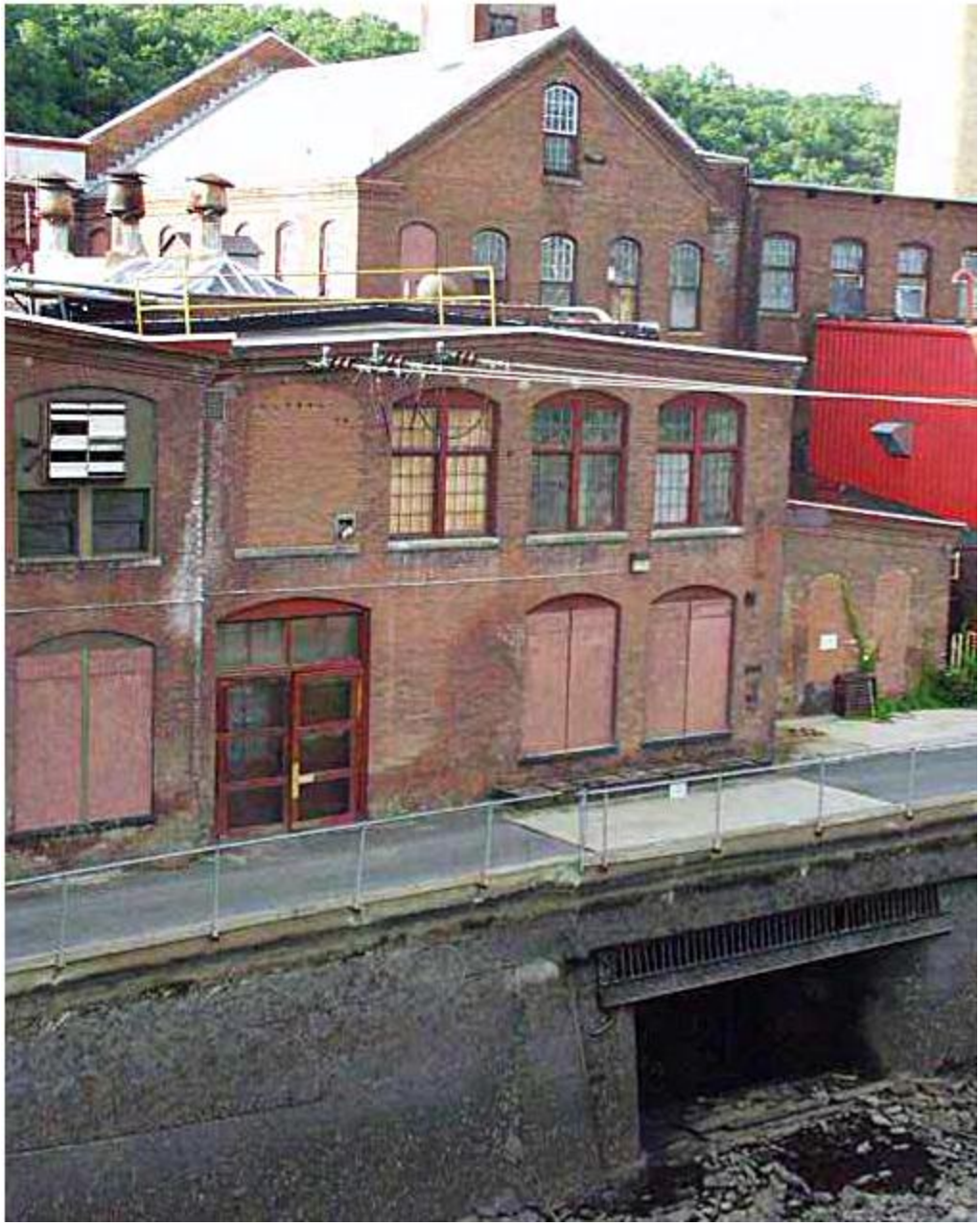


Front of Powerhouse Showing Access Way and Hydro Intake Under the Way

A Short Interpretive History of the Impact of Technology on the Manner and Location of Access to the Industrial Lots Laid Out by William P. Crocker, Engineer In 1868 Between Fifth Ave Bridge Over the Connecticut River and the Turners Falls Company Dam

By Peter Clark, Turners Falls Hydro. Prepared for the Montague Planning Board, summer 2000 in support of application for Approval Not Required subdivision.

Connecticut River and the Turners Falls Company Dam
A Short Interpretive History of the Impact of Technology on the Manner and Location of Access to the Industrial Lots Laid Out by William P. Crocker, Engineer In 1868 Between Fifth Ave Bridge Over the Connecticut River and the Turners Falls Company Dam

I. Introduction

While researching the history of the land under the powerhouse we seek to divide from the Strathmore Paper Company site in Turners Falls, we found one document after another that describes the industrial revolution that occurred in Montague, Massachusetts. The documents tell the story; but to interpret what we saw in the indentures, deeds, plans, maps, drawings and photos that we compiled from over 200 years of development history, we had to take into consideration the evolution of technology. This paper attempts to put some of these materials in context. First we try to describe what technology was available for transportation and for manufacturing and how it shaped choices for design of the City of Montague. Then we look at the data (documents, plans and drawings from the County Registry, the Library and Town Hall) to see if we can verify what we have described in our interpretation of history. And finally we explain how the original plan laid out by the engineer William Crocker in 1868 has determined today's access to the industrial sites along the canal. We believe that these facts and history provide a justification for Planning Board approval of the non-conforming access conditions that are part of the proposed powerhouse lot subdivision. The dimensions of the way have existed since 1868. The uses of the way have evolved and changed. Industries have flourished, failed and the sites have been put to new uses. Thus the uses of the way have evolved and changed. Approval of the present access would be accepting the same conditions that have pertained for more than 132 years for the hydro powerplant that has operated since 1918.

II. Historical Background and Observations

Between the late 18th Century and 1856 when the last boat passed the locks at Turners Falls, the principal means for transporting heavy and bulky loads was by Connecticut river boats. The Proprietors of Locks and Canals of the Connecticut River was incorporated in 1792. Soon the proprietors decided that developing a navigable river would be more efficient if they divided the project between two separate companies. So, in 1794 they formed the Proprietors of the Upper Locks and Canals to open up the river above Deerfield for transportation to Vermont by building a lock and a 2.5 mile canal around Turner's Falls. Captain Elisha Mack, mechanical engineer, discoverer of the cantilevered bridge, built the first dam on the Connecticut River at Turners Falls in 1793. The Montague lock and canal was operating by 1797. In 1798 new efforts were made to raise foreign capital in Holland to expand the canal system.

Early Visions for Economic Development

A group of German adventurers came up the Connecticut and founded "the City" that was to be the center of commerce for Northern New England. "Here the Germans would establish their learning; and great libraries, museums and institutes would be endowed; and Captain Mack would become president of a great polytechnic university. Great authors would establish the glory of the City; and poets would sing the charm of the hills, meadows and river." <http://genweb.net/-books/ma/montague1910/mmt097ch6.txt> page 235.

Later, about 1844, the railroad line being developed by Colonel John Alvah Crocker from Fitchburg reached Montague. Planning to go no further west, Crocker proposed to turn north near the mouth of the Miller's river and extend the railroad to Brattleborough. "It was well known that Colonel Crocker had his eye fixed upon the unlimited water powers of the Connecticut river and its tributaries of this locality. … According to Mr. Crocker's plan, Grout's corner or the mouth of the Miller's river would have been the center of a great manufacturing community, the circumference of which would have been a circle running through Northfield Farms, Factory Village, Montague City, Montague Center and Farley." (ibid., page 236).

This vision started a great debate about strategies for economic development which raged for years between Greenfield and Montague. The business leaders of Greenfield wanted new markets. They proposed to build the Hoosac tunnel for a railroad leading to the West. The Proprietors working at Montague wanted to use the regional railroads to reach the ports of Boston, New Haven and New York. They planned to exploit the power of the Connecticut river by building an industrial city at Turners Falls. At the heart of this debate was Colonel John Alvah Crocker who was the engineer who devoted 20 years of his life to building the Hoosac tunnel. The Hoosac tunnel took 48-years to build, cost nearly $13 million and the lives of 136 men. "And when it was done, every town that had been promised prosperity (Greenfield being almost the sole exception) began rapidly to decline in population and in valuation." (ibid., page 238).

Yet, Crocker's real vision was to harness the Connecticut river just as Lowell had tamed the Merrimac river. So, in 1865 every share of the original stock of the Proprietors of the Upper Locks and Canals was bought up by a group of entrepreneurs lead by Colonel Crocker. In 1866 the company name was changed to the Turners Falls Company. 700 acres of land along the river were purchased that year. A permanent dam with a crest length of 1,000 ft and fall of 28 ft. at the dam and up to 41 ft near the bottom of the canal and an estimated potential of 30,000 horse-power was completed on March 20, 1867 at a cost of $105,000. (Information from prospectus of the Turners Falls Company, 1868). By 1879 the company owned about 1,300 acres and the capital had increased to $300,000.

III. Montague's First Subdivision Plan

As the Turners Falls Company was being capitalized and gathering its resources, Crocker's brother William, the design engineer of the Turners Falls Company, prepared the first master plan for the proposed industrial city. It was recorded in 1868 (Plan Book 175, p.). This paper is about the design assumptions and technical specifications of that plan and their justification. We will endeavor to show you that this plan was the first subdivision plan for the whole City of Montague. It was designed to support industrial development at Turners Falls. In the proposed industrial area along the canal the ways were laid out to utilize the transportation methods feasible at that time, namely, river boats, railroads, walking, horses, oxen, horse carriages, ox carts, sleds and other vehicles.

The lots and their access ways were planned and built before zoning, before electricity, before large steam boilers or the transportation of coal, before roads were paved, and commuter parking was unheard of (people walked from the mill housing to the plant). The access way laid out by Crocker to the industrial lots was adapted to different transportation modes and heavy industrial technology no longer required by today's electronic high tech economy.

There are historic reasons why the access is 10' plus 12' wide, with several structures constructed in that way. The ways may be non-conforming to the specification for access to an

industrial park under present zoning specifications, but these way have been used for 130 years. Moving the canal or the buildings is out of the question, so the Planning Board must determine if the historic layout is suitable for the powerhouse's continued use as a hydro station. We propose no change in use, only to preserve and maintain the current design for renewable energy generation using the water powers purchased from the Turners Falls Company 125 years ago.

Established Manufacturer Demanded Rail Service to Connect to World Market

Lots at Turners Falls had to be auctioned at first to attract attention. There being so few takers, in 1870 the managers of the Turners Falls Company talked John Russell into being the first "anchor tenant" renting 700 horse-power. They gave him the best lot in the proposed industrial zone. Over the preceding 50 years Russell had successfully established the first cutlery business in America. He adapted his water turbines to operate trip hammers used to temper the steel blades and he gradually eliminated all hand labor in cutlery manufacturing. Russell sold his machine manufactured cutlery internationally at substantially lower prices than the hand-made cutlery competition from Sheffield, England. The Turners Falls Company convinced Russell to move from his established factories on the Green river in Greenfield to Montague. New mills were built in less than a year near the head of the Turners Falls canal. They were designed for the latest industrial technology. The Russell Cutlery site was located just north of property selected by the Keith Paper Company the next year where Indeck's coal fired powerplant is located today. Russell depended on the superior waterpower of the Connecticut river to eliminate the seasonal flow variation characteristic of the Green river. Moreover, John Russell Cutlery relocated to be closer to the railroad line. The business required reliable transportation to bring its annual inventory of supplies and to ship out its products for sale the world over.

William Crocker designed the site to handle these logistical needs: "The John Russell Cutlery Company, at its Turners Falls plant, was consuming 36,000 pounds of ivory a year, 112,000 pounds of ebony, 57,000 pounds of rosewood, 305,000 pounds of cocoa-wood, 600 tons of steel, and utilizing annually 400,000 pounds of grindstones, 44,000 pounds of emery, 3,000 pounds of beeswax, 25,000 bushels of charcoal, 2,000 tons of anthracite coal and 700 horse-power in its processes, as well ass a large amount of silver in plating blades and handles, while it now enjoyed transportation facilities through the medium of a branch railroad three-quarters of a mile in length, and as early as 1871 its annual sales were $1,500,000." (found in the chapter about Massachusetts Industries, page 459 in the 1882 Industrial Census of the United States).

Industrial demand for transportation was the reason that the railroads Alvah Crocker had brought into Montague included a spur along the canal. In the Crocker's plans for Turners Falls the spur came from the New Haven and Hartford Railroad line that ran north along the east side of the canal. Colonel Crocker also wanted to connect his proposed industries with rail lines to Boston and Vermont. The first proposal published by the Turners Falls Company included the spur crossing the canal in a 10' right of way along the west wall of the canal. By 1882 it was the primary access to all of the industrial sites along the canal from the Turners Falls Cotton Mill to the Clark and Chapman Machine Company at the gatehouse. In addition this spur served the Turners Falls Paper Company, Keith Paper Company, the John Russell Cutlery Company, the Montague Paper Company and the Shawmut Manufacturing Company so a second line had to be build in the same right of way for trains to pass. By 1882, these companies used more than 4,000 horse-power (hp) all from hydro turbines. The water rights are a perpetual lease that had a fixed price of about $7.50 per hp per year. Each property was allotted its hp-share of the canal flow.

Keith Paper Company's Access Planned by Turners Falls Company

Crocker himself took the lot north of Russell Cutlery and formed the Montague Paper Company to be constructed at that site. This company later became the first mill of the International Paper Company. Finally in 1871, the Turners Falls Company negotiated one of its first land sales to the newly formed Keith Paper Company. It took several years to implement. The Indenture dated September 2, 1873 (Book 427, page 107) describes the lot and its access. The access way was consistent with Crocker's plan; a 12' access way was proposed just west of the 10' railroad spur planned to run beside the canal to serve John Russell Cutlery and Crocker's paper mill. The indenture describing the proposed land sale to Keith Paper Company states:

> "Also subject to whatever rights of way or other rights which the New Haven and Northampton Railway has over the land lying southerly of the land herein conveyed, a right of way to the grantee *(Keith Paper Company)* and their agents, servants and workmen, to pass and return at all times over the way twelve (12) feet in width, with horses, animals, carts, sleds and other vehicles loaded and not loaded, as well as on foot, over, upon and across the land of the grantor *(i.e. across three unsold lots of the Turners Falls Company that would become Marshall Paper Company in 1896 and later Esleeck Manufacturing in 1902)*, lying southerly of the land hereby conveyed and between the same and the road to the suspension bride over the Connecticut River and westerly of the railroad leading to the mill of the grantee, the said right of passing and repassing to be executed substantially in the same manner, and in the same place as now exercised."

The size and location of the access way was designed and conveyed to be compatible with other parcels in this the original subdivision of industrial land in Montague. It included the 10' width necessary for a train spur and a 12' width for other modes of transportation (which at that date were workmen on foot, horses, horse drawn carts, sleds and other vehicles loaded and unloaded). This 22-foot way remains today. It runs along most of the frontage in front of the IPC and Esleeck paper mills with a few loading docks for trailer trucks now located in part of the 12' way. Now that the tracks have been removed, trucks can park parallel to the buildings with their backs to the loading docks at both Esleeck and IPC. There is more than enough room for other vehicles to pass. The way can be seen in the follow photos showing its current use.

Access way towards Fifth Ave. Bridge

Access way continuing toward Indeck

Crocker's Plan Included Technical Considerations In His First Subdivision Design

Bear in mind that Crocker's planning was speculative land development, drawn on paper. Crocker prepared a proposal (see Book 275, page 397) published on September 2nd, 1873. The wall-sized plan of "the City" hung at Town Hall long after the Turners Falls Company had ceased selling lots. It was the first and primary subdivision plan for Montague. It laid out roads, bridges, proposed widening and extensions of the canal, railroad rights of way, spurs and sidings as well as industrial, worker housing, commercial, residential and municipal lots.

The idea for an industrial city designed around a central power canal converted from an earlier transportation lock and canal system was first tested at the industrial cities of Lowell, Lawrence and Holyoke. At first the canal was more than sufficient to channel water flow to the hydro mechanical turbines located in the mill buildings that would be built at each site. However, now it was important to maximize the power available at each site by making the water level as high as possible above the point where the water returned to the river. This maximized the head (pressure) at each turbine. It would be another 50 years before the canal would be widened and dedicated to power generation serving a specialized powerhouse (Cabot Station). There was no powerhouse at the Keith Paper Company, the water power was distributed among 3 turbines. It was all mechanical power used to turn machinery, to pump slurryed raw materials or to lift loads with mill elevators.

The locks and canal at Turners Falls had been designed to minimize flow; 99.5% of the river flow went over the dam. Boat coming up river were relieved to enter the canal from the lock where there was no current. Now as more and more horse-power was allocated to the sites being sub-divided along the canal for industrial use, the canal flow was increasing and a larger cross-section was eventually needed in order to keep the rate of flow to a reasonable velocity. Eventually between 1915 and 1920 (date uncertain) the canal was deepened and widened by blasting out the rock in the 100' space saved for the proposed canal expansion in Crocker's 1868 plan. In 1922, Keith Paper was allowed to deepen its tailrace in the river and this with the 5' rise

of the canal walls increased the capacity of the hydroelectric turbine/generator set at Keith Paper to 950 kW. Keith and most of the other industries kept increasing their mill powers (rights to canal flow) every few years as they expanded and their energy needs increased. Their demand was a small percentage of the flow in the Connecticut river, and so the allotment was a constant cfs flow all year long, not a percentage of the flow as was the rule at other mill towns.

Why the Mill Buildings Had Many Floors

Finally, a word about the layout of the mills built along the canal. The mill buildings had to be designed to permit water to drop down through penstocks to turn the turbines installed in each mill. The rotating mechanical power was then distributed and transferred through the industrial building by a system of gears, leather belts and line shafts mounted on heavy ceiling beams on each floor (level) of the factory. Work was more easily done vertically than horizontally, using gravity and mechanical power distributed vertically. So Crocker located the industrial sites on a narrow strip between the canal and the river. Buildings had to be built on ledge to be stable and to afford water tight canal walls over which a railroad was engineered. This meant that the canal had to be blasted out of rock, so it took many years to enlarge and still keep the mills operating.

Crocker laid out the parcels along the canal in order to concentrate the energy of the river flow (an almost unlimited horse-power available) in the shortest distance down the canal. This meant that each mill had to be very compact and could not sprawl over the site. Look at the concentration of buildings show in the drawing of river front in 1882, 1884 and 1888 found in the appendix. Crocker allocated the waterpower labeling each lot with its assigned horse-power, even in his 1868 plan. It is evident that he was optimizing the use of the water which helps explain the size and location of each small industrial property. The mills had to go up, many being 5 to 7 floors in order to conserve space on the small lots, to use gravity in the process flow and to transfer the mechanical energy as efficiently as possible within each building.

Given the varying head at each site going down river the canal water velocity increased at the upper end of the canal until the design plans at the Registry show that Crocker planned to introduce a second lower canal at a level below the first canal. While this would reduce the head at each site, but permitted the water flow to be used in a second mill. This concept was pursued but abandoned. Such two-level canal systems had been adopted in Lowell and Lawrence. Before the lots being sold at Turners Falls ran out of upper canal sites, electricity was invented. Turners Falls Company installed its first 1000 kW generator in 1906. The Franklin Electric Light Company installed distribution lines along the canal.

Process Flow of Materials in Manufacturing Buildings

Another design factor that determined lot sizes and building locations on the lots is the proposed flow of materials through the manufacturing process. Keith Paper engineers designed the buildings, their size and shape to take advantage of gravity to help the material flow from the top to the bottom and to permit power (in rotating line shafts to reach machinery. Shaft horse-power is lost through friction and long distances. So the 11 Keith Paper buildings are all very close together, interconnected so that pulleys and belts could go from one building to the other and to permit efficient material flow minimizing handling. There are 3 elevators used to raise materials delivered by the railroad at level 3 (Canal Road) to the top of the process flow. So there was raw material storage at level 5, a pulper at level 4, beaters at level 3, paper machines at level 3, sizing at level 2, and then up the elevator for roll processing (e.g. drying and cutting) at level 4,

and finished product inventory and shipping at levels 3 and 4 (see labeled diagram and insurance maps of the mill buildings).

All raw materials entered the buildings at the canal level as did the municipal services such as the municipal water supply: to back up to the canal water supply, to flow to water treatment at level 2, to a coagulator at level 1, to the waste storage at levels 1 and 2 and to slurry bypass tanks at the levels 1 and 2. This design created a liquid flow process in the buildings starting from the canal level, dropping to lower floors and then pumped from level 1 back to the paper machines on level 3, with waste discharged from holding tanks on level 1 and 2 by gravity to the river. Pumps and elevators take a lot of energy to raise the process flow back up to a higher level. Thus the process was designed to minimize the energy needed to raise liquids and materials in the paper making process.

Thus the mill was laid out on the lot to take advantage of the raw material delivery access to the site via (1) the railroad line, (2) canal transport in early years, (3) canal water intakes, (4) municipal water lines in Canal Road and (5) a pedestrian bridge over the canal used by shift workers leading directly from the mill housing to the plant. Fire fighting apparatus was also installed at the Canal Road level (hose noggins, fire pumps and later fire suppression chemicals). After the railroad stared to fail economically, trucks began delivering fuel (coal and then fuel oil) along Canal Road.

The statement made at the last Planning Board meeting by the representative of Esleeck Manufacturing that Keith Paper Company's only right of access was through a 12' wide and 9.5' high tunnel under the Esleeck building is clearly wrong. It is reasonable to imagine that this access way was used to construct the foundations of both the Keith Paper and the Marshall Paper mills on adjacent sites. The same access route was undoubtedly used for delivery of machinery like the water turbine, pumps, boilers, fuel storage tanks and other heavy equipment located at the basement level of the mills. It gave access to the tailrace of the hydro plants operated by both mills. It may even have been used to haul out waste materials that could not be processed or discharged into the river or pumped up to town sewers.

The 12' wide access way under the Esleeck buildings was never used to deliver raw materials or workers to the paper mill. Both entered at the Canal Road level having been delivered by the railroad on its 10' ROW, come along the 12' access way or having crossed the bridge from the worker housing. There are 11 personnel doors, 6 loading dock entrances plus fuel, water and electrical transformers at the Canal Road level. In comparison, there are only 3 staff exits, two large garage doors and the waste water processing plant located at the basement level. The routes used for material and worker access to the mill building continue at the Canal Road level, just as defined in the 1873 Indenture and 1892 Deed of land conveyance to the Keith Paper Company by the Turners Falls Company.

Electricity Changes the Use of the Canal for Power Generation

Hydropower generation brought another design change. Efficiency was increased when flow was concentrated at a location that maximized the head (the vertical drop to the tailrace in the Connecticut river. Now a powerhouse where all the turbine capacity could be installed raised efficiency and helped with power distribution. It was no longer necessary to have mechanical turbines located in each industrial building. Electric wires connected the customer to the generator along distribution lines at higher distribution voltage (pressure) and served all the mills. The distribution line power was then transformed to the mill voltage and connected to the motors driving each machine. Equipment could now be laid out in any orientation without regard to

mechanical alignment. Small motors could use gearboxes to improve mechanical advantage way above that possible with the mechanical belt and pulley systems. This all happened 70 years after William Crocker first subdivided the land at Turners Falls.

Eventually the regional demand for hydroelectric power caused the canal to again reach its limit. Turner Falls Station had grown to 5,000 kW. So, in 1916 Cabot Station was built and the canal was extended down stream and widened in front of the intake gates in order to slow water velocity. Canal flow was increased to 16,000 cfs, the design flow capacity of the turbines installed along the canal. So, in 1951 Western Massachusetts Electric Company (WMECO) offered to use Keith Paper's water at the higher head of the Cabot Station. As an inducement, WMECO offered to share the increased kWh output generated with the 288 cfs that Keith Paper had acquired from the Turners Falls Company. This was legalized in the Water Exchange Agreement (Book , page) and exists today. WMECO traded kWh for cfs of water flow and shared the incremental output from the extra head at the lower end of the canal.

Planning Board Considerations for Subdivision

Today the Montague Planning Board is being asked to decide if one of the industrial sites originally divided by William Crocker in 1868 may be further subdivided. First the Board must determine if the existing frontage on a way along the canal is "a way in existence" at the time Montague adopted the Subdivision Control Law in 1968, exactly 100 years after Crocker's first subdivision plan for the City of Montague. Most of the large industrial lots he laid out 132 years ago still exist today. As explained above, Crocker divided the lots in the industrial zone so they minimized the distance from the canal to the river, to maximum vertical drop (horse-power) and to minimum distance from the mill's worker housing. He located mill housing just across a canal bridge so that workers on night shift could reach the mill with minimum distance and difficulty at night. At first gas lights and then electric streetlights were added for safety. This was a typical layout all along the canal system. From the start he proposed to replace river and canal boats for bulk load transportation with the new railroad. Some say the integration of transport and energy production was probably because Alvah Crocker owned several railroads and the locks and canal plus the banks that financed the development. But the rails were laid out along the same access route as canal and the roads serving the mills.

William Crocker laid out the community to support the mills as well. He located the supporting business district and municipal building directly behind the mill housing again so walking was possible. Municipal services (such as potable water, gas street lighting, sewer pipes, schools and hospital) were depicted along with shops selling materials for industry and the workers. Government building and services were located on different versions of the plan. Montague City was one of the first fully planned communities in the United States. Turners Falls was designed to maximize power for industry, to deliver heavy loads by rail. Roads for horses and sidewalks for people walking were secondary concerns in this "planned community" of 1868.

IV. What the Documents Show

In this section we selectively list and briefly discuss the some of the documents we have found describing the Keith Paper Company site and its development over the years. We will point out the evidence on which the observations made above are based.

1868 First design and layout of ways in Turners Falls (Plan Book 169, page 32 entitled: "Plan of the Projected City of Turners Falls in the Town of Montague, Massachusetts in March 1868 by William P. Crocker) shows his planned industrial community as proposed by the

Turners Falls Company. Roughly the same plan is included as Fig. 17, "Plan of the Privilege at Turner's Falls, showing proposed extension." shown on page , Department of the Interior Census Office, The Tenth Census 1880 of the United States, Vol. XVI, Waterpower, Part I, Washington, D.C., Govt. Printing Office, 1885

1873 Deeded 10' right of way for railroad as yet not built and to the west an adjacent 12' access way from lot southerly to the bridge over the Connecticut river (Book 427, page 107 and repeated in several other documents including the Indenture to Marshall Paper Company Book , page). These documents establish plan for access to 5th Ave. bridge from lot purchased by Keith Paper Company and later Marshall Paper Company.

1879 Sketch of Keith Paper Company in the lower corner of the 1902 picture (see Attached Picture 1). One can see the 22' wide ROW along the small canal in front of the buildings and we should note that the railroad tracks have not yet been laid in the RR easement. The canal is narrow and a pedestrian bridge crosses the canal just above the water connecting the mill to its housing. There is a small loading dock built in the 12' ROW in front of the storage building on the far right, but we cannot see if the serves wagons or is ready for the RR to be built.

1882 Photo of the original Keith Paper mill from Orra L. Stone, page 461, History of Massachusetts Industries, Their Inception and Success, Vol. I, S.J. Clarke Publishing Company, 1930, Boston, shows another storage warehouse has been added to the north end of Keith Paper buildings. It has a loading dock that is located partly in the 12' ROW.

1884 Drawing of the John Russell Cutlery Company, 50 years after its establishment in 1834. The picture was published in Illustrated Industries and Geography of America, pictures copyrighted in 1882 by George H. Adams and Sons, New York. This drawing shows only a narrow white line for the canal and shows nothing of the railroad lines near the canal.

1885 Drawing of the John Russell Cutlery Company in a book about the industries of Massachusetts found at the Turners Falls Public Library, L.H. Everts, Publisher, Philadelphia. This is very similar to the drawing above, but now a few more buildings are seen in the drawing and a large train locomotive is seen streaming south along the east side of the canal in what was the New Haven and Hartford right of way through Montague City. This connection to the main line was critical to Russell success.

1885 Another drawing published in the same book shows the extend of the industrial development along the canal and the suspension bridge over the Connecticut river below the Keith Paper Company. An enlargement of this drawing reveals that the next mill downstream that is visible is the Turners Falls Cotton Mill, the white building visible directly over the canal that appears as a white spot seen over the roof of the Russell Cutlery Company and bending around towards the Cotton Mill. The dam and gatehouse are clearly visible on the left side of the enlargement with the Montague Paper Company extending along the east bank until about the middle of the enlargement (over the island), then the John Russell Cutlery Company and finally the north gable end of the Keith Paper Company is visible. There is no Marshall Paper (later Esleeck) building so we know that the picture predates 1896.

1902 Picture of the Keith Paper Company (in a large frame found at the Turners Falls Public Library). This picture shows the addition of several new buildings (the addition of

Building No. 2 and 3 along the river, a new tower in front of them, Building No.7 into which a new paper machine was installed at the level of Canal Road (Level 3) and a new Building No. 10 on the south side of the managers offices. The pedestrian bride now has hand railings and the New Haven and Hartford rail line is visible in the foreground with a train streaming south. On the spur we can see another train going south from the direction of the Russell Cutlery factory just visible on the right. Behind this train there are rail cars standing on a siding in front of the loading docks beside the warehouse buildings. So, now the 12' access easement has been partly occupied by a new rail siding for the mill. There is another boxcar standing in front of Building No. 7 where the new paper machine was being installed. It is clear that the large door in the end of that building are meant to receive machinery and/or materials from the level of the railroad siding. Workers can be seen walking to the mill and into the mill on the other side of the canal bridge.

Note also that the powerhouse for the hydro has not been constructed since the plant is not generating its own electricity. The 3 turbines operated by Keith Paper were strictly mechanical powering the equipment on belt drives. The turbines were installed in three different buildings with their own intakes and separate tailraces at the river level. Some of these structures were visible this last week when WMECO drained the canal.

1906 Turners Falls Company generates first electric power with a 1,000 kW unit at its Turners Falls Station located on the canal and sold it to the Franklin Electric Light Company for distribution.

1911 Drawing of the Keith Paper Company (in a large frame found at the Turners Falls Public Library). Now there are two railroad lines passing in front of Keith Paper plus a rail siding with boxcars standing in front of the storage warehouse. The loading docks have been covered against the weather. The 3 railroad tracks must now fill most of the 22' right of way in front of the buildings. A new building has been added parallel to the tracks, now called Building No. 11 having 5 stories above the canal level and 7 stories from the foundation. It is interesting to see the addition of distribution line for electricity and perhaps telegraph wires along the railroad right of way on the east side of the canal. We don't see an interconnection crossing the canal to the mill yet, but we know that Keith was preparing to convert its power system to electric and steam driven motors. There are also lightning rods all along the tallest building and on top of the highest tower. People are beginning to understand the properties of electricity. A second bridge spans the canal, looking like a pipe bridge supported by trusses. Finally, the hydro intake gates are now visible in the picture, sticking out into the canal is a dock used to rake the trashracks at the intake where the new turbine generator would be installed in 1918.

1911 Turners Falls Company recorded its Canal Enlargement, Proposed Changes in Lands and Rights of Way of NY, NH & Hartford Railroad (Roller Plan 25, October 12, 1911 as revised November 16, 1911 drawn by H.M. Turner, Drawing #4143X).

1912 An agreement to install a large tunnel across the land of Keith Paper so the Turners Falls Company can drain the canal more rapidly than letting all the water out of the canal at it southern end (Book 576, page78). The agreement also provides for Turners Falls Company to build a new pedestrian bridge for Keith Paper at an increased height above the canal so that the bridge enters the mill at a level a full story (Level 4) above Canal Road. The canal was being widened and the canal walls were increased about 5 feet allowing the water to be raised about 3 feet from its former level. [I cannot recall the

date of an enormous plan that shows the rail lines and access ways in front of all the buildings from the 5th Avenue bridge to the IPC bridge and the gatehouse at the dam. It is located at the Registry in the oversized map drawer, Roller Map 25 for maps after 1912. The copy machine quit when we asked for a copy.

1913 Turners Falls Station had grown to five units totaling 5,000 kW of capacity.

1916 Cabot Station constructed with a capacity that eventually totaled 50,000 kW. To do this the canal had to be extended and widened.

1918 Keith Paper installed a new Hydraulic Turbine designed and built by I.P. Morris Co. in Philadelphia in 1918. It was rated at 1110 horse-power (950 kW) when it operated at 38' of head using approximately 290 cfs at max output. Later when the canal was raised by 5 feet and the tail race was deepened, the rated head increased to 46'. The generator was a General Electric No. 1012407, with 225 rpm and generating 937 kW at a .75 power factor. The generation voltage was 2300 volts. This state of the art power generating equipment was installed in a new powerhouse located between the first storage building noted in 1873 and in the place of the large silos visible in the earlier pictures. The powerhouse was of two stories, similar in shape and size to the building next to it with its gable end towards the railroad spur. It is unlikely that the house where the manager's offices were located was torn down at that time since there was no local power company needing to install their transformers at the level of Canal Road. The transformers of WMECO that are located there today must have been installed when the Water Exchange Agreement was signed and additional standby capacity was needed for the mill. From that time on the offices were relocated into the entrance to the mill on the third level near where the stairway tower is located.

1922 The Turners Falls Company has now been transformed into the Turners Fall Power and Electric Company. The Indenture dated May 1, 1922 (Book 876, page 12) recognized all the prior indentures of Keith Paper increasing its water flowage rights (mill powers) so that they totaled 288.814 cfs and costing a yearly rent of $9,875. The prior indentures were listed as: September 2, 1873, recorded with said deeds in Book 275, page 397; June 2, 1885 recorded with said deeds in Book 377, page 235; September 12, 1892 recorded with said deeds in Book 437, page 100; August 21, 1900 recorded with said deeds in Book 476, page 252; and recognizes that the power company has raised the canal walls to that there is 3 extra feet of head for which Keith is paying an additional $492.30 per year; the power company granted Keith the right to deepen its tailrace and in exchange Keith Paper grants the power company a right to raise its canal walls another 3 feet to it is 7 feet above the level index of 100 fixed at the gate house.

1923 Keith Paper Company makes changes to its gate house room for the trashracks and intake gates in front of the powerhouse because the canal water level has been increased. (See Plan Book 8, page 149). This shows that the intake gates and the building enclosing them have been built in the 12' access way in front of the powerhouse. This building became a lobby to the powerhouse and a gatehouse. The railroad track in front of the powerhouse had to be relocated and it is now clearly only one track wide.

1928 Another question that should be researched is whether the widening of the canal caused either of the rail lines on either side of the canal to be moved. As reported in the plan just above after 1922 there was only one rail in front of the powerhouse. Was any part of the 22' ROW reduced? See the photo on the bottom of the page cited above from Orra L.

Stone, page 461, History of Massachusetts Industries, Their Inception and Success, Vol. I, S.J. Clarke Publishing Company, 1930, Boston picturing the Keith Paper Company in 1928. One can see that the canal has been widened, but the width of the way in front of the buildings is indeterminate. There are however 2 boxcars standing in front of Building 11 in an area where a loading dock for tractor trailers is located today. From the attached picture we can see that vehicles can pass in front of that loading dock including the coal trucks that supplied Indeck and the fire engines of the Turners Falls Fire Department.

1951 The Water Exchange Agreement between WMECO and Keith Paper Company took advantage of the higher head at Cabot Station. Keith Paper shut down its hydro generation so the water could be used by Cabot and the latter shared half of the increased output with Keith. It was a swap of water for retail energy delivered to the mill with the exception of time of high flow in the Connecticut when the canal flow exceeded 16,000 cfs for extended periods of time.

1987 WMECO sold the land where the John Russell Cutlery Company had been located to IPC who then leased it to Indeck (Lease was recorded in Book 2541, page 89 to 114). This plan was approved as an ANR plan by the Montague Planning Board on June 8, 1987 (see Book 64, page 99). It used the 10' plus 20' way in front of the lot as frontage. Although connected to the green IPC Bridge owned by WMECO, the latter was deem unsafe for heavy loads like fire engines and coal delivery trucks. So, access along the right of way of the Hammermill Paper Company (IPC) and over land of Esleeck Manufacturing Company was required.

1987 In the final stages of the Indeck's financing of the coal-fired powerplant to be located on land of IPC, formerly the site of the John Russell Cutlery Company, Indeck obtained a license to pass over the land of WMECO, Hammermill and Esleeck to reach the 5th Ave. Bridge over the Connecticut river. Indeck wanted to use the same access route common to all the properties sold by the Turners Falls Company along that part of the canal. To eliminate all doubts concerning title, Indeck's lenders wanted the license to assure continued access along Canal Road. Attached to the license were 2 plans (Book 65, pages 74 and 75). The first is an almost exact duplicate of the ANR subdivision plan cited above. It is connected to a survey plan of the way from the edge of the leased IPC lot over the land formerly of Keith Paper Company and the land of Esleeck Manufacturing Company. It shows a way mostly 22' wide, but with several loading dock built out into the 12' access way adjacent to the 10' WMECO strip formerly the rail line ROW set aside by the Turners Falls Company for all the industries along the canal. The present way was paved by Indeck after strengthening with steel plates all the sections that pass over the tunnel of WMECO and the penstock intakes of the hydro plants of Esleeck and IPC. The way is about 13' wide at its narrowest. Regardless of the dimensions, this way has been used steadily for years as access to Indeck, IPC and Esleeck. It is the way along which all materials are delivered and finished product is taken away. All municipal services are delivered along the same way.

1995 Uncertain date when IPC shut down its paper mill. At that time Indeck lost its steam host, so Indeck leased the IPC building and started to rent them out (up to 22 renters at one time) in order to maintain a steam load for its co-generation plant.

1997 Uncertain date when Indeck mothballed its powerplant. UNITIL bought back its power purchase Agreement from Indeck. From that time IPC started trying to get the tenants out of the building, finally buying back the lease of the buildings from Indeck in 1999.

1999 Swift River Company and Hobbs Contracting sign a P&S agreement with IPC to purchase the powerplant at the IPC mill in Turners Falls.

1999 WMECO sold its Cabot Station to Northeast Generation Company (NGC) in December. WMECO advises IPC of its intent to assign the Water Exchange Agreement to NGC.

2000 IPC submitted an ANR subdivision plan of the powerhouse to the Montague Planning Board.

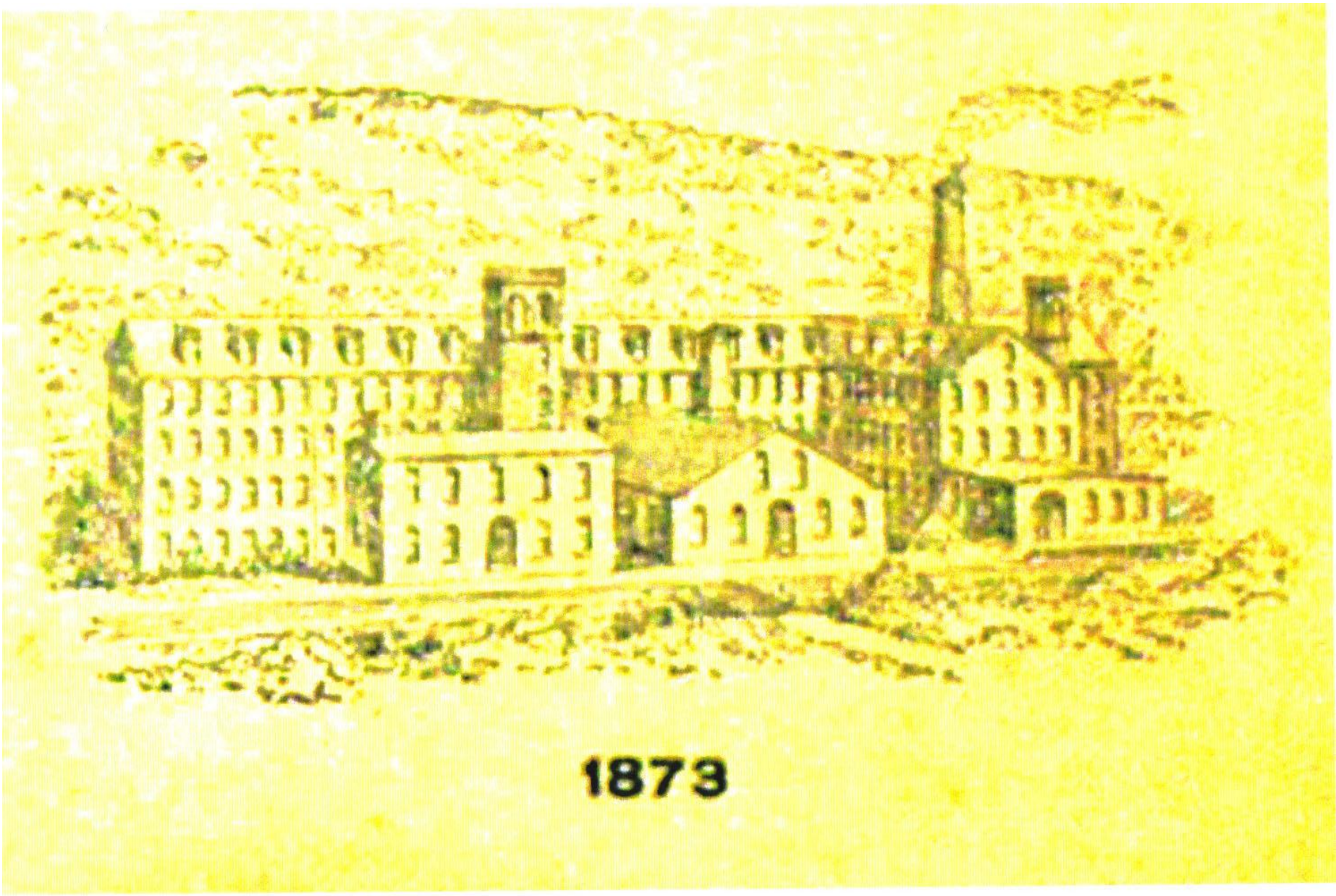
V. **Planning Board Approval Not Required**

The Planning Board must determine that the land to be divided has frontage on "a way in existence on the effective date of the Subdivision Control Law having, in the opinion of the Planning Board, sufficient width, suitable grades and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting and the installation of municipal services to serve such land and buildings thereon or to be built."

The data reviewed above shows that the way has been in existence since 1869. 10' of the way is owned by WMECO. It has been used as a railroad right of way for most of its existence, but was cleared of all rails and became primarily a truck access to the mills. 12' of the way is owned by either IPC or Esleeck and its shared by them with Indeck under the terms of a license confirming the deed 12' right of way granted to all properties along the canal and to Keith Paper Company in 1873. There is no evidence found that that access easement was ever given up by Keith, Hammermill, or IPC during their ownership of the property.

The second criteria is to determine if the way has "sufficient width, suitable grades and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting…" When Indeck got its license to use the way for delivery of coal to its powerplant, the road was improved and strengthened with steel plates and new pavement. The hydro powerplant has been in existence on the same way since 1918 and will require no new municipal services. The way has all the access needed for fire protection and to reach the front of the generator room on Canal Road. There is also another 12' wide way that permits access to the basement level where the water turbine is located. This access way runs under the Esleeck plant and under IPC's Building 10 into a courtyard of the IPC plant and hence by easement through the lower corridor of Building No.2 to reach the turbine below the powerhouse.

We recommend that the Planning Board approve the ANR plan to subdivide the powerhouse.



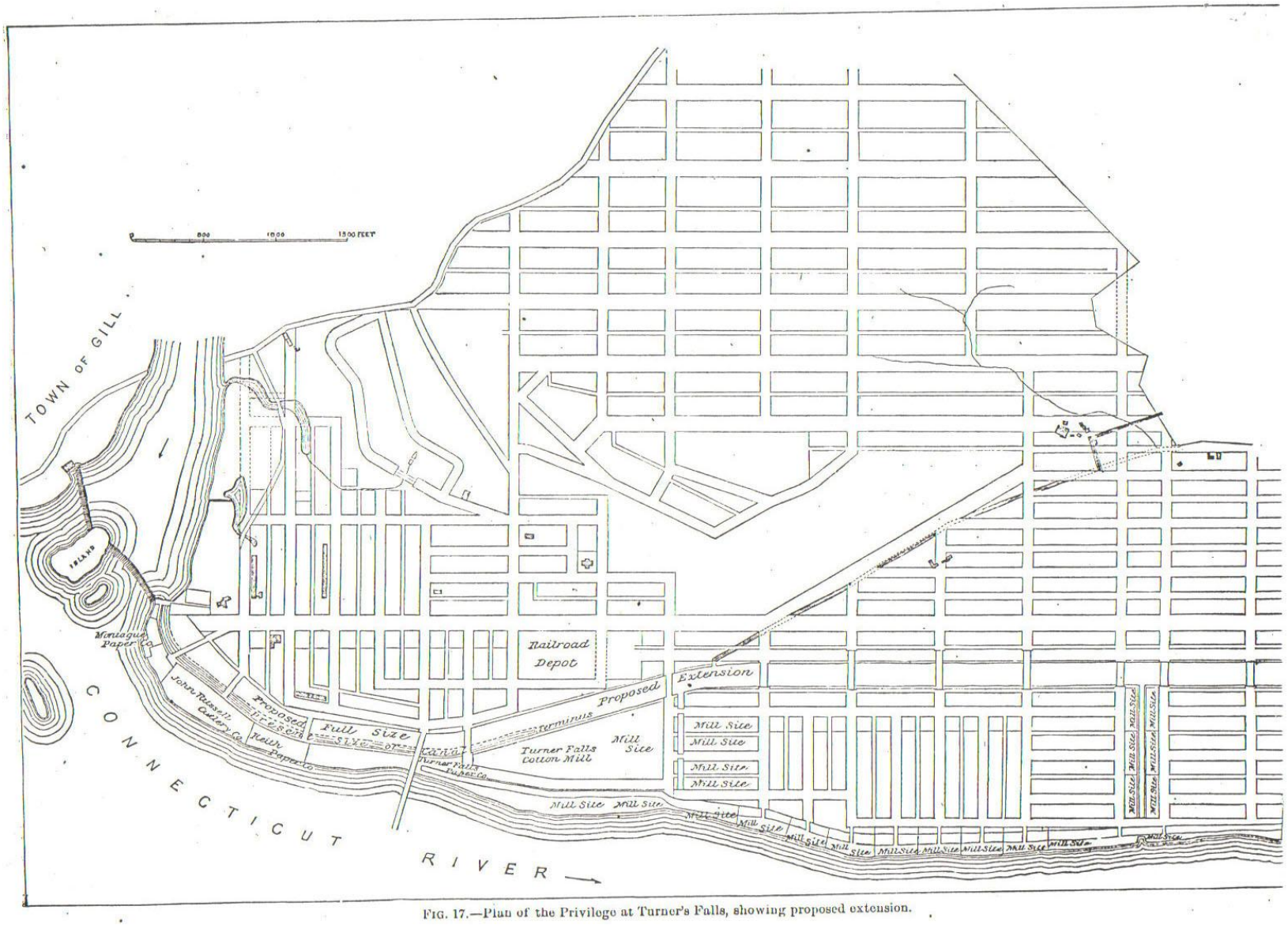
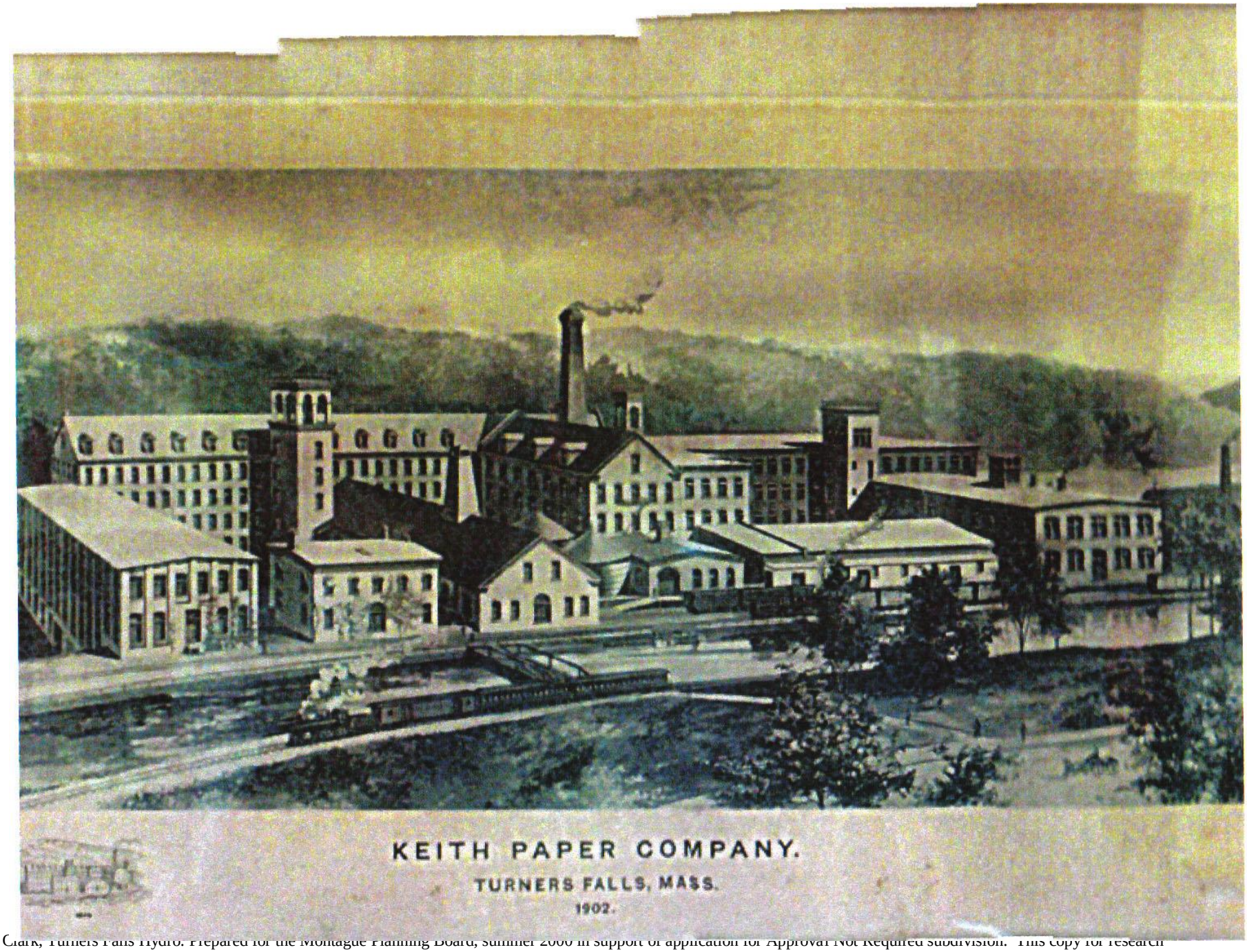
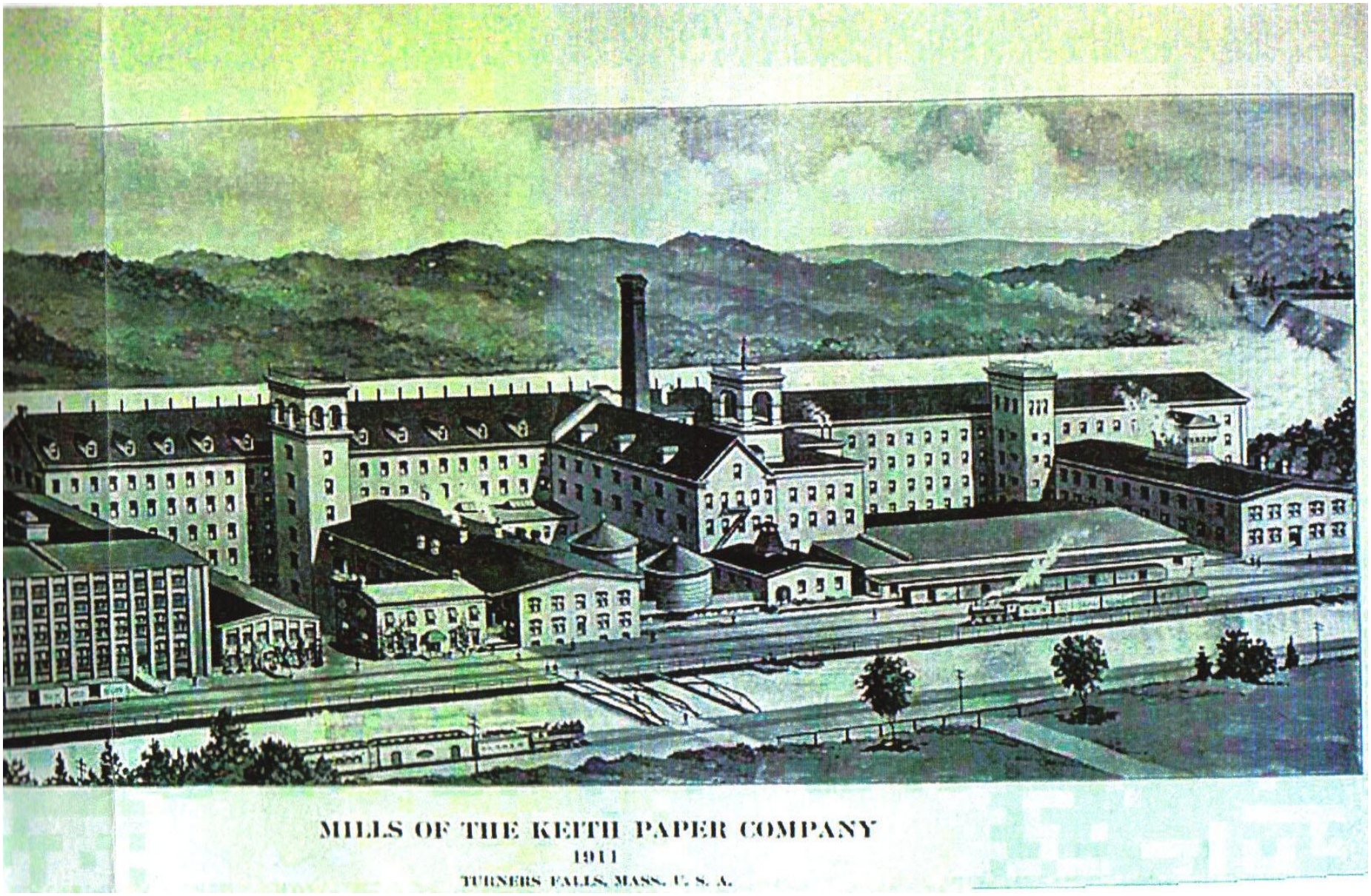


FIG. 17.—Plan of the Privilege at Turner's Falls, showing proposed extension.





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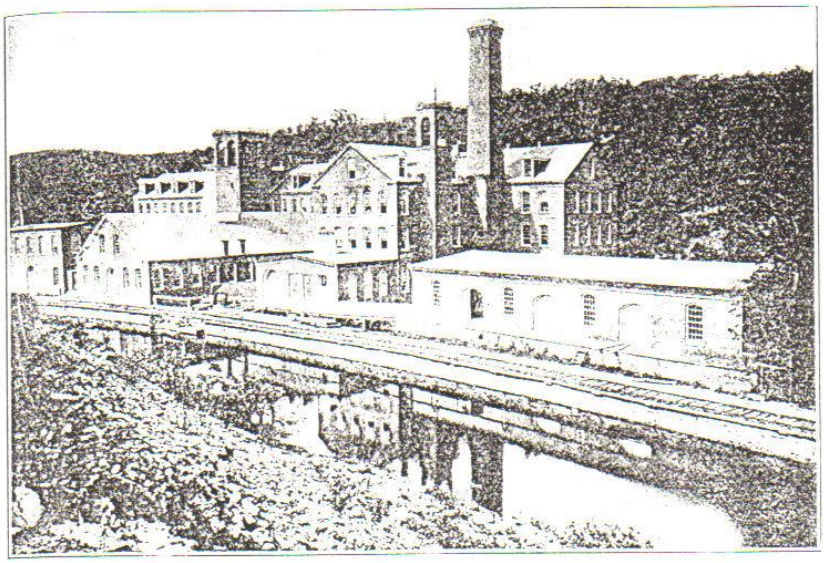
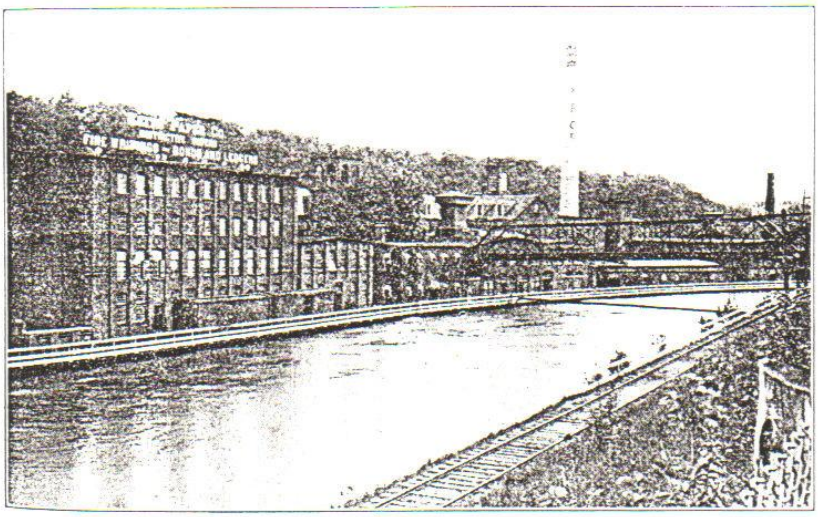
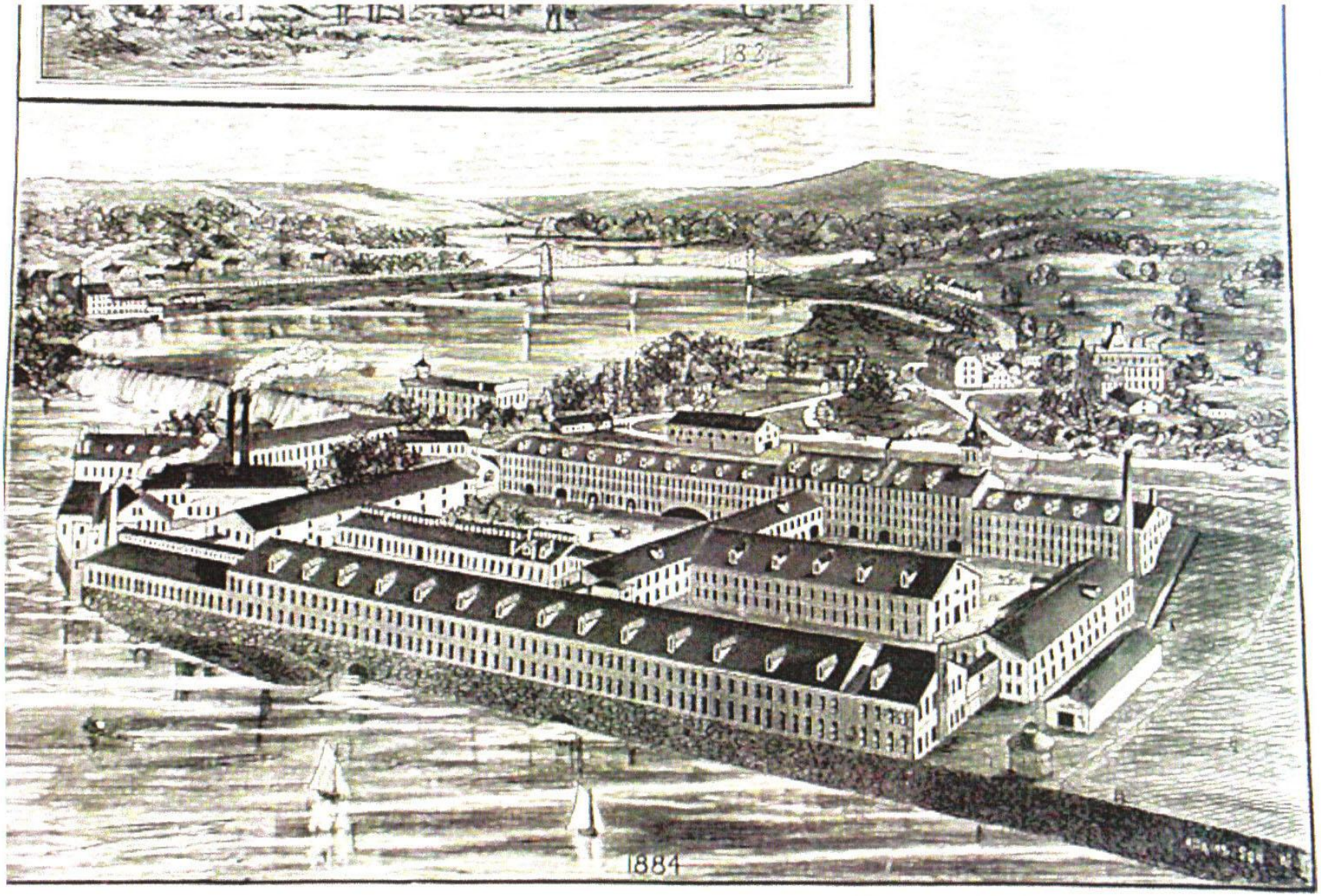


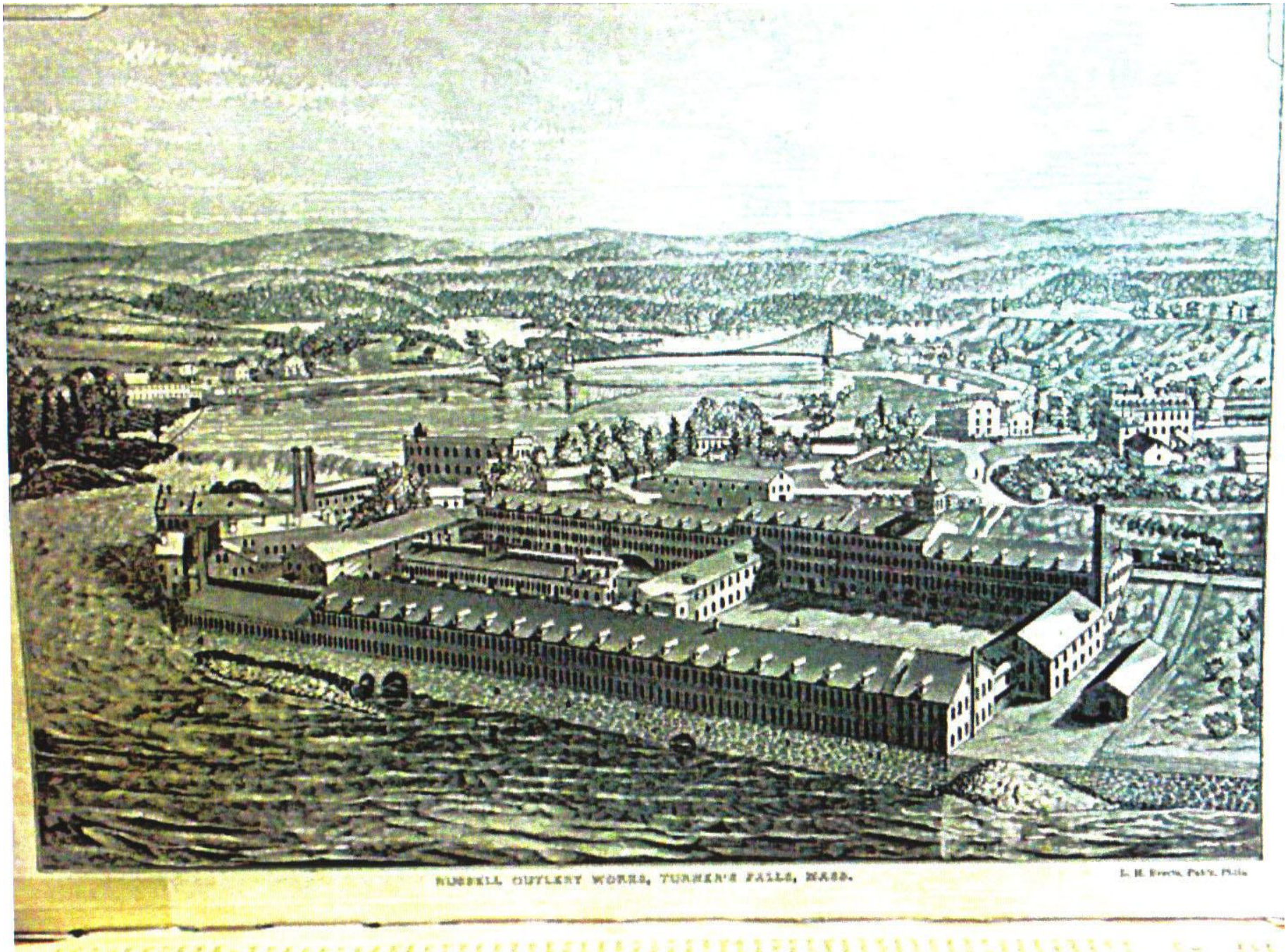
ORIGINAL PLANT, KEITH PAPER COMPANY, TURNERS FALLS

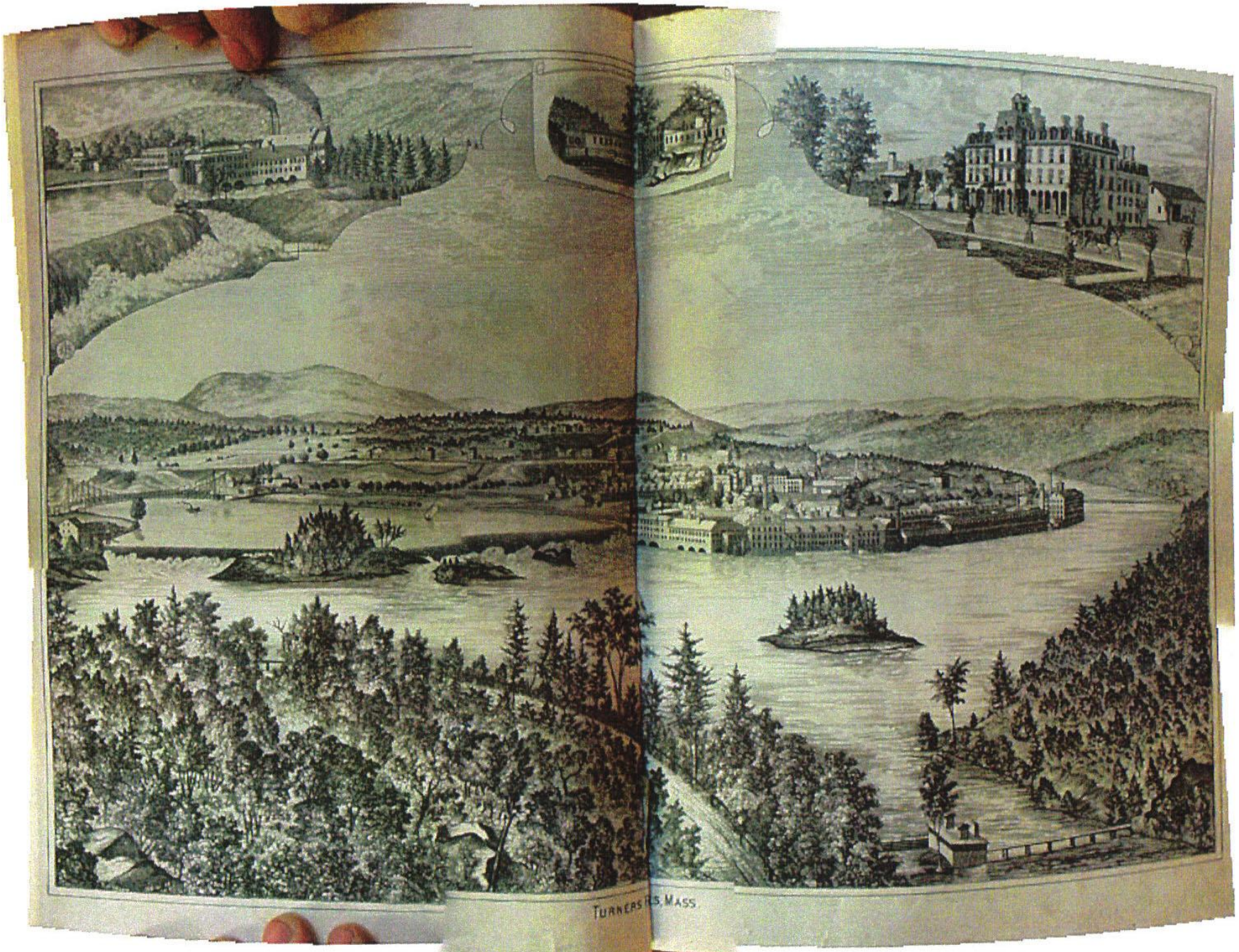


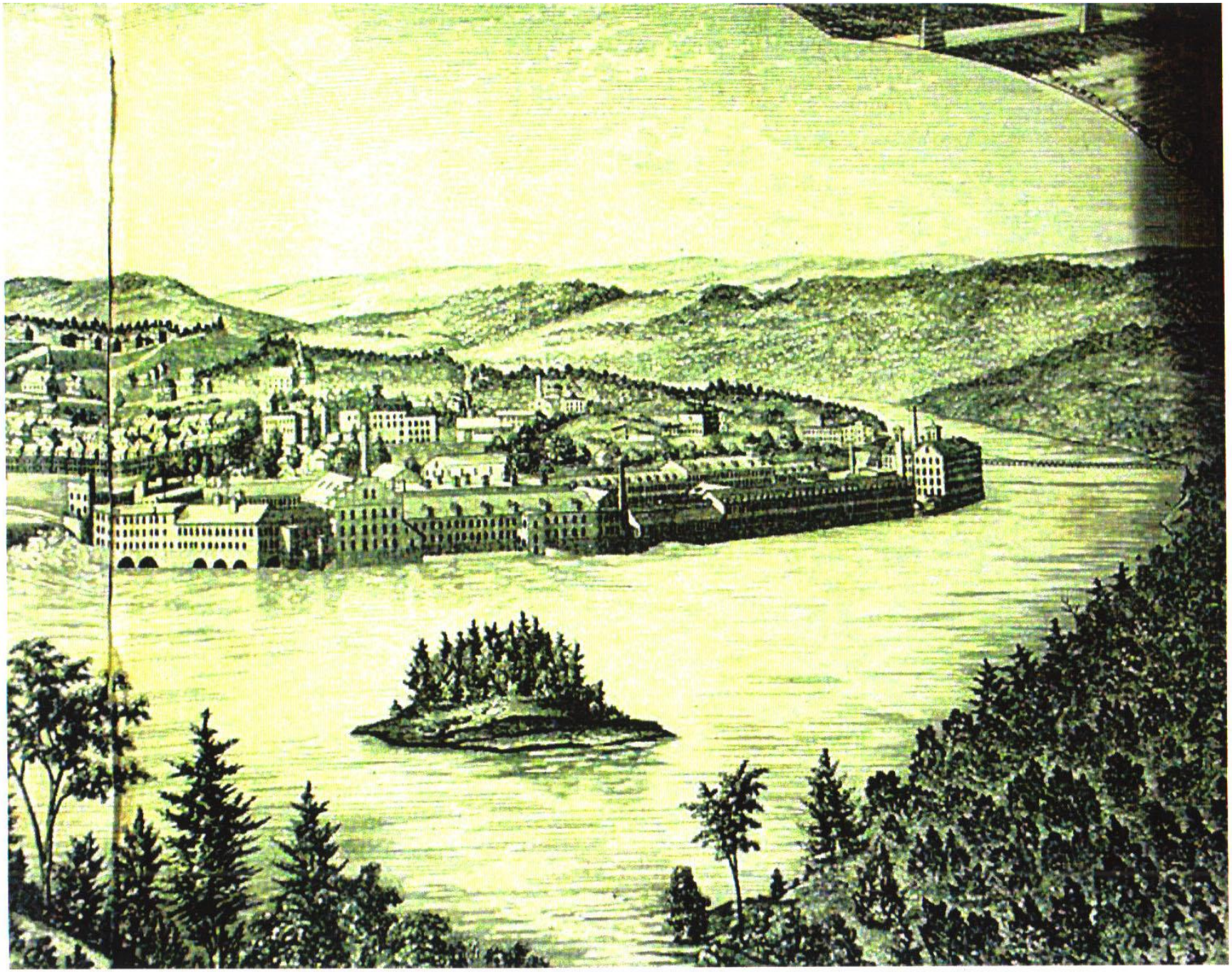
KEITH PAPER COMPANY, TURNERS FALLS, 1928



OF THE JOHN RUSSELL CUTLERY COMPANY SHOWING OLD WORKS OF 1834—AND NEW WORKS OF 1884—FIFTY YEARS' PROGR







By Peter Clark, Turners Falls Hydro. Prepared for the Montague Planning Board, summer 2000 in support of application for Approval Not Required subdivision. This copy for research purposes only. For permission to use, distribute or reprint, contact Montague Planning Department, (413) 863-3208.