-August.
[5]B-Evap-45%, 55%, 65% and 75% are brine evaporation rates (in/day) as percentage of total, fresh-water evaporation rate.
Bold indicates average values.

APPENDIX G

Appendix G. Weather data obtained from the south and north stations during 1979.

Parameters include: air temperature (max, min, and mean), solar radiation, wind velocity data (12 sectors), and wind direction data (12 sectors). The anamometer was mounted at a height of 13 to 16 feet (see figure 16).

Appendix G - Weather data collected at the south and north Sevier Lake weather towers, including wind speed and direction data. and solar radiation.

							[---------- Wind velocity in meters, per second (assumed) for each of the 12 sectors[3] ----------]												
No.	Tower	Date	Air[1] Max.	Air[1] Min.	Air[1] Mean	Solar[2] Radiation	0-30	30-60	60-90	90-120	120-150	150-180	180-210	210-240	240-270	270-300	300-330	330-360	Total[4] All Sect.
1	South	07/27/79	30.95	17.76	24.32	19.79	1.970	0.759	0.163	0.099	0.108	0.108	0.172	0.277	1.278	0.459	1.396	1.688	8.477
2	South	07/28/79	34.08	16.8	28.09	20.77	2.379	0.505	0.325	0.280	0.271	0.513	0.275	0.258	0.162	0.067	0.997	1.844	7.876
3	South	07/29/79	37.18	18.67	28.44	17.40	0.952	0.249	0.858	0.764	0.628	1.171	1.341	0.809	0.344	0.051	0.082	0.488	7.737
4	South	07/30/79	37.33	19.24	29.32	17.56	0.666	0.484	0.207	0.223	0.929	3.537	3.016	0.934	0.203	0.038	0.444	0.737	11.418
5	South	08/18/79	25.52	3.88	20.03	13.24	0.000	0.024	0.210	0.401	0.878	2.366	2.888	2.196	0.997	0.099	0.013	0.003	10.075
6	South	08/19/79	24.53	14.15	18.93	16.37	0.000	0.000	0.091	0.480	1.375	2.795	3.899	1.805	0.309	0.001	0.000	0.002	10.757
7	South	08/20/79	25.68	4.3	19.24	13.50	0.081	0.005	0.002	0.964	2.846	2.281	2.151	1.380	0.646	0.013	0.001	0.000	10.370
8	South	08/21/79	29.55	12.72	21.74	18.83	0.101	0.037	0.040	0.104	0.780	2.301	4.401	1.208	0.013	0.024	0.027	0.254	9.290
9	South	08/22/79	31.83	13.22	23.04	19.13	0.015	0.040	0.136	0.331	0.938	2.810	4.097	0.520	0.056	0.003	0.000	0.003	8.949
10	South	08/23/79	32.87	14.51	24.86	18.97	0.000	0.002	0.037	0.240	1.916	3.431	3.227	1.661	0.037	0.000	0.000	0.000	10.551
11	South	08/24/79	33.67	17.85	25.8	17.56	0.927	0.202	0.205	0.397	0.681	0.806	1.753	2.295	0.127	0.209	0.372	1.025	8.999
12	South	08/25/79	32.28	14.88	24.23	15.27	2.158	0.458	0.184	0.314	0.421	0.634	0.308	0.729	0.324	0.175	0.112	0.516	6.333
13	South	08/26/79	35.06	16.5	25.51	17.34	1.579	0.587	0.273	0.385	0.377	0.254	0.221	0.630	0.373	0.140	0.314	0.517	5.650
14	South	08/27/79	35.49	17.06	26.78	18.43	0.290	0.144	0.143	1.010	1.377	1.750	0.665	0.947	0.475	0.040	0.112	0.336	7.289
15	South	08/28/79	33.67	19.15	27.56	18.41	0.000	0.000	0.000	0.202	1.787	4.512	6.308	1.106	0.298	0.002	0.000	0.000	14.215
16	South	08/29/79	31.77	17.8	25.13	18.12	0.000	0.000	0.000	0.037	0.343	1.534	13.140	0.020	0.000	0.000	0.000	0.000	15.074
17	South	08/30/79	30.46	16.63	24.57	17.81	0.000	0.000	0.000	0.017	0.919	5.653	13.650	0.202	0.000	0.000	0.000	0.000	20.441
18	South	08/31/79	30.58	15.26	22.87	17.88	0.765	0.208	0.098	0.081	0.088	0.435	3.722	0.413	0.056	0.116	0.574	3.546	10.102
19	South	09/01/79	31.77	0.309	23.24	18.16	0.911	0.541	0.081	0.118	0.870	2.731	3.086	0.430	0.134	0.144	0.124	0.527	9.697
20	South	09/02/79	32.35	0.498	23.84	18.16	0.000	0.000	0.000	0.000	0.360	4.993	6.563	1.053	0.020	0.000	0.000	0.000	12.989
21	South	09/03/79	32.94	15.43	24.41	17.92	0.000	0.000	0.000	0.324	2.247	3.810	4.721	1.474	0.024	0.008	0.000	0.000	12.608
22	South	09/04/79	35.7	18.56	26.38	17.82	0.146	0.209	0.356	0.061	1.972	1.743	3.365	0.981	0.111	0.022	0.027	0.062	9.055
23	South	09/05/79	35.41	13.92	25.84	17.65	0.515	0.795	0.382	0.402	1.055	1.075	2.756	0.652	0.002	0.006	0.076	0.211	7.927
24	South	09/06/79	35.27	15.22	25.29	17.56	0.717	0.298	0.154	0.390	1.726	2.286	1.949	0.311	0.071	0.026	0.038	0.161	8.127
25	South	09/07/79	35.13	16.33	26.84	17.33	0.002	0.005	0.024	0.268	1.623	3.976	4.289	1.287	0.033	0.000	0.000	0.000	11.507
26	South	09/08/79	34.64	17.9	26.7	13.40	0.000	0.012	0.108	0.308	1.065	2.164	3.979	3.166	1.389	0.024	0.000	0.000	12.215
27	South	09/09/79	31.9	19.56	25.82	6.85	0.001	0.000	0.002	0.169	2.103	1.885	2.721	3.715	0.404	0.000	0.000	0.000	11.000
28	South	09/10/79	30.7	18.47	24.51	16.14	1.615	0.014	0.018	0.249	1.377	2.340	0.558	0.051	0.091	0.033	0.431	0.532	7.309
29	South	09/11/79	29.25	14.67	22.17	16.40	2.830	0.131	0.065	0.064	0.093	0.080	0.248	0.070	0.027	0.075	0.278	7.479	11.440
30	South	09/12/79	28.67	13.96	21.25	16.62	3.295	0.079	0.020	0.089	0.097	0.037	0.007	0.000	0.027	0.023	0.603	6.955	11.232
31	South	09/13/79	28.04	7.99	19.07	15.42	3.239	0.527	0.044	0.123	0.211	0.564	0.326	0.361	0.176	0.055	0.044	2.131	7.801
32	South	09/14/79	26.92	10.78	19.99	16.26	4.240	0.122	0.081	0.139	0.110	0.067	0.058	0.037	0.018	0.075	0.549	5.143	10.639
33	South	09/15/79	27.92	7.916	19.02	16.41	2.027	0.106	0.054	0.089	0.194	0.822	0.180	0.163	0.197	0.229	0.818	3.167	8.046
35	South	09/19/79	32.02	15.01	23.89	14.34	0.062	0.213	0.276	0.676	2.217	2.035	2.370	0.937	0.173	0.029	0.000	0.000	8.988
36	South	09/20/79	29.37	17.59	24.01	14.80	1.872	1.183	0.725	0.401	0.203	0.340	0.661	0.432	0.162	0.208	0.888	1.778	8.853
37	South	09/21/79	29.97	10.49	21.48	15.13	1.438	0.482	0.182	0.758	1.379	0.966	1.217	0.144	0.111	0.145	0.054	0.550	7.426
38	South	09/22/79	31.39	?	23.93	14.78	0.001	0.005	0.052	0.782	1.536	3.098	2.057	2.753	0.689	0.021	0.000	0.001	10.995
39	South	10/18/79	22.48	16.37	18.71	7.39	0.000	0.000	0.000	0.000	0.052	4.430	20.950	0.341	0.000	0.000	0.000	0.000	25.773
40	South	10/19/79	21.8	2.823	10.07	3.50	2.828	0.268	0.182	0.113	0.239	2.610	6.366	0.358	0.013	0.028	0.401	6.434	19.840
41	South	10/20/79	9.77	2.823	5.182	9.39	1.619	0.413	0.132	0.201	0.720	0.510	0.343	0.147	0.137	0.117	0.336	1.931	6.606
42	South	10/21/79	13.51	0.097	5.656	10.83	0.869	0.076	0.010	0.019	0.152	0.404	0.666	0.336	0.253	0.255	0.462	1.088	4.590
43	South	10/22/79	15.05	1.67	8.04	8.47	0.842	0.152	0.117	0.168	0.162	0.143	0.120	0.129	0.282	0.237	0.963	1.241	4.556
44	South	10/23/79	18.3	3.054	9.1	10.66	0.816	0.112	0.062	0.030	0.375	1.035	0.501	0.286	0.166	0.118	0.659	1.688	5.848
45	South	10/24/79	24.78	9.3	15.23	11.00	0.262	0.036	0.171	0.724	1.338	2.589	4.070	0.255	0.072	0.061	0.325	0.878	10.781
46	South	10/25/79	24.78	10.05	15.8	10.19	2.022	0.145	0.000	0.000	0.152	2.859	5.776	0.992	0.200	0.020	0.577	2.284	15.027
47	South	10/26/79	17.06	0.711	9.04	10.69	3.033	0.417	0.068	0.075	0.106	0.157	0.385	0.152	0.261	0.079	0.175	2.800	7.708
48	South	10/27/79	16.03	0.251	7.281	10.53	1.517	0.251	0.119	0.142	0.267	0.383	0.576	0.541	0.294	0.165	0.153	1.948	6.356

No.	Tower	Date	Air[1] Max.	Air[1] Min.	Air[1] Mean	Solar[2] Radiation	0-30	30-60	60-90	90-120	120-150	150-180	180-210	210-240	240-270	270-300	300-330	330-360	Total[4,5] All Sect.
49	South	10/28/79	15.39	2.516	6.632	8.33	2.278	0.111	0.104	0.045	0.039	0.071	0.070	0.128	0.049	0.692	6.968	1.948	12.503
50	South	10/29/79	7.405	0.442	3.874	8.40	3.238	0.437	0.024	0.015	0.024	0.017	0.077	0.016	0.015	0.008	0.479	11.130	15.480
51	South	10/30/79	8.23	?	1.485	5.76	1.302	0.254	0.016	0.012	0.081	0.718	0.235	0.210	0.151	0.134	0.466	3.987	7.566
52	South	10/31/79	8.9	?	0.71	8.94	0.374	0.069	0.119	0.209	0.638	1.699	1.036	0.239	0.123	0.233	0.123	1.094	5.956
53	South	11/01/79	9.46	?	2.992	9.32	1.839	0.329	0.093	0.109	0.125	0.086	0.148	0.128	0.234	0.120	0.920	2.413	6.544
54	South	11/02/79	16.72	1.21	5.63	8.79	1.102	0.310	0.059	0.050	0.258	0.483	1.224	0.167	0.179	0.086	0.483	2.679	7.080
55	South	11/03/79	16.63	4.832	9.47	5.55	0.013	0.000	0.000	0.029	0.601	3.904	6.039	1.185	0.918	0.252	0.441	0.670	14.052
56	South	11/04/79	12.23	?	4.668	8.61	0.587	0.270	0.249	0.064	0.419	1.479	0.062	0.564	0.154	0.087	0.174	1.175	5.284
57	South	03/15/83	8.31		2.6	11.80	0.104	0.047	0.020	0.024	0.040	0.080	0.100	0.030	0.040	0.040	0.100	0.400	1.025
58	South	03/16/83	9.3	2.6	5.4	10.10	0.100	0.100	0.040	0.040	0.100	0.040	0.300	0.100	0.010	0.100	0.100	0.100	1.130
59	South	03/17/83	9.7		3.9	7.90	0.040	0.100	0.020	0.100	0.100	0.200	0.300	0.100	0.030	0.020	0.040	0.100	1.150
60	South	03/18/83	9.3	0.8	3.7	9.40	0.100	0.030	0.020	0.040	0.200	0.300	0.100	0.040	0.010	0.030	0.040	0.200	1.110
61	South	03/19/83	5.1			9.60	0.100	0.100	0.020	0.020	0.100	0.300	0.100	0.100	0.030	0.040	0.100	0.020	1.030
62	South	03/20/83	9.3		3.2	11.30	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	1.200
63	South	03/21/83	7.9	0.5	2.9	9.15	0.020	0.000	0.000	0.020	0.100	0.300	0.200	0.000	0.002	0.000	0.030	0.300	0.972
64	South	03/22/83	10.4	1.9	5.7	11.20	0.010	0.004	0.010	0.030	0.100	0.200	0.400	0.100	0.100	0.010	0.020	0.010	0.994
65	South	03/23/83	10		4.8	7.80	0.100	0.100	0.040	0.100	0.100	0.100	0.100	0.100	0.100	0.030	0.100	0.100	1.070
66	South	03/24/83	6.1		1.5	9.80	0.100	0.100	0.010	0.020	0.100	0.200	0.100	0.100	0.100	0.020	0.040	0.100	0.990
67	South	03/25/83	8.7		1.6	13.70	0.100	0.040	0.040	0.040	0.200	0.300	0.100	0.100	0.040	0.010	0.010	0.100	1.080
68	South	03/26/83	11.6	0.9	5.4	14.50	0.200	0.040	0.100	0.040	0.100	0.100	0.100	0.100	0.100	0.040	0.100	0.100	1.120
69	South	03/27/83	13.5	1	6.4	10.10	0.100	0.002	0.002	0.004	0.030	0.200	0.200	0.040	0.010	0.003	0.200	0.200	0.991
70	South	03/28/83	10.7		3.7	12.00	0.030	0.010	0.010	0.010	0.100	0.400	0.200	0.100	0.040	0.040	0.040	0.100	1.080
		Average					**0.8774**	**0.1862**	**0.1095**	**0.2077**	**0.6423**	**1.4246**	**2.281**	**0.6187**	**0.1996**	**0.0831**	**0.3406**	**1.2605**	**8.231**
71	North	08/08/79	?	?	?	21.48	0	0	0	0	0	0	0	0	0	0	0	0	14.17
72	North	08/09/79	?	?	?	22.37	0	0	0	0	0	0	0	0	0	0	0	0	13.01
73	North	08/10/79	?	?	?	21.56	0	0	0	0	0	0	0	0	0	0	0	0	7.654
74	North	08/11/79	?	?	?	21.62	0	0	0	0	0	0	0	0	0	0	0	0	6.995
75	North	08/12/79	?	?	?	21.55	0	0	0	0	0	0	0	0	0	0	0	0	7.676
76	North	08/13/79	?	?	?	21.75	0	0	0	0	0	0	0	0	0	0	0	0	7.707
77	North	08/14/79	?	?	?	21.59	0	0	0	0	0	0	0	0	0	0	0	0	8.38
78	North	08/15/79	?	?	?	21.50	0	0	0	0	0	0	0	0	0	0	0	0	6.41
79	North	08/16/79	?	?	?	21.15	0	0	0	0	0	0	0	0	0	0	0	0	11.26
80	North	08/17/79	?	?	?	17.84	0	0	0	0	0	0	0	0	0	0	0	0	11.81
81	North	08/18/79	?	?	?	15.39	0	0	0	0	0	0	0	0	0	0	0	0	14.04
82	North	08/19/79	?	?	?	10.62	0	0	0	0	0	0	0	0	0	0	0	0	13.73
83	North	08/20/79	?	?	?	19.02	0	0	0	0	0	0	0	0	0	0	0	0	7.95
84	North	08/21/79	?	?	?	19.22	0	0	0	0	0	0	0	0	0	0	0	0	7.145
85	North	08/22/79	?	?	?	20.05	0	0	0	0	0	0	0	0	0	0	0	0	6.78
86	North	08/23/79	?	?	?	15.76	0	0	0	0	0	0	0	0	0	0	0	0	6.942
87	North	08/24/79	?	?	?	10.85	0	0	0	0	0	0	0	0	0	0	0	0	18.05
88	North	08/25/79	?	?	?	16.54	0	0	0	0	0	0	0	0	0	0	0	0	17.62
89	North	08/26/79	?	?	?	17.90	0	0	0	0	0	0	0	0	0	0	0	0	12.68
90	North	08/27/79	?	?	?	11.20	0	0	0	0	0	0	0	0	0	0	0	0	11.69
91	North	08/28/79	?	?	?	15.35	0	0	0	0	0	0	0	0	0	0	0	0	8.11
92	North	08/29/79	?	?	?	18.08	0	0	0	0	0	0	0	0	0	0	0	0	14.38
93	North	08/30/79	?	?	?	14.56	0	0	0	0	0	0	0	0	0	0	0	0	10.09
94	North	08/31/79	?	?	?	15.24	0	0	0	0	0	0	0	0	0	0	0	0	12.34
95	North	09/01/79	?	?	?	14.59	0	0	0	0	0	0	0	0	0	0	0	0	11.36
96	North	09/02/79	?	?	?	19.21	0	0	0	0	0	0	0	0	0	0	0	0	7.89
97	North	09/03/79	?	?	?	19.59	0	0	0	0	0	0	0	0	0	0	0	0	7.918

No.	Tower	Date	Air[1] Max.	Air[1] Min.	Air[1] Mean	Solar[2] Radiation	0-30	30-60	60-90	90-120	120-150	150-180	180-210	210-240	240-270	270-300	300-330	330-360	Total[5] All Sect.
98	North	09/04/79	?	?	?	19.47	0	0	0	0	0	0	0	0	0	0	0	0	9.34
99	North	09/05/79	?	?	?	18.20	0	0	0	0	0	0	0	0	0	0	0	0	9.02
100	North	09/06/79	?	?	?	13.46	0	0	0	0	0	0	0	0	0	0	0	0	5.389
101	North	09/07/79	?	?	?	18.06	0	0	0	0	0	0	0	0	0	0	0	0	6.072
102	North	09/08/79	?	?	?	18.58	0	0	0	0	0	0	0	0	0	0	0	0	6.085
103	North	09/09/79	?	?	?	18.67	0	0	0	0	0	0	0	0	0	0	0	0	14.1
104	North	09/10/79	?	?	?	18.60	0	0	0	0	0	0	0	0	0	0	0	0	18.56
105	North	10/11/79	?	?	?	11.34	0	0	0	0	0	0	0	0	0	0	0	0	4.115
106	North	10/12/79	?	?	?	12.62	0	0	0	0	0	0	0	0	0	0	0	0	4.659
107	North	10/13/79	?	?	?	10.87	0	0	0	0	0	0	0	0	0	0	0	0	6.042
108	North	10/14/79	?	?	?	11.55	0	0	0	0	0	0	0	0	0	0	0	0	10.49
109	North	10/15/79	?	?	?	9.81	0	0	0	0	0	0	0	0	0	0	0	0	11.25
110	North	10/16/79	?	?	?	11.54	0	0	0	0	0	0	0	0	0	0	0	0	8.2
111	North	10/17/79	?	?	?	8.75	0	0	0	0	0	0	0	0	0	0	0	0	5.277
		Average																	**9.8143**

[1] Air Max, Air Min, and Air Mean are reported in degrees C.

[2] Solar radiation is given in kilojoules/meter squared/minute

[3] Velocity (0-30) in meters per second (assumed), for example, is the wind speed for wind blowing from the direction range N.0E. to N.30E.

[4] Total all sectors represents the summed wind velocities from all 12 sectors.

[5] For the North Tower, the column "Total all sectors" represents meters of wind per one second (assumed) for all sectors combined. No individual sector data were given.

APPENDIX H

Appendix H. Weather data obtained from the National Weather Service Sevier Dry Lake station, located on the south shore of Sevier Lake, and operated by Crystal Peak Minerals personnel from October 1987 through April 1993.

Daily maximum air temperature, minimum air temperature, and mean air temperature, along with total precipitation and total evapotranspiration are given. Additional parameters not included in the table, but available from the Utah Climate Center, Utah State University, can be downloaded from the following Web site: <climate.usu.edu>. These parameters include snowfall, snow depth, heating degree days, cooling degree days, growing degree days and growing degree days.

Station: SEVIER DRY LAKE
Daily maximum air temp. °F
-99999 = no data

No.	Year	Month	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1987	Oct	76	77	81	78	77	74	86	77	-99999	-99999	83	72	65	65	64
2	1987	Nov	63	57	57	59	52	53	49	51	50	52	50	50	-99999	55	-99999
3	1987	Dec	50	50	60	60	58	-99999	39	43	51	54	38	30	28	26	25
4	1988	Jan	11	14	22	29	36	40	31	28	25	49	47	28	28	47	49
5	1988	Feb	32	30	25	25	26	22	29	39	35	42	45	30	48	41	38
6	1988	Mar	56	55	50	53	60	60	44	51	64	39	39	41	43	50	39
7	1988	Apr	54	66	71	71	62	78	81	50	54	62	69	80	75	64	60
8	1988	May	49	54	66	73	72	50	61	65	75	75	79	86	86	81	90
9	1988	Jun	80	78	96	93	89	84	80	81	82	89	91	86	85	80	87
10	1988	Jul	98	101	96	94	94	99	94	102	99	99	98	96	99	100	100
11	1988	Aug	95	95	93	87	88	82	85	85	90	94	87	88	92	83	84
12	1988	Sep	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
13	1988	Oct	80	80	85	85	74	72	72	73	71	72	70	60	74	74	73
14	1988	Nov	77	76	62	62	62	72	61	52	57	55	54	69	36	34	36
15	1988	Dec	38	41	43	43	39	32	39	38	36	39	37	43	45	45	40
16	1989	Jan	38	41	30	37	44	35	30	30	37	35	35	52	24	33	31
17	1989	Feb	53	52	41	23	13	10	8	11	16	37	38	39	45	26	28
18	1989	Mar	64	65	58	32	34	64	68	73	76	78	76	75	63	49	59
19	1989	Apr	-99999	-99999	70	-99999	59	70	76	79	76	74	64	65	70	79	80
20	1989	May	79	76	74	78	80	82	91	91	84	76	62	54	59	63	67
21	1989	Jun	74	82	78	70	77	81	86	81	86	82	76	85	86	93	101
22	1989	Jul	97	95	104	90	101	102	104	100	97	97	92	94	91	97	98
23	1989	Aug	95	95	93	94	96	96	98	93	84	85	89	93	96	94	96
24	1989	Sep	90	92	85	89	94	92	81	80	85	78	77	70	73	78	84
25	1989	Oct	70	77	70	69	63	71	68	69	75	80	85	83	82	84	68
26	1989	Nov	44	44	45	50	68	54	52	58	53	57	59	57	73	68	47
27	1989	Dec	36	41	37	36	41	44	41	44	44	49	37	31	30	36	38
28	1990	Jan	48	51	43	28	30	38	42	51	65	68	50	45	62	52	46
29	1990	Feb	42	32	39	36	44	38	47	30	29	28	45	49	46	30	23
30	1990	Mar	51	52	55	63	63	45	46	53	61	62	63	40	32	34	44
31	1990	Apr	60	65	64	68	66	69	68	65	61	63	65	70	71	69	81
32	1990	May	57	61	67	68	70	70	84	69	62	66	74	72	74	71	74
33	1990	Jun	74	59	79	99	97	90	92	87	89	91	83	73	83	86	81
34	1990	Jul	103	104	98	95	95	98	97	95	80	88	90	96	101	97	95
35	1990	Aug	99	89	90	95	96	96	96	98	101	98	95	94	94	91	90
36	1990	Sep	94	-99999	-99999	93	91	86	86	-99999	-99999	96	96	99	99	95	-99999
37	1990	Oct	78	79	72	69	85	82	75	62	53	59	74	61	65	75	79
38	1990	Nov	72	53	44	44	52	48	40	41	49	62	64	60	54	59	72
39	1990	Dec	-99999	-99999	31	36	31	40	34	-99999	-99999	35	43	56	35	41	-99999
40	1991	Jan	12	27	17	20	28	34	35	28	28	28	25	38	33	37	38
41	1991	Feb	40	33	44	43	41	41	44	33	44	46	46	51	42	51	53
42	1991	Mar	57	-99999	-99999	67	62	55	39	42	-99999	-99999	62	45	47	56	52
43	1991	Apr	68	58	63	61	70	77	77	62	52	71	41	39	42	51	68
44	1991	May	57	76	55	-99999	-99999	67	73	71	84	50	-99999	-99999	68	73	60
45	1991	Jun	-99999	-99999	63	78	82	83	83	-99999	-99999	86	86	94	95	88	-99999
46	1991	Jul	80	86	90	93	95	103	101	101	91	86	91	93	97	99	99
47	1991	Aug	94	90	-99999	-99999	91	93	90	92	96	-99999	-99999	97	90	93	93
48	1991	Sep	-99999	-99999	95	93	92	86	-99999	-99999	78	84	74	75	74	-99999	-99999
49	1991	Oct	73	78	79	78	-99999	-99999	76	86	78	77	77	-99999	-99999	79	74
50	1991	Nov	38	45	41	50	48	59	60	59	61	60	60	51	54	62	34
51	1991	Dec	36	27	37	34	35	37	44	49	35	37	34	37	41	38	41
52	1992	Jan	37	29	26	31	38	44	41	40	36	27	33	34	30	32	37
53	1992	Feb	-99999	-99999	45	41	44	44	43	-99999	-99999	54	50	52	50	51	-99999
54	1992	Mar	65	60	55	46	52	59	54	51	41	49	54	55	58	65	65
55	1992	Apr	63	63	61	-99999	-99999	74	67	68	74	76	-99999	-99999	79	76	74
56	1992	May	85	70	71	77	81	81	78	80	79	68	81	85	79	83	86
57	1992	Jun	82	83	90	84	91	87	85	86	84	88	88	89	85	79	87

58	1992	Jul	82	65	78	-99999	-99999	98	98	88	88	92	-99999	-99999	92	85	91
59	1992	Aug	98	100	102	100	96	92	86	89	94	97	96	98	99	98	98
60	1992	Sep	79	83	85	82	78	82	84	75	91	84	87	87	86	87	88
61	1992	Oct	85	87	82	71	68	67	70	62	72	71	70	73	81	85	72
62	1992	Nov	-99999	57	58	46	40	47	-99999	-99999	56	44	38	40	45	-99999	-99999
63	1992	Dec	36	39	58	42	-99999	-99999	38	48	49	53	62	-99999	-99999	55	31
64	1993	Jan	32	42	35	22	34	35	26	28	35	32	42	35	19	43	46
65	1993	Feb	33	44	33	29	30	33	42	40	37	49	42	49	46	41	41
66	1993	Mar	37	42	45	46	46	43	49	47	53	54	60	49	51	56	58
67	1993	Apr	61	62	55	59	66	50	51	56	69	70	64	60	48	53	56

Daily maximum air temperature (continued)

No.	**Day 16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
1	65	65	65	62	60	61	66	-99999	-99999	67	62	64	65	60	-99999	-99999
2	50	40	39	40	46	51	46	42	42	36	39	34	36	30	29	
3	33	40	39	33	33	40	42	27	-99999	20	15	18	20	28	40	11
4	38	-99999	-99999	30	30	22	25	25	21	15	21	26	48	51	45	32
5	36	37	35	38	41	41	44	44	45	47	51	49	58	62		
6	44	49	51	71	41	70	73	55	68	69	40	60	41	43	44	48
7	60	62	58	64	64	59	54	55	63	66	63	76	74	79	78	
8	82	67	60	66	72	78	84	86	87	89	89	86	87	67	52	67
9	95	97	92	90	96	92	96	98	100	94	89	95	101	94	89	
10	101	97	95	93	96	100	102	99	97	96	94	96	96	95	97	100
11	94	90	96	99	96	83	91	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
12	-99999	-99999	-99999	82	70	64	68	70	74	82	83	80	66	71	76	
13	72	74	72	78	76	75	73	74	68	60	70	72	68	75	73	71
14	46	43	38	41	44	51	56	67	38	35	48	46	47	44	38	
15	34	22	28	39	43	44	41	36	34	35	33	41	15	18	12	39
16	31	31	32	34	30	32	49	52	28	27	25	31	32	31	52	36
17	28	32	38	56	47	46	61	62	69	61	53	51	52			
18	69	54	67	62	50	61	68	70	70	64	60	60	74	65	57	74
19	82	84	81	86	84	85	78	77	69	66	56	57	57	60	68	
20	66	75	85	64	84	85	89	85	69	66	79	86	83	77	61	68
21	80	83	97	97	89	77	78	69	78	78	83	82	90	93	94	
22	97	97	98	103	103	99	93	94	95	95	98	95	95	98	100	98
23	96	91	86	88	87	87	89	87	70	76	88	90	88	94	90	87
24	86	84	71	69	63	71	78	82	85	84	89	88	85	89	84	
25	64	62	63	69	72	65	63	71	74	62	54	63	55	43	45	49
26	44	48	47	47	49	52	58	49	53	64	55	50	37	35	35	
27	37	36	38	36	37	36	43	43	41	39	33	35	31	42	35	33
28	42	45	40	38	35	36	38	38	50	37	42	53	51	55	50	51
29	25	36	34	38	37	34	32	43	37	48	42	47	52			
30	47	50	56	64	68	68	68	65	69	60	65	73	61	47	48	56
31	84	76	61	56	70	73	72	72	61	51	59	61	70	74	52	
32	64	68	82	78	75	78	83	84	84	69	72	74	82	62	69	76
33	81	77	90	89	83	88	93	102	101	101	101	102	100	102	102	
34	95	96	96	95	90	93	95	97	99	94	91	89	95	98	97	100
35	83	81	88	89	78	81	86	85	90	87	87	85	91	92	98	96
36	-99999	96	86	74	72	76	-99999	-99999	82	79	82	80	75	-99999	-99999	
37	81	80	56	66	57	51	51	61	61	65	66	74	75	79	77	75
38	55	51	56	57	58	50	43	44	49	50	63	34	26	28	27	
39	-99999	33	32	47	37	19	-99999	-99999	15	-99999	15	19	32	-99999	-99999	10
40	37	34	29	38	33	27	29	22	24	29	27	33	35	46	27	25
41	53	53	44	42	48	52	54	60	51	45	48	49	61			
42	-99999	-99999	55	64	51	50	42	-99999	-99999	62	55	44	48	-99999	-99999	54
43	68	68	64	60	63	66	68	64	66	71	55	51	49	52	56	
44	64	74	-99999	-99999	76	78	76	61	73	-99999	-99999	-99999	83	75	81	64
45	-99999	89	92	93	88	87	-99999	-99999	88	86	82	82	71	-99999	84	
46	98	97	98	91	94	90	91	92	96	95	97	95	98	98	98	98
47	95	-99999	-99999	94	95	96	98	93	-99999	-99999	97	94	88	89	91	-99999
48	80	74	82	81	80	-99999	-99999	84	77	76	79	83	-99999	-99999	84	
49	77	87	82	-99999	-99999	-99999	74	73	67	53	-99999	-99999	39	37	40	34

50	39	43	46	45	42	43	47	32	36	37	42	50	64	33	36	
51	40	36	36	43	33	24	29	38	24	27	25	20	33	34	27	34
52	37	32	33	30	34	26	28	32	33	47	41	40	40	35	43	41
53	-99999	-99999	52	51	58	60	-99999	-99999	57	51	53	53	56	60		
54	64	63	45	51	54	60	58	53	54	57	61	61	51	59	63	59
55	69	74	77	-99999	58	65	72	73	61	-99999	-99999	86	87	83	85	
56	85	86	88	87	77	80	56	74	77	79	86	84	79	75	75	80
57	75	76	80	90	91	93	94	95	95	90	87	80	93	96	88	
58	87	92	-99999	-99999	96	98	95	92	-99999	-99999	-99999	93	96	99	98	97
59	98	98	92	97	100	99	94	85	89	78	81	78	86	94	89	78
60	82	90	88	82	82	80	80	89	91	90	74	77	78	82	82	
61	67	72	71	75	73	78	75	65	68	-99999	65	65	64	64	64	59
62	51	52	51	47	47	-99999	-99999	55	39	34	-99999	-99999	-99999	-99999	37	
63	31	30	39	-99999	-99999	34	27	22	26	-99999	-99999	-99999	45	48	49	44
64	42	-99999	-99999	41	42	47	56	51	37	36	37	35	34	41	29	31
65	29	30	36	49	55	48	44	48	51	46	36	33	33			
66	62	64	68	60	66	65	69	64	74	69	69	63	49	45	55	56
67	64	67	72	60	54	63	79	79	61	60	72	78	64	67	74	

Station: SEVIER DRY LAKE
Daily minimum air temp. °F
-99999 = no data

No.	Year	Month	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1987	Oct	36	39	41	40	37	38	42	39	-99999	-99999	38	52	48	32	33
2	1987	Nov	50	39	34	34	38	37	34	30	34	28	25	25	-99999	28	-99999
3	1987	Dec	21	28	33	39	28	-99999	19	21	21	28	22	17	8	4	9
4	1988	Jan	-16	-11	7	13	18	21	5	-5	2	8	0	-3	1	8	11
5	1988	Feb	24	16	-7	-9	-7	-4	4	5	11	12	12	12	10	11	14
6	1988	Mar	36	31	30	29	29	31	20	25	19	29	19	21	19	25	25
7	1988	Apr	25	14	32	30	29	34	28	20	23	26	32	44	49	40	42
8	1988	May	27	28	37	45	35	25	32	35	38	38	40	48	42	43	55
9	1988	Jun	48	52	60	59	52	56	55	48	42	53	46	53	32	42	52
10	1988	Jul	64	75	70	62	63	54	56	60	74	70	59	59	64	55	57
11	1988	Aug	67	59	45	60	52	47	52	54	53	50	39	39	56	30	42
12	1988	Sep	52	54	54	51	56	54	53	54	50	48	46	44	42	43	45
13	1988	Oct	42	44	49	47	51	39	41	40	42	36	36	39	50	40	38
14	1988	Nov	37	26	29	29	41	29	29	33	35	34	22	14	14	15	14
15	1988	Dec	14	15	13	14	14	20	18	12	21	20	18	16	16	21	19
16	1989	Jan	4	12	1	9	2	6	3	4	3	4	9	9	3	-2	1
17	1989	Feb	29	13	20	-24	-31	-13	-26	-10	7	8	5	2	-4	-8	-4
18	1989	Mar	33	34	23	18	20	29	51	35	46	42	41	44	27	22	30
19	1989	Apr	29	35	32	30	22	35	37	38	26	38	33	33	35	41	48
20	1989	May	42	41	36	39	42	44	46	48	56	47	40	30	30	36	45
21	1989	Jun	41	44	41	40	46	44	48	48	58	49	48	50	53	55	57
22	1989	Jul	50	53	54	55	55	57	64	76	59	59	62	56	63	58	54
23	1989	Aug	70	65	62	64	55	58	69	63	62	60	58	62	64	57	65
24	1989	Sep	57	52	47	50	52	65	53	43	44	47	52	36	35	38	41
25	1989	Oct	42	38	35	33	30	34	33	32	39	42	39	41	44	48	33
26	1989	Nov	12	12	18	24	24	32	25	20	24	26	26	27	31	31	11
27	1989	Dec	7	7	7	7	12	18	12	12	25	14	19	3	3	6	10
28	1990	Jan	10	6	3	-4	4	4	13	18	21	20	15	14	21	26	26
29	1990	Feb	21	-4	-4	6	12	16	22	-2	-1	9	17	16	20	4	-7
30	1990	Mar	30	36	43	36	39	33	29	30	32	33	34	24	15	17	21
31	1990	Apr	31	36	34	41	38	32	44	34	32	34	35	40	35	40	43
32	1990	May	40	32	40	37	41	42	51	42	30	30	44	39	51	42	44
33	1990	Jun	32	35	42	55	53	52	52	52	52	61	54	52	45	58	44
34	1990	Jul	76	75	66	64	55	65	68	68	59	55	59	63	67	68	61
35	1990	Aug	61	55	58	60	53	55	57	61	64	65	61	58	58	61	64
36	1990	Sep	57	-99999	-99999	57	57	54	57	-99999	-99999	55	56	53	52	51	-99999
37	1990	Oct	40	45	35	36	47	45	34	27	24	25	32	21	30	34	30
38	1990	Nov	35	32	30	20	20	28	22	23	27	23	18	21	21	27	40
39	1990	Dec	-99999	-99999	3	3	11	6	5	-99999	-99999	4	11	29	21	18	-99999

40	1991	Jan	-11	-10	-5	6	16	18	13	5	11	12	0	-1	11	11	14
41	1991	Feb	-5	-6	-2	-4	10	10	10	9	12	5	10	19	23	27	27
42	1991	Mar	39	-99999	-99999	21	47	22	16	15	-99999	-99999	15	18	22	28	34
43	1991	Apr	31	29	33	30	40	40	39	25	20	27	24	25	22	24	25
44	1991	May	25	30	34	-99999	-99999	29	38	40	44	31	-99999	-99999	30	44	42
45	1991	Jun	-99999	-99999	43	54	59	44	48	-99999	-99999	50	50	59	57	70	-99999
46	1991	Jul	50	50	51	56	54	63	66	64	55	64	58	63	59	63	58
47	1991	Aug	64	62	-99999	-99999	52	59	59	50	53	-99999	-99999	55	60	62	58
48	1991	Sep	-99999	-99999	51	62	60	63	-99999	-99999	47	50	43	43	47	-99999	-99999
49	1991	Oct	45	43	42	39	-99999	-99999	32	45	40	36	38	-99999	-99999	35	34
50	1991	Nov	22	24	16	19	28	32	31	31	33	38	38	28	26	30	32
51	1991	Dec	1	5	8	10	10	10	10	24	25	21	23	17	18	6	5
52	1992	Jan	20	8	18	19	21	19	22	16	10	10	9	24	11	11	20
53	1992	Feb	-99999	-99999	17	20	21	23	25	-99999	-99999	29	39	30	34	28	-99999
54	1992	Mar	28	37	40	37	35	34	35	38	32	29	29	30	29	30	32
55	1992	Apr	34	30	34	38	38	36	38	36	40	48	44	48	47	39	39
56	1992	May	49	35	35	38	42	48	47	43	48	34	32	52	48	44	45
57	1992	Jun	48	49	53	51	57	52	52	50	50	55	53	58	47	45	40
58	1992	Jul	56	41	45	-99999	-99999	52	68	59	53	57	-99999	-99999	50	52	55
59	1992	Aug	56	58	58	64	66	65	56	58	59	58	60	61	63	65	64
60	1992	Sep	46	47	52	60	42	50	44	45	45	48	47	54	51	45	45
61	1992	Oct	45	47	43	33	34	35	29	28	34	33	32	32	37	40	35
62	1992	Nov	-99999	31	34	23	24	25	-99999	-99999	26	25	16	19	20	-99999	-99999
63	1992	Dec	12	18	21	17	-99999	-99999	9	22	28	22	29	-99999	-99999	9	16
64	1993	Jan	12	31	-1	-6	-10	-2	14	20	25	28	15	0	6	17	25
65	1993	Feb	24	19	25	24	23	12	27	21	30	32	30	24	19	19	18
66	1993	Mar	16	17	22	24	25	25	29	25	26	30	32	27	27	33	28
67	1993	Apr	35	35	28	36	42	36	26	27	29	31	34	35	22	25	30

Daily Minimum Air temperature (continued)

No.	**Day 16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
1	32	32	31	27	29	33	45	-99999	-99999	33	34	45	35	37	-99999	-99999
2	25	10	15	14	21	26	23	18	27	18	14	16	18	20	19	
3	20	24	20	9	17	26	22	1	-99999	-21	-15	-12	-9	-6	-15	-18
4	11	-99999	-99999	-27	-10	-16	-10	-15	-18	-16	-9	0	8	16	11	9
5	19	21	10	15	14	11	18	18	20	22	25	31	32	32		
6	21	21	22	27	30	38	11	28	30	19	13	9	29	28	26	21
7	46	38	40	42	39	31	30	33	41	28	36	42	36	52	26	
8	54	52	42	34	34	33	44	49	47	46	53	42	62	36	34	41
9	52	53	58	56	62	56	60	63	67	65	57	67	69	56	55	
10	60	74	54	54	56	58	66	65	49	59	67	58	58	54	58	60
11	52	49	57	45	50	56	55	66	65	58	55	53	55	55	53	51
12	46	41	28	42	44	40	40	42	44	48	44	45	35	34	38	
13	37	39	35	34	36	35	32	33	34	35	34	37	42	50	44	42
14	20	32	20	21	19	30	42	43	18	25	26	19	21	15	12	
15	15	12	16	-4	15	10	10	9	4	6	-3	-6	-1	-13	-5	1
16	1	3	5	4	0	2	3	8	5	2	-10	2	3	2	18	19
17	-2	0	10	12	18	22	28	33	39	29	16	20	21			
18	29	28	29	32	18	31	36	45	50	38	28	31	35	31	22	34
19	41	46	45	51	62	61	42	43	33	39	31	35	27	35	48	
20	40	40	33	32	33	44	52	38	46	36	32	62	48	46	36	38
21	52	52	55	52	52	38	46	56	47	43	55	58	55	55	50	
22	53	58	60	62	71	64	68	58	64	64	70	65	66	71	67	74
23	61	53	54	54	52	51	66	48	43	46	48	52	49	60	47	52
24	43	52	41	42	42	42	43	44	47	51	59	47	44	54	37	
25	24	25	26	29	33	35	43	49	50	32	30	30	26	20	20	22
26	18	19	19	19	21	17	16	20	23	22	32	16	9	6	7	
27	10	8	9	4	4	12	9	10	10	9	3	5	10	14	6	6
28	24	26	24	19	12	6	6	8	14	10	23	14	7	10	19	28
29	0	6	17	18	-4	-3	4	6	9	17	12	22	21			
30	24	32	30	29	43	33	31	36	30	30	30	44	41	35	36	32
31	42	47	47	35	40	41	47	47	39	37	37	35	41	36	36	

32	36	42	45	56	38	45	51	59	52	35	41	47	44	47	49	53
33	46	45	45	53	48	50	52	62	65	62	58	58	55	57	54	
34	63	57	65	65	58	65	62	59	74	70	64	54	57	60	57	59
35	61	56	55	57	52	56	51	50	55	55	57	56	48	55	59	55
36	-99999	52	49	40	43	44	-99999	-99999	49	46	45	46	51	-99999	-99999	
37	45	28	30	37	32	23	24	29	32	32	34	32	33	32	43	49
38	29	31	25	27	34	19	16	16	19	19	15	-7	-6	-3	1	
39	-99999	11	16	22	15	-15	-99999	-99999	-28	-99999	-15	-15	-11	-99999	-99999	-19
40	19	5	16	9	3	-1	-3	-3	-3	-2	-5	0	-5	-2	-9	-8
41	29	30	26	23	23	25	21	21	18	19	19	21	25			
42	-99999	-99999	24	34	31	28	25	-99999	-99999	30	27	29	21	-99999	-99999	19
43	34	30	27	30	33	34	33	32	38	39	28	34	25	25	22	
44	38	45	-99999	-99999	30	41	53	38	47	-99999	-99999	-99999	42	43	57	43
45	-99999	45	57	62	49	45	-99999	-99999	48	51	49	52	40	-99999	45	
46	69	60	68	68	60	56	57	59	61	66	63	60	61	58	64	61
47	57	-99999	-99999	58	59	58	60	57	-99999	-99999	61	66	60	49	51	-99999
48	38	39	45	41	42	-99999	-99999	36	39	40	41	47	-99999	-99999	46	
49	36	42	47	-99999	-99999	-99999	30	43	26	27	-99999	-99999	26	29	28	19
50	27	23	26	25	24	29	25	15	19	23	23	25	26	14	16	
51	15	17	21	27	20	6	7	-2	4	3	-6	-6	7	-99999	13	22
52	14	16	13	9	6	5	6	8	9	14	14	12	14	15	16	14
53	-99999	-99999	22	26	31	28	-99999	-99999	23	26	25	25	26	28		
54	34	37	31	29	32	34	35	36	28	30	33	38	40	34	31	34
55	42	43	35	35	28	33	37	35	33	40	37	50	45	44	58	
56	44	46	49	51	57	45	41	41	50	51	55	51	45	48	47	47
57	45	44	49	49	52	52	50	57	62	63	57	52	55	63	57	
58	59	54	-99999	-99999	56	65	66	68	-99999	-99999	-99999	59	58	62	60	60
59	62	62	62	61	65	65	68	55	49	45	41	38	43	52	57	53
60	59	60	52	48	49	45	47	47	57	38	33	33	35	40	45	
61	40	33	37	33	34	35	52	36	38	47	37	39	43	48	50	39
62	20	26	26	30	26	-99999	-99999	20	23	10	-99999	-99999	-99999	-99999	6	
63	7	11	22	-99999	-99999	-6	-2	-2	-3	-99999	-99999	-99999	-5	29	35	16
64	23	29	-99999	32	27	27	32	22	20	18	18	15	15	17	18	22
65	10	20	23	27	35	23	25	26	25	22	23	21	14			
66	35	37	35	32	34	35	27	30	36	46	43	37	37	37	33	32
67	33	31	43	24	25	31	36	39	38	30	31	36	30	30	35	

Station: SEVIER DRY LAKE
Element: Daily mean air temp. °F
-99999 = no data

No.	Year	Month	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1987	Oct	56	58	61	59	57	56	64	58	-99999	-99999	61	62	57	49	49
2	1987	Nov	57	48	46	47	45	45	42	41	42	40	38	38	-99999	42	-99999
3	1987	Dec	36	39	47	50	43	-99999	29	32	36	41	30	24	18	15	17
4	1988	Jan	-3	2	15	21	27	31	18	12	14	29	24	13	15	28	30
5	1988	Feb	28	23	9	8	10	9	17	22	23	27	29	21	29	26	26
6	1988	Mar	46	43	40	41	45	46	32	38	42	34	29	31	31	38	32
7	1988	Apr	40	40	52	51	46	56	55	35	39	44	51	62	62	52	51
8	1988	May	38	41	52	59	54	38	47	50	57	57	60	67	64	62	73
9	1988	Jun	64	65	78	76	71	70	68	65	62	71	69	70	59	61	70
10	1988	Jul	81	88	83	78	79	77	75	81	87	85	79	78	82	78	79
11	1988	Aug	81	77	69	74	70	65	69	70	72	72	63	64	74	57	63
12	1988	Sep	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
13	1988	Oct	61	62	67	66	63	56	57	57	57	54	53	50	62	57	56
14	1988	Nov	57	51	46	46	52	51	45	43	46	45	38	42	25	25	25
15	1988	Dec	26	28	28	29	27	26	29	25	29	30	28	30	31	33	30
16	1989	Jan	21	27	16	23	23	21	17	17	20	20	22	31	14	16	16
17	1989	Feb	41	33	31	-1	-9	-2	-9	1	12	23	22	21	21	9	12
18	1989	Mar	49	50	41	25	27	47	60	54	61	60	59	60	45	36	45
19	1989	Apr	-99999	-99999	51	-99999	41	53	57	59	51	56	49	49	53	60	64
20	1989	May	61	59	55	59	61	63	69	70	70	62	51	42	45	50	56
21	1989	Jun	58	63	60	55	62	63	67	65	72	66	62	68	70	74	79

22	1989	Jul	74	74	79	73	78	80	84	88	78	78	77	75	77	78	76
23	1989	Aug	83	80	78	79	76	77	84	78	73	73	74	78	80	76	81
24	1989	Sep	74	72	66	70	73	79	67	62	65	63	65	53	54	58	63
25	1989	Oct	56	58	53	51	47	53	51	51	57	61	62	62	63	66	51
26	1989	Nov	28	28	32	37	46	43	39	39	39	42	43	42	52	50	29
27	1989	Dec	22	24	22	22	27	31	27	28	35	32	28	17	17	21	24
28	1990	Jan	29	29	23	12	17	21	28	35	43	44	33	30	42	39	36
29	1990	Feb	32	14	18	21	28	27	35	14	14	19	31	33	33	17	8
30	1990	Mar	41	44	49	50	51	39	38	42	47	48	49	32	24	26	33
31	1990	Apr	46	51	49	55	52	51	56	50	47	49	50	55	53	55	62
32	1990	May	49	47	54	53	56	56	68	56	46	48	59	56	63	57	59
33	1990	Jun	53	47	61	77	75	71	72	70	71	76	69	63	64	72	63
34	1990	Jul	90	90	82	80	75	82	83	82	70	72	75	80	84	83	78
35	1990	Aug	80	72	74	78	75	76	77	80	83	82	78	76	76	76	77
36	1990	Sep	76	-99999	-99999	75	74	70	72	-99999	-99999	76	76	76	76	73	-99999
37	1990	Oct	59	62	54	53	66	64	55	45	39	42	53	41	48	55	55
38	1990	Nov	54	43	37	32	36	38	31	32	38	43	41	41	38	43	56
39	1990	Dec	-99999	-99999	17	20	21	23	20	-99999	-99999	20	27	43	28	30	-99999
40	1991	Jan	1	9	6	13	22	26	24	17	20	20	13	19	22	24	26
41	1991	Feb	18	14	21	20	26	26	27	21	28	26	28	35	33	39	40
42	1991	Mar	48	-99999	-99999	44	55	39	28	29	-99999	-99999	39	32	35	42	43
43	1991	Apr	50	44	48	46	55	59	58	44	36	49	33	32	32	38	47
44	1991	May	41	53	45	-99999	-99999	48	56	56	64	41	-99999	-99999	49	59	51
45	1991	Jun	-99999	-99999	53	66	71	64	66	-99999	-99999	68	68	77	76	79	-99999
46	1991	Jul	65	68	71	75	75	83	84	83	73	75	75	78	78	81	79
47	1991	Aug	79	76	-99999	-99999	72	76	75	71	75	-99999	-99999	76	75	78	76
48	1991	Sep	-99999	-99999	73	78	76	75	-99999	-99999	63	67	59	59	61	-99999	-99999
49	1991	Oct	59	61	61	59	-99999	-99999	54	66	59	57	58	-99999	-99999	57	54
50	1991	Nov	30	35	29	35	38	46	46	45	47	49	49	40	40	46	33
51	1991	Dec	19	16	23	22	23	24	27	37	30	29	29	27	30	22	23
52	1992	Jan	29	19	22	25	30	32	32	28	23	19	21	29	21	22	29
53	1992	Feb	-99999	-99999	31	31	33	34	34	-99999	-99999	42	45	41	42	40	-99999
54	1992	Mar	47	49	48	42	44	47	45	45	37	39	42	43	44	48	49
55	1992	Apr	49	47	48	-99999	-99999	55	53	52	57	62	-99999	-99999	63	58	57
56	1992	May	67	53	53	58	62	65	63	62	64	51	57	69	64	64	66
57	1992	Jun	65	66	72	68	74	70	69	68	67	72	71	74	66	62	64
58	1992	Jul	69	53	62	-99999	-99999	75	83	74	71	75	-99999	-99999	71	69	73
59	1992	Aug	77	79	80	82	81	79	71	74	77	78	78	80	81	82	81
60	1992	Sep	63	65	69	71	60	66	64	60	68	66	67	71	69	66	67
61	1992	Oct	65	67	63	52	51	51	50	45	53	52	51	53	59	63	54
62	1992	Nov	-99999	44	46	35	32	36	-99999	-99999	41	35	27	30	33	-99999	-99999
63	1992	Dec	24	29	40	30	-99999	-99999	24	35	39	38	46	-99999	-99999	32	24
64	1993	Jan	22	37	17	8	12	17	20	24	30	30	29	18	13	30	36
65	1993	Feb	29	32	29	27	27	23	35	31	34	41	36	37	33	30	30
66	1993	Mar	27	30	34	35	36	34	39	36	40	42	46	38	39	45	43
67	1993	Apr	48	49	42	48	54	43	39	42	49	51	49	48	35	39	43

Daily Mean Air Temperature (Continued)

No.	**Day 16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**
1	49	49	48	45	45	47	56	-99999	-99999	50	48	55	50	49	-99999	-99999
2	38	25	27	27	34	39	35	30	35	27	27	25	27	25	24	
3	27	32	30	21	25	33	32	14	-99999	-1	0	3	6	11	13	-4
4	25	-99999	-99999	2	10	3	8	5	2	-1	6	13	28	34	28	21
5	28	29	23	27	28	26	31	31	33	35	38	40	45	47		
6	33	35	37	49	36	54	42	42	49	44	27	35	35	36	35	35
7	53	50	49	53	52	45	42	44	52	47	50	59	55	66	52	
8	68	60	51	50	53	56	64	68	67	68	71	64	75	52	43	54
9	74	75	75	73	79	74	78	81	84	80	73	81	85	75	72	
10	81	86	75	74	76	79	84	82	73	78	81	77	77	75	78	80
11	73	70	77	72	73	70	73	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
12	-99999	-99999	-99999	62	57	52	54	56	59	65	64	63	51	53	57	
13	55	57	54	56	56	55	53	54	51	48	52	55	55	63	59	57

14	33	38	29	31	32	41	49	55	28	30	37	33	34	30	25	
15	25	17	22	18	29	27	26	23	19	21	15	18	7	3	4	20
16	16	17	19	19	15	17	26	30	17	15	8	17	18	17	35	28
17	13	16	24	34	33	34	45	48	54	45	35	36	37			
18	49	41	48	47	34	46	52	58	60	51	44	46	55	48	40	54
19	62	65	63	69	73	73	60	60	51	53	44	46	42	48	58	
20	53	58	59	48	59	65	71	62	58	51	56	74	66	62	49	53
21	66	68	76	75	71	58	62	63	63	61	69	70	73	74	72	
22	75	78	79	83	87	82	81	76	80	80	84	80	81	85	84	86
23	79	72	70	71	70	69	78	68	57	61	68	71	69	77	69	70
24	65	68	56	56	53	57	61	63	66	68	74	68	65	72	61	
25	44	44	45	49	53	50	53	60	62	47	42	47	41	32	33	36
26	31	34	33	33	35	35	37	35	38	43	44	33	23	21	21	
27	24	22	24	20	21	24	26	27	26	24	18	20	21	28	21	20
28	33	36	32	29	24	21	22	23	32	24	33	34	29	33	35	40
29	13	21	26	28	17	16	18	25	23	33	27	35	37			
30	36	41	43	47	56	51	50	51	50	45	48	59	51	41	42	44
31	63	62	54	46	55	57	60	60	50	44	48	48	56	55	44	
32	50	55	64	67	57	62	67	72	68	52	57	61	63	55	59	65
33	64	61	68	71	66	69	73	82	83	82	80	80	78	80	78	
34	79	77	81	80	74	79	79	78	87	82	78	72	76	79	77	80
35	72	69	72	73	65	69	69	68	73	71	72	71	70	74	79	76
36	-99999	74	68	57	58	60	-99999	-99999	66	63	64	63	63	-99999	-99999	
37	63	54	43	52	45	37	38	45	47	49	50	53	54	56	60	62
38	42	41	41	42	46	35	30	30	34	35	39	14	10	13	14	
39	-99999	22	24	35	26	2	-99999	-99999	-7	-99999	0	2	11	-99999	-99999	-5
40	28	20	23	24	18	13	13	10	11	14	11	17	15	22	9	9
41	41	42	35	33	36	39	38	41	35	32	34	35	43			
42	-99999	-99999	40	49	41	39	34	-99999	-99999	46	41	37	35	-99999	-99999	37
43	51	49	46	45	48	50	51	48	52	55	42	43	37	39	39	
44	51	60	-99999	-99999	53	60	65	50	60	-99999	-99999	-99999	63	59	69	54
45	-99999	67	75	78	69	66	-99999	-99999	68	69	66	67	56	-99999	65	
46	84	79	83	80	77	73	74	76	79	81	80	78	80	78	81	80
47	76	-99999	-99999	76	77	77	79	75	-99999	-99999	79	80	74	69	71	-99999
48	59	57	64	61	61	-99999	-99999	60	58	58	60	65	-99999	-99999	65	
49	57	65	65	-99999	-99999	-99999	52	58	47	40	-99999	-99999	33	33	34	27
50	33	33	36	35	33	36	36	24	28	30	33	38	45	24	26	
51	28	27	29	35	27	15	18	18	14	15	10	7	20	-99999	20	28
52	26	24	23	20	20	16	17	20	21	31	28	26	27	25	30	28
53	-99999	-99999	37	39	45	44	-99999	-99999	40	39	39	39	41	44		
54	49	50	38	40	43	47	47	45	41	44	47	50	46	47	47	47
55	56	59	56	-99999	43	49	55	54	47	-99999	-99999	68	66	64	72	
56	65	66	69	69	67	63	49	58	64	65	71	68	62	62	61	64
57	60	60	65	70	72	73	72	76	79	77	72	66	74	80	73	
58	73	73	-99999	-99999	76	82	81	80	-99999	-99999	-99999	76	77	81	79	79
59	80	80	77	79	83	82	81	70	69	62	61	58	65	73	73	66
60	71	75	70	65	66	63	64	68	74	64	54	55	57	61	64	
61	54	53	54	54	54	57	64	51	53	-99999	51	52	54	56	57	49
62	36	39	39	39	37	-99999	-99999	38	31	22	-99999	-99999	-99999	-99999	22	
63	19	21	31	-99999	-99999	14	13	10	12	-99999	-99999	-99999	20	39	42	30
64	33	-99999	-99999	37	35	37	44	37	29	27	28	25	25	29	24	27
65	20	25	30	38	45	36	35	37	38	34	30	27	24			
66	49	51	52	46	50	50	48	47	55	58	56	50	43	41	44	44
67	49	49	58	42	40	47	58	59	50	45	52	57	47	49	55	

Station: SEVIER DRY LAKE
Daily total precipitation (in)
-99999 = no data

No.	Year	Month	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1987	Oct	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0	0
2	1987	Nov	0	0.15	0	0	0.53	0.04	0	0	0	0	0	0	-99999	0.28	0
3	1987	Dec	0	0	0	0	0	0	0	0	0.09	0	0	0	0	0	0

4	1988	Jan	0	0	0.05	0.13	0.15	0	0	0	0	0	0	0	0	0
5	1988	Feb	0.03	0.01	0	0	0	0	0	0	0	0	0	0	0	0
6	1988	Mar	0.2	0	0.01	0	0	0	0	0	0	0	0	0.02	0	0	0.26
7	1988	Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17
8	1988	May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1988	Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1988	Jul	0	0	0.26	0	0	0	0	0	0	0	0	0	0	0	0
11	1988	Aug	0	1.47	0.07	0	0	0.29	0	0	0	0	0	0	0	0	0
12	1988	Sep	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
13	1988	Oct	0	0	0	0	0	0	0	0	0	0	0.27	0.28	0	0	0
14	1988	Nov	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0
15	1988	Dec	0	0	0	0	0	0.34	0	0	0	0	0	0	0	0.21	0
16	1989	Jan	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0	0
17	1989	Feb	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0
18	1989	Mar	0	0	0.15	0	0	0	0	0	0	0	0	0	0	0	0
19	1989	Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	1989	May	0	0	0	0	0	0	0	0	0	0	0.05	0	-99999	0.05	0.1
21	1989	Jun	0	0	0	0.14	0	0	0	0	0.45	0.45	0	0	0	0	0
22	1989	Jul	0	0	0	0	0	0	0	0.05	0	0	0	0	0	0	0
23	1989	Aug	0	0	0	0	0	0	0	0.51	0.02	0	0	0	0	0.04	0
24	1989	Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	1989	Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1989	Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	1989	Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	1990	Jan	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0	0
29	1990	Feb	0.18	0.11	0	0	0	0	0	0.1	0	0	0	0	0	0.08	0
30	1990	Mar	0	0	0	0	0	0.36	0	0	0	0	0	0.38	0.03	0	0
31	1990	Apr	0	0	0	0	0	0	0	0.23	0	0	0	0	0	0	0
32	1990	May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02
33	1990	Jun	0.25	0.21	0	0	0	0	0	0	0	0	0.15	0.1	0	0	0
34	1990	Jul	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0
35	1990	Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
36	1990	Sep	0	0	0	0.35	0	0	0	0	0	0	0	0	0	0	0
37	1990	Oct	0.02	0	0	0	0	-99999	-99999	0.1	0	0	0	0	0	0	0
38	1990	Nov	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
39	1990	Dec	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0
40	1991	Jan	0	0	0	0.31	0	0	0	0	0	0	0	0	0	0	0
41	1991	Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	1991	Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	1991	Apr	0	0.07	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0
44	1991	May	0	0	0	-99999	-99999	0.11	0	0	0	0.02	-99999	-99999	0.95	0.05	0.03
45	1991	Jun	-99999	-99999	0.4	0.02	0	0	0	0	0	0	0	0	0	0	0
46	1991	Jul	0	0	0	0	0	-99999	-99999	0.15	0.18	0	0.2	0	0	0	0
47	1991	Aug	0.08	0	-99999	-99999	0.22	0	0.02	0	0	0	0	0	0	0	0
48	1991	Sep	-99999	-99999	0.02	0	0	0	-99999	-99999	0.22	0	0.08	0	0.12	0	0
49	1991	Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	1991	Nov	0	0	0	0	0	0	0	0	-99999	-99999	0.21	0	0	0.13	0.34
51	1991	Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	1992	Jan	0	0	0	-99999	-99999	0.11	0.07	0	0	0	0	0	0	0	0
53	1992	Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0
54	1992	Mar	0	0	0.23	0.22	0	0	0.14	0.31	1.02	0	0	0	0	0	0
55	1992	Apr	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	1992	May	0	0	0	0	0	0	0	0	-99999	-99999	0.16	0	0	0	0
57	1992	Jun	0	0	0.1	0	0.02	0	0	0	0	0	0	0	0	0	0
58	1992	Jul	0	0.08	0	0	0	0	0	0	0	0	-99999	-99999	0.17	0	0
59	1992	Aug	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0
60	1992	Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	1992	Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	1992	Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	1992	Dec	0	0	0	0	-99999	-99999	0.03	0	0	0	0	-99999	-99999	0.09	0
64	1993	Jan	-99999	-99999	-99999	0.05	0	0	0.12	0.2	-99999	-99999	0.29	0	0.02	0	0
65	1993	Feb	0.17	0	0	0	0	-99999	-99999	0.05	0.07	0.13	0	0.03	0	0	0
66	1993	Mar	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0

67	1993	Apr	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0

Daily total precipitation (continued)

No.	Day 16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	0	0	0	0	0	0	0.15	-99999	-99999	0.05	0	0.17	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	
3	0	0	0	0.05	0	0	0.02	0.09	0	0	0	0	0	0	0.11	0
4	0	-99999	-99999	0.46	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0.12	0	0	0		
6	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0
7	0.13	0.23	0.26	0	0	0.16	0.04	0	0	0	0	0	0	0	0.03	
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0.62	0.01	0
9	0	0	0	0.05	0	0.2	0.1	0	0	0.08	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	
15	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0			
18	0	0	0	0	0	0	0	0	0	-99999	0.08	0	0	0	0	0.35
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
20	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0.27	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0.62	0	0	0	0	0	0	0	0	0	0	0	
25	0	0	0	0	0	0	-99999	0.02	0	0.65	0	0.05	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05
29	0	0	-99999	0.38	0	0	0	0	0	0	0	0	0			
30	0	0	0	0	0	0	0	0	0	0	0	0	0.35	0.35	0	0
31	0	0	0	0.01	0	0.01	0	0	0.69	0.29	0	0	0	0.03	0	
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0.01	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
34	0	0	0.06	0.7	0	0	0	0	0	0	0	0	0	0	0	0
35	0.12	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0.01	0	0	0	0	0.22	0	0	0	0	0	0	
37	0	0	0	0.61	-99999	-99999	0.1	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	
39	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0.01	0	0	0	0	0	0	0	0	0	0			
42	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.88
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	-99999	-99999	0.08	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	-99999	-99999	0.85	
49	0	0	0	0	0	0	0	0	0.12	0	-99999	-99999	0.92	0	0	0
50	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	
51	0	0	0	0.05	0.25	0	0	0	0	0	0	0	-99999	-99999	0.02	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	-99999	-99999	0.05	0	0	0	0	0		
54	0	0	0.11	0	0	0	0	0	0	0	0.02	0	-99999	-99999	0.22	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
56	0	0	0	0	0	0	0.54	0	0	0	0	0.22	0	0	0	0
57	0.01	0	0	0	0	0	0	0	0	0.02	0	0.07	0	0	0	
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

59	0	0	0	0	0	0.05	0	0	0	0	0	0	0	0	-99999	0.01
60	0.02	0	0	-99999	-99999	0.16	0	0	0.06	0	0	0	0	0	0	
61	0	0	0	0	0	0	0.11	0	-99999	-99999	0.38	0	0	0	0	0.91
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
63	0	0	0.06	0	0	0	0	0	0	0	0	0	0.09	0	0.05	0
64	0.25	-99999	-99999	0.1	0	0	0	0	0	0	0	0	0	0	0.02	0.1
65	0.12	0.01	0	0	0.18	0	0	0	0.03	0	0	0.15	0			
66	0	0	0.1	0.05	0	0	0	0	0	0	0	-99999	-99999	0.88	0.05	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Station: SEVIER DRY LAKE
Daily total evapotranspiration (mm)
-99999 = no data

No.	Year	Month	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1987	Oct	3.626	3.63	3.887	3.626	3.556	3.281	4.123	3.428	-99999	-99999	3.784	2.561	2.125	2.505	2.404
2	1987	Nov	1.531	1.508	1.598	1.687	1.209	1.28	1.129	1.291	1.158	1.337	1.266	1.254	-99999	1.419	-99999
3	1987	Dec	1.106	1.054	1.39	1.3	1.339	-99999	0.726	0.838	1.1	1.165	0.663	0.466	0.44	0.384	0.37
4	1988	Jan	0	0.042	0.313	0.472	0.648	0.757	0.523	0.377	0.372	1.062	0.941	0.407	0.444	1.025	1.113
5	1988	Feb	0.552	0.604	0.359	0.333	0.393	0.334	0.607	0.956	0.849	1.128	1.262	0.692	1.407	1.131	1.022
6	1988	Mar	1.944	2.007	1.719	1.95	2.433	2.431	1.56	1.952	2.836	1.101	1.338	1.444	1.597	1.995	1.282
7	1988	Apr	2.62	3.58	4.043	4.091	3.321	4.776	5.132	2.471	2.785	3.462	4.066	4.983	4.26	3.435	2.933
8	1988	May	2.594	3.06	4.097	4.648	4.849	2.781	3.745	4.117	5.201	5.218	5.669	6.345	6.531	5.891	6.666
9	1988	Jun	5.802	5.321	7.575	7.173	6.929	5.989	5.455	5.984	6.33	6.914	7.453	6.482	6.878	6.083	6.684
10	1988	Jul	7.683	7.32	6.878	7.144	7.07	8.281	7.444	8.467	6.986	7.331	7.859	7.54	7.714	8.284	8.191
11	1988	Aug	6.518	6.986	7.172	5.723	6.258	5.647	5.813	5.696	6.382	6.98	6.322	6.411	6.41	5.857	5.806
12	1988	Sep	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
13	1988	Oct	3.824	3.75	4.025	4.033	2.937	3.083	3.014	3.08	2.859	3.01	2.842	2.061	2.75	2.972	2.904
14	1988	Nov	2.683	2.649	1.895	1.877	1.683	2.338	1.775	1.278	1.477	1.382	1.438	2.044	0.766	0.691	0.752
15	1988	Dec	0.729	0.814	0.87	0.867	0.744	0.504	0.728	0.707	0.611	0.71	0.66	0.843	0.901	0.887	0.739
16	1989	Jan	0.68	0.797	0.466	0.684	0.842	0.626	0.488	0.496	0.672	0.629	0.655	1.18	0.365	0.545	0.524
17	1989	Feb	1.408	1.431	0.994	0	0	0	0	0.018	0.259	0.922	0.949	0.968	1.125	0.414	0.542
18	1989	Mar	2.53	2.609	2.28	0.892	0.974	2.704	2.451	3.348	3.405	3.702	3.589	3.47	2.833	1.944	2.559
19	1989	Apr	-99999	-99999	3.923	-99999	3.101	3.96	4.538	4.855	4.686	4.405	3.549	3.666	4.14	4.979	4.913
20	1989	May	5.396	5.091	4.998	5.417	5.604	5.815	6.926	6.897	5.626	5.025	3.622	3.111	3.639	3.927	4.036
21	1989	Jun	5.268	6.22	5.794	4.817	5.5	6.117	6.668	5.979	6.178	6.085	5.3	6.473	6.482	7.428	8.558
22	1989	Jul	8.172	7.773	9.069	6.932	8.565	8.631	8.607	6.99	7.743	7.732	6.767	7.398	6.515	7.727	8.027
23	1989	Aug	6.299	6.66	6.527	6.526	7.251	7.098	6.722	6.342	5.049	5.322	5.986	6.298	6.584	6.636	6.463
24	1989	Sep	5.523	5.914	5.233	5.556	6.027	5.176	4.44	4.639	5.093	4.256	3.92	3.706	3.964	4.344	4.827
25	1989	Oct	3.034	3.645	3.115	3.038	2.621	3.113	2.882	2.934	3.246	3.541	3.923	3.712	3.554	3.593	2.662
26	1989	Nov	1.173	1.162	1.19	1.362	2.191	1.432	1.404	1.671	1.427	1.578	1.652	1.542	2.25	1.99	1.128
27	1989	Dec	0.665	0.8	0.685	0.655	0.805	0.89	0.798	0.883	0.838	1.034	0.656	0.493	0.469	0.628	0.694
28	1990	Jan	0.996	1.069	0.814	0.38	0.488	0.695	0.847	1.143	1.662	1.788	1.128	0.968	1.587	1.194	0.972
29	1990	Feb	1.007	0.588	0.812	0.823	1.148	0.927	1.28	0.588	0.576	0.613	1.266	1.457	1.327	0.686	0.35
30	1990	Mar	1.732	1.661	1.622	2.483	2.438	1.323	1.528	1.989	2.533	2.613	2.695	1.322	1.006	1.102	1.655
31	1990	Apr	3.006	3.369	3.346	3.565	3.484	3.912	3.528	3.555	3.246	3.411	3.602	3.997	4.24	3.94	5.181
32	1990	May	2.914	3.661	4.095	4.32	4.441	4.421	5.841	4.332	3.904	4.339	4.913	4.854	4.594	4.663	4.973
33	1990	Jun	5.465	3.657	5.894	8.262	8.048	7.073	7.371	6.653	6.948	6.769	5.979	4.631	6.387	6.197	6.155
34	1990	Jul	7.607	7.876	7.542	7.18	7.667	7.585	7.192	6.843	5.106	6.582	6.647	7.325	7.861	7.112	7.249
35	1990	Aug	7.521	6.354	6.32	6.91	7.324	7.224	7.115	7.185	7.438	6.906	6.668	6.65	6.62	6.016	5.651
36	1990	Sep	6.014	-99999	-99999	5.777	5.5	5.002	4.834	-99999	-99999	5.953	5.877	6.256	6.233	5.779	-99999
37	1990	Oct	3.729	3.678	3.266	2.997	4.033	3.787	3.373	2.507	1.949	2.284	3.19	2.37	2.551	3.148	3.406
38	1990	Nov	2.442	1.439	1.01	1.129	1.455	1.204	0.919	0.94	1.227	1.813	1.881	1.694	1.428	1.602	2.082
39	1990	Dec	-99999	-99999	0.51	0.633	0.528	0.752	0.586	-99999	-99999	0.599	0.843	1.225	0.575	0.776	-99999
40	1991	Jan	0.014	0.287	0.157	0.272	0.43	0.591	0.643	0.453	0.463	0.464	0.364	0.678	0.61	0.73	0.765
41	1991	Feb	0.814	0.59	1.009	0.956	1.028	1.039	1.164	0.766	1.196	1.244	1.295	1.547	1.117	1.527	1.648
42	1991	Mar	1.907	-99999	-99999	2.873	2.063	2.165	1.297	1.471	-99999	-99999	2.71	1.69	1.8	2.349	1.947
43	1991	Apr	3.701	2.892	3.276	3.175	3.82	4.551	4.602	3.403	2.626	4.246	1.747	1.57	1.888	2.593	4.1
44	1991	May	3.367	5.272	2.99	-99999	-99999	4.396	4.915	4.642	6.129	2.65	-99999	-99999	4.597	4.833	3.316

45	1991	Jun	-99999	-99999	3.782	5.2	5.457	6.384	6.251	-99999	-99999	6.607	6.611	7.371	7.633	5.472	-99999
46	1991	Jul	5.748	6.592	7.115	7.332	7.709	8.511	8.001	8.113	7.035	5.648	6.858	6.847	7.693	7.774	8.014
47	1991	Aug	6.596	6.099	-99999	-99999	6.683	6.624	6.171	6.806	7.21	-99999	-99999	7.183	5.961	6.241	6.424
48	1991	Sep	-99999	-99999	6.251	5.547	5.485	4.524	-99999	-99999	4.287	4.789	3.946	4.015	3.756	-99999	-99999
49	1991	Oct	3.201	3.639	3.707	3.641	-99999	-99999	3.461	4.037	3.455	3.399	3.342	-99999	-99999	3.415	3.049
50	1991	Nov	0.89	1.163	1.035	1.385	1.216	1.681	1.725	1.66	1.719	1.575	1.561	1.268	1.405	1.717	0.303
51	1991	Dec	0.628	0.428	0.689	0.61	0.633	0.685	0.881	1.022	0.528	0.643	0.522	0.664	0.778	0.68	0.753
52	1992	Jan	0.654	0.472	0.348	0.487	0.689	0.898	0.787	0.789	0.677	0.442	0.6	0.541	0.528	0.587	0.707
53	1992	Feb	-99999	-99999	1.167	1.004	1.132	1.127	1.07	-99999	-99999	1.593	1.147	1.507	1.331	1.515	-99999
54	1992	Mar	2.673	2.223	1.774	1.209	1.76	2.308	1.942	1.621	1.113	1.791	2.153	2.226	2.478	3.006	3.008
55	1992	Apr	3.232	3.326	3.096	-99999	-99999	4.357	3.653	3.824	4.36	4.342	-99999	-99999	4.805	4.73	4.544
56	1992	May	5.939	4.573	4.701	5.342	5.747	5.573	5.247	5.657	5.37	4.502	6.024	6.05	5.438	6.117	6.495
57	1992	Jun	6.077	6.182	7.015	6.248	6.985	6.646	6.363	6.602	6.323	6.668	6.772	6.658	6.597	5.852	7.054
58	1992	Jul	5.687	4.158	5.677	-99999	-99999	8.202	7.351	6.359	6.68	7.063	-99999	-99999	7.321	6.241	6.949
59	1992	Aug	7.572	7.75	8.008	7.405	6.649	6.081	5.752	6.036	6.659	7.094	6.832	7.034	7.043	6.755	6.781
60	1992	Sep	4.64	5.014	5.035	4.238	4.524	4.674	5.026	4.043	5.657	4.817	5.119	4.864	4.825	5.047	5.107
61	1992	Oct	4.189	4.283	3.899	3.154	2.897	2.783	3.026	2.475	3.064	2.975	2.888	3.059	3.538	3.759	2.875
62	1992	Nov	-99999	1.642	1.635	1.181	0.904	1.183	-99999	-99999	1.533	1.014	0.843	0.893	1.065	-99999	-99999
63	1992	Dec	0.672	0.745	1.37	0.833	-99999	-99999	0.704	0.995	0.982	1.158	1.452	-99999	-99999	1.19	0.496
64	1993	Jan	0.546	0.679	0.57	0.237	0.448	0.568	0.395	0.39	0.549	0.349	0.867	0.607	0.266	0.914	0.982
65	1993	Feb	0.596	1.11	0.583	0.425	0.508	0.753	0.992	0.995	0.671	1.282	0.965	1.427	1.332	1.12	1.137
66	1993	Mar	1.125	1.382	1.524	1.573	1.575	1.409	1.725	1.683	2.069	2.096	2.508	1.846	1.998	2.259	2.513
67	1993	Apr	3.006	3.119	2.678	2.858	3.353	2.041	2.453	2.871	4.023	4.123	3.528	3.139	2.358	2.748	2.943

Daily total evapotranspiration (continued)

No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	2.455	2.43	2.416	2.246	2.092	2.081	2.116	-99999	-99999	2.345	2.02	1.876	2.136	1.795	-99999	-99999
2	1.21	0.871	0.835	0.862	1.044	1.193	1.015	0.893	0.808	0.685	0.787	0.625	0.672	0.46	0.439	
3	0.522	0.7	0.702	0.559	0.544	0.674	0.782	0.387	-99999	0	0.001	0.09	0.162	0.351	0.51	0
4	0.77	-99999	-99999	0.071	0.393	0.116	0.28	0.202	0.061	0	0.215	0.438	1.188	1.345	1.116	0.676
5	0.92	0.952	0.93	1.063	1.209	1.216	1.367	1.381	1.436	1.541	1.752	1.551	2.124	2.41		
6	1.684	2.021	2.165	3.634	1.319	3.482	3.778	2.483	3.519	3.644	1.612	2.917	1.447	1.654	1.799	2.187
7	2.706	3.356	2.862	3.448	3.587	3.323	2.882	2.907	3.467	4.127	3.685	4.976	4.915	4.983	5.474	
8	5.595	3.577	3.352	4.39	5.091	5.823	6.373	6.49	6.71	7.025	6.786	6.75	5.966	4.545	2.884	4.383
9	7.853	8.114	7.133	6.935	7.529	7.236	7.642	7.785	7.85	6.989	6.714	6.994	7.858	7.51	6.803	
10	8.193	6.521	7.525	7.22	7.553	8.038	7.913	7.479	7.852	7.316	6.483	7.321	7.298	7.302	7.396	7.716
11	6.731	6.289	6.742	7.411	6.903	4.999	6.041	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999	-99999
12	-99999	-99999	-99999	4.435	3.252	2.819	3.138	3.23	3.497	4.079	4.227	3.904	2.924	3.294	3.599	
13	2.821	2.898	2.789	3.155	2.977	2.893	2.764	2.789	2.393	1.888	2.461	2.521	2.171	2.404	2.394	2.286
14	1.074	0.789	0.771	0.863	0.973	1.142	1.125	1.646	0.749	0.564	1.029	0.993	1.014	0.921	0.733	
15	0.582	0.292	0.414	0.622	0.837	0.858	0.774	0.637	0.567	0.603	0.491	0.657	0.153	0.077	0.08	0.684
16	0.528	0.546	0.589	0.643	0.511	0.584	1.12	1.277	0.509	0.47	0.29	0.587	0.629	0.599	1.4	0.782
17	0.574	0.739	1.051	1.894	1.484	1.428	2.226	2.254	2.642	2.286	1.894	1.803	1.873			
18	3.347	2.269	3.25	2.851	2.134	2.836	3.35	3.31	3.119	3.033	2.916	2.895	4.071	3.362	2.816	4.177
19	5.367	5.502	5.214	5.636	4.799	5.038	5.063	4.945	4.326	3.879	3.093	3.086	3.298	3.43	3.783	
20	4.158	5.26	6.601	4.2	6.513	6.475	6.76	6.629	4.336	4.387	6.001	5.784	6.166	5.447	3.838	4.612
21	5.667	6.104	8.037	8.149	6.978	5.803	5.68	3.65	5.635	5.787	5.927	5.567	6.968	7.412	7.746	
22	7.901	7.681	7.718	8.369	7.797	7.599	6.324	7.129	6.915	6.896	6.922	6.789	6.699	6.778	7.378	6.468
23	6.658	6.311	5.597	5.826	5.752	5.76	5.167	5.797	3.992	4.529	5.818	5.895	5.721	5.995	5.935	5.401
24	4.948	4.472	3.516	3.278	2.708	3.403	3.978	4.285	4.458	4.215	4.383	4.616	4.365	4.447	4.296	
25	2.447	2.302	2.333	2.65	2.78	2.295	1.969	2.323	2.484	2.067	1.631	2.101	1.693	1.156	1.231	1.385
26	1.017	1.152	1.106	1.097	1.155	1.262	1.473	1.132	1.261	1.68	1.25	1.139	0.712	0.641	0.642	
27	0.666	0.634	0.689	0.614	0.639	0.639	0.826	0.83	0.774	0.717	0.538	0.599	0.515	0.817	0.609	0.56
28	0.85	0.948	0.789	0.77	0.703	0.723	0.789	0.806	1.244	0.795	0.935	1.394	1.291	1.479	1.317	1.315
29	0.504	0.94	0.87	1.049	0.889	0.802	0.819	1.298	1.07	1.615	1.33	1.573	1.873			
30	1.826	1.888	2.402	3.046	3.113	3.371	3.424	3.12	3.574	2.866	3.298	3.747	2.723	1.7	1.756	2.623
31	5.569	4.539	2.774	2.866	4.183	4.505	4.183	4.204	3.314	2.331	3.209	3.504	4.315	4.915	2.548	
32	4.064	4.331	6.007	4.909	5.353	5.53	5.963	5.651	6.082	4.764	4.964	4.98	6.172	3.345	4.198	4.944
33	6.087	5.586	7.356	6.934	6.289	6.915	7.56	8.487	8.151	8.321	8.51	8.66	8.468	8.69	8.792	
34	7.113	7.578	7.109	6.933	6.587	6.579	7.078	7.525	6.782	6.267	6.249	6.525	7.222	7.496	7.464	7.787
35	4.825	4.861	5.81	5.817	4.625	4.764	5.607	5.492	5.882	5.473	5.346	5.113	6.098	5.959	6.511	6.371
36	-99999	5.725	4.734	3.781	3.494	3.803	-99999	-99999	4.122	3.893	4.153	3.914	3.259	-99999	-99999	

37	3.356	3.406	1.888	2.374	1.879	1.63	1.606	2.085	2.031	2.239	2.252	2.711	2.735	2.946	2.688	2.407
38	1.385	1.176	1.433	1.451	1.413	1.188	0.938	0.965	1.126	1.153	1.615	0.507	0.33	0.403	0.411	
39	-99999	0.562	0.522	0.943	0.664	0.064	-99999	-99999	0	-99999	0.001	0.064	0.376	-99999	-99999	0
40	0.72	0.639	0.498	0.783	0.614	0.431	0.465	0.302	0.35	0.487	0.407	0.627	0.633	1.029	0.367	0.335
41	1.641	1.643	1.235	1.189	1.507	1.719	1.869	2.221	1.753	1.456	1.627	1.689	2.386			
42	-99999	-99999	2.405	2.975	2.042	2.052	1.558	-99999	-99999	3.027	2.537	1.663	2.123	-99999	-99999	2.618
43	4.031	4.113	3.783	3.386	3.637	3.937	4.181	3.814	3.892	4.429	3.063	2.502	2.593	2.876	3.284	
44	3.997	4.96	-99999	-99999	5.588	5.659	4.861	3.71	4.817	-99999	-99999	-99999	6.358	5.302	5.407	3.896
45	-99999	7.216	7.186	7.047	6.953	6.943	-99999	-99999	6.984	6.58	6.097	5.948	4.976	-99999	6.507	
46	7.174	7.582	7.22	6.031	7.076	6.678	6.756	6.779	7.251	6.757	7.249	7.095	7.468	7.589	7.255	7.398
47	6.708	-99999	-99999	6.434	6.488	6.632	6.775	6.213	-99999	-99999	6.449	5.729	5.252	5.802	5.94	-99999
48	4.46	3.863	4.445	4.398	4.251	-99999	-99999	4.58	3.901	3.764	3.97	4.16	-99999	-99999	4.16	
49	3.201	3.806	3.322	-99999	-99999	-99999	2.864	2.619	2.415	1.632	-99999	-99999	0.906	0.715	0.893	0.768
50	0.736	0.942	1.021	0.984	0.872	0.834	1.037	0.587	0.683	0.672	0.844	1.112	1.641	0.596	0.673	
51	0.751	0.63	0.602	0.766	0.52	0.345	0.458	0.618	0.34	0.4	0.288	0.195	0.559	-99999	0.412	0.538
52	0.74	0.585	0.631	0.552	0.659	0.445	0.504	0.626	0.663	1.145	0.941	0.913	0.923	0.756	1.048	0.986
53	-99999	-99999	1.687	1.62	1.972	2.145	-99999	-99999	2.068	1.723	1.867	1.886	2.075	2.326		
54	2.924	2.803	1.567	2.088	2.267	2.722	2.553	2.116	2.426	2.647	2.941	2.832	1.81	2.812	3.24	2.854
55	3.94	4.482	5.015	-99999	3.267	3.876	4.545	4.714	3.526	-99999	-99999	5.929	6.237	5.8	5.48	
56	6.41	6.501	6.688	6.49	4.704	5.804	2.934	5.194	5.215	5.451	6.251	6.177	5.752	5.092	5.149	5.836
57	5.317	5.492	5.825	7.237	7.269	7.56	7.774	7.64	7.361	6.479	6.409	5.654	7.412	7.436	6.543	
58	6.116	7.109	-99999	-99999	7.553	7.36	6.794	6.124	-99999	-99999	-99999	6.831	7.298	7.519	7.448	7.277
59	6.854	6.821	5.953	6.664	6.839	6.662	5.721	5.251	5.94	4.763	5.17	4.879	5.61	6.265	5.435	4.266
60	3.936	4.756	4.81	4.294	4.228	4.114	4.026	4.834	4.707	4.964	3.632	3.837	3.864	4.095	3.97	
61	2.431	2.837	2.699	2.969	2.805	3.084	2.518	2.211	2.339	-99999	2.128	2.07	1.896	1.717	1.619	1.64
62	1.264	1.263	1.212	0.992	1.036	-99999	-99999	1.344	0.743	0.639	-99999	-99999	-99999	-99999	0.688	
63	0.506	0.486	0.686	-99999	-99999	0.48	0.365	0.266	0.336	-99999	-99999	-99999	0.777	0.933	0.878	0.885
64	0.86	-99999	-99999	0.682	0.838	1.047	1.381	1.265	0.76	0.747	0.789	0.742	0.715	0.962	0.532	0.548
65	0.687	0.648	0.882	1.5	1.717	1.523	1.303	1.521	1.717	1.488	0.958	0.85	0.938			
66	2.721	2.861	3.256	2.694	3.164	3.089	3.535	3.138	3.931	3.227	3.365	3.019	1.771	1.388	2.493	2.623
67	3.656	4.004	4.259	3.457	2.93	3.695	5.296	5.272	3.354	3.491	4.708	5.314	3.94	4.263	4.954	

APPENDIX I

Appendix I. Chemistry of brine samples collected from the 20-foot-deep auger holes drilled throughout Sevier Lake (unpublished analyses by Chemical and Mineralogical Services between 1979 and 1983).

The majority of the samples were collected during 1979; a few were collected in1986.

Sample-ID[1]	Date	SPC Y-N[2]	SPC X-E[3]	Density[4]	Na[5]	K[5]	Mg[5]	Ca[5]	Cl[5]	SO_4[5]	TDS[5]	HCO_3[6]
2010-5	11/26/1986	272455.6	1573248	1.120	61600	1920	3550	860	100000	18500	166455	1
2011-100	8/28/1979	255858.5	1543138	1.160	95000	3800	4370	500	122600	31390	222121	1
2011-101	8/28/1979	258562.8	1540579	1.180	102000	3850	4490	440	136740	31720	236644	1
2011-102	8/28/1979	255901.2	1540484	1.170	77500	4050	4850	360	155600	30900	233556	1
2011-103	8/28/1979	258418.5	1548460	1.130	66500	2900	3700	510	107780	30490	187504	1
2011-104	8/28/1979	255773.2	1548418	1.130	82500	2650	3410	560	96330	27110	188106	1
2011-105	8/28/1979	258446.9	1545820	1.130	75500	2750	3360	630	98350	25870	182708	1
2011-106	8/28/1979	255830.1	1545778	1.120	66000	2600	3220	580	90260	23240	165982	1
2011-107	8/28/1979	258204.3	1553747	1.120	63000	2500	3260	580	92280	22250	164170	1
2011-109	8/28/1979	258361.6	1551100	1.130	72500	2600	3390	580	99690	24640	180000	1
2011-110	8/28/1979	255730.5	1551043	1.120	66500	2550	3310	580	92280	23570	168562	1
2011-30	11/26/1986	271474.3	1556580	1.120	64600	2060	3750	910	101000	18500	170375	1
2011-45S	11/5/1986	274441.7	1535363	1.220	116500	6180	7500	270	183680	37670	288361	1
2011-6	11/26/1986	276972.3	1543501	1.120	64400	2280	3550	750	100000	21700	172036	1
2011-73	11/26/1986	263453.1	1561760	1.100	55200	1860	3350	780	81400	21700	149355	1
2011-80	8/28/1979	260950.0	1553769	1.130	86000	1950	3380	600	92280	21510	182053	1
2011-82	8/28/1979	260992.7	1551129	1.120	71000	2100	3480	650	95320	24390	175839	1
2011-84	8/28/1979	261049.6	1548503	1.110	61000	2000	3330	680	90260	20600	160243	1
2011-86	8/28/1979	261120.7	1545878	1.120	67000	2000	3530	650	97670	22250	172411	1
2011-88	8/28/1979	261149.1	1543209	1.140	82000	2050	3910	600	105080	23980	190895	1
2011-88	11/5/1986	261149.1	1543209	1.140	82000	2050	3910	600	105080	23980	190895	1
2011-90	8/28/1979	261177.6	1540583	1.140	80000	2450	4520	550	104410	23730	189175	1
2011-92	8/28/1979	261234.5	1537958	1.150	77000	3850	4430	550	125290	29660	209374	1
2011-92-N	12/21/1979	262464.2	1536968	1.110	56000	3300	3210	670	89970	25050	160541	1
2011-92-N	12/21/1979	262464.2	1536968	1.110	56000	3450	3010	680	89330	24720	159631	1
2011-92-S	12/21/1979	259636.5	1536841	1.140	70500	3830	3850	540	113580	30080	195070	1
2011-92-S	12/21/1979	259636.5	1536841	1.120	59500	3570	3340	630	96350	28350	171196	1
2011-94	8/28/1979	261305.6	1535289	1.250	171000	4350	5060	170	165710	42930	311376	1
2011-95	8/28/1979	258603.4	1537901	1.190	106000	4400	6670	420	140780	39300	250059	1
2011-95	11/5/1986	258603.4	1537901	1.190	106000	4400	6670	420	140780	39300	250059	1
2011-96	8/28/1979	255965.3	1537868	1.200	119000	3150	5740	280	152240	35180	262992	1
2011-97	8/28/1979	258631.8	1535261	1.140	72500	3200	3560	530	107780	34860	195114	1
2011-98	8/28/1979	256020.9	1535230	1.190	132000	2700	4540	300	115370	39220	247168	1
2011-99	8/28/1979	258491.1	1543169	1.130	76000	2800	3620	640	101040	26700	186549	1
2012-2	8/28/1979	277191.5	1533020	1.140	72500	3850	3220	650	111150	32470	196351	1
2012-2	11/5/1986	277191.5	1533020	1.140	72500	3850	3220	650	111150	32470	196351	1
2012-20	8/28/1979	266882.2	1517119	1.100	52500	2150	2900	740	82800	18540	145118	1
2012-24	8/28/1979	266882.2	1519710	1.130	74000	3250	3030	600	105080	20520	182726	1
2012-27	11/5/1986	269412.1	1525015	1.120	57200	3800	3390	630	95080	24560	164875	1
2012-27A	12/21/1979	269233.0	1525087	1.120	57200	3800	3390	630	95080	24560	164875	1
2012-27B	12/21/1979	269233.0	1525087	1.120	61400	3850	3180	650	100820	22740	172000	1
2012-28	8/28/1979	266738.8	1525035	1.160	98000	3650	3480	590	118550	27360	216922	1
2012-34	8/28/1979	261305.6	1532920	1.130	60500	3100	3700	590	119570	25380	188354	1
2012-36	8/28/1979	261376.7	1530295	1.130	70000	2900	2900	740	98430	25540	177442	1
2012-37	8/28/1979	264078.9	1527598	1.150	89000	3650	3330	680	115860	29420	210383	1
2012-37	11/5/1986	264078.9	1527598	1.150	89000	3650	3300	680	115860	29420	210357	1
2012-38	8/28/1979	261419.4	1527555	1.160	84500	3500	3360	500	120380	35270	213371	1
2012-39	8/28/1979	264013.4	1524819	1.150	85500	3500	3540	480	120580	27110	209313	1
2012-40	8/28/1979	261476.2	1524929	1.130	74000	3050	2930	690	94440	23570	175823	1
2012-41	8/28/1979	264085.2	1522372	1.130	70000	3050	3070	600	107410	24800	184894	1
2012-42	8/28/1979	261533.1	1522375	1.240	156500	4750	6150	180	161950	56200	311073	1

Sample-ID[1]	Date	SPC Y-N[2]	SPC X-E[3]	Density[4]	Na[5]	K[5]	Mg[5]	Ca[5]	Cl[5]	SO_4[5]	TDS[5]	HCO_3[6]
2012-43	8/28/1979	264085.2	1519638	1.120	63000	2950	3070	680	101430	20760	171330	1
2012-44	8/28/1979	261590.0	1519649	1.120	63500	2350	3090	640	100100	21590	170777	1
2012-46	8/28/1979	261646.7	1517047	1.120	61000	2550	3420	680	99760	21750	168893	1
2012-48 B	8/28/1979	245747.8	1504430	1.120	68500	2600	3030	680	98100	19530	171821	1
2012-49	8/28/1979	256124.4	1517047	1.110	62500	2550	2890	750	93450	18790	163000	1
2012-52	8/28/1979	258873.6	1522318	1.120	78000	2850	2750	700	90450	20100	173973	1
2012-53	8/28/1979	256242.5	1522261	1.120	64000	2900	2940	680	93110	24470	167946	1
2012-55	8/28/1979	256299.4	1519606	1.160	82500	3400	3870	520	128850	31970	216474	1
2012-56	8/28/1979	258774.0	1527541	1.140	74500	3550	3090	580	105600	30080	190702	1
2012-56	11/5/1986	258774.0	1527541	1.140	74500	3550	3090	580	105600	30080	190702	1
2012-57	8/28/1979	256124.4	1527482	1.150	80500	3750	3360	640	109800	33370	201235	1
2012-58	8/28/1979	258830.9	1524901	1.170	87500	3800	4150	420	137420	37490	231436	1
2012-59	8/28/1979	256185.6	1524901	1.160	73000	3650	4870	330	137420	29580	214526	1
2012-60	8/28/1979	258688.7	1532863	1.180	91000	4400	4080	320	142130	50100	247483	1
2012-61	8/28/1979	255981.0	1532807	1.190	126500	4000	4290	490	122600	43100	252924	1
2012-62	8/28/1979	258731.3	1530252	1.150	78500	3450	3510	540	115860	28920	200678	1
2012-63	8/28/1979	256052.7	1530144	1.160	90500	3850	4430	480	122600	36500	222724	1
2111-100	11/26/1986	233814.4	1535075	1.160	86400	3380	3500	420	122000	38900	219483	1
2111-109	11/5/1986	225650.9	1546776	1.130	72500	2600	3390	580	99690	24640	180000	1
2111-17	11/26/1986	254038.1	1542010	1.120	62200	2400	3200	650	92700	28300	169152	1
2112-1	8/28/1979	254023.9	1532878	1.150	83000	3850	3410	550	121250	31970	212200	1
2112-1	11/5/1986	254023.9	1532878	1.150	83000	3850	3410	550	121250	31970	212200	1
2112-10	8/28/1979	251577.7	1522289	1.160	93500	3500	3720	550	120580	34280	220802	1
2112-11	8/28/1979	254294.1	1519663	1.140	80000	2950	3030	680	107100	24560	191509	1
2112-12	8/28/1979	251606.2	1519638	1.160	92500	3250	3410	550	123940	26530	215672	1
2112-13	8/28/1979	254322.5	1517052	1.130	84000	2600	3020	690	99690	20020	185858	1
2112-14	8/28/1979	251677.2	1517009	1.130	82500	2650	2750	690	100370	18810	183867	1
2112-15	8/28/1979	254393.6	1514384	1.130	72000	2600	3250	680	101710	23070	179920	1
2112-18	8/28/1979	249074.6	1516938	1.130	73500	2800	2870	720	104410	21840	182425	1
2112-19	8/28/1979	246400.9	1516895	1.140	78000	3400	3570	660	116530	24140	198509	1
2112-21	8/28/1979	246457.7	1514255	1.160	122500	3000	2720	740	99690	19940	214302	1
2112-22	8/28/1979	248946.6	1522218	1.190	97000	5150	5060	380	156280	36260	252210	1
2112-23	8/28/1979	246301.3	1522175	1.160	83000	3850	3640	540	125290	34200	215966	1
2112-24	8/28/1979	248989.3	1519578	1.130	72000	3300	2980	680	106430	24060	185354	1
2112-25	8/28/1979	246358.2	1519535	1.130	75000	2950	2700	700	98350	23240	179593	1
2112-26	8/28/1979	248861.3	1527484	1.170	92000	4350	4110	420	129670	34770	226769	1
2112-27	8/28/1979	246201.8	1527441	1.190	119000	4400	4200	420	137080	36990	253857	1
2112-28	8/28/1979	248889.7	1524872	1.140	76000	3150	2910	500	112830	27690	195684	1
2112-29	8/28/1979	246272.9	1524829	1.140	86000	3100	2710	550	105420	29170	199079	1
2112-3	8/28/1979	254066.5	1530252	1.150	76000	3850	3480	580	111820	36260	201730	1
2112-30	8/28/1979	248747.5	1532778	1.160	89000	4300	4790	460	128660	32880	224216	1
2112-31	8/28/1979	246088.0	1532749	1.240	150000	5000	6140	130	167050	47460	303048	1
2112-32	8/28/1979	248809.1	1530144	1.220	138500	4400	5830	280	151220	43590	281820	1
2112-33	8/28/1979	246159.1	1530052	1.260	185000	5500	6960	160	167050	51990	330683	1
2112-4	8/28/1979	251449.7	1530195	1.200	106500	5250	5620	360	151560	48860	265125	1
2112-44	11/5/1986	243698.7	1519478	1.160	110000	4100	4030	480	108640	25130	217569	1
2112-5	8/28/1979	254123.4	1527612	1.170	90000	4400	4280	580	128660	35180	224872	1
2112-54	11/5/1986	235947.7	1511372	1.120	68000	3300	3060	550	102640	17960	174563	1
2112-55	11/5/1986	238479.2	1516752	1.130	73000	2600	2920	490	101310	21260	178389	1
2112-6	8/28/1979	251478.1	1527541	1.180	115000	4050	3810	470	128660	39630	247136	1
2112-7	8/28/1979	254180.3	1524943	1.140	79500	2700	3540	710	116530	26620	201404	1

Sample-ID[1]	Date	SPC Y-N[2]	SPC X-E[3]	Density[4]	Na[5]	K[5]	Mg[5]	Ca[5]	Cl[5]	SO_4[5]	TDS[5]	HCO_3[6]
2112-71	11/26/1986	232889.9	1532464	1.140	78000	2840	3200	510	106000	34800	197675	1
2112-8	8/28/1979	251549.2	1524901	1.150	78500	2700	3330	620	123270	29420	206817	1
2112-9	8/28/1979	254223.0	1522318	1.140	96000	2950	2890	680	97670	24390	197000	1
2211-50	11/26/1986	206949.0	1543951	1.140	73000	2680	2900	540	104000	33400	189930	1
2212-23	12/21/1979	217174.6	1526855	1.110	57500	2800	3000	680	97460	16730	160514	1
2212-23	11/5/1986	217174.6	1526855	1.110	57500	2800	3000	680	97460	16730	160514	1
2212-24	12/21/1979	214515.1	1526798	1.120	59500	2850	3100	670	102560	18870	167455	1
2212-35	12/21/1979	211884.0	1526741	1.140	69500	3800	4030	480	127400	15820	193886	1
2212-5	12/21/1979	222436.7	1526984	1.120	61500	3350	4430	600	120000	8320	176964	1
2212-5	11/5/1986	222436.7	1526984	1.120	61500	3350	4430	600	120000	8320	176964	1
2212-60	11/26/1986	203905.5	1529267	1.140	73600	3280	3280	660	117000	22700	193439	1
2212-94	11/26/1986	193452.3	1523773	1.140	75800	3540	3420	700	123000	20600	199175	1
2312-16	11/26/1986	188375.1	1513099	1.150	79600	3680	4020	750	133000	16900	206913	1
2312-72	11/26/1986	174878.4	1528710	1.140	75600	3420	4250	830	127000	15600	198860	1
2312-84	11/26/1986	169786.9	1518051	1.150	78800	3520	4450	870	132000	15300	204296	1
2412-45	11/5/1986	148880.6	1507091	1.130	76000	2640	1980	940	108580	14280	180903	1
	Average			**1.146**	**82217**	**3308**	**3734**	**576**	**114129**	**27775**	**201269**	

[1] In the case of sample ID 2312-72, this sample is located in T.23S., R.12W., quarter section number 72.

[2] SPC Y-N is State Plane coordinate - Central zone - northing.

[3] SPC Y-E is State Plane coordinate - Central zone - easting.

[4] Density is given in g/cc

[5] Na, K, Mg, Ca, Cl, SO_4, and TDS values are given in mg/L.

[6] HCO_3 was not determined, but is given a value of one in this table for use in the AquaChem program. AquaChem is a registered Waterloo Hydrogeologic, Inc. software name.

APPENDIX J

Appendix J. Chemical analyses of brine samples from the five deep wells (analyzed by Chemical and Mineralogical Services during 1978).

No.	Well	Depth Interval	Cl-g/L	Mg-g/L	Ca-g/L	Na-g/L	K-g/L	SO_4-g/L	HCO_3-g/L	TDS-g/L	Br-ppm	Li-ppm	B-ppm
1	SDL-2	10-15	124.08	6.12	0.08	84.30	3.52	38.21	0.1	256.41	70	15.5	47
2	SLD-2	465-470	13.65	1.05	0.70	10.20	0.03	2.90	0.1	28.63	8	0.5	13
3	SDL-2	515-520	57.78	3.00	1.12	36.10	0.80	13.62	0.1	112.52	3	5.5	13
4	SDL-2	630-635	74.45	3.38	0.65	52.00	1.57	18.49	0.1	150.64	41	9	20
5	SDL-2	775-760	31.73	2.37	1.37	20.10	0.05	5.49	0.1	61.21	20	1	17
6	SDL-2	820+825+835-840	26.06	1.99	1.14	15.80	0.06	5.04	0.1	50.19	14	1	11
7	SDL-3	195-200	3.19	0.35	0.35	2.70	0.01	1.21	0.1	7.91	2	1	15
8	SDL-3	315-320	3.01	0.22	0.06	2.20	0.01	0.81	0.1	6.41	1	1	13
9	SDL-3	415-420	2.66	0.28	0.24	1.70	0.01	0.77	0.1	5.76	1	1	18
10	SDL-3	555-560	17.02	1.22	0.78	10.20	0.04	6.28	0.1	35.64	13	1	13
11	3SDL-	615-620	18.43	1.25	0.77	10.60	0.05	6.04	0.1	37.24	10	1	29
12	SDL-3	660-665	6.03	0.40	0.23	4.60	0.02	1.70	0.1	13.08	4	1	10
13	SDL-3	658-680+700-705	10.64	0.73	0.45	7.30	0.02	3.39	0.1	22.63	6	1	12
14	SDL-3A	555-560	8.15	0.59	0.35	5.20	0.02	2.39	0.1	16.80	4	1	13
15	SDL-3A	615-620	9.22	0.65	0.40	5.50	0.02	2.85	0.1	18.74	5	1	11
16	SDL-3A	660-665	5.85	0.44	0.28	4.20	0.02	1.65	0.1	12.54	3	1	17
17	SDL-3A	700-705	16.66	1.13	0.71	10.40	0.05	5.97	0.1	35.02	11	1	16
18	SDL-3A	760-765	19.85	0.41	0.89	13.70	0.09	7.09	0.1	42.13	13	1	13
19	SDL-3A	800-805+820-825	18.79	1.31	0.82	11.70	0.06	6.47	0.1	39.25	11	1	10
20	SDL-3A	875-880	2.48	0.22	0.15	1.80	0.02	0.36	0.1	5.13	3	1	9
21	SDL-3A	895-900+915-920	14.53	1.04	0.74	9.70	0.07	5.55	0.1	31.73	8	1	9
22	SDL-4	195-200	49.45	2.21	0.78	35.10	1.52	13.68	0.1	102.84	29	9	35
23	SDL-4	255-260	45.02	1.95	1.12	29.30	0.34	8.67	0.1	86.50	28	8	25
24	SDL-4	355-360	42.01	2.43	1.20	26.90	0.13	7.95	0.1	80.72	25	1	18
25	SDL-4	410-415	11.52	0.68	0.34	8.40	0.20	2.21	0.1	23.45	7	1	11
26	SDL-4	455-460	18.08	0.91	0.42	11.50	0.13	3.18	0.1	34.32	12	2	15
27	SDL-4	515-520	30.49	1.98	1.05	18.40	0.12	6.06	0.1	58.20	18	1	13
28	SDL-4	575-580	24.28	1.66	0.94	13.50	0.54	5.39	0.1	46.41	14	1	19
29	SDL-4	615-620	44.84	2.62	1.06	27.40	0.09	10.33	0.1	86.44	27	4.5	13
30	SDL-4	715-720	20.03	1.34	0.83	10.80	0.97	3.95	0.1	38.02	11	1	12
31	SDL-4	855-860	18.79	1.45	0.79	9.70	0.07	3.39	0.1	34.29	10	1	12
32	4SDL-	915-920	32.44	2.58	1.46	17.30	0.05	5.78	0.1	59.71	19	1	8
33	W-5	395-400	4.08	0.26	0.24	2.80	0.04	1.44	0.1	8.96	2	<.5	5
34	W-5	455-460	1.68	0.12	0.08	1.00	0.01	0.50	0.1	3.49	<1	<.5	5
35	W-5	555-560	0.35	0.05	0.07	**0.40**	0.01	0.14	0.1	1.12	1	<.5	7
36	W-5	615-620	0.35	0.04	0.03	**0.40**	0.01	0.03	0.1	0.96	<1	<.5	<1
37	W-5	715-720	0.35	0.03	0.04	**0.40**	0.01	0.03	0.1	0.96	<1	<.5	<1

Bold values were initially reported as below detection limit, the estimated value of 0.4 g/L was entered to make AquaChem® Operate

HCO_3 analysis did not include HCO_3 so an estimated value of 0.1 was entered so AquaChem® would operate

TDS values are calculated as sum of components

The locations of the wells are given in table 1

APPENDIX K

Appendix K. Results of Inductively Coupled Plasma (ICP) analyses of 10 sediment samples from Sevier Lake (analyzed at the University of Utah's Earth Science Laboratory (now the Energy & Geoscience Institute) to determine the major and trace elements present).

The following samples were analyzed: (1) the original unwashed mud samples, (2) the samples after they had been washed six times with deionized water, and (3) the first-wash water. The first wash was done using 50 grams of dried sediment mixed with 510 ml of deionized water. The slurry was allowed to stand for six days with daily agitation before the first-wash water was separated from the solids.
The appendix also gives the average values for the ten samples, and the elements that were not detected and the minimum detection limits for these elements. See the footnote at the bottom of the table for unit designations.

The following elements were reported only one time, and were not included in the tables.
Gold (0.17 ppm) was detected in the first wash water for sample 5.
Silver (6.0 ppm) was detected in the unwashed sample for sample 6.
Lead (42 ppm) was detected in the washed sample for sample 6.

Sediment Sample No. 1 (2011-34-A)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.69% ox	0.706% ox	2600 ppm
K	1.69	1.61	137
Ca	11.10	12.36	209
Mg	3.20	3.47	65
Fe	2.07	2.14	0.16
Al	7.72	8.27	----
Si	----	----	11
Ti	0.31	0.334	----
P	0.105	0.109	
Sr	310.0 ppm	362.0 ppm	2.49
Ba	0.04	0.045	----
Mn	0.041	0.043	----
Co	3.0	3.0	----
Ni	9.0	13.0	----
Cu	11.0	88.0	----
Zn	34.0	25.0	----
Li	50.0	50.0	0.40
Be	1.30	1.3	----
B	----	----	1.1
Zr	64.0	69.0	----
La	23.0	24.0	----
Ce	21.0	20.0	----

Sediment Sample No. 2 (2011-25-A)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.65% ox	0.680% ox	2513 ppm
K	1.61	1.60	123
Ca	10.66	11.71	157
Mg	2.92	3.18	63
Fe	2.07	2.29	0.11
Al	7.65	8.50	----
Si	----	----	13
Ti	0.304	0.331	----
P	0.096	0.108	----
Sr	279.0 ppm	284.0 ppm	1.37
Ba	0.038	0.04	----
Mn	0.040	0.045	----
Co	3.0	4.0	----
Ni	8.0	13.0	----
Cu	9.0	86.0	----
Zn	25.0	27.0	----
Li	44.0	44.0	0.38
Be	1.2	1.3	----
B	----	----	0.7
Zr	60.0	66.0	----
La	21.0	24.0	----
Ce	15.0	23.0	----

Sediment Sample No. 3 (2011-23-A)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.31% ox	0.785% ox	2130 ppm
K	1.66	1.65	111
Ca	11.41	12.02	144
Mg	2.80	2.96	59
Fe	2.02	2.19	0.08
Al	7.65	8.44	----
Si	----	----	12
Ti	0.315	0.340	----
P	0.107	0.111	----
Sr	285.0 ppm	296.0 ppm	1.26
Ba	0.043	0.047	----
Mn	0.041	0.045	----
Co	3.0	3.0	----
Ni	8.0	12.0	----
Cu	10.0	74.0	----
Zn	22.0	25.0	----
Li	40.0	39.0	0.37
Be	1.2	1.3	----
B	----	----	0.6
Zr	64.0	7.0	----
La	23.0	24.0	----
Ce	21.0	22.0	----

Sediment Sample No. 4 (2011-19-A)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.68% ox	0.435% ox	2615 ppm
K	1.24	1.27	144
Ca	26.91	27.16	1110
Mg	2.25	2.88	39
Fe	1.55	1.9	0.07
Al	5.59	6.85	----
Si	----	----	21
Ti	0.191	0.235	----
P	0.081	0.097	----
Sr ppm	1203 ppm	999.0	7.17
Ba	0.061	0.063	----
Mn	0.032	0.040	----
Co	3.0	4.0	----
Ni	10.0	12.0	----
Cu	9.0	28.0	----
Zn	18.0	22.0	----
Li	57.0	60.0	0.41
Be	1.0	1.3	----
B	----	----	0.6
Zr	41.0	52.0	----
La	10.0	13.0	0.3
Ce	18.0	21.0	----

Sediment Sample No. 5 (2011-18-A)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.28% ox	0.777% ox	1846 ppm
K	1.52	1.48	82
Ca	9.98	10.60	161
Mg	2.72	2.77	52
Fe	2.14	2.10	0.12
Al	7.32	7.71	----
Si	----	----	12
Ti	0.321	0.337	----
P	0.101	0.106	----
Sr	275 ppm	282.0 ppm	1.21
Ba	0.042	0.045	----
Mn	0.039	0.042	----
Co	3.0	4.0	----
Ni	8.0	11.0	----
Cu	8.0	53.0	----
Zn	23.0	23.0	----
Li	36.0	33.0	0.3
Be	1.2	1.2	----
B	----	----	0.5
Zr	67.0	70.0	----
La	23.0	24.0	----
Ce	21.0	25.0	----

Sediment Sample No. 6 (2011-41-B)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	6.62% ox	0.604% ox	1061 ppm
K	1.40	1.18	53
Ca	12.45	15.17	823
Mg	8.01	3.14	144
Fe	1.53	1.67	0.08
Al	5.33	6.42	----
Si	----	----	8.0
Ti	0.205	0.244	----
P	0.073	0.095	----
Sr	540.0 ppm	868.0 ppm	21.11
Ba	0.033	0.033	----
Mn	0.03	0.056	0.05
Co	3.0	3.0	----
Ni	9.0	12.0	----
Cu	10.0	51.0	----
Zn	45.0	174.0	----
Li	107.0	37.0	0.25
Be	1.0	1.0	----
B	----	----	1.1
Zr	40.0	48.0	----
La	17.0	18.0	0.1
Ce	12.0	19.0	----

Sediment Sample No. 7 (2011-SS-W Trib)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	1.74% ox	0.475% ox	5150 ppm
K	1.04	1.34	296
Ca	17.02	14.71	1100
Mg	2.83	10.13	175
Fe	1.32	1.19	1.84
Al	5.22	6.69	----
Si	----	----	14
Ti	0.197	0.254	----
P	0.076	0.092	----
Sr	1239 ppm	518 ppm	11.75
Ba	0.017	0.044	----
Mn	0.047	0.039	----
Co	2.0	4.0	----
Ni	6.0	13.0	----
Cu	8.0	30.0	----
Zn	70.0	27.0	0.6
Li	33.0	118.0	0.99
Be	0.8	1.3	----
B	----	----	2.2
Zr	39.0	50.0	----
La	15.0	20.0	----
Ce	17.0	20.0	----

Sediment Sample No. 8 (2011-SS-13-15)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	8.48% ox	0.320% ox	6870 ppm
K	1.54	1.56	305
Ca	13.82	17.69	1135
Mg	3.53	4.59	128
Fe	2.13	2.79	0.17
Al	6.91	9.17	----
Si	----	----	10.0
Ti	0.273	0.358	----
P	0.105	0.135	----
Sr	200.0 ppm	209.0 ppm	5.59
Ba	0.023	0.031	----
Mn	0.037	0.048	----
Co	3.0	4.0	----
Ni	12.0	20.0	----
Cu	11.0	47.0	----
Zn	25.0	38.0	----
Li	59.0	65.0	0.76
Be	1.2	1.6	----
B	----	----	2.2
Zr	50.0	65.0	----
La	19.0	23.0	----
Ce	19.0	26.0	----

Sediment Sample No. 9 (2011-02-C)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.89% ox	0.398% ox	3035 ppm
K	1.65	1.51	257
Ca	16.51	17.48	1208
Mg	5.18	5.89	67
Fe	2.01	2.22	0.13
Al	6.98	7.90	----
Si	----	----	13.0
Ti	0.244	0.276	----
P	0.082	0.094	----
Sr	879.0 ppm	776.0 ppm	10.58
Ba	0.031	0.036	----
Mn	0.038	0.043	----
Co	3.0	4.0	----
Ni	14.0	14.0	----
Cu	12.0	61.0	----
Zn	31.0	32.0	----
Li	152.0	152.0	1.11
Be	1.4	1.5	----
B	----	----	1.7
Zr	50.0	55.0	----
La	19.0	21.0	0.3
Ce	18.0	23.0	----

Sediment Sample No. 10 (2011-15-C)

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	3.40% ox	0.497% ox	6840 ppm
K	1.35	1.33	305
Ca	15.73	16.91	867
Mg	5.78	7.04	448
Fe	1.53	1.86	0.11
Al	5.95	7.13	----
Si	----	----	19
Ti	0.204	0.242	----
P	0.076	0.091	----
Sr	732.0 ppm	1107 ppm	6.35
Ba	0.044	0.059	----
Mn	0.033	0.040	----
Co	3.0	4.0	----
Ni	10.0	12.0	----
Cu	10.0	57.0	----
Zn	19.0	27.0	----
Li	75.0	84.0	0.43
Be	1.1	1.3	----
B	----	----	0.8
Zr	42.0	51.0	----
La	16.0	19.0	----
Ce	15.0	19.0	----

Sediment Sample - Average of all 10 samples

Element	Unwashed Mud	Washed Mud	1st Wash Water
Na	4.17% ox	0.568% ox	3466 ppm
K	1.47	1.45	181.3
Ca	14.56	15.57	691.4
Mg	3.92	4.60	124.0
Fe	1.83	2.03	1.57
Al	6.63	7.70	1.25
Si	----	----	13.3
Ti	0.256	0.295	0.250
P	0.090	0.103	1.25
Sr	594.0 ppm	570.0 ppm	6.89
Ba	0.037	0.044	1.25
Mn	0.038	0.044	2.50
Co	3.0	3.7	0.050
Ni	9.4	13.2	0.25
Cu	9.8	57.5	0.125
Zn	41.0	42.0	0.250
Li	65.3	68.2	0.54
Be	1.1	1.3	0.010
B	----	----	1.15
Zr	51.7	59.6	0.25
La	18.6	21.0	0.25
Ce	17.7	21.8	0.50

Elements not detected - Minimum Detection Limits

Element	Min Dete Limit
V	250 ppm
Cr	2
Mo	50
Pb	10
Cd	5
Ag	2
Au	16
As	25
Sb	30
Bi	100
U	2500
Te	50
Sn	5
W	1200
Th	150

For the unwashed and washed muds, the values for Na, K, Ca, Mg, Fe, Al, Ti and P are given in terms of % oxide. The remaining elements in these fractions are given in terms of parts per million (ppm). All values in the first wash water column are given in terms of ppm. An analysis for Si was not made on the muds, but only on the first-wash water as an extra preparation step was necessary.

APPENDIX L

Appendix L. Relative concentrations for 18 elements in 0-5-foot-deep Sevier Lake samples using the Utah Geological Survey's Rigaku ZSX Mini® x-ray fluorescence spectrometer (samples were run for the Utah Geological Survey by Bountiful High School student Emily Toone in March and April of 2003).

The samples are representative of the upper five-foot composite of mud samples obtained during the augering of the 20-foot holes scattered throughout the lake. Raw elemental analyses were refined using Rigaku's $CaCO_3$-balance calculation and applying one of the seven matching libraries that were based on Sevier Lake samples with known compositions. Values are reported as mass percents. ND means not detected. The locations of the auger holes are shown on figure 19. The northing and easting values are the drill hole coordinate values used in figure 19.

Samp No.	Northing	Easting	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO
2010-003	251	145	4.88	3.33	5.53	24.90	0.05	1.66	3.57	1.11	29.36	0.24	0.04	0.04
2010-011	241	134	10.50	3.47	4.99	28.20	0.04	3.82	7.60	1.02	21.57	0.24	0.00	0.04
2010-022	231	145	3.79	3.41	5.22	23.30	0.06	1.67	2.24	1.01	31.83	0.26	0.00	0.05
2010-024	221	134	8.05	6.63	3.92	18.80	0.00	2.96	6.29	0.87	28.30	0.23	0.00	0.03
2011-007	260	83	10.90	4.74	4.99	23.10	0.00	4.18	8.69	1.17	22.47	0.20	0.00	0.04
2011-015	260	103	4.37	3.55	6.64	30.40	0.00	2.01	3.00	1.23	25.66	0.36	0.00	0.04
2011-019	260	113	4.90	3.55	7.11	30.50	0.07	0.91	3.35	1.17	25.49	0.37	0.00	0.05
2011-025	249	123	6.76	3.91	5.81	23.50	0.05	4.35	6.65	1.23	25.44	0.21	0.04	0.04
2011-057	239	92	5.57	4.88	4.96	25.10	0.05	3.79	4.78	1.05	26.50	0.30	0.00	0.03
2011-061	239	103	6.20	3.05	5.55	29.70	0.05	2.15	4.01	1.11	25.66	0.39	0.05	0.03
2011-069	239	123	8.14	2.94	6.16	29.90	0.07	2.06	6.04	1.21	22.86	0.36	0.09	0.08
2011-085	229	92	12.00	13.00	5.70	25.00	0.11	2.06	6.04	1.21	28.30	0.41	0.00	0.10
2011-097	219	73	22.00	5.50	4.00	16.00	0.09	15.00	14.00	2.20	19.50	0.00	0.00	0.04
2011-109	221	103	10.10	8.14	1.91	12.60	0.00	9.61	6.72	0.69	27.51	0.10	0.00	0.00
2012-003	260	63	11.00	6.20	9.30	34.00	0.17	2.30	7.50	3.20	25.44	0.56	0.00	0.10
2012-013	249	13	15.00	9.60	5.10	21.00	0.10	6.20	14.00	2.40	26.56	0.00	0.00	0.05
2012-023	239	43	15.00	11.00	5.60	21.00	0.09	4.00	12.00	2.10	26.67	0.25	0.00	0.00
2012-031	239	63	13.00	14.00	3.20	18.00	0.09	4.10	9.90	1.70	31.99	0.25	0.00	1.60
2012-039	225	53	15.00	6.50	6.00	23.00	0.13	4.80	15.00	2.90	26.84	0.27	0.00	0.09
2012-045	229	33	8.50	8.20	6.70	28.00	0.13	2.30	7.20	2.90	32.67	0.34	0.00	0.00
2012-054	219	43	11.00	12.00	5.30	23.00	0.15	4.00	8.00	2.40	32.05	0.31	0.00	0.00
2012-062	219	63	18.00	7.20	5.40	21.00	0.10	9.40	14.00	2.70	22.30	0.24	0.00	0.07
2111-007	209	111	13.00	13.00	4.10	20.00	0.11	4.50	11.00	2.10	30.87	0.32	0.00	0.00
2111-011	209	101	15.00	14.00	3.20	17.00	0.00	5.80	13.00	1.90	28.35	0.21	0.00	0.00
2111-019	209	81	33.00	4.50	1.50	7.30	0.05	11.00	26.00	0.81	13.50	0.13	0.00	0.00
2111-045	202	121	12.00	12.00	5.30	24.00	0.14	4.00	10.00	2.40	29.02	0.34	0.00	0.00
2111-048	191	111	12.00	12.00	3.60	18.00	0.00	3.20	10.00	1.80	34.35	0.25	0.09	0.06
2111-056	191	91	15.00	8.70	4.10	19.00	0.10	4.30	14.00	2.20	29.92	0.26	0.00	0.05
2111-063	187	78	23.00	7.00	3.50	15.00	0.07	7.20	18.00	1.90	20.11	0.18	0.00	0.06
2111-072	181	81	23.00	5.90	4.30	17.00	0.10	15.00	12.00	2.00	18.10	0.23	0.00	0.00
2111-080	181	101	15.00	9.20	4.80	20.00	0.16	3.50	13.00	2.50	29.30	0.27	0.00	0.09
2111-082	181	111	13.00	9.90	5.50	24.00	0.14	3.20	9.80	2.30	29.42	0.38	0.00	0.08
2111-084	171	111	8.60	6.20	5.30	37.00	0.16	3.20	5.30	2.10	30.31	0.31	0.00	0.00
2111-092	171	92	18.00	6.40	4.90	20.00	0.12	9.50	14.00	2.20	23.64	0.28	0.00	0.06
2111-106	161	101	17.00	6.80	5.60	21.00	0.11	6.90	13.00	2.20	25.16	0.36	0.00	0.00
2111-114	161	81	15.00	9.30	4.60	20.00	0.10	4.30	12.00	2.20	29.25	0.23	0.00	0.05
2112-007	209	53	16.00	8.30	5.10	20.00	0.10	9.20	13.00	2.60	24.26	0.23	0.00	0.06
2112-015	209	33	12.00	8.20	6.00	26.00	0.08	2.60	9.30	2.40	30.03	0.32	0.00	0.07
2112-036	190	63	19.00	6.00	4.90	19.00	0.00	15.00	8.70	2.60	21.35	0.26	0.00	2.10
2112-044	190	43	15.00	8.40	5.20	19.00	0.11	3.00	12.00	2.20	30.03	0.26	0.00	0.56
2112-048	190	33	10.00	12.00	5.20	25.00	0.00	2.80	8.50	2.50	32.33	0.34	0.00	0.06
2112-073	169	63	20.00	5.80	4.80	19.00	0.00	13.00	12.00	2.20	22.02	0.26	0.00	0.00
2112-081	169	43	14.00	11.00	4.60	19.00	0.10	5.60	10.00	2.10	29.70	0.27	0.00	0.00
2112-085	169	33	11.00	12.00	4.80	21.00	0.11	4.30	10.00	2.20	31.32	0.36	0.00	0.00
2112-100	159	53	11.00	12.00	4.60	20.00	0.10	9.10	7.90	2.10	29.98	0.34	0.00	0.00
2211-007	151	91	14.00	7.70	5.30	19.00	0.11	3.60	13.00	2.00	30.14	0.12	0.00	0.00
2211-019	140	101	9.80	11.00	6.80	29.00	0.09	3.10	7.50	2.80	29.70	0.55	0.00	0.09
2211-027	140	81	19.00	6.80	5.30	19.00	0.11	7.00	14.00	2.10	22.24	0.16	0.00	0.05
2211-040	197	101	16.00	7.50	5.30	22.00	0.11	5.20	13.00	2.20	27.34	0.32	0.00	0.06
2211-053	110	81	16.00	9.50	5.80	24.00	0.14	7.00	12.00	2.30	21.85	0.34	0.06	0.00
2211-077	108	91	11.00	8.90	6.10	28.00	0.00	3.50	7.30	2.30	30.31	0.44	0.08	0.07
2212-003	149	63	16.00	8.80	5.60	22.00	0.12	8.20	16.00	2.30	23.20	0.26	0.00	0.00
2212-015	149	33	3.80	4.20	8.80	36.00	0.19	0.78	1.00	2.70	34.85	0.55	0.00	0.00
2212-021	139	43	14.00	10.00	5.30	22.00	0.00	9.80	13.00	2.20	23.36	0.28	0.00	0.06
2212-055	118	53	12.00	11.00	4.30	20.00	0.12	3.70	8.60	1.80	33.34	0.29	0.00	0.00
2212-063	108	63	11.00	4.70	7.00	32.00	0.14	2.90	6.20	2.80	30.20	0.45	0.10	0.00
2212-067	108	53	16.00	8.50	5.20	22.00	0.13	4.90	11.00	2.20	26.05	0.26	0.00	0.00
2212-071	108	43	13.00	8.80	5.10	22.00	0.12	4.00	9.60	2.10	29.86	0.10	0.00	0.07
2212-075	108	33	12.00	11.00	5.40	23.00	0.17	5.00	10.00	2.20	28.74	0.33	0.00	0.06
2212-097	98	63	10.00	11.00	5.30	23.00	0.15	6.00	6.90	2.30	30.93	0.31	0.00	0.05

Samp No.	Northing	Easting	Fe_2O_3	SrO	Br	F	CuO	CO_2	Calcite
2010-003	251	145	2.13	0.07	0.00	0.00	0.00	23.04	52.40
2010-011	241	134	1.56	0.06	0.00	0.00	0.00	16.93	38.50
2010-022	231	145	2.06	0.10	0.00	0.00	0.00	24.97	56.80
2010-024	221	134	1.61	0.13	0.00	0.00	0.00	22.20	50.50
2011-007	260	83	1.75	0.07	0.00	0.00	0.00	17.63	40.10
2011-015	260	103	2.29	0.05	0.00	0.00	0.00	20.14	45.80
2011-019	260	113	2.50	0.05	0.00	0.00	0.00	20.01	45.50
2011-025	249	123	1.90	0.07	0.00	0.00	0.00	19.96	45.40
2011-057	239	92	2.04	0.10	0.00	0.00	0.00	20.80	47.30
2011-061	239	103	1.91	0.05	0.00	0.00	0.00	20.14	45.80
2011-069	239	123	3.40	0.06	0.00	0.00	0.00	17.94	40.80
2011-085	229	92	2.90	0.17	0.00	0.00	0.00	22.20	50.50
2011-097	219	73	1.80	0.17	0.00	0.00	0.00	15.30	34.80
2011-109	221	103	0.75	0.28	0.00	0.00	0.00	21.59	49.10
2012-003	260	63	3.50	0.09	0.00	0.00	0.00	19.96	45.40
2012-013	249	13	2.40	0.19	0.00	0.00	0.00	20.84	47.40
2012-023	239	43	2.20	0.21	0.00	0.00	0.00	20.93	47.60
2012-031	239	63	0.39	0.00	0.00	0.00	0.00	25.11	57.10
2012-039	225	53	2.50	0.17	0.02	0.00	0.00	21.06	47.90
2012-045	229	33	3.10	0.20	0.00	0.00	0.03	25.63	58.30
2012-054	219	43	2.50	0.27	0.00	0.00	0.00	25.15	57.20
2012-062	219	63	1.90	0.02	0.02	0.00	0.00	17.50	39.80
2111-007	209	111	1.90	0.24	0.00	0.00	0.00	24.23	55.10
2111-011	209	101	1.50	0.31	0.00	0.00	0.00	22.25	50.60
2111-019	209	81	0.52	0.13	0.00	1.30	0.00	10.59	24.09
2111-045	202	121	2.60	0.23	0.00	0.00	0.00	22.78	51.80
2111-048	191	111	2.00	0.44	0.00	0.00	0.00	26.95	61.30
2111-056	191	91	2.10	0.30	0.00	0.00	0.00	23.48	53.40
2111-063	187	78	1.50	0.18	0.00	0.00	0.00	15.79	35.90
2111-072	181	81	1.80	0.14	0.00	0.00	0.00	14.20	32.30
2111-080	181	101	2.50	0.24	0.00	0.00	0.00	23.00	52.30
2111-082	181	111	2.70	0.28	0.00	0.00	0.00	23.08	52.50
2111-084	171	111	2.50	0.12	0.00	0.00	0.00	23.79	54.10
2111-092	171	92	1.90	0.18	0.00	0.00	0.00	18.56	42.20
2111-106	161	101	2.30	0.18	0.00	0.00	0.00	19.74	44.90
2111-114	161	81	2.20	0.32	0.00	0.00	0.00	22.95	52.20
2112-007	209	53	2.30	0.20	0.02	0.00	0.00	19.04	43.30
2112-015	209	33	2.50	0.19	0.00	0.00	0.00	23.57	53.60
2112-036	190	63	0.02	0.02	0.00	0.00	0.00	16.75	38.10
2112-044	190	43	2.20	0.37	0.00	0.00	0.00	23.57	53.60
2112-048	190	33	2.80	0.31	0.00	0.00	0.00	25.37	57.70
2112-073	169	63	2.00	0.16	0.00	0.00	0.00	17.28	39.30
2112-081	169	43	2.00	0.37	0.00	0.00	0.00	23.30	53.00
2112-085	169	33	2.20	0.27	0.00	0.00	0.00	24.58	55.90
2112-100	159	53	2.20	0.31	0.00	0.00	0.00	23.52	53.50
2211-007	151	91	2.00	0.35	0.00	0.00	0.00	23.66	53.80
2211-019	140	101	3.50	0.00	0.00	0.00	0.00	23.30	53.00
2211-027	140	81	1.80	0.16	0.00	0.00	0.00	17.46	39.70
2211-040	197	101	2.30	0.25	0.00	0.00	0.00	21.46	48.80
2211-053	110	81	2.30	0.09	0.00	0.00	0.00	17.15	39.00
2211-077	108	91	2.90	0.19	0.00	0.00	0.00	23.79	54.10
2212-003	149	63	2.30	0.13	0.00	0.00	0.00	18.20	41.40
2212-015	149	33	4.00	0.12	0.00	0.00	0.00	27.35	62.20
2212-021	139	43	2.10	0.10	0.02	0.00	0.00	18.34	41.70
2212-055	118	53	2.00	0.40	0.00	0.00	0.00	26.16	59.50
2212-063	108	63	3.60	0.13	0.00	0.00	0.00	23.70	53.90
2212-067	108	53	2.20	0.21	0.00	0.00	0.00	20.45	46.50
2212-071	108	43	2.60	0.28	0.00	0.00	0.00	23.44	53.30
2212-075	108	33	2.60	0.24	0.00	0.00	0.00	22.56	51.30
2212-097	98	63	2.40	0.26	0.00	0.00	0.00	24.27	55.20

Samp No.	Northing	Easting	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO
2311-001	88	73	8.50	16.00	6.00	27.00	0.16	4.20	7.40	2.50	30.87	0.39	0.00	0.08
2311-003	79	72	14.00	9.60	6.70	26.00	0.15	7.50	12.00	2.50	23.92	0.40	0.00	0.08
2311-005	59	72	10.00	11.00	8.50	34.00	0.19	4.40	6.80	2.20	25.72	0.49	0.00	0.08
2311-007	48	73	5.90	12.00	6.80	29.00	0.20	4.00	7.10	3.00	31.60	0.47	0.00	0.10
2311-010	38	72	10.00	17.00	5.80	24.00	0.14	9.30	8.30	2.40	25.89	0.32	0.00	0.06
2312-007	58	53	14.00	13.00	4.60	20.00	0.13	7.20	13.00	2.20	26.50	0.11	0.00	0.08
2312-019	88	23	7.90	11.00	5.50	24.00	0.17	7.20	6.60	2.30	30.98	0.42	0.00	0.00
2312-030	78	43	12.00	16.00	4.50	20.00	0.12	9.10	9.80	2.10	27.96	0.30	0.00	0.06
2312-042	68	63	9.60	14.00	5.10	22.00	0.11	11.00	10.00	2.20	27.73	0.26	0.00	0.08
2312-054	68	23	8.70	16.00	5.90	26.00	0.15	5.70	7.90	2.50	29.42	0.35	0.00	0.05
2312-060	58	33	11.00	18.00	4.50	20.00	0.10	14.00	7.70	2.00	26.39	0.24	0.00	0.06
2312-064	58	43	15.00	16.00	4.70	20.00	0.00	9.80	13.00	2.10	23.64	0.27	0.00	0.06
2312-076	48	63	6.30	17.00	6.10	23.00	0.14	14.00	7.40	2.00	26.67	0.34	0.00	0.00
2312-092	38	33	8.60	16.00	5.30	24.00	0.10	7.86	7.20	2.20	28.52	0.43	0.00	0.06
2312-096	38	43	13.00	14.00	4.60	20.00	0.11	10.00	10.00	2.20	25.89	0.27	0.05	0.04
2312-100	38	53	12.00	22.00	4.50	20.00	0.10	0.04	13.00	2.00	23.42	0.27	0.00	0.00
2412-011	28	33	9.00	13.00	5.70	24.00	0.14	8.00	7.20	2.30	29.70	0.32	0.00	0.07
2412-017	23	18	5.00	5.50	9.50	36.00	0.21	2.00	2.90	3.30	31.88	0.55	0.00	0.08
2412-031	18	43	11.00	9.80	6.30	26.00	0.15	6.20	10.00	2.50	27.85	0.32	0.00	0.00
2412-039	18	63	10.00	14.00	5.30	23.00	0.17	7.60	8.90	2.30	28.46	0.29	0.00	0.00
2412-045	8	23	8.50	9.50	7.60	28.00	0.13	5.70	7.90	3.30	28.41	0.37	0.00	0.06

Samp No.	Northing	Easting	Fe_2O_3	SrO	Br	F	CuO	CO_2	Calcite
2311-001	88	73	3.30	0.18	0.00	0.00	0.00	24.23	55.10
2311-003	79	72	3.10	0.13	0.00	0.00	0.00	18.78	42.70
2311-005	59	72	3.90	0.10	0.00	0.00	0.00	20.18	45.90
2311-007	48	73	3.60	0.22	0.00	0.00	0.00	24.80	56.40
2311-010	38	72	2.60	0.13	0.00	0.00	0.00	20.31	46.20
2312-007	58	53	2.10	0.19	0.00	0.00	0.00	20.80	47.30
2312-019	88	23	2.80	0.19	0.00	0.00	0.00	24.32	55.30
2312-030	78	43	1.90	0.22	0.00	0.00	0.00	21.94	49.90
2312-042	68	63	2.30	0.18	0.00	0.00	0.00	21.77	49.50
2312-054	68	23	2.80	0.16	0.00	0.00	0.00	23.08	52.50
2312-060	58	33	2.10	0.18	0.00	0.00	0.00	20.71	47.10
2312-064	58	43	2.10	0.11	0.00	0.00	0.00	18.56	42.20
2312-076	48	63	2.60	0.15	0.00	0.00	0.00	20.93	47.60
2312-092	38	33	2.20	0.17	0.00	0.00	0.00	22.38	50.90
2312-096	38	43	1.90	0.18	0.00	0.00	0.00	20.31	46.20
2312-100	38	53	1.90	0.07	0.00	0.00	0.00	18.38	41.80
2412-011	28	33	2.50	0.22	0.00	0.00	0.00	23.30	53.00
2412-017	23	18	4.40	0.15	0.00	0.00	0.00	25.02	56.90
2412-031	18	43	3.10	0.18	0.00	0.00	0.00	21.85	49.70
2412-039	18	63	2.70	0.20	0.00	0.00	0.00	22.34	50.80
2412-045	8	23	3.40	0.12	0.00	0.00	0.00	22.29	50.70

Samp No.	Northing	Easting	Fe_2O_3	SrO	Br	Rb_2O	F	CuO	CO_2	Calcite
2311-01	88	73	3.30	0.18	ND	ND	ND	ND	24.23	55.10
2311-03	79	72	3.10	0.13	ND	ND	ND	ND	18.78	42.70
2311-05	59	72	3.90	0.10	ND	ND	ND	ND	20.18	45.90
2311-07	48	73	3.60	0.22	ND	ND	ND	ND	24.80	56.40
2311-10	38	72	2.60	0.13	ND	ND	ND	ND	20.31	46.20
2312-07	58	53	2.10	0.19	ND	ND	ND	ND	20.80	47.30
2312-100	38	53	1.90	0.07	ND	ND	ND	ND	18.38	41.80
2312-19	88	23	2.80	0.19	ND	ND	ND	ND	24.32	55.30
2312-30	78	43	1.90	0.22	ND	ND	ND	ND	21.94	49.90
2312-42	68	63	2.30	0.18	ND	ND	ND	ND	21.77	49.50
2312-54	68	23	2.80	0.16	ND	ND	ND	ND	23.08	52.50
2312-60	58	33	2.10	0.18	ND	ND	ND	ND	20.71	47.10
2312-64	58	43	2.10	0.11	ND	ND	ND	ND	18.56	42.20
2312-76	48	63	2.60	0.15	ND	ND	ND	ND	20.93	47.60
2312-92	38	33	2.20	0.17	ND	ND	ND	ND	22.38	50.90
2312-96	38	43	1.90	0.18	ND	ND	ND	ND	20.31	46.20
2412-11	28	33	2.50	0.22	ND	ND	ND	ND	23.30	53.00
2412-17	23	18	4.40	0.15	ND	ND	ND	ND	25.02	56.90
2412-31	18	43	3.10	0.18	ND	ND	ND	ND	21.85	49.70
2412-39	18	63	2.70	0.20	ND	ND	ND	ND	22.34	50.80
2412-45	8	23	3.40	0.12	ND	ND	ND	ND	22.29	50.70

APPENDIX M

Appendix M. Elemental composition of the sediments from the deep Sevier Lake SDL-2, SDL-3A, SDL-4, and W-5 holes (samples were run by J.W. Gwynn during January and February 2004.

The depth column represents the top of each five-foot interval analyzed. Values are given in terms of weight percent. Raw elemental analyses were refined using Rigaku's (2002) $CaCO_3$ balance calculation and applying one of the seven matching libraries that were based on Sevier Lake samples with known compositions. In the refined analyses, $CaCO_3$ is given in place of the CaO. In the following tables, both CaO and CO_2 are back-calculated from the $CaCO_3$ value.

Appendix M. Chemical analyses of sediments from deep hole SDL-2 as determined by semi-quantitative x-ray fluorescence analysis.

Depth	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO	Fe_2O_3	CuO	ZnO	As_2O_3	$Rb2_O$	SrO	RuO_2	CO_2	Calcite
000	1.89	3.95	3.95	31.20	0.11	0.72	2.12	1.20	29.19	0.21	0.07	0.04	2.31	ND	0.027	ND	ND	0.101	ND	22.91	52.10
010	2.98	9.07	5.74	31.60	0.10	3.76	3.44	1.94	21.63	0.27	ND	0.05	2.31	ND	ND	ND	ND	0.106	ND	16.97	38.60
035	3.73	8.21	7.94	35.10	0.11	3.95	4.48	2.31	17.48	0.27	0.03	0.04	2.52	ND	ND	ND	ND	0.090	ND	13.72	31.20
055	2.23	7.05	6.93	32.20	0.12	1.58	2.51	2.06	23.59	0.34	ND	0.04	2.72	ND	ND	ND	ND	0.100	ND	18.51	42.10
035	3.73	8.21	7.94	35.10	0.11	3.95	4.48	2.31	17.48	0.27	0.03	0.04	2.52	ND	ND	ND	ND	0.090	ND	13.72	31.20
070	1.94	5.34	10.60	41.20	0.14	0.61	1.58	2.65	17.99	0.40	ND	0.05	3.28	ND	ND	0.018	ND	0.065	ND	14.11	32.10
085	1.70	5.38	8.81	38.60	0.13	1.13	1.46	2.33	20.62	0.34	ND	0.07	3.18	ND	ND	ND	ND	0.078	ND	16.18	36.80
100	1.62	7.27	7.01	32.70	0.11	0.49	1.44	2.12	24.71	0.24	ND	0.07	2.78	ND	ND	ND	ND	0.100	ND	19.39	44.10
115	2.22	5.57	9.04	40.80	0.14	0.48	1.39	2.32	19.11	0.38	ND	0.06	3.44	ND	ND	ND	ND	0.054	ND	14.99	34.10
130	1.79	4.92	8.30	37.40	0.15	0.32	1.39	2.30	22.19	0.42	ND	0.06	3.28	ND	0.017	ND	0.018	0.060	ND	17.41	39.60
145	1.77	5.83	7.66	35.90	0.13	0.28	1.20	2.10	23.25	0.41	ND	0.06	3.06	ND	0.017	ND	ND	0.067	0.0610	18.25	41.50
160	1.45	6.91	6.96	32.40	0.11	0.45	1.33	1.82	25.33	0.26	ND	0.06	2.79	ND	ND	ND	ND	0.232	ND	19.87	45.20
175	1.34	5.39	7.47	35.40	0.14	0.37	1.15	1.95	24.26	0.32	0.04	0.05	2.93	0.058	0.013	ND	ND	0.082	ND	19.04	43.30
190	1.61	5.85	8.38	39.20	0.15	1.16	0.93	2.11	20.62	0.36	0.04	0.05	3.27	ND	ND	ND	ND	0.082	ND	16.18	36.80
205	1.58	5.65	8.80	40.30	0.14	0.40	1.05	2.26	20.17	0.38	ND	0.07	3.28	ND	ND	ND	ND	0.068	ND	15.83	36.00
220	1.59	5.29	8.26	38.10	0.14	0.38	1.23	2.09	21.96	0.43	ND	0.06	3.22	ND	ND	ND	ND	0.079	ND	17.24	39.20
235	2.84	5.46	7.50	35.80	0.11	0.96	3.04	2.14	21.63	0.29	ND	0.07	3.00	ND	0.018	ND	ND	0.079	ND	16.97	38.60
250	1.69	5.12	8.47	38.70	0.16	0.64	0.90	2.03	21.63	0.34	ND	0.05	3.19	ND	0.027	ND	ND	0.065	ND	16.97	38.60
265	2.96	6.17	6.89	33.50	0.12	1.16	3.11	1.89	22.92	0.32	ND	0.05	2.77	ND	ND	ND	ND	0.100	ND	17.98	40.90
280	1.79	5.56	8.96	40.60	0.12	0.45	0.83	2.12	19.95	0.42	ND	0.06	3.44	ND	ND	ND	ND	0.060	ND	15.65	35.60
295	2.42	4.87	8.67	38.80	0.13	0.52	2.18	2.12	20.39	0.39	ND	0.06	3.36	ND	ND	ND	ND	0.060	ND	16.01	36.40
310	1.28	4.85	6.82	32.90	0.12	0.31	0.76	1.78	26.84	0.36	0.04	0.07	2.68	ND	ND	ND	ND	0.121	ND	21.06	47.90
325	1.63	5.22	7.95	37.00	0.11	0.53	0.65	1.96	23.03	0.38	ND	0.05	3.30	ND	ND	ND	ND	0.078	ND	18.07	41.10
340	1.15	6.4	6.21	31.50	0.10	0.35	0.68	1.68	27.45	0.30	ND	0.06	2.44	ND	ND	ND	ND	0.142	ND	21.55	49.00
355	1.31	5.36	8.31	37.20	0.12	0.78	0.63	1.95	22.86	0.39	ND	0.06	3.05	ND	ND	ND	ND	0.062	ND	17.94	40.80
415	1.39	5.74	8.19	37.50	0.12	0.27	0.64	2.02	22.58	0.40	ND	0.06	3.27	ND	ND	ND	0.020	0.066	ND	17.72	40.30
475	1.56	5.26	8.92	40.70	0.16	0.38	0.94	2.22	20.17	0.40	ND	0.06	3.36	ND	0.014	ND	ND	0.064	ND	15.83	36.00
535	2.61	5.33	8.06	37.80	0.12	0.74	2.12	2.12	21.12	0.31	ND	0.06	3.07	ND	ND	ND	0.016	0.065	ND	16.58	37.70
595	2.43	4.92	8.85	41.70	0.17	0.69	2.10	2.15	18.66	0.35	ND	0.06	3.19	ND	ND	ND	ND	0.058	ND	14.64	33.30
655	2.02	5.30	9.01	41.80	0.14	0.48	1.14	2.29	18.94	0.39	ND	0.07	3.44	ND	ND	ND	ND	0.085	ND	14.86	33.80
715	1.78	470	9.31	42.80	0.18	0.33	0.75	2.22	18.94	0.45	ND	0.08	3.51	ND	0.017	ND	0.018	0.067	ND	14.86	33.80
765	1.39	4.97	9.30	42.50	0.15	0.50	0.70	2.11	19.05	0.53	ND	0.08	3.72	ND	ND	ND	ND	0.065	ND	14.95	34.00
800	1.47	4.89	7.99	38.50	0.15	0.44	1.14	2.13	22.08	0.43	ND	0.06	3.32	ND	ND	ND	ND	0.079	ND	17.32	39.40

Depth is given in feet from surface.

Appendix M. Chemical analyses of sediments from deep hole SDL-3A as determined by simi-quantitative x-ray fluorescence analysis.

Depth	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO	Fe_2O_3	CuO	ZnO	$Rb2_O$	SrO	CO_2	Calcite
035	1.86	4.83	9.23	38.10	0.17	0.96	0.47	2.00	21.52	0.40	ND	0.05	3.51	ND	0.015	ND	0.077	16.88	38.4
055	2.21	5.28	9.26	39.30	0.17	0.84	0.70	2.04	20.39	0.43	ND	0.06	3.24	ND	ND	ND	0.072	16.01	36.4
070	1.46	5.69	8.45	36.30	0.16	0.50	0.56	1.93	23.25	0.40	ND	0.05	2.92	ND	ND	ND	0.071	18.25	41.5
085	2.14	4.99	9.52	39.70	0.17	0.69	0.78	2.02	20.39	0.36	ND	0.05	3.12	ND	.013	ND	0.076	16.01	36.4
100	2.17	4.71	9.96	40.80	0.19	0.65	0.65	2.21	19.50	0.39	ND	0.05	3.35	ND	ND	ND	0.060	15.30	34.8
115	1.85	5.12	8.23	36.10	0.15	0.36	0.56	1.88	23.36	0.41	ND	0.07	3.50	ND	ND	ND	0.072	18.34	41.7
130	1.61	5.61	7.46	34.00	0.08	0.42	0.65	2.02	24.99	0.33	ND	0.04	3.16	ND	ND	ND	0.081	19.61	44.6
145	1.69	5.11	8.32	35.20	0.14	0.83	0.63	1.85	23.81	0.39	.04	0.05	3.07	ND	ND	ND	0.015	18.69	42.5
160	1.23	8.31	6.09	27.80	0.09	0.84	0.62	1.54	28.35	0.19	ND	0.03	2.51	ND	ND	ND	0.133	22.25	50.6
175	2.48	4.89	10.30	43.00	0.18	0.55	0.79	2.14	17.59	0.52	ND	0.05	3.65	0.016	ND	0.015	0.053	13.81	31.4
190	2.02	5.00	8.92	37.70	0.17	0.42	0.54	1.97	22.24	0.40	ND	0.05	3.08	ND	ND	ND	ND	17.46	39.7
205	1.76	4.80	8.89	39.00	0.20	0.46	0.51	1.82	21.68	0.39	ND	0.05	3.24	ND	ND	ND	ND	17.02	38.7
220	1.68	4.93	8.29	36.30	0.14	0.66	0.59	1.87	23.36	0.52	ND	0.05	3.14	ND	ND	ND	ND	18.34	41.7
235	1.58	4.46	8.23	36.20	0.17	0.62	0.45	1.75	24.15	0.39	ND	0.06	2.87	ND	ND	ND	ND	18.95	43.1
250	1.83	4.52	9.38	40.30	0.16	0.50	0.47	1.96	20.73	0.48	ND	0.05	3.30	ND	ND	ND	ND	16.27	37.0
265	1.26	5.01	9.04	37.80	0.15	0.36	0.54	1.90	22.47	0.41	ND	0.05	3.30	ND	ND	ND	ND	17.63	40.1
280	2.33	4.47	10.20	42.70	0.17	0.41	0.65	2.04	18.43	0.50	ND	0.05	3.57	ND	ND	ND	ND	14.47	32.9
295	1.56	4.64	8.20	34.60	0.15	0.45	0.54	1.71	24.99	0.34	0.04	0.04	3.10	ND	ND	ND	ND	19.61	44.6
310	2.17	5.24	10.00	41.40	0.16	0.64	0.72	1.98	18.88	0.36	ND	0.06	3.43	ND	ND	ND	ND	14.82	33.7
325	1.62	5.93	7.36	32.90	0.10	0.57	0.63	1.75	25.66	0.29	ND	0.04	2.94	ND	ND	ND	ND	20.14	45.8
340	1.32	5.52	7.79	34.70	0.16	0.61	0.71	2.06	24.32	0.33	ND	0.04	3.27	ND	ND	ND	ND	19.08	43.4
355	1.57	5.14	8.66	37.10	0.13	0.70	0.59	1.91	22.80	0.42	ND	0.04	2.88	ND	ND	ND	ND	17.90	40.7
415	1.22	3.77	9.29	37.80	0.16	0.61	0.51	1.95	23.08	0.51	ND	0.06	4.09	ND	ND	ND	ND	18.12	41.2
475	1.32	5.91	7.40	33.70	0.14	0.45	0.62	1.78	25.49	0.31	0.04	0.05	2.62	ND	ND	ND	ND	20.01	45.5
535	1.37	4.16	9.88	40.20	0.18	0.47	0.52	2.04	20.73	0.43	ND	0.06	3.67	ND	ND	ND	ND	16.27	37.0
595	1.75	5.24	7.97	35.00	0.12	0.69	0.55	1.87	24.20	0.35	ND	0.04	3.07	ND	ND	ND	ND	19.00	43.2
655	1.69	3.98	9.50	40.60	0.16	0.41	0.51	1.94	20.84	0.45	0.03	0.05	3.43	ND	ND	ND	ND	16.36	37.2
715	1.63	4.07	9.32	40.00	0.17	0.65	0.51	1.91	21.01	0.50	ND	0.05	3.66	ND	ND	ND	ND	16.49	37.5
760	1.55	4.69	8.36	36.80	0.17	0.62	0.55	1.85	23.36	0.40	ND	0.05	3.19	ND	ND	ND	ND	18.34	41.7
815	1.40	4.22	8.40	36.50	0.14	0.44	0.52	1.96	23.81	0.40	ND	0.06	3.42	ND	ND	ND	ND	18.69	42.5
875	1.56	4.27	9.44	40.00	0.16	0.71	0.53	1.96	20.73	0.47	ND	0.06	3.80	ND	ND	ND	ND	16.27	37.0
composite	1.20	4.24	7.66	32.50	0.15	0.44	0.46	1.68	26.67	0.05	ND	0.05	3.49	ND	ND	ND	ND	20.93	47.6

Depth is given in feet from surface

Appendix M. Chemical analyses of sediments from deep hole SDL-4 as determined by simi-quantitative x-ray fluorescence analysis.

Depth	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO	Fe_2O_3	NiO	CuO	ZnO	Rb_2O	SrO	CO_2	Calcite
000	0.216	1.16	1.59	14.0	0.15	0.32	0.08	0.329	45.10		0.069	0.03	1.78	ND	ND	ND	ND	0.080	35.40	80.50
010	1.63	3.77	3.51	21.6	0.13	2.58	0.83	0.85	35.52	0.18	ND	0.02	1.44	ND	ND	ND	ND	0.146	27.88	63.40
025	2.56	5.50	7.96	33.4	0.18	4.64	2.85	1.99	21.12	0.33	ND	0.04	2.77	ND	ND	ND	ND	0.138	16.58	37.70
035	2.97	5.49	7.02	29.9	0.09	11.20	2.74	1.90	20.23	0.27	ND	0.03	2.21	ND	ND	ND	ND	0.108	15.87	36.10
055	1.81	2.03	2.45	18.6	0.13	1.94	1.32	0.575	39.00	0.16	ND	0.02	1.32	ND	ND	ND	ND	0.094	30.60	69.60
070	3.12	4.89	5.31	26.8	0.12	5.35	2.84	1.41	26.67	0.28	0.062	0.03	2.10	ND	ND	ND	ND	0.139	20.93	47.60
085	2.73	6.23	7.98	34.3	0.16	5.99	2.88	2.24	19.33	0.31	ND	0.04	2.55	ND	ND	ND	ND	0.121	15.17	34.50
115	2.74	4.81	9.88	41.2	0.18	1.22	2.07	2.52	17.54	0.42	ND	0.05	3.46	ND	ND	ND	ND	0.060	13.76	31.30
130	2.86	5.63	7.78	33.6	0.12	1.24	2.87	2.18	22.75	0.31	ND	0.04	2.68	ND	ND	ND	ND	0.116	17.85	40.60
145	2.44	4.65	9.60	39.8	0.16	1.12	2.00	2.23	19.27	0.41	ND	0.04	3.02	ND	ND	ND	0.016	0.074	15.13	34.40
160	2.32	5.15	8.71	37.7	0.17	0.70	1.45	2.00	21.46	0.38	ND	0.04	2.97	ND	ND	0.016	ND	0.085	16.84	38.30
175	3.72	4.75	9.33	39.7	0.16	0.78	3.20	2.12	18.38	0.39	ND	0.05	2.88	ND	ND	ND	ND	0.077	14.42	32.80
190	3.41	4.58	10.10	39.4	0.18	1.19	2.79	2.08	18.38	0.46	ND	0.05	2.94	ND	ND	ND	ND	0.069	14.42	32.80
205	3.06	4.46	9.96	41.7	0.16	1.46	2.39	2.10	17.31	0.44	ND	0.04	3.25	ND	ND	ND	ND	0.065	13.59	30.90
220	2.12	4.77	8.38	36.4	0.14	0.56	1.46	1.74	23.20	0.33	ND	0.05	2.77	ND	ND	ND	ND	0.134	18.20	41.40
235	2.61	4.89	9.74	40.5	0.15	1.35	1.97	2.05	18.66	0.36	ND	0.05	3.04	ND	ND	ND	ND	0.054	14.64	33.30
250	1.46	5.22	7.34	32.8	0.14	0.59	1.24	1.72	26.11	0.31	ND	0.04	2.40	ND	ND	ND	ND	0.116	20.49	46.60
265	1.95	5.00	9.48	40.0	0.14	0.81	0.81	1.83	20.28	0.47	ND	0.06	3.20	ND	ND	ND	ND	0.066	15.92	36.20
280	2.15	4.65	9.37	38.4	0.14	0.64	1.26	1.98	21.01	0.40	ND	0.06	3.41	ND	ND	ND	ND	0.062	16.49	37.50
295	2.76	3.99	7.55	33.6	0.11	1.00	2.11	1.92	24.20	0.42	ND	0.06	3.16	0.017	ND	ND	0.017	0.068	19.00	43.20
310	1.98	5.69	8.73	37.3	0.15	0.91	1.43	1.83	21.57	0.35	ND	0.04	3.02	ND	ND	ND	ND	0.063	16.93	38.50
325	2.05	6.29	8.10	37.3	0.12	0.62	1.26	1.92	21.96	0.36	ND	0.06	2.68	ND	ND	ND	ND	0.079	17.24	39.20
340	2.22	5.51	7.69	35.0	0.13	3.56	1.28	1.88	21.96	0.35	ND	0.05	3.10	ND	ND	ND	ND	0.066	17.24	39.20
415	1.90	5.37	8.77	38.5	0.16	0.46	0.63	2.00	21.68	0.44	ND	0.04	2.97	ND	ND	ND	ND	0.100	17.02	38.70
475	1.81	4.02	8.96	40.5	0.17	0.53	0.85	1.84	20.96	0.42	ND	0.06	3.34	ND	ND	ND	0.016	0.065	16.44	37.40
535	1.84	4.58	9.03	41.1	0.17	0.36	0.70	1.98	20.51	0.46	0.057	0.05	3.00	ND	ND	ND	ND	0.069	16.09	36.60
595	1.78	4.26	9.11	40.9	0.18	0.34	0.51	1.84	20.68	0.46	0.041	0.05	3.58	ND	ND	ND	ND	0.069	16.22	36.90
655	1.17	4.94	8.88	39.0	0.18	0.60	0.44	1.92	21.96	0.38	ND	0.05	3.18	ND	ND	ND	ND	0.075	17.24	39.20
715	1.65	4.33	9.84	42.4	0.19	0.53	0.60	2.07	19.22	0.40	ND	0.05	3.57	ND	ND	ND	ND	0.069	15.08	34.30
760	1.49	5.07	8.36	38.0	0.15	0.86	0.75	2.07	22.36	0.40	ND	0.05	2.88	ND	ND	ND	ND	0.094	17.54	39.90
815	1.64	4.26	8.89	42.6	0.15	0.53	0.47	1.97	19.95	0.49	0.054	0.05	3.19	0.019	ND	ND	ND	0.064	15.65	35.60
875	1.93	3.84	8.19	45.6	0.17	0.52	1.12	1.87	18.71	0.50	0.112	0.04	2.67	ND	ND	ND	0.016	0.082	14.69	33.40
925	1.59	4.58	9.65	42.6	0.13	1.20	0.52	2.06	18.88	0.41	0.031	0.05	3.38	ND	####	ND	ND	0.072	14.82	33.70
970	2.01	3.51	7.69	46.1	0.18	0.46	1.07	1.94	18.88	0.48	0.075	0.04	2.71	ND	ND	ND	ND	0.081	14.82	33.70

Depth is given in feet from surface.

Appendix M. Chemical analyses of sediments from deep hole SDL-5 as determined by semi-quantitative X-ray fluorescence Analysis.

Depth	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	SO_3	Cl	K_2O	CaO	TiO_2	Cr_2O_3	V_2O_5	MnO	Fe_2O_3	ZnO	Rb_2O	SrO	CO_2	Calcite
000	1.38	3.66	11.4	40.60	0.19	0.33	0.57	1.43	20.00	0.44	ND	ND	0.09	4.08	0.019	0.016	0.093	15.70	35.700
010	1.11	2.29	5.01	25.90	0.07	2.62	0.42	0.59	33.39	0.24	0.045	ND	0.04	1.83	ND	ND	0.265	26.21	59.600
025	1.67	4.47	9.36	35.00	0.13	1.58	0.63	1.21	23.53	0.45	0.035	ND	0.06	3.15	0.049	ND	0.144	18.47	42.0
035	1.15	6.24	9.23	33.90	0.14	1.39	0.48	1.25	23.70	0.41	0.032	ND	0.07	3.27	0.020	0.016	0.097	18.60	42.3
055	1.34	6.41	10.4	36.80	0.16	2.40	0.60	1.33	20.39	0.45	0.074	ND	3.66	0.01	ND	ND	0.050	16.01	36.4
070	1.33	5.89	10.2	37.20	0.14	0.56	0.61	1.27	21.68	0.39	ND	ND	0.07	3.60	ND	ND	0.059	17.02	38.7
085	1.63	5.78	10.8	39.00	0.15	0.44	0.64	1.35	20.11	0.44	0.030	ND	0.09	3.71	0.014	ND	0.063	15.79	35.9
100	1.40	6.14	10.3	38.10	0.14	0.46	0.59	1.26	21.01	0.40	ND	ND	0.07	3.56	ND	ND	0.075	16.49	37.5
115	1.68	5.56	10.5	38.10	0.14	0.52	0.61	1.24	20.96	0.40	ND	ND	0.07	3.74	0.021	ND	0.082	16.44	37.4
130	1.76	5.80	9.77	36.90	0.11	0.81	0.58	1.17	21.91	0.42	ND	ND	0.08	3.44	ND	0.018	0.090	17.19	39.1
145	1.58	5.95	9.95	37.70	0.14	0.70	0.60	1.41	21.35	0.39	ND	ND	0.07	3.38	0.013	0.015	0.066	16.75	38.1
160	1.67	5.61	10.8	37.90	0.12	0.52	0.63	1.36	20.62	0.48	ND	ND	0.09	3.88	ND	ND	0.078	16.18	36.8
175	1.55	6.14	11.1	39.50	0.14	0.60	0.57	1.45	19.50	0.40	ND	ND	0.07	3.62	ND	0.016	0.075	15.30	34.8
190	1.52	7.14	8.92	34.40	0.13	0.39	0.60	1.32	23.48	0.37	ND	ND	0.06	3.20	ND	ND	0.075	18.42	41.9
205	1.53	6.43	9.76	36.80	0.15	0.57	0.55	1.37	21.63	0.42	ND	0.055	0.08	3.53	ND	ND	0.165	16.97	38.6
220	1.69	5.56	10.2	39.30	0.13	1.32	0.50	1.30	20.17	0.41	ND	ND	0.08	3.39	0.014	ND	0.100	15.83	36.0
235	1.60	5.37	11.6	41.30	0.12	0.62	0.52	1.37	18.66	0.45	ND	ND	0.08	3.60	ND	DN	0.060	14.64	33.3
250	1.47	5.36	10.5	39.30	0.15	0.35	0.48	1.44	20.45	0.48	ND	ND	0.10	3.78	ND	0.020	0.067	16.05	36.5
265	1.31	5.59	8.74	34.90	0.16	0.47	0.44	1.39	24.32	0.38	ND	ND	0.06	3.07	ND	ND	0.105	19.08	43.4
280	1.45	5.48	10.8	40.40	0.14	0.36	0.39	1.54	19.67	0.44	ND	ND	0.07	3.71	0.017	ND	0.074	15.43	35.1
295	1.42	6.02	9.19	36.10	0.16	0.34	0.32	1.37	23.08	0.35	ND	ND	0.06	3.31	0.015	ND	0.099	18.12	41.2
310	1.39	5.20	10.7	40.80	0.18	0.44	0.25	1.38	19.89	0.37	0.034	ND	0.06	3.57	ND	ND	0.083	15.61	35.5
325	1.23	5.28	10.7	40.10	0.02	0.37	0.18	1.38	20.56	0.37	ND	ND	0.09	3.36	ND	ND	0.074	16.14	36.7
340	1.44	4.62	10.5	43.20	0.15	1.12	0.31	1.29	18.71	0.45	ND	ND	0.06	3.35	ND	0.015	0.077	14.69	33.4
355	1.21	5.07	7.56	35.90	0.17	0.63	0.41	1.05	25.10	0.29	0.049	ND	0.05	2.61	ND	ND	0.154	19.70	44.8
390	0.936	3.34	7.19	35.70	0.11	0.51	0.21	0.99	27.06	0.40	0.039	ND	0.04	2.18	ND	ND	0.079	21.24	48.3
415	1.44	3.50	7.96	39.20	0.11	0.96	0.24	1.07	23.98	0.33	0.071	ND	0.03	2.19	ND	ND	0.096	18.82	42.8
450	0.531	1.94	3.91	22.80	0.12	0.10	0.06	0.50	38.60	0.21	ND	ND	0.03	1.34	ND	ND	0.061	30.30	68.9
475	0.708	1.47	3.02	19.10	0.14	0.09	0.04	0.38	41.29	0.09	0.058	ND	0.02	1.26	ND	ND	0.059	32.41	73.7
510	0.2873	1.62	2.41	14.60	0.11	0.10	0.04	0.35	44.60	0.14	0.053	ND	0.03	0.97	ND	ND	0.059	35.00	79.6
535	1.04	3.06	5.63	28.70	0.11	0.09	0.04	0.72	32.78	0.19	ND	ND	0.03	1.86	ND	ND	0.061	25.72	58.5
560	0.903	2.42	4.53	28.30	0.12	0.08	0.03	0.57	34.35	0.23	ND	ND	0.04	1.44	ND	ND	0.058	26.95	61.3
595	0.692	5.05	4.22	28.90	0.09	0.10	0.04	0.52	32.78	0.18	ND	ND	0.04	1.60	ND	ND	0.055	25.72	58.5
630	1.44	1.39	7.57	70.00	0.07	0.02	0.02	1.75	14.80	0.34	ND	ND	0.03	2.52	ND	ND	0.060	11.61	26.414
655	1.519	0.833	7.32	70.50	0.07	0.01	0.02	1.60	16.60	0.04	ND	ND	0.02	2.62	ND	ND	0.053	13.03	29.627
680	1.56	1.07	7.68	68.30	0.09	0.02	0.02	1.71	16.20	0.04	ND	ND	0.01	2.90	ND	ND	0.048	12.71	28.913
715	1.32	1.11	6.42	72.10	0.0803	0.01	0.03	1.44	14.70	0.29	0.060	ND	0.02	2.30	ND	ND	0.050	11.54	26.236

Depth is given in feet from surface.

APPENDIX N

Appendix N. Copy of the procedure, titled "Starting with a pile of bagged mud," developed during the wet sieving of the Sevi er Lake muds that were obtained by augering 20-foot-deep holes across the lake (written under the direction of J.W. Gwynn).

For each hole, a sieve analysis was done for each of the four, five-foot intervals.

STARTING WITH A PILE OF BAGGED MUD

1. Arrange mud samples according to hole number and depth range, 0-5, 5-10t, 10-15, and 15-20 feet.

2a. Record hole numbers in increasing order.

2b. Consult notebook and determine which muds are to be sieved.

2c. On Sevier Lake map, mark new holes with a red, 1982 slash.

3a. Build boxes, securing with fiber tape and place bagged muds in numerical order into them.

3b. Build tops of boxes and label hole numbers after muds are panned, bottled and sieved.

4a. Label the dram bottles and pans with hole numbers and depth.

4b. Abbreviations for depths are as follows: A=0-5 feet, B=5-10 feet, C=10-15 feet, and D=15-20 feet.

5a. Wet-sieve muds from all the bags. A thin layer of mud in the aluminum pan is all that is needed.

5b. Place pans in oven and dry them

5c. Place bottles in the box that you have built.

5d. When panned muds are dry, stack them in a box and fill out Chemical & Mineralogical Services work order sheet.

6. Sieving:

   a. On 1/2-inch-wide masking tape, label the hole number and depth. Be sure to do each depth at one time, all A's, then all B's.
   b. Stick labels onto wide, vertical side of the flat boxes, 7 labels per box.
   c. Weigh out, on the triple-beam balance, 200 grams of the dried mud. Weigh as many mud samples as you think you can sieve in one day. Weight each sample on a small square of plastic and place on the counter in some order so as not to forget which is which. Put scale back on shelf.
   d. Place stacked sieves into sink and wet down. Set blender to left of sink, and set box with taped numbers to the right of sink.
   e. Fill blender to second line with tap water.
   f. Drop in 200-gram sample and blend. While blending, place five weigh boats to right side of sink.
   g. Turn off blender and at the same time, remove and pour into sieves.
   h. Work the slurry through the sieve stack by rattling the sieves back and forth.
   i. Rinse out slurry remains from blender into stack and work through stack.
   j. While shaking the sieves, rinse tap water through and make sure all mud globs are worked through top sieve.
   k. Pull off top sieve and rinse grains to one side then squirt bottle to rinse grains into first weigh boat.
   l. Repeat above (k) process with each sieve, making sure the water in the weigh boat is not cloudy.
   m. Pour off excess water from weigh boats and place in descending size into box. When pouring off water, some organic matter will be lost.
   n. Repeat the process for each of the pre-weighed mud samples.
   o. Place box with samples in a safe place to dry.

7. Weighing:

   a. Use Mettler balance to weigh samples.
   b. Zero scale to weigh boat.
   c. Weigh sample to an accuracy of ± .1 gram.
   d. Record weights in note book.

e. Stack the five samples of each hole and place in box to side of scale.
f. Place sample number on to the top of weigh boat.

8. Visual ID

   a. Look at each sample and estimate the mineral weight percent of aragonite, pellets, gypsum, quartz, limestone, organic and other minerals.

9. Calculate the total weight of sample, the total weight percent, total weight of gypsum, and the total weight of the outwash, clastic grains, quartz+limestone+rock fragments.

10. Plot total weights of gypsum and outwash material on the appropriate map overlays. This is to be done for each depth and one for each mineral. There will be total of eight maps.

APPENDIX O

Appendix O. Observed depth to the top and bottom of brine determined during the augering of the 20-foot-deep holes, and the thickness of the salt crust at each hole location (data from CPMC field notes1979 to 1982).

This table reports data for 560 holes. The average thickness of the salt crust is 3.00 inches over an area of about 37 square miles. Data in the table are sorted by hole number. For example, hole 2212-73 means T. 22 S., R. 12 W., and unique quarter-section number 73 (refer to figure 19 for quarter-section numbering system). An explanation of the column headings is given at the end of the table.

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
08/11/81	2010-001	1	20	?	
07/28/81	2010-002	nd	nd	?	no brine
08/11/81	2010-003	3.5	20	?	
08/12/81	2010-004	3	8	T	
08/12/81	2010-005	?	?	T	"unknown" level
08/11/81	2010-006	1	20	?	
08/11/81	2010-007	1	20	?	
08/11/81	2010-008	3	20	?	
08/11/81	2010-009	4	20	?	
08/13/81	2010-010	nd	nd	T	no brine
08/13/81	2010-011	?	?	T	"unknown" level
08/13/81	2010-012	?	?	?	"unknown" level
08/13/81	2010-013	nd	nd	T	no brine
08/13/81	2010-014	nd	nd	?	no brine
08/13/81	2010-015	nd	nd	T	no brine
08/13/81	2010-016	nd	nd	?	no brine
08/13/81	2010-017	?	?	T	"unknown" level
08/12/81	2010-018	nd	nd	T	no brine
08/12/81	2010-019	?	?	?	"unknown" level
08/12/81	2010-020	?	?	T	"unknown" level
08/12/81	20100-21	nd	nd	?	no brine
08/12/81	2010-022	?	?	T	"unknown" level
08/14/81	2010-023	?	?	T	"unknown" level
08/14/81	2010-024	nd	nd	T	no brine
08/14/81	2010-026	?	?	?	"unknown" level
08/14/81	2010-028	nd	nd	T	no brine
06/27/81	2011-001	nd	nd	nf	no brine
07/08/81	2011-003	nd	nd	nf	no brine
07/08/81	2011-004	?	?	nf	"unknown" level
06/27/81	2011-005	nd	nd	nf	no brine
07/10/81	2011-006	?	?	?	"unknown" level
06/27/81	2011-007	nd	nd	nf	no brine
07/08/81	2011-007	nd	nd	nf	no brine
07/08/81	2011-008	nd	nd	nf	no brine
06/26/81	2011-009	18	20	T	
07/09/81	2011-009	7.5	20	nf	
07/10/81	2011-010	?	?	T	"unknown" level
06/26/81	2011-011	nd	nd	T	no brine
07/10/81	2011-012	?	?	?	"unknown" level
07/09/81	2011-013	5	20	nf	
07/09/81	2011-014	nd	nd	nf	no brine
07/10/81	2011-015	?	?	?	
07/10/81	2011-016	nd	nd	?	no brine
07/09/81	2011-018	nd	nd	nf	no brine
07/09/81	2011-020	nd	nd	nf	no brine
07/12/81	2011-021	10	20	T	
07/09/81	2011-022	nd	nd	nf	no brine
07/12/81	2011-023	3	20	T	
07/12/81	2011-024	3	20	T	
07/12/81	2011-025	nd	nd	T	no brine
07/09/81	2011-025?	4	nd	nf	pocket of brine
07/12/81	2011-026	0.13	20	T	
07/12/81	2011-027	?	?	T	"unknown" level
07/15/81	2011-028	0	20	nf	artesian
07/12/81	2011-029	0.33	20	?	
07/15/81	2011-030	?	?	nf	"unknown" level
07/12/81	2011-031	1	nd	?	
07/15/81	2011-032	0.13	20	T	
07/10/81	2011-033	?	?	T	"unknown" level
07/15/81	2011-034	?	?	T	"unknown" level
07/10/81	2011-035	?	?	T	"unknown" level
07/15/81	2011-036	0.5	20	T	
07/10/81	2011-037	?	?	T	
07/15/81	2011-038	?	?	T	"unknown" level
07/13/81	2011-039	?	?	?	"unknown" level
07/13/81	2011-040	?	?	?	"unknown" level
07/13/81	2011-041	?	?	nf	"unknown" level
07/13/81	2011-042	?	?	?	"unknown" level
07/13/81	2011-043	0.5	20	nf	
07/13/81	2011-044	?	?	T	"unknown" level
07/13/81	2011-046	nd	nd	?	no brine
07/25/83	2011-047	?	?	?	"unknown" level
09/01/79	2011-050	14	15	6	
07/23/81	2011-051	0.5	15	T	
09/02/79	2011-052	10	20	1	
07/25/83	2011-053	?	?	?	"unknown" level
07/13/81	2011-054	nd	nd	?	no brine
07/24/81	2011-055	?	?	T	"unknown" level
07/24/81	2011-056	?	?	T	"unknown" level
07/23/81	2011-057	?	15	T	
07/25/81	2011-059	?	?	T	"unknown" level
07/25/81	2011-060	?	?	T	"unknown" level
07/24/81	2011-061	?	?	T	"unknown" level
07/26/81	2011-061	?	?	T	"unknown" level
07/26/81	2011-064	?	?	T	"unknown" level
07/26/81	2011-065	?	?	T	"unknown" level
07/26/81	2011-065	?	?	T	"unknown" level
07/25/81	2011-067	?	?	T	"unknown" level
07/28/81	2011-067	?	?	T	"unknown" level
07/28/81	2011-068	?	?	T	"unknown" level
07/28/81	2011-069	?	?	T	"unknown" level
07/28/81	2011-070	?	?	T	"unknown" level
08/14/81	2011-072	nd	nd	?	no brine
07/28/81	2011-073	?	?	T	"unknown" level
12/04/81	2011-074	15	20	nf	
07/26/81	2011-075	?	?	T	"unknown" level
12/03/81	2011-076	15	20	nf	
07/26/81	2011-077	?	?	T	"unknown" level
12/03/81	2011-078	15	20	nf	
07/25/81	2011-079	?	?	T	"unknown" level
08/23/79	2011-080	0	20	nf	
07/25/81	2011-081	?	?	T	"unknown" level
08/23/79	2011-082	0	20	T	
07/24/81	2011-083	?	?	T	"unknown" level
08/23/79	2011-084	0	18	nf	
08/23/79	2011-086	0	20	nf	
09/02/79	2011-087	15	20	0.75	
08/23/79	2011-088	0	16	2	

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
09/02/79	2011-089	15.5	20	1	
08/23/79	2011-090	0	17	4	
09/02/79	2011-091	12	20	1	
08/23/79	2011-092	0	15	nf	
08/23/79	2011-092 (n	nd	20	0.75	
08/23/79	2011-092 (n	8	20	0.5	
08/23/79	2011-092 (s	nd	20	1	
08/23/79	2011-092 (s	15	20	1	
09/01/79	2011-093	18	20	3	
08/23/79	2011-094	0	12	12	
12/06/81	2011-108	10	15	nf	.
12/02/81	2011-111	10	20	nf	
12/06/81	2011-112	15	20	nf	
12/02/81	2011-113	10	15	nf	
12/06/81	2011-114	10	15	nf	
08/14/81	2011-115	3	11	?	
08/14/81	2011-116	7	20	?	
12/02/81	2011-117	?	?	T	"unknown" level
12/04/81	2011-118	10	15	nf	
06/28/81	2011-119	?	?	T	"unknown" level
06/28/81	2011-120	nd	nd	T	no brine
06/28/81	2011-121	10	nd	T	pocket of brine
06/28/81	2011-122	nd	20	T	
06/26/81	2011-123	10	nd	nf	pocket of brine
06/26/81	2011-124	nd	nd	T	
06/26/81	2011-126	nd	nd	T	no brine
06/27/81	2011-127	nd	20	T	
06/26/81	2011-128	nd	nd	T	no brine
06/27/81	2011-128	nd	20	nf	
06/27/81	2011-129	nd	20	T	
06/27/81	2011-130	?	?	T	"unknown" level
06/27/81	2011-131	nd	nd	nf	no brine
07/08/81	2011-132	?	?	T	"unknown" level
07/08/81	2012-001	nd	nd	nf	no brine
07/08/81	2012-002	nd	nd	nf	no brine
07/08/81	2012-003	?	?	nf	"unknown" level
09/06/79	2012-006	nd	20	T	
07/15/81	2012-007	2	20	T	
07/25/83	2012-008	nd	nd	T	no brine
09/06/79	2012-009	nd	nd	0.125	no brine
09/06/79	2012-010	15	20	0.5	
09/04/79	2012-012	nd	nd	0.5	no brine
09/06/79	2012-013	16	20	T	
09/25/79	2012-014	19	nd	1	
09/03/79	2012-015	nd	nd	T	no brine
09/03/79	2012-016	nd	nd	nf	
09/03/79	2012-017	nd	nd	nf	no brine
09/03/79	2012-018	nd	nd	T	no brine
09/03/79	2012-021	18	20	0.063	
09/03/79	2012-023	17	20	nf	
09/04/79	2012-025	nd	nd	1	
09/25/79	2012-027	11	16	1	
07/25/83	2012-028	nd	nd	T	no brine
09/01/79	2012-030	10	12	4	
09/06/79	2012-031	18	20	1	
09/01/79	2012-032	15	20	2	
09/01/79	2012-033	nd	20	1	
08/23/79	2012-034	0	15	12	
09/01/79	2012-035	?	?	1	"unknown" level
09/02/79	2012-038	0	17	nf	
09/03/79	2012-040	0	18	nf	
09/03/79	2012-042	0	17	nf	
09/03/79	2012-044	0	17	nf	
09/03/79	2012-046	1	16	nf	
09/04/79	2012-047	5	19	nf	
07/25/83	2012-047	?	?	T	"unknown" level
03/09/82	2110-001	10	15	nf	
03/09/82	2110-002	10	15	nf	no brine
03/09/82	2111-001	15	20	nf	
03/09/82	2111-002	15	20	nf	
03/08/82	2111-003	nd	nd	nf	no brine
04/20/82	2111-005	15	20	T	
03/07/82	2111-006	15	20	nf	
03/04/82	2111-007	10	15	nf	
03/08/82	211100-7	nd	nd	nf	no brine
03/05/82	2111-008	10	15	nf	
04/15/82	2111-009	15	20	T	
04/15/82	2111-010	nd	nd	0.5	no brine
04/15/82	2111-011	15	20	T	
04/14/82	2111-012	15	20	T	
04/20/82	2111-013	10	15	T	
04/20/82	2111-014	nd	nd	0.5	no brine
04/30/82	2111-015	1	20	2	
05/25/82	2111-015	15	20	1	
04/30/82	2111-016	10	15	1	
05/25/82	2111-016	10	15	1	
04/30/82	2111-017	nd	nd	3	no brine
05/02/82	2111-018	5	15	4	
05/02/82	2111-019	nd	nd	4	no brine
05/03/82	2111-020	nd	nd	4	no brine
05/02/82	2111-021	nd	nd	4	no brine
06/03/82	2111-022	10	15	4	
06/03/82	2111-023	nd	nd	4	no brine
06/03/82	2111-024	nd	nd	4	no brine
05/02/82	2111-025	nd	nd	4	no brine
06/03/82	2111-025	10	15	4	
06/03/82	2111-026	10	15	4	
06/04/82	2111-027	10	15	6	
06/04/82	2111-028	10	15	6	
04/29/82	2111-030	nd	nd	4	no brine
05/03/82	2111-031	nd	nd	4	no brine
04/29/82	2111-032	nd	nd	4	no brine
04/20/82	2111-033	nd	nd	0.5	no brine
04/18/82	2111-034	10	15	0.5	
04/30/82	2111-035	nd	nd	2	no brine
04/18/82	2111-036	15	20	4	
04/14/82	2111-037	10	15	T	
04/14/82	2111-038	nd	nd	T	no brine

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
04/14/82	2111-039	10	15	T	
04/14/82	2111-040	15	20	T	
03/07/82	2111-041	nd	nd	nf	no brine
03/07/82	2111-042	15	20	nf	
03/04/82	2111-043	nd	nd	nf	no brine
03/08/82	2111-045	nd	nd	nf	no brine
03/08/82	2111-046	10	15	nf	
03/05/82	2111-047	15	20	nf	
03/02/82	2111-048	10	15	nf	
03/02/82	2111-049	10	15	nf	
04/14/82	2111-050	10	15	T	
03/19/82	2111-051	15	20	nf	
04/14/82	2111-052	nd	nd	T	no brine
03/21/82	2111-053	nd	nd	nf	no brine
04/18/82	2111-054	nd	nd	0.5	no brine
04/16/82	2111-055	15	20	1	
04/18/82	2111-056	15	20	4	
04/16/82	2111-057	5	20	4	
04/29/82	2111-058	10	20	4	
04/28/82	2111-059	nd	nd	6	no brine
04/29/82	2111-060	nd	nd	4	no brine
05/03/82	2111-061	nd	nd	2	no brine
06/03/82	2111-062	nd	nd	4	no brine
04/19/82	2111-064	nd	nd	5	no brine
06/03/82	2111-064	nd	nd	6	no brine
04/19/82	2111-065	15	20	6	
04/06/82	2111-067	nd	nd	6	no brine
04/19/82	2111-068	10	15	4	
04/06/82	2111-069	15	20	6	
04/28/82	2111-070	10	15	4	
04/05/82	2111-071	15	20	4	
05/03/82	2111-072	nd	nd	2	no brine
04/06/82	2111-073	10	15	6	
04/16/82	2111-074	15	20	T	
04/16/82	2111-076	nd	nd	4	no brine
03/31/82	2111-077	10	15	T	
03/19/82	2111-078	15	20	nf	
03/19/82	2111-079	nd	nd	nf	no brine
03/31/82	2111-080	10	15	T	
03/31/82	2111-081	10	15	T	
12/22/81	2111-082	nd	nd	nf	no brine
12/22/81	2111-083	nd	nd	T	no brine
02/18/82	2111-090	10	15	nf	
02/23/82	2111-091	5	15	nf	
02/18/82	2111-092	nd	nd	4	
02/22/82	2111-093	10	15	nf	
02/18/82	2111-094	nd	nd	8	
04/04/82	2111-094	nd	nd	6	no brine
04/04/82	2111-095	10	15	nf	
04/06/82	2111-096	nd	nd	4	no brine
04/04/82	2111-097	nd	nd	6	no brine
04/06/82	2111-098	nd	nd	6	no brine
04/03/82	2111-100	10	15	6	
04/03/82	2111-101	nd	nd	6	no brine

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
04/19/82	21111-063	15	20	6	
02/22/82	2111-110	15	20	nf	
02/22/82	2111-111	15	20	nf	
04/03/82	2111-112	nd	nd	T	
05/24/82	2111-113	10	15	3	
04/03/82	2111-114	10	15	6	
05/24/82	2111-115	15	20	2	
04/03/82	2111-116	nd	nd	6	
05/25/82	2111-117	nd	nd	3	no brine
04/03/82	2111-118	15	20	T	
05/25/82	2111-119	15	20	1	
08/22/79	2112-017	nd	nd	nf	no brine
08/03/79	2112-02	14	17	12	
08/03/79	21120-24	17	20	2	
08/03/79	2112-026	4	16	thick	
08/03/79	2112-028	13	17	thick	
08/03/79	2112-030	13	18	18	
08/03/79	2112-032	13	16	18	
08/21/79	2112-034	5	20	3	
08/21/79	2112-035	3	20	6	
08/21/79	2112-036	10	20	18	
08/21/79	2112-037	5	20	8	
08/21/79	2112-038	11	20	18	
08/21/79	2112-039	2	20	1	
08/09/79	2112-046	nd	nd	T	
08/09/79	2112-047	16	18	T	
08/09/79	2112-050	nd	nd	nf	no brine
08/09/79	2112-051	nd	nd	1	no brine
08/22/79	2112-052	18	20	nf	
09/24/82	2112-052	5	10	nf	
08/22/79	2112-053	15	20	nf	
08/22/79	2112-054	16	20	1	
08/22/79	2112-055	nd	20	T	
08/22/79	2112-056	5	20	nf	
08/22/79	2112-057	nd	20	nf	
08/22/79	2112-058	18	20	T	
08/28/82	2112-059	15	20	0.5	
07/10/82	2112-060	10	15	0.5	
07/27/82	2112-061	15	20	0.5	
07/10/82	2112-062	nd	nd	0.5	no brine
08/28/82	2112-063	10	15	0.75	
07/10/82	2112-064	10	15	1	
08/28/82	2112-065	10	15	1	
07/10/82	2112-066	nd	nd	1	no brine
08/28/82	2112-067	15	20	Thick	
07/10/82	2112-068	10	15	3	
08/28/82	2112-069	10	15	1	
07/10/82	2112-070	nd	nd	2	no brine
08/28/82	2112-071	nd	nd	8	no brine
10/07/82	2112-072	15	20	2	
09/25/82	2112-073	15	20	0.5	
09/25/82	2112-074	15	20	0.5	
09/25/82	2112-075	10	15	0.5	
07/14/82	2112-076	10	15	0.5	

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
07/09/82	2112-077	nd	nd	0.5	no brine
07/08/82	2112-078	10	15	0.5	
07/09/82	2112-079	10	15	T	
07/08/82	2112-080	10	15	T	
07/09/82	2112-081	10	15	nf	
07/08/82	2112-082	10	15	nf	
07/09/82	2112-083	10	15	nf	
07/08/82	2112-084	15	20	nf	
07/09/82	2112-085	10	15	nf	
07/08/82	2112-086	10	15	nf	
07/09/82	2112-087	10	15	nf	
07/08/82	2112-088	5	10	nf	
10/11/82	2112-089	5	10	nf	
12/10/79	2112-090	nd	20	0.5	
02/09/79	2112-091	nd	20	T	
12/10/79	2112-092	nd	nd	T	no brine
02/09/79	2112-093	nd	nd	T	
12/10/79	2112-094	nd	nd	T	no brine
02/09/79	2112-095	nd	20	0.063	
12/10/79	2112-096	nd	nd	T	no brine
02/09/79	2112-097	nd	nd	T	no brine
02/09/79	2112-099	nd	nd	0.5	no brine
12/10/79	2112-100	nd	nd	0.25	no brine
02/09/79	2112-101	nd	20	0.2	
02/21/82	2211-005	10	15	nf	
02/22/82	2211-006	15	20	nf	
02/21/82	2211-007	nd	nd	nf	no brine
02/22/82	2211-008	15	20	nf	
05/24/82	2211-009	10	15	2	
05/24/82	2211-010	nd	nd	0.5	no brine
05/24/82	2211-011	15	20	1	
05/24/82	2211-012	nd	nd	1	no brine
05/25/82	2211-013	15	20	3	
05/25/82	2211-014	15	20	1	
06/05/82	2211-025	10	15	T	
06/05/82	2211-026	10	15	T	
06/08/82	2211-027	nd	nd	0.5	no brine
06/18/82	2211-027	nd	nd	nf	no brine
06/08/82	2211-028	10	15	0.5	
05/26/82	2211-029	nd	nd	2	no brine
05/26/82	2211-030	10	15	1	
05/26/82	2211-031	15	20	1	
05/26/85	2211-032	nd	nd	1	no brine
06/05/82	2211-034	10	15	T	
06/05/82	2211-035	nd	nd	nf	no brine
06/08/82	2211-036	10	15	0.5	
06/08/82	2211-037	10	15	0.5	
06/09/82	2211-038	nd	nd	0.5	no brine
06/09/82	2211-039	10	15	0.5	
06/17/82	2211-040	10	15	0.5	
06/17/82	2211-041	10	15	0.5	
06/09/82	2211-042	nd	nd	0.5	no brine
06/09/82	2211-043	10	15	0.5	
06/17/82	2211-044	nd	nd	0.5	no brine
06/17/82	2211-045	nd	nd	0.5	no brine
09/20/80	2211-046	nd	20	T	much brine
06/17/82	2211-047	10	15	nf	
06/09/82	2211-048	10	15	nf	
06/09/82	2211-049	10	15	nf	
09/20/80	2211-050	nd	20	T	
06/18/82	2211-051	5	10	nf	
06/18/82	2211-052	nd	nd	nf	no brine
09/20/80	2211-066	nd	20	T	
06/18/82	2211-079	nd	nd	nf	no brine
12/08/79	2212-005	7	nd	0.25	pocket of brine
12/08/79	2212-007	nd	nd	T	no brine
12/08/79	2212-009	nd	nd	T	trace brine
10/07/82	2212-009	5	10	nf	
12/07/79	2212-010	11	16	nf	
12/08/79	2212-011	nd	nd	T	no brine
10/07/82	2212-011	10	15	nf	
12/07/79	2212-012	nd	nd	T	no brine
12/08/79	2212-013	nd	nd	T	no brine
10/07/82	2212-013	10	15	nf	
12/07/79	2212-014	nd	nd	nf	no brine
12/08/79	2212-015	nd	nd	nf	no brine
10/07/82	2212-015	10	15	nf	
11/04/79	2212-020	nd	nd	nf	
11/04/79	2212-022	nd	nd	nf	
11/05/79	2212-023	17	20	0.125	
11/05/79	2212-024	11	18	nf	
10/11/82	2212-024	5	10	nf	
12/07/79	2212-025	15	nd	nf	brine pocket
10/29/82	2212-032a	5	10	nf	
10/29/82	2212-032b	10	15	nf	
10/26/82	2212-032c	10	15	nf	
10/26/82	2212032d	?	?	nf	"unknown" level
11/05/79	2212-035	11	16	0.25	
11/05/79	2212-036	nd	nd	nf	no brine
11/05/79	2212-038	16	20	T	pocket of brine
11/04/79	2212-039	nd	nd	T	
11/04/79	2212-040	nd	20	T	trace brine
11/04/79	2212-041	nd	nd	T	no brine
11/04/79	2212-042	nd	nd	nf	no brine
11/20/79	2212-043	nd	nd	T	
11/20/79	2212-044	nd	nd	nf	no brine
11/29/83	2212-046	nd	nd	T	no brine
11/20/79	2212-047	nd	nd	nf	
11/20/79	2212-048	nd	nd	T	no brine
11/30/79	2212-049	nd	nd	T	no brine
11/29/83	2212-050	nd	nd	T	no brine
11/29/83	2212-051	nd	20	nf	
11/29/83	2212-052	nd	nd	T	no brine
11/30/79	2212-053	nd	20	T	
11/30/79	2212-054	nd	nd	T	no brine
11/30/79	2212-055	nd	20	nf	
12/01/79	2212-056	nd	nd	T	no brine
11/05/79	2212-057	15	18	nf	pockets of brine

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
11/30/79	2212-059	nd	21	0.125	
11/30/79	2212-060	nd	nd	4	no brine
12/01/79	2212-067	nd	nd	T	no brine
12/01/79	22120-69	nd	nd	T	no brine
12/01/79	2212-071	nd	20	nf	
10/28/82	2212-072	15	20	nf	
12/01/79	2212-073	nd	21	T	
10/28/82	2212-074	15	20	nf	
12/01/79	2212-075	nd	nd	nf	trace brine
10/28/82	2212-076	10	15	nf	
10/28/82	2212-078	10	15	nf	
12/07/79	2212-08	15	20	T	pockets at
10/27/82	2212-083	10	15	nf	
10/26/82	2212-084	10	15	nf	
10/29/82	2212-085	10	15	nf	
10/26/82	2212-086	?	?	nf	"unknown" level
10/27/82	2212-087	10	15	nf	
10/27/82	2212-088	10	15	nf	
10/27/82	2212-089	15	20	nf	
10/27/82	2212-090	10	15	nf	
10/27/82	2212-094	5	10	nf	
10/28/82	2212-700	10	20	nf	
10/13/80	2311-010	nd	nd	nf	no brine
10/13/80	2311-011	nd	20	T	
10/11/82	2312-008	20	20	nf	
10/23/82	2312-010	10	15	nf	
10/25/82	2312-011	10	15	nf	
10/23/82	2312-012	10	15	nf	
10/25/82	2312-013	10	15	nf	
10/23/82	2312-014	10	15	nf	
10/25/82	2312-015	10	15	nf	
12/08/82	2312-016a	10	15	nf	
12/08/82	2312-016b	10	15	nf	
01/09/83	2312-016c	10	15	nf	
01/09/83	2312-016d	10	15	nf	
11/21/82	2312-020	10	20	nf	EP#1
11/21/82	2312-020	10	15	nf	EP#2
11/21/82	2312-020	10	15	nf	EP#3
10/13/82	2312-022	10	15	nf	
10/13/82	2312-023	5	10	nf	
10/14/82	2312-024	10	15	nf	
10/13/82	2312-025	10	15	nf	
10/14/82	2312-026	10	15	nf	
10/13/82	2312-027	10	15	nf	
10/14/82	2312-030	10	15	nf	
10/13/82	2312-031	10	15	nf	
01/15/83	2312-034	10	15	nf	
01/10/83	2312-036a	10	15	nf	
01/10/83	2312-036b	10	15	nf	
01/10/83	2312-036c	10	15	nf	
01/10/83	2312-036d	10	15	nf	
10/11/82	2312-058	15	20	nf	
10/11/82	2312-059	15	20	nf	
10/12/82	2312-060	10	15	nf	

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
10/12/82	2312-061	10	15	nf	
12/12/82	2312-076	10	15	nf	
12/12/82	2312-077	10	15	nf	
12/12/82	2312-078	10	15	nf	
10/12/82	2312-082	15	20	nf	
10/12/82	2312-084	10	15	nf	
10/12/82	2312-085	10	15	nf	
10/11/82	2312-087	20	20	nf	
10/11/82	2312-090	15	20	nf	
10/11/82	2312-091	15	20	nf	
11/10/80	2312-094	?	?	T	"unknown" level
11/10/80	2312-096	nd	20	T	
11/10/80	2312-097	nd	20	T	
11/10/83	2312-098	0	20	nf	artesian
11/10/80	2312-099	nd	20	T	
11/10/80	2312-100	?	?	T	"unknown" level
11/10/80	2312-101	6	nd	nf	brine pocket
11/10/80	2312-905	?	?	nf	"unknown" level
10/13/80	2411-001	nd	20	nf	
10/13/80	2411-002	nd	nd	nf	no brine
09/23/80	2412-001	nd	20	T	
09/23/80	2412-002	nd	20	T	
01/11/83	2412-002a	10	15	nf	
01/11/83	2412-002b	10	15	nf	
01/11/83	2412-002c	5	10	nf	
01/11/83	2412-002c	10	15	nf	
09/23/80	2412-003	nd	20	T	
10/25/80	2412-005	?	?	T	Level of brine
10/25/80	2412-006	nd	21	T	
10/25/80	2412-007	?	?	T	Level of brine
10/25/80	2412-008	nd	20	T	
10/25/80	2412-009	nd	20	T	
10/25/80	2412-010	nd	nd	T	
10/25/80	2412-011	nd	21	T	
10/25/80	2412-012	16	nd	T	pocket of brine
11/11/80	2412-013	nd	21	T	
11/11/80	2412-014	nd	20	T	
11/11/80	2412-015	nd	nd	nf	no brine
11/11/80	2412-016	nd	nd	nf	no brine
10/29/80	2412-018	nd	20	nf	
10/29/80	2412-019	nd	nd	nf	no brine
10/29/80	2412-020	nd	nd	nf	no brine
10/29/80	2412-021	nd	nd	nf	no brine
11/11/80	2412-022	nd	nd	T	no brine
10/29/80	2412-023	nd	nd	nf	no brine
11/11/80	2412-024	nd	nd	T	no brine
10/11/80	2412-025	nd	nd	nf	no brine
10/14/80	2412-026	nd	nd	nf	no brine
10/29/80	2412-027	nd	20	nf	no brine
10/29/80	2412-028	nd	nd	nf	no brine
10/11/80	2412-029	nd	nd	nf	no brine
10/11/80	2412-029	10	20	T	
10/14/80	2412-030	nd	20	nf	trace brine
10/11/80	2412-031	nd	nd	nf	no brine

Date	Hole No.	High[1]	Low[2]	Crust[3]	Comments[4]
10/14/80	2412-032	nd	nd	nf	no brine
10/14/80	2412-033	nd	nd	nf	no brine
10/14/80	2412-034	nd	nd	nf	no brine
10/14/80	2412-036	nd	nd	nf	no brine
10/29/80	2412-037	?	?	nf	"unknown" level
10/29/80	2412-038	nd	nd	nf	no brine
10/13/80	2412-039	nd	20	nf	
10/13/80	2412-04	nd	20	nf	
10/29/80	2412-040	nd	nd	nf	no brine
11/11/80	2412-044	nd	nd	nf	no brine
11/11/80	2412-045	nd	nd	nf	no brine
10/11/80	2412-05	nd	20	T	
10/14/80	2412-056	nd	nd	nf	no brine
12/18/81	N #1	?	?	nf	"unknown" level
12/18/81	N #6	nd	nd	nf	no brine
12/06/81	N sect 2	nd	nd	nf	no brine
12/18/81	S #1	?	?	T	"unknown" level
12/18/81	S #2	?	?	T	"unknown" level
12/18/81	S #6	nd	nd	nf	no brine

[1] High (ft): depth to top of brine (nd = not determined)
[2] Low (ft): depth to bottom of brine (nd = not determined)
[3] Crust thickness (in): nf = none found, T=trace (probably .125 in or less)
[4] Comments: no brine, level of brine not known, brine pocket etc.

APPENDIX P

Appendix P. Water content in the Sevier Lake sediment samples.

A small amount of wet mud was taken from each plastic bag and weighed - weights are all in grams. The mud was then placed in an aluminum dish and thoroughly dried and re-weighed. Water content (percent H_2O) content in the sample was calculated as (wet weight - dry weight) divided by wet weight. From these data, and the information from Appendix I, the percent of dissolved salts in the muds can be determined. Level A = 0-5 feet, level B - 5-10 feet, level C = 10-15 feet, and level D = 15 to 20 feet in depth.

WATER CONTENT OF SEVIER LAKE SEDIMENTS

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O	SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2011-048	A	29.070	19.140	9.930	34.16	2012-020	A	45.400	37.340	8.060	17.75
2011-050	A	34.140	22.390	11.750	34.42	2012-021	A	40.690	27.180	13.510	33.20
2011-052	A	26.890	17.450	9.440	35.11	2012-022	A	42.780	29.150	13.630	31.86
2011-054	A	36.520	23.450	13.070	35.79	2012-023	A	42.420	29.750	12.670	29.87
2011-080	A	31.310	20.750	10.560	33.73	2012-024	A	36.670	25.820	10.850	29.59
2011-082	A	34.650	23.320	11.330	32.70	2012-025	A	39.050	26.100	12.950	33.16
2011-084	A	25.880	17.760	8.120	31.38	2012-026	A	42.170	28.700	13.470	31.94
2011-086	A	35.520	23.890	11.630	32.74	2012-027	A	37.830	25.550	12.280	32.46
2011-087	A	28.880	19.510	9.370	32.44	2012-028	A	35.430	23.050	12.380	34.94
2011-088	A	31.570	21.250	10.320	32.69	2012-030	A	42.180	27.450	14.730	34.92
2011-089	A	30.550	21.710	8.840	28.94	2012-031	A	34.490	23.710	10.780	31.26
2011-090	A	23.900	16.000	7.900	33.05	2012-032	A	44.740	31.540	13.200	29.50
2011-091	A	32.560	20.790	11.770	36.15	2012-033	A	38.440	27.040	11.400	29.66
2011-092	A	43.910	27.950	15.960	36.35	2012-034	A	38.790	23.720	15.070	38.85
2011-092-NE	A	41.320	29.370	11.950	28.92	2012-035	A	38.530	25.990	12.540	32.55
2011-092-NW	A	31.040	21.230	9.810	31.60	2012-036	A	32.230	21.190	11.040	34.25
2011-092-SE	A	34.370	20.820	13.550	39.42	2012-037	A	40.190	24.100	16.090	40.03
2011-092-SW	A	41.490	25.600	15.890	38.30	2012-038	A	39.330	25.340	13.990	35.57
2011-093	A	30.660	21.750	8.910	29.06	2012-039	A	37.260	23.070	14.190	38.08
2011-094	A	40.870	23.830	17.040	41.69	2012-040	A	29.530	18.960	10.570	35.79
2011-095	A	40.800	24.940	15.860	38.87	2012-041	A	31.390	22.110	9.280	29.56
2011-096	A	32.530	20.700	11.830	36.37	2012-042	A	31.180	21.090	10.090	32.36
2011-097	A	34.210	21.900	12.310	35.98	2012-043	A	29.340	21.710	7.630	26.01
2011-098	A	35.990	23.330	12.660	35.18	2012-044	A	42.450	29.210	13.240	31.19
2011-099	A	32.670	21.580	11.090	33.95	2012-045	A	36.240	29.840	6.400	17.66
2011-100	A	34.250	22.680	11.570	33.78	2012-046	A	37.990	28.850	9.140	24.06
2011-101	A	31.140	20.210	10.930	35.10	2012-048	A	34.800	23.970	10.830	31.12
2011-102	A	29.860	19.860	10.000	33.49	2012-049	A	42.390	32.370	10.020	23.64
2011-103	A	31.020	20.440	10.580	34.11	2012-051	A	35.530	28.710	6.820	19.20
2011-104	A	38.790	25.940	12.850	33.13	2012-052	A	29.610	19.910	9.700	32.76
2011-105	A	39.000	27.360	11.640	29.85	2012-053	A	27.450	16.770	10.680	38.91
2011-106	A	31.500	21.620	9.880	31.37	2012-054	A	32.980	22.920	10.060	30.50
2011-107	A	33.350	22.800	10.550	31.63	2012-055	A	28.180	19.170	9.010	31.97
2011-109	A	38.720	26.130	12.590	32.52	2012-056	A	35.390	22.950	12.440	35.15
2011-110	A	32.730	22.200	10.530	32.17	2012-057	A	37.650	26.700	10.950	29.08
2012-002	A	36.510	25.450	11.060	30.29	2012-058	A	34.770	21.070	13.700	39.40
2012-004	A	40.610	27.710	12.900	31.77	2012-059	A	37.600	25.140	12.460	33.14
2012-005	A	37.540	26.590	10.950	29.17	2012-060	A	42.340	28.390	13.950	32.95
2012-006	A	37.750	27.650	10.100	26.75	2012-061	A	43.570	25.030	18.540	42.55
2012-009	A	40.710	26.440	14.270	35.05	2012-062	A	42.800	27.520	15.280	35.70
2012-010	A	30.840	19.840	11.000	35.67	2012-063	A	35.770	26.270	9.500	26.56
2012-011	A	27.610	18.310	9.300	33.68	2112-001	A	38.870	26.040	12.830	33.01
2012-012	A	26.030	16.940	9.090	34.92	2112-003	A	36.080	23.810	12.270	34.01
2012-013	A	33.820	22.240	11.580	34.24	2112-004	A	39.050	24.200	14.850	38.03
2012-014	A	32.200	21.580	10.620	32.98	2112-005	A	44.530	32.370	12.160	27.31
2012-015	A	32.180	25.230	6.950	21.60	2112-006	A	37.140	27.210	9.930	26.74
2012-016	A	31.060	20.800	10.260	33.03	2112-007	A	39.070	24.750	14.320	36.65
2012-017	A	36.240	30.020	6.220	17.16	2112-008	A	39.300	25.940	13.360	33.99
2012-018	A	32.280	25.170	7.110	22.03	2112-009	A	39.020	24.870	14.150	36.26
2012-019	A	34.550	28.480	6.070	17.57	2112-010	A	31.680	20.660	11.020	34.79

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2112-011	A	32.000	21.250	10.750	33.59
2112-012	A	38.920	23.320	15.600	40.08
2112-013	A	44.870	32.250	12.620	28.13
2112-014	A	36.530	25.240	11.290	30.91
2112-016	A	30.000	23.480	6.520	21.73
2112-017	A	32.200	27.200	5.000	15.53
2112-018	A	36.460	26.940	9.520	26.11
2112-019	A	31.410	18.060	13.350	42.50
2112-021	A	45.490	32.350	13.140	28.89
2112-022	A	38.850	26.350	12.500	32.18
2112-023	A	34.170	23.600	10.570	30.93
2112-024	A	32.990	22.760	10.230	31.01
2112-025	A	34.840	22.090	12.750	36.60
2112-026	A	40.120	28.510	11.610	28.94
2112-027	A	43.650	27.130	16.520	37.85
2112-028	A	40.670	27.510	13.160	32.36
2112-029	A	33.410	22.830	10.580	31.67
2112-030	A	32.500	21.150	11.350	34.92
2112-031	A	33.410	21.390	12.020	35.98
2112-032	A	30.640	19.060	11.580	37.79
2112-033	A	37.630	25.350	12.280	32.63
2112-034	A	40.790	26.280	14.510	35.57
2112-035	A	44.360	25.570	18.790	42.36
2112-036	A	34.240	21.680	12.560	36.68
2112-037	A	33.500	21.400	12.100	36.12
2112-038	A	41.100	27.940	13.160	32.02
2112-039	A	34.570	23.340	11.230	32.48
2112-040	A	37.950	25.650	12.300	32.41
2112-041	A	31.530	20.840	10.690	33.90
2112-042	A	45.260	29.950	15.310	33.83
2112-043	A	41.180	24.340	16.840	40.89
2112-044	A	36.760	22.680	14.080	38.30
2112-045	A	36.590	26.140	10.450	28.56
2112-046	A	41.300	26.530	14.770	35.76
2112-047	A	45.300	27.870	17.430	38.48
2112-048	A	49.500	33.690	15.810	31.94
2112-049	A	45.060	31.440	13.620	30.23
2112-050	A	38.360	32.290	6.070	15.82
2112-051	A	45.510	34.790	10.720	23.56
2112-052	A	42.710	33.040	9.670	22.64
2112-052.5	A	221.700	169.700	52.000	23.46
2112-053	A	38.170	27.780	10.390	27.22
2112-054	A	40.850	30.870	9.980	24.43
2112-055	A	45.110	31.210	13.900	30.81
2112-056	A	45.930	31.990	13.940	30.35
2112-057	A	43.330	29.890	13.440	31.02
2112-058	A	45.000	30.770	14.230	31.62
2112-072	A	203.800	130.600	73.200	35.92
2112-073	A	178.600	101.300	77.300	43.28
2112-074	A	206.400	124.300	82.100	39.78
2112-075	A	230.500	140.200	90.300	39.18

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2112-089	A	184.500	155.200	29.300	15.88
2112-099	A	36.700	22.280	14.420	39.29
2112-100	A	38.640	25.050	13.590	35.17
2112-101	A	30.770	19.960	10.810	35.13
2212-005	A	31.910	19.190	12.720	39.86
2212-007	A	41.190	25.090	16.100	39.09
2212-008	A	36.690	24.590	12.100	32.98
2212-009	A	169.100	115.300	53.800	31.82
2212-009	A	40.770	25.520	15.250	37.40
2212-010	A	37.870	25.900	11.970	31.61
2212-011	A	122.400	82.700	39.700	32.43
2212-012	A	42.470	31.160	11.310	26.63
2212-013	A	212.200	147.600	64.600	30.44
2212-014	A	42.010	30.430	11.580	27.56
2212-015	A	187.800	158.600	29.200	15.55
2212-024	A	148.600	100.500	48.100	32.37
2212-025	A	45.930	31.850	14.080	30.66
2212-026	A	44.580	34.520	10.060	22.57
2212-070	A	170.400	132.800	37.600	22.07
2212-072	A	199.400	144.400	55.000	27.58
2212-084	A	141.000	98.100	42.900	30.43
2212-088	A	214.700	136.800	77.900	36.28
2212-094	A	166.500	112.600	53.900	32.37
2312-011	A	180.900	117.400	63.500	35.10
2312-014	A	168.900	116.200	52.700	31.20
2312-016a	A	190.200	130.200	60.000	31.55
2312-016b	A	141.500	91.700	49.800	35.19
2312-016d	A	134.500	92.800	41.700	31.00
2312-022	A	191.400	146.200	45.200	23.62
2312-023	A	275.100	227.700	47.400	17.23
2312-024	A	228.300	153.700	74.600	32.68
2312-025	A	199.500	138.400	61.100	30.63
2312-026	A	172.600	120.300	52.300	30.30
2312-027	A	176.400	124.400	52.000	29.48
2312-030	A	206.300	131.100	75.200	36.45
2312-031	A	155.200	100.400	54.800	35.31
2312-034	A	142.900	93.200	49.700	34.78
2312-036a	A	159.700	115.500	44.200	27.68
2312-036b	A	163.300	128.400	34.900	21.37
2312-036c	A	166.500	130.200	36.300	21.80
2312-036d	A	185.700	136.400	49.300	26.55
2312-058	A	371.900	261.000	110.900	29.82
2312-059	A	210.300	146.400	63.900	30.39
2312-060	A	254.100	174.700	79.400	31.25
2312-061	A	186.200	133.300	52.900	28.41
2312-076	A	137.800	91.800	46.000	33.38
2312-077	A	174.900	117.100	57.800	33.05
2312-078	A	144.800	93.100	51.700	35.70
2312-082	A	188.200	128.100	60.100	31.93
2312-083	A	371.500	257.800	113.700	30.61
2312-084	A	196.800	138.100	58.700	29.83

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2312-085	A	198.500	140.500	58.000	29.22
2312-086	A	139.300	97.500	41.800	30.01
2312-087	A	180.900	134.340	46.560	25.74
2312-090	A	167.000	119.200	47.800	28.62
2312-091	A	170.100	120.900	49.200	28.92
2313-016c	A	167.800	116.700	51.100	30.45
2412-002a	A	160.400	128.000	32.400	20.20
2412-002b	A	131.200	102.200	29.000	22.10
2412-002c	A	144.500	94.800	49.700	34.39
2412-002d	A	136.200	101.100	35.100	25.77
2212-011	Aa	35.210	25.350	9.860	28.00
2212-013	Aa	37.650	26.450	11.200	29.75
2212-015	Aa	28.960	26.850	2.110	7.29
2011-048	B	28.360	18.890	9.470	33.39
2011-050	B	25.660	16.990	8.670	33.79
2011-052	B	32.710	22.140	10.570	32.31
2011-054	B	34.920	22.900	12.020	34.42
2011-080	B	32.660	22.140	10.520	32.21
2011-082	B	27.080	17.990	9.090	33.57
2011-084	B	33.140	21.180	11.960	36.09
2011-086	B	24.100	16.050	8.050	33.40
2011-087	B	26.350	17.280	9.070	34.42
2011-088	B	31.590	20.900	10.690	33.84
2011-089	B	32.720	21.130	11.590	35.42
2011-090	B	29.080	18.620	10.460	35.97
2011-091	B	28.450	17.750	10.700	37.61
2011-092	B	37.170	24.030	13.140	35.35
2011-092-NE	B	33.930	22.040	11.890	35.04
2011-092-NW	B	34.550	22.220	12.330	35.69
2011-092-SE	B	33.450	21.230	12.220	36.53
2011-092-SW	B	36.440	22.810	13.630	37.40
2011-093	B	39.780	27.000	12.780	32.13
2011-094	B	31.770	21.010	10.760	33.87
2011-095	B	49.280	31.730	17.550	35.61
2011-096	B	26.490	17.000	9.490	35.82
2011-097	B	40.430	26.450	13.980	34.58
2011-098	B	32.450	21.080	11.370	35.04
2011-099	B	26.300	17.840	8.460	32.17
2011-100	B	29.480	19.650	9.830	33.34
2011-101	B	31.620	20.370	11.250	35.58
2011-102	B	31.450	21.160	10.290	32.72
2011-103	B	37.060	24.620	12.440	33.57
2011-104	B	35.820	24.160	11.660	32.55
2011-105	B	38.080	26.520	11.560	30.36
2011-106	B	37.210	24.150	13.060	35.10
2011-107	B	27.450	19.140	8.310	30.27
2011-109	B	33.370	22.490	10.880	32.60
2011-110	B	33.520	22.790	10.730	32.01
2012-002	B	42.560	28.100	14.460	33.98
2012-004	B	39.940	27.600	12.340	30.90
2012-005	B	39.820	27.200	12.620	31.69
2012-006	B	31.890	22.220	9.670	30.32
2012-009	B	33.580	21.880	11.700	34.84
2012-010	B	31.220	20.630	10.590	33.92
2012-011	B	33.920	22.070	11.850	34.94
2012-012	B	34.470	23.180	11.290	32.75
2012-013	B	46.900	32.070	14.830	31.62
2012-014	B	28.150	18.820	9.330	33.14
2012-015	B	34.320	26.320	8.000	23.31
2012-016	B	37.950	28.080	9.870	26.01
2012-017	B	36.890	29.700	7.190	19.49
2012-018	B	27.100	20.420	6.680	24.65
2012-019	B	35.050	27.580	7.470	21.31
2012-020	B	39.820	31.220	8.600	21.60
2012-021	B	37.070	26.600	10.470	28.24
2012-022	B	40.420	29.400	11.020	27.26
2012-023	B	34.960	25.240	9.720	27.80
2012-024	B	34.650	24.440	10.210	29.47
2012-025	B	45.720	30.040	15.680	34.30
2012-026	B	39.970	27.930	12.040	30.12
2012-027	B	37.320	24.770	12.550	33.63
2012-028	B	41.580	29.120	12.460	29.97
2012-030	B	47.690	32.440	15.250	31.98
2012-031	B	36.510	23.910	12.600	34.51
2012-032	B	32.710	20.790	11.920	36.44
2012-033	B	36.260	22.820	13.440	37.07
2012-034	B	38.150	25.850	12.300	32.24
2012-035	B	39.720	28.150	11.570	29.13
2012-036	B	30.350	20.350	10.000	32.95
2012-037	B	42.580	29.950	12.630	29.66
2012-038	B	32.920	21.870	11.050	33.57
2012-039	B	44.010	30.730	13.280	30.17
2012-040	B	27.880	18.770	9.110	32.68
2012-041	B	32.250	22.680	9.570	29.67
2012-042	B	46.940	32.800	14.140	30.12
2012-043	B	42.340	29.480	12.860	30.37
2012-044	B	36.190	26.030	10.160	28.07
2012-045	B	37.020	29.730	7.290	19.69
2012-046	B	28.920	21.570	7.350	25.41
2012-048	B	34.940	24.560	10.380	29.71
2012-049	B	32.720	23.840	8.880	27.14
2012-052	B	44.150	29.850	14.300	32.39
2012-053	B	33.520	22.360	11.160	33.29
2012-054	B	27.490	18.970	8.520	30.99
2012-055	B	39.380	23.980	15.400	39.11
2012-056	B	35.990	22.950	13.040	36.23
2012-057	B	38.700	26.080	12.620	32.61
2012-058	B	28.710	18.750	9.960	34.69
2012-059	B	37.270	25.030	12.240	32.84
2012-060	B	32.760	22.960	9.800	29.91
2012-061	B	34.000	21.920	12.080	35.53
2012-062	B	34.860	22.340	12.520	35.92

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2012-063	B	34.480	22.870	11.610	33.67
2112-001	B	46.660	31.930	14.730	31.57
2112-003	B	41.760	29.100	12.660	30.32
2112-004	B	36.370	24.770	11.600	31.89
2112-005	B	39.120	26.380	12.740	32.57
2112-006	B	33.850	22.100	11.750	34.71
2112-007	B	37.160	24.000	13.160	35.41
2112-008	B	38.120	25.550	12.570	32.97
2112-009	B	43.850	29.530	14.320	32.66
2112-010	B	29.430	19.840	9.590	32.59
2112-011	B	35.350	23.130	12.220	34.57
2112-012	B	35.650	24.290	11.360	31.87
2112-013	B	37.580	25.870	11.710	31.16
2112-014	B	33.710	22.040	11.670	34.62
2112-016	B	31.170	24.870	6.300	20.21
2112-017	B	44.780	34.020	10.760	24.03
2112-018	B	34.680	24.620	10.060	29.01
2112-019	B	29.170	19.530	9.640	33.05
2112-021	B	41.520	28.800	12.720	30.64
2112-022	B	42.210	28.320	13.890	32.91
2112-023	B	32.220	20.810	11.410	35.41
2112-024	B	42.710	29.130	13.580	31.80
2112-025	B	33.490	22.580	10.910	32.58
2112-026	B	30.630	20.460	10.170	33.20
2112-027	B	38.700	24.770	13.930	35.99
2112-028	B	37.980	25.290	12.690	33.41
2112-029	B	43.450	28.780	14.670	33.76
2112-030	B	42.500	27.400	15.100	35.53
2112-031	B	34.070	23.020	11.050	32.43
2112-032	B	33.820	23.130	10.690	31.61
2112-033	B	34.160	22.930	11.230	32.87
2112-034	B	38.560	26.780	11.780	30.55
2112-035	B	39.570	26.590	12.980	32.80
2112-036	B	37.400	24.830	12.570	33.61
2112-037	B	41.880	26.860	15.020	35.86
2112-038	B	40.120	25.860	14.260	35.54
2112-039	B	43.340	26.680	16.660	38.44
2112-040	B	38.870	25.940	12.930	33.26
2112-041	B	37.490	25.920	11.570	30.86
2112-042	B	37.370	24.030	13.340	35.70
2112-043	B	43.000	28.320	14.680	34.14
2112-044	B	41.290	26.200	15.090	36.55
2112-045	B	46.570	32.020	14.550	31.24
2112-046	B	36.960	25.360	11.600	31.39
2112-047	B	39.130	25.830	13.300	33.99
2112-048	B	43.390	29.920	13.470	31.04
2112-049	B	42.740	29.750	12.990	30.39
2112-050	B	44.330	36.700	7.630	17.21
2112-051	B	36.880	27.530	9.350	25.35
2112-052	B	47.420	33.540	13.880	29.27
2112-052.5	B	211.000	150.400	60.600	28.72

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2112-053	B	41.780	30.970	10.810	25.87
2112-054	B	46.740	34.620	12.120	25.93
2112-055	B	44.200	30.750	13.450	30.43
2112-056	B	37.040	25.370	11.670	31.51
2112-057	B	35.590	24.390	11.200	31.47
2112-058	B	38.820	26.110	12.710	32.74
2112-072	B	164.400	107.800	56.600	34.43
2112-073	B	194.900	127.700	67.200	34.48
2112-074	B	251.900	137.000	114.900	45.61
2112-075	B	189.600	120.500	69.100	36.45
2112-089	B	156.700	124.500	32.200	20.55
2112-099	B	37.540	25.510	12.030	32.05
2112-100	B	33.090	21.770	11.320	34.21
2112-101	B	30.640	21.100	9.540	31.14
2212-005	B	40.140	26.690	13.450	33.51
2212-007	B	33.340	22.150	11.190	33.56
2212-008	B	37.070	25.110	11.960	32.26
2212-009	B	177.200	117.000	60.200	33.97
2212-009	B	34.220	24.780	9.440	27.59
2212-010	B	45.380	32.000	13.380	29.48
2212-011	B	200.200	133.900	66.300	33.12
2212-012	B	39.480	27.670	11.810	29.91
2212-013	B	189.200	133.900	55.300	29.23
2212-014	B	39.690	28.090	11.600	29.23
2212-015	B	231.100	194.300	36.800	15.92
2212-024	B	193.200	130.300	62.900	32.56
2212-025	B	42.250	27.670	14.580	34.51
2212-026	B	37.040	27.270	9.770	26.38
2212-070	B	193.400	163.600	29.800	15.41
2212-072	B	184.700	138.700	46.000	24.91
2212-084	B	170.600	111.500	59.100	34.64
2212-088	B	159.400	107.500	51.900	32.56
2212-094	B	192.700	135.500	57.200	29.68
2312-011	B	169.000	113.200	55.800	33.02
2312-014	B	192.900	135.800	57.100	29.60
2312-016a	B	158.600	109.400	49.200	31.02
2312-016b	B	132.400	90.100	42.300	31.95
2312-016d	B	168.700	121.200	47.500	28.16
2312-022	B	244.400	175.600	68.800	28.15
2312-024	B	229.800	158.600	71.200	30.98
2312-025	B	184.500	130.400	54.100	29.32
2312-026	B	189.800	134.400	55.400	29.19
2312-027	B	169.900	121.100	48.800	28.72
2312-030	B	226.800	157.400	69.400	30.60
2312-031	B	207.700	141.900	65.800	31.68
2312-034	B	147.200	96.800	50.400	34.24
2312-036a	B	176.100	131.400	44.700	25.38
2312-036b	B	136.800	114.400	22.400	16.37
2312-036c	B	165.500	143.300	22.200	13.41
2312-036d	B	151.400	119.100	32.300	21.33
2312-058	B	355.500	254.000	101.500	28.55

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2312-059	B	173.300	121.500	51.800	29.89
2312-060	B	190.000	137.000	53.000	27.89
2312-061	B	200.200	135.700	64.500	32.22
2312-076	B	167.900	114.200	53.700	31.98
2312-077	B	136.700	94.000	42.700	31.24
2312-078	B	166.500	111.200	55.300	33.21
2312-082	B	157.700	111.100	46.600	29.55
2312-083	B	329.500	231.900	97.600	29.62
2312-084	B	159.500	111.600	47.900	30.03
2312-085	B	183.700	130.300	53.400	29.07
2312-086	B	189.800	128.700	61.100	32.19
2312-087	B	155.300	113.800	41.500	26.72
2312-090	B	185.200	134.400	50.800	27.43
2312-091	B	191.600	134.500	57.100	29.80
2313-016c	B	147.900	107.300	40.600	27.45
2412-002a	B	168.000	141.700	26.300	15.65
2412-002b	B	135.400	114.100	21.300	15.73
2412-002c	B	137.100	96.000	41.100	29.98
2412-002d	B	134.900	99.900	35.000	25.95
2212-011	Ba	39.940	28.170	11.770	29.47
2212-013	Ba	40.410	26.870	13.540	33.51
2212-015	Ba	52.610	45.380	7.230	13.74
2011-048	C	26.120	16.830	9.290	35.57
2011-050	C	34.010	22.010	12.000	35.28
2011-052	C	34.080	23.070	11.010	32.31
2011-054	C	35.000	23.320	11.680	33.37
2011-080	C	38.990	25.560	13.430	34.44
2011-082	C	32.640	21.570	11.070	33.92
2011-084	C	35.060	23.050	12.010	34.26
2011-086	C	30.760	20.470	10.290	33.45
2011-087	C	29.620	20.270	9.350	31.57
2011-088	C	27.860	18.040	9.820	35.25
2011-089	C	27.460	18.870	8.590	31.28
2011-090	C	26.300	17.300	9.000	34.22
2011-091	C	36.560	23.500	13.060	35.72
2011-092	C	39.770	25.720	14.050	35.33
2011-092-NE	C	36.880	27.040	9.840	26.68
2011-092-NW	C	33.050	21.370	11.680	35.34
2011-092-SE	C	39.910	26.580	13.330	33.40
2011-092-SW	C	36.550	24.160	12.390	33.90
2011-093	C	30.540	20.550	9.990	32.71
2011-094	C	39.220	25.180	14.040	35.80
2011-095	C	30.400	19.950	10.450	34.38
2011-096	C	35.520	23.240	12.280	34.57
2011-097	C	35.700	22.910	12.790	35.83
2011-098	C	32.410	21.120	11.290	34.83
2011-099	C	30.480	20.870	9.610	31.53
2011-100	C	33.200	22.140	11.060	33.31
2011-101	C	27.950	17.670	10.280	36.78
2011-102	C	23.240	15.330	7.910	34.04
2011-103	C	30.440	20.120	10.320	33.90
2011-104	C	31.980	21.070	10.910	34.12
2011-105	C	30.660	20.270	10.390	33.89
2011-106	C	34.770	23.170	11.600	33.36
2011-107	C	35.070	23.700	11.370	32.42
2011-109	C	40.060	26.840	13.220	33.00
2011-110	C	38.900	27.090	11.810	30.36
2012-002	C	36.770	23.190	13.580	36.93
2012-004	C	37.930	25.570	12.360	32.59
2012-005	C	35.690	24.760	10.930	30.62
2012-006	C	29.610	21.740	7.870	26.58
2012-009	C	34.320	22.960	11.360	33.10
2012-010	C	30.480	20.130	10.350	33.96
2012-011	C	31.050	20.230	10.820	34.85
2012-012	C	29.690	20.760	8.930	30.08
2012-013	C	24.280	16.870	7.410	30.52
2012-014	C	31.880	21.850	10.030	31.46
2012-015	C	34.180	26.920	7.260	21.24
2012-016	C	32.090	22.360	9.730	30.32
2012-017	C	29.170	23.110	6.060	20.77
2012-018	C	42.700	28.540	14.160	33.16
2012-020	C	38.630	29.180	9.450	24.46
2012-021	C	31.820	21.250	10.570	33.22
2012-022	C	38.410	26.210	12.200	31.76
2012-023	C	32.820	23.300	9.520	29.01
2012-024	C	45.750	33.180	12.570	27.48
2012-025	C	34.760	23.740	11.020	31.70
2012-026	C	29.940	20.060	9.880	33.00
2012-027	C	32.400	22.420	9.980	30.80
2012-028	C	35.880	24.430	11.450	31.91
2012-030	C	44.260	31.220	13.040	29.46
2012-031	C	41.950	27.670	14.280	34.04
2012-032	C	43.970	28.810	15.160	34.48
2012-033	C	38.420	26.840	11.580	30.14
2012-034	C	36.360	23.820	12.540	34.49
2012-035	C	41.550	29.180	12.370	29.77
2012-036	C	35.890	22.760	13.130	36.58
2012-037	C	35.310	22.650	12.660	35.85
2012-038	C	31.860	21.150	10.710	33.62
2012-039	C	42.470	27.950	14.520	34.19
2012-040	C	32.080	21.600	10.480	32.67
2012-041	C	36.190	24.930	11.260	31.11
2012-042	C	44.900	30.690	14.210	31.65
2012-043	C	33.770	23.360	10.410	30.83
2012-044	C	40.580	25.240	15.340	37.80
2012-045	C	33.160	23.360	9.800	29.55
2012-046	C	28.530	23.770	4.760	16.68
2012-048	C	36.760	25.370	11.390	30.98
2012-049	C	30.000	21.870	8.130	27.10
2012-051	C	33.680	26.110	7.570	22.48
2012-052	C	39.120	26.170	12.950	33.10
2012-053	C	32.590	22.170	10.420	31.97

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2012-054	C	33.050	23.970	9.080	27.47
2012-055	C	33.170	22.290	10.880	32.80
2012-056	C	36.700	24.390	12.310	33.54
2012-057	C	43.170	28.090	15.080	34.93
2012-058	C	36.260	23.960	12.300	33.92
2012-059	C	32.990	21.300	11.690	35.43
2012-060	C	37.140	25.000	12.140	32.69
2012-061	C	39.110	26.460	12.650	32.34
2012-062	C	31.690	20.780	10.910	34.43
2012-063	C	37.240	24.240	13.000	34.91
2112-001	C	44.450	29.030	15.420	34.69
2112-003	C	41.180	27.360	13.820	33.56
2112-004	C	31.550	21.250	10.300	32.65
2112-005	C	35.680	22.700	12.980	36.38
2112-006	C	33.060	21.560	11.500	34.79
2112-007	C	37.030	24.230	12.800	34.57
2112-008	C	35.070	23.720	11.350	32.36
2112-009	C	31.760	21.280	10.480	33.00
2112-010	C	35.950	24.150	11.800	32.82
2112-011	C	28.590	19.370	9.220	32.25
2112-012	C	36.750	25.140	11.610	31.59
2112-013	C	34.970	24.750	10.220	29.23
2112-016	C	30.640	24.420	6.220	20.30
2112-017	C	37.930	30.940	6.990	18.43
2112-018	C	28.350	20.490	7.860	27.72
2112-019	C	34.630	23.390	11.240	32.46
2112-021	C	33.870	23.830	10.040	29.64
2112-022	C	35.850	23.660	12.190	34.00
2112-023	C	43.950	29.260	14.690	33.42
2112-024	C	34.890	23.300	11.590	33.22
2112-025	C	35.680	23.010	12.670	35.51
2112-026	C	31.460	21.200	10.260	32.61
2112-027	C	35.020	22.530	12.490	35.67
2112-028	C	33.270	22.050	11.220	33.72
2112-029	C	40.550	26.340	14.210	35.04
2112-030	C	33.950	22.260	11.690	34.43
2112-031	C	34.610	22.420	12.190	35.22
2112-032	C	40.170	26.050	14.120	35.15
2112-033	C	35.160	22.870	12.290	34.95
2112-034	C	39.050	24.540	14.510	37.16
2112-035	C	41.990	27.130	14.860	35.39
2112-036	C	30.460	20.050	10.410	34.18
2112-037	C	35.220	22.280	12.940	36.74
2112-038	C	32.800	20.740	12.060	36.77
2112-039	C	44.700	28.480	16.220	36.29
2112-040	C	40.300	26.330	13.970	34.67
2112-041	C	39.650	25.790	13.860	34.96
2112-042	C	35.980	25.010	10.970	30.49
2112-043	C	33.300	21.940	11.360	34.11
2112-044	C	50.920	32.590	18.330	36.00
2112-045	C	42.760	29.020	13.740	32.13
2112-046	C	41.300	26.890	14.410	34.89
2112-047	C	42.150	27.930	14.220	33.74
2112-048	C	42.900	30.420	12.480	29.09
2112-049	C	43.020	30.050	12.970	30.15
2112-050	C	44.430	35.270	9.160	20.62
2112-051	C	37.120	27.440	9.680	26.08
2112-052	C	45.370	32.960	12.410	27.35
2112-052.5	C	201.500	165.100	36.400	18.06
2112-053	C	41.580	28.050	13.530	32.54
2112-054	C	53.610	36.440	17.170	32.03
2112-055	C	41.820	26.030	15.790	37.76
2112-056	C	47.730	29.440	18.290	38.32
2112-057	C	49.130	31.830	17.300	35.21
2112-058	C	47.660	33.020	14.640	30.72
2112-072	C	170.000	106.600	63.400	37.29
2112-073	C	213.600	130.800	82.800	38.76
2112-074	C	186.000	112.100	73.900	39.73
2112-075	C	192.900	116.000	76.900	39.87
2112-089	C	158.900	126.200	32.700	20.58
2112-099	C	37.140	24.650	12.490	33.63
2112-100	C	29.300	19.020	10.280	35.09
2112-101	C	29.690	19.430	10.260	34.56
2212-005	C	36.230	26.760	9.470	26.14
2212-007	C	36.400	23.570	12.830	35.25
2212-008	C	38.430	26.450	11.980	31.17
2212-009	C	171.400	124.300	47.100	27.48
2212-009	C	35.710	23.650	12.060	33.77
2212-010	C	40.400	27.900	12.500	30.94
2212-011	C	186.100	139.100	47.000	25.26
2212-012	C	42.610	30.050	12.560	29.48
2212-013	C	176.200	124.800	51.400	29.17
2212-014	C	41.000	28.580	12.420	30.29
2212-015	C	250.100	198.800	51.300	20.51
2212-024	C	187.000	130.200	56.800	30.37
2212-025	C	38.940	26.060	12.880	33.08
2212-026	C	38.180	26.920	11.260	29.49
2212-070	C	217.100	171.600	45.500	20.96
2212-072	C	202.900	155.700	47.200	23.26
2212-084	C	153.800	105.700	48.100	31.27
2212-088	C	171.200	118.200	53.000	30.96
2212-094	C	182.900	120.600	62.300	34.06
2312-011	C	178.600	123.300	55.300	30.96
2312-014	C	161.700	109.100	52.600	32.53
2312-016a	C	167.700	118.200	49.500	29.52
2312-016b	C	159.200	108.400	50.800	31.91
2312-016d	C	146.900	103.100	43.800	29.82
2312-022	C	179.800	128.200	51.600	28.70
2312-023	C	273.600	202.200	71.400	26.10
2312-024	C	187.900	125.700	62.200	33.10
2312-025	C	190.100	126.700	63.400	33.35
2312-026	C	195.200	123.200	72.000	36.89

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2312-027	C	149.000	104.300	44.700	30.00
2312-030	C	189.400	122.400	67.000	35.37
2312-031	C	269.900	180.100	89.800	33.27
2312-034	C	198.900	144.800	54.100	27.20
2312-036a	C	192.000	146.000	46.000	23.96
2312-036b	C	135.600	112.900	22.700	16.74
2312-036c	C	178.400	147.900	30.500	17.10
2312-036d	C	136.700	111.100	25.600	18.73
2312-058	C	401.000	268.700	132.300	32.99
2312-059	C	153.400	107.800	45.600	29.73
2312-060	C	221.100	156.900	64.200	29.04
2312-061	C	171.800	124.000	47.800	27.82
2312-076	C	161.900	104.700	57.200	35.33
2312-077	C	152.900	97.300	55.600	36.36
2312-078	C	154.800	97.300	57.500	37.14
2312-082	C	197.600	129.500	68.100	34.46
2312-083	C	338.200	261.100	77.100	22.80
2312-084	C	170.000	114.700	55.300	32.53
2312-085	C	197.500	127.800	69.700	35.29
2312-086	C	175.500	132.900	42.600	24.27
2312-087	C	169.600	122.900	46.700	27.54
2312-090	C	161.100	114.400	46.700	28.99
2312-091	C	195.000	142.800	52.200	26.77
2313-016c	C	177.400	125.000	52.400	29.54
2412-002a	C	145.400	115.200	30.200	20.77
2412-002b	C	166.500	135.900	30.600	18.38
2412-002c	C	135.200	101.800	33.400	24.70
2412-002d	C	127.100	95.600	31.500	24.78
2212-011	Ca	42.810	29.500	13.310	31.09
2212-013	Ca	40.310	28.680	11.630	28.85
2212-015	Ca	40.230	30.350	9.880	24.56
2011-048	D	27.440	18.770	8.670	31.60
2011-050	D	25.100	17.740	7.360	29.32
2011-052	D	30.390	22.010	8.380	27.57
2011-054	D	30.680	22.080	8.600	28.03
2011-080	D	36.810	26.320	10.490	28.50
2011-082	D	25.470	18.500	6.970	27.37
2011-084	D	28.200	20.040	8.160	28.94
2011-086	D	32.140	22.080	10.060	31.30
2011-087	D	30.580	22.440	8.140	26.62
2011-088	D	27.840	18.980	8.860	31.82
2011-089	D	28.900	19.780	9.120	31.56
2011-090	D	26.670	17.880	8.790	32.96
2011-091	D	40.000	28.470	11.530	28.83
2011-092	D	44.310	29.560	14.750	33.29
2011-092-NE	D	30.750	23.690	7.060	22.96
2011-092-NW	D	29.370	21.220	8.150	27.75
2011-092-SE	D	37.350	26.260	11.090	29.69
2011-092-SW	D	35.540	24.600	10.940	30.78
2011-093	D	40.260	30.010	10.250	25.46
2011-094	D	30.160	21.530	8.630	28.61
2011-095	D	32.470	21.500	10.970	33.79
2011-096	D	29.910	21.120	8.790	29.39
2011-097	D	35.000	23.330	11.670	33.34
2011-098	D	30.710	20.770	9.940	32.37
2011-099	D	44.560	30.570	13.990	31.40
2011-100	D	26.620	18.180	8.440	31.71
2011-101	D	28.140	19.750	8.390	29.82
2011-102	D	26.050	17.220	8.830	33.90
2011-103	D	33.160	24.800	8.360	25.21
2011-104	D	28.970	21.780	7.190	24.82
2011-105	D	32.430	23.380	9.050	27.91
2011-106	D	30.960	21.620	9.340	30.17
2011-107	D	29.960	22.010	7.950	26.54
2011-109	D	34.150	25.680	8.470	24.80
2011-110	D	29.180	22.000	7.180	24.61
2012-002	D	38.190	26.990	11.200	29.33
2012-004	D	39.800	27.160	12.640	31.76
2012-005	D	37.170	25.690	11.480	30.89
2012-006	D	30.620	21.970	8.650	28.25
2012-009	D	28.000	19.640	8.360	29.86
2012-010	D	27.900	20.610	7.290	26.13
2012-011	D	30.800	21.660	9.140	29.68
2012-012	D	26.210	18.470	7.740	29.53
2012-013	D	36.590	26.200	10.390	28.40
2012-014	D	35.660	25.960	9.700	27.20
2012-015	D	30.500	23.590	6.910	22.66
2012-016	D	27.010	17.770	9.240	34.21
2012-017	D	32.570	25.180	7.390	22.69
2012-018	D	37.650	27.720	9.930	26.37
2012-019	D	42.140	32.520	9.620	22.83
2012-020	D	40.470	30.210	10.260	25.35
2012-021	D	27.360	20.060	7.300	26.68
2012-022	D	31.320	21.560	9.760	31.16
2012-023	D	35.820	26.590	9.230	25.77
2012-024	D	34.780	24.240	10.540	30.30
2012-025	D	34.280	24.030	10.250	29.90
2012-026	D	38.530	24.910	13.620	35.35
2012-027	D	32.940	24.930	8.010	24.32
2012-028	D	36.070	26.290	9.780	27.11
2012-030	D	40.980	30.850	10.130	24.72
2012-031	D	38.380	26.990	11.390	29.68
2012-032	D	39.800	26.940	12.860	32.31
2012-033	D	35.600	26.630	8.970	25.20
2012-034	D	36.570	25.390	11.180	30.57
2012-035	D	37.150	25.490	11.660	31.39
2012-036	D	35.570	23.880	11.690	32.86
2012-037	D	36.350	27.530	8.820	24.26
2012-038	D	34.700	22.890	11.810	34.03
2012-039	D	41.340	25.990	15.350	37.13
2012-040	D	29.740	21.130	8.610	28.95
2012-041	D	30.730	19.890	10.840	35.27

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2012-042	D	34.620	23.350	11.270	32.55
2012-043	D	41.780	28.400	13.380	32.02
2012-044	D	43.500	28.950	14.550	33.45
2012-046	D	34.610	28.090	6.520	18.84
2012-048	D	35.170	26.570	8.600	24.45
2012-049	D	43.790	30.150	13.640	31.15
2012-051	D	27.000	22.370	4.630	17.15
2012-052	D	33.190	21.380	11.810	35.58
2012-053	D	37.390	25.570	11.820	31.61
2012-054	D	45.360	29.250	16.110	35.52
2012-055	D	34.770	25.670	9.100	26.17
2012-056	D	28.280	19.550	8.730	30.87
2012-057	D	35.840	25.660	10.180	28.40
2012-058	D	40.220	26.840	13.380	33.27
2012-059	D	30.310	23.850	6.460	21.31
2012-060	D	37.060	25.300	11.760	31.73
2012-061	D	38.490	24.880	13.610	35.36
2012-062	D	39.340	25.630	13.710	34.85
2012-063	D	38.190	26.330	11.860	31.06
2112-001	D	41.780	30.990	10.790	25.83
2112-003	D	38.560	26.860	11.700	30.34
2112-004	D	37.960	26.970	10.990	28.95
2112-005	D	38.370	25.220	13.150	34.27
2112-006	D	35.130	23.760	11.370	32.37
2112-007	D	37.360	26.750	10.610	28.40
2112-008	D	43.230	30.840	12.390	28.66
2112-009	D	35.740	23.050	12.690	35.51
2112-010	D	27.730	18.150	9.580	34.55
2112-011	D	35.000	24.190	10.810	30.89
2112-012	D	32.230	21.110	11.120	34.50
2112-013	D	34.970	25.230	9.740	27.85
2112-014	D	33.200	24.730	8.470	25.51
2112-016	D	25.480	20.570	4.910	19.27
2112-017	D	40.790	32.570	8.220	20.15
2112-019	D	41.580	31.870	9.710	23.35
2112-021	D	35.110	25.300	9.810	27.94
2112-022	D	36.020	27.830	8.190	22.74
2112-023	D	35.780	25.990	9.790	27.36
2112-024	D	31.970	22.030	9.940	31.09
2112-025	D	33.580	23.750	9.830	29.27
2112-026	D	36.150	25.490	10.660	29.49
2112-027	D	28.730	19.230	9.500	33.07
2112-028	D	27.760	19.860	7.900	28.46
2112-029	D	36.380	26.280	10.100	27.76
2112-030	D	36.710	23.110	13.600	37.05
2112-031	D	30.840	20.110	10.730	34.79
2112-032	D	33.740	23.300	10.440	30.94
2112-033	D	35.440	22.870	12.570	35.47
2112-034	D	44.660	28.750	15.910	35.62
2112-035	D	36.000	22.840	13.160	36.56
2112-036	D	41.460	26.400	15.060	36.32
2112-037	D	39.550	24.600	14.950	37.80
2112-038	D	37.670	25.190	12.480	33.13
2112-039	D	36.690	24.270	12.420	33.85
2112-040	D	39.410	27.320	12.090	30.68
2112-041	D	32.370	22.440	9.930	30.68
2112-042	D	32.600	24.670	7.930	24.33
2112-043	D	32.270	21.590	10.680	33.10
2112-044	D	33.460	23.540	9.920	29.65
2112-045	D	38.450	27.420	11.030	28.69
2112-046	D	42.690	28.700	13.990	32.77
2112-047	D	43.980	29.090	14.890	33.86
2112-048	D	36.480	25.570	10.910	29.91
2112-049	D	45.270	33.120	12.150	26.84
2112-050	D	37.990	30.590	7.400	19.48
2112-051	D	37.440	27.920	9.520	25.43
2112-052	D	34.790	25.470	9.320	26.79
2112-052.5	D	212.700	168.400	44.300	20.83
2112-053	D	38.840	28.270	10.570	27.21
2112-054	D	43.970	31.080	12.890	29.32
2112-055	D	51.210	35.830	15.380	30.03
2112-056	D	40.410	29.700	10.710	26.50
2112-057	D	39.610	28.270	11.340	28.63
2112-058	D	35.290	24.890	10.400	29.47
2112-072	D	203.500	124.900	78.600	38.62
2112-073	D	195.000	122.000	73.000	37.44
2112-074	D	219.200	141.800	77.400	35.31
2112-075	D	167.600	99.800	67.800	40.45
2112-089	D	148.700	117.000	31.700	21.32
2112-099	D	36.810	25.890	10.920	29.67
2112-100	D	28.670	19.760	8.910	31.08
2112-101	D	28.220	19.050	9.170	32.49
2212-005	D	34.890	22.600	12.290	35.22
2212-007	D	33.260	22.080	11.180	33.61
2212-008	D	34.550	23.970	10.580	30.62
2212-009	D	187.700	139.700	48.000	25.57
2212-009	D	43.840	30.520	13.320	30.38
2212-010	D	41.580	29.330	12.250	29.46
2212-011	D	168.200	123.100	45.100	26.81
2212-012	D	40.300	28.280	12.020	29.83
2212-013	D	186.700	148.000	38.700	20.73
2212-014	D	38.220	27.600	10.620	27.79
2212-015	D	185.400	154.000	31.400	16.94
2212-024	D	168.000	117.000	51.000	30.36
2212-025	D	42.520	28.920	13.600	31.98
2212-026	D	40.210	28.080	12.130	30.17
2212-070	D	160.800	127.600	33.200	20.65
2212-072	D	203.700	156.700	47.000	23.07
2212-084	D	176.900	121.100	55.800	31.54
2212-088	D	206.000	142.800	63.200	30.68
2212-094	D	169.900	115.300	54.600	32.14
2312-011	D	172.300	122.700	49.600	28.79

SAMPLE	LEVEL[1]	WET WT.	DRY WT.	DIFF WT.	%-H_2O
2312-014	D	184.800	132.700	52.100	28.19
2312-016a	D	138.600	99.500	39.100	28.21
2312-016b	D	164.900	114.200	50.700	30.75
2312-016d	D	159.300	115.300	44.000	27.62
2312-022	D	251.200	177.200	74.000	29.46
2312-023	D	327.400	246.700	80.700	24.65
2312-024	D	164.400	115.700	48.700	29.62
2312-025	D	181.100	130.200	50.900	28.11
2312-026	D	197.200	139.200	58.000	29.41
2312-027	D	158.600	113.300	45.300	28.56
2312-030	D	204.300	147.700	56.600	27.70
2312-031	D	208.400	155.600	52.800	25.34
2312-034	D	125.800	91.600	34.200	27.19
2312-036a	D	159.900	118.800	41.100	25.70
2312-036b	D	130.600	105.400	25.200	19.30
2312-036c	D	136.000	117.400	18.600	13.68
2312-036d	D	179.600	147.200	32.400	18.04
2312-058	D	514.500	423.500	91.000	17.69
2312-059	D	210.600	158.600	52.000	24.69
2312-060	D	196.700	150.900	45.800	23.28
2312-061	D	184.100	141.200	42.900	23.30
2312-076	D	177.100	133.900	43.200	24.39
2312-077	D	163.900	113.100	50.800	30.99
2312-078	D	120.600	83.500	37.100	30.76
2312-082	D	172.200	119.100	53.100	30.84
2312-083	D	296.100	224.600	71.500	24.15
2312-084	D	169.600	118.000	51.600	30.42
2312-085	D	202.200	150.200	52.000	25.72
2312-086	D	140.600	99.600	41.000	29.16
2312-087	D	153.200	119.300	33.900	22.13
2312-090	D	143.900	105.100	38.800	26.96
2312-091	D	187.000	138.400	48.600	25.99
2313-016c	D	142.100	99.500	42.600	29.98
2412-002a	D	121.400	97.400	24.000	19.77
2412-002b	D	146.200	126.300	19.900	13.61
2412-002c	D	118.300	104.400	13.900	11.75
2412-002d	D	121.800	88.200	33.600	27.59
2212-011	Da	36.350	25.090	11.260	30.98
2212-013	Da	35.220	27.570	7.650	21.72
2212-015	Da	32.650	26.310	6.340	19.42

[1] A = 0-5 FEET, B = 5-10 FEET, C = 10-15 FEET, D = 15-20 FEET.
Wet, dry, and diff. weights given in grams

APPENDIX Q

Appendix Q. Results of brine-evaporation tests two and three performed on Sevier Lake brine by J.W. Gwynn in 1981.

Information obtained through the two experiments includes (1) chemical changes that take place in the brine as it is evaporated and salts are precipitated, (2) mineral species that are precipitated, (3) density and index of refraction of the concentrating brines, (4) lithium and uranium values in the concentrating brines, and (5) trace elements in beginning and ending brines of test three.

SEVIER LAKE PROJECT - BRINE EVAPORATION

Experiment No. 13 - July 23 through Sept 03, 1981 by J.W. Gwynn

PREFACE

During the summer of 1980, field personnel obtained three carboys of Sevier Lake brine. The brine was collected by pumping from the twenty-foot-deep, pre-cased auger holes on an east-west line crossing the lake within T. 20 S., R. 11, 12 W. Starting from the east side and moving successively from hole to hole toward the west, carboys one and two were completely filled, and the third was filled about two-thirds full. For this experiment, carboys two and three were used in tests two and three respectively. Carboy one had been used previously for other testing.

PURPOSES

The purposes of this experiment were: first, to determine the chemical changes that take place in the brine as it is evaporated and salts are precipitated; second, to determine the mineral species of salt that are precipitated; third, to determine the density and index of refraction of the brine as it concentrates; fourth, to determine how lithium and uranium values change as the brine is concentrated; and fifth, to determine what trace elements may concentrate in the evaporating brines.

PROCEDURE - FOR PURPOSES ONE AND TWO

The brine in carboys two and three was poured into two large rectangular plastic containers positioned on the north side of the Utah Geological Survey building. The brine level was marked and dated on the containers. The brine contained clay, so to avoid contaminating the salts that would eventually be precipitated; the brine was decanted, after the clay had settled. The clay was then removed from the containers, and the brine replaced.

The evaporation tests involved allowing the brine to evaporate naturally until it was saturated with respect to sodium chloride. At this time, samples of both the brine and the precipitated salts were taken. Also, the level of the brine and the temperature were recorded, and then all of the precipitated salt was removed. This same procedure was followed periodically for the next few weeks until no brine remained to be sampled. Towards the end of the testing period, the plastic containers were brought indoors due to rain. Once inside, heat lamps and a fan were used to accelerate the evaporation rate.

The brine samples taken during evaporation were put in small plastic bottles and capped. The salt samples were placed in plastic vials, covered with the mother liquor, and sealed. All samples were then immediately prepared for analysis. Salt samples were prepared removing the brine from the salt in a centrifuge, and putting the salt in sealed plastic bags.

The salt and brine samples were sent to Great Salt Lake Minerals and Chemicals (GSLM) for analysis for Na, K, Mg, Cl, SO_4, and Li. The mineralogical makeup of each salt sample was determined by x-ray diffraction on a Norelco x-ray diffraction unit at the University of Utah.

ANALYTICAL RESULTS - FOR PURPOSES ONE AND TWO

Table Q1 gives the chemical analyses for the twenty-five brine samples that were analyzed by GSLM. Also given are the mole-percents for K, Mg, and SO4 for each sample from each of the two test brines. Figure Q1 shows the tabulated data plotted on a triangular phase diagram (25°C).

Table Q2 gives the chemical analyses of the nineteen salts that were collected during the evaporation test. A summary of the salts that were identified in each sample is also shown. The percentage of each salt is not given.

Table Q1 - Chemical analyses of brines for evaporation tests 2 and 3.

Sevier Lake Brine Evaporation Test 2

No.	K	Na	Mg	Cl	SO4	H2O	K-mp	Mg-mp	SO4-mp	Date.
1	0.35	6.52	0.39	10.76	1.28	80.70	13.05	47.47	39.46	07/23/81
2	0.45	9.34	0.51	15.15	1.80	72.75	12.58	46.13	41.28	08/04/81
3	0.48	9.66	0.55	15.47	1.94	71.90	12.50	46.31	41.18	08/05/81
4	0.51	9.59	0.58	15.57	2.08	71.67	12.81	45.85	41.61	08/07/81
5	0.59	9.45	0.69	15.46	2.50	71.31	12.13	45.79	42.07	08/11/81
6	0.71	9.29	0.83	15.10	2.96	71.11	12.17	46.14	41.67	08/17/81
7	1.01	8.71	1.14	14.70	4.08	70.36	12.63	45.83	41.52	08/25/81
8	1.17	8.31	1.40	14.38	4.81	69.93	12.17	46.97	40.84	08/28/81
9	1.51	7.79	1.79	14.10	6.26	68.55	12.21	46.58	41.20	08/31/81
10	1.99	7.08	2.38	13.51	8.32	66.72	12.10	46.61	41.27	09/02/81
11	2.33	5.01	4.35	13.39	12.31	62.61	8.82	53.13	38.04	09/03/81
12	2.09	3.95	4.16	13.35	9.05	67.40	9.14	58.59	32.26	09/08/81
13	2.40	1.71	5.88	19.83	6.75	66.43	8.90	70.59	20.49	09/09/81
27	0.32	6.77	0.37	10.63	1.48	80.43	11.78	43.96	44.25	1980

Sevier Lake Brine Evaporation Test 3

No.	K	Na	Mg	Cl	SO_4	H_2O	K-mp	Mg-mp	SO4-mp	Date.
15	0.29	6.13	0.34	9.62	1.72	81.90	10.42	39.15	50.42	04/23/81
16	0.43	9.70	0.52	15.09	2.86	71.40	9.57	37.76	52.65	08/04/81
17	0.46	9.73	0.57	15.02	3.11	71.11	9.43	38.04	52.52	08/05/81
18	0.51	9.58	0.66	14.79	3.55	70.91	9.21	38.43	52.34	08/07/81
19	0.66	9.30	0.82	14.39	4.22	70.61	9.76	39.18	51.04	08/11/81
20	0.94	9.05	1.16	13.61	6.14	69.10	9.70	38.59	51.69	8-17-81am
21	0.98	8.98	1.21	13.45	6.45	68.93	9.66	38.43	51.89	8-17-81pm
22	1.66	7.92	2.35	10.91	12.69	64.47	8.48	38.62	52.86	08/25/81
23	2.10	7.46	1.93	12.90	8.40	67.21	13.85	40.98	45.16	08/28/81
24	2.74	6.94	2.16	13.39	7.95	66.82	16.94	43.00	40.04	09/01/81
25	2.93	4.96	3.37	14.28	7.82	66.64	14.52	53.84	31.62	09/02/81
26	2.48	1.49	6.40	17.53	7.26	64.84	8.55	71.05	20.38	09/03/81
28	0.27	6.35	0.35	9.47	1.96	81.60	8.94	37.36	53.86	1980

EXPLANATION

K, Na, Mg, Cl, SO4 and H2O are given in weight percent.
K-mp, Mg-mp, and SO4-mp are given in terms of mole percent
Sample numbers 1 to 13, and 14 to 26 were analyzed by Great Salt Lake Minerals and Chemicals Corp. Samples 27 and 28 were analyzed by American Chemical and Research on 9/26/80.

Table Q2. Chemical analyses of salts for evaporation tests 2 and 3.

Sevier Lake Brine Evaporation Test 2

							[----------Salts Present----------]					
No.	**K**	**Na**	**Mg**	**Cl**	**SO4**	**H2O**	**Hal**	**Gyp***	**Blod**	**Hex**	**Sch**	**Kain**
27	0.11	36.6	0.16	56.34	0.48	6.25	x	x				
28	0.1	37.73	0.34	58.94	1.06	1.83	x	x				
29	0.1	37.67	0.22	58.8	0.69	2.52	x	x				
30	0.2	37.4	0.28	57.52	0.88	3.72	x	x				
31	0.3	37.37	0.24	57.52	1.27	3.3	x	x				
32	0.32	37.97	0.22	58.77	0.99	1.73	x	x				
33	4.6	27.79	2.29	42.89	13.92	8.51	x				x	
34	4.67	24.76	2.76	36.21	18.9	12.7	x				x	
35	2.24	6.08	7.92	9.37	33.11	41.28	x			x	x	?
36	3.82	12.13	6.19	19.97	27.15	30.74	x			x		x
37	6.33	10.88	7.05	28.7	19.07	27.97	x			x		x

Sevier Lake Brine Evaporation Test 3

							[----------Salts Present----------]					
No.	**K**	**Na**	**Mg**	**Cl**	**SO4**	**H2O**	**Hal**	**Gyp**	**Blod**	**Hex**	**Sch**	**Kain**
38	0.2	36.78	0.16	57.18	1.09	4.59	x	x				
39	0.19	34.93	0.28	53.95	1.64	9.01	x	x				
40	0.28	35.37	0.54	53.89	3.8	6.12	x	x				
41	0.43	33.23	0.18	49.9	5.51	10.12	x	x				
42	0.21	19.1	5.55	14.71	42.2	18.01	x		x			
43	0.49	18.93	5.32	15.14	40.74	19.38	x		x			
44	6.54	23.83	2.74	34.33	20.31	11.25	x				x	
45	7.61	16.93	4.25	29.02	21.92	20.27	x				x	x

EXPLANATION

Hal	=	Halite	=	$NaCl$
Gyp	=	Gypsum	=	$CaSO_4.2H_2O$
Blod	=	Bloedite (Astrakanite)	=	$MgSO_4.Na_2SO_4.4H_2O$
Hex	=	Hexahydrite	=	$MgSO_4.6H_2O$
Sch	=	Schoenite (Picromerite)	=	$MgSO_4.K_2SO_4.6H_2O$
Kain	=	Kainite	=	$MgSO_4.KCl.3H_2O$

* Minor amounts of gypsum determined to be present.

DISCUSSION

Figure Q1 shows the plotted positions of the original brines for tests two and three. These points show that the composition of the brine, which lies within the sediments of Sevier Lake, is not constant from one location to another. The differences in the evaporation paths, too, suggest that there are differences in the brine. The differences in the brine evaporation paths may be explained in part, however, by the evaporation rates applied during the two tests, especially during the time that the last three to four samples of each run were taken. In both cases, however, the final ion ratios were coincident. Had sufficient brine existed for continuing the test, I expecte that the evaporation paths would have continued toward the carnallite and bischofite fields. The evaporation path of both brines was confined to the bloedite field of the phase diagram.

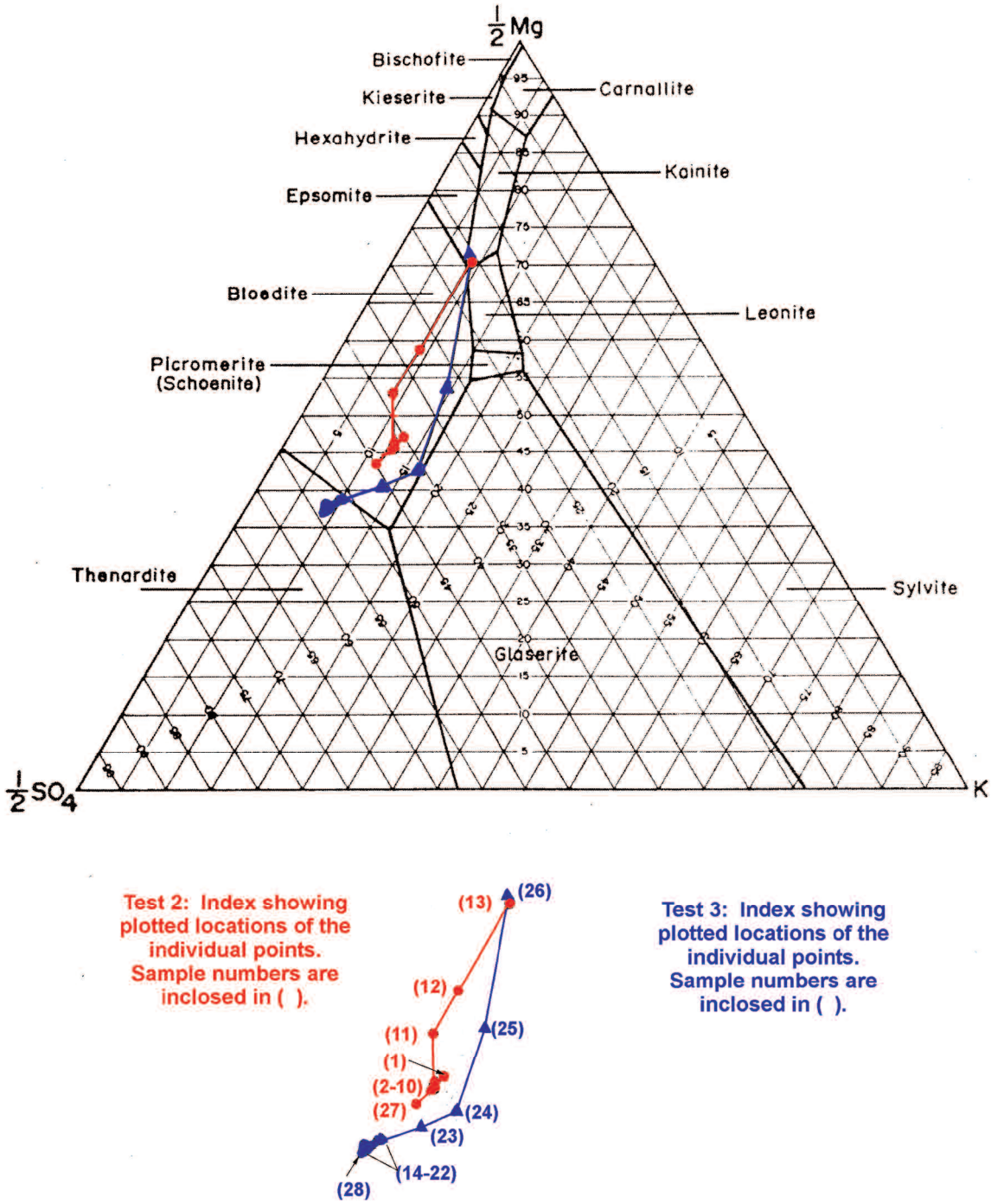


Figure Q1. *Triangular phase diagram showing the evaporation paths of test two and test three brines (at 25° C).*

Table Q2 shows that a number of salt species, identified by x-ray diffraction, were precipitated from the brines during the evaporation tests. Of particular interest is the small amount of gypsum ($CaSO_4.2H_2O$) that was precipitated from the two brines at least from the point of sodium chloride saturation up to the point of magnesium saturation. If sufficient calcium exists in the brine, it will precipitate as the sulfate salt gypsum.

In test two, the first salt to precipitate along with halite was hexahydrite, which was followed by kainite. The brine temperature was maintained between 21 and 31° C. From the evaporation path as it is plotted on figure Q1, however, these minerals would not have been expected. An explanation for this problem might be that during the test, which was carried out at an accelerated rate, insufficient time was allowed for complete brine-salt equilibrium to take place. Such complete equilibrium may have shifted the evaporation path towards the higher K values, into the schoenite field, and towards the higher Mg values, into the hexahydrite field. The evaporation path did reach the kainite field.

In test three, the first salt to precipitate along the halite was bloedite followed by schoenite and kainite. Again, the three minerals that precipitated from the brine would not have been predicted, except for kainite, from the evaporation path taken during test three. The explanation for this apparent discrepancy is the same as was given for test two.

In general, based on these two tests only, the following salts may be precipitated from Sevier Lake brines during a normal summer evaporation sequence. First, large quantities of sodium chloride (halite) will precipitate. This salt will precipitate constantly, though at a decreasing rate, throughout the entire evaporation - precipitation sequence. If large quantities of halite are to be kept separate from the magnesium and potassium salts, the evaporation must be done in staged ponds, under a carefully controlled brine movement schedule. Second, bloedite may or may not be precipitated. If at all possible, the precipitation of this salt should be avoided as it depletes the brine of magnesium. Third, precipitation of hexahydrite followed by schoenite and kainite can be expected towards the end of the evaporation sequence. Carnallite would be expected if evaporation were carried out for a longer period of time, especially during the fall months.

If the concentrated brine is exposed to lower ambient temperatures, such as during the fall and winter months, large quantities of epsomite ($MgSO_4.7H_2O$) and/or hexahydrite would precipitate. Under the same cold temperatures, near 0°C, but with less concentrated brines, mirabilite ($Na_2SO_4.10H_2O$) would precipitate in large quantities. It would be of interest to determine the summer evaporation path of a brine which had previously been depleted in sodium and sulfate by the precipitation of mirabilite. In general, the following commercially valuable salts could be produced from Sevier Lake: halite, mirabilite, hexahydrite, epsomite, and possibly some K or Mg double salts such as picromerite, leonite and kainite.

Figures Q2 and Q3 show the change in the weight percent of the five ions (Na, K, Mg, Cl, and SO_4) plotted against a linear time scale. It is more convenient and normal, however, to view the decrease of sodium over time as a smooth descending line if the only sodium-bearing salt being precipitated is sodium chloride. Thus, figure Q4 shows the data in figure Q2, adjusted to a non-linear time base to straighten out the sodium line. In test three, however, bloedite was precipitated in addition to the sodium chloride. Thus, in figure Q5, an arbitrary downward dip has been placed in the sodium chloride line to represent the precipitation of bloedite. Also on figures Q2 through Q5, the points at which the various mineral species were noted to start and stop precipitating have been added.

PROCEDURE - FOR PURPOSE THREE

The density of each brine sample was determined with a Parr-Metler specific gravity meter. The index of refraction was determined with an Abbe refractometer. Both determinations, which are shown in table Q3, were determined at 25°C, the temperature being controlled by a constant temper-

Table Q3. Density and Index of refraction data

Test/Sample No.	Density (g/cc)	Index of Refraction
2- 1	1.1406	1.3672
2	1.2102	1.3820
3	1.2170	1.3836
4	1.2175	1.3838
5	1.2208	1.3844
6	1.2271	1.3851
7	1.2387	1.3867
8	1.2473	1.3883
9	1.2626	1.3906
10	1.2877	1.3943
11	1.3125	1.4005
12	1.3087	1.4014
13	1.3101	1.4098
14	1.3214	1.4186
3- 15	1.1357	1.3653
16	1.2253	1.3841
17	1.2257	1.3841
18	1.2322	1.3847
19	1.2384	1.3862
20	1.2585	1.3880
21	1.2612	1.3885
22	1.2989	1.3934
23	1.2861	1.3928
24	1.2863	1.3939
25	1.2947	1.3978
26	1.3182	1.4128
27*	0.9968	1.3333

*No. 27 is deionized water

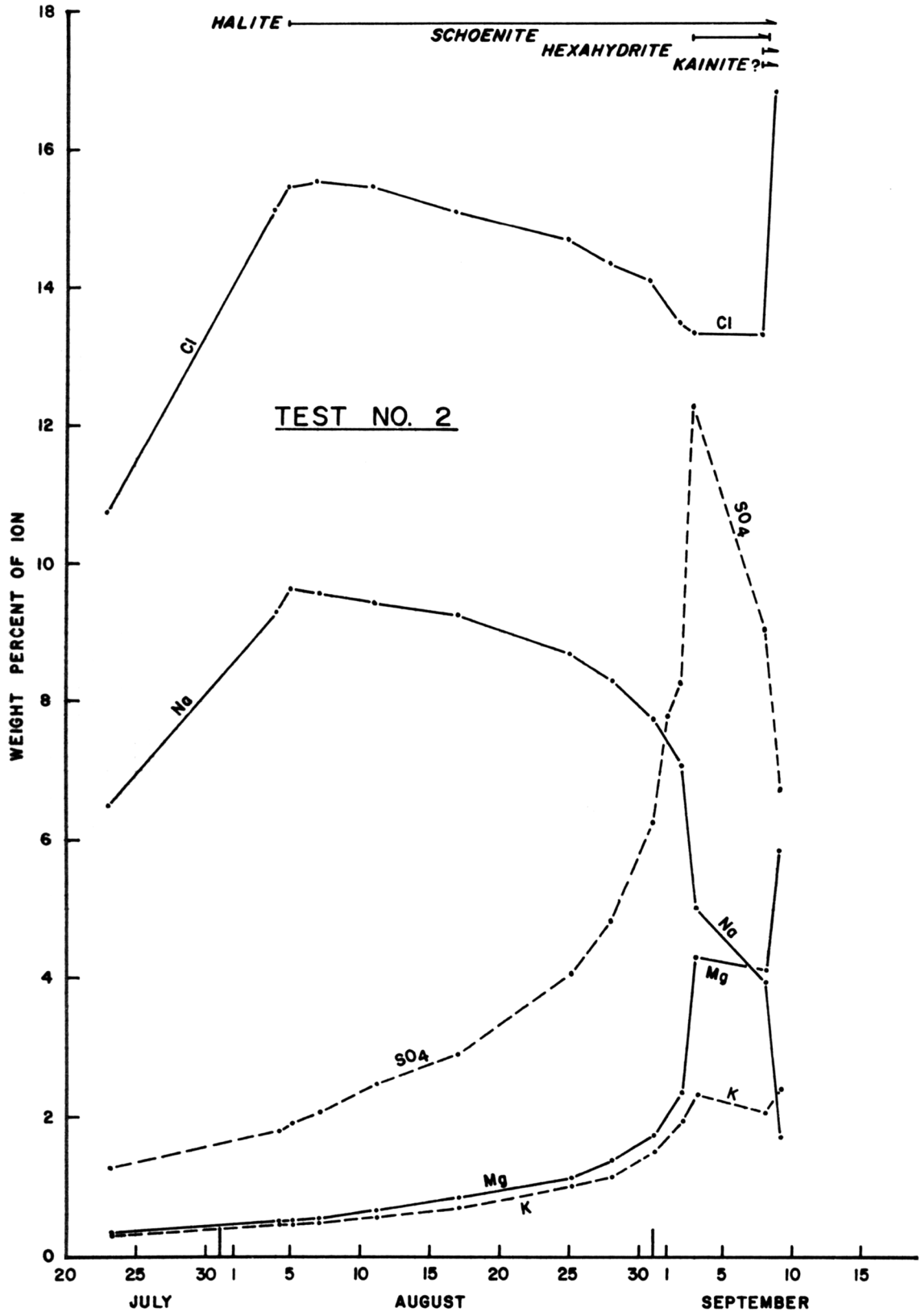


Figure Q2. *Graph showing weight percent of ions plotted against time, and the range of the precipitated minerals for test 2.*

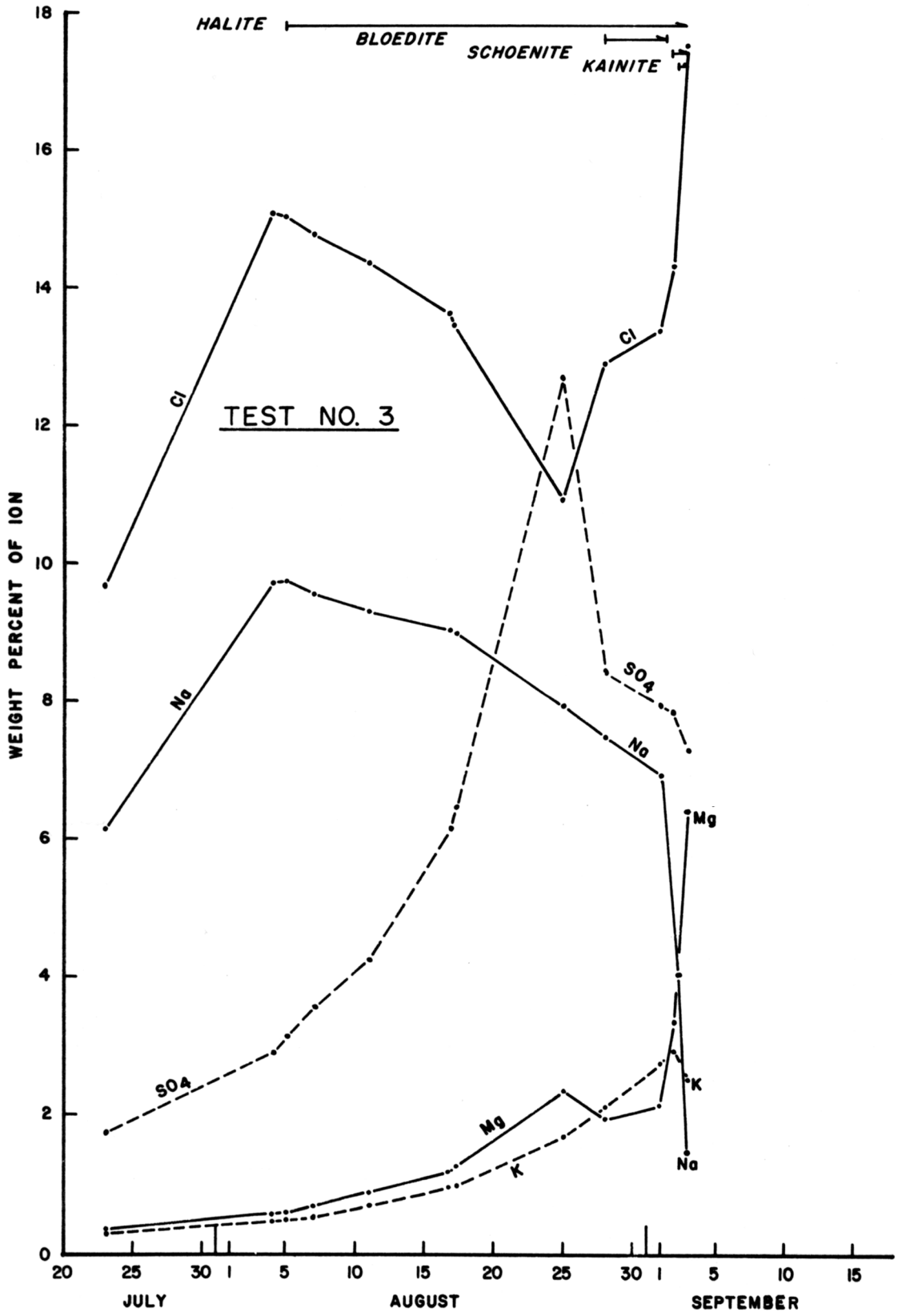


Figure Q3. *Graph showing weight percent of ions plotted against time, and the range of the precipitated minerals for test 3.*

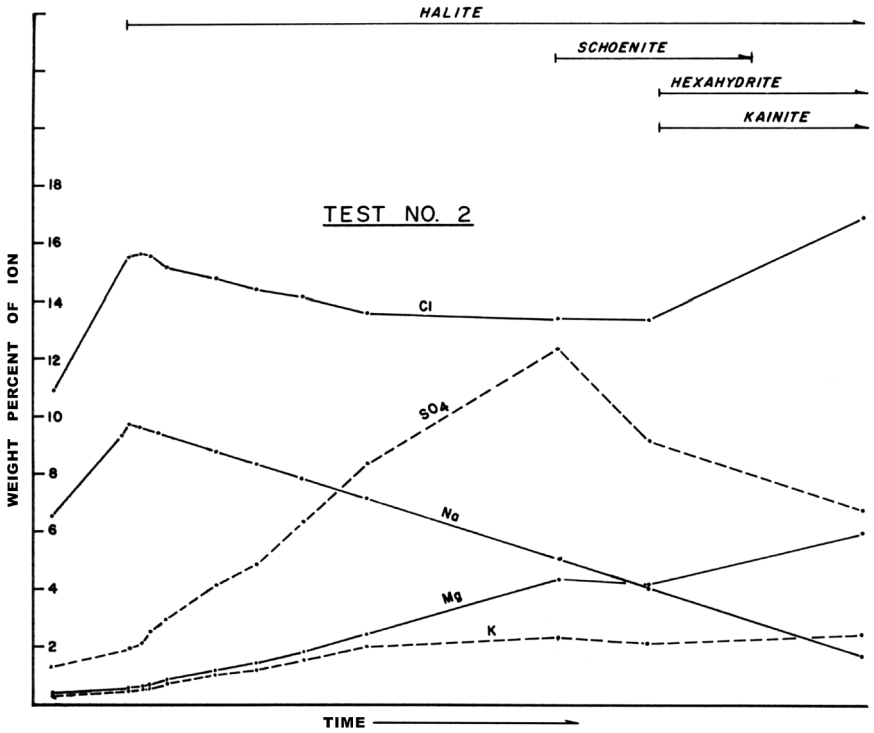


Figure Q4. *Graph showing percent of ions plotted against nonlinear time, and the range of the precipitated minerals for test 2.*

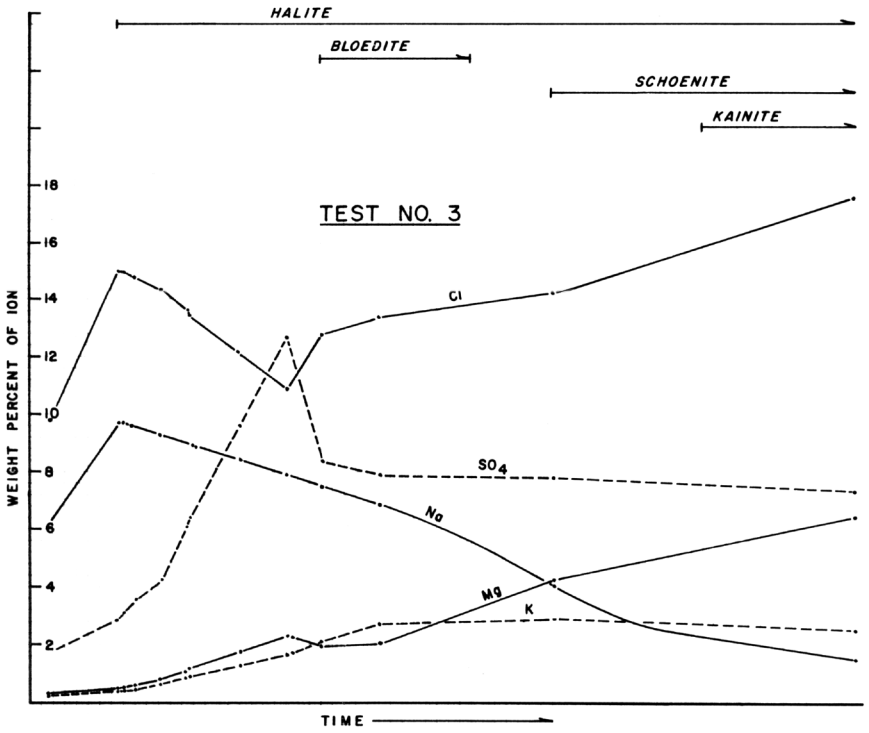


Figure Q5. *Graph showing percent of ions plotted against nonlinear time, and the range of the precipitated minerals for test 3.*

ature bath. Cloudy brine used for the index of refraction measurements or entrained air bubbles in brine used for density measurements can affect the accuracy of these readings.

DISCUSSION

The index of refraction can be, under the proper conditions, correlated with the magnesium content of brine. The test is a relatively inexpensive and quick procedure. Such a test is routinely used by American Metals Climax (AMAX) to monitor the stage of evaporation on their Great Salt Lake solar ponds. If uniform feed brine was provided to a solar pending operation on Sevier Lake, the refractive index of the brine could be used to estimate the magnesium content and thus the evaporative stage of that brine. Figure Q6 shows the refractive index of the evaporated brines in tests two and three plotted against the magnesium content.

ANALYTICAL RESULTS - FOR PURPOSE THREE

The density of the brine can also be used to determine the stage of evaporation. Figure Q7 shows the brine density plotted against the magnesium content. This plot also reveals the difference between the two brine types.

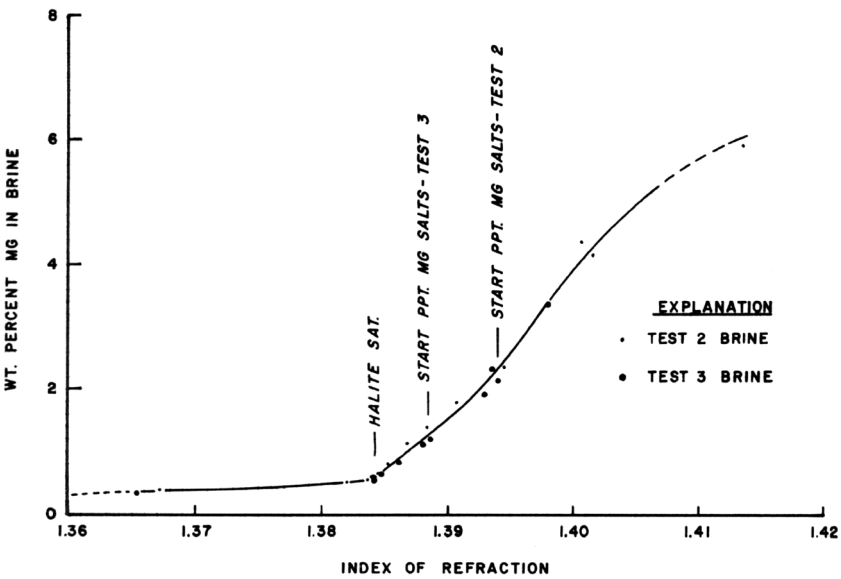


Figure Q6. *Graph showing weight percent Mg in brine plotted against the index of refraction, and the points of salt saturation. (Ppt = precipitating.)*

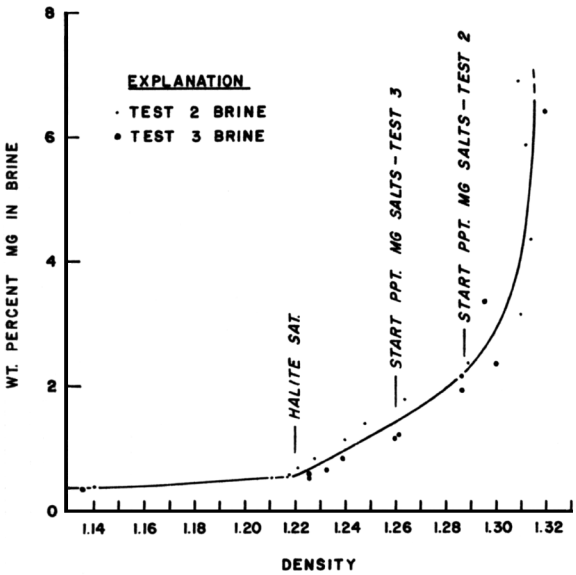


Figure Q7. *Graph showing weight percent Mg in brine plotted against density, and the points of salt saturation. (Ppt = precipitating).*

PROCEDURE - FOR PURPOSE FOUR

A split of each brine sample that was sent to GSLM was also sent to Chemical and Mineralogical Services (CMS) to be analyzed for lithium and uranium. The lithium was analyzed by atomic absorption and the uranium analyzed fluorometrically. In addition to these analyses, both the salts were analyzed for lithium by GSLM, though their results do not appear to be as consistent as those done by CMS.

ANALYTICAL RESULTS - FOR PURPOSE FOUR

Table Q4, shows uranium (U_3O_8) and lithium (Li) values in brines from CMS; and analytical values for lithium from GSLM for the brines and corresponding salts.

Test –	Brine Sample No.	CMS U_3O_8 (ppb)	CMS Li (ppm)	GSLM Li (ppm)	Salt Sample No.	GLSM Li (ppm)
2 –	**1**	1.5	25	68	—	—
	2	-1.0*	30	95	—	—
	3	1.0	35	85	2– 27	8
	4	-1.0	35	87		-
	5	-1.0	45	107	28	1
	6	1.0	55	116	—	—
	7	1.0	75	156	29	3
	8	-1.0	90	191	30	3
	9	-1.0	120	249	31	5
	10	-1.0	165	119	32	6
	11	5.0	335	259	33	12
	12	5.0	410	315	3– 35	22
	13	130.0	1040	32	36	24
	14	35.0	1450	NA	—	—
3 –	**15**	3.5	25	70	—	—
	16	3.5	35	61	—	—
	17	8.0	35	65	3– 38	2
	18	8.0	40	72	—	—
	19	4.0	55	96	39	4
	20	4.0	75	121	—	—
	21	4.0	80	148	—	—
	22	6.5	150	249	40	10
	23	19.5	180	131	42	10
	24	30.0	235	160	43	19
	25	50.0	565	404	44	14
	26	190.0	1435	1151	45	51

* —1.0 indicates less than 1.0 parts per billion

The uranium values do show an irregular, increasing trend with concentration of the brines. It is unknown why the number two test uranium values are consistently 1ower than the number three test values.

The lithium values for the brines, given by CMS, show a increase with brine concentration. Figure Q8 shows the CMS lithium values, for the two brine tests, plotted against the corresponding magnesium values. In test two, it can be seen that the plot is fairly linear until the first magnesium-bearing salt, schoenite, is precipitated. At this point, magnesium fails to increase at the same rate as the lithium. In test three, the linear nature of the magnesium-lithium ceases to be linear as bloedite is precipitated, which is also a magnesium-bearing salt.

Although the analyses for uranium are not conclusive, these data suggest that as the brines concentrate, both uranium and lithium stay in solution and reach substantial concentrations. The increasing lithium values reported by GSLM in the salts are probably due to brine entrained within the salts rather than lithium being precipitated as a salt.

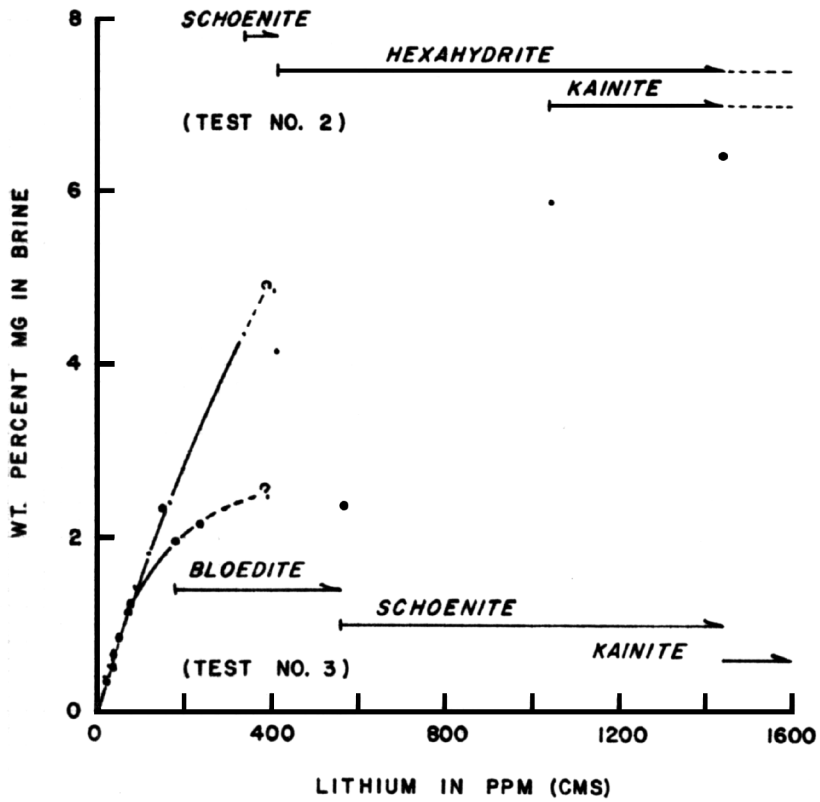


Figure Q8. *Graph showing wt. percent Mg in brine plotted against the lithium (in ppm), and the zones of salt saturation for tests 2 and 3.*

PROCEDURE - FOR PURPOSE FIVE

A sample of unconcentrated Sevier Lake brine and a sample of the final concentrated brine, both from test three, were submitted to the University of Utah - Earth Science Laboratory analytical facility for a thirty-seven element ICP analysis.

ANALYTICAL RESULTS - FOR PURPOSE FIVE

Table Q5 tabulates the analyses for thirty-seven elements in the unconcentrated and concentrated brines.

Table Q5. *ICP trace element analyses of concentrated and unconcentrated brines.*

Element	Unconcentrated Brine (ppm)[1]	Concentrated Brine (ppm)[1]
Na	68,400	6,400
K	3,050	11,850
Ca	528	33
Mg	4,475	110,250
Fe	1.30	1.49
Al	-12.50	2.6
Si	65	89
Ti	-2.50	-0.500
P	-12.5	21.4
Sr	20.74	0.51
Ba	-12.5	9.1
V	-25.0	-5.00
Cr	-1.00	0.66
Mn	-5.00	-1.00
Co	-0.500	0.30
Ni	-2.50	0.9
Cu	-1.25	2.7
Mo	-25.0	-5.00
Pb	-5.00	1.4
Zn	-2.50	17.0
Cd	-1.25	-0.250
Ag	-1 .00	-0.200
Au	-0.20	-0.20
As	-12.5	-2.50
Sb	-15.0	-3.00
Bi	-50.0	-10.0
U	-125	852
Te	-25.0	-5.00
Sn	-2.50	7.2
W	-2.50	1.9
Li	32.88	-0.2003
Be	-0.100	0.045
B	17.7	1000
Zr	-2.50	-0.500
La	-2.50	-0.500
Ce	-5.00	-1.00
Th	-50.0	-10.0

[1] Negative numbers indicate concentrations below detection limits, for example, -12.50 = less than a detection limit of 12.50 ppm.

[2] The ICP analysis of uranium in the concentrated brine shows a value of 85 ppm as opposed to a value of only 190 ppb as reported by CMS. The question remains, is uranium present in the brines in terms of ppm, as reported by the ICP, or in terms of ppb as reported consistently by CMS?

[3] The ICP analysis shows less than 0.200 ppm of lithium to be present as opposed to the value of 1435 ppm reported by CMS. A reason for this gross discrep ancy is not clear.