UNIT SIX: The Science and Politics of Water

INTRODUCTION FOR THE TEACHER

Key Topics
Epidemics, environment, society & technology, reversal of river

Objectives
Students will
a. read government documents, newspapers, letters, and speeches related to Chicago waterways, 1848-1900
b. place scientific and technological questions in societal and political context
c. analyze primary sources related to political, scientific and health issues
d. form an argument based on progress/development and costs/benefits

Summary
As Chicago urbanized and became a metropolis this expansion of people and industry had an adverse impact on the condition of the lake and rivers. The rights of individuals and the public came into conflict and Chicago’s commercial success threatened its own health and safety as well as people in towns downriver. The unit opens in the early years of the city of Chicago and closes with the construction of the Sanitary and Ship Canal.

State Goals and Standards Met in Unit 6
State Goal 1: A, C
State Goal 5: A, B
State Goal 15: A
State Goal 16: A, B, C, D, E
State Goal 17: A, C, D
PORTAGES

1. Survey your classroom: how many students? desks? teachers? books? Now, double the amount of students only. What problems might result and how you would manage them? Then imagine you double the number of students again, and again? Assume the number of supplies and size of the room increases slightly but does not match the increased population. How many total students would you have in the classroom? What kinds of problems would result and what kind of solutions would you suggest?

2. What are all the ways human beings use water today? Consider both domestic, commercial, and industrial uses. What are the special considerations for water use in the urban environment as opposed to a less developed environment?
LESSON 1
Public Responsibility in a Growing City

In 1673, after Marquette and Jolliet used the Chicago Portage shown to them by the Kaskaskias, Jolliet envisioned the building of a canal that would link the Great Lake systems to the Mississippi River. One hundred and sixty years later, such a canal was built and a city was born. Would Marquette or Jolliet consider such changes “progress?” Who might think differently? When looking at the past, we are confronted with the questions:

- Does progress always happen in one direction?
- Are the changes wrought by growth always good?
- What are the circumstances from which changes arise?
- What is the new situation created?

When Chicago became an inland seaport, the population and physical area of the city expanded by leaps and bounds. A look at Chicago population figures reveals how a booming Inland Seaport helped develop the city over one lifetime.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
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<tbody>
<tr>
<td>1832</td>
<td>- 200 people</td>
</tr>
<tr>
<td>1840</td>
<td>- 4,470</td>
</tr>
<tr>
<td>1857</td>
<td>- 93,000</td>
</tr>
<tr>
<td>1880</td>
<td>- 503,185</td>
</tr>
<tr>
<td>1890</td>
<td>- 1,099,850</td>
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What problems or challenges lurked behind this incredible growth? Many social, economic, and political changes would occur in a city that more than doubled every decade as new and different people with different interests and needs settled. Regardless of class, race or ethnicity, one factor that affected all was the infrastructure—and in particular, the quality of the water that people bathed in, cooked with, and drank. Public health problems reached several crisis points over the 19th century as hundreds of thousands of people settled in Chicago. Such questions arose as: How could the city insure there was enough clean drinking water for everybody? Where and how would wastes be disposed? These were not easy questions for a number of reasons. First and foremost, scientists and doctors did not yet understand what caused diseases. Another fundamental issue was: Was it the responsibility for a municipality to provide safe water? And, if so, what were the rights and responsibilities of citizens (including business owners) in keeping the water clean? As scientists, doctors, and engineers around the world worked to find the cause of and cure for epidemics, political and economic interests translated the research into laws and programs.

The sources in this unit document some of the scientific, social, political, and economic questions with which the community struggled over the course of the 19th century.
Horses and the Water Supply


DOCUMENT 15—ORDINANCE TO PREVENT FILTH FROM ENTERING THE WATER SUPPLY

June 9, 1848

TRANSCRIPTION

An Ordinance, to prevent filth from entering into the Hydraulic Works of the Chicago Hydraulic Company from Lake Michigan.

Be it ordained by the Common Council of the City of Chicago that no person or persons shall thereafter drive any horse, or horses, or other animal into Lake Michigan at the East end of Lake Street, in said city (or between the Hydraulic Works of said Company, and the South Pier, for the purpose of washing or cleaning said horse or horses or other animal.) Nor shall any person or persons wash or clean any carriage or vehicle whatsoever, within said limits, or cause the same to be done.

Any person, who shall violate any provision of the foregoing ordinance shall forfeit to the City of Chicago the penalty of Ten dollars, to be collected before any Justice of the Peace, or Court having Jurisdiction there of:

Passed June 9th 1848

James H. Woodworth
Mayor

S. Abell
City Clerk
QUESTIONS

1. What is this ordinance about?

2. Why would the City Council care about the washing of horses?

3. What other kinds of wastes might contaminate the city’s water supply?
ACTIVITIES

1. Make a list of what comprises the infrastructure of a city. Discuss what fundamental concerns have changed or stayed the same from the 19th to the 21st century.

2. Scientific knowledge and inventions change society (such as the invention of the telephone or a cure for polio or aids). In small groups, think of five scientific achievements — then describe how they changed society. Display on a poster board with a drawing or photograph you find to illustrate each. Share with the class and discuss the connection between science and society.

3. Hold a debate about private property and public rights and responsibilities.
In 19th century Chicago, cholera and typhoid epidemics killed thousands of people. The Chicago River, Lake Michigan, and the I&M Canal all factored in the scientific, political, and economic struggle to improve the public health of the city. Major infrastructure projects improved the water quality for a brief period but the wastes from a booming population and industries quickly overwhelmed each attempt. If wastes filled the Chicago River and Lake Michigan, the city’s residents fell ill; but if wastes were pumped via the I&M Canal, downriver communities suffered. When a flood occurred in 1885, sewage flowed into Lake Michigan which caused thousands of people to contract cholera, typhoid and other bacteria-induced diseases. This crisis was the straw that broke the camel's back. The political and economic will of the region turned to building a Sanitary and Ship Canal.

The S&S Canal, which reversed the eastward flow of the South Branch of the Chicago River so that it would drain into the Mississippi River rather than Lake Michigan, is considered by the American Society of Civil Engineers to be one of the greatest feats of engineering. What was called the “Eighth Wonder of the World” by some, however, was seen as something entirely different by others. St. Louis brought a suit against the Sanitary District, lest the sewage of Chicago pollute that city. Chicago insisted all potential bacterial hazards would become diluted in the strong current. Towns and cities along the Illinois River to St. Louis found little comfort. The ensuing conflict took place in the courts, public opinion, and the science lab.
These figures are from the “Deaths, Disasters, and Disturbances in Chicago” at the Chicago Public Library website. What primary sources did the Municipal Reference Librarians use to create this report? How reliable is it?

### Epidemics in 19th Century Chicago

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DEATHS</th>
<th>RATE PER 100,000 PERSONS</th>
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<tbody>
<tr>
<td>1849</td>
<td>678</td>
<td>2,897</td>
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<tr>
<td>1850</td>
<td>420</td>
<td>1,402 (416 deaths from July 18 to August 21)</td>
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<tr>
<td>1851</td>
<td>216</td>
<td>635</td>
</tr>
<tr>
<td>1852</td>
<td>630</td>
<td>1,626</td>
</tr>
<tr>
<td>1853</td>
<td>1</td>
<td>—</td>
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<tr>
<td>1854</td>
<td>1,424</td>
<td>2,162</td>
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<tr>
<td>1855</td>
<td>147</td>
<td>184</td>
</tr>
<tr>
<td>1856-1865</td>
<td></td>
<td>not significant</td>
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<tr>
<td>1866</td>
<td>990</td>
<td>494</td>
</tr>
<tr>
<td>1867</td>
<td>10</td>
<td>—</td>
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From “Early Epidemics in Chicago,” Chicago Public Library website [www.chicagopubliclibrary.org/004chicago/disasters/early_cholera.html](http://www.chicagopubliclibrary.org/004chicago/disasters/early_cholera.html)

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<thead>
<tr>
<th>YEAR</th>
<th>DEATHS</th>
<th>RATE PER 100,000 PERSONS</th>
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<td>1872</td>
<td>524</td>
<td>142.6</td>
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<td>1881</td>
<td>568</td>
<td>105.2</td>
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<tr>
<td>1882</td>
<td>462</td>
<td>82.4</td>
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<tr>
<td>1890</td>
<td>1,000</td>
<td>91.6</td>
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<tr>
<td>1891</td>
<td>1,997</td>
<td>173.8</td>
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<tr>
<td>1892</td>
<td>1,489</td>
<td>124.1</td>
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A Victim of Cholera


DOCUMENT 17 – PHYSICIAN’S CHOLERA REPORT

June 3, 1849

TRANSCRIPTION

PHYSICIANS’ REPORT.

No. 2 of Deaths

Date 3d June Name, Edward Walin Age, 40 Sex, male
Nation, Irish
Location, Wolcott street North Division
Occupation, Laborer, at House moving
Habits, Rather intemperate

Diarrhoea, Present. & Profuse
How long standing, Twelve hours
Vomiting, character of, Present. Fluid
Cramps, where, Present. Abdomen & Extremities
Purging, character of, Rice Water & Profuse
Intellectual State, Dull. with tendency to Coma
State of skin and extremities, Cold & Clammy, Profuse perspiration
State of other secretions, No secretion from Kidneys or salivary glands

Pulse weak & entirely absent at times

Treatment, Sulphur & Charcoal 3 grs. Calomel 10 grs. Quinine 5 grs.
optium 1 gr. Mix. Repeated every 3 hours
Mustard to extremities and abdomen
All the external heat possible applied
to extremities.

Result, Death. 12 hours after the premonitory sympt
and six hours after the first med was given

Remarks

This patient had been laboring hard in the open
air till 12 o'clock at night previous to the
attack at 2 in the morning. Was probably
intemperate. Lived in a garret into which
5 or 6 others were crowded. Died in the opinion
of the undersigned on act of neglect in Calling med aid.

W. B. Herrick M.D.
ACTIVITY

1. Summarize and separate the facts from opinion in the doctor’s report. Make a list of each.

<table>
<thead>
<tr>
<th>Doctor’s Comment</th>
<th>Fact</th>
<th>Opinion</th>
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2. If you were an investigative reporter, what questions would you ask the doctor? What other questions might you still want to investigate?

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________________________________________________________________________
The past year has been one of unexampled health in our young and vigorous metropolis. Whilst this continues, however, we should not forget the past scourges of the cholera. We should recollect, also, that the completion of the Illinois Central Railroad brings us in close proximity with the malarious districts of the South. It is important, therefore, that we employ all means in our power to promote the permanent health of the city. Among the most important is a thorough system of sewerage. Former Councils have given this subject some attention, but comparatively little has yet been done. It is hoped that you will give it due consideration.....A sufficient supply of pure and wholesome water is indispensable to the health of our city. Although a much larger sum has been expended for that purpose than was at first anticipated, and the time long since past when we had a right to expect the completion of that work so far as to furnish the most densely populated portions of the city with a sufficient supply of water; yet it is evident that more means will be required to render the works available to the extent required. With this view, the Legislature have authorized you to make a loan for that purpose, and there is no doubt that a matter of so much importance will receive from you due consideration, and that there will be nothing on your part to retard the completion of this important work.
To the Editor of The Tribune

Morris, Ill. Feb. 6 (1879)—The subject of the enlargement of the Illinois & Michigan Canal has been agitating the citizens from Chicago to Peoria; but there is a deeper interest taken in the matter by the people than appears upon the surface. It is a fact that ever since the water from the Chicago River was let down into the Illinois River, the stench has been almost unendurable. People have been unwilling to say much publicly about it for many reasons, but mainly because they thought it would have a tendency to inure their property and interfere with their business, and also because they believed that after the water had been running for a year, Chicago River would be so washed out that the accumulated filth would be washed away, and then the water from the lake would be clear; another reason is, that the people have been at a loss to know what good it would do to complain; but the nuisance has become so intolerable that forbearance has ceased to be a virtue. The stench is greater now that it was the first year after the water was let down, so that instead of being better, it is worse.

Before the Chicago River emptied into the Illinois River, the Illinois River was full of choice fish; immediately thereafter, the fish died to such an extent that at the xxx at Marseilles they were obliged to keep wagons and men with pitchforks to remove the thousands of dead fish which accumulated at the bars of the sluiceways in such quantities as to prevent the water coming through. The fish all along the river have been so poisoned that they have made many sick who have eaten them. But, the greatest trouble is the stench which consistently arises from the river. It can only be compared in strength with the rendering establishments near Chicago…

...Something must be done. The people on the line of the canal and river will not much longer stand this nuisance, and although they would be glad to see Chicago have a means of egress for its sewerage, they are not willing that their own homes should be destroyed, their property sacrificed, their health undermined, and perhaps their lives lost, for the purpose even of assisting Chicago in so laudable an undertaking….

E.M.
QUESTIONS

1. To what does the new mayor attribute the cause of deaths and what is his solution?

2. How many people died from cholera or other water-borne disease in 1854?

3. Does the city of Chicago have an obligation to residents of down-river towns, such as E.M. from Morris? Explain your point of view.

4. Make a list of the types of primary sources used as evidence throughout this lesson. Discuss the credibility of each.
**ACTIVITY**

Make PRIMARY SOURCE POETRY with one of primary sources presented in this unit. This is a small group activity.

**Here’s what to do:**

**Materials Needed:**
Markers, large sheets of paper (such as flip-chart or butcher paper), long strips of paper—at least 3 per student, glue

1. Select a primary source from this unit.

2. Each student in the group should circle four phrases within the text that they find particularly interesting or relevant or ... even poetic.

3. Write these phrases on long strips of paper.

4. Group members share their phrases with one another.

5. Make a poem with those phrases—not all need be used. At least one phrase by each individual should be included. If, for poetic reasons, the group wants to repeat phrases, do so. It is best if students may spread out their phrases on the floor or a large table. Once the phrases are arranged to form a poem, the strips of paper should be glued to a large sheet of paper (such as flip chart).

6. The group makes a title for their poem and signs their names. Post the poem on the wall. A poet should be chosen from each group to read the poem aloud.
LESSON 3
Testing the Waters

The science of bacteriology helped lead the way in determining what caused cholera, typhoid and other bacterial diseases. As planning for the Sanitary and Ship Canal continued full steam, the Illinois Board of Health conducted scientific experiments to demonstrate “the possibility of complete reduction of organic wastes to harmless inorganic forms.” The State Board of Health asked Professor John Long and doctors F. Robert Zeit and Gustav Futerrer of Northwestern University to research the potential contamination of down river localities which might be caused by the reversal of the river. They conducted experiments involving guinea pigs injected with samples of water from various points along the drainage canal in which pathogens were found. A summary of their report indicated that by the time the Illinois River reached Peoria, evidence of Chicago sewage had virtually disappeared, apparently due to the heavy influx of “pure” water from Lake Michigan. At LaSalle, Henry, Peoria, and Pekin, however, there was a great introduction of organic matter.
The Science and Politics of Water

A Scientific Report on River Sewage (1 of 2)

The Science and Politics of Water

A Scientific Report on River Sewage (2 of 2)

QUESTIONS

1. What was Zeit’s goal in administering injections to guinea pigs? What does he believe his results indicate about the water samples?

2. Why might there be more sewage at lower Peoria?

3. How do the report’s findings fit with the reputed fish killed at Marseilles?

4. Do you think the scientists’ findings are valid? Why or why not? Ask the school’s science teacher to examine the report—what might he/she have to say about the method used and the results derived?
ACTIVITY

Using a map of the state of Illinois and the waterways, label (or trace) the Illinois River and its tributaries and label the cities indicated in the report. Visually differentiate between cities where significant amounts of pathogens were found as opposed to those where negligible amounts were found.
In 1892, the city of Chicago established an up-to-date laboratory to begin monitoring potentially impure products.

“….The examination and supervision of the milk used by the City is of great importance, but it is very much more important that the water we drink should be pure. Sanitation in all its many branches in our day depends so much upon bacteriological examinations of various kinds, that the Department cannot successfully cope with the important problems placed before it without the aid of a fully equipped laboratory. Bacteriological examination is the only true and reliable guide to the degree of efficacy of the public and private disinfection that comes under our charge.

“Any statements or advice concerning the quality of water, ice, or food products not based upon the results of bacteriological in addition to chemical examination is practically worthless. It is the only means of positively diagnosing Cholera, or of deciding between true and false Diptheria, while it plays a leading part in diagnosing all contagious diseases…."

**VOCABULARY**

- **Efficacy**
  - effectiveness

- **Disinfection**
  - removal of potential sources of bacterial disease

- **Diagnose**
  - evaluate a problem
QUESTIONS

1. How has the role of the city changed in ensuring public health between 1848 and 1892?

2. How might citizens have reacted to the changing role?

3. What is the role of industry in the public health of a community? How has it changed between the 19th and 20th centuries? Give your reasons.
LESSON 4
Solving the Problem

Just as the Chicago Portage Route helped define the region’s transportation potential, so too the problem of polluted water had regional impact. While reversing the flow of the Chicago River, “flushing” the sewage to the west seemed a solution to Chicago’s problem, it raised serious public health concerns for towns and cities to the west, St. Louis for one. On the morning of January 2, 1900, the Board of Trustees of the Metropolitan Sanitary Districts—without official authorization from Illinois Governor Tanner, and in an effort to circumvent an injunction from the city of St. Louis, shoveled and blasted open the last remaining obstacle that would permanently reverse the flow of the Chicago River. The Chicago Daily News provided the story.

Consider:

• How do you think citizens of Chicago reacted to this article? What about citizens in downstate Illinois? In St. Louis? Write a letter to the Chicago Daily News in the voice of each constituency.

• Create a diagram or construct a timeline of the political, economic, and scientific factors involved in solving the region’s water problem.
The Science and Politics of Water

Chicago Daily News January 2, 1900:

GREAT CANAL IS OPENED
WATERS OF LAKE MICHIGAN AT LAST PERMITTED TO FLOW FREELY INTO THE DRAINAGE CHANNEL.

TRUSTEES PLY THEIR SHOVELS
PRESIDENT BOLDENWECK AND OTHERS CAST FORMALITY ASIDE AND LABOR
— NO PERMIT FROM TANNER — ST. LOUIS FORESTALLED.

Lake Michigan’s waters are flowing into the drainage canal. Removal of the last barriers separating the Chicago river from the great sanitary and ship canal was begun at 9 o’clock to-day and the event to which all Chicago and the engineering world has been looking forward as one of the greatest engineering achievements in history was accomplished. By noon a stream of several hundred gallons a minute was rippling down the long wooden flume from the collateral canal at Kedzie avenue into a broad canal itself and the rapid work of blasts and dredges was gradually widening the breach and increasing the volume of water surging through the narrow gorge.

It was the shovels of President William Boldenweck and Trustee B.A. Eckhart that started the flow itself through the opening at about 10:35 O’clock. A blast shot off in the frozen clay at 10:21 had failed to make any perceptible impression and a tiny stream trickling over the rough clods was the only sign that the official opening of the canal had been completed. Trustees Boldenweck and Eckhart leaped with their shovels upon the precarious earthen boom, by severe muscular exertion toppled over several huge frozen blocks loosened by the blast, and in a moment the thin sheet of water magnified to the proportions of a small cataract.

Threw Formality to the Winds
The words, “Let ‘er go,” pronounced by President Boldenweck, was the nearest approach to formality of the entire occasion. Besides the nine sanitary district trustees and the district officials there were hardly more than a dozen persons present. Each trustee was provided with a brand-new shovel, to be preserved as a memento, but instead of being used in a perfunctory was the shovels were used for actual excavation necessitated by the absence of an adequate force of laborers, and the trustees, with perspiration streaming down their brows, were the pictures of energetic activity.

Head Off St. Louis Injunction
Not only was there an entire absence of form, but there was an absence of written authority for the opening. The most eloquent please of the trustees could not convince Gov. Tanner and his special inspection commission that a permit for the opening of the canal could rightfully be issued in the immediate future, and the utmost that could be secured was a promise on the part of the state officials to turn their backs and not to look while the canal was being opened. The act of the trustees turning the water without the formal consent of the state was to forestall the attempts on the part of St. Louis to obtain an injunction to prevent the opening of the canal.

Arrange Opening Quietly
After a conference with the special inspection commission at Joliet last evening the trustees arranged to open the canal to-day. They kept it as quiet as they could and mutually agreed to go direct to the place after breakfast. Trustee Joseph Braden was the first to appear on the ground. He arrived shortly after 8 o’clock. Trustee Zina R. Carter came next in his boggy, and the remainder straggled along until they were all there at 9 o’clock.

During the night the dredge had cleared away clay until a wee bit of water had flowed over the bank into the wooden flume. That froze soon, however, and there was hardly six inches of water between the earth and the wooden sluices in the flume at 9 o’clock.
Timbers Are Pulled Away
Chief Engineer Isham Randolph, President Boldenweck, Marshal Coen and a couple of laborers started on the wooden sluice at 9 o’clock. The timbers were pulled away one by one and the water crept down the length of the narrow flume, which is about twenty feet wide and 200 feet long. A little that occasionally worked through the ice above served to keep up the flow and the canal was officially opened.

To make a greater semblance of a flow a blast was inserted in the earth, and, after a scramble for shelter, President Boldenweck ignited it at 10:21 a.m. A thousand clods were propelled several hundred feet in the air as the charge roared, and as all rushed for the bank it was expected that the earth boom had been demolished. It was not, however, but the earth was loosened and it was the work of manual labor only – labor performed by the trustees – to start the water moving over the edge.

Danger of Ice Blockade
Ice threatened to choke up the opening as fast as the laboring trustees could keep it clear. The blocks, several inches thick, crowded down into the gulch. Picks were brought to break them up and they were shoved through. The danger of an ice blockade is not over, according to Chief Engineer Randolph, and the greatest vigilance and activity will have to be maintained if the flume is to be kept clear for the inrush.

The brownish tint of the Chicago river water made a marked contrast to the clear blue of the ice in the canal itself. Gradually the brown surface spread from the mouth of the flume over the acres of ice, and soon the opposite bank was reached. Down the canal it crept, inch by inch, the line of demarcation being clearly preserved for the long-distance vision, until it reached the Illinois-Central bridge. There it stopped, as a small barrier necessitated the intermediate basin being filled before the flow would pass over.

May Reach 30,000 Flow
It may take ten days, two weeks, or possibly longer to fill the canal, according to Chief Engineer Randolph. It will depend upon the ice effects, the variable capacity of the flume, and other conditions. All that dredges, blasts, and picks can do to keep it moving at the rate of several thousand cubic feet a minute will be done. If all obstacles can be removed within a day or two it may be possible, he estimates, to send in a flow of about 30,000 cubic feet per minute. That will make a perceptible current in the river.

The trustees do not deny that they have overstepped their authority in turning in the water, but they say the injunction prospects justified their haste. They do not fear the great consequences – that is, the majority foes not, although Trustee Jones thinks the step is a great mistake – as they anticipate no opposition from the state canal commission or Gov. Tanner, in view of the understanding arrived at.

At the time the water was turned in the Lockport sluice gates were open. That makes the canal now actually open, according to the trustees. They propose to keep the sluice open and when the canal is filled up to its sills the water will pass out into the Des Plaines river, according to their intentions.

Divided as to Wisdom
“It’s all right,” commented Trustee Carter, in justification of the step. “The governor and the special commission understand the situation, and while they cannot consent to having the canal opened and as the courts cannot enjoin the commission from an act already done, I think we will have little to fear from the injunctions.”

“It’s a great mistake,” said Trustee Jones. “I opposed the step strenuously, as I think it would be far better to wait a few days, or weeks longer until the canal is finished and until legal permission is granted before letting in the water. The valley interests may make accusations of broken faith.”

“We ought to have turned the in water several days ago,” said President Boldenweck, “permit or no permit.”

“The water is in now and there is no disguising that we did it entirely without authority,” said Trustee Braden. “I think the circumstances justified the means, however, and don’t expect opposition from the state.”

Engineer’s Hopes Realized
Chief Engineer Randolph had a faraway look in his eye as he stood musing over the sluice, with its torrent below. His voice trembled as he said: “This is what I’ve been waiting for all these years.”

When the water is high enough the main opening to the canal at Western avenue will be dredged out and the full flow of 360,000 feet a minute will be established. The canal is not yet finished at the Chicago end, however, and as the Joliet end is far from completion it is predicted that it will be Feb. 1 or perhaps later before Chicago is obtaining the entire benefit of the full flow and before the great undertaking can be regarded as even informally complete. After the full flow is established, much on bridge, occasional widening and deepening will remain to be done and it will be eighteen months or two years before the channel will take its final form.
Flow is Rapidly Increasing
Soon the dredge had enlarged the throat and the wash of the current tore the opening larger. By 2 o’clock an opening fifteen feet wide and ten feet deep existed and 20,000 or 25,000 cubic feet were passing through. By night, it is expected, the earth bank will be largely eaten away by the combined action of the water and the dredge as high as 50,000 or 60,000 may be flowing.

CANAL A TRIUMPH OF ENGINEERING
It Causes the Waters of the Chicago River to Flow Upstream
Probably no public work has ever been undertaken by any other state or municipality which, from its very inception, was designed to do so much for navigation and other commercial interests of the country as the Chicago drainage canal. The requirement of law which compelled the construction of rock sections to meet the demands of the next generation was wise, for it has laid the foundation of a mammoth ship canal, connecting the great lakes with the Mississippi river and the Gulf of Mexico.

The canal, if confined by law to the single requirement of disposing of Chicago’s sewage, could have been constructed for from $12,000,000 to $14,000,000, so the sanitary district can justly claim to have expanded at least $20,000,000 in the direction of the great navigable waterway.

The proceedings of congress will show that, in the last hundred years, of petitions and demands for congressional appropriations for harbors and canals and public improvements, no petitioning city or community has contributed for purely commercial purposes 5 per cent of the amount which this sanitary district has contributed toward the commercial waterway to connect the great lakes with the Gulf of Mexico.

A Triumph of Engineering
As an engineering triumph, the great interest in the Chicago canal lies in the fact that it disposes of the sewage of this city in a manner contrary to the laws of nature and contrary to the laws of gravity. The common law of England from the days of the conquest, when customs began to be molded into laws, down to the present time, and indeed, the laws and customs of the Latin races as well, have recognized in the flowing streams of the lands the natural outlet of the sewage of all populous communities. Were the city of Chicago situated upon the Illinois River, or were the entire area of the city even situated in the natural watershed of the Des Plaines river, there would be no significance in the plans forever to turn the sewage of the city down the valley of the Des Plaines and Illinois rivers; but the uniqueness of the canal plan is that it restores topographical conditions existing in prehistoric times – when the overflow waters, if, indeed, not all the waters of the great lakes region, flowed down the Mississippi valley – by making a cut through the glacial drift and rock between Chicago and Lockport of an average flow of about thirty-five feet, in order to once more restore the gravity flow from Lake Michigan to the Des Plaines and Illinois valleys.

It is not because a canal has been constructed, but because a canal has been constructed which diverts the sewage of the city of Chicago from its inherent right of communities to dispose of sewage by the natural gravity flow of the country.

Course of the Canal
When the Chicago river has been deepened and widened in order to increase its flow and capacity, the canal itself, properly speaking, begins at the south branch of the Chicago river at Robey street and continues southward as an entirely artificial channel until it reaches the controlling works at Lockport, a distance of twenty-eight miles, of entirely artificial construction.

At Lockport the channel widens to about 500 feet into a windage basin in which the large lake vessels can be easily tuned and maneuvered. The fall from the mouth of the Chicago river to the Lockport works, and, it is to be remembered that henceforth the Chicago river will flow upstream, as commonly understood, is only seven feet, so that the flow of water in rapidity and volume through the Chicago river to the canal is entirely controlled by the beartrap dam and controlling works situated at the Lockport terminus, the fall south of the controlling works being abrupt and about forty feet in the next four miles. It is by means of these controlling works that the water was turned down the valley by simply opening the great gates or valves and it is also by means of the controlling works that the waters down the valley can be as suddenly turned off in case emergencies might demand.
Therefore, the popular belief that the waters of the canal, having once been turned down the valley the flow might be unceasing and beyond human control is erroneous, for the flow of this great volume of 300,000 cubic feet per minute can be stopped almost as easily as the simple turning of a faucet in the spigot of a barrel. The controlling works have involved the construction of seven sluice-gates of metal, with the necessary bulkheads, and one bear-trap dam. The sluice-gates have a vertical flow of twenty feet and an opening of thirty-two feet.

**Dimensions of Bear-Trap Dam**

The bear-trap dam has an opening of 160 feet and an oscillation of seventeen feet vertically. This dam is essentially two great metal leaves, hinged together, and working between masonry bulkheads. The downstream leaf is securely hinged to a very heavy foundation, and the upstream leaf is so placed as to present the barrier to the water. This structure is operated by admitting water through properly constructed conduits, controlled by valves, beneath the leaves just described.

To raise the crest of the dam, water is admitted from the upstream side and the discharge shut off until the desired height is obtained, and then the valves are adjusted so that the volume of water beneath the leaves shall be constant. To lower the crest, the water beneath the leaves is drawn off until the desired height is reached, when the valves are again arranged so as to maintain a constant volume of water.

The first work in this great enterprise was begun on “Shovel day,” Sept. 3, 1892, on the rock cut below Lemont, on the line between Cook and Will Counties; so that a little over seven years have been consumed in the entire work involving an outlay of about $33,000,000. Over 80 per cent of the entire work was done during the so-called panic period, and owing to this fact, the entire cost of construction was reduced about $8,000,000. Indeed, the board of trustees and its engineers are unanimous in the belief that the work could not now be duplicated under existing prices for both labor and material for less than $40,000,000. Up to the present time and for the last fifteen years the entire sewage of the city of Chicago, which empties into the Chicago river, has, as a matter of fact, been flowing down the Des Plaines valley and into the Illinois and Mississippi rivers and this sewage has been in a highly offensive condition, for it has passed down the Illinois & Michigan canal, into which it was dumped by the Bridgeport pumping works from the south fork of the south branch, in a volume of only about 40,000 cubic feet per minute. It is this same flow of actual sewage, therefore, and no more and no less, that is to pass down the Illinois valley, but diluted by a tremendous flow of water from Lake Michigan, increasing the total volume to 300,000 cubic feet per minute, or nearly eight times the past flow, and, by the rapid process of oxidation that takes place in surging and flowing water, this sewage will be rendered innocuous and harmless even before the city of Joliet is reached, if the contention of the most eminent chemists and bacteriologists is correct.

Later on, in six or seven months, when the system of intercepting sewers now in process of construction by the city of Chicago is completed, an approximate of 4,200 cubic feet per minute of sewage which is now flowing into Lake Michigan will be diverted into the Chicago river and canal, so as to increase by the addition of 6,000 feet per minute of sewage the amount now going down the Illinois river. Consequently, it is said, it will be several months after the opening of the canal before any one can complain of receiving a single ounce of Chicago sewage additional to that which has for years been flowing down the valley; and, reduced to a plain statement of facts, according to one of the trustees, the only complaint which the valley towns can now make against the opening of the canal is that it will immediately benefit their present conditions by a water dilution of seven and one-half times the volume of sewage now diverted into the valley.

**Built According to Law**

The canal has been constructed in strict conformity with the requirements of the law under which the sanitary district of Chicago was organized and it is of sufficient size and capacity to produce and maintain at all times a continuous flow of at least 300,000 cubic feet of water per minute, with a current not exceeding one mile per hour. The flow of water is of the minimum depth of twenty-two feet in the earth sections of the canal and the same depth throughout the rock sections, which are constructed of a width of 160 feet at the bottom. All of the rock sections and five of the earth sections have now a capacity for a flow of 600,000 cubic feet of water per minute, so that when the population of the city of Chicago increases to 3,000,000 people, these sections will still be adequate for all demands; consequently the only work then remaining to be done to fulfill the **continued**
requirements of law and the necessities of the increasing population will be the mere work of shoveling and dredging to deepen and widen eight miles of the earth sections to conform to the rock sections. Origin of the Enterprise

The plan of the Chicago canal can hardly be said to have been original with any one man. It has been a growth, a development and many men can justly lay claim to having played a prominent part in this great public work. The Hering commission, under Mayor Harrison the first, made definite recommendations for the disposal of Chicago sewage by this method. Later on, a joint commission was appointed by the general assembly of Illinois to sit between sessions and formulate a bill for discussion by the XXXlst general assembly. This commission in January, 1889, presented to the general assembly at Springfield a bill drawn under its direction and suggestion by John P. Wilson of Chicago, which became the ground work for the present sanitary district act. The valley people offered amendment after amendment; the bill was considered in standing committees, in joint committees, in committees of the whole and in great detail to the two houses of the general assembly of that year and finally enacted into a law full of compromises and concessions.

The sanitary district was organized, under the requirements of law, by an affirmative vote of the people within the district in November, 1890, and it comprises within its area 182 square miles. The popular impression that in its area it is practically co-extensive with the limits of the city of Chicago is entirely erroneous.

The area of the city in the sanitary district, including eleven and three-quarters square miles of Cicero recently annexed, is 440 and 1/4 square miles. The area of the sanitary district in Cicero now and outside the city limits is six and three-quarters square miles. In the town of Lyons thirty-six square miles. All that part of the city south of 87th street is not in the sanitary district. . . .
QUESTIONS

1. How does the Daily News article appear to view the actions taken by the Board of Trustees? In what way does the language support the newspaper's view? (See, for example, the section titled “Built According to Law”.)

2. What is your opinion of the Trustees’ actions? Were they justified in acting “above the law,” or should they have faced some form of punishment?

3. Why do you suppose Governor Tanner and other state officials, while not authorizing the opening of the canal, agreed to “turn their backs and not look?”

4. In the section entitled “A Triumph of Engineering,” the article claims that the canal restores the watershed drainage to prehistoric conditions prior to glaciation. The article also refers to the “inherent right of communities to dispose of sewage by the natural gravity flow of the country.” What other points are made to justify this illegal act? What is your opinion of this argument?
Analyze the editorial cartoon using the worksheet found in the appendix. Then draw a cartoon from the St. Louis point of view.
UNIT EXTENSIONS

• Develop a Timeline
Chicago suffered from a series of cholera epidemics and other public health crises over the course of the 19th century as it struggled to create an effective infrastructure for the booming city. Engineering and science both provided tools to help alleviate the problem of sanitary conditions. Politics—in the form of laws—worked both for and against attempts to clean-up the city and provide sanitary water for all. Create a timeline that traces both the public health crises and the various attempts at improvement. Begin your timeline at the founding of the city of Chicago and end at the opening of the first water treatment facility in the 20th century. Check out the “Learn Chicago” section and the “Down the Drain” on-line exhibition from the Chicago Public Library: http://www.chipublib.org/digital/sewers/sewers.html.

• The Changing Chicago River
At one point in time, the Chicago River was considered so polluted that buildings constructed along the river had little or no windows facing the river side. Now, residential housing along the river is at a premium. Do a history project on the changes in uses and attitudes towards the river.

• Great Lakes Water Quality
Water quality remains a scientific and political issue. Of particular importance today is the Great Lakes which is shared by two countries. Research the history of environmental concerns about the great lakes. Consider doing a comparison between the history water quality efforts between the U.S. and Canada with the Chicago-St.Louis. How have jurisdictional issues changed over the century?

http://www.great-lakes.net/envt/water/quality.html

http://www.epa.gov/owow/tmdl/atlas/index.html (EPA atlas of polluted waters)

Do invasive species exist in our waterways today? Where? How did they get into the water system and how are scientists, environmental groups, and governmental bodies working to rid them?

• Cholera in our Time?
Do cholera epidemics still occur? If so, where are they located and what conditions cause them? What might be needed to prevent them?

• The Struggle for a “Free and Clear” Lakefront
The politics of water—or more specifically, the lakefront—played itself out in the nineteenth and early 20th century. Conduct research into the history of the struggle between the public and private interests for ownership of Chicago’s lakefront.
• **Today’s Waterways**
Do a environment project which requires student action. Consider doing scientific water quality testing or joining environmental clean-up campaigns or investigating a current political issue related to water quality and following up by writing/visiting legislators.

Check out the Environmental Protection Agency’s “Surf Your Watershed” at www.epa.gov/surf/ and then the national and local chapters of the not-for-profit environmental groups.

• **Places to Visit**
There are many places where the legacy of the Chicago Portage, Illinois and Michigan Canal, and Sanitary of Ship Canal can be found. Consider visiting one of these sites. If you do so, find one artifact or primary source and write a description of it. Then explain its significance to Chicago’s history.

**Metropolitan Reclamation District**

**Sanitary and Ship Canal and the Lemont Historical Society**

**Peggy Notebart Nature Museum**

**Boat tour of Chicago River and locks**

**Boat tour of Cal-Sag/Lake Cal harbor area**

**Isle a la Cache**

**Chicago Board of Trade**