JERICHO-UNDERHILL WATER DISTRICT

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History of the Jericho-Underhill Water District

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EARLY HISTORY: ORIGIN OF THE JERICHO-UNDERHILL WATER DISTRICT

Thorpe Private Water System

Beginning in the summer of 1894 Thomas Thorpe constructed a water system to serve the village of Underhill Flats and Riverside. The source was a spring located at 14 Blakey Road on the northwesterly side of the Roaring Brook. The location provided a gravity fall of 132 feet to the village. The spring with concrete spring box is still in use in 2013 for the residence at 14 Blakey Road; and remnants of the supply pipe running along Roaring Brook to the Flats were still visible in 2013. The supply pipe ran at least to the property at 22 Poker Hill Road, Underhill and continued along Roaring Brook almost to the Bridge on Vermont Route 15. Water service started in October of 1894. In the spring of 1895 hydrants were added to the system and the watering trough in the park at Park Street and Vermont Route 15 was built. In 1897 the railroad put in a new water tank at the depot which was supplied by the Thorpe system. A large cylindrical brick/stonewall water reservoir (and for a time wooden structures) were located behind 9 Meadow Lane, Underhill. This cylindrical reservoir may have been connected to the Thorpe system at one time. By the 1950s the land on which the reservoir was sited was part of the Orville Wrisley farm and the reservoir was said to have been a reserve water tank for the railroad; it was not connected to the water system. For many years the water system included a valve pit located behind the house at 10 Dumas Road, Underhill. It is not known whether this valve pit was part of the original Thorpe system which supplied the Flats village area; or was constructed later. It connected water mains on Poker Hill Road to mains in Underhill Flats until 1987 when it was removed.

Underhill Water Company

In 1925 the Underhill Water Company took over the Thorpe system. One of the backers of the Underhill Water company was Lucius C. Fowler, a local merchant. According to the grandson of L. C. Fowler, the Underhill Water Company was a stock company. Local merchants, water customers and maybe others were the stock holders. By this time the supply mains had been extended along Vermont Route 15 to its intersection with River Road (formerly Steam Mill Road), and then easterly along River Road to serve four houses. The water main ditches had been dug by hand; and hydrants had been added. L.C. Fowler was a major stock holder and served as the Director or Manager of the System until his death in 1936. In 1936 Perrin Fowler, the son of Lucius inherited the Fowler stock and became a major stock holder of the system; he took over the management of the system. In 1941 John W. Hitchcock deeded a 40 foot square at 379 Vermont Route 15 “with all springs of water thereon” to the Underhill Water Company. (The property at 379 Vermont Route 15 was known later as the Axel Ringwig Farm, and in the late 1960s was owned by J. Lee Murray). These springs became the water source for the Underhill Water Company. A cistern was located near the springs, and a shed accessed from Palmer Lane housed the water system pump, pressure tank and associated electrical equipment. At this time the system may have been owned or operated by Perrin Fowler or his father. At least in the mid 1940s the system was maintained by Stanley Hoag and his assistant Leroy Keith. In the 1950s the system may have been maintained by Archie Kirby. By the late 1950s there were problems with leaks in the distribution system. Some of these were the result of the piping and connections having been underground and in service for over fifty years. Also, by this time Perrin Fowler, according to his son was tiring of maintaining the system and welcomed the prospect of a public water system.

In 1961 the Jericho-Underhill Water District was formed by Act of the Vermont Legislature and it purchased the Underhill Water Company soon thereafter.

FIRST FIFTY YEARS: JERICHO-UNDERHILL WATER DISTRICT

District Incorporated

The Jericho-Underhill Water District (JUWD) was established as a municipality in 1961 by an act of the General Assembly of Vermont approved on July 31, 1961. The act is titled "No. 317 --- An Act to Establish and Incorporate The Jericho-Underhill Water District. [S. 133.]". The District was comprised of 65 parcels of residential and business land in Jericho (Riverside) and 50 parcels in Underhill (Underhill Flats). There is some overlap in parcels in part because along Park Street part of each parcel on the Jericho side is in Underhill. Based on these numbers the total number of customer properties in the original District would have been no more than 106.

In 1962 the JUWD purchased the existing Underhill Water Company system which had previously provided water to Riverside and Underhill Flats. The source was springs located at 379 Vermont Route 15, Jericho. The system included a cistern or reservoir, a pump, a pressurized tank and water mains. The pump and tank were housed in a small building accessed from Palmer Lane. By the late 1960s, according to a 1971 newspaper account the system was "plagued by inadequate distribution lines and lack of storage capacity. Water use had to be curtailed during the summer and there was insufficient capacity to serve planned residential development".

In 1969 the District entered into a Legal Services Agreement and a Loan Agreement with the US Department of Agriculture. This was the beginning of a system upgrade project to develop a new water source, provide adequate storage, and to update and expand the distribution system. At the time the District Board consisted of Leon Dumas, President, J. Lee Murray and Harold E. Sargent Trustees.

Property Acquisition

The District with the cooperation of several residents obtained property within its boundaries for this project. Wesley Jacobs granted an easement to the District for constructing a water main connecting the storage tank to the distribution system. Paul and Virginia Jones sold a lot at 47 Maple Ridge to the District for use as a storage tank site. Kenneth and Emily Mitchell sold the District approximately 2 acres and a right of way at 431 Vermont Route 15, Underhill for use as a well field. On March 17, 1970 the District obtained an easement and right-of-way for a waterline between Jacobs and Kittells land. This pipeline runs through the Park Street cemetery and allows water to flow by gravity from the tank on Maple Ridge Road into the distribution system. On July 22, 1970 the District received an option to purchase part of Lot #10 of the Maple Ridge Development from Paul E. Jones and Virginia N. Jones. At the time Leon Dumas was President of the District and agent for the JUWD. This option was for land for the Maple Ridge water storage tank. On April 22, 1971 a Deed conveyed a triangular lot to the District for use as the site of the 250,000 gallon tank. In exchange for the Maple Ridge land, the District agreed to provide water for the Maple Ridge Development which was owned by the Jones'. This included District responsibility to maintain water lines and the cistern that is the storage reservoir for homes in the Maple Ridge Development at elevations higher than the District tank. On April 30, 1971 the District received a Warranty Deed from Kenneth and Emily Mitchell. This deed for about 2 acres was for land on which to locate 10 or more shallow wells, for the site of a pump house, for a right of way for a water main connecting to the new distribution pipes laid along Route 15, and for access to the wells.

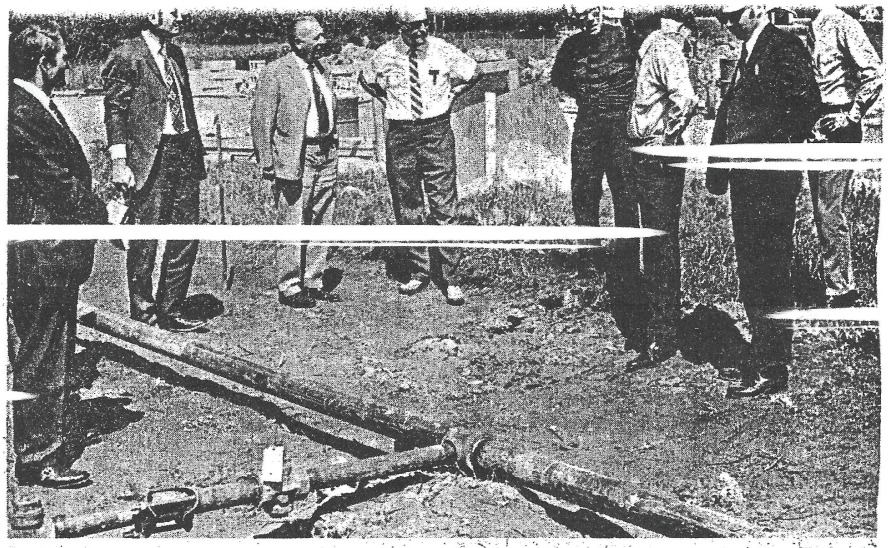
During this period but unrelated to the system upgrades, the District entered a formal agreement with Axel Ringwig. This agreement dated June 1, 1971 split the District's $187.21 cost

of repairing a line (along Palmer Lane?) with Ringwig; and provided for Ringwig to replace a section of line. This agreement was signed by J. Lee Murray, Harold Sargent, Leon Dumas.

Water System Upgrade

The District Board hired Fenton, Keyes and Associates of Providence R.I. to do the engineering and design for the system upgrade project. The design included a well point well field, distribution lines using 8" pipes, hydrants, and a 250,000 gallon welded steel storage tank.

The project was financed, according to a newspaper account at the time, with "a development grant of $152,000 from Farmers Home Administration (FmHA), a bond loan of $114,000 from FmHA, and a construction grant of $38,000 from the State of Vermont. The program is called the 'Aiken Rural Water Program' since Senator Aiken pushed it through Congress". The closing for the loan agreement with Farmer Home Administration (FmHA) occurred at the Underhill Fire Station in the summer of 1971. The loan closing was attended by Senator George D. Aiken as well as District, local and state officials.



STATE and town officials, led by Sen. Aiken (fourth from right) visit the pumphouse facility at Underhill Flats.

Underhill-Jericho Gets Water Loan

UNDERHILL FLATS — Sen. George D. Aiken was observer here Tuesday as a loan check for $114,000 in exchange for general obligation bonds was presented by the Farmers Home Administration to the Jericho-Underhill Water District for installation of its new water system.

The project is being financed with a development grant of $152,000 from FHA, a loan of $114,000 from the same agency, and a construction grant of $38,000 from the State of Vermont. The program is called the "Aiken Rural Water Program," since Aiken pushed it through Congress.

Led by Sherman K. Sprague, state FHA director, and J. Lee Murray, a trustee of the water district, the group including Aiken toured the new facility which is still under construction.

Work is proceeding as planned and it is expected the new system will be in full operation by September.

In addition to providing the residents of the district with drinking water and fire protection, the system will serve two new schools and is expected to stimulate the construction of new residential units within the water district.

Approximately 110 customers will be connected to the water system upon completion of construction this fall.

The new system was designed by Fentron G. Keyes Associates of Providence, R.I. It consists of a well field, pumping facility, 17,000 feet of distribution lines, and a 250,000-gallon tank on a nearby hill.

The new water system will replace the former Underhill Water Co., the existing water system purchased by the Jericho-Underhill Water District in 1962.

The old facility, which relied on springs for supply, was plagued by inadequate distribution lines and lack of storage capacity.

Water use had to be curtailed during the summer and there was insufficient capacity to serve planned residential development.

PRESENT for the check presentation are (from left) David J. Howe, Sen. Aiken, J. Lee Murray and Sherman K. Sprague.

Present during the loan closing at the Underhill-Jericho Fire Station were David J. Howe, chief of community programs; Richard H. Mansfield, FHA engineer; Robert Pratt, FHA district supervisor, all of Montpelier; Craig Buchanan, FHA county supervisor, Essex Junction; attorney Eric Schuppin, Jericho, and trustees J. Lee Murray, Harold E. Sargent and Leon Dumas all of Underhill Flats.

Figure 1. Jericho-Underhill Water District receives grant and loan from Senator Aiken

The construction for the new wells started in the summer of 1971 and was done by H.A. Manosh of Morrisville, VT and others. H.A. Manosh constructed a pumping facility and 17,000 feet of distribution lines. Lang–New England installed a 10 well point well field. The 250,000 gallon Maple Ridge Tank was built by Caldwell Tanks, Inc of Louisville KY. J. Lee Murray served as authorized District representative of new construction (until 1976). The system went into operation in the fall of 1971 and served approximately 110 customers.

Figure 2. Maple Ridge Water Storage Tank

Design of New System

The Distribution system included 8" asbestos cement mains along Vermont Route 15 from Browns River in Jericho to Dumas Road in Underhill, Raceway Road from Route 15 to the Creek, Willow Lane, Brookside Drive, River Road (sometimes called Steam Mill Road) from Vermont Route 15 to Park Street, Park Street, and Meadow Lane. Many customer connections to the distribution system were made using sub-mains and service lines some of which were galvanized with brass fittings; or black plastic tubing.

According to Harold E. Sargent a District Trustee at the time, the District received two bids for the distribution lines/mains: one for ductile iron, and the other for asbestos cement pipe. The FmHA which controlled the issuance of the loan and bonds, insisted the District install asbestos cement pipe because it was cheaper and FmHA assumed therefore more people could be served water. This was a short sighted decision because leaks developed due to incorrect tapping methods used on the asbestos cement pipe. The District spent years finding and redoing these taps. In addition, the District found the asbestos cement pipe shed asbestos fibers; and state and federal health authorities were unable to answer concerns related to ingesting asbestos fibers. Eventually it was determined asbestos fibers were not a health hazard when ingested in drinking water in small amounts.

The well point wells were approximately 10 to 20 feet deep. After some use it became apparent that surface water was entering the wells, indicating a possible source of contamination. To protect the wells a 10 foot high clay berm was built over the wells to seal them from surface water. The clay was dug from an adjacent field owned by Kenneth and Emily Mitchell.

Figure 3. Well Point Field and Pump House

The pump house contained two pumps each driven by 25 horse power electric motors. During the first few years of operation, the well field and pumps at times provided in excess of 200,000 gallons of water per day. The actual customer need was less than 25,000 gallons per day, but due to leaks many times that amount of water was needed. The pump house also included usage recording equipment and chlorination equipment; and was later fitted with fluoridation equipment.

Figure 4. Pump House

New Regulations

In 1971 the District adopted a set of Regulations. A significant provision found in the early versions of the Regulations was that any new water mains must be cement lined ductile iron, and any new service lines must be copper. This was to address the severe leak problems which were plaguing the system. The galvanized and brass fittings were corroding and the black plastic lines would fail due to freezing, system water pressure, or movement of the ground. The Regulations were amended in 1980, 1987, 1990, and several more times. The more recent amendments were to adjust water rates, change connection fees, and allow the Board to approve alternate materials for main and service lines.

System Improvements

On February 6, 1973 the District received a Deed from Paul and Virginia Jones for the Maple Ridge cistern, 987ft pipeline and 20ft right of way around the cistern and pipeline. This is the Deed for the Maple Ridge Road housing development water system and resulted in the District becoming responsible for maintenance of that water system.

Figure 5. Maple Ridge Cistern

In 1973 the District voted to fluoridate its water. This District fluoridation program has been conducted in conjunction with the State Department of Health. The State Department of Health provides equipment and testing supplies. The District buys the fluoride material and maintains the equipment. In July of 1978 the Old Pump House and Reservoir at 379 Vermont Route 15 (owned by J. Lee Murray at the time) was demolished. It was no longer needed as a backup to the new well field. The old pump was stored for many years at the Pump House at 431 Vermont Route 15. Until 1978 a short section of Poker Hill Road was served by a small plastic line. A covered valve pit on property at the end of Dumas Lane was used to control the water mains along Poker Hill Road. In 1978, Peter Allendorf, acting as a real estate agent for Wesley "Tippy" Jacobs, extended this line along Poker Hill Road to serve additional house lots along Poker Hill Road and to provide water to Barrett Lane. This work was done by Ralph Russin Excavating of Underhill. Allen Bolio constructed Barrett Lane at this time; GW Tatro Construction of Jeffersonville installed a 1 ½ inch water line on Barrett Lane. In 1979 there was a brown winter with very little snow. The well field was damaged by freezing and the District Board used bales of hay to insulate and protect the wells. Also, in 1979 the District reviewed the boundaries of all the properties within the District, to determine the overall District boundaries. This was needed because properties listed in the original legislative act had been subdivided and developed and the District boundaries were not always clear. Looking back over the 1970s the District obtained a new water source which was more reliable, had more capacity, and allowed development in the community. As with any system constant attention to details, implementation of improvements and attention to maintenance were accomplished. The Board was successful in handling these responsibilities.

New Water Source Study

Minutes of the 1980 District Annual Meeting indicate that the Board was concerned about the adequacy of the 10 point well field. There was discussion about replacing the pumping system and well field with a gravel packed well and submersible pump.

In 1982 a winter fire destroyed the Wheeler Barn located on property on Raceway Road. This fire drained the District water tanks and highlighted the inadequacy of the well field. Imme-

diately after the fire the Underhill Jericho Fire Department pumped water from Roaring Brook to refill the storage tank. For a period of several months after this fire, the Greenmont Lumber Company pumped water from its wells to maintain water in the storage tank. A public meeting was held to discuss the problems of the water system which included well field inadequacy and continuing distribution system leakage. As a result water rates were raised 30% to make various repairs. As of March 8, 1982 the District declared a moratorium on new customers within the District; this effectively halted development within the District. Also, a "Water Committee" of six persons, headed by Alan Morse was formed to look into the possibility of another source of water for the District. Gerard Adams of Underhill was hired to drill test holes to characterize the existing well field. It was concluded "there is little hope of improving the present well field". In 1983 the geo-hydrologist firm of Wagner, Heindel and Noyes was hired by the District to find potential water sources. In 1984 Wagner, Heindel and Noyes provided a report which identified possible well-site locations within the District. In 1984 the Board met with the Vermont Agency of Environmental Conservation to discuss funding and construction of a new water source. The scope of work for locating a new well field was defined and sent to five firms requesting bids.

Maintenance Problems

Also, in 1984 several repairs were made to the system. The Pump House was insulated, painted and re-roofed; the well point berm was re-graded and seeded, a new roof was installed over the Dumas valve pit, one of the pumps was rebuilt, and the telephone communication lines between the Maple Ridge tank and pump house were replaced.

Further in 1984, divers from the Reliance Corporation were hired to inspect the Maple Ridge water storage tank and determine whether the tank needed repair or recoating. In 1985 the Maple Ridge tank was drained, sandblasted and painted inside and out. While the sandblasting and painting were occurring, the District maintained water pressure by continuously pumping from the wells; two pressure relief valves at low points in the system kept the pressure within acceptable limits. This work was done by the original tank construction company Caldwell Tanks, Inc of Louisville KY. Tragically, one of the painters slipped on wet paint and fell from the top of the 32 foot storage tank, breaking several bones. The person was severely injured, but survived and eventually recovered.

Annual reports from the early 1980s indicate that in many of those years several leaks were discovered and repaired. Experts from the North East Water Works Association conducted a leak survey; no additional leaks were found, but usage continued high. Marc Maheux, new system operator at the time, borrowed leak detection equipment from the Champlain Water District to assist him in his search for leaks. The 1985 Annual Report stated that average usage had decreased from about 146,000 gallons/day to about 74,000 gallons/day. Leak repair continued throughout the 1980s.

New Water Source

In 1985 the District received State funding to pursue a new water source. The District hired Webster-Martin Engineers of South Burlington, VT to do the engineering for a new source and other system improvements. The engineering work was done primarily by Jeff McDonald. A hydro-geologic evaluation in search of groundwater in sufficient quantity and quality for the District was conducted by Groundwater Associates of Arlington, MA. On Aug 5, 1986 the District concluded option agreements with Mary Bushnell and Merton and Grace Mills. These agreements made land available for the drilling and evaluation of test wells and observation wells by Groundwater Associates. These wells and this area were tested in 1989 and 1990 for use as a new District water source.

In February 1987 petitions to extend the water system up Poker Hill Road and along Barrett Lane were received by the District. The petitions resulted in engineering plans for a new water main crossing of Roaring Brook, replacing about 250ft of plastic line along Poker Hill Road with an 8" main, and adding a hydrant. The plans did away with the valve pit behind the Leon Dumas house on Dumas Lane. This work was included as part of the project to develop a new water source.

In 1987 exploratory test wells were drilled by Layne New England (later Hydro-Group, and then Layne again). The test wells near the pump house had high iron and manganese; test wells near Browns River had an estimated capacity of 250 gallons/minute with low iron and manganese. The Board prepared a voter check list and a District boundary map showing all property with in the District. Based on the information about the test wells and the recommendation of the Board, the District voters approved bonds of $400,000 for a new well near Browns River and for water main improvements along Poker Hill.

In 1987, an old chicken coop owned by the United Church of Underhill and located next to the United Church of Underhill Parsonage barn (at 9 Park Street, on the former Gallop Property) was donated to the District and moved to a site at the well point field. This building was refurbished and has been used since then by the JUWD as a storage facility for material and records. Over the years this building was repaired and painted by Chester Willey, Richard Eldred, Jim Kozlowski, and others. It was painted once by Boy Scouts of local Troop 627.

Figure 6. Storage Building

On April 13, 1987 the District received a Water Line Easement Deed for the Wonderhill Estates Development along Harvest Run Road; the development required an extension of the water main along Harvest Run. This development project of Allen and Alonna Bolio was allowed by the Board in spite of the moratorium because a new water source had been located and the voters had approved by vote the bonds to finance development of the new source. Three houses in the development were added to the system in 1987 and more since. On Oct 8, 1996 the District receive the final Easement Deed for this development.

District Acquires Land for New Source

On January 12, 1988 the District received a Warranty Deed from Merton and Grace Mills; and on June 23, 1988 the District received a Warranty Deed from Mary Bushnell. These documents resulted in the District obtaining: land in Underhill for new wells, land for a treatment/control building, and land for an access road within the District and convenient to existing mains. Part of this agreement was for the District to extend the water line along River Road to serve the Bushnell property at 58/63 River Road. On Oct 3, 1988 the District received a site plan from Pe-

ter Hartwick for the Valley's Edge Development. Approval of this plan was dependent on completing the development of a new District water source. The development included a loop extension of the District main on Raceway Road to serve Valley's Edge Road and 28 new houses.

Construction for New Source

In 1989 Blow and Cote of Morrisville VT completed the construction associated with the new production well, control building, and main; the production well was drilled by Hydro-Group of Massachusetts. The new gravel packed well produced only 150 gallons/minute. This was disappointing because based on information obtained from the 6 inch gravel-developed test well it had been expected to produce about 250 gallons/minute. Also, in the summer of 1989 Blow and Cote completed Poker Hill and Dumas Lane valve pit work of "Contract #2". The Poker Hill work done on Contract #2 included crossing Roaring Brook, installing a hydrant, installing about 50 feet of pipe and a valve on Poker for future extension, and connecting the copper pipe (installed by Peter Allendorf on Poker Hill Road in 1978) to Barrett Lane. This improved the water service and fire protection to customers in that area, eliminated the valve pit and made that part of the system more reliable.

Figure 7. Production Well Mound

Figure 8. Control Building

During the summer of 1989 while the construction was going on, a new service line was being installed at Sinclair Towers Inn, 389 Vermont Route 15. A contractor was working on the service line when the connection to the main failed and blew out. This resulted in a stream of water being

directed at a third story window of the Inn with such force that the window was broken and water was sent streaming into the third floor of the building. The main was quickly shut down, but the water damage was considerable. The damage repair costs were recovered through the District insurance.

Looking back on the 1980s the system required considerable maintenance. The 1982, 1987 and 1988 Annual Reports mention wells points being back flushed or cleaned and being brought back on line. An item from 1988 was the construction by Kenneth Mitchell of a berm to protect the pump house and the storage shed from flooding by the Roaring Brook. In 1989 a leak in the line supplying the Maple Ridge cistern was found and repaired. It is also interesting to note that during the connection moratorium of the 1980s, the District made some exceptions before a new source was located. One exception allowed the addition of service to create an apartment at an existing customer residence; another allowed a new connection to a store that had suddenly found its well un-usable.

As mentioned above even though the water production of the new well was disappointing, work on the new well continued in 1990. It was discovered found that the new gravel-packed well had not been drilled in the gravel formation that served the test well. The engineer decided to place the gravel-packed well closer to the center of the well site for better sanitary protection. Efforts were made to develop the production well using a technique known as hydro-jetting. Output increased a few gallons per minute but the well was still rated at 150 gallons/minute. Concurrently, the controls for the well, the pump and the equipment for water treatment had been debugged and the new well went on line in the fall of 1991.

Second Well Developed

Due to the limitations of the new well, the Board decided to install a production pump to the original 6 inch diameter exploratory test gravel well, creating a second production well for the District. The Board applied for and received State approval. The pump and additional main connections and controls were installed. The second well went on line in March of 1992, and was rated for 150 gallons/minute. Both wells pumping at the same time are rated for 290 gallons/minute total. The two production wells are used alternately during normal system operation; having two production wells improves the reliability of the system to provide water. Around this time the Mary Bushnell property was added to the District and served with water.

The Valley's Edge main extension was completed in the summer of 1992. The District received a Warranty Deed from Peter Hartwick dated Oct 31, 1994. The warranty deed from a developer is generally given to the District after a year of operation and results in the District taking responsibility for the maintenance of that part of the system. In 1992 the District approved a 6" main extension for the six lot Creekside Road Development of Warren Palmer. The development required an extension of the main and connections to each house. The District regulations require a fee for the tie-in of the main and for each connection. Warren Palmer sued the District saying that as a developer he should not be required to pay both fees. The Board was represented by Vince Paradis of Bergeron, Paradis & Fitzpatrick, LLC of Essex Junction VT and in 1995 the Board prevailed in the suit; the development and connection fees contained in the District regulations were upheld as valid as interpreted by the Board. The Creekside Development resulted in the addition of 6 customers.

Well Head Protection Study

In 1992 the Board authorized spending $1200 as its share of an EPA sponsored $16,000 demonstration study of the geology surrounding the District wells. The purpose of the study was to

understand the geology of the wells and to define a well-head protection area using numerical methods. The study was conducted in 1992 by Wagner, Heindel and Noyes, Inc of Burlington, VT. The study modeled the clay layers between the surface and the depth at which ground water is withdrawn for District use. These impeding layers have low leakage and protect the ground water from surface contaminants. The model was calibrated and checked against measurements from existing wells within the water shed. After review and revision a final report dated 1994 was issued. The final report includes a map defining a 200 foot isolation zone, a 25 year time of travel zone, and the water shed boundary.

Increased Testing

Many significant changes to District operating requirements occurred in the early 1990s due to new State and the Environmental Protection Agency (EPA) rules. In 1992 the District was required to test for fluoride daily instead of weekly as in the past. In 1993 the District was required to test for lead and copper at 20 home/business locations; this testing has continued periodically at the same locations to the present. In 1993 the State began charging every District 1 cent for each 1000 gallons of water pumped to pay for implementing the Federal Safe Drinking Water Act; this water-pumped fee has increased to 2 cents per thousand gallons in 1994 and has increased in the years since. By 1995 testing for volatile organics, synthetic organics, radon and other elements or materials resulted in substantial new costs for the District; with the benefit of knowing the quality of the water provided to customers.

In 1993 the Maple Ridge Tank was inspected by divers from Civil Engineering Associates of Shelburne VT. The divers inspected the tank and took pictures showing the condition of coatings and the sediment in the tank. The interior coatings were in good condition, and very little sediment had accumulated. The exterior of the tank needed touch-up painting.

Computerized Records and Maps

In 1993 the first District computer was purchased and put into use. In 1996 Marc Maheux started compiling digital records of District data for historical purposes. The records included service locations using Map Info, water usage, and testing results. In 2006 Marc created the District Website hosted by Dream Host. This site now provides public access to notices, regulations, forms, test results, operational data, minutes of meetings, and other information. The site is constantly updated and contains the most recent data.

Operating and Maintenance Issues

During the cold winter of 1993/1994 the District spent $13,000 on pipe thawing. The cost included the purchase of thawing equipment to speed up the thawing process. As a result the District identified about 20 houses and businesses many along Vermont Route 15 which were prone to freezing. The Board authorized these houses to run a trickle of water to prevent the freezing of service lines. The District billed these customers based on their past average use and not for the additional water used to prevent freezing. In the years since, many of these lines have been buried deeper or insulated, but the practice of running a trickle of water to prevent freezing is still used by a few customers when authorized by the Board.

In 1994 the Board decided there was a need to install dual check valves at houses located at higher elevations within the District. The purpose of the dual check valve is to prevent water from within a premises being withdrawn back into the system when high flows occur due to hydrant use in fighting a fire. Such high water use may pull water from swimming pools, heating systems, hot water heaters, or mud puddles where a hose has been left. By 1996 dual check valves had been installed at 22 houses and are now required for every new connection added to the District.

In 1995 the District extended service to a property with a long driveway on Maple Ridge Road. A sub-main through the property at 38 Maple Ridge was replaced to provide adequate water for this new connection; and at the same time the District improved the connection to the residence at 38 Maple Ridge. The project started in the summer of 1995 with an agreement letter by H. Sargent and the owners. The summer was very rainy; grass seed did not take hold and erosion along the ditching occurred. Further landscaping was done and the issues were finally resolved in 2001.

Source Protection Plan Created

In 1996 the first Source Protection Plan was approved by the State. This plan is required by the State's agency of Environmental Conservation and assesses potential sources of contamination of the District water source. The assessment involves contacting property owners within the watershed and understanding whether their septic, fuel storage, fertilizer, pesticide, or animal waste practices could contaminate the District wells. The District provides property owners with information about the District wells, good practices, and asks for their cooperation in safeguarding the District water sources. The plan was written by Marc Maheux based on information he compiled from questionnaires and interviews. This plan shows the various zones from which water District originates and potential sources of contamination. This document has been updated every three years since.

More Computerized Records

In 1997 the District started a project to precisely locate curb stops, waterlines, and main valves within the system. This information is helpful when it is necessary to operate a valve in a routine or emergency situation. It is especially useful in winter when snow or ice may cover curb stop or valve access. During good weather each valve was located, a photograph was taken showing the relationship to the residence or surrounding landmarks, and locating measurements were recorded. It took a couple of years and several people to gather all this information. The information was organized by property code and printed. Paper and electronic copies were distributed to the Chief Operator and Board Members. This information is stored digitally so it can be accessed easily, and updated as needed.

Low Water Pressure

In 1998 the District installed sealed atmospheric tanks at four high elevation houses. This was done to prevent backflow into the system and to improve water service at these residences by increasing water pressure.
Backflow was prevented by an air gap between the system and the tank.

District Recognized on TV

In the spring of 1999 the District officers were interviewed on television during Vermont's Drinking Water Week. Harold Sargent, President and Marc Maheux, Chief Operator appeared on the "Across the Fence" program of WCAX-TV. The District was used as an example of a small groundwater system typical of many in the state. "Across the Fence" is sponsored by the University of Vermont Extension Service.

Brown's River Challenge

In 1999 the District stabilized 120 feet of Brown's River Bank near the control building. The Board had become concerned because the river bank was eroding and the river edge was moving toward the control building. There was also concern that the river bed would erode and

expose pump control circuit conduits or the force main and they would be vulnerable to damage by floating debris or ice. The state Agency of Environmental Conservation approved the Board's plan for stabilization which was consistent with state requirements. Rip-rap was placed along the river's edge. The effect was that the river bank moved away from the control building for many years. The river bed erosion was perhaps slowed, but did not stop. Within a few years the pump control circuit conduits were exposed.

The summer of 1999 was very dry and many private wells were either dry or low. The District made water available to these people and also sold water to the Town of Underhill for use by people in Underhill Center. To make the process of obtaining water easier for those in need, Marc and Jane Maheux allowed people to draw water from a faucet at their business, Countryside Florist, 419 Vermont Route 15, Underhill.

Looking back over the 1990s the major accomplishment was switching to a new water source: two deep wells. These wells have provided excellent quality water and at present more than enough for continued development in the community.

Major Leak Repaired

In early February 2000 daily water usage in the system doubled indicting a leak. Temperatures were well below freezing and the ground was snow covered. The District asked for customer input as to the locations of wet spots or other indicators of a leak. On February 18th a customer reported that while snowmobiling in the vicinity of the outdoor ice rink at the Underhill ID School Building, he got wet from water under the snow. The weather was so cold that there should have been no water at that spot. Curb stop location information was used to locate and shut off the water to the school. The leak was repaired the next day. It was found that the service line to the school was not very deep and went under the ice rink. Water had been applied to the ice surface daily, and eventually worked its way to the service line causing the service line to freeze. The school agreed to place the ice rink in some other location in the future.

In June of 2000 half a dozen customers all served by the same sub-main spur on the west side of Route 15 in Underhill reported that the water pipes in their houses were vibrating. This vibration was traced to a fluttering toilet tank valve at a business at 413 Vermont Route 15. The fluttering valve apparently excited a resonance in the spur.

Poker Hill Water Mains Upgraded, Tanks Cleaned

During the summer of 2000 extensive work was done along Poker Hill Road. The project known as Contract II or the Poker Hill Extension had been designed and approved in the 1990s at the same time as the new well effort. This work on Poker Hill Road was coordinated by Marc Maheux and conducted by J. Durbrow Excavating of Underhill and E. J. Prescott of South Burlington, VT. The work included installing 900ft of 8" ductile iron pipe, 2 hydrants, 2 future connections, and 4 road cuts. Unexpectedly, blasting was needed to remove a very large boulder blocking digging of the pipe ditch. This project which was completed Aug 31, 2000, extended the main from lower Poker Hill Road, and improved customer flows and fire protection.

In 2001 the District tanks were inspected and cleaned by divers from Underwater Solutions (?) of Massachusetts. Again not much silt was found, but it was recommended that the tank be repainted in the next few years. Acting on the recommendation from the tank inspection, the Board hired Phelps Engineering of Middlebury to prepare a plan for painting the tank and to make recommendations for constructing a second tank to make tank maintenance easier.

District Budgeting Formalized

For fiscal year 2001 the Board for the first time prepared and the District adopted an annual Water District budget as a planning and reporting method. Also the District joined the Vermont League of Cities and Towns (VLCT) and through that cooperative organization bought workmen's compensation insurance, property insurance, and liability insurance for officers.

District Recognized for Outstanding Operation

In 2002 the District's "Public Water System Permit to Operate" was renewed for 5 years. During the re-permitting review, the State Water Supply Division found that "the system is one of the best operated and managed systems in Vermont". Several improvements were made in 2002. The telephone line telemetry between the Maple Ridge tank and the control building was replaced with a radio signal system. This reduced the telemetry cost because it was no longer necessary to rent a telephone line. The District began a plan to replace aging water meters over a ten year period by replacing approximately 25 meters with newer models. Also in 2002 the District took another step in computerizing its operations and began using Quick Books software for accounting and reporting of financial status.

In response to heightened security concerns which occurred after the September 11, 2001 terrorist attack on the World Trade Center in New York City, the District removed maps and other detailed information about the water system from its website. Also, the District reviewed its emergency response status.

District Builds Second Storage Tank

In 2003 Michael and Sylvia Forsberg of Underhill made an unsolicited offer to the District of land on Poker Hill Road in exchange for water service. A survey by Brad Holden of Underhill showed that the land on Poker Hill Road was at the same elevation as the based of the Maple Ridge Tank. This meant that the District could add a second tank to the system which would improve storage, fire flows, increase reliability and make system maintenance easier and less costly. Based on the design work of Phelps Engineering and their estimate of costs for the engineering and construction costs a series of public meeting were held to explain the project. As a result in April 2003 the Voters of the District approved a new bond at lower interest rates of $640,000.00. This money was to be used to payoff the old bonds (which happened in July 2003), construct the new Poker Hill water tank, extend the 8" main along Poker Hill Road to the tank, provide a 4" sub-main to serve houses near the new tank, and paint the Maple Ridge Tank. On May 12, 2003 the District received a Quit Claim Deed from Michael and Sylvia Forsberg for the Poker Hill Tank Site. With this in hand the Board distributed bid documents prepared by Phelps Engineering. When bids were received, it was found that all bids were much higher than the estimated cost. The Board began working with Phelps Engineering to reduce the cost of the project. The design of the tank was changed from a glass-lined tank to a welded steel tank primarily because of concerns with freezing; but this reduced cost somewhat. NL Chagnon Contractors of Winooski was selected to do the construction. With NL Chagnon assistance the Poker Hill service building next to the tank was designed, avoiding the cost of a structural engineering design. Also, it was decided to delay the Maple Ridge tank painting.

Construction started in November of 2003. As mentioned above, NL Chagnon was the Contractor; and Pittsburg Tank and Tower of Henderson KY constructed and coated the tank. Phelps hired an observer to make sure the construction followed the engineering plans. Marc Maheux represented the District for this project and worked to coordinate the work of the engineers and contractors. Additional cost was saved when Marc assumed many of the duties of the observer. Concrete was poured in the cold and snowy winter weather of December 2003 under a heated tent. The steel tank

was erected and welded in January 2004. NL Chagnon installed the main extension using directional boring. Directional boring was started in February 2004 and was difficult because of the boulders located in the path of the bore. Several times it was necessary to use a backhoe to open a ditch so the pipe could be laid. Also, it was difficult to pull the tracing wire through the boring without breaking it. As a result the tracer is not functional over all sections of the main extension. Most of the heavy construction including the sub-main was completed by spring; and equipment was installed in the service building. The equipment in the Poker Hill service building includes booster pumps which pressurize tanks and the sub-main to provide pressure for several houses near the tank in elevation.

Figure 9. Poker Hill Storage Tank

Coating of the tank was delayed until warm weather in late May. The tank was coated Sherwin-Williams NSF approved coatings. In July 2004 substantial completion of the Poker Hill Tank project was reached and the tank was put into service. Several new customers along Poker Hill Road were connected to the system. As the summer weather became hotter, coating curing problems became evident. The coatings emitted volatile organic compounds (VOC's) into the tank and the water was not safe to drink. The District drained the tank to let the coatings cure; when the tank was refilled in the fall of 2004 the water was still not usable. The tank was unused during the winter of 2004/2005 and the entire year of 2005. During the summer of 2005 the tank was drained several times in hopes that the heat would cure the coatings further. Not until the middle of 2006 had the VOC's lowered to an acceptable level. The Poker Hill Tank was returned to full service in September 2006.

It took a several years to work the bugs out of the booster pump arrangement in the Poker Hill service/pump building. A surge tank was installed, and the controls were reprogrammed.

Infrastructure Upgrades and Improvements

In 2004 Park Street was dug up for repairs and relocation of sidewalks; and sidewalks were installed along River Road. The District took this opportunity to make upgrades and repairs. Service lines were placed deeper or insulated. By chance the District found and repaired a long time undetected leak at the westerly end of Park Street. Water usage immediately dropped by several thousand gallons per day.

In 2005 the District made several adjustments along Route 15 so the sidewalk could be upgraded. The first section was between Jolley's Store at 341 Vermont Route 15 and Raceway Road; then a couple of years later between Raceway Road and Palmer Lane. Curb stops were located and repaired when required and protected by risers; hydrants were checked, service lines susceptible to

freezing were insulated. Plans have been made for the Palmer Lane to Underhill Town line sidewalk section, but as of 2013, this had not yet been started.

In August and September of 2005 the Maple Ridge storage tank was recoated by Marcel A. Payeur, Inc of Sanford, ME. First the old coatings were removed by sandblasting. The external coatings contained lead and lead abatement procedures were required and used. The sandblasted tank was inspected and judged to be in good condition. Finally the new coatings (Tnemec brand) were applied. The new coatings cured quickly and the tank was in use by the end of September 2005. In conjunction with the recoating, the exterior ladder was shortened and a ladder guard added. Lightning surge protection was added at the Maple Ridge tank.

In 2005 The District agreed to allow an 8" extension of the main along Dickenson Street to serve property which David Villeneuve intends to develop. This extension is still pending in 2013.

In 2006 a new hatch was added to the cistern on Maple Ridge, and flapper valves were added to the tank and cistern overflow. This was in response to a state inspection and recommendation. The Boy Scouts of Troop 627 as a community service project painted the District storage building located at the well field.

In 2007 it was noticed the electrical power and control line conduits installed under Brown's River in the early 1990s had become exposed. These conduits provide power to the well pumps and send control signals between the Control Building and the pumps. The conduits had been exposed due to erosion and movement of the Brown's River. There was a concern that the power or control wires could be damaged during the winter or during flooding. In October 2007, the District removed the electrical lines from the conduits under the river and rerouted them overhead on telephone poles. In September 2008 the District noticed further erosion of the river bed and placed stones over the conduits and main which go under Browns River.

In August 2008 the District pulled the well pumps from both production wells. The wells were inspected by video camera and found to be in good condition. The old pumps were replaced with new as these had been in the ground in service for 16 or 17 years. Once in a while the District receives a complaint of an odor of hydrogen sulfide from the water; in 2008 the District tested periodically for hydrogen sulfide but generally it was not detected. These odor complaints tend to be are few and seasonal.

Water Main Extended

In 2007 the District allocated water to the Jacob's Hill housing development of Phillip Jacobs. The water main was extended from Harvest Run up Jacob's Hill Road and two hydrants were installed. The main was put into service in November 2009; and 5 customers have been added to the District. This development is expected to expand in future years.

Matching Funds

In early 2009, the District applied for American Recovery and Reconstruction Act (ARRA) money for several projects. ARRA was a federal government program for "shovel-ready" projects to stimulate the economy out of the "Great Recession". Initially the District funding need score did not make the funding cut; but upon appeal the District proposal for automatic sampling of chlorine in the system boosted the score and the District did qualify for funding. At a warned meeting in May 2009 the District voters authorized a loan of $145,000 for several projects: replacing the water main under Brown's River, installing backup generators for the Control

Building and Poker Hill, automatic sampling of chlorine and upgrade and replacement of meters for outside reading. This funding of which 57% was reimbursed by the ARRA stimulus program allowed the District to make needed improvements and long term investments in the District infrastructure. Under the provisions of the program all the work had to be completed by the end of 2010.

The engineering for replacing the water force main under the Brown's River was done by O'Leary and Burke of Essex Junction, VT; and the directional boring construction by Bore-Tech of St. Johnsbury, VT. The new force main is 12 inch diameter high density poly ethylene (HDPE) pipe. It was placed under the river bed several feet lower than previously and should provide reliable service for many years. Backup generators were purchased for both the Control Building and the Poker Hill Tank; the Control Building generator was installed by Wayne Russin Excavating Company of Underhill and the Poker Hill generator by Reliant Electric Works of South Burlington. In their first few years of operation the generators had already proven useful during several power outages, one of which lasted two days. The installation of the automatic chlorine sampling equipment required installing a 600ft sample line so that the sampling was done at the entry point of the system. The District for many years has maintained a low background level of chlorine in the water. This equipment will allow better control of the chlorine concentration. All the meters within the District were replaced and contain a feature which allows reading from outside the house. The reading is done using an electronic reader which records the water usage in a memory. Because the reading is done outside the house, the time and effort to read the District meters has been reduced substantially, and because the reading is done electronically there are fewer errors. After reading all the meters, the content of the memory is moved into software that computes customer bills. Marc Maheux has adapted the billing software to support computer based billing of District customers.

The District completed the ARRA projects within the allotted time in 2010 but it took until 2012 before the District received all the government money promised.

Recent Development
In July of 2010, the Board allocated water to Peter Geise for 4 lots to be developed along Vermont Farmhouse Road in Underhill; this has resulted in customers being added to the District.

2011 to 2013

Leaks and Repairs
On a cold day in January of 2011 a leak was found on Palmer Lane. The repair required working in a water filled hole. The repair was coordinated by Marc Maheux and done by contractor Wayne Russin Excavating of Underhill.

Over Memorial Day weekend in 2011 the Poker Hill tank was hit by lightning. This destroyed the electronic drives of the booster pumps in the Poker Hill building, resulting in low water pressure for the several houses on Poker Hill Road which are only slightly lower than the tank elevation. In response the District purchased and installed another pump to provide pressure over the weekend. In the following weeks the electronic controls were replaced and the variable frequency drive driven pumps put back into operation. The booster pipe header was replaced and improved and the new extra pump was installed as a backup.

In the fall of 2011 the District tanks and cistern were inspected by divers. The tanks and coatings were found to be in good condition. A small amount of accumulated sediment was removed from each tank.

In January of 2012 on a cold morning a leak was noticed at the Brown's River Middle School. The leak was undermining the driveway in front of the school and needed to be repaired. Marc Maheux arranged for the school to be closed early so the water to the school could be shut off for the repair. The Middle School administration got approval to close early, notified parents and obtained buses to take the students home. Wayne Russin Excavating started the work late morning and completed the water line repair and driveway re-grading by the end of the day. Water quality testing was required (?) and completed

During the summer of 2012 the District installed a sub-main along Route 15. This was to replace some aging parts of the system and also to reduce the likelihood that water lines might freeze. This work was done by Wayne Russin Company; and coordinated by Marc Maheux. During the summer of 2012, the District buildings were painted by Don's Custom Painting of Jericho.

Fluoridation Questioned

In 2012 the District decided to reconsider fluoridation. A customer had been discussing this issue with the District for a couple of years. The District had started fluoridation after a 1973 vote in favor. In preparation for the vote a public hearing was held. At the hearing voters and experts spoke both in favor of fluoridation and against fluoridation. The District vote was held in November 2012 in conjunction with the Presidential vote; so there was a large turnout. The result of the vote was to continue fluoridation

UNDERHILL ZONING/JUWD

The Jericho Underhill Water District is the basis for the Residential Zoning District in Underhill Flats. The revised zoning regulations adopted in 1973 used the Underhill section of the Water District as the boundary for the zoning district. Residences with water from the JUWD require one acre of land; residences with a private well require 2 acres. The requirements have remained the same throughout the years. The map boundary of the Residential District is also unchanged, although the JUWD has since greatly expanded

Proposed revisions of the Underhill Residential District which would adjust the map boundary and allow denser development within the district were rejected by the voters in 2014. The Underhill Planning Commission is working on the problem.

SUMMARY JERICHO-UNDERHILL WATER DISTRICT – 2013

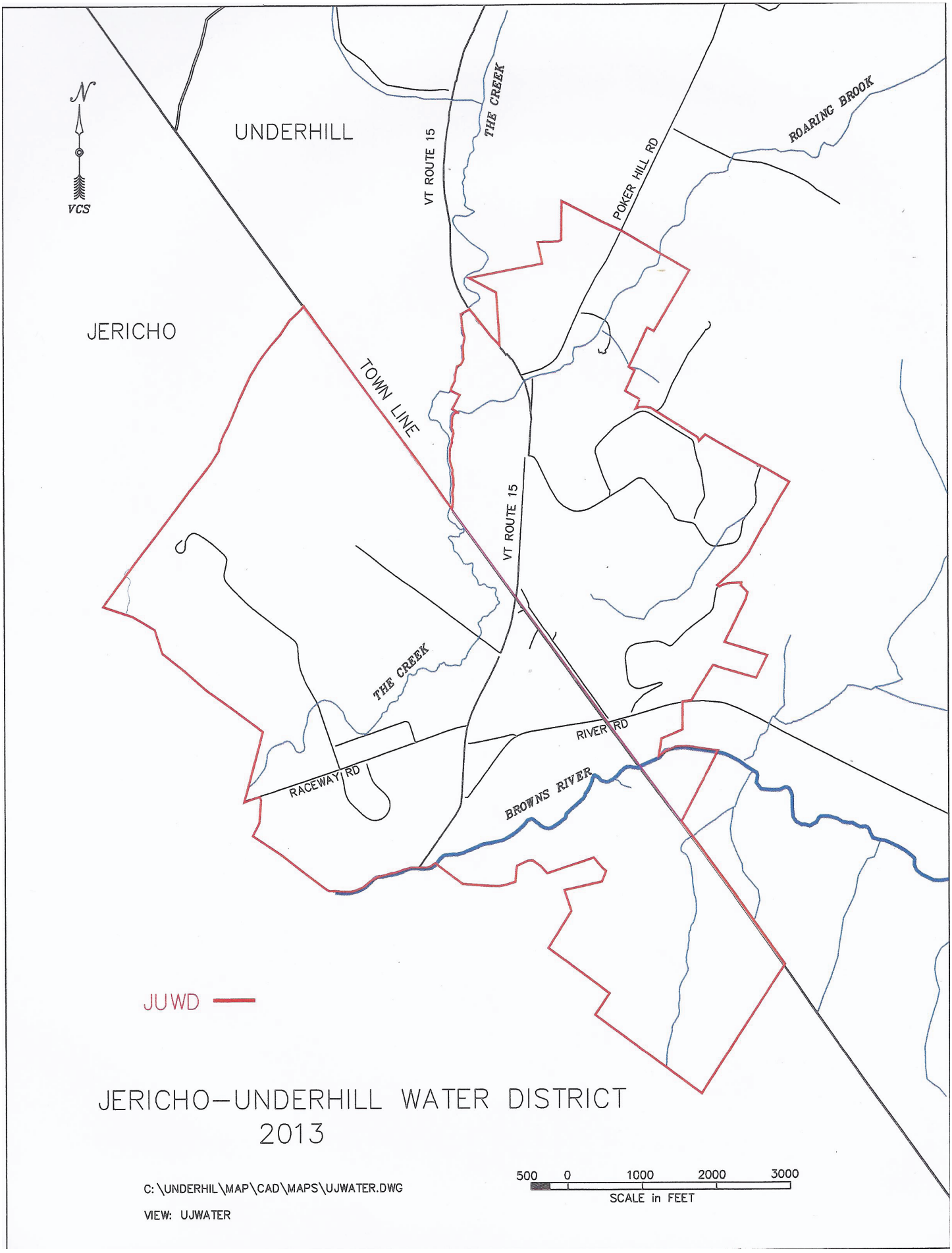
The Jericho-Underhill Water District is a municipality which provides drinking water and fire hydrant access to about 310 households, schools and businesses in the Riverside section of Jericho and the Underhill Flats section of Underhill. The District estimates it serves approximately 800 residents plus school children (grades kindergarten to eighth). An outline of the District boundaries is shown in Figure 1.

The District water source is classified as ground water and is delivered by two gravel wells about 175 feet deep located within the District. The source water originates in the area which includes the valley extending from Underhill Flats easterly to Underhill Center all the way to the ridge of Mount Mansfield. In addition to wells, the District maintains two water storage tanks, approximately 8 miles of water distribution mains, a control building, a storage building, a pump house, and an unused well point field.

The water is treated with chlorine as a safeguard against microbes, phosphate to sequester iron and

manganese, and fluoride for dental health. The water is tested in accordance with State requirements for fluoride and chlorine daily, phosphate several times a week (that is almost daily), bacteria monthly, nitrate annually and for various organic and inorganic contaminants on an annual or longer periodic basis.
The District delivered an average of 52,370 gallons of water per day in FY2012. The quality of the water is excellent and it has a pleasing taste.

The District Board consists of the following elected officers: President, two Trustees, Clerk, Assistant Clerk, Treasurer, and Collector. The District Board meets monthly and holds a warned Annual Meeting. The Annual Meeting is presided over by an elected Moderator. The District elects three Auditors who conduct an annual review of the financial statements. The system is operated and maintained by a certified Chief Operator and Assistant Operator according to State mandates as well as Regulations adopted by the District. For FY 2012 the expense and capital improvement spending was $119,076. The estimated cost of water for a family of four in FY2012 was $480.


N
VCS
UNDERHILL
JERICHO
VT ROUTE 15
THE CREEK
POKER HILL RD
ROARING BROOK
TOWN LINE
VT ROUTE 15
THE CREEK
RIVER RD
RACEWAY RD
BROWNS RIVER
JUWD
JERICHO–UNDERHILL WATER DISTRICT
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SCALE in FEET

Figure 10: Jericho-Underhill Water District Map 2013.

ACKNOWLEDGEMENT:

The authors thank Betty Moore of Underhill Center for her encouragement, suggestions, and editing of this history. PHM, MM, HES.

REFERENCES:

Early History:

* Irish, Gary. “The Underhill Water System”, Feb 10, 2013. Private Communication containing a summary of newspaper information 1894 to 1897, and comments
* Dwyer, Lorraine S. “The History of Underhill”, 1976. pg 26
* Marc Maheux. Various meetings and discussions winter and spring 2013
* Keith, Doug. Conversation 2-23-2013
* Clark, Randy. Conversation 3-14-2013
* Keith, Leroy. Conversation 4-17-2013
* Fowler, Jim. e-mail accounts dated 5-6-2013 and 5-7-2013 provided courtesy of Randy Clark
* Lee Dumas. Telephone Conversation 1-28-2014

First Fifty:

* Newspaper Clipping from 1971
* JUWD Annual Reports and Meeting Minutes
* Deeds and Documents in JUWD safe deposit box
* Conversations with present and former members and staff of the District and with present and former community residents. Names included Marc Maheux, Harold E. Sargent, Randall Clark, Douglas Keith, Leroy Keith, and Peter Mitchell.

Next Fifty:

* JUWD Annual Reports and Meeting Minutes
* Betty Moore e-mail 8-1-2014

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Today:

* JUWD Annual Meeting and Reports FY 2012.