HISTORY OF THE

ENFIELD SEWER SYSTEM

By Kurt Gotthardt

2012

The following report is a history of the Enfield sewer system, and the conditions of the Mascoma River and the Mascoma Lake, prior to a sewer system being built within the Town of Enfield. The EPA's order to fix the "problem", the town's response to that order, and the different options the town considered prior to building a sewer system that connected Enfield to the Lebanon Waste Water Treatment Plant.

The information in this report is mostly a direct copy from the cited sources. A few sections I had to re-write due to the way the original report was worded.

The first section is from the "Mascoma River Watershed, Staff Report", the first comprehensive environmental study of the Mascoma River, done in 1952 by the New Hampshire Water Pollution Commission. It then proceeds through the years until the final section describing the 2012 Route 4 sewer line extension form Baltic St. to the Canaan Town Line.

MASCOMA RIVER WATERSHED
STAFF REPORT
NEW HAMPSHIRE WATER POLLUTION COMMISSION
APRIL 1952

Recommended Use Classification

Class A
Acceptable for public water supply after disinfection
Coliform Bacteria – 50 MPN/100 ml.

Class B-1
Acceptable for bathing and recreation, fish habitat and public water supply after treatment
Coliform Bacteria – 240 MPN/100 ml.

Class B-2
Acceptable for recreational boating, fish habitat, industrial and public water supplies after adequate treatment
Coliform Bacteria – 1,000 MPN/100 ml.

Class C
Acceptable for recreational boating, fish habitat, and industrial water supply
Coliform Bacteria – not specified MPN/100 ml.

Class D
Acceptable for transportation of sewage and industrial waste without nuisance
Coliform Bacteria – not specified MPN/100 ml.

(MPN – Most Probable Number)

Significance of Coliform Group

U.S. Public Health Service standard for drinking water.

Not more than 1.05 MPN/100ml. of sample

New Hampshire Class A standard for public water supply before disinfection.

50 MPN/100ml. of sample

Indicative of good water – normal for inland waters free of sewage pollution

1.05 - 240 MPN/100ml. of sample

Normal for inland streams subjected to agricultural drainage and/or wildlife. Considered unsafe for bathing if sanitary survey indicated pollution to be of human origin

240 – 2,400 MPN/100ml. of sample

Sewage polluting not far distant. Considered dangerous for bathing

2,400 – 24,000 MPN/100ml. of sample

Definite evidence of fresh sewage pollution. General menace to health. Dangerous for bathing.

24,000 – 240,000 MPN/100ml. of sample

Heavy sewage pollution. Definitely dangerous to health and for bathing.

240,000 – 2,400,000 MPN/100ml. of sample

Normal sewage.

2,400,000 – 240,000,000 MPN/100ml. of sample

MPN'S Of Coliform Bacteria in Mascoma Lake

Where the Mascoma River enters Mascoma Lake

Station Number L-1 – greater than 70,000 MPN/100 ml.

Station Number L-2 – 70,000 MPN/100 ml.

Station Number L-3 – 6,200 MPN/100 ml.

Station Number L-4 – 2,300 MPN/100 ml.

Station Number L-118 – 7,000 MPN/100 ml.

Station Number L-119 – 13,000 MPN/100 ml.

Where the Knox River enters Mascoma Lake

Station Number L-25 – 6,200 MPN/100 ml.

Station Number L-43 – 2,300 MPN/100 ml.

Pollution Sources

Town of Enfield – Raw Sewage – 30,000 gallons/day

Baltic Mill – Raw Sewage – 5,000 gallons/day

Baltic Mill – Untreated Textile Wastes – 740,000 gallons/day

2012 - New Hampshire Water Classification
RSA 485-A:8 Standards for Classification of Surface Waters of the State.

Class A waters: shall be of the highest quality and shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 47 Escherichia coli (E. coli) per 100 milliliters, or greater than 153 Escherichia coli per 100 milliliters in any one sample; and for designated beach areas shall contain not more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 Escherichia coli per 100 milliliters, or 88 Escherichia coli per 100 milliliters in any one sample; unless naturally occurring. There shall be no discharge of any sewage or wastes into waters of this classification. The waters of this classification shall be considered as being potentially acceptable for water supply uses after adequate treatment.

Class B waters: shall be of the second highest quality and shall have no objectionable physical characteristics, shall contain not more than either a geometric mean based on at least 3 samples obtained over a 60-day period of 126 Escherichia coli per 100 milliliters, or greater than 406 Escherichia coli per 100 milliliters in any one sample; and for designated beach areas shall contain not more than a geometric mean based on at least 3 samples obtained over a 60-day period of 47 Escherichia coli per 100 milliliters, or 88 Escherichia coli per 100 milliliters in any one sample; unless naturally occurring. There shall be no disposal of sewage or waste into said waters except those which have received adequate treatment to prevent the lowering of the biological, physical, chemical or bacteriological characteristics below those given above, nor shall such disposal of sewage or waste be inimical to aquatic life or to the maintenance of aquatic life in said receiving waters. The waters of this classification shall be considered as being acceptable for fishing, swimming and other recreational purposes and, after adequate treatment, for use as water supplies.

(Fecal coliform bacteria are bacteria found in feces. Fecal coliforms are a subset of a larger group of organisms known as coliform bacteria. An example of one group of fecal coliform bacteria is Escherichia coli or E. coli.)

Economics

Fundamentally the Mascoma River watershed can be defined as an industrial shed with concentrated industrial enterprise and heavy stream pollution only on the lower reaches of the main drainage stream. For multi-use of the River the situation is ideal - water supply, recreational and conservation storage uses upstream are followed by industrial water supply, waste disposal and power generation uses downstream.

Industry is without question the mainstay of the valley. Industry provides a yearly salary income to valley people of about 4 million dollars. Agriculture and recreation trail way behind. Of the estimated $5,200,000 income for the valley, industry accounts roughly for 87%, agriculture 10% and recreation about 3%. Recreational development of the watershed, with some local exceptions, has been only moderate. The entire economy of both Lebanon and Enfield is based on their primary industries. The totals for the watershed show that 87.8% of the population of the rely on its basic industries for support.

Although these figures are not exact, anyone familiar with the area and its people and industries must agree that the figures reflect fairly the present economy. Much (87%) of the industry so important to the economy of the watershed depends on the Mascoma River for power, process water and/or waste disposal. It is clearly evident that the River is a very essential element in the economic structure of the valley. It should also be remembered that the industries using the River did not just happen to be located near the River; they were, on the contrary, erected on the banks of the River for the express purpose of using the stream in their manufacturing processes.

Of the three industries in Enfield, the Baltic Mill, operated by the American Woolen Company, is by far the largest employing 250 of the estimated 320 people working in the community. Almost the entire economy of the village section of Enfield relies on the operation of the Baltic Mill.

Lake Mascoma attracts a summer population which adds a lot to the activities in and around Enfield throughout the summer months. In Enfield the value of recreation property is 22% of all the property in town. In the two top recreation towns of Canaan and Enfield, most recreational properties are summer homes belonging to individuals rather than large inns and hotels.

Mascoma Lake is the center of recreation for the region and even here there are no really large boat liveries, restaurants or centers of entertainment as there are on similar clear-water lakes in the state. Sail boating, swimming and fishing are popular among the cottage owners and Dartmouth College students and faculty members who use the lake.

From Canaan to the Baltic Mills in Enfield the River slowly meanders through farm country and pasture land. A short stretch downstream of the mill is turbulent and often brilliantly colored by dye wastes from the woolen mill. The river between the Baltic Street Bridge and the South Street Bridge in Enfield is ponded and quiet.

During the spring and other periods of high flow the appearance of the stream is satisfactory but during low flow months some sewer outfalls are exposed along the banks of this pond, gas bubbles are erupting, and an oily coat adheres to the bank vegetation. Tin cans, garbage, fluorescent tubes, burned-out light bulbs, and other refuse are, at times to be seen in this area and downstream to the Main Street dam.

From Main Street dam to Mascoma Lake, the River is fairly turbulent, somewhat marred in appearance by bankside refuse disposal, occasional floating garbage, and about a dozen small sewer outfalls. The situation could develop into a local nuisance if dumping of garbage and refuse continues uncontrolled.

Dilution in the Lake adequately disperses the sewage solids. Most of the bulky refuse snags in the alders and other bank side vegetation at the river mouth. Physical appearance is often unsightly in the immediate cove where the River enters the Lake. This, of course, can be eliminated with a little local control.

Summary of Findings

The staff has found that the Mascoma River is of C quality from its junction with the outlet brook from Crystal Lake in Canaan Center (Canaan Street Lake) to its entrance into Mascoma Lake. Raw sewage from both individual and group sewerage systems (all privately owned and operated) in the towns of Canaan and Enfield are chiefly responsible for the class C condition. An estimated 3/4 million gallons per day of industrial wastes discharged from the Baltic Woolen Mill (American Woolen Co.) add to the pollution at Enfield.

About nine acres of Mascoma Lake (1,115 acres total) in the vicinity of the inflowing Mascoma River are of C quality. This is in violation of the B-1 classification assigned to the Lake in July, 1947. About one acre of Mascoma Lake at the outlet of the Knox River is of C quality. This also is in violation of the B-1 classification assigned to the Lake in July, 1947.

A close look at the M.P.N. results show quite definitely that the sewage from Enfield violates the B-1 classification of Mascoma Lake. The area of such violation is limited to about 9 acres and does not extend to any of the commonly used bathing sites.

The lake area contaminated by coliform bacteria from Enfield sewage is rimmed by water weeds and is in general, an area that would probably not be used for bathing even if the pollution were removed.

On an M.P.N. basis, sewage from the Knox River inlet violates the present B-1 classification to a very limited extent. (About 3 acres). However, its proximity to an excellent and heavily used bathing beach definitely requires that the sewage be eliminated from Knox River.

Caplan's Dam is upriver above Mascoma Lake in Enfield about halfway between sampling stations #13 and #14 and ponds water for about 1/4 mile. (Station #13 is the first highway bridge immediately upstream of the railroad bridge, and station #14 is the fourth highway bridge going upstream, about 1/2 mile above station #13.) About two- thirds of the sewer out falls in Enfield discharge to the River in this ponded area (between dam and station #14).

Discharge
Town of Enfield – Raw Sewage – 30,000 gallons/day
Baltic Mill – Raw Sewage – 5,000 gallons/day
Baltic Mill – Untreated Textile Wastes – 740,000 gallons/day

MPN'S Of Coliform Bacteria in Mascoma Lake
Where the Mascoma River enters Mascoma Lake:

Station Number L-1 – greater than 70,000 MPN/100 ml.
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Station Number L-119 – 13,000 MPN/100 ml.

Where the Knox River enters Mascoma Lake:

Station Number L-25 – 6,200 MPN/100 ml.
Station Number L-43 – 2,300 MPN/100 ml.

Recommendations

It is recommended that an expenditure of about $5,500 to correct a small amount of pollution at Enfield Center and one or two other widely scattered spots on the watershed. This cost is not excessive, and most of the work required should be done as a matter of local good housekeeping.

The tributary waters are used for fishing, and are used by children for bathing and swimming, in spite of the pollution generally known to exist in these waters. It is your staff's opinion that these waters should be as safe as they are attractive for swimming and bathing; it is noted that only a relatively small cost will provide a considerable mileage of B-1classification water.

The Mascoma River from headwaters to the Baltic Mill in Enfield is very attractive and only a small amount of individual treatment ($1,400) in Canaan Center would be required to meet the B-1 classification. No other work is known to be necessary to provide a B-1classification on the Mascoma River downstream to its junction with Orange Brook in Canaan.

The Mascoma River in Enfield is currently classified as C. It is recommended that for the moderate amount of sewage and industrial pollution now being discharged into the river, a C rating should be allowed to continue as is, but with no increase or change in character of pollution.

A small portion of Lake Mascoma is degraded below the B-1classification imposed by the Legislature in 1947 due to the condition of the stream itself. However, the area is small (about 9 acres) and would be, in any event, undesirable for swimming. There is no real damage here to the general recreational character of Lake Mascoma.

It would cost $300,000 or more to sewer Enfield and treat its sewage and industrial waste, which is financially out of reason for Enfield for what might be gained by a B-2 or B-1 classification for this small reach of stream and area of lake.

The Baltic Mill in Enfield has been in operation for over 50 years; it is constructed and located for use of river waters for power, process and industrial waste disposal. Damage to the River is slight, as demonstrated by laboratory and biological studies of the waters downstream from Enfield. Furthermore, the recreational use of the Lake has been growing steadily over the years in spite of the small amount of pollution entering.

A COMPREHENSIVE MASTER PLAN FOR ENFIELD, NEW HAMPSHIRE 1966

Lake Shores

Other aspects that have affected and influenced town growth in Enfield, primarily from a recreation point of view, are the lake shores. Unless Enfield undertakes remedial measures to clean up these lake shores and prevent the continued pollution of the water it will lose these amenities and find it most expensive in the future to regain such a natural marvel. The cleaning up of the shores of the lakes and their accessibility will have their effect on the land development in Enfield year around as well as seasonal.

Sewer

All sewage disposals are on an individual basis in Enfield at the present time. In order for the built-up area of the town to be rehabilitated it is essential that a single sewer system replace the various waste disposal facilities now existing which are not satisfactory in the urban area where there are more than two families per acre. In many cases even more dense population than occurs in the urban area is found along Mascoma and Crystal Lakes. These seasonal residences also have sewage problems. In these locations continuation of private utilities is the more economical solution. However, minimum standards for lot area and specified methods of waste disposal need to be established and adhered to; otherwise a public system will soon be mandatory.

ENFIELD, NEW HAMPSHIRE
REPORT ON SEWERAGE AND SEWAGE DISPOSAL
FOR ENFIELD VILLAGE
1967

Mascoma Lake

Currently existing conditions within the Town violate Chapter 147 of the New Hampshire Water Supply and Pollution Control Commission laws by the discharging of untreated sewage to the Mascoma River and Lake. Since the waters of Mascoma Lake are used extensively for recreation, the discharge of raw sewage constitutes a health hazard. This discharge of raw sewage occurs from both private sewage disposal systems as well as from some existing privately owned sewers.

Population Forecast

We estimate the population of the Town for the year 2010 to be about 3,500. (Actual 2010 census was 4,582). We estimate that the population of Enfield village will increase from an estimated 1,300 in 1966 to about 2,000 persons in the year 2010. Using an estimated 1970 sewered population of 1,000 persons, we have projected the average population trend to the year 2010. We estimate that 1,800 persons will be served by the proposed system in 2010.
(In 2010 there were 454 connections).

At the present time there is only one industrial waste producing industry within the Town of Enfield. The Baltic Mill of the A. G. Dewey Company employs approximately 300 persons in the Manufacture of woolen and synthetic broad woven cloth.

Quantity of Sewage

During the period 1962 - 1966, the average daily water consumption ranged from 232,000 gpd (gallons per day) in 1962 to a high of about 266,000 gpd in 1966. This amounts to a per capita consumption of about 222 gpd in 1966 using a serviced population of 1,200. This high per capita consumption can be attributed to the fact that individual services have not been metered.
(In 2010 the gpd of wastewater was 79,100.)

Description of Existing System

There are no existing public sanitary sewers in Enfield Village. A number of houses on South Street (part of Shaker Hill Rd.), Pillsbury Street, New Shaker Hill Road and Union Street are sewered directly to a small lagoon located at the lower end of Union Street near Pillsbury Street. Most of the other houses in the Village are served by either private sewage disposal systems or by systems which discharge directly to the Mascoma River.

Stream Standards

Streams and rivers constitute a great natural resource for the areas in which they are located. The discharge of untreated sewage into the streams and rivers reduces their value for many uses. The extent of the damage caused by the discharge of untreated sewage varies with each individual case. Any pollution reduces the value of water for some particular use. Extensive pollution of a stream with sewage may result in a menace to public health.

The above statements do not mean, however, that no sewage may be discharged to a stream or river. Rivers and streams have the ability to assimilate, without creating a nuisance, limited amounts of sewage, the amount depending upon the size and nature of the stream and the purposes for which the water is to be used.

The impervious nature of much of the surficial soil deposits in Enfield as well as the high groundwater table in the lower Main Street area caused by high water levels in Mascoma Lake have caused the failure of many private sewage disposal facilities. The discharge of private sewers into local ponds and streams within the Village has created a nuisance in these water courses.

The construction of lateral and intercepting sewers proposed in this report will alleviate these local nuisance conditions. The transportation of the sewage to a common disposal point on the Mascoma River does, however, raise the question of the adequacy of the river to receive the sewage.

The Mascoma River became subject to the following classification of surface waters in New Hampshire when the General Court enacted a bill on July 31 1967 to take effect on September 11 1967.

The Mascoma River is now subject to the following classifications.

Class A – Mascoma River and all its tributaries from their sources to Goodwin's Bridge in the City of Lebanon.

Class B – From the upstream side of Goodwin's Bridge located approximately 1,1000 feet downstream of the Lebanon Water Works, to the downstream side of the Hanover Street Bridge in the City of Lebanon.

Class C – From the downstream side of the Hanover Street Bridge to its confluence with the Connecticut River in the city of Lebanon.

Since the Mascoma River is the source of the public water supply for the City of Lebanon, it is classified Class A upstream of the Lebanon Water Works and thereby carries this classification both upstream and downstream of Mascoma Lake in Enfield. The standards for a Class A water indicate that discharge of any wastes into a Class A stream is prohibited. This means that at the present time any proposed sewage treatment works for Enfield would be in violation of the Standards for Classification for Surface Waters, unless the effluent from such works was piped all the way to Goodwin's Bridge, 1,000 feet downstream of the Lebanon Water Work.

Analyses of the Mascoma River are not made systematically, but rather infrequently as problems develop. A staff report of the New Hampshire Water Pollution Commission summarizing observations and data collected during the course of a fish kill investigation in August, 1958, indicated that the oxygen content in the Mascoma River was substantially above the 75 per cent saturation value required by the "B" classification.

Analyses by the Commission show that the Mascoma River is very attractive and relatively pollution free but that just downstream of Enfield Village there is a relatively high bacterial concentration in the river as well as an increase in certain chemical wastes from time to time. A major portion of the bacterial contamination is contributed by the sewage from Enfield Village while the chemical and other type wastes can be attributed to the effluent from the Baltic Mill. These contaminants are carried downstream by the Mascoma River and enter Mascoma Lake less than one mile from their origin. They contain nutrient elements which probably contribute toward stimulated plant growth and algae problems in certain parts of Mascoma Lake.

Industrial Wastes

The only industrial plant in Enfield, New Hampshire, is that of the A. G. Dewey Company - Baltic Mill. The plant is a textile mill and produces (1) woolen and synthetic broad woven cloth for the Women's Wear Trade; (2) woolen blanket cloth for the Defense Supply Agency; and (3) baseball uniform cloth.

The present plant production is 36,000 linear yards of woven material per week. The maximum plant production is estimated to be 45,000 to 55,000 yards per week depending on the type of cloth produced. Raw materials used are grease, wool, wool wastes, reclaimed wool, cotton, rayon and other synthetic fibers. The amount of each used in any given time period is governed by the types of material to be produced. The present consumption of raw materials is 60,000 pounds per week with an estimated maximum consumption of 75,000 pounds per week.

The manufacturing processes employed are those of blending, carbonizing, stock dyeing, piece dyeing, carding, spinning, weaving and finishing. Stock dyeing is done in seven 500 lb. capacity kettles, which utilize approximately 2,500 gallons of water per dyeing cycle.

Maximum production of 600,000 lbs. weekly involves 110 dyeing cycles and 275,000 gallons of water consumption. Dye stuffs used are coal tar products which are nearly exhausted onto the stock fibers, but which will usually leave a trace of color into the discharge water. Chemicals utilized in color removal or application varies as to method of dyeing.

In addition, color stripping, chrome dyeing; acid dyeing and premetalized dyeing are performed. Chemical utilization includes acetic acid, formic acid, bichromate of soda, sodium sulphate anhydrous, zinc oxide and wetting agent, (Nonionic Surfactant).

Quantities of any item used would not be over 20 per cent by weight of cloth, most being much less than 10 percent. Discharge is into a 3-ft by 4-ft common waste channel under the mill with the Liquid having a pH of 5 to 6.

Piece dyeing is done in kettles of 8 to 10 piece capacity which use approximately 4,000 gallons of water per dyeing cycle. Maximum weekly production would be 350 pieces or 35,000 lbs. With total water consumption of 160,000 gallons. Dye-stuffs and chemicals used are the same as in the case of stock dyeing with the addition of chemicals used in color application, removal or bleaching. These include a sequesterInsasent (Versene), Zinc oxide, Zn (HS02CH20.), Zn (HS03CH2 0) 2, Hydrogen Peroxide, Ammonia, Tetrasodium pyrophosphate, acetic acid, formic acid, wetting agent (Nonionic surfactant) Cationic Softeners (fatty esters), Chloregal D (amino compound), Sodium Sulphate Anhydrous, Borax and Salt.

Discharge is into the 3-ft by 4-ft common waste outlet with the Liquid having an average pH rating of 4 to 6. At full production the carbonizing process would result in production of 300 to 400 pieces of cloth which would be equal to 30,000 to 40,000 pounds of cloth.

A 1,500 gallon tank contains a 4 per cent solution of Sulphuric Acid and water which is, used for carbonizing. This tank is dumped 2 to 3 times a week into a small drain and into the large 3-ft by 4-ft common waste outlet under the Wet finishing section of the plant. Water usage of this unit would be 9,000 to 10,000 gallons weekly.

At full production, cloth is scoured in washers at a weekly rate of 600 to 700 pieces, such quantity being equal to 60,000 to 70,000 pounds of cloth. The basic scouring agent is a non-degradable synthetic detergent. Small quantities of ammonia, softeners (fatty esters), whiting agent (Non-Ionic), or alkali may be used, depending upon the type of cloth being scoured. Scouring may cover two or more hours, much of which is rinsing time, involving the use of large quantities of clear water. A normal scouring cycle for an eight piece set of cloth could result in 10,000 gallons of water consumption. Weekly water usage of the six washers is estimated at 875,000 gallons, which is discharged into the 3-ft by 4-ft common waste outlet.

The plant employs approximately 300 people on a three-shift, five day week basis. The sanitary sewage estimated from the employees is 6,000 gallons per day. To meet the receiving water classification, these wastes, with the exception of the large volume of condenser water, must be collected and adequately treated prior to discharging into the Mascoma River. Several in plant modifications and pretreatment facilities must be afforded to make the waste effluent suitable for admission to any biological treatment process contemplated by the Town.

Proposed Treatment Plant

Two sites were considered for the construction of sewage stabilization ponds and these studies designated as Plan A. A conventional treatment plant was studied at a site near the westerly end of Mascoma Lake at Mascoma with discharge of the effluent downstream of the intake to the Lebanon water treatment plant; this alternate is distinguished as Plan B. Also studied as Plan C, were the facilities needed to convey all sewage and industrial wastes to Lebanon for treatment at the proposed plant site in West Lebanon.

Plan A

We have laid out a two-cell stabilization pond at two locations and prepared cost estimates for the construction of each. The first location is between the B. & M. Railroad and the Mascoma River, just east of Lovejoy Brook and is shown as an alternate sewage stabilization pond site. These two cells consist of a total of 23 acres.

The ponds have been oriented so as to be a minimum of 600-ft from any habitation after the relocation of one house on the north bank of the Mascoma River on Westcott Road. Surveys mode at the site indicate that there is not sufficient material available at the site to permit the construction of the necessary dikes above the flood potential of the Mascoma River without importing nearly all of the required fill. This fact, when coupled with the required relocation of one house and the fact that the site contained little adjacent land for future expansion, caused us to investigate another site.

The second and more preferable location considered for a two-cell stabilization pond is located south of the easterly end of Finn Hill Road (Shedd St.) and west of Westcott Road in a wooded area. The two cells have been laid out to provide a total area of 26 acres which will be more than adequate to handle the initial and future overage BOD loadings of 400 and 550 lbs. per day.

These ponds have also been oriented so as to provide a minimum of 600-ft from any residence on Finn Hill Road or Westcott Road (none at present) and at least 700-ft from New Shaker Hill Road.

The effluent from most sewage treatment plants is highly enriched with nutrient elements such as nitrogen and phosphorus, which are in excess of the biological requirements of the treatment plant and which stimulate plant growth in the receiving waters. While this excess is not directly toxic, its ability to fertilize and thereby cause aquatic growths to flourish, can produce a number of undesirable effects.

These effects can be the production of algae or other aesthetic effects such as scummy or cloudy waters which possess tastes and odors. Fish kills can occur upon the death of these aquatic growths in the fall because of a depletion of dissolved oxygen in the receiving stream.

During more recent years, the latter part of each summer has seen a rise in the undesirable effects of the presence of nutrients in Mascoma Lake. Whether or not the presence of these aquatic growths can be blamed to some degree on the fact that untreated sewage does enter Mascoma Lake from Enfield Village is a matter of opinion. The discharge of untreated wastes from Enfield Village as well as ill-functioning individual sewage disposal systems around the cottage lined shores of Mascoma Lake probably tend to aggravate the problem. Therefore, we have included in our investigation, studies of methods which would prevent the direct addition of any effluent from the proposed sewage stabilization ponds into the Mascoma River. This can be accomplished by process known as spray irrigation or combination of spray irrigation and a ridge and furrow system which will prevent any effluent from directly entering the Mascoma River and subsequently Mascoma Lake.

Plan B

This alternate consists of a sewage treatment plant of the activated sludge type near, the outlet of Mascoma Lake providing secondary treatment of the sewage. Chlorine facilities are included for disinfection purposes. The site is too small and close to habitations to permit disposal of the sludge on the site. The sludge disposal method included consists of dewatering by flotation and trucking the concentrated sludge to a disposal area located on nearby land.

Plan C

The City of Lebanon has had design plans and specifications prepared by Metcalf & Eddy for a primary treatment plant to be located in West Lebanon at the confluence of the Mascoma and Connecticut Rivers.

MASCOMA LAKE PROJECT
DARTMOUTH COLLEGE
NOVEMBER, 1971

Introduction

To correct past mistakes, projects are under way to study causes of and possible cures for "environmental problems". Unfortunately, most studies emphasize a single perspective and overlook the broad picture of the total environment. This study looks at the problem of pollution in Lake Mascoma from a number of perspectives - biological, economic, governmental, and sociological. Our goal was to reach a comprehensive understanding of the "problem" and to proceed from there to find the optimum solution. Mascoma Lake, located in Enfield and Lebanon, New Hampshire, has been plagued in recent years by seasonal algal blooms. The state has attempted to control algae growth with copper sulfate treatments for a number of years.

Copper Sulfate Treatment

LAKE NAME: Mascoma Lake
LOCATION: Grafton Co., New Hampshire, USA
SURFACE AREA: 4.5 km2
MAXIMUM DEPTH: 20.7 m

PROBLEM:
Nuisance blue-green algal blooms (predominantly Anabaena and Aphanizomenon); moderate interference with recreation. Some tastes and odors in the municipal water supply.

RESTORATION OBJECTIVE:
To control the nuisance algal growth. To improve the recreational potential. To provide good water quality for municipal uses.

RESTORATION METHODOLOGY:
The lake was treated with 3,400 kg of copper sulfate in August, 1964;
with 2,720 kg in June, 1967;
and with 3,040 kg in August, 1969.

All applications were performed by "bag dragging" to evenly distribute the algicide to a 3.1 m depth.

Application of copper sulfate at a dosage rate of 6.7 kg/ha cost a total of $2,900 USA.

RESULTS (OR STATUS FOR ONGOING PROJECTS):
Chemical treatment provided seasonal control of the nuisance algal blooms.
(Permanent improvement appears to have resulted since woolen mill wastes have been eliminated and the phosphate load to the system has been reduced.)

History

An acknowledgement of a pollution "problem" came in mid-July of 1968 when the New Hampshire Water Supply and Pollution Control Commission (WSPCC) ordered Lebanon and Enfield (WSPCC order numbers 1387 and 1388) to cease polluting the Connecticut and Mascoma Rivers respectively. The order was directed to the Enfield Village Fire District. The Dewey textile mill was also ordered by the WSPCC to stop polluting the Mascoma River.

The first evidence in print of strong local concern about the lake's condition came in July of 1969 with what appears to have been a massive algal (algae?) bloom. That summer, state officials were concerned about the threat of algal blooms throughout the state. An "Aquatic Nuisances" bill was passed by the New Hampshire General Court, with an appropriation of $100,000. It was vetoed by Governor Walter Peterson on the ground that sufficient funds were not available for all bills passed that season.

Property owners complained strenuously about the algal problem. There was also a health factor; samples from the lake yielded a coliform bacteria count of 460 per 100 ml. 220 units above the level deemed satisfactory in New Hampshire for Class B water. The Governor asked the New Hampshire Executive Council for, and received, $2,900 from the State Operating Budget Contingency Fund to provide for copper sulfate treatment of the lake. In August of 1969, Lebanon City Manager, Kenneth Boehner, suggested that Lebanon and Enfield study possibilities for a combined sewage treatment plant. (Enfield's consulting engineers, Camp, Dresser and McKee, Inc., had, in 1967, recommended a tie-in with Lebanon.)

In early November 1969, the WSPCC informed Lebanon that the federal contribution to its project would be pre-financed by the state, but that it had to be built within one and a half years, and some kind of construction or financing had to begin within three and a half months. Lebanon was told, therefore, to start construction on what was described as a $5 million project by the fall of 1970, and have a bond issue passed by April of the same year.

Enfield, if it wanted to participate in the project, would therefore have to vote to join at its March town meeting. In December of 1969, officials from Enfield and Lebanon agreed that Enfield should join the proposed Lebanon sewage treatment system. Part of Enfield's willingness to cooperate with Lebanon might have been the result of federal funding for up to 95 percent (including state share) for "regional" treatment plants compared with lesser funding without regionalization. Also, Enfield's consulting engineers (Camp Dresser and McKee) had recommended the tie-in as the cheapest means of complying with the state order. In January of 1970 it appeared that Enfield had little choice but tie-in to the Lebanon system.

In January 1970, the Dewey Mill announced it was closing for a month.

A joint sewer plan was approved at the Enfield Town Meeting in March 1970. Lebanon went ahead with preliminary plans to include Enfield.

Meanwhile, in March 1970, A.G. Dewey announced that his mill could not make any capital contribution to any sewerage treatment facility in Enfield beyond the cost of a pipe running from the mill to a collection line. Camp, Dresser and McKee had recommended that the mill pay a substantial amount toward construction of a sewerage treatment facility, based on estimates that 60 percent of Enfield's sewage emanated from the mill.

Enfield and Lebanon received extensions of their orders to July 1971.

In: June 1970, the New Hampshire Executive Council again voted to release $3,500 for copper sulfate treatment of Mascoma Lake. At that time, state aquatic biologist Terry Frost said visibility in the lake was reduced to five feet.

In December 1970, Lebanon City Manager Kenneth Boehner brought attention to federal regulations that require industries that contribute more than 22 percent of a municipality's sewage outflow to contribute a proportionate share of treatment cost.

On February 3, 1971, it was announced that no proposals for a bond issue would be presented to the voters of Enfield at the town meeting.

In February 1971 the Dewey Mill closed permanently.

In March 1971, the Lebanon City Council was presented with what is now the present plan, a revision of the 1970 Metcalf and Eddy plan, costing $10.7 million.

It was expected that one quarter of the project would be funded by the city. Land taking for the project was expected to begin within six weeks. Lebanon still expected Enfield to participate.

Then, in April 1971, it was announced that Enfield would not enter into Lebanon's treatment facility. Enfield had received a letter from Metcalf of the WSPCC advising him that closure of the mill might make feasible a local facility. Camp, Dresser and McKee advised Enfield that it could get by with a facility costing $2.5 million in capital outlay, of which $350,000 plus un-estimated annual operating expenses would be paid locally. Had Enfield tied into the Lebanon system, it was estimated Enfield would have paid $405,000 in outlay plus $32,000 per annum operating expenses.

During April 1971, with the deadline of the state order three months away Chairman of the Enfield Board of Selectmen, Charles Tupper, requested a one year further extension of the cease and desist order. The extension was granted; the town now has until July 23, 1972 to comply.

During May, the New Hampshire General Court voted down all proposed broad-based taxes. State funds for treatment facilities do not exist.

Presently, Enfield has no firm plans for sewage collection and disposal. Camp, Dresser and McKee offered to revise their treatment plans (for $3,500). The status of state and federal aid, and the status of state-enforcement action, are unclear.

Stream Study

As legislation against pollution becomes stricter in many American communities, it becomes increasingly important to assess the exact amount and location of pollution. To get this information a detailed study travelling up a stream to its headwaters is necessary. The changes in nutrient content from one sample site to another provide a fairly accurate indication of pollution sources.

The Knox River, contributing 5 percent of the total inflow, enters the southeastern end of the lake. Most of the area along the river is uninhabited.

Although Enfield Center is located directly on the river, there are fewer than twenty homes located within the area. There is a laundry; however which was of prime concern in the study.

The La Salette stream flows into the west side of the lake through the property of St. Pius School for Boys. It was the smallest of the three inlets contributing only 0.5 percent of the total inflow. There were no homes or businesses located upstream, only the school for boys at the lower end of the stream.

Agricultural runoff from a hay field probably accounts for some of these high values. More importantly, the boys' school dumps its laundry wastes into the stream after the water has been filtered.

It appears that the laundry is contributing excessively high amounts of phosphate to the river. Most of the houses located directly on the river appeared to be dumping wastes directly into the river. Even if these homes did not *(not?)* have septic tank systems, the lots are so small and homes so close that there is little doubt that some, if not all, of their wastes *(would?)* eventually reach the river.

The Mascoma River was studied on two separate days. Sampling Station M-8 had concentrations overwhelmingly higher than all the others. This was unquestionably due to sampling location. The sample was taken at the outlet of a pipe running directly into the river; it was obviously raw sewage.

Enfield Town

The history of the algal problem on Lake Mascoma has been dealt with elsewhere. In brief, the lake was first treated about ten years ago but was not considered to have significant problems until recently. A bloom in 1969 sparked the present concern and interest. That bloom was treated with copper sulfate (Cuso4). The lake was treated again in 1970. With the recent appearance and treatment of blooms, the pollution problem as such came to the forefront. The town was ordered by the WSPCC to abate disposal of raw sewage into the Mascoma River and so many plans for sewage treatment have been considered and reconsidered.

The town had considered combining with Lebanon on a regional facility, but that idea has been dropped and a local facility is now under consideration.

A peculiarity of the Enfield Town Government is the inclusion of a sub government structure within the town. This is the Enfield Precinct structure which now exists as a holdover from the town's earliest days. This Precinct (Village District) includes the northwest sector of the town and may be identified as the "urban" sector of the town. The precinct exists as a service structure, providing fire and water services to the urban area, but it also carries some legal powers outside those of the town.

The existence of such a body as the Precinct is both a convenience and an inconvenience. It is convenient to the extent that it makes it possible to deal with just the "urban" area of the town. When the WSPCC made its order to abate pollution of the Mascoma Lake it directed its order to the Precinct. The Precinct designation is also an inconvenience because it unnecessarily clouds the lines of responsibility. Examples of this have been the question of whether in fact the town or Precinct should have responsibility to abate pollution and the question of legal title and therefore control of land deeded to the Precinct as opposed to the town.

Within any political structure there are both formal and informal components. Informal structures are mostly a matter of the interest groups. Enfield has a fairly simplified interest structure composed of three basic groups categorized by three perspectives.

1. "Keep expenses down, no matter what."

This group is composed of older citizens of the community who want to see the budget balanced and the town kept out of debt. Spokesmen for this group express with pride the fact that Enfield has no long-term debt of any kind. This group has held sway in the town for many years and during this time the budget has been balanced. The basic reason for the influence of this group is its size. In 1960 the older age groups formed a high percentage of the town population. These older people represent the farming community, the Grange, and much of the Enfield Center population.

2. Keep expenses down but improve the town."

This group is a newly-emerging group of younger and somewhat more progressive citizens. Their desire is to improve the town, build its economic base, and attract industry. They are willing to accept some debt if necessary. The growth of this group has been supported by two recent changes. The most important of these seems to have been the moving of the Town Meeting from daytime to nighttime. During the day the younger citizens found it harder to get away from their jobs to attend the meeting. This gave the older citizens a considerable political advantage. The nighttime meeting has improved the position of the younger group.

A more subtle change has been the relative reduction in size of the elderly population. Where in 1960 the 65 and over population was about 14.5 percent of the total population, the latest figures show it to be down to 12 percent. Though 12 percent is still a high percentage, the relative decline does seem to have had a political impact.

3. "Maintain the lakes and the rights of the people who live around them."

This group, represented by the Mascoma Lake Community Association and the Crystal Lake Association, is composed mostly of those people who have invested in the lakes. This group is composed primarily of summer residents. The members have limited political influence since they don't vote in Town Meeting or elections. Their interests are aimed at preservation of the lakes and fair treatment of property owners around the lakes.

The Crystal Lake Association seems to be the more active and more powerful of the two groups. It has a smaller group to organize and has had active support from the local permanent residents who are members. The Mascoma Lake Association, on the other hand, has a very large group to organize and has had trouble getting them together. Of some 200 households, they have developed close association with only about 75 and most of these are summer residents. The Mascoma group has been limited to exerting influence on a very narrow range of topics and then only to a small degree. They have done little on the issue of pollution and sewage treatment.

Pressures on the decision-making structures of a town can come from the following sources:

I. Perception of the problem

II. Priorities

III. Economic base and taxes

IV. Other communities

V. State and federal governments

I. Perception of the Problem

As used here the perception of a town is defined as the way in which the body politic of the town perceives the problem in question, in this case pollution of Lake Mascoma.

It is fair to say that the people involved in the governance of the town recognize that Lake Mascoma is polluted and that there is a problem. There is also a widespread belief that the closing of the Baltic Mill has largely solved the problem. Most people have adopted a wait-and-see-attitude. Since there was no algal bloom this year some are reticent to do anything or spend anything on sewage treatment or pollution control.

II. Priorities

The question of priorities is important to understand how pollution control fits into the decision-making process of the town. The situation was well put by Mr. Tupper, Chairman of the Selectmen, who noted that Enfield has many problems and that each problem can't be the most important one. The priorities of a town will be affected mostly by cost and degree of necessity. According to Mr. Tupper and others, Enfield has at least five other pressing demands.

These include obtaining financial support for elderly and disabled citizens in the face of state budget cuts, obtaining development controls to protect the town from unplanned growth, providing good schooling, providing well-maintained highways, and providing a recreational program. What may seem a terribly important problem to an outsider may be just one of many to a decision maker?

From discussions with the town's decision makers, it seems fair to say that at the present time financial support and zoning are the leading priorities. Pollution control and sewage treatment are somewhat lower on the list. It is something that would involve considerable resources, and the decision makers, in conjunction with the perceptions discussed above; don't see the problem as being that immediate nor its solution worth the price.

III. Economic Base and Taxes

The willingness and ability of the town to solve the problem of pollution in the lake is largely a function of the town's fiscal resources and the importance of the lake to the economy of the town.

The taxes were analyzed according to the geographical areas used.

Town Total	**Percent of Town Taxes (Residences Only)**
Village District	36.24
Mascoma Lake Front	28.72
First Outlying Sector	6.04
Second Outlying Sector	6.46
Crystal Lake Front	11.31
Third Outlying Sector	6.84
Spectacle Pond Front	2.74
Other Residences	5.65

Permanent Residential Taxes	**Percent of Permanent Residences Total**	**Percent of Town Taxes (Residences Only)**
Village District	53.99	37.77
Mascoma Lake Front	13.83	8.91
First Outlying Sector	8.94	5.76
Second Outlying Sector	8.40	5.41
Crystal Lake Front	4.47	2.88
Third Outlying Sector	6.76	4.35
Spectacle Pond Front	1.29	0.83
Seasonal Residential Taxes	**Percent of Seasonal Residential Total**	**Percent of Town Taxes (Residents Only)**
Village District	4.12	1.47
Mascoma Lake Front	55.65	19.81
First Outlying Sector	7.92	2.82
Second Outlying Sector	2.95	1.05
Crystal Lake Front	23.70	8.44
Third Outlying Sector	6.99	2.49
Spectacle Pond Front	5.36	1.91

These data show clear and important points. (1) Of those taxes included in this survey, Mascoma Lake property accounts for almost 30 percent of the total. (2) Of those taxes collected from all seasonal residents, Mascoma Lake property accounts for almost 56 percent of the total. (3) Of the taxes included in the survey, those collected from property on the three major water bodies in the town account for almost 43 percent of the town total.

The importance of the lakes and especially Mascoma Lake is clear from these figures. With the lakefront property contributing 30 percent to the town's tax revenue and with two-thirds of that 30 percent coming from seasonal residences, it is clear that the town is heavily dependent on the lake as a financial resource.

Another method that has been employed to consider the structure of the town tax base and to measure the importance of the lake to that base was to measure the amount of taxes paid for the average residence in each of the geographical areas considered.

This data reveals that there is a broad range of assessed value in the town (assessed value being a reflection of the amount of taxes paid). In 1970 the taxes paid for a residence equaled [its assessed value] + [100] x [$3.90].

Of particular interest is the fact that the averages for both permanent and seasonal homes on Mascoma Lake and for seasonal homes on Crystal Lake are well above the town average. This further indicates the value of the lakes and seasonal residences to the town. This value is further substantiated by the fact that the seasonal average is well above the permanent average. This suggests that not only are lakefront properties an aggregate of great value to the town, but that they are of significantly greater value on an individual basis than other properties.

Average Tax/Residence	**Permanent**	**Seasonal**
Village District	345.42	376.89
Mascoma Lake Front	423.23	452.84
First Outlying Sector	473.20	471.01
Second Outlying Sector	300.15	273.87
Crystal Lake Front	514.66	366.08
Third Outlying Sector	278.59	274.05
Spectacle Pond Front	691.55	228.15
Average	361.21	380.97

Over-All Town Average: 368.15

This table exhibits one fact which is difficult to explain. Generally, for each sector the figures are relatively the same for permanent and seasonal with the seasonal figures being slightly higher than the permanent ones (this is borne out in a comparison of the averages). However, in both the Crystal Lake Sector and the Spectacle Pond Sector, the relation is reversed and markedly so. It is not clear why this is so, as the residences don't appear to have any major differences in terms of structure of size. Rationalization of this question might prove beneficial to the town.

Other Communities and Governmental Bodies

Lebanon has shown little official interest in the problem of Mascoma Lake. At one point the City of Lebanon and the Town of Enfield were considering constructing a combined sewage treatment plant. Lebanon's interest in this arrangement was mostly financial and not concern for the cleaning of the lake. This is so even though the City takes its drinking water from the Mascoma River below the lake.

The people of Lebanon seem to feel that it is unfortunate the lake is polluted, but as far as their water source is concerned, they maintain that their pumping station does a fine job of purifying the water. They see no immediate need to have the lake cleaned except that it might make for a better recreational area. The City, then, has not applied any significant pressure on the Town of Enfield to control or abate its pollution.

The interest of the UVPDC (Upper Valley Planning and Development Council) has been mostly in an advisory capacity to the town. The Council is interested in promoting a sewage facility, but most efforts with Enfield have been for designing a zoning ordinance. Here again priorities are important. The Council apparently feels it has a more realistic chance of being useful on this front than on sewage treatment.

This could be for a number of reasons, the most significant of which seems to be financial. The Council doesn't receive enough contributions to make work on sewage treatment for individual towns worthwhile; state and federal governments have limited the possibilities for productive effort in this field.

There seems to be little pressure from outside the community to act on Mascoma Lake immediately. It again is one of many problems that need to be dealt with, with only limited resources available.

October Algal Bloom

During the week of October 18 it came to the attention of this study that an algal bloom was in progress on Lake Mascoma. Samples of the algae were collected from the lake water and identified as Anabaena Scheremetievii, a blue-green alga similar to those that have occurred in blooms of previous summers.

At the peak of the bloom more than 50% of the lake's surface was covered with a green, scum-like coating and thick masses of algae had accumulated along the entire leeward shore of the lake. The bloom persisted for a period of approximately three weeks. Had this condition arisen during the summer it is likely that recreational activities on the lake such as swimming water-skiing, and fishing would have been severely curtailed?

Blue-green algal blooms are uncommon in the region during the fall due to sub-optimal temperature conditions but this year weather conditions during the months of September and October have been unusually mild. It is probable that a combination of autumnal circulation and exceptionally mild weather conditions is responsible for the bloom this fall.

This interpretation supports the study's finding that the lake contains sufficient amounts of nutrients to support an algal bloom and that blooms are likely to occur in response to the proper climatological and meteorological conditions.

1974 Smithsonian Article - "Troubles brew below a lake's shining surface"

Can villagers and visitors in a small town take unsought academic advice and do their part for our aging waters? Perhaps.

Lake Mascoma, lying in a lovely valley six miles east of Lebanon, New Hampshire, is just such a lake. Well, at any rate, Mascoma used to be such a lake. Now as the motorist approaches the lake he encounters diamond-shaped highway signs saying "THICKLY SETTLED."

The words eloquently explain why now you can ski on the water but you wouldn't want to drink it. It's OK to swim there, but who would want to when the algal bloom turns the surface kelly green as it has several times in recent years? The lake surface still shimmers in the sun but underneath there's a worrisome content of raw sewage.

The Mascoma people have contributed generously of nutrients, sewage, detergents and their wastes. The process apparently has been building up for years at Lake Mascoma, but it took the first big algal bloom in 1969 to arouse people to action. The Montgomerys run a lakeside motel and had a good year but "last year the lake was kelly green."

All think something should be done. A massive effort to help came gratis from a surprise source, Dartmouth College. The investigators - students with biological, economic, political and socio-logical interests and with faculty advice, carried out an exhaustive study of the causes of Lake Mascoma's malady and remedies for it.

A dozen investigators commuted to Mascoma in the summer of 1971, nosing into every phase of life, and left no feelings harder than those of an Enfield selectman who observed that "Dartmouth needed something to study and Mascoma happened to be nearby."

In 1972 the Dartmouth group published their two-pound, 334-page study. The $18,000 "Mascoma Lake Project" reported conditions and made hard recommendations for saving the day.

To begin with, there are two distinct population elements at Mascoma. Most of the 250-odd houses on the lakeshore are owned by nonresidents. The town of Enfield, which brushes the lake, has mostly permanent residents.

The lake people (who are mostly seasonal residents) pay 30 percent of the half-million dollars collected in property taxes by the town but they cannot vote in the town. The year-round residents worry not about the lake alone but also about such things as education and roads. The setup is perfect in a way: Each element can blame the other for 90 percent of all ills.

The sources of pollution are no mystery. Some town and some lake residents dump sewage and other wastes directly into the lake or into the Mascoma River, which splits the town just before emptying its gamy cargo into the lake. The Enfield Elementary School pipe goes directly into the river with no treatment.

So now it is almost two years since the Dartmouth crew combed the lake and what has been done? It is tempting to answer with one melancholy word: nothing. That would be unfair (if only slightly). Indeed, the community stirrings are enough to sustain a small hope that Mascoma will once again be crystal clear and potable, if not in this decade perhaps some time in the next.

Furthermore, the Lake Mascoma association gets credit for a somewhat effective campaign against high-phosphate detergents. The Enfield selectmen added to the pressure in August with a proclamation which, after all of the "whereas," said: "WE THEREFORE call upon all residents of Enfield to make a serious effort to aid in reducing the phosphate content of Enfield's surface waters by using only soaps or those brands of detergents with no phosphate content or of low phosphate content for all cleaning, dishwashing and laundry purposes."

Not all New Englanders, however, are given to newfangled ideas or to certain kinds of cooperation. New Hampshire's motto is “Live Free or Die” and for some, to "live free" is to dump raw sewage into the nearest water.

When asked whether the town couldn't order its health officer to police the raw-sewage dispersal, Selectman Arthur W. Blain smiled: "Well, you wouldn't want to cause trouble.” Enfield selectman William A. Maloy is not one of those, but he does share in a problem. He lives in the village on the bank of the Mascoma River. "My home is on a pipe which collects waste from seven or eight homes and pours it directly into the river. What should I do? It will cost $1,500 to install a septic tank, after which the pipe will still be going by me and into the river. And presumably we will have a general system for everybody in a few years."

ENFIELD MASTER PLAN
ENFIELD, NEW HAMPSHIRE
1985

Municipal Sewer System

At present, no municipal sewer system exists in Enfield. Sewage is processed through the use of individual subsurface disposal systems or is retained in holding tanks which are pumped periodically.

Enfield has an agreement with the City of Lebanon whereby septage pumped from Enfield is accepted for processing at the Lebanon Sewer Treatment Plant. Unfortunately, the majority of the sewerage generated in the Enfield Village area is now discharged directly into the Mascoma River.

After several studies of sewer system alternatives since 1967, a plan was adopted whereby Enfield will sewer the Village area and pump the sewerage to the Lebanon Treatment Plant. U.S. Environmental Protection Agency (EPA) funding has been approved for this project, with construction of the Village system scheduled to begin in the fall of 1985 and the Lebanon interceptor scheduled for construction in the spring of 1986.

ENFIELD MASTER PLAN
ENFIELD, NEW HAMPSHIRE
1995

Water Quality

Prior to 1991, sections of the Mascoma River, in Enfield and lower Lebanon, were classified as C. However, today all surface waters are classified as either A or B with only those watersheds serving as town water supplies classed as A waters.

Sewer System

The Enfield Municipal Sewer System was completed in 1988. Prior to that, untreated sewage from Enfield's village was a major source of pollution to the Mascoma River and Lake.

About 302 lots are served or 10 percent of the lots in Enfield. Of those receiving service, about 68 percent are single family residential users, 5 percent commercial, and 23 percent multi-family residential users including apartment buildings and condominiums. There are currently no industrial users.

The design capacity of the Enfield system is an average daily flow of 182,000 gallons per day. Flows at the time of construction (1988) were estimated at 111,000 gallons per day.
(In 2010, the average daily flow was 29,100 gallons per day, with 454 users.)

About 80 percent of the flow is generated by Enfield Village with the remainder from the Route 4A section.

When Enfield constructed the system, it was guaranteed a certain capacity from Lebanon's sewage treatment plant. About 50 percent of that capacity is now utilized.

The system is operated by the Enfield Sewer Department with one shared employee. There are seven part-time employees including an operation visitant, clerk, and meter reader. The highway Department provides some equipment and operators as needed.

All users are metered and fees assessed from a fee table. Average users pay about $260 per year.

The department is in the process of finding a long-term facilities expansion plan. The early system has enough capacity to service the well inside of the Dry Bridge Area along Route 4. However, this would require a joint effort with Lebanon, and they have shown little interest. The expansion plan details proposed areas for sewer expansion which would include serving about an additional 148 lots at a cost of $1.37 million. However, no method of funding such expansion has been developed.

TOWN OF ENFIELD
MUNICIPAL SEWER EXPANSION PLAN
NOVEMBER, 1997

The Enfield Municipal Sewer System was completed and placed into operation during the summer of 1988.

In 1992 the Town constructed a sewer extension to serve the Flanders Street area.

In 1997 the Propsect Hill area of Route 4 was sewered.

The Enfield Village Area currently has 352 units hooked up with capacity to accommodate an additional 250 to 350 single family homes or equivalent units.

The Route 4A area has 45 units hooked up with the ability to accommodate some 75 to 100 additional units along Route 4A from Evenchance Road to the Lebanon/Enfield town line.

The Lower Shaker Village Sewer System was acquired by the Town in 1997 adding 99 additional units to the system.

Enough reserve capacity was purchased from the City of Lebanon to eventually serve Enfield properties on the west side of “Dry Bridge Hill” (Route 4 from the intersection of Route 4 and route 4A to Daniel’s Trailer park, and some distance further east up the hill).

US ROUTE 4 ENFIELD SEWER EXSPANSION
2012

Approval of the Route 4 Sewer & Water Extension Project
March 17, 2012 Town Meeting Minutes

Article 5: To see if the Town will vote to raise and appropriate the sum of two million seven hundred fifty thousand dollars ($2,750,000) (gross budget) for the construction of a sewer main extension along US Route 4 from Baltic Street approximately one mile to the Enfield/Canaan town line, to raise and appropriate the sum of four hundred fifty thousand dollars ($450,000) (gross budget) for the construction of a water main extension along US Route 4 from Baltic Street easterly to approximately one mile to the Enfield/Canaan town line; to authorize the issuance of not more than $3,200,000 of bonds or notes and to authorize the Board of Selectmen to issue and negotiate such bonds or notes and to determine the rate of interest thereon, in accordance with RSA 162-K:8. All dedicated tax increments received by the municipality pursuant to RSA 162-K:10 shall be pledged for the payment of these bonds and used to reduce or cancel the taxes otherwise required to be extended for this purpose, and to authorize the annual withdrawal of funds from the Tax Increment Finance District Fund in an amount sufficient to cover payments of said bond in accordance with RSA 162-K.

Special Warrant Article
2/3 Paper Ballot Vote Required
The Board of Selectmen recommends this article by a vote of 2-0.
The Budget Committee recommends this article by a vote of 9-0.

J. Kluge made the motion to accept the article as printed; F. Cummings seconded. Town Manager Steven Schneider pointed out that the water/sewer extension project was the major reason the Tax Increment Finance District Plan was adopted in 2005. We have available sewer capacity to support new businesses and the availability of water and sewer will encourage commercial development. The engineering design has been completed and work may begin next month, April of 2012, and tentatively be completed by November.

Warrant Article Passed: Yes – 104 No – 33