Norwich Sewer Committee Report

Committee Members:

Lynn McGrew, Chairman
Daniel French*
Glennis Gold*
Jeff Goodrich**
Robert Haynes
Douglas Hoffman
Brian Livingston
Alison May*
Stuart L. Richards
Dean Seibert
Robert White

Dated June 23, 2005

*****Resigned

**Called to Active Military Duty

Norwich Sewer Committee

Executive Summary

The Sewer Committee provides here our summary findings by charge on a complex subject. To understand each issue more completely, how we made our determinations, and the material that we relied on to accomplish our task we ask the reader to refer to the page references at the end of each charge and the appendices.

1. Complete an overview of the existing use. To date and historically Norwich is and has been comprised primarily of single family stand alone homes. There are few condominiums, few apartments, and relatively few commercial properties. This historical settlement pattern has meant that the vast majority of septic systems are on-site and individual. There are a handful of community on-site systems for residential and commercial users. There is no municipal sewage disposal at present. (See Pp 7-8 for further information).

2. Determine whether or not there is a problem with the current system and make recommendation of changes. Vermont officials who have been consulted including engineers, administrators and regulators have told this committee that we do not have a problem with the current system. Two commonly held misperceptions are examined under this charge. The first is that the village is sitting on a cesspool. The second is that the suds that appear primarily in the spring indicate an environmental problem. Both are misperceptions and no problem has been identified. The number of failed sewage systems is few and there is no environmental reason to recommend changing the current system which appears to operate well. We do recommend that public education inform residents on appropriate maintenance procedures for on-site septic disposal and that storm water drainage be improved. (See Pp 8-10 for further information).

3. Evaluate whether a groundwater quality study is needed. No environmental problem requiring further study or expenditure of funds has been identified. Nevertheless, we include a very rough cost estimate for doing a study of this type. (See P 10 for further information).

4. Determine what area should be serviced by the study. The study focuses on three areas: (a) Central Village, (b) Land bounded by I-91, Rt.5south, Rt. 10A and the Hartford town line, and (c) River Rd from Lewiston to the Rt.5 junction. This selection was made for historical reasons, finite boundaries, and accessible location. (See Pp 10-11 for further information).

5. Review the future requirements of single site systems; determine if community septic fields (multi-site) could be utilized in Norwich. Single site systems remain a means of on-site disposal which can facilitate growth in both the Village and in the rural areas of Town where soils allow. Community systems of varying sizes are also possible and they could provide increased density. (See Pp 11-15 for further information).

6. Determine if we should construct a treatment facility or tie in to an existing facility. The high costs of constructing a treatment facility and operational costs as well as the difficulties in obtaining permits, have persuaded this committee that constructing our own facility is not a viable option. Tying into the Hanover system is theoretically possible. Hanover must address many issues relating to needed improvements and their current users before considering our request. Hartford may be receptive to Norwich tying into their system. (See Pp 15-17 for further information).

7. Determine land acquisition purchase expense, and costs, benefits and funding sources for both construction and operation of a municipal sewer system or a tie in to an existing facility. The estimated capital cost (not including financing) for sewer and water for Route 5 South and River Rd. plus the Village including Hawk Pine and Hopson Rd. could be $25,117,719. All estimates in this section for a number of different scenarios are approximations based on various assumptions and the limited engineering review of Dufresne-Henry Engineering. It appears that funding sources other than Norwich taxpayers will be limited if available at all. (See Pp 17-22 for further information).

8. Review the possibility of phasing in the project and determine what the effect of the development will be on Norwich. Phasing is commonly done and usually possible. It can serve to lessen the impact of development by spreading it out over a longer time and payback period. See Charge 9 for the effect of development. . (See Pp 22-25 for further information).

9. Determine what effect the general growth will be on the quality of life in Norwich. Any growth will involve change. The degree of change to the community is related to the amount of growth. Whether this change improves or degrades the quality of life depends on a person's outlook. Quality of life will be different for different people, for some better, for others worse. For some, significant change promoted by community or municipal sewer represents an opportunity to diversify the community by providing affordable housing, increased school census, and increased jobs and commercial opportunities. For others, this same growth will increase infrastructure costs, degrade property values, increase traffic, and change the small town that we know into a larger town that is foreign. The Committee believes the best way to resolve these issues is through public discussion, revision of the Town Plan, and through the ballot box. (See Pp 26-30 for further information).

10. Perform an analysis of Planning/Zoning development issues that would be impacted by a municipal sewer system. The town's present policy and regulatory framework do not address a sewered future. Both the town's zoning and subdivision regulations would need to be revised to accommodate sewer service areas, costs and policies. Issues that would be impacted by municipal sewer are municipal infrastructure and costs including roads, fire, police, schools and quality of life. Both zoning and subdivision regulations would likely require change to include higher density where on-site community or municipal sewerage was available. The establishment of sewer districts with different types of housing – apartments, condominiums, commercial properties, and possibly new height restrictions are likely . These and other considerations would be part of the zoning and subdivision changes. Prior to moving forward with either municipal sewage or community septic programs which involve town funding, a town-wide conversation and approval process is necessary. (See Pp 30-32 for further information).

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Sub-Committee Charges:

Sub-Committee 1. Items 1-3 on the Selectboard Charge – Lynn McGrew, Coordinator, Brian Livingston, Stuart L. Richards

1. Complete an overview of the existing use
2. Determine whether or not there is a problem with the current system and make recommendation of changes.
3. Evaluate whether a groundwater quality study is needed

Sub-Committee 2. Items 4-7 on the Selectboard Charge – Douglas Hoffman, Coordinator, Robert Haynes, Dean Seibert, Jeffrey Goodrich

4. Determine what area should be serviced by the study.
5. Review the future requirements of single site systems; determine if community septic fields (multi-site) could be utilized in Norwich.
6. Determine if we should construct a treatment facility or tie in to an existing facility.

7. Determine land acquisition purchase expense, and costs, benefits and funding sources for both construction and operation of a municipal sewer system or a tie in to an existing facility.

Sub-Committee 3. Items 8-10 on the Selectboard Charge – Robert White, Glennis Gold, Daniel French

8. Review the possibility of phasing in the project and determine what the effect of the development will be on Norwich

9. Determine what affect the general growth will be on the quality of life in Norwich

10. Perform an analysis of Planning/Zoning development issues that would be impacted by a municipal sewer system.

Alison May – Floater between sub-committees

Introduction

This study was initiated by unanimous action of the Norwich Selectboard. The Selectboard appointed 11 members, all those who applied, in October, 2003 to a Sewer Committee. Over time, 3 members resigned, and a 4th member was called to military duty, reducing the final number to 7 before completion of this report. The Sewer Committee was charged with gathering and analyzing information relating to municipal and on-site sewage disposal possibilities and with making recommendations based on the ten Selectboard charges. The issues under consideration which were part of the Selectboard charges are not new to Norwich. The issues of cost, advisability, practicality and desirability related to municipal sewage disposal have been studied a number of times and each time the idea has been either rejected or deferred. Even though much of the information uncovered by the sub-committees is not new some of the circumstances, attitudes and needs of the town may have changed in the intervening years since the last study. This study tries to assess the previous information as well as changes that may have occurred since the last study in addition to updating the factual context. Historically, there have been at least 5 prior studies done. These studies and their outcomes are described in Appendix 1 of this report. New information relating to the potential for community disposal systems and new state regulations and standards which encourage community systems are analyzed. This report is organized by numbered charge and the response to each charge as it has been presented by each sub-committee. The Final Report begins with an Executive Summary which presents in concise form the issues and findings, and recommendations of this committee with a reference to the portion of the report that goes into greater detail. The appendices provide greater information which explain in part how we reached some of our conclusions.

Background

Two primary reasons have been identified to justify the creation of municipal sewage in Norwich. The first is the presence of environmental hazards in either the ground or surface water caused by numerous failures of on-site sewage systems, or other causes, which present a health threat and require remediation through municipal sewage. The second justification for municipal sewage is to promote development of various kinds - commercial, residential high density, affordable housing, etc. Various benefits have been suggested as a rationale for increasing development. The short list drawn by supporters of increased development suggests that increased development may lower taxes and it may foster a more diverse and "vibrant" community with greater job opportunities. Opponents of increased development which will result from municipal sewerage have focused on the negative impacts to the quality of life, a change in the historical character of the town attributable to high density housing and or increased commercial development. Charges 1-3 deal with an overview of existing on-site sewage disposal and an examination of any current environmental problems that may exist as a result of our current development patterns. Charges 4-10 address the costs, benefits and negatives of municipal and community sewerage and or problems specified in the charges. In many ways, with 20/20 hindsight, the Sewer Committee's charges appear to be a bit premature because the town's current efforts to rewrite it's zoning regulations and prepare a new town plan and do a town survey of opinions appear to be the best venue through which to consider a sewered or non sewered future.

Charge #1 - Complete an overview of the existing use

Today the town of Norwich is comprised almost exclusively of single family residences utilizing individual on-site septic systems. There are few condominiums and limited commercial development of approximately 50 businesses (including retail, restaurants, an hotel, office space, and financial offices). There are approximately 1,371 stand-alone residences in Norwich, with about 300 of them in the Village. The standard state allocation for on site sewage is 70 gallons per person per day (140 gallons per bedroom) with an average occupancy of 3 inhabitants per dwelling or 210 gallons of sewage generated per dwelling. This results in approximately 60,000 gallons per day billed in the Village of Norwich through the community Fire District's water system for the approximately 900 residents of the village. This historical settlement pattern of single family homes, very few condominiums, and limited commercial development has meant that almost all residential sewage disposal throughout town is individual and "on-site", rather than community or municipal.

The exception to this historical settlement pattern of single-family, stand-alone dwellings is the approximately 3% (46 of 1417) of Norwich's housing stock which is multi-unit (more than 3). These condominium units are served by community on-site systems. They are:

1.	Heritage	8 Units	11.2 Acres
2.	Elderly Housing	24 Units	3 Acres
3.	Norwich Meadows	14 Units	22 Acres

In addition to these condominiums, Starlake Village with 13 units and Hopson Lane with 5 units, are served by on-site community sewage disposal systems. Elderly housing generates approximately1893 gal./day of effluent due in part to the lower occupancy of each unit.

Some of the commercial and larger scale on-site systems may have, multiple users. They are:

Facility	Gallons of water/day *.
Marion Cross School	890
Dan& Whits	1000
Norwich Inn	1870
Carpenter and Main St. Building	1600
Charter One Building	300
Ledyard Building	100
Mascoma Bank	62
Norwich Square	1800
Emerson Ct.Nursery	60
Aldrich House	190
Parker House	134

Water utilization varies to some degree depending on the time of year. The estimates above were calculated in the spring quarter when percolation was slowest.

Estimates of the current volume of septic on River Rd and Rt 5 south were based on water usage by properties in Lewiston, and the number of employees and type of businesses on Rt. 5 and River Rd. as reported during a visit to each, The assumption was made that the fourteen units in the Ledges generate 3700 gallons/day and that the average home on River Rd has six residents.

On the basis of these assumptions, the estimated current daily volume would be;

Rt. 5 south	3000gal./day
Lewiston	55 gal./day
River Rd.	8840 gal/day
Total	11,900 gal/day

A further exception to the single-family, stand-alone pattern in Norwich is the presence of approximately 167 apartments[1] on the same property as single family residences (in garages or ancillary buildings) or, as for most of the apartments, in the same structure as the primary residence. Of the 1417 dwelling units[2] about 44 are 2nd dwelling units on the same property. Probably most of these apartments share the same septic system as the primary residences.

Charge #2- Determine whether or not there is a problem with the current system and make recommendation of changes.

In the village there have been few on-site septic failures reported in the last ten years. (Appendix 5 is a map showing the soil quality and failure locations over the last 9 years). According to Norwich's Zoning and Planning Administrator, Phil Dechert, those sewage system failures that have occurred are mostly attributable to end-of-useful life or poor maintenance practices. According to Roger Thompson, Program Manager, Wastewater Dept. Vermont Environmental Conservation Dept., as systems fail, the replacement systems will tend to be more modern and effective than the systems they replace because of changes in technology and sometimes because of changed regulations. (See Appendix 3, Minutes/Notes of Roger Thompson's presentation on 10/31/03.)

Two anecdotal misconceptions have been evaluated. The first is that Norwich is "sitting on a cesspool." Thompson stated that this is most unlikely. He said that most effluent is treated by the soils it passes through after it travels a very short distance and that it is unlikely to end up in the ground water. The most likely explanation for odors that occur is that they are probably generated by naturally occurring vegetative or chemical agents. He further stated that even if there were pollution in the groundwater it would not constitute a health hazard in Norwich because we have a community water supply which is not affected by ground water. In addition, water quality tests are unnecessary since virtually everyone in the village is on town water. (See Appendix 3)

Terry Shearer, Regional Engineer for Windsor County, said "He doesn't feel, with his experience as Area Engineer, that surface water testing is necessary, and that the problem areas in the village have been taken care of by new modern systems."

[1] This information derives from the preliminary 2004 Grand List in which the word "apt(s)" is present. If "apt(s)" is not used to describe a property, then an apartment would not be included in this number. Accuracy in this count may also suffer from an unknown number of apartments which may not actually be utilized as a dwelling space or when the apartment may not be separated from the main space within the same building.

[2] This number is obtained by sorting the 2004 Interim Grand List using the words/phrases "dwl" and "house" and adding "apt" to it.

Another set of comments related to the advisability of testing and potential problems in Norwich came from a meeting with Larry Fitch, Division Director of Facilities Engineering Division, and Alison Lowery, Waste Water Management, Principal Soil Scientist at the Agency of Natural Resources in Waterbury. The meeting took place on Oct 15, 2003. They said, " A hydrogeologic study is not needed at this time. Norwich is not on any watch or mandate list. Funding for municipal systems in the absence of environmental problems is not readily available. Grants and loans are possible for studies. Surface water sampling would be of interest to the state , but we don't feel it is necessary."

The second popular misconception is that there is an environmental problem related to "suds" which appear primarily in the spring and at other times of the year. Tom Willard said that these are usually naturally occurring and generally caused by surfactants such as pollen which tend to break up the surface tension of the water and create suds. They are usually nothing to be concerned with. John Lawe, Md., Norwich Health Officer, said much the same at a subsequent meeting. (See Appendix 4 for Tom Willard's additional comments)

Limited studies of E-coli and macro-invertebrates in Blood Brook were done by the Norwich Conservation Commission and by Lindsay Putnam, respectively, in the summer of 2003. Neither study pretends to be definitive or conclusive, nevertheless we include them here as Appendix 6/7 since they can form data points for future studies if any are done. The Norwich Conservation Commission has completed further studies of Blood Brook and other brooks in 2004 which appear to show low to very low E-coli readings with the exception of two extremely high spikes in July.
(See http://www.anr.state.vt.us/dec/waterq/cfm/volmon/index.cfm
Then go down to Norwich Conservation Commission and click.
The initials are for various locations on Bragg Brook (BR), Blood Brook (BB), New Boston Brook (NB) and Charles Brown Brook (CB). The "A" and "B" reflect the duplicate samples taken simultaneously at each site.)
This data has not been professionally analyzed at this time. Once it is analyzed it is suggested that the Selectboard review it to see if any action is indicated. If there were a pollution problem in Blood Brook it is more likely than not that the problem would be a result of a few failed systems which would require replacement or repair. It would be hard to justify the Town spending large sums for a municipal sewage system to cure a few failed systems when all that is needed is to repair or replace them. Also included are comments from Jeff Goodrich, Engineer, relating to the Conservation Commission study included as Appendix 8.

We are fortunate to have, according to the 1996 soils maps (Appendix 5), the most suitable soils available for on-site sewage disposal, throughout the village, with the exception of the Carpenter Street area. Historic on site septic failures and the reasons for these failures are shown on information supplied by Phil Dechert, Norwich Zoning and Planning Administrator. (Appendix 5).

In the course of investigating potential sewage or contamination problems in town a number of individuals provided information to help us determine if problems exist. They were: John Lawe, Norwich Health Officer, Phil Dechert, Norwich Zoning and Planning Administrator, Tom Willard, Deputy Director, Agency of Natural Resources, Water Quality Division, Roger Thompson, Program Manager, Wastewater Dept. Environmental Conservation Dept., Terry Shearer, Regional Engineer for 'Windsor County, Garry Gulka, Chief Waste Prevention Section, Allison Lowry, Principal Soil Scientist Wastewater Management Division, Larry Fitch, Division Director Facilities Engineering Division, Frank Olmstead, Norwich Conservation Commissioner, Lindsay Putnam, former Conservation Commissioner and Brion McMullen, Administrator Norwich Fire District Water System.

Based on all the information that we have received and investigated and the professionals that we have talked to and relying on their expert opinions, we have not been able to find any existing septic or sewage related environmental problem that requires the expenditure of town funds for either correction or for further study. Individual septic systems that fail should continue to be dealt with by the individual owners involved.

Charge #3- Evaluate whether a groundwater quality study is needed

Based upon the information received in Charge #2, it is this committee's clear opinion that a study of groundwater quality is not warranted. To date no problem has been identified that would require such a study. Therefore, the expenditure of funds for a groundwater study appears to be unwarranted at this time. There appears to be no environmental problem that would require the construction of a municipal sewage system, either as an extension to another town's municipal sewage system or as a rationale for the construction of publicly owned community systems.

For the record, a rough quote was obtained from Enman Engineering to do a groundwater and surface water study. (See Appendix 9.)

Related Recommendations-

The current usage of on-site, privately owned, septic disposal systems has been effective in providing safe and sanitary removal of septic waste for the load that it carries today. It appears that continuation of this historical pattern of on-site systems will allow for additional incremental development throughout town. Measures that might be taken to ensure safe and sanitary continued operation of these systems in the village and throughout town are:

1. Initiate educational programs encouraging Norwich residents to install water conservation devices and procedures
2. Educate residents to pump their septic tanks at appropriate intervals since most septic failures appear to be a result of improper maintenance.
3. Storm water drainage should be improved and extended to help to control ground water levels
4. Abatement efforts to reduce storm water run off from Hawk Pine should be explored.
5. Responsibility for advocating for the above should be defined within Town government and might include the Selectboard, Planning Commission, Fire District's Water Department, and the Conservation Commission among others.

Charge # 4 - Determine what areas should be served by the study.

Much of the information contained in Charges 4-7 was reviewed by the engineering firm of Dufresne-Henry.

Three geographic areas were selected as the principal foci for this report. Each has been identified in the Town Plan and by the Mixed-Use Commercial Development Study Group of the Planning Commission (1997) as logical places for commercial growth and possibly higher density housing. All are areas that have either been specifically designated for commercial development or have historically been characterized by mixed uses.

The Committee considered areas that are relatively well delineated by finite boundaries such as the fire district, current zoning districts or regions that are naturally demarcated by roads or terrain. A case could be made for including other areas that may in the future be considered for development. While lands west of Route 5 South could readily be accessed if sewerage were installed in the Rt. 5 south corridor, west of Rt. 5 is currently zoned rural residential in

which commercial or high density residential development is not permitted. Furthermore , there are no physical features which naturally delineate developable land in this area. Consequently the committee concluded that inclusion of that land in planning for sewerage is contingent on further discussions of the Planning Commission which is currently ongoing related to mixed-use districts and the Select Board.

Beaver Meadow, Union Village and Pompanoosuc are hamlets within Norwich, which have not been considered in this study but which in the years ahead may become centers of modest growth. While it is unlikely that those hamlets could be served by conventional municipal sewerage the potential of community on site systems remains to be explored. Because the ability of the town to invest in sewerage is finite, the future septic requirements of the hamlets should be addressed if balanced growth in Norwich is to be achieved.

Study areas include

(a) Central Village

(b) Land bounded by I-91, Rt.5south, Rt. 10A and the Hartford town line

(d) River Rd from Lewiston to the Rt.5 junction.

Charge #5 - Review the future requirements of single site systems; determine if community septic fields (multi-site) could be utilized in Norwich

A. Community on site septic systems are not new but newer and advancing technologies now provides alternative solutions to waste disposal in a much greater variety of circumstances. The utility of these systems is site specific. In Norwich they may have relevance to areas of the Village, to areas designated for commercial development and to locations where conventional municipal sewer systems are not at all practical.

B. Land characteristics and acreage theoretically suitable for on site disposal:

River Rd.

Route 5 south

In order to estimate the acreage suitable for on site systems in the three areas under consideration, Rt. 5south(East), Lewiston, and River Road a one half inch grid was placed over soil maps on which land is designated as well suited, moderately well suited, minimally suited or unsuitable for on site septic. The soil maps themselves are approximations. This method of determining acreage, while simple, seemed to correlate reasonably well with Planning Administrator Phil Dechert's computer analysis of some sample areas.

Rt.5 South including Dresden Property

Class	Acreage
Well Suited	2.2
Moderately well suited	37.6
Minimally suited	53.35
Total	93.15
Wetlands	17.00
Total	110.05

Excluding Dresden Property

Class	Acreage
Well suited	2.2
Moderately well suited	8.5
Minimally suited	21.4
Total	32.1

Lewiston

Class	Acreage
All soils are disturbed but are likely to be moderately well suited	3.0

River Rd,

Class	Acreage
Well suited	.9
Moderately well suited	7.0
Disturbed but probably are likely to be at least moderately well suited	2.4
Total	20.3
Wetlands	48.00

Currently Rt5 is divided into 15 parcels, Lewiston into 8parcels and River Rd. into 20.
In order to determine the amount of acreage required to handle on site septic at various build out densities a number of assumptions have been made.
Every element of this "Build- out " is highly speculative. The soils data, on which it is predicated while, providing some guidance, may be inaccurate when applied to specific areas and is insufficient to allow any firm conclusions to be drawn.
The assumptions on density and use are made only for purposes of illustration. Clearly decisions on these features would have to be made for a "build out" to have substantive, real world relevance. The purpose of this exercise is merely to make some guestimate of the volume of septic that might be generated if the areas under consideration were fully built out. Time is also an unknown variable. It is probably reasonable to assume that River Rd and Rt. 5 south would not be fully built for many years to come. On the other hand if additional infrastructure made these areas attractive to major developers this time frame might be dramatically shortened.
Assumptions
1. All land designated on USDA Ancillary Soil Ratings maps designated as (a) well suited, (b) moderately suited and (c) marginally suited is considered as potentially developable. Land designated as wetland has been excluded. No consideration has been given to the fact that slopes, setbacks, buffers etc would reduce the number of developable acres
2. Calculations have been based on the assumption that each unit developed would have a septic requirement equal to that of a single-family residence. Clearly this would not be the case but it is a place to begin. While in general, businesses in town except for hostelries produce less septic than homes with a comparable number of people over a twenty four hour period there are exceptions to this and future exceptions could be very large depending on the nature of the business.
3. Two scenarios have been used for illustration. One assumes a density of four units per acre and the other assumes a density of eight units per acre (approximately the density of the senior housing units in the center of the Village)
4. For purposes of calculating the amount of acreage necessary to handle on site septic for the two densities selected it is necessary to use an "application rate " a measure of the amount of land necessary to accommodate a given amount of septic based on the characteristics of the land. We do not have the data on the land under consideration to permit anything but a guess There is apparently only a marginal correlation between the general soil characteristics

described on USDA soil rating maps and application rates for a specific piece of land. An application rate of 0.35 GPD/square foot would be considered a low rate. Whether it is low enough for the land under consideration is unknown but it is the figure that has been applied to all land on the USDA maps not designated as wetland.
5. An application rate of ,35GPD/square foot of land results in a figure of 3.5 acres required to handle 10,000 GPD. (Forcier and Aldrich sample disposal field layouts for 10,000GPD) From this, the assumption has been made that for every 10,000 gallons of septic produced at a given density of development 3.5 acres should be allocated for sewerage. Such an extrapolation may be fraught with error.
6. On -site systems that exceed 30,000 gallons per day fall into a different regulatory category. The assumption is that multiple onsite systems, developed as the demand increases would be required.
7. Above a certain volume, indirect discharge regulations apply. No calculation of this factor is included
8. The calculations on available developable land were made as though none of the land was currently developed and that all of the land, currently held by approximately thirty-five owners would be developed at a density equivalent of either four or eight units per acre.
It is assumed that each residential unit would discharge 245 gallons per day (design flow Environmental Protection Rules Chap 1 Wastewater System and Potable Water Supply Rules Aug, 2002)
Methodology

1. A grid of half inch squares was placed over the USDA soil maps and the number of acres of developable land on the east side of Rt.5 south, River Rd. and Lewiston was determined
2. An illustration by Forcier and Aldrich Engineering demonstrating that 3.5 acres of land is necessary to handle 10,000GPD at a low application rate has been extrapolated to each 10,000GPD generated by the hypothetical densities of four or eight units per developable acre
3. There are 43,560 square feet in one acre

Sample calculation
Rt. 5
Number of developable acres (including all Dresden land) =93
# of units at a density of four acres per unit = 372
Gallons per unit =245
Total # gallons per day = 245x372 = 91140

Sample calculation for determining the necessary acreage for an onsite system
3.5 acres required for each 10,000 gallons
91140 gallons produced so # acres required =3.5x91140 divided by 10,000 = 31acres. These 31 acres would be deducted from the 93 acres leaving 62 acres or room for 248 dwellings
Results: Gallons per day
Rt5 including Dresden (93 acres) Dresden encompasses approximately 75% of developable lands of the Rt5 south commercial area.
4 units/acre = 91140 GPD
8 units/acre = 182280 GPD
Rt5 excluding Dresden (21 acres)
4 units/acre = 20580 GPD
8 units/acre = 41160 GPD
Lewiston (3) acres
4 units/acre = 2940 GPD

8 units/acre = 5880 GPD

River Rd (20 acres)
4 units/acre = 19600 GPD
8 units/acre = 39200 GPD
Total gallons per day at a density of 4units per acre (Dresden included) = 113,680gpd
Total gallons per day at a density of 4units per acre (Dresden excluded) = 43,120
Total gallons per day at a density of 8 units per acre (Dresden included =227,360gpd
Total gallons per day at a density of 8 units per acre (Dresden excluded = 86,240gpd
Results: # acres required for on site system
Rt5 including Dresden (93acres)
4 units/acre = 32 acres
8 units/acre = 64
Rt5 excluding Dresden(21 acres)
4 units/acre = 7 acres
8 units/acre = 14 acres
Lewiston (3 acres)
4 units/acre = 1 acres
8 units/acre = 2acres
River Rd (20 acres)
4units/acre = 7 acres
8 units/acre = 14 acres

Conclusion: Based on a set of assumptions which are hypothetical, on site systems would reduce the acreage for development at a density of 4 units/acre by approximately one third and approximately two thirds at a density of 8units/acre. The amount of land required should be increased by 60% if set back requirements are included.

D. Further Study Requirements
On site community systems are site specific and require sophisticated technical expertise. The problem in Norwich is further complicated by the fact that the areas under consideration have multiple owners so that only the most preliminary assessment of what could be done in theory can be made. Several additional steps would be necessary before a reasonable assessment of feasibility could be determined Subsequent steps would include.

Feasibility Study
a. Engineering table top analysis
b. Limited cost analysis

Preliminary Engineering
a. On site field analysis, testing
b. Detailed cost analysis of alternative on site systems
c. Recommendations and solutions

Pre Design
a. Archeological investigations
b. Hydrogeologic/aquatic analysis
c. Bond vote

Final Designs
Construction

E. Vt. Technical Requirements for on site systems
For systems handling between 6500 and 30,000 gallons per day septic tanks and two alternating subsurface disposal systems each at 100% of capacity are required

Sub-surface disposal of 30,000 to 50,000 requires two alternating subsurface disposal systems each at 100% of capacity, BOD/TSS effluent of 15/15 mg/liter with sand or textile filters. A discharge of greater than 50,000 gallons also requires two alternating disposal systems in addition to secondary wastewater treatment, including BOD/TSS , phosphorus and nitrogen removal. These requirements are spelled out as of April 30, 2003, in Vt. EPR's Chapter 14 " Indirect Discharge Rules"

F. How an onsite community system works. There are many variations on the theme but the Warren Vt. Demonstration is illustrative of the principles involved. Warren has 1600 residents most of whom are served by individual septic systems. The new system, as previously indicated will serve 85 properties and has a capacity of 30,000 gallons per day. A reduction in the amount of discharge is an important goal so educational efforts to reduce wastewater production by the use of low flow toilets, shower heads etc. is an important component of the project. Sewage from homes and businesses first flows into the owner's septic tank. Individual tanks will be pumped out on a scheduled basis and the sludge will be removed from site by a hauler Effluent from the properties then flows by gravity or is pumped by a low pressure pump into a central station. It is then pumped into a 50,000 holding tank, where it passes through a series of filters. Subsequently, the effluent, which is at this point, is essentially clear flows into one of six leach fields. Six other leach fields are held in reserve. The leach fields are beneath athletic fields and above ninety feet of sand and gravel.

User charges are $4.00 per 1000 gallons plus a base charge of $200.00 per living unit plus $47.00 per bedroom

This demonstration project was financed as follows

1,500,000 –EPA Grant
1,300,000 - EPA STAG Grant
800,000 – State Pollution Abatement Grant
830,000 – Town Bond Issue
$4,430,000 Total Cost + Land

The Town is the administrative body, does the billing and will be responsible for administrative maintenance. The system involves sophisticated monitoring of flow and components of the effluent, which is carried out electronically from the state of Washington. The operator of the system is Simon Operations Systems (S.O.S.) of Waterbury.

Charge #6 - Determine if we should construct a treatment facility or tie into an existing facility

A. The question of the construction of a sewage treatment plant for Norwich was not pursued in depth. The cost, concern about regulatory impediments, and the feasible option of linking to an existing facility in an adjacent town suggested that a more comprehensive analysis was not warranted

B. Tying into an existing facility. There appear to be no regulatory prohibitions against Vt.- N.H. cooperative programs for septic disposal. See Appendix 2 for descriptions of inter-state and intrastate co-operative arrangements between towns in Vermont and New Hampshire.

(a) Discussions with Hartford:

Members of the Norwich Sewer Committee met with Hartford Town Manager Hunter Rieseberg and Public Works Director Rich Menge in March 2004. Numerous follow up meetings were held between Mr. Rieseberg and Bob Haynes to determine Hartford's willingness to continue with these conceptual discussions. According to Mr. Haynes:

"Mr. Rieseberg has repeatedly indicated his willingness to discuss this possibility. He suggests that this is not a new analysis, having reviewed the potential for the Dresden School District to connect to Hartford's system for playing fields with facilities on the former CO-OP land. While Hartford must remain mindful of its needs to accommodate future growth in its residential housing base and commercial areas such as Sykes Mountain Avenue, Quechee Village, the Dothan area and Rt5 south of the Veterans Administration Hospital, Mr. Rieseberg has encouraged us in two ways.

First, Hartford is in the midst of a several year process of physically separating storm water catch basins and drains from sewer mains in some areas of town (archaic design-not unusual- Lebanon is doing so as well). These connections require expensive and unnecessary treatment of clean water as it mixes with sewerage. An example of this work is a project scheduled this summer ('06) for the Taft Flat section of Route 5. These improvements will continue to increase the overall capacity of Hartford's municipal system, despite significant recent growth and new connections.

Second, Mr. Rieseberg stated that he and his Public Works personnel are amenable to the concept of allowing connection by Norwich, if it will underwrite the costs of increasing and/or improving Hartford's system which are required by this connection. Obviously, any agreement would be subject to approval by the Hartford Selectboard. A very rough estimate of $500,000 to $1,000.000 was suggested in order to accept 100,000 GPD of effluent. (100,000 GPD translates into roughly 450 housing units).The higher number would likely be required if any plant expansion were necessary at the time of the connection. Something closer to the lower end of the range is possible if only upgrades to piping, pumps and associated infrastructure in the vicinity of Olcott Drive and Route 5 were necessary.

A central element to any agreement would be that Norwich's gallonage would be guaranteed. In return, Norwich would contribute to future plant upgrades and improvements on a pro-rata basis (Norwich's percentage divided by Hartford's total capacity). Plant expansions are typically planned in units of 100,000 GPD. Therefore, if Norwich needed more than 100,000 GPD, a 200,000 GPD expansion would be required and would need to be paid for. Obviously, a more precise estimate of average daily flows, the type of effluent (toilets only, chemical waste, food processing?) and a time line would be necessary in order to develop a meaningful budget.

Finally, Mr. Rieseberg suggested that operational costs would be billed directly to users at par with Hartford rate payers; in other words, without any mark up to Norwich customers."

Hartford presently treats 1.2 MGD at a cost of $800k/yr.

(Additional information is provided in Charge 7 of this report)

(b) Discussions with Hanover
Members of the Norwich Sewer Committee met with Hanover Town Manager and the Director of Public Works in November 2003.
Although Hanover is willing to discuss a sewer connection with Norwich they are faced with a number of uncertainties that they must resolve before it is possible for them to contemplate additional demands on their system. These uncertainties include the status of development in Centera, their obligation to the Hospital their connection with West

Lebanon and their response to a federally related mandate for an update of their system that may cost approximately $8 million. These uncertainties will likely put off for several years any consideration by Hanover of a tie in by Norwich.
(c)Consideration of administrative relationships with other towns for septic disposal

C. Administrative relationships with other towns
Self interest and joint interests may be competing concerns in any cooperative relationship between municipalities. In the absence of legislation or regulation that mandates such cooperation, in the best case scenario there would be recognizable benefits to both parties that would at least balance anticipated liabilities. This dichotomy must be of particular concern to Norwich for if the decision is made to encourage or to accommodate growth that is dependent on septic disposal in an adjacent town, it is reasonable to assume that in a relative short period of time there would be no reasonable contingency

There are examples of Norwich purchasing services from adjacent towns that have their supporters and detractors. As the needs and resources of each town evolve, so the rationale for those relationships grows or diminishes.

If Norwich were to enter a compact with an adjacent community for septic disposal it is reasonable to assume that Norwich would be interested in safeguards so that some control of our own destiny is assured. This might be best achieved by contracting for or buying capacity for an extended period of time along with an option to buy and build capacity as required in the future. Clearly any recipient town might expect to set a fair price for their participation. If the Norwich Select board should enter substantive negotiations for septic disposal with either Hartford or Hanover it would be wise to explore in detail examples of such partnerships
Further discussions with either Hartford or Hanover require some estimation of the anticipated volume of flow. Other factors such as the nature of the contents of the effluent would factor into cost and feasibility but the principal factor is volume for this determines the ability for the receiving town to accommodate Norwich either now or in the future. Please refer to Appendix 2 for further information

Charge # 7 - Determine land acquisition, purchase expense, costs and benefits and funding sources for both construction and operation of a municipal sewer or tie in to an existing facility

See charge #6 for concerns related to the construction of a sewer plant in Norwich

A. Capital Costs

1. Engineering studies
The State of Vermont fee allowance formula to review standard projects. is Preliminary Engineering 3.45% of construction, Final Design 6.9% and Construction Phase Engineering 12.65%, for a total engineering allowance of 23% These percentages are used for budget purposes. Actual fees are subject to negotiation and vary with project complexity.
Preliminary Engineering provides the facility planning necessary to define a project sufficiently to take it to the voters for a bond vote and to submit it to the regulatory authorities for project approval. This is typically referred to as Step I. Step II is Final design. Sometimes additional services are required beyond engineering, such as archaeological, wetlands investigations, and ACT 250 review. The final phase is Step III, or construction.

2. Land acquisition
The purchase of land might be required for pump stations and right of ways Substantial land would be necessary for on site disposal. No estimates for the cost of land and legal fees have been made since these expenses would be driven entirely by the design of the system.

3. Pipe
The cost of purchasing and laying pipe includes trenching, road resurfacing and miscellaneous items. Since these costs are entirely dependent on terrain and complexities introduced by existing development, two estimates, a high and a low have been used in these calculations These estimates have been derived from current figures derived from projects in other communities and by extrapolation from the Engineering News Record (ENR) Cost Index applied to the 1967 report on installing sewerage in the village of Norwich.

4. Pumps
Depending on the terrain high or low-pressure pumps may be required.
Cost estimates of $110,000 for a low-pressure pump and $220,000 for a high-pressure pump have been used in the following calculations.

Village District, limited to the fire district with extension to Hanover =50893 lineal feet of pipe, one low pressure and one high pressure pump

	Pipe	Pump	P+P	Eng. (23%)	Total
@$100/ft	$5,089,300	$330,000	$5,419,300	$1,246,439	$6,665729
@$150/ft.	$7,633,950	$330,000	$7,963,950	$1,831,708	$9,795,568

Village District limited to the fire district with extension to Hartford=56118 lineal feet of pipe, one low pressure and one high pressure pump

	Pipe	Pump	P+P (23%)	Eng.	Total
@$100/ft.	$5,611,800	$330,000	$5,941,800	$1,366,614	$7,308,414
@$150/ft.	$8,417,700	$330,000	$8,747,700	$2,011,971	$10,759,971

Village District with addition of Hawk Pine and Hopson Rd. Extended to Hanover. This extension adds 19,125 ft. for a total of 70,018ft.

	Pipe	Pump	P+P (23%)	Eng.	Total
@$100/ft.	$7,001,800	$330,000	$7331,800	$1,686,314	$9,018,114
@$150/ft.	$10,502,700	$330,000	$10,832,700	$2,491,521	$13,324,221

Village District with addition of Hawk Pine and Hopson Rd. extended to Hartford. This extension adds 19,125 ft. for a total of 75,243ft.

	Pipe	Pump	P+P a(23&)	Eng.	Total
@$100/ft.	$7,524,300	$330,000	$7,854,300	$1,806,489	$9,660,789

@$150/ft	$11,286,450	$330,000	$11,616,450	$2,671,783	$14,288,233

River Rd. District to Hanover=6000 lineal feet. Two low-pressure pumps required

	Pipe	Pump	P+P	Eng. (23%)	Total
@$100/ft.	$600,000	$220,000	$820,000	$188,600	$1,008,600
@$150/ft.	$900,000	$220,000	$1,120,000	$257,600	$1,377,600

River Rd. District to Hartford.= 13,850 lineal feet. One low pressure and one high-pressure pump required

	Pipe	Pump	P+P	Eng. (23%)	Total
@$100/ft.	$I,385,000	$330,000	$1,715,000	$394,450	$2,109,450
@$150/ft.	$2,077,500	$330,000	$2,407,500	$553,725	$2,961,225

Rt.5 South District to Hanover=7850 lineal feet. One low-pressure pump required

	Pipe	Pump	P+P	Eng. (23%)	Total
@$100/ft.	$785,000	$110,000	$895,000	$205,850	$1,100,850
@$150/ft.	$I,177,500	$110,000	$1,287,500	$296,125	$1,583,625

Rt. 5 South to Hartford=5225 lineal feet. One low-pressure pump required

	Pipe	Pump	P+P	Eng. (235)	Total
@$100/ft.	$522,500	$110,000	$632,500	$145,475	$777,975
@150/ft.	$783,750	$110,000	$893,000	$205,562	$1,098,562

Capital costs for an entire system connected to Hartford

Village including Hawk Pine +Hopson Rd 70018 lineal feet
River Rd 6000 lineal feet
Rt. 5 south (minus 10A 0r 1500ft.) 6350 lineal feet
Total 88718 lineal feet

Four low pressure and one high-pressure pump required

	Pipe	Pumps	P+P	Eng. (23%)	Total
@100/ft	$8,871,800	$660,000	$9531,800	$2,192,314	$11,724,114
@150/ft.	$13,307,700	$660,000	$13,967,700	$3,212,571	$17,180,271

Plus Contingency fee of 20%

Total construction cost for Norwich sewer system, not including expansion of Hartford plant and not including the cost of a bond

Low $14,068,936

High $20,616,325

Cost of adding capacity to Hartford treatment plant

Mr. Hunter Rieseberg, Hartford's Town Manager, has indicated that, subject to Select Board review and approval Hartford might be able to accept from Norwich up to 100,000 gallons of sewage per year. This would necessitate up grading pumps, valves main size etc. at a cost of $500,000 to $1,000,000.
Other figures indicate that Hartford has 9991 gallons of reserve capacity at this time. Presumably this discrepancy is related to the fact that Hartford will reduce the amount of storm water handled by the plant thereby adding reserve capacity. According to the EPA the long term consequences of "tightening up the system" may be less than expected.
Average costs for constructing additional plant capacity estimated by Dufresne-Henry are between $10.00 and $15.00 per gallon received. The projected # of gallons based on the volumes generated by the current Fire District, and estimates based on low and high density build outs of Rt. 5 South District and the River Rd District are as follows:
Fire District 60,000gpd.
Rt. 5 South (Dresden included at 4 units/acre 91140gpd.
Rt. 5 South Dresden included) at 8 units /acre 182280gpd
River Rd. 4 units /acre 245480gpd
River Rd 8units/acre 45080gpd

Total at 4units/acre +current Fire District 221,700gpd
Total at 8units/acre+current Fire District 287,360gpd.

Hartford construction costs for 287,360	at $10,00/gallon=	$2,873,600
Hartford construction costs for 287,360	at $15.00/gallon=	$4,310,400

Water for River Rd and Rt5 South-
If municipal sewerage served Rt. 5 South and River Rd. a significant additional demand for water for human consumption, fire protection and commercial development would occur and extension of municipal water to those areas would be required
Currently the Water District delivers approximately 61,000 gallons per day to its subscribers. The aquifer now used is an almost limitless source, which is replenished by waters from the Connecticut River. At the current rate of pumping, it takes approximately one hundred and twenty five days for water to filter from the river into the aquifer. As the rate of pumping increases, the filtration rate is shortened. At a volume above 125,000 GPD chemical and microbiological assessment could trigger the need for a water treatment facility.
Extension of water to River Rd.- Lewiston could be achieved by a connection to the existing system at the junction of Rt. 5 and Lower Loveland Rd., paralleling River Rd. and connecting with the current system at the junction of Mckenna Rd. and Rt.10A. Currently an antiquated spur serves Lewiston from Mckenna Rd. The total distance for the Rt.5-Lewiston system would be approximately 9400 ft.
Extension of water along Rt.5 South to the Hartford border could be achieved by a connection to the current system at the junction of Rt.10A and Rt. 5 south. The distance to the Hartford town line is approximately 5500 ft.
12-inch pipe at a minimum would be desirable. If it was anticipated that water would be sold to either Hanover or Hartford larger pipe might be considered. (District Administrator, Prudential Committee)

In sum, a total of 14,858 feet of pipe would be required. The estimated cost would be approximately $100 per foot or $1,485800 plus an Engineering fee of .23 plus a contingency fee of 20%.

Pipe	Eng.	Contingency	Total
$1,485,800 +	$341,734 +	$182,934 =	$2,010,468

Since sewer lines and water lines must be laid at least ten feet apart, the cost savings of doing the two at the same time is approximately 5%
$2,010,468 less 5%=$1,909,945
A. Twenty-year bond at 6% to cover these costs would be $3,330,180
B. Maintenance and repair costs
These estimates are derived from an extrapolation of costs of maintenance incurred by the town of Williston Vt., which processes 600,000gallons per day. Whether there is a reasonably close linear relationship between the volume handled and the cost of maintenance is problematic but it provides a place to begin.
The maintenance cost to Williston, excluding capital costs is $618,000 per annum. Based on a similar ratio of approximately one dollar per annum for every gallon processed per day the cost for maintenance of River Rd. and Rt. 5 South collectively would run between $43,000(4units per acre) and $227,000(8units per acre) Based on current water usage in the village (60,000) gallons per day), the maintenance cost for the village would be approximately $60,000 annually.
C. User fees paid to the recipient town
Although the cost of disposal can vary according to the nature of the effluent it is anticipated that user fees paid by Norwich to either Hanover or Hartford would be based principally on volume. Presumably the Town of Norwich would levy a tax on individual users also based on volume which would offset the cost of disposal.
In Hartford the current retail sewer tax is $3.90/1000gallons. A volume of 43,000 to 227,000gpd. has been calculated for River Rd and Rt. 5 South together based on a build out of 4 units or 8 units per acre. A retail tax of $3.90/1000gallons would cost the town between $103 and $545 per day or an annual cost of$37,595 to $198,925 The annual cost of Village septic would be $52,560 based on current water consumption
D. Bonds
Currently Municipal Bond Rates are less than 5%. Dufresne-Henry recommends that 6% be used for planning purposes. The constant for determining the annual cost of a twenty-year bond at 6% is .08718.
A theoretical alternative is the State Revolving Loan Fund with a rate as low as 1%. Applications for these loans are prioritized according to need and are usually awards are usually made in response to an existing problem. It is reasonable to assume that Norwich would have difficulty qualifying but the possibility should not be excluded.

E. Summary of costs
The high estimate costs for sewer and water for Route 5 South and River Rd. plus the Village including Hawk Pine and Hopson Rd. is $25,117,719. If this were paid for by a bond at 6% for twenty years the total cost would be approximately $43,795,260.
Annual costs would be

$2,189,762	Bond
$ 287,000	Maintenance
$ 251,485	Disposal

Total annual cost $2,728,247

F. Methodology for determining costs.
If Norwich should decide that sewerage is a necessity it is reasonable to assume that because of cost, the infrastructure would evolve gradually. The number of combinations permutations and assumptions is large. Each of the generalizations in this assessment must be reconsidered as planning evolves.
The following methodology may be helpful

1. Estimate the number of lineal feet required
2. Multiply that figure by the cost of purchasing and laying pipe. ($100/ft.----$150/ft)
3. Determine the number, type and cost of pumps. A total of $300,000 is reasonable for most scenarios.
4. Calculate the engineering fees (23% of capital costs)
5. Add a contingency fee of 20%
6. Estimate the number of gallons of sewage that will be generated in any scenario.
7. Calculate the cost of the donor town building capacity for the sewage generated at a rate of $10.00 to $15.00 dollars per gallon
8. Multiply the above costs by .08178 to determine the annual cost of a 6%bond.
9. Estimate the maintenance costs as $1.00 annually for every gallon of sewage generated per day
10. Assume that the retail user fee would be approximately $3.90 per 1000 gallons generated

Charge #8 - Review the possibility of phasing in the project and determine what the effect of the development will be on Norwich.

Readers are also referred to responses to Charge #9 for additional information and clarification to this question.

The question above asks whether sewer service could or should be phased, and whether phasing would be beneficial to save cost and/or to mitigate potential negative impacts that might be associated with sewer-induced development. The answer to the above question is yes on both counts – phasing is a possibility, and yes - phasing in some ways could positively reduce costs and moderate negative impacts of excessive growth and development.

Since sewer would never be provided to the whole town, and there is no apparent mandate for sewer for public health or environmental reasons, phasing sewer is better considered in light of other potential public benefits. This would specifically be focused on community desires to facilitate sewer to serve areas deemed by the town as appropriate for denser housing, commercial or mixed – use development as has been recently considered by a three day series of community workshops. With phasing, the locations, rate of growth, and patterns of development could be linked with sewer capacity distribution, and greater densities of housing can be accomplished.

There are many additional aspects of the phasing that need to be considered:

Different options for phased sewer: Municipal sewer extensions to either Hanover or Hartford or development of community septic systems:

1. Sewer phasing could occur as a municipal sewer connection to either Hanover and/or Hartford to serve either existing developed areas or new growth. Sewer service could also

be in the form of community septic systems to serve planned areas to achieve higher densities at modest levels.

2. The economies of scale of connecting to the Hanover or Hartford municipal sewer systems suggest that higher levels of development would be needed to support the greater cost of sewer lines and municipal connections.
3. Community systems, which are typically smaller scaled, are less expensive but more limited in capacity. have a proven track record for both residential and commercial However, applicability to specific new sites is dependent on yet to be performed soil testing.
4. State permitting will require that sewer service be limited to a compact, well-planned area to avoid sewer-induced sprawl.

Sewer could be phased in Norwich in the following ways with the following benefits:

1. Sewer service could be phased over time through an allocation procedure that would ensure efficient use of the investment, compliance with town development regulations and optimizing payback of any public expenditures.
2. Phasing could allow time for proper planning and regulatory preparations.
3. Community septic service, developed on a small incremental basis with individual fields, could be phased to provide community sewage capacity on a small incremental basis. However, the availability and appropriateness of specific community septic sites is mostly unknown, although soils maps give a general indication of where they may exist.
4. Use of innovative town - private partnerships to share initial capital and long-term operational costs could be developed and matched to sewer allocations for desirable commercial and housing development.
5. Phasing could ensure a slower and steadier growth rate instead of a sudden surge of additional housing and other commercial development and focus development attentions in areas that can be comprehensively planned to maximize efficiency and public/economic benefit.
6. Costs to the town could be minimized by defining sewer service areas and a master plan for future development such that most of the capital cost of sewer could be paid by developers or users of the sewer service area.
7. Phasing could allow time for gradual implementation of a sewer system, before committing to a complex capital and operational cost and management system.
8. Phasing could optimize the potential for the market to incrementally absorb new mixed-use and residential uses in the town at a reasonable rate.

Sewer phased by the allocation system

1. The most common way that phasing is accomplished for sewer is thru the allocation of sewage capacity on a per gallon basis for commercial uses or per residential units per year. This can be for either existing development or new planned development in the sewer service district. As sewer users request and purchase an allocation, towns ~~are~~ typically “meter out” the allocation to ensure the capacity is efficiently used, and that the cost of the system is adequately reimbursed.
2. One consideration in Norwich is the relationship of sewer service to the types and rate of growth that the town has seen in recent decades. According to town records, there has been an average of 15 housing units per/yr between 1990 - 2004 and 20+ units per/yr in the 1980’s. Providing sewer capacity could increase the rate of growth of the sewer served areas in the town The effects of that growth is a broad community consideration with many dimensions, and should be explored as part of the towns efforts to update it’s Town Plan.

Possible phasing types and benefits: A larger capacity municipal sewer connection to either Hanover or Hartford

Under a municipal sewer extension approach, phasing would define a sewer a service area that could connect to either Hanover or Hartford. With adequate planning, both towns could be in a position to entertain receiving Norwich sewage. But for practical purposes, the lengths and costs of sewer line extensions suggest that connections to adjacent town sewer services could be more cost - effective if the length of piping and other infrastructure cost was minimized. This suggests that RT 5 south is probably best connected to Hartford, and RT 5/River Road north is best connected to Hanover because the distances are closest.

Costs of service to each town could cause these assumptions to vary and the range of cost for these extensions has been provided in Charge #7.

Area Phasing

Geographically the area of service for municipal sewer would be quite limited – the village, RT 5 south, and River road north. These are all areas on the eastern edge of the town and are adjacent to neighboring towns with sewer service. These areas have been considered as places where denser growth could take place in the future, and sewer service could be an incentive for that to happen. These new development locations also could have an advantage over other locations in that they do not impact the historic growth center of the town, but could create new well planned growth locations – new villages for the future.

Possible phasing types and benefits: Privately or municipally owned community septic fields

On an incremental basis, community leach fields could be used to create more sewage capacity in areas that have appropriate soils. These could be located in a more dispersed manner across town, and could be phased over time as the need or opportunity arose.

Community leach fields could be designed and built either by private development or developed by the town as a public field in town identified growth locations. Included in this scenario could be community fields to support the growth of future small village/hamlet centers, the development of a village community field to support limited commercial or denser residential development in the village proper. By the nature of their limited capacity, community fields are smaller and would support less development, and be less costly than municipal systems.

Some possible ways to phase sewer costs:

Since Norwich doesn't meet the criteria of the traditional state and federal funding programs that provide sewer to communities with known health and safety issues, the town will either have to pay for sewer itself or set up a system which requires sewer users and private sources to pay for sewer improvements.

1. Define town sewer service areas, and bond to pay for sewer improvements. New development made possible by the infrastructure would be assessed a hook up fee commensurate with the bond valuation, so the areas served would pay the costs of the bond over a 10-20 year period. Operational costs would paid as user fees for the service users.
2. Define service areas and provide incentive zoning for development that would best be served by municipal sewer extensions to either Hanover or Hartford. If sewer service were to be paid for privately, development of the service area would need to be at a density level that makes private extension of sewer economically viable. The town would need to provide a regulatory structure to prescribe growth in those locations, and zoning density incentives and permit/policy support for private development to pay both the capital and operational costs of sewer to different areas. The town would also need to be a party to negotiate the provisions for connections to either Hartford or Hanover.

3. A variation on #2 would be for the town to identify locations where community septic fields could be located in areas of high capacity soils and suitable topography. In this case the town and possible development partners would need to undertake the appropriate technical studies to guide those decisions. Once locations and field designs are known, the town could either act to implement this themselves, or allow private development to implement the fields and new development associated with them.
4. The town, if it desired to use sewer as an incentive for Smart Growth, could pursue grant funds associated with affordable housing, and job creation thru federal earmarks, state planning grants and Federal Community Development Block Grants that may be available. In this case, the town could create a vision plan that articulates those principles, and when the state increases funding for smart growth infrastructure, Norwich could be well positioned for those funds.
5. There are currently state planning funds available as long-term low interest loans from VT ANR (Agency of Natural Resources) for feasibility studies and technical assessments.

Some initial conclusions:

The Village

The most expensive area of town to provide sewer would be the village proper, so under current conditions with town water and functional individual leach fields, there is limited justification to incur the estimated $8-10M that a village system could cost to install. While there is a greater density of commercial and residential land uses in the village, the community has spoken in the past that great increases in development in the village would raise concern. There appears to be little momentum to increase density, to promote more multi-family development or rebuilding at higher density. This could however, be an issue to be explored in the New Town Plan because, on one hand, the desire to preserve the village as it is today is a strong local sentiment, but new design and planning tools are available that could ameliorate these concerns.

One limitation of the village is that there are few large contiguous areas where new development could underwrite the capital costs of sewer to the village. The perception that the village is “built – out, meaning that the number and disposition of houses has been articulated, but may not actually be the case because there are a number lots in the village that are larger than the minimum lot size of 20,000 s/f that could be either subdivided or built with additional units in future development. Traditionally sewer growth scenarios have allowed increased density through zoning.

Community Systems

Smaller scale in-ground community septic systems have been advocated as less expensive, better suited to Norwich’s small scale and more flexible for broader community use for compact development around the countryside in Norwich, as opposed to a larger municipal sewage system connected to either Hanover or Hartford. However, without any funding for technical studies, the limitations and opportunities of these systems are presently unknown. A limited trial sample of possible community septic sites that could be developed in association with new mixed use zoning and /or multi family housing should be a part of future town planning efforts.

What will the effect of the development will be on Norwich.

Please refer to Charge #9

Charge #9 - Determine what affect the general growth will be on the quality of life in Norwich.

There are a number of possible outcomes that could occur in a sewered future for Norwich:

If current trends continue at the hospital, and college and throughout the Upper Valley, Norwich will likely face continued significant development pressure, which could result in growth regardless of municipal sewer, community septic or not. The question of how much Norwich grows is a town decision that is broader then the scope of this study, and whether sewer can be a positive tool to implement the town's future objectives for growth is best applied to this larger context. Consider these possibilities:

On the positive side:	On the negative side:
1. Development could become concentrated in sewer served areas of town, leaving other areas (presumably more rural) less developed.	1. Greater densities of development could be inconsistent with the town's historic character.
2. Sewage infrastructure could promote growth and development of existing business. This could, on one hand, reduce the "Bedroom community" status of the town, and reduce traffic growth by developing a "walkable community" but also carries the possibility of undesirably large growth of business developments and service demanding new commercial uses.	2. Whether greater density would cause a commensurate lowering of development pressure on the rural areas of town is a debatable question but worthy of reflection and study.
3. Greater densities of development could assist in the development of more affordable housing.	3. The additional cost associated with a municipal sewer system could make the development of affordable housing uneconomic.

Would sewer service negatively affect the town as a whole?

The answer would be "yes" if:	*Conversely, the answer would be "no" if:*
1. The cost of providing sewer caused a significant tax burden upon all residents forcing long time residents to leave due to the tax increase attributable to infra-structure costs such as roads, police, or fire protection.	1. Increased housing brought new families to town and higher school enrollment increased state education funding and lowering the tax rate and statewide contribution we make because of low enrollment and high per pupil cost.
2. The resultant patterns of development compromised the historic character of the town as a whole and particularly the village or riverfront corridor.	2. Increased density allowed for new neighborhood development similar to the beloved downtown neighborhoods in the village proper.
3. Increased density caused a dramatic and negative change in the socio- economic characteristics of the community.	3. Commercial development created economic opportunity, local job

4. If increased traffic from new development impacted residents.

5. If the cost of sewer was imposed upon those who didn't benefit from its presence.

6. If the providing of sewer caused rapid uncontrolled growth that impacted every resident of the community.

7. If "strip" commercial development were to occur associated with the highway interchange.

8 . If commercial development were to occur such that the economic vitality of the village were compromised and vitality of institutions such as Dan and Whits were threatened.

retention, less bedroom commuter traffic, and more volunteer fire fighters.

4. Strict access management and commercial development regulations and design guidelines were enacted with progressive new zoning.

5. Opportunities for a more diverse local economy based that fit Norwich's population, or if new job opportunities were created such that people could live and work in Norwich.

6. If new development was sited to have good access to public transportation and along roads with good access.

7. Economic incentives provided by sewer, were paid for by the private sector with town facilitation, and resulted in a more diverse community.

8. If sewer growth was efficiently planned for and managed to facilitate public benefits.

The tax and fiscal implications for town services from additional development have not been recently studied to carefully determine an optimal connection between positive and negative levels of development and the role that sewer might play. This is a fundamental question that needs to be answered.

A measure of value: possible development patterns and how they measure up between a sewered and unsewered future:

EQUATING SEWER WITH QUALITY OF LIFE: THE VILLAGE

Future expansion of either residential or commercial uses in the village has been determined to be relatively limited. While it has become clear that the myth that the village is largely built out to the potential of it's physical capacity may not be true, there is a general sense on the part of village residents that they enjoy the way it is, and a strong feeling that significant change would be negative. As stated in Charges 4-7, it is also likely that this reluctance to change also equates with a reluctance to incur the cost of sewer to the village when there are no apparent environmental impacts from the present system.

It has been stated in the past in the Norwich Community Profiles that some new downtown businesses such as a village cafe would be beneficial for the town's "quality of life". A gathering place as such could create a place for informal gathering and socializing. Currently few if any

septic sites in the commercial district could accommodate the sewage requirements for this kind of use exist. A small - scale community system located at the village fringe could facilitate such a business development with public benefits as well. On a limited basis, on larger village lots, some additional housing could also be accommodated with either sewer or community septic and a compact, well - designed neighborhood of mixed scale housing could be developed as infill with close proximity to services. But the cost of sewer could be excessive and the change undesirable.

EQUATING SEWER WITH QUALITY OF LIFE: RT 5 SOUTH

It was possible to discern a general sense from the mixed-use workshops that excessive commercial and residential development in the Rt 5 south corridor was seen as potentially damaging to the look and feel of the open rural landscape south of town. Adding sewer to this area could create additional pressure for development to an undesired level, and it is questionable whether the allocation of as much as 100,000 gpd of sewer capacity from Hartford could ever be efficiently used in this area with beneficial results. There are some commercial properties in this area such as King Arthur Flour that have made significant investments for on-site septic/water systems already that may be reluctant to abandon those systems to pay a second time for municipal service.

EQUATING SEWER WITH QUALITY OF LIFE: RIVER ROAD TO RIVER CROSSING

There has been greater receptivity to increased density and mixed uses between Lewiston and Rt 5 north in the area known as River Crossing. With the close proximity to the Connecticut River, over development of this area carries some concerns that could potentially be ameliorated by sewer instead of septic disposal, and development in this area of mixed uses could also include greater housing density than community fields might offer. Close attention would need to be paid to the viewshed from Route 5 and the Connecticut River looking toward any development in this area.

A self - assessment: Under what growth scenarios can Norwich preserve and enhance its quality of life and how does sewer effect that result?

Quality of life is largely a local issue and probably best measured by defining local values and local public opinion. However, in the same way as one uses a mirror to check ones appearance, there are tools available to assist town planners and other concerned citizens in the assessment and measurement of community values. Studies that might inform this consideration include:

- Community Profile 1995, Draft Community Profile 1998, Town Plan 1996, re-adopted 2001, Norwich Affordable Housing Committee Report, 2002
- Some Town committee reports indicate that some Norwich citizens believe growth is essential for Norwich to preserve and improve its current quality of life.
- In 1995, a key issue raised among the Norwich Community Profile participants was “Growth [including] the definition of what kind of growth we want: residential, agricultural, economic/industrial (see pgs. 30 and 35-36).
- In the Norwich Community Profile of 1998, “Commercial Development [and the] creation of a Master Plan. . .” received 99 votes, the most of the weekend (see pgs. 33-35).
- Issues regarding general growth are addressed throughout the Norwich Town Plan with the goal of creating growth while also preserving natural resources and open land that are consistent with the town’s fiscal capacity (see especially, Chapter 3 – Land Use Plan, Chapter 5 Natural and Historic Resources, Chapter 8 – Community Facilities and Services Plan). The Norwich Town Plan does not tell us how much growth there ought to be and

defines points of further investigation needed to determine this. It also places great value on preserving scenic and natural resources and retaining the historic character of the town.

- Objective #5 – "Determine if a public wastewater treatment system would create a basis for concentrating growth in designated areas" (see Ch. 8, pgs. 13-14).
- The Norwich Town Plan provides a number of cautionary notes with regard to sewer and additional development. The plan states that a strong regional economy and new technology for on-site sewage treatment, or municipal sewer, have the potential to create four or five times the number of houses as currently exist. Were this to occur some of the advantages of a small community would be at risk. One of the goals of the Plan is to "preserve and protect the character of the current village center…." and the rural character of the Town. (see Ch. 3).

An additional measurement of the potential pros and cons of development with and without sewer has been prepared by this committee, using a format borrowed from the VT Forum on Sprawl and the VT Smart Growth Collaborative. The results indicate a potential benefit from development patterns that promote compact development in mixed uses, greater opportunity from development within existing developed centers such as the village and/or the benefits off creating new compact development centers a such as a new hamlet or mixed use development at River Crossing. See Appendix 10 for a series of analyses dealing with sewered/unsewered scenarios and potential growth patterns.

Concluding points:
In the past, there has been the perception that allowing sewer to Norwich could allow unbridled new commercial and intense residential development that would ruin the town. The town may have been spared a certain destiny by not having municipal sewer in an era that has created suburban and commercial sprawl.

Today, however, better planning tools and state regulations are available for towns such as Norwich. Close study of the trends and results of 40 years of infrastructure defined growth gives a better understanding of the problems and opportunities associates with both sewer and past zoning and development practices.

Most importantly, local control can guide the future direction of growth and development in Norwich that would be healthy and in the town's best interests. The residents and non-resident property owners can and should be part of a town conversation about the community's future and sewer service is a potential part of that equation if the Town decides to go in this direction.

Sewer is a tool and not an end in itself. Norwich's quality of life is linked more to the residents than a sewered or unsewered future.

Charge #10 - Perform an analysis of Planning/Zoning Development issues that would be impacted by a municipal sewer system.

The current Norwich Town Plan (1991), subdivision and zoning regulations (2005 anticipated) do not address the policy and land use implications of sewer service but Town Plan Objective #5 "Determine if a public wastewater treatment system would create a basis for concentrating growth in designated areas" (see Ch. 8, pgs. 13-14) raises the very question that this study addresses. Consequently, there is little to work with as a basis to assess current policies and regulations since they do not exist.

- The last rewrite of the Town Plan was 1991 (re-adopted in 1996), and readopted again in 2001 without significant changes. The current plan reflects very few issues and opportunities that sewer raises, because sewer simply was not a consideration at the time.
- There is no larger planning overview of the issues around sewer to use as a guide for regulatory changes that sewer service to part of town would require.
- Many of the issues and opportunities that surround sewer are more recent phenomena than the current town plan.
- The charter of the Norwich Fire District does not include municipal sewer.

Recently revised Vermont state regulations (VSA) require communities contemplating new or extended sewer service to adopt local regulations to guide the development that municipal sewer would facilitate. If Norwich were to change its policies to allow sewer service development either as a public infrastructure or by a private entity, a number of state permits would be required before the system's actual implementation. Notable in these processes would be: VT Act 250, the Federal Clean Water Act, Army Corps of Engineers permits, and the Vermont Agency of Natural Resources water supply and sewage discharge permits.

The specific provision for sewer service that would be required by state regulations include:
- Defining a specific sewer service area where the infrastructure would be allowed, and an extension policy.
- Defining growth management tools to prevent strip commercial development or other undesirable development impacts.

Whereas, in the past, many towns used sewer as both a service to preserve public health as well as an economic engine for development, the fiscal realities from Act 60, affordable housing and other town concerns have not been dealt with in a town-wide conversation that would lead to community understanding and certainly not a consensus that sewer for Norwich is something the town needs or desires. This report may assist in further understanding by the public and lead to further town-wide conversations.

Often sewer policies are tailored to assist in promoting specific land uses deemed by the town as a public interest. These are often included as incentive zoning to promote specific development patterns and land uses such as public facilities, affordable housing, and jobs creating economic development. Also, sewer service areas can be complemented by open space plans for natural area preservation, trails and greenways and specific criteria in project development review through PRD review, cluster development growth centers etc.

For the areas under consideration, a variety of regulatory changes would be needed:
- A defined sewer service area with new zoning districts based upon sewer service
- Conditional use criteria for community systems
- Design guidelines to prevent sprawl-like development patterns
- Hook up costs and connections
- Policies for sewer allocation
- Creation of a town sewer department or contracting of sewer maintenance and management to the fire district (if they wanted to assume that job) or to a private entity
- Municipal agreements/contracts with the receiving towns for sewer service.

Detailed area studies have not been done for any of the future growth center areas of town that could be served with sewer. So presently development is uncoordinated among multiple property owners who could all benefit - and the town could benefit from those planning efforts to envision their future as sewered or unsewered. Build out plans need to be developed and

educational visual materials need to be prepared for public discussion. Without those tools in hand, the future will be only talk with no visual descriptions. These are essential tasks for future study.

Currently the town has received funds through the Municipal Planning Grant program to begin a study of five different sites as possible mixed-use districts and to begin to engage the public's participation. However, the grants funds may not be adequate for the depth of issues that will be raised. Additional resources to answer the technical and quality of life questions may be needed.

As a general rule, the town's development regulations have been exactly that – a process to regulate, channel and limit development so that rural areas of the town are not inappropriately developed. As a counterpoint to that perspective, encouraging sewer will require a different flavor of regulations that read more as incentives, provide a planning overview and inspiration, and are weighted in favor of increased development. This will require a shift to some degree, although recent work by the planning commission is examining this.

Planning should be done that is thoughtful and comprehensive. Simple solutions should be avoided, such as limiting development densities by under sizing pipe sizes or limiting the capacity pump stations, in favor of well thought out regulations that are embraced by the town.

In the cases where private development can pay for sewer extensions it should be encouraged and encoded in town policies. Development regulations should be crafted that link sewer use to excellent development practices, smart growth development and projects that benefit the town's economic and housing vitality.

Excellent resources are available from the Two - Rivers Ottauquechee Regional Planning Commission and the state about towns that have made positive planning and regulatory improvements to allow for new development that is linked to new sewer service.

Conclusions:

Current town policies in the Town Plan and development regulations under the Zoning and/or Subdivision review processes do not deal with the realities of sewer and make only slight references to sewer as a potential subject for future study.

With the Master Plan outdated, and feelings about growth and development in Norwich unresolved at this time, it is also important that sewer not be isolated as a single issue.

Presently, the Planning Commission is exploring issues directly relating to growth and the Town's development policies, as the commission is planning a town wide survey, completing a rewrite of the Zoning Regulations, preparing to rewrite the Town Plan and studying the possibility of Mixed Use Districts.

The question about the relationship of sewer to future growth that might occur in the town and how that might effect the quality of life is a very complex one. Without clear guidance from the town's future planning goals this question must be limited in scope.

The bottom line is that new development policies and regulations would be needed to properly guide development patterns and to govern a municipal sewer system.

Appendix 1: History of Previous Sewer Studies in Norwich

Village septic

The central Village encompasses the business district and those residences, with a few exceptions, that are served by municipal water. This section concerns the current status and likely needs in the foreseeable future for disposal of septic waste in this area.

Over the past thirty five years there have been a number of reports exploring the needs and most reasonable solutions to septic disposal in the Village A comprehensive but not exhaustive list, followed by a synopsis of each follows. The original documents are on file with the Town Clerk or with the Prudential Committee

(1) 1967: “Preliminary Planning For Sewers and Sewage Treatment Facilities” Done for The Norwich Prudential Committee by Webster –Martin Engineering Firm
(2) Undated; “A Sewer System for Norwich” Barrett Ripley, Stephen Lotterhand and William Kinschner sent to Maurice Aldrich, Chair of The Prudential Committee.
(3) 1971: “Feasibility Study of Technical Alternatives in Norwich, VT.” Mark Werre, Candidate for B.E. Degree, Thayer School of Engineering
(4) 1971: “Sewage Treatment for Norwich” A.O. Converse, Professor of Engineering and Robert Pieri, Thayer School of Engineering
(5) 1977: “Norwich Drainage Project “ Done for the Central Resource Conservation and Development (RC&D), Sponsored by the Prudential Committee and organized by Barbara Holland, local homeowner

(1) A village municipal system was designed consisting of 16,000 feet of trunk, lateral sewers, an interceptor line of approximately7, 000 feet and an aeration treatment plant discharging into the river, to be located at the current site of the Montshire Museum It was designed to serve approximately180 homes in the village and commercial establishments in the business district The sewer lines were sized for a population of 3800 and the treatment plant for 1900. Substantial Federal funding was available at the time.
Pipes were placed beneath the interstate in 1967 and have been installed beneath the Ledyard bridge

(2) This study considered four options including renovating the existing on site systems, connecting with adjoining towns, constructing a treatment plant or doing nothing. It was the author’s opinion that a Norwich treatment plant was the best option and that all homes and businesses in the village should be required to connect to it. It was recommended that a sewer district be established and that only the people served should pay for using the system. Unofficially, Hanover did not appear to be interested at the time. The total construction cost was estimated to be $1,007,390. Cost to the town was estimated to be $335,000 No estimates of the projected expense of maintenance, repair and replacement were included.

(3) This study included consideration of further extending the system proposed by Webster and Martin in order to arrive at the theoretic best match from a cost perspective between the size of the distribution system and the number of users. For purposes of modeling, the author considered extensions to Turnpike Rd, Hopson Rd and Rt. 5 north. He also explored, for modeling purposes, a maximum build out of 900 connections in the village, assuming that each house and business had 63 ft. of frontage. (There were approximately 290 connections to the water system at the time). Werre concluded that connecting 243 of those closest to the village center

would be the optimal number. There are currently 280 connections to the water system.
The author compared costs and concluded that with proper installation and maintenance of on site systems the expense would be approximately one half that of a municipal system.

(4) This study emphasized the option of on site sewage disposal. It focused on four specific areas including Carpenter St, Church St., Pine Tree Rd., the Norwich Inn and a point source of pollution near the Norwich Pool.
The Carpenter-Church St. area was considered to be a problem because of the high water table, narrow layers of non-porous soil and a flat slope. This resulted in flooded basements and evidence of septic effluent in a surface drainage ditch. The remedial options were considered to be either lowering the ground water, installing built up leech fields or pumping the septic tank effluent to a suitable site for ground disposal. The recommendation was a combination of installing drainage pipes to lower the water table and replacement of some of the leech fields with built-up beds. The Pine Tree Rd. area was found to have good percolation but in some areas ledge lies close to the surface. The recommendation was to improve and repair the leach fields. The soil behind the Norwich Inn was found to be excellent for percolation. It was suggested that a new standard septic tank-leach field be built.
Recommendations included the following; (a) a soil Conservation Service study of Church St. (b) the Town institute a septic tank pumping and inspection program, (c) a professional engineering firm review the results of an inspection program and estimate the cost of using individual treatment systems (d) based on the foregoing the Town choose between a municipal sewer and individual septic systems.
Action; Carpenter St. area was studied by the U.S. Dept. of Soil Conservation Service. A Resource Conservation and Development plan was presented to the homeowners of the Carpenter St.-Church St. area of the village.

(5) A Prudential Committee sponsored, home owner organized and federally funded (partially) project was initiated that entailed contouring the land, clearing the swale that provides natural drainage to that area and installing a subsurface system of clay barriers and drains. Upon completion, The Prudential Committee agreed to be responsible for operation and maintenance of the system.

Growth in the Village has been very gradual during the past three decades. In 1967, the Norwich Prudential system had 290 connections. In 2003 there were 332. Thirty-two of the 52 added in this period of thirty-six years can be attributed to Heritage Condos (8units) and Senior Housing (24 units). In the last twenty years new or major upgrades of on site systems have been constructed in the Village to serve the Norwich Inn, Dan&Whits, Norwich Square, Marion Cross Elementary School, Senior Housing and Norwich Meadows.
In at least eight instances homes on Main St. have been converted into small business establishments. Typically, conversion from home to office space results in less water usage and consequently less septic. The expansion of the Marion Cross School has added to the septic disposal needs of that facility
The Village residential area has long been zoned for two dwelling units on one-half acre of land (4 units per acre) If Affordable Housing bonuses are exercised density can go as high as 6 units per acre. Although the vast majority of homes are single dwelling units this density was established with the tacit assumption that the soil can adequately accommodate the septic load. Obviously that determination would have to be made on a case-by-case basis.

Soil maps suggest that Village soils in most areas should percolate satisfactorily. Percolation is marginal between Cliff St. and Carpenter St. because of a high water table and veins of clay. Unfortunately soil analyses performed by the Webster-Martin Engineering Firm in 1967 have been removed and are not available for reference. Anecdotally the issue of a high water table in this area has been aggravated by additional runoff as a consequence of development in Hawk Pine.
In the eight years from 1995 to 2003 one home system has failed in the Village as a consequence of inadequate maintenance, three have failed because of marginal soil conditions, seven dry wells have been rehabilitated and seven systems have been upgraded. As a consequence of better system design and better maintenance there is a presumption that on site disposal is improving.

Appendix 2: Co-operative arrangements between municipalities

There are numerous examples of cooperation between municipalities in Vermont for the treatment and disposal of septic waste. Most are bilateral, some are multilateral. There are examples of partnerships between communities across the Connecticut River and at least one across an international border. Several of these were visited in order to better understand the operational and administrative relationships between those towns for septic disposal.

There appear to be no regulatory prohibitions against VT-NH cooperative programs for septic disposal.

Examples of cooperative relationships include:

Rock Island Quebec > Derry line Village VT
Wells River > Woodsville
Walpole NH > Bellows Falls VT
Westminster Town NH > Canaan VT
Barre VT > Barre City VT
Williston + Essex Town VT > Essex Jct. VT
Berlin VT (portions) >Montpelier VT

<u>Administrative relationships between towns for septic disposal</u>.
The administrative and operational relationships between Walpole NH and Bellows Falls VT and between Williston VT and Essex Junction VT were explored.

<u>Bellows Falls</u>

Salient features of administration include:
1. Walpole NH bought capacity in the Bellows Falls plant. That capacity was financed by a bond payment of $448,000 per year for twenty years.
2. There is no formal administrative relationship between the two towns. Functionally things appear to work well.
3. Septic received by Bellows Falls from Walpole is monitored for volume, total suspended solids (T.S.S.), and biological oxygen demand (B.O.D.). Walpole is billed on the basis of a formula, which considers each of these variables. (Examples of commercial activities that discharge an effluent with a high B.O.D. include creameries and breweries).
4. Walpole, the sending town is responsible for the maintenance of their collection and pumping system and for the billing of the individual users.
The bill to Walpole is approximately $60-70,000 per year. The cost to each household is approximately $600.00 annually. The hookup fee is $350.00.

5. A development group added an extension for commercial development. They were charged $10,000 for the hook up. Responsibility for this extension was ultimately assumed by the Town of Bellows Falls.

Williston+Essex Town > Essex Junction

Salient features of administration include:

1.Total plant capacity is 3.53 million gallons per day. Each of the three towns owns capacity. In 1998, the cost of an upgrade was shared by all three communities. Williston is now financing an upgrade of 2000,000 gallons per day and they will own all of this additional capacity.

2. A tripartite agreement was established in 1998. There is a joint review committee consisting of two representatives from each town.

3. Williston, a community of 8500 residents and 3000 connections generates on an average 600,000 gallons per day.

4. Maintenance costs are $618,000 per year. Deprecation is calculated at $65,000 per year.

5. Manpower requirements include 25% of a Public Works Director, three full time and one half time maintenance workers (each of whom spend one half their time on the water system.

6. Household costs are $1.225/1000 gallons.

7. Developers are charged $4.00 gallons for a building permit and a holding fee to cover the time between issuance of the permit and completion of the project.

Appendix 3: Presentation by Roger Thompson October 31, 2003 - Excerpts of Notes by Jeff Goodrich and Stuart L. Richards

Goodrich's Notes –

- Roger was the Regional Engineer from 1979 to 1996.
- Roger has a master's degree in geology.
- Roger has 30 years of wastewater-related experience.

Dean asked Roger about the adequacy of our existing system, how to determine the adequacy, and what health protection issues should be considered. Dean asked, for example, what is the rate of die-off for various things like Giardia, E-Coli, etc.

Roger said there are two main pathways or vectors of transmission: 1) a failed wastewater disposal system, and 2) in the water supply. The State uses a two-year time of travel as a "moderately conservative" approach. Large systems require a hydrogeological study to confirm/model the travel time. Vermont also has very conservative setback distances for small systems. There is no absolute standard. Vermont provides a lot of security, more conservative than other states.

Lynn asked if we should have any concerns with a municipal water system. Roger said no, our concern should be about surface contamination.

Lynn asked what we should monitor. Roger said there is no requirement for monitoring. Monitoring is normally based on nitrate concerns in soils near the surface, which would be a concern for a shallow water supply. Lynn asked what the source of nitrates is. Roger said nitrates come from biological sources.

Lynn asked about the source of suds and phosphorus. Roger said soaps. Suds in streams rarely have anything to do with wastewater. Nitrate and phosphate contamination results in vegetal growth. Herbicides and fertilizers are typical sources for such contamination.

Lynn asked again what if we should monitor anything. Roger said he is not sure what it is we would monitor. He is not aware of any widespread contamination that is worth monitoring. Nitrates are primarily a water supply concern and we have a municipal water system. If pathogen contamination is a problem, it is typically localized and does not contaminate more than one well. Roger said anecdotally that a Town with one doctor would likely see patterns that would be the basis for establishing contamination and implementing monitoring. Phil noted that with very permeable soils the effluent may go into the water table and not be treated with the same efficiency as less permeable soils. Jeff discussed developing groundwater contours, evaluating soils, monitoring existing wells, and different testing approaches as means for modeling and evaluating contamination if it exists.

Roger asked (rhetorically) what we would do with anything we find. He noted that if we had a water supply that could be contaminated, that would be one thing. Roger also noted that older systems that get replaced are improving the groundwater quality. Roger mentioned the hydrogeological study performed by the school, which concluded that groundwater from the school site ultimately discharges to the Connecticut River. Roger was doubtful that there would be any contamination of the river. He suggested a simple mass balance calculation, assuming no attenuation, to conservatively predict the potential to contaminate the river. Roger thought Wagner Heindel and Noyes performed the study.

Lynn noted that Jeff Mathias said the Joint Rivers Commission has stated that the Connecticut River does not have the capacity for another wastewater treatment plant. Jeff Goodrich noted that such a statement cannot be true and would be unequivocally false. Jeff also understood water quality in the River has been improving over the years and that portions of the Connecticut River are Class A. Stuart asked for a definition of classes. Jeff said he thought the publications from the Joint Commissions listed the New Hampshire classifications and Stuart could look it up. Stuart again asked about surface water classification.

Roger said he thought Class A waters in Vermont were designated based on the belief that there would be no contamination threat. These waters are typically protected for future drinking water.

Subsequently Jeff Mathias said, on May 25, 2005 “... the Connecticut River Joint Commissions Upper Valley River Subcommittee cautions that the Norwich portion of the Connecticut River may not have the capacity for another wastewater treatment plant. An excerpt from the Connecticut River Corridor Management Plan, Volume IV Upper Valley Region follows. Note that this “segment” of the river goes from Northern Bradford to Southern Lebanon.

MUNICIPAL AND INDUSTRIAL DISCHARGES

As noted earlier in this report, there are 19 municipal and five industrial discharges into the main stream and its tributaries in this segment of the river. If this number increases, a problem could potentially occur because the lack of gradient in this segment affects the regeneration capacity, or the ability of the river to assimilate additional wastes, according to the Connecticut River Water Quality Assessment produced by the states. The impoundment area above the Wilder Dam acts as a lake without much of the mixing process found in running water. Such areas are apt to encourage the growth of algae when nutrients are present and oxygen levels are low, because of the effects of temperature and water density layering which further reduce the river's waste assimilation capacity. The main stem in this segment does, however, have the advantage of increased volumes due to the entry of major tributaries, which increases the capacity of the water to assimilate additional wastes. Lebanon's combined sewer overflow discharges to the main stem as well as to the Mascoma River are also an issue during storm events, when they can affect water quality. Separation of the storm sewer network from the sanitary sewers is being addressed through the city's facility planning.

Bob asked about whether there are alternatives and innovation that can increase wastewater disposal system capacity. Roger said that for existing failed systems there is a variance process because people have the right to be there. The State's primary focus is protecting drinking water. The State will not issue a permit for surfacing systems. In such cases, a holding tank may be required. He said that what we consider dramatically substandard in the State regulations has been functioning in Norwich for years.

Bob asked if some standards are excessively conservative. Roger said the concept is to design for the worst case, which results in standards that some may consider excessive.

Jeff noted that the State might consider reductions in setbacks, depending on the issues. Jeff also discussed factors of safety in design and that professionals debate the factor of safety when designing by State standards. Depending on issues from flows to soils, a range in factor of safety as low as two to as high as ten might be argued.

Jeff asked about the availability of new technologies for designing systems. Roger noted the State treatment standard is 30/30 BOD (biological oxygen demand)/TSS (total suspended solids). The main objective of State rules that allow alternative technologies is to increase the loading rate while minimizing the bio mat. Roger said that is why the regulations can allow doubling the flow rates for a system.

Stuart asked Roger to comment on the new regulations with respect to multi-family and density. Roger says the new regulations attempt to take advantage of the flow averaging that will occur. For instance, an indirect discharge permit for 13 houses may now accommodate 20 houses.

Stuart asked if soils and other technical aspects could provide a break too. Roger said that the old regulations required 24" to bedrock and seasonal high water table. The new regulations are based on a performance standard for 18" of soil above the water table.

Stuart asked about if there are benefits from the new regulations with respect to higher density. Roger said that the new regulations essentially accommodate 10 houses where 8 were previously possible.

Bob asked about the need to maintain replacement areas in the design. Roger said this requirement is still in the regulations to plan ahead for failure. He said there is a 50/50 chance replacement areas will not be required. Roger said stone and other components must be disposed of properly at $60/ton during replacement because it is considered hazardous waste by the State. A replacement area allows the existing system to rest for reuse or until the bed materials are no longer considered hazardous. Roger noted that the new regulations are based on political decisions more than anything else.

Phil noted that replacement systems may be built for the existing capacity, or the new rules will apply.

Jeff asked about a comparison between flow rates generated for on-site versus municipal disposal, which was the intended follow on question to Stuart's query about multi-family and density considerations. Roger noted municipal sewer rates consider 70 gallons per day per capita. Roger explained how the new rules could arrive at that flow in a multi-family setting.

Jeff asked about the possibility of creating a basal area (the creation of receiving soil if the existing site conditions are inadequate). Roger says if the system will discharge effluent to the surface, the State will not allow this, except in Addison county where houses are on clayey soils. The rules basically require 18" to bedrock or seasonal high water table for a suitable site and adding soil to create a viable site is not currently in the regulations. There was a back and forth

discussion between Roger and Jeff to clarify the meaning of basal area and the possibility of creating receiving soils if effluent does not surface. Roger noted that this is not currently in the regulations.

Stuart asked about the Secretary of State saying that the new regulations will make Vermont 50% more developable. Roger said he did not agree with this characterization. The Secretary of State was specifically speaking about the potential impact from very general slope information provided by the Natural Resource Conservation Service with respect to slopes ranging from 20% to 30%. Roger said that there are simply not 50% more sites. Right now, slopes for on-site wastewater disposal systems are limited to 20%, which is a political decision, not a performance based decision. Roger noted that there are different rules for systems over 6,500 gpd and that slope requirements may be different. These are the rules that would govern a community system.

Jeff asked if Roger is aware of any problems with existing on-site wastewater disposal systems. Roger is not aware of very many issues since 1976. Problems, if they occur, typically relate to older systems. Roger said that Phil is the expert in Norwich.

Phil noted that he only calls Springfield if the system is not "grandfathered" or is a commercial system. Cook used to get permits, but others did not. Failures have typically related to maintenance rather than soils or other things. There is a surfacing issue in certain areas in the Village. Some people are also ending up with funny looking back yards as they replace systems along Carpenter Street.

Bob noted that things injected in the soils through a wastewater disposal system would not be put in the ground with a municipal system.

Jeff asked about Roger's thoughts concerning a community on-site wastewater disposal system for the Village. Roger noted the area would have to be very large, with permeable soils, and would likely require capacity to deal with at least 30,000 to 40,000 gallons. Roger emphasized the need to find a large area with good soils to deal with this kind of flow.

Lynn said that there is a rumor that we are sitting on a cesspool. Roger said he does not know about that, but it is not likely. Roger noted that effluent percolating through just a few feet of soil loses its smell, even after as little as one foot. Color diminishes too.

Stuart asked if Roger has a concern about the possibility of a cesspool. Roger said no. Roger asked what the goal of the community would be with a municipal water system and stated that if drinking water were an issue, concerns would be appropriate. Maybe then borings and testing would be needed.

Appendix 3 Continued

Richards' Notes -

Roger Thompson, Program Manager, Wastewater Division of Environmental Conservation Dept. He is a geologist who administers the regional district engineering offices of the Dept. of Environmental Conservation. He deals with sewage flows up to 6500 gpd. (at 140gpd per bedroom-70 gpd per person is the new state standard - this is about 46 bedrooms. Depending on credits for elderly housing, or linked units with pre-treatment, this could mean more bedrooms).

Seibert - Do we have a problem that needs solution? Thompson - If a system surfaces, contamination of drinking water is a vector of disease transmission. Viruses require physical separation from drinking water. 2 year time of travel or 200' from sewage is a state requirement. 50' separation from a municipal water pipe is required also. Nitrate is a

byproduct of human wastes. Suds may be a concern, it's a naturally occurring concern. (See comments of Tom Willard in Appendix 4 below for further information).

There may be contaminants in the water table from untreated waste in the village due to very permeable soils.—Dechert

Thompson- It is not a significant problem if the ground water is polluted as long as there is municipal water supply and so long as it doesn't flow into surface waters. Thompson doubts that ground water would affect the Connecticut River. He said it is unlikely that the smells reported anecdotally are pollution. (e coliform lasts only a few days in the soil). The cause of smells coming from drilled holes which have been reported anecdotally is most likely vegetative or chemical, but not generally harmful. Heindel and Noyes did a study of school's pollution. Connecticut River is now an A stream no longer a D stream.

Thompson referred questions on surface water quality to Wally Maclane - water quality division to answer questions about surface water quality and said he would forward state surface water quality standards. (This has been received).

Old systems in the village can be fixed with a "best fix" if it doesn't contaminate drinking water and if it doesn't surface although some systems may be considered substandard. According to Thompson and Goodrich, Vermont has conservative standards. Goodrich - At times there may be a safety factor of 5 built in causing systems to be over-designed.

Goodrich- thinks state setbacks can be reduced depending on the ground conditions.

Is there a significant difference under the 2002 state specifications and regulations from the 1996 specifications and regulations that would allow an increase in density under the 2002 state specifications in Norwich? Thompson - Under the new rules as you connect houses together you get a reduction in design flow which allows for increased density. 24" is now reduced to 18" for the separation between effluent disposal systems and groundwater. Innovative systems are now permitted by the state. All systems must keep wastewater 6" below the ground. Performance based systems and standards are now used rather than an inflexible standard under the rules adopted last year if a town chooses to adopt these rules.(Norwich has not adopted the new rules and standards). Scientific evaluation is necessary by a qualified technician or engineer who is required to use the performance standards.

Thompson- The new state specs and regulations allow considerably more density and could be used to promote elderly housing, affordable housing, etc. VT requires replacement fields. You have to meet the minimum soil conditions. The former Secretary for the Agency of Natural Resources, Scott Johnstone said that adoption of the new standards in 2002 had the potential to increase developable land by 50%. Thompson said that the Secretary's comment applied to a proposal to increase slopes to 30% from the existing 20% but this proposal was not adopted and the existing slope requirement is not to exceed 20% for installation of on-site septic systems. The newspapers reported the Secretary's comment as a blanket statement that related to all the changes in the regulations and specifications which were adopted. (In a phone conversation that I had with Thompson after the meeting he confirmed that in his opinion there would be significantly more developable land as a result of the June, 2002 changes irrespective of whether there was a change in slope requirements.)

Condition of existing Norwich systems - Thompson is not aware of problems with systems built since 1976. They have functioned pretty well. If problems exist they are most likely from older systems. Some people may fix up their systems without getting a permit. Failures are related to maintenance issues. Thompson said ground water quality will improve over time because replacement systems will need to conform to newer and more stringent Vermont rules.

Some people in town have commented, “We’re sitting on a cesspool”. Thompson said - What is the goal ? If it’s not going to be drinking water and it doesn’t affect drinking water then don’t worry and it is unlikely that “you’re sitting on a cesspool”.

A reduction to 105 gpd for senior living is permitted. Some possible locations for off-site sewage disposal may be under protective easements. Investigate these parcels of land and others for possible multi family disposal systems i.e.-Warner meadows, Milt Frye Land, Betty Booth land and others. Rather than build a municipal system these or other parcels could serve as off site disposal areas.

Appendix 4 Comments of Tom Willard

Notes from discussion between Stuart Richards and Tom Willard, Deputy Director, Agency of Natural Resources, Water Quality Division. 11/3/03

This discussion related to surface waters.

C and D classification for surface waters have been discontinued. The current categories are:

A.1. Ecologically significant water which are high altitude and pristine A.2. Water Supplies- high chemistry but low biological standards

B. All other waters

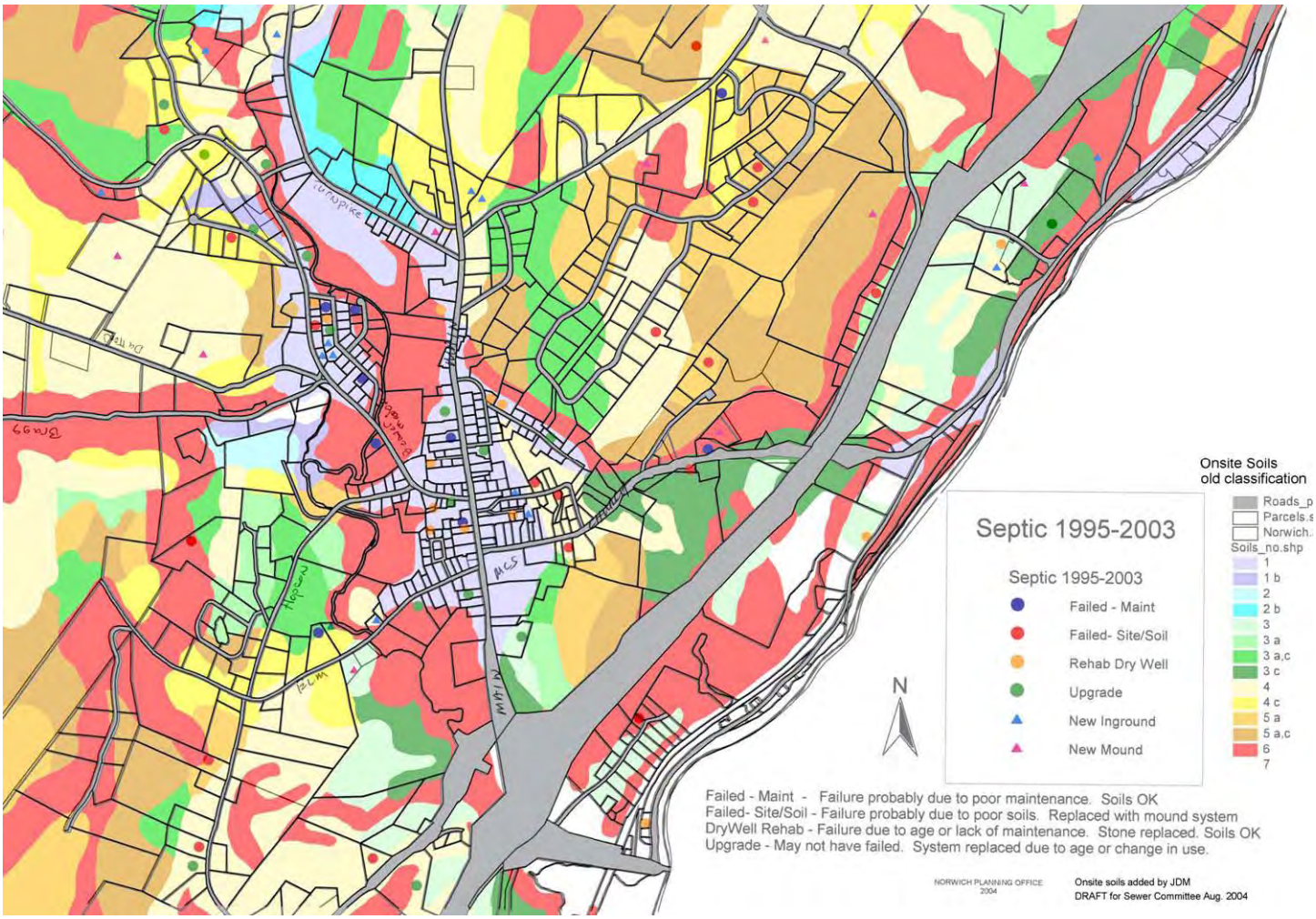
1. Waters almost in their natural condition without much human or other impacts.
2. Most other water
3. Water where flows have been restricted by dams or other means

With regard to the presence of E.coli in streams, you should differentiate between that which comes from human waste and that which may come from other warm blooded animals such as beavers, ducks, farm animals, etc. When looking at Frank Olmstead’s results and for other future studies, if any, it would be helpful to know the weather conditions - rain (heavy,light), temperature, etc. Willard did not feel that the E.coli numbers presented by Olmstead represented a problem.

With respect to suds which appear in the spring and fall, Willard said that these are generally naturally occurring and generally caused by surfactants such as pollen which tend to break up the surface tension of the water and create suds They are usually nothing to be concerned with. John Lawe said much the same at a subsequent meeting.

Willard referred me to Stephan Syz, a regional planner who is available to go over any test results and discuss our concerns. He also can help in any studies that we might want to design.

Appendix 5 – Soils Map of Norwich and On-Site Sewage Disposal Failures



Appendix 6: Conservation Commission Study

To: Norwich Conservation Commission

From:	Frank Olmstead
Re:	Summer 2003 E. coli water testing
Date:	October 17, 2003

Background

Beginning in early May of this year, several members of the Conservation Commission collected monthly water samples from Blood Brook (and at one site on lower New Boston Brook) The samples were taken to Fall Mountain Water Testing of Charlestown, New Hampshire for laboratory analysis of E. coli. There were a total of four sites, but each site was not sampled every month.

The sites, by number and with the person responsible, follow:

1. Blood Brook near the Elm Street Bridge (Warren Thayer)
2. New Boston Brook near the town transfer station (Lee Michaelides)
3. Blood Brook on Beaver Meadow Road near the catholic church from the Huntley Drive side (Frank Olmstead)
4. Blood Brook on Turnpike Road below Dream and Do Farm (Frank Olmstead)

During the summer of 2002 we had planned to conduct much more extensive sampling throughout the greater Blood Brook watershed, including sites on Charles Brown Brook, Bragg Brook, and several more sites on Blood Brook and New Boston Brook. We had originally planned to use a do-it-yourself plate/sample test kit called Coliscan EasyGel. This was recommended by Geoff Dates of Hartland, a consultant from RiverNetwork, who helped us come up with our test protocol (such as it was), which was to consist primarily of ascertaining counts of E. coli and total coliform. The advantage of the EasyGel was that the low cost of test materials would have allowed us to conduct many, many more tests throughout the watershed.

Unfortunately, we had a very difficult time reading and counting the cultured samples from this test method (specifically separating and counting the E. coli and the general coliform), and we ultimately decided that our results were not sufficiently consistent or accurate to proceed. So no testing was done in 2002, except to try to get the hang of the EasyGel materials.

For the first two months of this year, we conducted parallel tests using the EasyGel materials and comparing them with the “hard” results from Fall Mountain. Inconsistencies between EasyGel samples themselves and between the EasyGel results and the Fall Mountain results led us to abandon use of the EasyGel materials altogether. Thus, we limited our recorded work in the summer of 2003 to the more expensive but accurate results from Fall Mountain Water Testing.

Goals and Practical Considerations

After much time spent with Geoff Dates of River Network trying to organize our goals and generating a variety of possible tests to meet them, we eventually narrowed down our initial work to sampling for E. coli. This was because of the large number of in-ground septic systems that are clustered around Blood Brook, especially nearer to the heart of town. The number sites were eventually restricted because of the relatively high cost of an individual test ($30) by Fall Mountain Water Testing and the time constraints of the individuals involved. We have not yet acquired high quality, non-mercury water thermometers for each sampler (as suggested by Geoff D.), so we did not record water temperature at the time of sampling. For this first year, we just wanted to collect a small amount of accurate data about the presence of E. coli and then try to determine what (if anything) we should do next.

The Tests and the Results

The established state standard for E. coli for “recreational waters” in Vermont is measured as not exceeding 88 colonies per 100 milliliters of water.

Water samples were collected directly from a moving portion of the brook in sterile plastic bottles provided by Fall Mountain. Each sample was about 3 or 4 fluid ounces, which was far more than enough for the tests. Samples were placed in coolers and then brought to my (Frank’s) office and placed in a refrigerator. An employee of Fall Mountain came by to pick up the samples later in the day, at which time they were placed in his cooler for transport to Charlestown. I am confident that we kept the samples sufficiently cool until they reached Charlestown.

Tests of the following sites were taken on the following days:

- Site #3 on May 6, 2003
- Sites #1, 2, 3 & 4 on June 3, 2003
- Sites #1, 2, 3 & 4 on July 8, 2003
- Sites #1, 2 & 3 on August 5, 2003 (Note: The location of site #2 on this day was a little above the transfer station, whereas sampling on the other occasions was a little below.)
- Site #1 on September 2, 2003

The results were as follows:

Results in

Date	Sites by number	colonies/100 ml	Comments
5/6/03	#3	20clny/100ml	rapid water flow
6/3/03	#1	16clny/100ml	
	#2	46clny/100ml	
	#3	67clny/100ml	rapid flow
	#4	<1clny/100ml	rapid flow
7/8/03	#1	660clny/100ml	
	#2	42clny/100ml	
	#3	131clny/100ml	flow was very slow; air temp. about 80 dgr.
	#4	138clny100/ml	
8/5/03	#1	280clny/100ml	
	#2	160clny/100ml	
	#3	200clny/100ml	

9/2/03 #1 92clny/100ml

What does it mean?
The short answer is, “I don’t know.” There seemed to be an increase in E. coli during the warmer months and when the water flow slowed down, but these variables were not controlled or recorded in any careful manner. I think it would be unwise to conclude much from this.

It is also evident that site number one (Blood Brook near the Elm St. Bridge), which is the site farthest down the brook, had one extremely high count. It is possible that someone with some expertise in the area of water quality would be able to conclude something from these results, but I have my doubts.

Where next?
I am not sure about where to go from here. Because there were some E. coli spikes in the warmer months and because Blood Brook and its major tributaries are so prominent in town, it is tempting to continue testing. If this seems to be the sentiment of the Commission, I would suggest that the above results be given at least a cursory review by some knowledgeable people and that we seek input on how to tighten up and record any pertinent variables, possibly such as water temperature.

Note: I checked with Jill Kearney at the Recreation Dept. about E. coli tests at the pool this summer. Jill located one result of a sample taken on July 7, 2003. The test was submitted to the lab at the State of Vermont, and the result was 77clny/100ml. This is interesting to compare/contrast with our four samples taken the next day.

f\conscom\ecoli03.doc

Please note that as of August, 2004 the Conservation Commission has received a grant to do an additional study along Blood Brook. The testing is ongoing at this time and no data has been released or conclusions reached at this time.

Appendix 7 Continued Lindsay Putnam’s Comments

From ???@??? Mon Oct 20 14:27:34 2003
Date: 20 Oct 2003 14:27:34 EDT
From: Stuart L. Richards 63
Subject: Re: Sewer Study
To: Lindsay.Putnam@valley.net (Lindsay.Putnam), lsmcgrew@sover.net, brianandelaine@earthlink.net

Lindsay,
Many thanks for your input. It sounds like the anecdotal info regarding “suds” should be followed up on as well as the pipe coming out of the condo area on Beaver Meadow road and the bridge under Rte. 5.
Stuart
--- You wrote:
Stuart,
In our tests of Blood Brook we were sampling benthic macroinvertebrates (bottom dwelling stream creatures) and assessing water quality based on pollution tolerance (or intolerance) for each species. Our results (two different samplings last fall) indicated that, in the Warner Meadow area, the water quality was very high. We found a large number of BMI’s that do NOT tolerate pollution well at all. We only sampled this one site, at one time of year.

The previous fall, we did an informal walk and eye-ball survey of the section of the Brook that runs through town, in conjunction with a mapping project (presented to the Conservation Commission in 2001). I don't recall seeing any visual indications of septic trouble (algae blooms, etc.), with the exception of the pipe coming out of the condo area on Beaver Meadow road. That had quite a bit of algae bloom on it. There were also blooms further downstream in the area of the bridge under Rte. 5. I can't say that this means anything at all except that there were plenty of nutrients available at those sites that algae like. Anecdotally, I have heard people say that in the area of the brook behind Huntley/Sargent street, there are sometimes (usually in the spring) huge billows of some kind of foam that come down stream. The people described them as looking like huge piles of washing machine suds. I haven't seen this myself, but they were quite amazed and wondered if it was some kind of pollution.
If you would like to see any of this "officially" recorded, the Conservation Commission has copies of both the reports that the students did.
Hope this helps a little,
Lindsay
--- end of quote ---

Appendix 8: Comments on Conservation Commission Study

In Frank Olmstead's report, he notes E. Coli spikes in the warmer months, but (reasonably) does not draw any conclusions. When considering this information with respect to wastewater, keep in mind that high groundwater conditions typically occur between March and May. Consequently, I would expect system failure and contamination from wastewater in the spring, when the groundwater "capacity" is lowest. As groundwater dissipates, "capacity" increases. Consequently, the information in Frank's summary does not suggest (at face value) contamination from wastewater.

With regard to testing, I would be interested in seeing total coliform, E. Coli, and fecal coliform data before attempting to establish a wastewater contamination corollary.

Jeff (Goodrich)

Appendix 9: Blair Enman Proposal for Further Study of Groundwater and Surface Water
From ???@??? Tue Nov 11 11:31:36 2003
From: EnmanEngr@aol.com
Date: Tue, 11 Nov 2003 11:31:16 EST
Subject: Engineering Study
To: stuart.l.richards.63@Alum.Dartmouth.ORG
CC: cheindel@gmavt.net

Stuart:
I spoke with Craig Heindel, Heindel & Noyes. Part of your objectives are
hydro-geology and part engineering. We would collaborate to provide coverage in both areas.
In quick summary:
PLANNING
Attend organizational meeting to discuss general groundwater, surface water and wastewater issues and learn of the committee's objectives, estimate $1,000.
Outline materials (maps etc) needed from the Town/Village, outline program for monitoring, locations, issues and then attend presentation meeting with Town/Village, estimate $3,000.
IMPLEMENTATION
Drilling equipment, ($1,200/day + $200 mobilization @ 2 days= $2,600), LAB ANALYSIS

sampling ($500/event @ 6 events = $3,000), laboratory analysis ($200/event @ 6 events = $1,200), estimate $6,000 to $7,000.
SUMMARY & CONCLUSIONS
Mini-report on ground water, surface water contamination and engineering options and presentation to the committee, estimate $2,000 to $3,000.
Craig and I discussed tasks that you may be able to accomplish yourselves. Several communities have set up river watch groups. You may find that if you do this and then you could do your own sampling. You may find others that have done the same and could provide some guidance. What you really need us for is to set up a program and provide the analysis that can eventually be ferreted through the state for funding of a wastewater system, if that is in fact warranted.

Please keep me posted. Call me with any questions you may have. I hope we may be able to work on this together.
Blair Enman, P.E.
Enman Engineering, P.C.
230 N Main St.
Rutland, VT 05701
(802) 775-3437

Appendix 10

1. Smart Growth Index (SGI)
SGI is a GIS sketch model for simulating alternative land-use and transportation scenarios, and evaluating their outcomes using indicators of environmental performance:

- Regional growth management plans
- Land-use, transportation and neighborhood plans
- Land development reports
- Environmental impact report
- Special projects

EPA Smart Growth: Smart Growth Index Website —http://www.epa.gov/deed/topic/sg-index.htm.
See also the Vermont Smart Growth Collaborative website

2. Quality of Life Progress Report
see *Measuring Progress: Community Indicators and the Quality of Life,* David Swain. (April, 2002).
An excerpt from the article abstract follows:
. . .[Community indicators] are useful, within the context of an overall community-improvement process, both as a planning tool, based on a community's vision, and as an evaluation tool to measure progress on steps taken toward improvement. Their usefulness is maximized when they are both directly tied to public-policy and budget decision making and when the community feels a sense of ownership of the indicators through direct citizen involvement with them.
2003 Quality of Life Progress Report – http://www.jcci.org/qol/qol.htm

3. Upper Valley Housing Coalition
UVHC designed a set of Project Endorsement Guidelines with broad community input over a five month period that details the type of housing and development Upper Valley community

leaders and citizens wanted to promote. It should be noted that many of the people who participated in this were bankers, developers, realtors, architects and others, whose livelihoods are directly tied to promoting growth. While based on the concepts of Smart Growth, these Guidelines looked carefully at the types and impacts of development and growth, as well as where it should be located. Further, input from all the participants was clear that for the entire Upper Valley region to remain strong, all the communities needed to be involved.

Selected highlights from the Guidelines

- Promote strong, vibrant, and healthy downtowns and villages
- Good access to public transportation
- Development that helps sustain our regional economy and preserves our high quality of life
- Preserving and minimizing impact on our natural resources
- A mix of housing types and sizes for all demographics within our community. This concept runs strongly counter to the historic settlement and growth pattern in Norwich where we have primarily private stand alone homes
- Housing that serves a diversity of incomes
- Housing in or linked to a village center (or designated growth center)
- Mixed-use development that promotes neighborhood design

(For complete document see http://www.uvhc.org/endorsement.html).