SNOWY CAPS TO LOVELAND'S TAPS
Printed June 1989

Chapter One
The Early History

Loveland's water story begins with the Big Thompson River. Before the arrival of the white man, Arapaho hunting parties would ride through the valley and camp along the river near the sulphur spring that bubbled out of the ground on the southeast side of Mariana Butte.

Explorers wending their way westward used the river as a natural pathway through the wilderness. From 1837 to 1842, Philip Thompson explored, trapped, and traveled along the river known to the Indians as the Big Pipe. Thompson, in his exploration of the river now named for him, may have been the first white man to travel through the valley. John C. Fremont's expedition followed the Big Thompson River in 1843. Fremont described it as a "fine stream, sixty-five feet wide and three feet deep."

Fur trappers camped on its banks in search of beaver and other animals. Brothers Nicholas and Antoine Janis set up a trapper's camp along the Big Thompson River and stayed several years before moving on. Mariano Medina arrived at their camp in the summer of 1858. Medina had a colorful background as a guide, interpreter, and mountain man, and was the first permanent settler in the Big Thompson Valley. He claimed to have traveled with Fremont's party as interpreter and introduced Kit Carson as an old friend when Carson visited him in 1868.

As the demand for beaver decreased, mountain men started looking for permanent locations for their new homes. Prospectors who failed to make their fortunes in the Colorado goldfields took a second look at the dry land of the High Plains, which the explorers Zebulon Pike and Major Steven Long described as a virtual desert. The Big Thompson Valley had much to offer: plentiful water supply, wild game, timber for cabins, forage for cattle, and maybe even gold!

Settlements mushroomed along the streams where mountain men had camped. Medina built a toll bridge across the Big Thompson and forced travelers to cross his bridge by fencing his land. His settlement, called Namaqua, included a fort and a combination saloon and store on the north side of the river, and rental cabins on the south side.

In 1862, trouble with the Indians along the North Platte River caused the Overland Stage to change its route to follow the Cherokee Trail, a path used by the Cherokee Indians on their trading expeditions to the Northwest. The stage had to cross Medina's bridge, and Namaqua became a stage stop. By 1876, Namaqua had been eclipsed by the town of St. Louis, later called Winona, located three miles downstream.

In 1861, three years after Mariano Medina settled on the Big Thompson, Colorado was organized as a territory. Larimer County was created shortly thereafter with a population of only 100 people. That year drought caused a partial crop failure, so settlers diverted water from the streams to save their gardens and potato patches. During the 1860's and '70's, agriculture in the area grew and so did the need for water. With an annual rainfall of less than 15 inches, the settlers felt the importance of water from the beginning.

Water Rights

Laws concerning surface water were written into the Constitution when Colorado became a state in 1876. The Constitution declared that the water of every natural stream is public property, and it established an appropriation system for determining how individuals acquire rights to use water.

Under the system, persons may appropriate water even though they intend to use the water far from the stream. The law states that whoever first claims the water for beneficial use has established the right to use it. The date of appropriation then becomes the basis for determining which rights are senior and which are junior. This principle of “first in time, first in right” is known as the Doctrine of Prior Appropriation. It differs from the Riparian Doctrine found in the humid east, where owners of land along a stream are entitled to full use of the water, as long as it is undiminished in quality or quantity.

Two main classes of appropriation were identified in the Constitution:

1) Diversion of water from the stream for immediate use (direct flow rights).
2) Diversion from the stream for storage for later use.

A direct flow appropriator cannot store his water for later use, and the storage appropriator usually may fill his reservoir only once a year. In each of the two main classes, uses were also prioritized in order of importance: domestic, agricultural, and then manufacturing and mining.

Colorado became a leader in the legal concept of water rights, now generally adopted in all western states. This original concept dates back to the California gold rush of 1848, when miners had to divert water from nearby streams to wash their gold. Disputes over water were settled by fists, guns, and shovels, with the winner of the fight getting the water. An informal set of rules developed regarding water in the goldfields.

It became accepted practice that the miner who first used the water had the first right to it, even if another miner’s claim was closer to the stream. The second miner to use the stream had the second right to it and so on down the line. Miners brought this system with them when they came to Colorado during the gold rush of 1859. Later as the gold boom died out, some miners moved down onto the plains and applied this same concept to their new agricultural interests along the river valleys.

History of Irrigation

Water played a key role in the settlement of this semi-arid land long before the white man appeared on the scene. Remnants of dams and terraces at Mesa Verde give evidence of an ancient irrigation system, perhaps in use by 1000 AD, that permitted the Anasazi Indians to grow their crops with a meager water supply. In spite of the skillful management of soil and water, the cliff dwellers disappeared, perhaps because of prolonged droughts.

The first white settlers in the Big Thompson Valley lived along the river banks with easy access to the abundant water. They grew oats, beans, wheat and potatoes. Apple trees were first planted in 1871. By 1920, one and a half million pounds of cherries were being produced in the valley annually, and Loveland claimed to be the largest producer of red raspberries in the country.

Settlers eventually banded together to construct small ditches that allowed irrigation of the arid lands above the flood plain. As the population of the area grew, and the land farther from the river was settled, companies formed to build bigger ditches. Landowners and farmers usually were the stockholders. Each stockholder was responsible for digging and maintaining the ditch across his own property.

The Big Thompson Ditch Company was granted the earliest appropriation date of 1861, and other companies soon followed. The Chubbuck Ditch, built by a group of farmers in 1867, was the first to bring Big Thompson water to the bluffs above the river. As the ditches proved successful, irrigated agriculture expanded rapidly.

When David Barnes and his family arrived in 1873, they moved to a 320-acre farm on a bluff north of the Big Thompson River. The Barnes farm was bounded on the west by what is now Garfield Avenue, on the east by Monroe Avenue, on the north by 14^{th} Street and on the south by First Street.

His daughter Lena recalled, “it was a bleak prairie, nothing in sight but prairie dogs, rattlesnakes, and hoot owls.” Hauling water to irrigate was a difficult and time-consuming task, so Mr. Barnes constructed a ditch to divert water to his land. Today, still in operation, it is known as the Barnes Ditch.

Lake Loveland

Along with building ditches, reservoirs were constructed to store spring flood water for summer use. A small pond known as Hays Lake, located at the bottom of a great natural depression about a half-mile north of town, was the scene of early cattle round ups. In 1894, the Greeley and Loveland Irrigation Company used this site to construct a reservoir named Lake Loveland.

The depression was a natural reservoir site, with uniform slopes needing little embankment. The Barnes Ditch carried water from the Big Thompson River to fill the reservoir during the spring, and the stored water was let out into the Loveland and Greeley Canal (originally the Chubbuck Ditch) during the irrigation season. That system continues to operate today.

Connecting the lake to the canal, a mile south, was a challenge. The first half-mile was constructed as a tunnel through soft sand-stone, lined with concrete or brick. A circular culvert five feet in diameter, lined with bricks, ran the next 2,400 feet. The last 250 feet to the canal was an open channel.

A brick water tower, seven feet in diameter, was built offshore to house the machinery used to raise and lower the control gates. The reservoir was first filled during the spring of 1895, capturing 12,000 acre-feet of water. Over 4,500 men worked on the project, which used some 650,000 bricks held together by 1,500 barrels of concrete.

Early Water Diversion

Colorado’s water shortage stems not so much from a lack of water, but from the uneven distribution of it. Although about 80% of Colorado’s precipitation occurs on the Western Slope, the most fertile farmland lies east of the Continental Divide. As early as the 1880’s, farmers dreamed of importing water from western Colorado to the Great American Desert on the east.

After conducting a preliminary survey in August 1884, Colorado State Engineer E. S. Nettleton decided it was not feasible to divert mountain water from the Western Slope. In his report, he stated: “A tunnel of 14 to 17 miles is entirely impractical to construct.”

Henry Joseph Heinricy, a local farmer, for many years searched the Rocky Mountains west of Loveland for sources of water. “Eureka!” Heinricy exclaimed when he finally located a site on the Western Slope along the top of Flat Top Mountain, now part of Rocky Mountain National Park.

He approached the Louden Ditch Company for backing to construct a ditch to divert water to the Big Thompson Basin. After they turned him down, he went to B.D. Sanborn of Greeley, a man known to be interested in irrigation projects. Sanborn’s influence resulted in twenty men from Greeley each contributing $100 to finance the project.

In 1902, Heinricy’s dream came true as the Eureka Ditch began diverting water across the Continental Divide into the Big Thompson River. This farsighted pioneer has been called by some the father of the Colorado-Big Thompson Project.

Chapter Two
Pioneer Loveland

The history of Loveland began with the completion of the Colorado Central Railroad from Golden to Cheyenne in 1877. The best route for the line was through David Barnes' farm. Barnes laid out the streets of a new town after he finished harvesting his wheat and oats in 1877. He named the new town Loveland after his friend William Austin Hamilton Loveland, president of the Colorado Central Railroad. After the town was platted, Barnes brought 1,200 cottonwood trees from the Platte River and planted some on every street.

St. Louis, located a mile farther down the river from the Barnes farm, had become the commercial center for the entire valley. When lot selling began in Loveland, many businesses, including the Post Office, moved to the new site. By June 1878, 18 businesses were settled on Main Street (Fourth Street). Corner and business lots sold for $100 each.

The town, as first established, ran from A Street (Lincoln Avenue) west to E Street (Garfield Avenue) and from First Street north to Eighth Street. Main Street became the main business street and B Street (Cleveland Avenue) the main north-south street.

The formal organization of Loveland took place May 11, 1881. Just a year after the city's founding, its population was 250. The town was an instant success. Three factors contributed to its growth – its location along a major north-south rail line, its situation half way between Longmont and Fort Collins, and the ample supply of dependable water from the Big Thompson River.

Water By The Barrel

Loveland's first public water supply flowed from the Barnes Ditch along the streets in small ditches. This was supplemented in freezing weather by water delivered in 50-gallon whiskey barrels from tank wagons. The price for water bailed from or pumped up from the Big Thompson River was 25 cents a barrel. Foote and Stoddard's livery stable were the principal merchants.

Water for pupils at the public school (Fourth Street and Cleveland Avenue) was delivered in a barrel in front of the school. The children drank from a tin cup chained to the barrel. When a new school was built on Washington Street, it had two barrels with the luxury of two tin cups for each.

According to Eugene Smith, pioneer resident, large sucker fish once escaped into the Barnes Ditch. Fish were scooped up into the barrels out of the laterals all over town, and out of gardens where water happened to be running.

For the benefit of the farmers who came to town and their horses, an open well was dug in the middle of Fourth Street. The well had boards around it about three feet high with a pulley over the top. As a bucket of water was pulled up, another bucket went down.

Later, for fire protection, two 12-foot cisterns were dug and kept filled with water. Hand pumps, with hoses and handles for four men, were installed in each cistern. Large, heavy sheets of flagstone covered the cisterns in the middle of Fourth Street.

Before 1883, Loveland had no organized fire department, only a volunteer bucket brigade. That year two volunteer hose companies developed – the Bartholf Hose team and the Loveland Hook and Ladder. Loveland never had fire wagons drawn by horses. The men themselves, in harness, pulled the equipment.

The Artesian Well

When Loveland's flour mill and grain elevator were destroyed by fire in 1885, it became evident that the cisterns did not provide enough water. This trauma precipitated residents to issue a $5,000 bond to drill an artesian well. The Fort Collins Artesian Well and Drilling Company, Swan brothers proprietors, were hired to drill the well on the southwest corner of Fourth Street and Cleveland Avenue. The bonds did not provide sufficient funds to reach a good supply of water, and in 1886 a second series of bonds were issued to continue the well "to not more than 3,000 feet." The well construction stopped at 2,742 feet when a small flow of water came to the surface. After cleaning out the well and installing a two-inch pipe, the flow of water increased to 40 barrels a day. Hopes were high for a suitable water supply. But soon only a trickle of water flowed, with a high concentration of mineral salts and unpleasant to the taste. As a means of supplying the town with good soft, wholesome water, the $14,000 well was a failure.

A circular stone fountain was erected over the well and the people of Loveland sampled the water. On April 26, 1900, the *Loveland Reporter* stated, "Nearly every traveling man visiting Loveland heads for the artesian well and swallows a lot of the mineral water bubbling from it. They claim many merits for the water, as do many of our own citizens. Soon the town will bottle and ship this water to many points, so great are its medicinal properties."

Eugene Smith tells the story of the day the water wagon failed to deliver water to his mother's barrel. She sent him to the artesian well for a bucket of water to make some tea. The tannin in the tea leaves, combined with the minerals in the water, made a fiery red concoction; the most vile he ever tasted.

Besides the mineral water, the well also produced a natural gas. An effort was made to use this gas to light the Bartholf-Allen Opera House (located on the same corner as the well) for a production of "Uncle Tom's Cabin," but this was not a success either. The flow was too uneven, and the lights failed in the middle of the first show.

The circular fountain was replaced in 1932 by a terra cotta one with two spigots – mineral water on the east side (lit with gas from the water) and city water on the west (lit with electricity). Harold Marion Dunning attached a bronze plaque to the fountain in memory of David Barnes. Well water continues to flow from the fountain but its taste has not improved with the years. The well, the deepest ever drilled in Colorado, was made famous when Ripley featured it in his "Believe It or Not" column in January, 1941.

The Water Works

The failure of the well to meet expectations led to a demand for a new water system. After an election on October 11, 1886, the Town issued $40,000 worth of bonds for the construction of a nine-mile pipeline to serve the town.

With a water supply assured, the town trustees in march 1887 established a Department of Water Works. Ordinance 27 provided for water rates, meters, a superintendent, and even licensing of plumbers. Soon to follow was a network of distribution pipelines and fire hydrants, carrying water to homes and businesses.

Town Councilors W.D. Hemingway, J. J. Ryan, and S. B. Harter were appointed to a temporary Committee on Water Works to oversee the pipeline construction. A permanent Water Works Committee was established in April 1888 with members John J. Ryan, S. B. Harter and Vollie VanBramer.

The Big Dam

To supply additional water for irrigation, engineer John H. Nelson constructed a log dam on the Big Thompson River for the Home Supply Ditch Company in 1880. It was located nine miles west of Loveland, just above Chasteen's Grove. In 1887, the Town of Loveland built a wooden pipeline to carry water from the dam into the town.

During a flood in 1894, the log dam was washed away. Determined to build a dam that would not wash out, John Nelson designed a stone and concrete dam to take its place. Charles Lester was the primary stone mason, and George Kelly was the contractor on the project, which cost $11,000. The Big Dam is one of the oldest masonry arch design dams in Colorado. The dam is 60 feet high from the bedrock to the top. Rocks weighing up to 2,000 pounds were hauled in by team and wagon and laid in concrete for the bottom layer.

Jessie Chasteen Whiteside was living at Chasteen's Grove when her home became headquarters for the construction crew while the dam was being rebuilt. When interviewed by Zethyl Gates in 1972, Mrs. Whiteside related the store of John Nelson's accident. He was knocked off a cliff as he was helping to lower rocks into the canyon. Nelson hit the edge of a wheelbarrow and "split his face open from his forehead to his mouth, just as clean is if you'd done it with a knife." The doctor was summoned and arrived fairly tipsy, accompanied by a few friends. He put 3 or 4 stitches in Nelson's face, but didn't even wash off the blood. Horrified by the doctor's behavior, Jessie's mother cleaned him up, got her needle and thread out of her sewing basket and finished the stitching job. Mrs. Whiteside saw Nelson many years later and he looked "just fine."

Nelson's design has stood the test of time, even surviving the Big Thompson Flood in 1976. The City of Loveland takes its water supply out of the north side of the dam, and the Home Supply Ditch carries water out on the south. The Big Dam was dedicated as a Colorado Civil Engineering Historical Landmark in 1986.

Chapter Three
Water Supply

As snow accumulates in the high country, it's good news for the Water Utility. All of Loveland's water originates from mountain snowmelt. In an average year, almost three-fourths of the stream flow volume occurs from May through July.

Today the sources of water for the Loveland Water Utility are direct flows from the Big Thompson River, City ownership in private ditches (which also derive their water from the Big Thompson River), and water from the Colorado-Big Thompson and Windy Gap projects (which divert water from the Colorado River Basin into the Big Thompson Basin).

The Big Thompson River has historically been Loveland's primary source of water. In July 1881, Loveland purchased its first water rights from Francis E. Everett of Golden. In 1897, the City acquired 3.44 cubic feet per second of direct flow rights from the Hillsborough Ditch Company. This water was part of the earliest filing on the Big Thompson River, dated November 10, 1861. The City acquired additional direct flow rights from the Big Thompson Ditch and Manufacturing Company in 1925. Together, these rights supply approximately half of the City's current annual use of 7,200 acre-feet of water. An acre-foot of water is one acre of water one foot deep, or 325,851 gallons.

Before 1985, City owned ditch water could only be diverted at specific locations, not always at the water treatment plant where it was needed. To use this water, the City had to exchange ditch water for Colorado-Big Thompson water. That year, a Transfer Decree granted the right to divert ditch water at any of several headgates along the river.

Colorado-Big Thompson Project

In the dry years of the 1930's, the ditches produced very little irrigation water, and the available water on the eastern side of the mountain had already been appropriated. Most of the suitable reservoir sites for storing spring flood water for summer use had been developed by 1910. Farmers and developers alike turned back to the old idea of bringing some of the unused water from the Western Slope over to the east. Since additional Western Slope water couldn't be brought around or over the mountains, the only workable solution was to actually bore through the Continental Divide.

In 1935, $150,000 of Works Progress Administration (WPA) funds were allotted to the Bureau of Reclamation for exploration of the idea. The Northern Colorado Water Conservancy District was organized in 1937 to contract with the federal government to construct and administer the project.

Actual construction of the Colorado-Big Thompson (C-BT) Project, whose waters originate from the headwaters of the Colorado River, began in 1938 with a dam and power plant at Green Mountain on the Western Slope. The project has proven to be of immense importance to Loveland and the surrounding area, supplying irrigation and municipal water, as well as power for industries.

In 1940, the Alva B. Adams Tunnel was bored thirteen miles through a solid granite mountain. The bore was so long that the curvature of the earth had to be taken into account. Drilling commenced from both sides of the tunnel, and when the drillers met in the middle, their surveys were true to within half an inch. The tunnel is 9.75 feet in diameter. Water finally flowed through the tunnel and into the Big Thompson River in June 1947.

The final section of the project was completed in 1959, twenty-one years after construction began. The C-BT project provides supplemental water to about 720,000 acres and more than 400,000 people in the South Platte River Basin.

Since the quantity and quality of the Big Thompson River water fluctuates throughout the year, C-BT water is used to supplement Loveland's demand. For Loveland to get water from the system, it flows from the Adams Tunnel to Flatiron Reservoir and then is pumped to nearby Carter Lake and into the Charles Hansen Feeder Canal. A turn-out constructed by the City diverts C-BT water from the canal into the City's 600 acre-foot Green Ridge Glade Reservoir, north of the water treatment plant.

Windy Gap Project

In the early 1960's, six cities in northeastern Colorado, including Loveland, banded together to find additional water supplies to serve their growing municipalities. The cities filed for water rights on the Colorado River on July 17, 1967. In 1970, the Municipal Subdistrict of the Northern Colorado Water Conservancy District was formed to develop a new water supply on the Western Slope known as the Windy Gap Project. Surplus runoff water from the Colorado and Fraser Rivers is captured in a dam west of Granby and is pumped from the diversion dam to Lake Granby. The water is stored there until it is transmitted through the C-BT system to the Front Range.

Construction on the project began in July 1981, and it became operational in the spring of 1985. As the project progressed, three of the cities with municipal power systems transferred all or part of their allotment to the Platte River Power Authority. Loveland owns one-twelfth of the project. Although Loveland hasn't needed it yet, water from the Windy Gap Project could provide the City with about 4,000 acre-feet annually.

The Eureka Ditch

In 1940, Albert Beebe, who then owned the Eureka Ditch, paid a $40.70 debt by giving the City 200 feet of water service pipeline in the Campion area and all rights to the Eureka Ditch system. For Loveland to continue to claim rights to the water from the ditch, the State requires that the ditch flow routinely be measured.

For 25 years (1938-1963) this was done by the late Earl Denton of Loveland. When interviewed in 1962 by Bus Tarbox, Denton said, "I drive 80 miles to Green Mountain Ranch and then ride horseback for 11 miles up Tonahutu Creek. The final two miles to the weir (a box-like measuring device for determining the amount of water flow) are occasionally made on skis or showshoes over drifts a horse couldn't navigate."

Denton made these trips once a week from the end of May to mid-September to take readings. In 1958, a 30-day clock device was installed to record water flow on a graphite chart. It turned the weekly trips into monthly ones.

Today, the City retains ownership of the Eureka Ditch, and the 30-day clock is still in operations. Each year the City receives credit for approximately 100 acre-feet of water from the ditch. It turned out to be a good trade for the City!

Water Resource Planning

Short-and long-range planning is necessary for the City to maintain adequate supplies of raw water to meet its growing needs. Since drought is a natural unpredictable occurrence in Colorado, Loveland is continuing to plan for future dry periods. To accomplish this, the City has acquired water rights beyond their current needs. Therefore, the City owns more ditch water than it is now using and leases water to area agricultural and industrial users. Before the City serves water to newly developed areas, the developers must transfer water rights to the City to serve that development. So as water use and demand grows, City ownership in local ditch and reservoir companies increases.

In 1986, the City initiated a three-phase drought study to determine future water needs and to plan for future water supplies. The first phase of the study determined that Loveland has adequate sources of water to meet present needs, even during a 100-year drought. However, if Loveland grows at a moderate rate for the next 15-20 years, and should a 100-year drought occur during that time, there could be a water shortage.

The second phase of the study evaluated alternatives to meet Loveland's future water supply demand. The preferred alternative was to expand Green Ridge Glade Reservoir to a total capacity of 3,500 acre-feet and to purchase extra units of C-BT water. Additional engineering studies and financial impacts of the selected project will be studied in more detail during phase three.

Chapter Four
Water Treatment

Raw water becomes drinking water at the City's water treatment plant located in Chasteen's Grove nine miles west of Loveland, on the north side of the Big Thompson River.

When the Loveland area was first settled, the water in the river was usually of fair quality. But as the population increased the supply became more and more polluted. The original pipeline, installed in the spring of 1887, took water directly out of the river from the Big Dam and piped it into the City without benefit of filtration. This unfiltered water never caused any epidemics, but dysentery was rampant every summer.

A brochure, published in 1898 to attract new residents to Loveland, touted pure water as one of Loveland's chief attractions. It pointed out, "the water, fresh from the springs and melting snow banks, is taken from the river where it emerges from mountain canyons before it is contaminated by irrigation, alkali or mining processes."

Mr. H. Mendelson, chief chemist for the sugar better factory, did a chemical analysis of Loveland's water in October, 1901. He found the water to be "nearly chemically pure." Rarely had he seen water so pure as Loveland's.

Water Treatment Beginnings

In 1902, special screens were ordered from Chicago to place over the inlet pipes at the Big Dam. The *Loveland Register* reported that "the screens will prevent fish and other kinds of live animals from getting inside the pipe." They were fifteen feet long and fastened onto the ends of the pipes four feet below the water.

The first treatment facility for Loveland was a slow sand filter installed in 1906, at the site of the present water treatment plant. This filter consisted of about four feet of upgraded sand through which the water flowed before emptying via an underdrain. As the filter became dirty, it was shut down and the top layer of sand was removed by hand. It was a simple but tedious process.

In 1917, another slow sand filter and a clearwater storage reservoir were added; the same year disinfection of water with hydrochloride began. Engineers recommended disinfection by ultra-violet rays in 1924, but this was too costly for the City. A building was constructed in 1924 to house six rapid sand filters (a bed of sand of uniform density) and two sedimentation basins. These additions brought the plant capacity to four and one-half million gallons per day (MGD).

The late William Davis, who retired in 1970 after almost forty years of service, recalled some of the problems he faced at the treatment plant, including catching a bear in a trap in 1952.

Anchor ice, ice found attached to the bottom of an otherwise unfrozen stream, was always a problem as it kept water from coming through the headgate to the plant. Davis remembered it could necessitate a trip to the river every 15 minutes or so throughout a cold night to break up the ice. This inconvenience was relieved by placing a pole with three white flags spaced a foot apart into the ice that covered the intake structure. With a spotlight on them, the flags could be seen from the bedroom window of the house at the plant. As the ice built up, one by one the flags disappeared. As long as three flags were showing, it meant things were all right and Davis could rest for another hour. If only two flags were visible, it meant the headgate was clogged with ice and it was time to get up and begin work.

On Christmas Eve 1937, Davis remembered when a 24-inch concrete line from the river to the treatment plant broke. He and other employees worked through Christmas Day to restore the line, finishing the job just before the water stored in the 1.5 million gallon tank ran dry.

Howard Yoakum worked with Bill Davis at the plant for 18 years, beginning in 1949. Yoakum remembers how the two of them ran the plant seven days a week; Davis worked the morning shift and he worked from 2 p.m. to at least 10 p.m. It was a rough job – no weekends or holidays off. Yoakum, a natural handyman, had no formal training for his job at the treatment plant, but learned everything on-the-job. There was no real laboratory, so only chlorine, turbidity, and pH were tested. After almost 30 years of service, Howard Yoakum retired in 1978.

C-BT Water Arrives

In 1952, as the City began to use C-BT water, algae became a problem. Algae can cause foul taste or odor to be carried through the treatment process. In the late 1950's, carbon was used in an attempt to control this problem. To remove algae more efficiently, two microstrainers were installed, one in 1960 and a second in 1963. These machines use a rotating drum which is covered with a very fine wire mesh (over 20,000 openings per square inch). Water flows through the drums and the algae is held back and washed out with the waste water. Since C-BT water now goes into a reservoir before entering the plant, the algae problem has been reduced and the microstrainers have been eliminated.

Loveland's population growth between 1930 and 1950 was fairly slow and there were few improvements to the water treatment system. Between 1950 and 1965 Loveland's population doubled. New buildings, modern appliances, second bathrooms added to existing homes, and rising health standards created a growing demand for high quality water. In 1962, a 3 MGD treatment facility was added at the plant site. After this addition, the plant had a total of 16 rapid sand filters and a capacity of 12 MGD. Converting a sedimentation basin into two filters in 1966 brought the plant capacity to 13.5 MGD.

In 1968, the rapid sand filters began to be converted to mixed media filters. These filters process three times more water than the rapid sand filters. Mixed media filters use three different materials of increasing densities: crushed anthracite coal, filters, sand, and garnet sand. The addition of two mixed media filters increased the plant capacity to 17.5 MGD.

Lyle Herman, the present plant Superintendent, remembers the spring of 1969 when the runoff caused a small flood. The water, three and one half feet over the top of the Big Dam, washed down rattlesnakes, "like you wouldn't believe." They were crawling everywhere trying to escape the flood. In the following months, the plant staff killed about sixteen of them.

The Big Thompson Flood

On the one hundredth anniversary of the State of Colorado, July 31, 1976, a flash flood dumped nearly 12 inches of rain in less than four hours in the scenic Big Thompson Canyon causing 145 deaths – and the worst natural disaster in the state's history. The Big Thompson River, 19 feet above its normal water level, destroyed 418 homes and 52 businesses.

The water supply to the City of Loveland was reduced from 18 MGD to under 2 MGD as the flood moved through the Big Thompson River system. Silt and debris blocked the intake gates; raw sewage from a broken sewer line in Estes Park briefly poured into the river and 100 feet of the 36-inch steel transmission line washed out. The Big Siphon, located across the entrance to the Big Thompson Canyon, was destroyed. In spite of all the damage, the flood restricted plant production for only five days.

According to Superintendent Herman, during the flood the water rose 9 ½ feet over the top of the Big Dam. Two staff members at the plant watched the entire steel truss bridge from above the Big Dam go down the river.

The turbidity of the water, a measurement of the amount of suspended particles, was high for a long time after the flood. This made the treatment of the water a slow and laborious process. Extra chlorine had to be added to the water supply. Severe watering restrictions were enacted as the plant produced only a minimal amount of water. The effects of the flood were felt at the treatment plant for more than three years because of the road construction and runoff problems.

Green Ridge Glade Reservoir

Plans for a raw water storage reservoir were drawn up in the 1960's, but it wasn't until after the Big Thompson Flood in 1976 that construction began. Green Ridge Glade Reservoir, a 600 acre-foot reservoir located just north of the plant, was ready for use in 1979. Herman recalls the reservoir's construction and how every morning he found fresh deer tracks across the new fill they had laid the day before.

A new diversion structure was built to bring C-BT water from the Charles Hansen Feeder Canal into the reservoir. Before the reservoir existed, C-BT water was dumped into the river near the Big Siphon and taken out at the City's intake. This second source of water for the treatment plant helps ensure an adequate water supply during emergencies. The project included a pipeline from the reservoir to the plant.

If Green Ridge Glade Reservoir had existed at the time of the Big Thompson Flood, there would have been an alternate raw water supply. Need for the reservoir was again demonstrated in 1978 when the treatment plant intake structure became plugged with debris due to upstream highway reconstruction activities. Plant output was only affected for two days, but had the reservoir been in service, plant production would have been uninterrupted.

The Lawn Lake Flood in 1982 resulted in contamination of Loveland's water supply as it was being stored in Lake Estes. It was the uncontaminated water in the City's reservoir that provided the plant with sufficient water.

Chasteen's Grove

John Chasteen came from Kentucky as an Indian fighter and horse trader and stayed to homestead. He built his first log cabin beside the Big Thompson River in what came to the known as Chasteen's Grove. In 1880, Chasteen built a log-walled house above the grove. The house, which had always been lived in, has been expanded and modernized, but some of the old log walls remain. An old bunkhouse, which provided quarters for the men who worked for the original Chasteen family, and a chicken coop stood on the property for many years.

For nearly 100 years, Chasteen's Grove, located below the Big Dam and the treatment plant, was a popular spot for leisurely picnics along the river. In an interview with the *Loveland Reporter Herald* in 1976, Mary Ellen Chasteen Bowman described her childhood in the house at Chasteen's Grove. Her family charged 25 cents a car to enter the picnic area. The land was sold to the City in 1947 after the death of her father, Ed Chasteen. The picnic area has been closed since the Big Thompson Flood stripped the park of its trees and grassy areas.

Howard Yoakum and his family lived in the house from 1949 until 1967, the years he worked at the plant. He and his wife Alpha loved the old rambling house and the peaceful atmosphere at the grove.

Chasteen's Grove Water Treatment Plant

Continual growth in Loveland led to a treatment plant expansion to 30 MGD in 1981. The expansion included an 800,000 gallon clearwell receptacle for treated water storage, sedimentation basins, and a control room with laboratory for testing water. A new intake structure from the river was also part of this project. The plant can be expanded one more time to a capacity of 46 MGD. An open house and dedication ceremony was held at the plant on April 24, 1982, and it became known as Chasteen's Grove Water Treatment Plant.

The Treatment Process

Big Thompson River water enters the plant through an intake structure, which screens the water to make sure no fish or large pieces of debris are collected. The water then flows through a grit basin to settle out heavier sand particles. Potassium permanganate is added to help remove impurities, kill harmful bacteria, and destroy bad tastes and odors. Since 1952, fluoride has been added to help prevent tooth decay.

Next, the water enters the flocculation basin where big paddles stir the water. Here alum, a coagulant, is added which binds small particles into heavier, more readily settled, masses. From there the water passes into sedimentation basins where it moves very slowly and allows the heavier particles to sink to the bottom and be removed. All but the most minute particles settle out here. The last step is filtration, where even microscopic particles are removed.

Water flowing out of the filters is collected in a clearwell where it is treated with chlorine to prevent bacterial growth in the transmission lines.

Water Quality

Through a national effort that began more than 70 years ago, the United States has achieved drinking water standards that are among the most stringent in the world. The U.S. Public Health Service issued the first federal drinking water standards in 1914. Until 1974, the standards only controlled bacteria and viruses that cause cholera, typhoid, and other waterborne diseases. Although the standards were very successful in curbing the spread of such disease, public concern over the safety of drinking water supplies prompted new legislation.

The Safe Drinking Water Act of 1974 (SWDA) set national standards for allowable levels of contaminants, guidelines for treating drinking water, and monitoring and reporting requirements for public water systems. An amendment to the SDWA passed in 1986 set limits on the levels of 42 chemicals and elements besides the 31 already being tested.

The Laboratory

A modern, well-equipped laboratory constantly analyzes samples of treated water from the treatment plant and the distribution system. Three times a day, plant operators do 14 tests to determine the optimum chemical dosages. Loveland’s treated water constantly meets, or is of higher quality than, federal and state standards.

The laboratory is certified for bacteriological testing. A laboratory technician runs 45 tests each month from water taps throughout the City, assuring that Loveland’s residents are receiving water that is bacteriologically safe. Today, the laboratory uses electronic instrumentation to analyze the water. Samples are sent to the laboratory at the Colorado Department of Health for tests requiring more sophisticated instrumentation. In the past, all the tests were done by visual comparison, which was not very precise.

In the early 1970’s, Bill Davis brought in a bucket of treated water from the plant, and the four operators tested it for turbidity on a Hellige visual turbidimeter. They got four different answers. So Bill went to get another bucketful of water to try the test again. Four more tests were taken before Davis confessed that he had never dumped the original bucket of water. One operator got the same result the second time, but that still meant there were seven different numbers for turbidity. The electronic turbidimeter used today accurately produces just one number.

Chapter Five
Water Distribution

Today treated water is delivered to about 40,000 people within the Loveland area. Purified water leaves the treatment plant in transmission lines and is directed either into storage tanks or to customers. A network of water mains distributes the water to customer's taps, sprinklers, and fire hydrants.

The Wood Pipeline

In 1887, Loveland's first pipeline was installed. Specifications for the pipeline included a well just above the mouth of the Home Supply Ditch at the Big Dam, a culvert across the main channel of the river, and a 6-inch wooden transmission line running nine miles to Fourth Street and Railroad Avenue.

The well was to be 6½ feet below the bed of the river and not less than 6 feet square in the inside. The walls of the well were to be made with "good flat-faced rock."

The original specifications for the 6-inch pipe called for "the best quality wrought iron, lap-welded and coated with asphalt." But the Michigan Pipe Company convinced the town council that wood was a better material and won the construction bid.

Random lengths of bored Michigan pine logs were banded with continuous flat wrought iron to make the pipe. The exterior was tarred and wooden spigots connected the pipe lengths. The pipeline stayed in service until about 1930 when part of it was abandoned. A portion of this line remained in service until 1939.

Digging trenches for the pipeline was no easy task. The work was done by hand with picks and shovels. The trenches were eight feet deep.

The contract included twelve fire hydrants and over 10,000 feet of smaller diameter pipe. Each fire hydrant was set with a 3-foot diameter brick manhole. The final bill came to $41,400, and the pipeline was completed in August 1887.

The Committee on Water Works, overseeing the pipeline construction, reported to the town council in April 1887 that, "they found the work was being done in a very imperfect and unworkmanlike manner. The pipe was laid crooked and the joints were not driven close together." To assure the pipeline was put in according to specifications, the Committee employed Mr. Charles Pulliam for $60 a month to superintend the construction.

But the town council had different ideas and voted to hire Mr. J.L. Connors as superintendent of the project for $3 a day. In June 1887, Town Marshal David James took on additional duties as Superintendent of the Water Works, replacing Mr. Connors. James received $20 per month, in addition to his $60 a month salary.

In 1901, citizens approved a $60,000 bond issue to pay for a new pipeline to supply Loveland's sugar beet factory with water. A 12-inch continuous wood stave pipeline of Douglas fir was completed that year, from the Big Dam to Eighth Street and Lincoln Avenue.

John H. Nelson, the town surveyor, drew the plans for the pipeline. Unrolled, the plans were 14 feet in length. Three bids were submitted for the pipeline construction, and choosing the contractor was surrounded with controversy. In March 1901, the Water Works Committee opened the bids at a closed meeting and awarded the contract to the highest bidder, J.E. Rhodes.

Outraged citizens convinced the town council to rescind that contract and award it to the lowest bidder, McCabe and Teagarden of Boulder. After being awarded the bid, the Boulder company pleaded with the council to let them construct an iron pipeline, instead of a wooden one. It seems they had made a mistake in their bid and couldn't possibly put in a wood line for the amount bid. The third bidder, Holme & Allen, was awarded the final contract for $39,600 and constructed the line as specified.

The wood stave line consisted of boards two inches thick, five inches wide, and ten feet long. To be watertight, the tongue and groove boards were squeezed together with 5/8-inch diameter threaded bands. The bands were held in place with shoes (pieces of threaded metal with nuts that tightened). An 8-inch cast iron main carried the water the remaining distance to the factory.

W. A Riley was awarded the contract to excavate and backfill the pipeline. He advertised for workers: laborers $1.75 a day and rock men $2.00 a day. A cook was wanted for $40.00 a month.

Wood Pipeline Memories

Donald C. Moss, longtime resident, remembers the 12-inch wood pipeline that crossed his father's farm (the early Rist-Benson homestead) that was rented from the Great Western Sugar Company. Mariano Medina's cabins and the Namaqua fort were in his backyard. The house had City water; its pressure powered his mother's washing machine.

Moss recalls that the wooden transmission line was forever springing leaks in their fields. The City maintenance crew, composed of Ursa Chambers, Mr. Spotts, and others would come out, dig up and repair the leak. The leaks were hard on the crops because the standing water often killed the plants. The maintenance crew had to drive their vehicles across the fields to get to the leak and that also damaged the crops. But no one ever complained or asked the City of Loveland for damages.

This main went across the river bottom, climbed alongside the Barnes Ditch across the pasture of Mr. Moss's grandfather Bartlow at the end of Eighth Street. The small leaks in that pasture were seldom reported and hardly ever repaired. The leaks supplied irrigation water for the pasture. The main went east across the Bartlow farm and under one corner of the house. Mr. Moss recollects one very cold winter in about 1918 when the pipeline sprang a large leak about 30 feet east of the house. The water shot up to the tops of the poplar trees surrounding the house. It froze and the weight of the ice stripped the trees of their limbs. Ice covered the house and yard.

The 12-inch wood line ran through the property on Glade Road where Ted Van Dusen grew up. He recalls hauling water from the river to the house until his father figured out how to tap the line. Apparently, the Van Dusen family had free water service for a period of time.

The Leaning Tower of Pisa

Loveland's "leaning Tower of Pisa" was constructed in 1918 at 14th Street and Cleveland Avenue. The 70-foot high, 27-foot diameter steel-laced concrete water tank looked like a medieval tower. With a capacity of 250,000 gallons, its original purpose was to provide water pressure for the northeast section of the city. In 1925 its usefulness ended with the expansion of the treatment plant and two new transmission lines. It cost $8,000 to build the tower structure, less than the cost to demolish it in 1967 to make possible the widening of Highway 34.

In 1924, a one and one-half million gallon concrete storage tank was built on the west side of town, near the Devil's Backbone. The tank's innovative design and construction techniques generated a lot of interest. William Hewett was the designer. Once the concrete pouring began, it went on 24 hours a day until completion. After the concrete set, steel bands were tightened around the tank. It was quite an undertaking at that time. Permanently taken out of service in 1985, this tank is scheduled to be demolished.

Also in 1924, a 20-inch wood stave pipeline was installed from the water treatment plant to the new storage tank, and a 24-inch wood line was constructed from the tank to Tenth Street and Garfield Avenue. The 20-inch wood line was in service until 1981, when a 48-inch line was installed to carry the purified water to the cement tanks near the Devil's Backbone. The 24-inch wood line is still in service on Tenth Street from Colorado Avenue to Garfield Avenue.

In 1938, a 20-inch cast iron pipeline with leadite joints was laid alongside the 24-inch wood line with help from Works Progress Administration (WPA) forces. The WPA, a federal agency of the 1930's, found community improvement projects for unemployed workers. Although the wood line and very few breaks over the years, the cast-iron line with leadite joints averaged about two breaks a year.

A four million gallon prestressed concrete storage tank was constructed in 1953 near the Devil's Backbone, adjacent to the tank built in 1924. It leaked until 1967 when it was sealed with a rubber fillet lining. In 1963, the Chicago Bridge and Iron Company constructed a 100,000 gallon elevated steel water storage tank in Campion. Another four million gallon steel tank was built off 29th Street, just west of Wilson Avenue in 1965. Interestingly, the supported steel dome roof was fabricated on the floor of the tank and then raised into position by compressed air.

A five million gallon storage tank was built in 1983 at Taft Avenue and 42nd Street SW. Neighbors who originally opposed the tank later agreed it was attractive after extensive landscaping at the site.

The City's four storage tanks help to equalize pressure in the distribution system, meet peak hour demands, and provide water for fire protection. Although most of the system operates by gravity, there are four booster pump stations to provide adequate water pressure to higher areas.

Distribution system mains range in size from 4 to 36 inches and have been constructed of wood stave, cast iron, ductile iron, and polyvinyl chloride (PVC). In recent years, PVC has been used extensively for 12-inch and smaller mains, while ductile iron is used for larger mains. Today there are about 500 miles of water lines in Loveland.

Leaky Pipes

John Smit, retired foreman of the construction crew, remembers it was the City's philosophy for many years to repair water lines without shutting them off so that no one was left without water. Repairing water lines under pressure was difficult. When lines had to be shut down, customers were supplied water through hoses from other mains.

According to longtime water utilities employees Allan Olmstead and Dean Bach, in 1963 the 20-inch cast-iron line sprang a leak where it crossed the Big Thompson River. The leak was caused by deterioration of the leadite joints. They had to dam the river and divert the water around the area where they were working. The crew worked day and night to repair the pipe. To replace the leadite, they filled the holes with jute and then caulked them with lead wool. To complete the job, a bell dresser was tightened over the joint.

Olmstead and Bach remember well the day in July 1969 when "the men walked on the moon." A homeowner was digging in his backyard and hit what he thought was a tree root. As water shot into the air, it didn't take him long to discover that he had put a hole in the 24-inch wood pipeline. Olmstead and Bach were on the scene soon after it happened and ended up spending two nights there before the line was repaired.

Repairing the old wooden line was a difficult and time-consuming task. First, the bands had to be taken off, and then a rubber shield and a steel plate were positioned over the hole. Bands with shoes were wrapped around the pipe at close intervals. A special tool called a "crow's foot" was used to install a nut onto the shoe to hold the bands tight. When water was run through the line, leaks were still evident. So pieces of redwood were hammered into the holes and then broken off in splinters. As the splinters became wet and swelled, the line became watertight.

Maintaining water lines, valves, and meters in good working order is a time-consuming but important task. Crews inspect, test, and repair all the parts of the transmission system. Each year over 1,000 fire hydrants are flushed to clean sediment out of the water mains.

Water Restrictions

It was only six years after the water utility was established that lawn watering regulations appeared on the books. It must have been an exceptionally dry summer in 1893, for in July the town fathers passed an ordinance dividing the town into two sections; one district watering from

5 a.m. until 1 p.m. and the other from 1 p.m. until 9 p.m. This was in effect from April to September each year with the hours reversed after three months.

The City again imposed watering restrictions on its customers during the summer of 1970. A decrease in water consumption following the restrictions was readily apparent. Until 1981, watering restrictions let customers water only every two or three days. In some years, regulations prohibited customers from watering during the hottest part of the day. The installation of water meters and the expansion of the water treatment plan allowed the restrictions to be lifted.

Water Meters

In July 1979, the Loveland City Council approved an ordinance requiring water meters for all new construction and for existing homes when ownership changed hands. Before that time, the City only required meters for commercial accounts within the City and for all accounts served outside the City limits. Less than a year later, June 1980, the council passed another ordinance requiring meters for all water customers.

By 1981, the City was completely metered at a cost of over $3 million. The average annual water usage declined by 20 percent. Before metering, the water treatment plant's maximum day demand was 22 million gallons per day (MGD). Maximum day since metering has been 16.7 MGD. Loveland's water usage currently averages 188 gallons per capita per day (gpcd).

Water Rates

The methods of charging for water have gone through many changes in the past 100 years. In the years before the City supplied water, an enterprising businessman charged 25 cents for a whiskey barrel of water. In 1887, the water utility established a flat rate, based on the type of dwelling and the number of fixtures. Customers paid the yearly fee in advance. For a residence with five rooms or less, the rate was twelve dollars. Each toilet and bathtub in the house carried an additional two dollar fee. For a barber shop or blacksmith shop, the rate was ten dollars per year. To keep one horse, cow, or other animal for private use, the fee was two dollars per year, and additional animals were only one dollar a head.

Getting customers to pay their water bills was a continual problem. In May 1892, Town Marshal Kelly was instructed to turn off water service to sixty customers who had not paid their bills. By the time twenty services had been turned off, those who had not paid were lined up at the city clerk's office ready to pay.

In July 1901, the town council decided bills must be paid by everyone using the town's water, whether they were hooked up or not. This resulted in the arrest of F.M. Brinkley, who pled guilty to using water from a hydrant. He was fined, but the fine was dismissed.

Until 1968, rates were based on a flat fee determined by fixture count. But keeping track of the number of bathrooms and toilet fixtures in homes was hard. So in July 1968, the City developed a flat rate charge per family based upon average water usage. Lot size determined the rate for lawn sprinkling. Since 1981, the monthly billing has reflected actual water use with the installation of meters. A water bill has a fixed or minimum charge and a volume or consumption charge. The volume charge assesses the same rate per thousand gallons, regardless of the amount of water used.

Chapter Six
Wastewater Collection and Storm Drainage

As Loveland's population grew, the disposal of domestic wastes became a public problem. Early settlers used privy vaults, water closets, cesspools, and latrines to dispose of sanitary wastes. These methods drained the wastes into the soil, polluted wells, and smelled bad.

To Sewer or Not

In 1893, the problem of sewage disposal in Loveland came before the town council. Councilman Spotts told the council from several privy vaults was a hazard to public health. The Council ordered the vaults be replaced with more sanitary means.

Controversy over installing a sewer system began in 1900, when a $5,000 bond issue was placed on the ballot. A bond issue to build an electric power plant was also to be voted on. Heated arguments were reported in the local newspapers until the April 3 election. While the *Loveland Register* advocated installing a sewer system, the *Leader* was decidedly opposed. In February, the Register stated arguments favoring the system:

"A sewerage system will benefit the health of our people. It will afford a complete drainage system for our beautiful town. Draining swamps and marshes and removing stagnant surface water has been so beneficial to any community that no one in this age questions the results."

Opponents balked at the cost, and said "at this time there is no crying need for a sewerage system." Voters defeated the sewer bond issue, but opted for electric lights.

In February 1902, an informal vote of the citizens was conducted, and this time the outcome was in favor of constructing a sewer and drainage system. Ordinance 82 established a public sewer system on October 24, 1902. It stated, "A public sewer for sanitary drainage is a necessity. The welfare and prosperity of the town demand its immediate construction. The absence of such a sewer is a constant menace to the health of the inhabitants of this the town, and a public sewer for sanitary reasons is now and hereby declared necessary."

Engineer J.L. Frankeberger was hired to survey and make plans for the sewer system. Dunningan and Palmer Company was awarded the bid, and the construction was completed by February 1903. A sanitary sewer fund was created to pay the $10,230 construction fee.

Two sanitary sewer mains were constructed of vitrified clay pipe – one to serve the east side of town and one to serve the west. The east side main ran down Washington Street from the alley between Seventh and Eighth Streets, south to First Street. The line continued west on First Street to Railroad Avenue and then headed south to empty into the Big Thompson River. To serve the west side, a main was built on Garfield Street from Seventh Street south to First Street, then east to connect with the other sewer.

Beneath the sanitary sewer, an 8-inch underdrain was installed to alleviate the groundwater problem. The sewer system carried both wastes and storm runoff directly into the river.

Manholes were built by hand using vitrified clay bricks and cement mortar. Some of these manholes are still in use.

The sewer main the town funded was known as the public sewer, other mains were added by district. By ordinance, sewer districts began to be established in early 1903. Funding for the district sewer lines was solely by the property owners, although the lines were owned and maintained by the town. As Loveland grew, new districts were formed, and the sewer system expanded.

Retired employee Ted Van Dusen recalls digging trenches by hand for new sewer lines in the 1930's. The crew dug over a hundred feet of 8-foot deep trench a day. John Smit remembers the City purchasing a Barber Green ditch digger in the early 1950's. It was bought as surplus from the Army after the Japanese internment camp closed near Greeley. After its purchase, trenches were not dug by hand again. By 1955, the department had purchased a backhoe.

Most sewer lines older than 10 years were constructed of vilified clay pipe (VCP) using cement mortar joints. For the past ten years, polyvinyl chloride pipe (PVC) has been used almost exclusively for small sewers, with reinforced concrete pipe (RCP) used for sewers larger than 12 inches in diameter. Currently, precast concrete manholes are being used in sanitary sewer construction.

Sewer lift stations have allowed sewer service to be extended to lower lying areas of new development. Thirteen lift stations now in operation lift the wastewater to a higher elevation where it can flow by gravity.

Sewer System Maintenance

Early sewer cleaning was a very unpleasant task with a tool called a rodder. A wooden rodder has three-foot sections, like a broom handle, that hooked together. It was pushed by hand into the pipe until it hit the blockage, then it took eight men to crank it to loosen the blockage. Whatever was blocking the line would come into the manhole so fast that it was hard to get out of the manhole ahead of it.

Today sewer lines are cleaned at least once a year using two hydraulic jet cleaners. Problem areas are rodded and flushed as often as necessary.

Sewer Rates

In January 1947, customers began to be charged for their sewer service. Until that time, sewer system construction and maintenance was paid out of general City funds. The yearly rate was made part of the quarterly water bill. A private residence was charged $4.00, a restaurant $12.00, and a canning factory $16.00. Today, the sewer bill is paid monthly. The rate is determined each March based on the average amount of water a residence has used during the months of December, January and February. These months record the indoor water usage, most of which ends up going down the drain.

Infiltration

Loveland has a high groundwater problem in many areas as a result of snowmelt, precipitation, and poor drainage. During the irrigation season, additional water seeps out of irrigation ditches and reservoirs such as Lake Loveland, and the water table rises.

Flows in the sewer collection system fluctuate dramatically from season to season due to infiltration and inflow. Infiltration is the entrance of groundwater into the sewer system from cracked pies, broken joints, improper connections, and leaky manholes. Inflow is the illicit discharge of surface water from rain and snowmelt into sewers from roof leaders, foundation drains, storm sewers, and catch basins. During high flow periods, large amounts of grit, sand, and silt may be carried to the wastewater plant, decreasing the plant's efficiency.

Storm Drainage

Management of storm water is new to the Water/Wastewater Department. Until 1986, the Street Department was responsible for storm drainage and street sweeping.

The City doubled its population during the 1970's and storm runoff problems increased in frequency and intensity. The existing drainage system was inadequate, but no funds were available for improvements. The only storm drainage projects constructed were the result of flooding damage.

A manual outlining storm drainage policies and design criteria for improvements was completed in 1979. It required developers to submit a detailed drainage study of the land being developed. Drainage fees, designated for future storm drainage improvements, were also collected.

In 1982, three irrigation companies agreed to allow the City to continue to use their facilities for storm water. They stipulated that the City create a master plan for storm water improvements and provide the necessary financing. The master plan divided the Loveland area into 22 main drainage basins and 400 local basins. The plan included preliminary designs for many major, and some minor drainage improvements. Cost estimates were also made. The master plan, formally adopted by the city council in August 1986, serves today as the guideline for storm water improvements. That same year, the criteria manual was substantially updated.

Storm Water Utility

In 1987, a storm water utility was established to initiate a storm water management program. The utility is in the beginning phase of a long-term $35 million storm drainage and flood control improvement program.

The utility is funded by a monthly storm water utility fee paid by customers and based on total lot size and category. Fee categories include residential, commercial, industrial, and institutional properties. About half of the fee revenue is used for system maintenance, street sweeping, minor project improvements, and program administration. The other half is devoted to minor and major capital improvement projects. Minor projects include catch basin replacement, small storm sewer replacement, erosion protection, culverts, and drainage ditches. Regional detention facilities, floodway channels, large storm sewers, ditch crossings, and spill structures are examples of major projects.

Storm water maintenance crews perform street sweeping, inlet and catch basin cleaning, street washing, storm sewer flushing, detention basin mowing, and minor construction projects.

As storm drainage improvements are made, there are several side benefits. All open channel storm water facilities (i.e. ditches, creeks, rivers) require maintenance access roads. These roads may serve as part of the city-wide hike and bike trail system. The large regional detention facilities can serve as parks and open space. The Big Thompson River floodplain, gravel pit ponds, and wetlands may become wildlife habitat areas.

Chapter Seven
Wastewater Treatment

Methods for treating wastewater were explored in the late 1800's, but the process was deemed too costly for most cities. Many cities found their drinking water sources polluted with raw sewage, causing outbreaks of cholera and other epidemics. When the public became aware of water pollution dangers in the 1920's, cities began to treat their wastewater.

The first efforts emphasized primary treatment – or simply separating the solids from the liquid. Later, secondary or biological treatment was added with the development of the trickling filter and activated sludge processes. A trickling filter is a circular tank filled with stones, with windmill-like arms that rotate above the tank spraying wastewater over the stones. Organisms grow on the stones and biologically break down organic wastes contained in the wastewater. The activated sludge treatment process features the addition of air (oxygen) to help biologically purify wastes. This process continues to be the basis for treatment today.

The Imhoff Tank

Loveland's first wastewater treatment facility was built in 1935 as a city relief project with the Public Works Administration funds and labor. This facility, treating wastewater from the east side of town, was an Imhoff tank on South Madison, just north of the Big Thompson River.

The Imhoff tank was a settling basin that separated solids and liquids into two distinct chambers. The separate chamber for solids allowed anaerobic decomposition to proceed rapidly. After the wastewater passed through a rock filter, a ditch carried it to the river. Ted Van Dusen recalls that a neighboring family, the Wards, raised worms with the effluent from the tank.

Railroad Treatment Plant

In 1940, a large, modern treatment plant was constructed by WPA workers. The plant, known as the Railroad Sewage Disposal Plant, was located just north of the fairgrounds on Third Street South and Railroad Avenue. This one MGD trickling filter and anaerobic digestion facility cost $120,000 to build. The city only contributed $35,000; the balance paid for with federal funds.

The Railroad plant was one of the first plants in Colorado to use the biological treatment method. A trickling filter, flocculator, anaerobic digester, and clarifier were built at the plant site. Frank Phillips was the first caretake of the treatment plant for a salary of $80.00 per month. This plant was simple to operate and discharged the best effluent in the State during the 1950's and 1960's, according to Ted Van Dusen.

Van Dusen, who worked at Plant No. 1 until it closed, recalls the steps to the basement and into the digesters were made from running boards off Model A Ford cars salvaged from a junk yard.

Both the Imhoff tank and Railroad Avenue plant were taken out of service in 1962, when a new wastewater treatment plant began operating. Ted Van Dusen remembers cleaning out the digesters for the final time and finding the bottom full of cherry pits that had come to the plant over the years from the cherry factory.

South Boise Treatment Plant

A new three MGD wastewater treatment plant was built in 1962 on the site of an old pig farm. The trickling filter and anaerobic digestion plant, known as the Boise Avenue Treatment Plant, was built a mile east of the old plant on Boise Avenue, between the Farmer's Ditch and the Big Thompson River.

Three separate interceptor sewers (24-inch Boyd Lake, 24-inch South Eighth Street, and 33-inch Fairground) converge in a manhole just north of the headworks to bring all the wastewater to the plant. The flow of wastewater into the plant varies significantly throughout the day.

Before natural gas was introduced at the plant, methane was used to heat the boilers and a waste gas burner. When the wind blew and the pilot light went out, the gas would go straight out of the plant. There was no need for an emergency alarm; the neighbors soon called to complain about the odor.

With the aid of a 75 percent EPA construction grant, the plant was expanded to a capacity of 7.7 MGD in 1977. During this construction period, the Railroad Plant was temporarily reopened to take some of the load off the Boise Avenue Plant. It was permanently abandoned and dismantled in 1977.

The wastewater plant underwent a $5.1 million modification and expansion between 1985 and 1987 to eliminate hydraulic problems and expand the plant's biological treatment capabilities. The sequence of the plant flow was changed to increase the plant's capacity without excessive construction costs. The revised facility can treat an average flow of eight million gallons per day.

The Process

Superintendent Johnny Tuxhorn, department employee since 1969, remembers the time when treating wastewater was regarded as a minor function of the City. Today, wastewater treatment is a complicated and important process, requiring operators to be certified in plant operations.

As wastewater enters the plant, grit and debris are removed by screening. Clarifiers then remove most of the settleable solids. In the trickling filter, organisms decompose the organic solids. The thousands of rocks in the trickling filter were taken from the Big Thompson River. Two final clarifiers separate the microorganisms from the treated wastewater.

Chlorine is mixed with wastewater to kill harmful microorganisms. Sulfur dioxide is added farther downstream to dechlorinate the wastewater before it is discharged to the Big Thompson River.

Sludge is the heavy, slimy residue left as wastewater is cleaned. It consists of solids removed from the wastewater, together with water removed with the solids. Before it can be disposed, sludge must be treated. Anaerobic digesters process and biologically stabilize sludge, producing methane gas and rendering the sludge into fertilizer.

Wastewater Laboratory

Even though wastewater had been treated for many years, streams and rivers in the United States were still polluted in the 1960's. In the 1970's treating wastewater became a more sophisticated science. The Federal Water Pollution Control Act amendments of 1972 and 1977 (Clean Water Act) set stringent requirements for wastewater returning to the nation's waterways.

In compliance with the Clean Water Act, the City was issued a National Pollutant Discharge Elimination System (NPDES) permit to discharge wastewater from the treatment plant. Wastewater testing for operational control and NPDES permit reporting takes place in a new, well-equipped laboratory. Lab chemists and technicians test for dissolved oxygen, coliform bacteria, suspended solids, and dissolved metals in the Big Thompson River two to three times a week.

Since 1986, the laboratory has been biomonitoring to determine if the effluent might be toxic to aquatic life. Ceriodaphnia (tiny water fleas) and fathead minnows are placed in containers of effluent and monitored for 48 hours. If some die, it indicates that toxins exist in the water and further testing needs to be done. So far not a single organism has died during the tests.

As a result of federal regulations, Loveland has instituted a pretreatment program for those industries that may discharge potentially toxic wastes into the City's collection system. The Water Quality Control Division of the Colorado Department of Health requires Loveland to monitor such industries and to enforce applicable pretreatment regulations.

Chapter 8
The Organization

The Water/Wastewater Department is responsible for securing an adequate raw water supply and for providing Loveland residents with a reliable and safe supply of drinking water. The department maintains sufficient capacity to collect and treat wastewater in a manner that protects the public health. Operating a storm drainage system to keep flood damage to a minimum during extreme storms is also a duty of the department.

The Divisions

The Water/Wastewater Department has five divisions – Administration; Water Treatment; Distribution, Collection and Storm Drainage; Technical Services; and Wastewater Treatment. Since November 1986, the Administration; Distribution, Collection and Storm Drainage; and Technical Services divisions have been housed at a modern Service Center facility located at First Street and Wilson Avenue.

The Administration division includes administrative, technical, and engineering staff. This division is responsible for budgeting and personnel matters. Engineers review plans for water, sewer, and storm drainage improvements for new subdivisions. They also plan for new facilities, pipeline extensions, and raw water supply options. Water conservation, public relations, and a program to monitor water quality are all coordinated here.

The Water Treatment division turns raw water into high quality drinking water. Operators are on duty 24 hours a day, seven days a week, with three 8-hour shifts.

The Distribution, Collection, and Storm Drainage division is responsible for maintaining and sometimes constructing water, sewer, and storm drainage pipelines and facilities. This division is divided into Customer Services, Operations and Maintenance, and Storm Drainage.

Customer Service personnel repair and maintain water meters and remote readouts, and make water and sewer taps for new services. They keep records of service lines and meters, and they provide this information to the public and Utility Billing. Customer complaints regarding water leaks and meter problems are handled here. Operations and Maintenance personnel maintain water and sewer lines, and replace or repair undersized or damaged mains. Storm Drainage personnel keep the storm drainage system operating, and construct storm drainage facilities and lines. Street sweeping, which keeps dirt and debris from entering storm drainage structures, is one of their duties.

The Technical Services division was formed in 1982 to provide expertise in the repair and maintenance of the sophisticated equipment that is needed to operate the utilities.

The Wastewater Treatment division treats wastewater to standards of quality set by the federal and state governments before discharging it. The plant runs two 8-hour shifts.

Water Board

The Water Board was formed in 1981 to make policy recommendations to the City Council concerning water resource issues. Meeting monthly, the Board makes long-range plans for Loveland's future raw water supply and storage needs. The Board has nine members; two are City Council members and seven are appointed by the City Council. The term of office is four years.

Employee of the Quarter

In 1983, an Employee of the Quarter committee was formed to recognize employees who are performing above and beyond their normal job duties. The committee is comprised of a representative from each of the five divisions. Nominations are submitted to the committee by any department employee; the committee then reviews the nominations and chooses an outstanding employee. The Director presents the certificate of award and a department pin to the Employee of the Quarter.

Computers

In 1983, the computer age arrived at the Water/Wastewater Department with the purchase of a personal computer (PC) that was shared by three engineering staff members. Demand for more computers grew after employees found many applications for Lotus 1-2-3 software. Utility accountant Jim Bruce discovered that generating the annual budget with Lotus saved labor and time. The word spread, and now all City departments use a similar budget worksheet.

Now with two word processing stations, the typewriter is nearly obsolete. Many engineering applications have found their way from slide rule and calculator to PC. More powerful computers allow the department to model water use in the entire Big Thompson River basin. A desktop publishing station produces camera-ready artwork and newsletters, doing away with cutting and pasting. This book was produced on Xerox Ventura Publisher. The treatment plants use personal computers for process analysis, record-keeping and budgeting. Each division is able to access the City's mainframe computer to review budget and expense information.

Today the department owns fourteen personal computers and a Supervisory Control Data Acquisition (SCADA) mini-computer. The use of computers has increased productivity and improved the quality of work supplied to customers.

Computer Monitoring

The SCADA computer system monitors equipment in remove water and wastewater pump stations and reservoirs. Five minutes at the printer each morning tells of any problems that need attention in the field.

Remove transmitting units (RTU's) are installed at 15 lift pump stations, four water tanks, and the water and wastewater treatment plants.

Tank level, pump runtime activity, wetwell levels, pump-room temperatures and moisture, power and pump failures, and plant flows are all monitored by SCADA.

Centennial Celebrations

During 1988, the Water Utility celebrated the completion of 100 years of water service to Loveland's residents. Loveland Mayor Herm Smith proclaimed the first week of May 1988 as Loveland Water Utility Centennial Week.

The Water Utility hosted an open house at the Service Center with displays of water memorability and provided tours of the water and wastewater treatment plants. Mayor Herm Smith and Water Utility Director Ralph Mullinix spoke at the commemorative ceremony attended by over 300 people.

Creative children from area schools submitted entries to the Water Utility Centennial poster and essay contests. The topic for the poster contest was "From Snowy Caps to Water Taps." The theme for the essay contest was the "importance of water in our lives." Prizes were given for the top four winners from each school.

The premiere summer event was the Water Fun Day on Saturday, July 30. Approximately 1,000 people turned out for the event, which included water games and contests for all ages. Games included a fishing pond for children, water balloon fights, a bucket relay race, and a spoon race.

Water conservation, sprinkler system, and Xeriscape gardening displays were featured, as were fire engine and water safety demonstrations. A highlight of the day was watching various city officials being dunked into the cold water of a dunking machine. At three tosses for a dollar, money was raised and contributed to the Parks and Recreation Department for the development of the hike and bike trail.

Technical Service employees constructed a brass water sprayer with a big sign on top publicizing the Water Department. The sprayer has been used at numerous local running races to cool down runners. It also cooled participants at the Water Fun Day.

Loveland in the Mainstream is the title of a video produced as a department overview. The video is shown to organizations to promote community awareness of the many aspects of the department. Junior and senior high school students see the video for educational purposes, and for a view of careers in the water and wastewater industry. Businesses considering locating in Loveland can learn about the department's water supply and modern treatment facilities.

A time capsule will be buried by the front door of the Service Center with a copy of this history. After the capsule is buried, a huge boulder moved from the water treatment plant will sit over the capsule. A brass plaque with information about opening the capsule in twenty-five years will be attached to the rock.

Epilogue

Water from the Big Thompson River meant life to the early settlers. Water provided the foundation for Loveland to grow and flourish. Loveland has been transformed from a dry, treeless expanse of grassy plains to a land of lakes and cottonwoods, green lawns, and fertile fields. We have come a long way since drinking water flowed in ditches along the streets.

The Water Utility has improved and modified the water service to Loveland residents many times over the years. Managing our current water supplies and developing new sources will ensure good drinking water for the years ahead. As the Big Thompson River flows on, so the Water Utility will continue to meet the challenges of the future with creativity and innovation.