City of Dover, N.H.
Master Plan

Community Facilities and Utilities

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Submitted by:

Appledore Engineering, Inc.
600 State Street, Suite D
Portsmouth, N. H. 03801

CITY OF DOVER MASTER PLAN

COMMUNITY FACILITIES AND UTILITIES CHAPTER

2000

The City of Dover gratefully acknowledges the contribution of the following citizens who volunteered to serve on the Master Plan Committees. Their time and effort was crucial to the planning process.

MASTER PLAN STEERING COMMITTEE

Jack Story, Chairman
Thomas Fargo
Reuben Hull
Pete Lavoie
Erv Sparkman
Margaret Stevenson
Debra Dineen
Dan Gabriel
David Landry
Stephania Pearce
Brian Stern

COMMUNITY FACILITIES AND UTILITIES WORKING GROUP

Roland Hofemann
Trudy McAtavey
Beth Thompson
Dave White
Jeff Mason
Kevin McEneaney
Jon Towle

Table of Contents

Tables

Figures

Maps **Following Page**

Appendices

Community Facilities and Utilities Goals and Objectives

Overall Goal: **The City of Dover should strive to effectively meet the municipal, social, educational, and utility service needs of its residents and businesses in a responsible and efficient manner. When the delivery of such services is in the City's interest, consideration should be given to regional cooperation.**

Public Facility Goal **Plan for, finance and develop an efficient system of public facilities and services to accommodate anticipated growth and development.**

Objective 1: Promote a pattern of growth and development that allows for cost effective delivery of services consistent with the needs of the City.

Objective 2: Assure that the public health and safety of the City's residents are met.

Objective 3: Program public facility improvements through a Capital Improvement Program (CIP) that is based upon the policies and actions from this Master Plan and an appropriate system of priorities.

Objective 4: Encourage public/private cooperation in planning for and financing improvements to the City's public facilities.

Objective 5: Encourage educational programs that use a variety of community resources including conservation lands, historic resources, community facilities and local businesses.

Objective 6: Conserve financial and environmental resources through waste reduction and recycling.

Utility Goal **Provide a high quality, well-maintained system of public and private utilities that accommodates future development and is consistent with the City's growth policies.**

Objective 1: Operate, maintain and upgrade the City's water, storm water and sewer facilities within the existing service area consistent with the health and safety needs of the City's residents at a reasonable cost in accordance with the City's operating budget and Capital Improvement Plan.

Objective 2: Extension of utilities into areas outside existing utility service areas shall be assessed with the goal of providing efficient, cost effective services taking into consideration the secondary costs to the City (such as schools, fire, police, recreation and environmental impact).

Objective 3: Work cooperatively with private utility companies in the planning and development of facilities to ensure that Dover's residents are properly serviced.

Objective 4: Where practical and feasible, encourage the placement of utilities underground that allows for future expansion and long-term capacity.

Objective 5: Program public utility improvements through a Capital Improvement Program that is based upon the policies and actions from this Master Plan and an appropriate system of priorities.

Community Facilities

Introduction

The City of Dover and its employees are recognized as providing a high level of effective services. The Dover government is a large, complex organization delivering a wide and diverse range of services to the residents and businesses of the City. City business is conducted by the City Council managing about half of the budget and the School Board managing the rest with only bottom line funding approval by the Council. By definition it is a bureaucracy and, like most other bureaucracies, our City government and its activities has evolved over time to meet the new demands placed on it by growth. Sometimes that growth has been slow and steady and sometimes it has been very rapid such as we are currently facing as we enter the new millennium. In either case attention has sometimes been focused on meeting the new needs rather than finding ways to deliver existing services in the most efficient way. The City and School budgets have been developed separately without first setting limits for combined growth and identifying areas of mutual need and possible joint efforts to hold costs down. This has resulted in adding new people, facilities, equipment and activities at ever-increasing costs. Efforts at last minute budget cutting to hold cost down have sometimes been misdirected to things such as deferring necessary maintenance or new programs, which eventually resulted in higher costs. Dover needs to change that approach to managing its business.

The residents and businesses of Dover are entitled to a major effort toward the City government "reengineering" its organization and its processes to achieve the most efficient delivery of services. Toward that end this plan calls for a number of specific actions designed to begin the process. They include:

- Implement a "Performance Improvement Program" by the City and School Administrations;
- Establish an annual summit between the City Council and School Board to coordinate efforts;
- Conduct a feasibility study of merging the existing Police Department and Fire and Rescue Service into a combined Public Safety Department;
- Establish an ad hoc committee to evaluate the potential benefits of combining City and School building and grounds maintenance; and
- Consider developing and adopting an impact fee ordinance to charge new development a fee that is directly related to the fiscal impact to City services. Impact fees could be collected for municipal facilities for schools, fire, police, recreation, water, and sewer.

The "reengineering" effort will be focused on elimination of non value added or minimal value activities and rebuilding the critical processes to have them function in a more efficient and effective manner. These efforts will not be allowed to result in a reduction of the high level of personal and property safety or essential services now provided. In fact it is expected to increase those levels at a reduced cost.

In future budget processes, City Departments and the School Administration will strive to offset the delivery of new services with elimination of, or improvement to, existing processes and programs. The City Council and the School Board will hold the City Manager and the School Superintendent responsible to meeting this challenge. Through this approach, Dover will come to be recognized as a leader an a model for efficient, effective and affordable government.

Fire Protection and Emergency Management

The City of Dover Fire and Rescue Service is comprised of 44 full-time uniform employees in two locations, as well as one civilian employee, one part-time employee and four call firefighters. In addition, the City maintains a fleet of four engine trucks and two aerial ladder trucks as well as three ambulances. At present, this department is responsible not only for fire suppression, but also a number of other services including emergency medical service, vehicle extrication, water rescue, high-angle rescue, hazardous materials response and air quality identification and monitoring. The department also provides a number of non-emergency services including fire prevention and code enforcement, public fire and safety education, fire investigation, vehicle and residential lock-out and water extrication.

The Dover Fire and Rescue Service has prepared a background paper—*Master Plan Considerations, September, 1998*—that documents the current situation within the Service as well as considerations for future actions to meet the Mission of the Service. In addition, the Service has prepared a report that addresses fire station needs—*Examination of the City of Dover Fire Station Needs, Strategic Management of Change*. Parts of each of these have been incorporated into this discussion. **Each of these reports are incorporated by reference into this Master Plan.**

Buildings and Equipment

The Dover Fire and Rescue Service has two locations:

Central Fire Station

Located on Broadway in downtown Dover, this facility is a three-story, 7000 sq. ft. brick structure built in 1899. The apparatus bay is 3000 sq. ft. while the remainder of the space is devoted to offices, kitchen, training/day room, physical training/locker room, and bunk rooms. Originally built to house three vehicles and a small number of firefighters, today the station has seven vehicles including two pumpers, two ambulances, a ladder truck and a forestry jeep. See Table 1 for a listing of department vehicles.

South End Fire Station

This station, located on Durham Road just south of Interchange 6 on the Spaulding Turnpike, is an approximately 6,000 sq. ft. single story block structure built in 1967 with a small addition completed in 1999. The apparatus bay is 4,664 sq. ft. with the remaining space devoted to a kitchen, physical training room, and bunk rooms. With three bays this facility houses two pumper trucks, a ladder truck, one ambulance, a heavy rescue vehicle, house trailer and air boat.

Table 1. Fire Vehicles

CENTRAL STATION					**LIFE EXPE**
TYPE	***MODEL***	***CALL SIGN***	***PURCHASE YR***	***ORIGINAL VALUE***	***FRONT***
Pumper	E-One	Engine 3	1991	170,000	8
Pumper	Mack	Engine 4	1980	80,000	8
Ladder	Maxim	Truck 2	1975	50,000	12
Ambulance	Marque	Rescue 1	1999	80,000	4
Ambulance	Wheel Coach	Rescue 3	1989	60,000	4
Forestry	Jeep	Forestry 1	1960	4,000	12
STAFF CARS					
Sedan	Ford Crown Vic	Car 1	1997	18,000	10
Suburban	Chevy	Car2	1989	25,000	12
Suburban	Chevy	Car3	1997	33,000	12
Pick up	Ford F 250	Car4	1976	13,000	12
SOUTH END STATION					
Pumper	Becker	Engine1	1994	150,000	6
Pumper	Mack	Engine 5	1980	80,000	8
Ladder	Grumman	Truck 1	1989	385,000	15
Ambulance	Marque	Rescue 2	1994	60,000	4
Heavy Rescue	Hackney	Squad 1	1997	160,000	20
Air Boat	Yankee	Boat 1	1996 used	15,000	15
House Trailer	Vagabond	Safety Trailer	1993 used (1956)	3,000	6
Aluminum Boat	unknown	Boat 2	1975	2,000	15

Fire Suppression—Personnel and Response Time

The fire suppression force consists of four shifts spread over the two stations. Each shift is made up of seven firefighters, a shift lieutenant and a shift commander—36 individuals in total. In addition to fire suppression, these individuals engage in training, equipment maintenance, fire prevention inspections and public education. The following represents the number of calls that the fire suppression team responded to in 1998:

Fires	113
Overpressure/Ruptures	3
Medical emergencies	1,561
Other rescues	24
Hazardous conditions	434
Service calls	1,370
Investigative responses	325
False calls (fire & medical)	511
Total calls	**4,341**

In 1998 there was only one major fire—an $80,000 dollar loss to a residential structure.

The number of fire personnel has decreased over the years and the number of responsibilities has increased including the Rescue Service. In 1979 the fire department had 13 individuals per shift, whereas today there are nine. Recommendations established by the City/County Managers Association in its *Managing Fire Services* publication for fire suppression suggest that there should be between four and eight firefighters for initial ladder set up, ventilation, search and rescues. It is recommended that a minimum of two individuals be responsible for search and rescue and possibly up to four. In addition, between two and four individuals are required to handle and operate hose lines. The number in any given fire will depend upon the size and complexity of the fire. The Dover Fire and Rescue Service does not meet these standards. At present the City provides two engine companies with three persons, one ambulance with two persons and one ladder truck with one person. This situation may be particularly problematic should there be multiple alarms.

Response Time

The department uses the guideline of seven minutes to reach a fire—a time that is based upon data from several sources that indicates a structure and its contents can typically be fully in flames in this time frame. This time includes detection and reporting the fire, dispatch of fire equipment, travel time to the fire scene and set up time at the scene. In order to achieve the seven minute standard, travel time should be 3-4 minutes. This requires that a fire station be located within one and one-half to two miles from the area that it serves. At present approximately 75% of all structures in the City are within the required travel radius of one of the two fire stations.

Given the City's geography and growth, the north and south ends of the City have response times that can exceed this standard. The City is approximately ten miles from Dover Point to the Rochester line. In addition, it is divided by two rivers and the Spaulding Turnpike. Existing traffic conditions in the downtown area also make it difficult for fire apparatus to travel the required distance within three minutes. Much of the City's recent and projected growth has been north and west of the downtown area, much of it outside the one and one -half to two mile radius from the existing fire stations.

ISO Rating

Another measure to evaluate a City's ability to suppress fires is through standards set by the Insurance Services Office, Inc. (ISO) for fire insurance rates. In the most recent evaluation the City improved its rating from a Class 4/9 to a Class 3/9 effective July 1, 1999. Much of this improvement was the result of repair and maintenance of the City's water system that is documented in the Water Section of this Master Plan Chapter. This rating may reduce fire insurance costs on commercial properties.

Call Concentration

The following is a percentage break down of calls by City wards for 1998:

Ward	**Percent**
1	19
2	18
3	14
4	10
5	27
6	11
Mutual Aid	1

Mutual Aid

The department currently has mutual aid agreements with the following communities: Rochester, Somersworth, Rollinsford and Pease International Trade Port in New Hampshire and Berwick, North Berwick, South Berwick, Eliot and Lebanon in Maine.

Emergency Medical Services

In addition to fire suppression the department also provides emergency medical services. There are 16 paramedics who are cross-trained in fire, rescue and hazardous materials handling. The primary ambulance operates from the Central Fire Station. In total there are three ambulances between the two stations. In addition two pumper trucks are equipped with "Advanced Life Support" equipment. Providing emergency and medical assistance represents the highest call volume for the department, accounting for 1,585 calls or 36% of all responses.

The Emergency Medical Service of the department returns revenues to the General Fund. In the past seven years the revenues have increased annually from $40,000 to $300,000.

At present the equipment and personnel appear to be adequate. However, since the primary service is out of the Central Station, the north and south ends may not be serviced with the same level of response as the central part of the City. Some medical treatments require response times of 4-8 minutes (CPR, for example). Such a response time may not always be possible to all sectors of the City.

Fire and Rescue Training

The department is responsible for training its staff in routine as well as advanced operational procedures for fire, rescue and emergency services. Such training is important not only to field capable and qualified

staff, but also to keep up with the new and changing federal and state laws and regulations regarding training. At present there is no training officer position in the department. It had been a part-time position until 1997, when it was no longer funded. As the number of calls has increased, the disruption to training personnel has also increased.

Fire Prevention and Public Safety Education

The department has an active program of fire prevention and education. A comprehensive fire and life safety ordinance was adopted in 1998 (based on the NFPA Life Safety Code and Fire Prevention Code), which includes a stringent fire sprinkler section. The department also works closely with businesses to address potential fire and life safety issues and problems. In addition, the department participates in reviews of all new buildings to ensure compliance with the City's codes. Finally, the department has a rigorous program to investigate all fires and identify issues that can be used in the public education program.

The department has a proactive fire prevention program that reaches a wide range of residents from school groups to businesses to senior citizens. A number of programs have been developed that are communicated by a variety of media including speaking engagements that have been undertaken to educate the public. The department works with the school department to implement the NFPA school fire safety curriculum and the Children's Fire Safety Festival.

Emergency Management

The fire department is responsible for emergency management. All communication is handled through the Public Safety Communications Center. In the event of a major disaster, such as a severe winter storm, the Emergency Operations Center in City Hall is opened to coordinate all emergency-related activities. This facility currently has ample space to accommodate key City officials and is equipped with an emergency generator and key communications equipment. Although the space is adequate at present, more appropriate and functional space is needed in order to provide necessary emergency services.

City Hall has only enough space for 195 emergency victims and is only one of two shelters that has an emergency generator. Other emergency shelters include all the public schools as well as St. Thomas Aquinas, Portsmouth Christian Academy, the Dover Recreation Center, and the Dover Housing Authority Recreation Center. The new Middle School contains the most fully equipped shelter, including an emergency generator, gymnasium, locker room and food services. It will also be able to accommodate up to 3,000 people.

This facility increases the total capacity for City shelters from 9,481 to over 10, 600. Other potential shelters include: community centers, the National Guard Armory and other City buildings. Although the Middle School is the best equipped shelter, the other shelters should be provided with emergency generators.

Dover does not seem to have a potential emergency problem from flooding. The current zoning and the federal National Flood Insurance Program appear to have controlled growth in these areas. Some concern has been raised about the flooding that has occurred along the upper part of the Cochecho River because of the use of flash boards on the Cochecho River and Watson Road Dams. These flashboards are supposed to be designed to give way under flood conditions, but it is not clear that the Cochecho Dam flashboards have this capability.

Recommendations

1. Undertake the location, design and construction of a third fire station for the north end in order to efficiently and safely meet existing needs as well as future growth in this area.

2. Add a Training Officer to the department staff. Depending upon the nature of this position, an alternative might be to have an individual responsible for training on a part time basis with responsibility for other needed duties the rest of the time. Consideration should be given to out-sourcing this function.

3. Seek to achieve personnel levels based upon the standards established by the City/County Managers Association in its *Managing Fire Services* publication.

4. In coordination with the City's Water and Sewer Division continue to improve water flows throughout Dover to improve the City's ISO ratings.

5. Continue to provide programs and services to the community that encourages fire prevention and provides public safety education.

6. Acquire emergency generators for all emergency shelters that do not currently have such equipment.

7. Establish a vehicle replacement program based upon the expected life cycle of critical fire safety apparatus that is programmed into the Capital Improvements Program.

8. Establish a task force to evaluate the potential for the delivery of more cost effective services through integration of both the Police Department and Fire and Rescue Service into a combined Public Safety Department.

9. Consider adopting an impact fee ordinance for the Fire Department that would enable the City to collect fees to offset the fiscal impact of new development.

Police Department

The Dover Police Department is currently housed in a 14,000 sq. ft. space in the basement of City Hall where it has been since 1933. In this space are all offices and storage as well as a cell block. Since that time there have been a number of interior renovations attempting to make the space more efficient and to take advantage of changing policies and technologies. At present there are 64 full time employees and 12 part time. There is one chief, two captains, seven lieutenants, six sergeants and 35 officers.

Since 1988, the department has been an internationally accredited law enforcement agency with its most recent accreditation awarded in 1998. The department is now one of less than 51 such enforcement agencies to attain this status for the third time.

Organization

The department is organized into two major divisions—Field Operations and Support Services. Field operations personnel provide "first contact" services with the public and include patrol officers, first line supervisors, or public safety dispatchers. The support service personnel serve in a variety of support functions and include detectives, DARE officers and neighborhood officers.

The department currently operates a Comprehensive Community Policing and Drug Prevention Program that is supported by federal grants. This program is focused on early intervention and interaction with the youth of the community in an effort to continue to maintain a low crime rate in the City while projecting a positive image of the police. At present, the department is concentrating on two neighborhoods—Woodman Park and Mineral Park. As part of this program there are bike patrols and education programs in the schools. The department's bike patrol runs during the spring and summer months and includes an officer in the downtown area. There are four certified bike patrol officers in the department.

In general, the department deploys its personnel in four ways: on foot, in patrol vehicles, on bicycles and on horses. In the spring of 1998 in an effort to increase the department's visibility within the community, an experimental mounted patrol was initiated. Initial feedback from the community has been positive.

A Special Response Team of ten trained officers has also been instituted to deal with incidents involving high risk arrests such as narcotics, felony or hostage taking. This group has also been trained for search and rescue.

Police Activity

Much of the police department's activity is generated through the police dispatcher. In 1997 the department received 90,583 telephone calls or the equivalent of 250 per day. The department is also responsible for dealing with incidents in the station lobby as well as radio/computer transmissions. In 1997 there were 253,328 radio transmissions, 175,590 state computer transmissions and over 1650 security alarms received through department alarm monitors. The average response time to incidents for both 1997 and 1998 was 28 minutes. Activities requiring criminal investigations are categorized as Part I and Part II. Part I activities are the most serious crimes as defined by the FBI such as murder, arson or armed robbery. Part II investigations are lesser crimes and are defined as criminal mischief. The department has been successful in maintaining a below average crime rate, in part due to its community-oriented programs that are directed at reducing crime and delinquency

Other department activity over the past two years involved the following:

Category	1997	1998
Patrol mileage	239,102	231,768
Accidents	962	893
Criminal Investigations		
Part I	976	835
Part II	1398	1318
Total Part I & II	*2,766*	*2,468*
Motor Vehicles	2322	1818

Accidents

During 1997 there were 962 reported automobile accidents while in 1998 there were 893 reported accidents, a decrease of 69 accidents. For both years the highest concentration of accidents was during the 8 hour period from 11 am to 7 pm. During that period 556 accidents were reported or 57% of the total in 1997; 473 accidents or 53% of the total for 1998. For both periods the highest number of accidents were reported for Weeks Crossing and Washington Street. The figure below identifies areas where there were 5 or more accidents in both years.

Location	1997	1998
Alumni Drive	14	15
Back River Road	12	8
Broadway	11	27
Central Avenue	282	276
Chestnut Street	8	6
Dover Point Road	28	45
Durham Road	7	7
Henry Law Avenue	5	5
Knox Marsh Road	9	11
Littleworth Road	5	8
Locust Street	10	8
Main Street	20	16
New Rochester Road	20	17
Portland Avenue	10	7
Scammel Bridge	10	13
Silver Street	13	15
Sixth Street	7	14
Sixth Street Connector	20	5
Sixth/Whittier	7	7
Tolend Road	9	9
Washington Street	26	22
Weeks Crossing	27	22

Activity by Reporting Area

The following figure presents police activity by geographic reporting area:

Area	1997	1998
Northeast	3855	3648
Northwest	3490	3414
Miracle Mile	1795	1718
Upper Square	2409	2451
Lower Square	1647	1571
District Court	279	323
Headquarters	1422	1611
Southeast	5487	5495
Southwest	5515	5702
Housing Project	1224	1233
Other	747	565

Space and Personnel Needs

At present the Police Department is operating in a facility that is undersized and insufficient to meet the needs of the agency or the community. There is a lack of both work and storage space. As the City continues to grow this situation will become more problematic. Future growth will also require a level of personnel to accommodate this growth.

Recommendations

1. Establish a police facility in consideration of the National Standards for Police Space with consideration being given to re-location into existing available buildings in the downtown area. The existing station only marginally meets the existing needs of the department that is "over-utilizing" available space.

2. Establish a vehicle replacement program based upon the expected life cycle of the front-line police cruisers and other police vehicles that is programmed into the Capital Improvements Program. Any retired patrol vehicles should continue to be used in less demanding roles throughout the various City departments.

3. Upgrade and update the department's impoundment area to provide for indoor and outdoor space for evidentiary purpose of storage and investigation. Such an area should be included as part of the new police facility.

4. Continue to pursue federal grants for community policing and other programs that are appropriate to the departments needs.

5. Continue to provide both school-based education programs relative to crime and safety and well as neighborhood outreach programs for crime prevention.

6. Establish a task force to evaluate the potential for the delivery of more cost effective services through integration of both the Police Department and Fire and Rescue Service into a combined Public Safety Department.

7. Consider adopting an impact fee ordinance for the Police Department that would enable the City to collect fees to offset the fiscal impact of new development.

Schools

The City of Dover currently operates three elementary schools (Woodman Park, Garrison, and Horne Street), a middle school, and a senior high school along with a vocational center. All of these facilities are within a two-mile radius of City Hall. A new middle school opened its doors in January 2000 and accommodates students for grades six, seven and eight. The fifth grade classes from the elementary schools will relocate to the new school in September 2000. In addition, the City took advantage of new legislation passed by the state to implement a kindergarten program in 1998.

The Dover public school system serves more than 3,900 students. The challenging academic program is complemented by a full array of extracurricular activities including music, sports, clubs, social events, drama, and service learning opportunities. There is a District Educational Improvement Plan (DIEP), which creates a framework for the school's reform efforts. Community members are invited to participate on any of the following committees: Steering, Community Involvement, Curriculum, Assessment, or Professional Development.

Educational Quality Indicators

The Dover School District Goals in 1999-2000 were:

1. For the next five years, we will focus on literacy as our top academic priority for students in all grade levels.
2. We will continue our commitment to the integration of technology as a tool for learning in all subject areas.
3. We will support curriculum review, revision and alignment on a systematic basis for all disciplines. To facilitate the monitoring of curriculum, we will continue to develop a plan for restructuring our middle management personnel.

The school system's basic education program and facilities are approved by the State of New Hampshire Department of Education through its "Approval Designation" program. Dover's school system is currently approved to the year 2004 when it will be evaluated again. Dover High School is also accredited by the New England Association of Schools and Colleges for the six-year period from 1997 to 2003. A progress report on recommendations was submitted in October 1999.

Each year the district administers state assessment tests as part of New Hampshire's *Education and Improvement Assessment Program* to the 3rd, 6th, and 10th grade students. Starting in 1998, student results are reported both as proficiency levels and as scaled scores. These scores provide parents and guardians with more precise information about a student's level of achievement. These numeric scores are averaged at the school, district, and state levels to produce mean-scaled scores. These scores provide greater facility in tracking educational improvement over time. It is important to keep in mind that a mean-scaled score is only an arithmetic average. It does not represent the range of achievement exhibited by students.

The 1999 results were released in October. The 3rd grade results in both English and mathematics showed improvement over the previous two years. Similarly the 6th grade class showed improvement over the past two years in English, mathematics, science, and social studies. Tenth graders experienced slippage from previous years in each of the areas tested – English, mathematics, science, and social studies. Mean-scaled scores in each subject area are based on the performance of the group of students tested in a particular year. For tracking improvement over time, cumulative averages of mean-scaled scores over three years are

more useful. Furthermore, mean-scaled scores should not be used as the sole basis for making educational improvement decisions.

At present over 65% of the senior students at the high school take the SAT exams. Over the past several years the scores have been at or slightly above the national average for the verbal and mathematics tests.

Programs

In 1993 the school district undertook a technology plan. This involved the purchase of new computer equipment for students and administration as well as upgrading existing computer equipment. In addition, this plan has established DoverNet, a program that links City departments, such as the library, and allows student and faculty to communicate via computer and the Internet. Dover residents also have access to this system and information about the district through the City's web site (www.ci.dover.nh.us).

Space Standards

The Dover school system has established space standards that generally exceed those established by the State of New Hampshire.

The Dover School Committee recommends:

1. 20 Students per class in kindergarten and first grade;
2. 25 students per class in grades two through six;
3. Art and music rooms in each school.

The State allowable maximum is:

1. 25 Students per class in grades one and two;
2. 30 square feet per student, per room with 30 students maximum in grades three through six.

Existing Conditions

Two significant programs have been undertaken in the last several years. In 1998, the City undertook the construction of a new 153,000 square foot middle school near the current high school on Durham Road. The facility has been designed to accommodate four grade levels – fifth through eighth grades. In September 2000 the four grade enrollment is expected to be 1,050 students. A kindergarten program was established in 1981 for just one year. After state legislation and funding provided incentives to school districts for kindergarten in 1997, the School Board voted to establish a permanent program in September 1998. Two new kindergarten classrooms were constructed at both Garrison and Horne Street Schools. Woodman Park was able to use existing space that had been originally designed for kindergarten use.

The following is a brief synopsis on each elementary school. In 1997 the School Department contracted with Team Design of Londonderry to conduct a physical building analysis of each school. The capital improvements noted in the discussion below are based upon recommendations from that study.

Woodman Park School – is located near the Spaulding Turnpike and Silver Street area. The school has an enrollment of 528 students in grades K-5 and has all twenty-five classrooms in use. The fifth grade will be relocated to the middle school in September 2000. Music lessons and "Odyssey of the Mind" are being held in the back foyer and special reading classes take place in small areas previously used as storage space.

The existing library space barely meets minimum State requirements. The school department is currently undertaking a $1.2 million renovation that includes replacement of all existing windows as well as interior systems upgrade (HVAC, electrical, etc.) and ADA compliance. Roof replacement and major site work repairs are expected to be added to this project. The offices for the district-wide administrative offices for Special Education, Curriculum Supervision and Federal funds are located in this school. The City is developing plans to move these offices to a central location. The student and neighborhood playground was just evaluated as substandard by the manufacture of the equipment because the lack of annual maintenance. The playgrounds at each of the elementary schools require continual maintenance.

Horne Street School – has an enrollment of 439 students in grades K-5 grades and is located on Horne Street not far from Glenwood Avenue. The fifth grade will be relocated to the middle school in September 2000. The school is located on twelve beautiful acres allowing children to enjoy creative physical activities. In the fall of 1999, a new large playground structure was added to this area to enhance outdoor physical education and recreation. All 18 classrooms are being utilized. The library is a converted classroom that falls short of meeting State standards. The stage is being used for Occupational Therapy as well as storage. Instrumental music lessons are held in a locker room and Reading and Resource teachers share a small room off of the foyer. There are currently two modular classrooms located behind the school. It has been recommended that this school be renovated to be ADA compliant as well as to upgrade the mechanical and electrical systems. In addition, the windows and roof need to be replaced.

Garrison School – is located on Garrison Road and has an enrollment of 622 students in grades K-5 and is the largest of the three Dover elementary schools. The fifth grade will be relocated to the middle school in September 2000. The school contains 22 classrooms, all of which are being utilized. There are two modular classrooms on the school site. Music lessons take place in locker rooms and preschool classes share one room. The theater stage is used as a storage facility and is unable to be used for anything else. Similar to Horne Street School, Garrison needs to be upgraded to be ADA compliant and to improve the electrical and mechanical systems. Windows and the roof should also be replaced.

In addition to the above, support space in all three schools such as conference rooms; specialist rooms (reading, speech, and special needs); guidance offices; teacher workrooms, and administrative spaces are either absent or at capacity.

Dover High School and Regional Vocational Center – Built in 1967, this facility has an enrollment of 1440 students in grades 9 – 12. The New England Association of Schools and Colleges accredits the high school. It is 212,000 SF and three floors. There are approximately 60 classrooms including a vocational center, a gymnasium, cafeteria, and auditorium. The City Capital Improvement Plan includes funds for complete replacement of doors and windows in FY2000 as well as an additional layer of the KalWal exterior panels. The District is planning a general renovation and upgrade of the facility over the next several years. Dover High School also provides educational services for Barrington and Nottingham tuition students.

Dover Middle School – This new state of the art school adjacent to the high school has been constructed to accommodate up to 1200 students in grades 5, 6, 7, and 8. It includes a double court gym of over 10,000 SF as well as a 7,000 SF library/media center and a 7,000 SF cafeteria. There are two separate wings that will each house approximately 500 students initially. Grades 5 and 6 will be in one wing and grades 7 and 8 in the other. Program areas for art, music, technical education, family, and consumer science and physical education meet or exceed state standards.

Enrollments

Since 1989 Dover school enrollments have been on the increase. Total enrollment for the system was 3207 in 1990 and 3957 in 1999, an increase of 750 students or an increase of 23.4%. See Table 2, Dover Public Schools – 10 Year Enrollment. During that same period the elementary census went from 1553 to 1592, an increase of 39 students. There was a drop in elementary enrollment after 1991 when the 6th grade elementary classes were moved to the Dover Junior High School, which then became the middle school. During this period kindergarten was also added, in effect compensating for the transfer of 6th grade students to the middle school. Since the kindergarten is a ½ day program, it is only necessary to have space for approximately half the total enrollment. During this same time period the junior high school (middle school) enrollment went from 399 to 778, an increase of 379 students. The new middle school is able to accommodate this number of students as well as the 5th grade classes, which will enter in September 2000. The high school enrollments have increased from 1255 to 1587, an increase of 332 students or an increase of almost 26.5%.

Projections

For the past several years the School Department has been using a locally developed school enrollment projection model. This model is based upon past enrollment data, birth rates, City building permit data, Planning Department population data, and the most recent population and building permit projection data provided by Applied Economics Research (AER) of Laconia, NH as part of the City's Land Use and Economic Chapters for the Master Plan. Given these parameters, the model was tested against actual data for the period 1986 to 1996. The model appears to closely track actual enrollments with predicted enrollments for this period. The most recent update to this model was in October 1998. However, the projected K-8 enrollment for 1999 was almost 2260 whereas the actual enrollments were 2370—100 more than the model projected.

This model projects elementary and middle school enrollments to 2006. It predicts a drop in elementary enrollments in 2000 when the 5th grade moves to the middle school. By 2006 it is projected to reach 1113, accounting for the half day kindergarten program. The middle school will increase significantly in 2000 when approximately 250 5th grade students will be added to bring the projected total to 1058. By 2006 this figure is expected to reach 1069, still within the design capacity of the school. The total enrollment for pre-school through grade 8 is projected to be approximately 2200 by the year 2006, with a predicted peak at approximately 2275 in 2002. The model should continue to be refined to reflect the greater than predicted enrollments for the elementary and middle schools.

One factor that the City needs to be cognizant of is the effect of local private school enrollments, such as St. Mary's, St. Thomas Aquinas High School, and the Portsmouth Christian Academy on City projected enrollments. Although these schools accept students from surrounding communities, a number will come from Dover.

Table 2 - 10 Year School Enrollments
Dover Public Schools

Grade	Oct. 1989	Oct. 1990	Oct. 1991	Oct. 1992	Oct. 1993	Oct. 1994	Oct. 1995	Oct. 1996	Oct. 1997
K									
1	263	297	279	256	243	254	273	273	272
2	286	251	278	258	267	232	246	243	262
3	240	274	252	266	252	254	239	238	247
4	234	233	260	262	267	244	274	233	233
5	211	236	237	257	256	278	248	259	236
6	192	210	241	245	259	262	273	257	268
7	213	194	215	254	248	257	263	269	246
8	194	192	199	219	225	247	249	255	268
Spec, transitional classes, home study & Chapter 1 Kindergarten -started in 1991 Elem. Jr. & Sr. High levels									
	87	87	84	95	92	106	91	85	113
9	262	260	287	285	321	322	339	348	384
10	301	250	274	292	306	302	329	349	365
11	301	311	252	284	292	318	302	344	349
12	269	275	273	231	263	266	254	249	269
Post graduate & part time students									
	148	149	150	161	164	172	162	154	149
Total Elem	1491	1553	1355	1356	1353	1334	1351	1312	1342
Total Jr. High	419	399	663	729	733	768	785	781	794
Total High	1291	1255	1247	1263	1346	1380	1386	1444	1525
Total	3201	3207	3265	3348	3432	3482	3522	3537	3661

* Grades 6, 7 & 8 combined in 1991 as total DMS

** Increase in 1997 due to home study students actually added.

*** Public kindergart en established 1998

10/25/1999

Recommendations

1. Implement a formal, visible and continuing "Performance Improvement Program" in all areas of school administration. The purpose of the program will be to achieve more efficient and effective operations. The program will be designed to identify and eliminate unnecessary and/or ineffective activities and to change significant and critical processes to make them more efficient and/or effective. The program will be directed by the School Superintendent, involve all employees and managers and be guided, overseen and evaluated by an external consultant with knowledge and experience in establishing and operating these type programs. The Superintendent and the consultant will make routine periodic reports to the School Board and the citizens on initiatives taken and results.

2. Implement a formal annual summit between the Dover City Council and the Dover School Board to discuss common goals, challenges and financial issues. This meeting should be held in the springprior to the submission of formal budgets by the City Manager and the Superintendent of Schools.

3. Implement the recommendations in the recently approved Capital Improvement Program including:

    - Dover High School exterior improvements
    - Woodman Park School interior improvements
    - Relocation of SAU and all Central Administrative offices
    - Horne Street School system upgrades
    - Garrison School system upgrades
    - Dover High School interior improvements

4. Continue to track school enrollments and projections in order to determine the most appropriate long-term strategy for managing enrollment growth. Such strategies might include: reallocating elementary school space with the absence of the 5th grade, analyzing loss of high school students from surrounding communities and a process to search for, and acquire, a parcel of land in an appropriate location for a new elementary school.

5. Work with the Recreation Department to provide appropriate facilities for the athletic/ recreation needs of the school department and the City, including the coordination of facility scheduling.

6. Continually update the school's curriculum to meet the needs of the City's student population as well as the demands of local and regional businesses and industries. Such curriculum should take full advantage of all the City's resources—human, built and natural.

7. Continue to improve the recycling efforts in all the schools so that that the materials recycled are consistent with those recycled through the City's Bag & Tag/Recycling Program.

8. Work with the City to implement a purchasing program that encourages the use of recycled materials.

9. Proceed with the replacement or relocation of the alternative school to ensure continued accreditation.

10. Consider adopting an impact fee ordinance for the Community Services Department that would enable the City to collect fees to offset the fiscal impact of new development.

Public Library

The Dover Public Library, built in 1905, constructed of brick and granite with a slate roof, is a total of 20,000 sq. ft. on three floors. In 1988 a 6000 sq. ft. addition was undertaken that included structural reinforcement, an enlarged Children's Room, expanded periodical and seating area and an update of the electrical, heating and sprinkler systems. At present, the library space isallocated as follows:

Space	Square Feet
Fiction; Non-fiction Stacks	2624
Periodicals/Reading Room	1025
Mezzanine	750
Main Desk Area	504
Children's Room	2224
Reference	1000
Meeting Rooms (3)	1675
Browse Room	525
Video Room	375

The three meeting rooms include a Trustee's Room, a Tutoring Room and Lecture Hall. In total these rooms were used by the public 565 times during 1998.

In 1994 the library began the process of automating all internal operations including acquisitions and circulation. In cooperation with the school libraries, the collections were electronically linked to the DoverNet system. Initiated in 1995, this system allows access to catalogs from home computers through the Internet.

The library houses over 95,300 volumes including 21,382 children's books and 2800 books-on-tape, 142 music CDs and 2184 videocassettes. In fiscal year 1999, the total number of patrons with library cards was 18, 915 and circulation was 252,940 volumes. Of these 156,210 were adult, 95,443 were children and 1,287 went to Dover schools.

Currently the library has nine full-time staff and 16-part time employees.

Recommendations

With the addition and refurbishing of the library in the late 1980's and early 1990's, the library is generally in good condition. During that period an elevator and lift were added to make the building ADA-compliant. At present its major deficiency is central air conditioning, although a small portion of the library was air conditioned with the renovation. Planned capital expenditures for FY 2000 include new main floor carpeting at a cost of $14,000 and the resetting and repairing of the front granite steps at a cost of $12,500.

City Hall

The present City Hall was dedicated in 1935 and was designed to be completely fireproof. The only wood is for interior finishing. It contains one million bricks, 190 tons of steel and 16 fireproof vaults. It has three functional floors. The basement houses the Police Department. On the second floor there are number of City administrative offices including: City Manager, City Clerk, Finance, Economic Development, Assessing, Planning and Community Development, and Human Services. The third floor holds the administrative officers of the School Department and Community Services, Code Enforcement, a large auditorium and the City Council Chambers. The auditorium can hold up to 900 people.

During the early 1990's it became apparent that the offices in City Hall were overcrowded and inefficient and that additional space was necessary. In 1993 the Joint Space Needs Committee commissioned a space needs study for both City Hall and the Department of Public Works (now Community Services) on River Street. The space needs for the Community Services Department are currently being considered by the City as part of the relocation plan discussed under the Community Services Section of this chapter.

The space needs study surveyed all of the departments in City Hall except for the Police Department. It was assumed that the police department would be re-located to a more suitable facility. The results of the survey indicated a significant shortage space for the Human Services Department as well as the School Department, although some of this apparent need may be met through better utilization of the current space. The Planning Department also indicated a need for additional space, particularly for a conference room and equipment storage. Other space needs were not as significant although each of the other offices except for code enforcement identified additional space needs.

Subsequent to this report the City commissioned a consulting architect in 1994 to come up with conceptual designs to renovate the space in City Hall to accommodate the required needs. Two options were presented—both of which made greater use of the auditorium space. Neither of these options has been implemented.

Many of the space needs identified in the Space Needs Survey still exist. The relocation of the Police Department and Community Services offices from City Hall in the near future presents an opportunity to re-consider how the City can accommodate the space needs of the offices in City Hall.

Recommendations

1. Implement a formal, visible and continuing "Performance Improvement Program" in all departments of the city administration. The purpose of the program will be to achieve more efficient and effective operations. The program will be designed to identify and eliminate unnecessary and/or ineffective activities and to change significant and critical processes to make them more efficient and/or effective. The program will be actively directed by the City Manager, involve all employees and managers and be guided, overseen and evaluated by an external consultant with knowledge and experience in establishing and operating these type programs. The City Manager and the consultant will make routine periodic reports to City Council and the citizens on initiatives taken and results.

2. Implement a formal annual summit between the Dover City Council and the Dover School Board to discuss common goals, challenges and financial issues. This meeting should be held in the spring prior to the submission of formal budgets by the City Manager and the Superintendent of Schools.

3. Upgrade the internal utility systems in City Hall including electrical, telephone and HVAC.

4. Re-allocate existing department space in City Hall in light of the additional space that is available in the former middle school and former district court building such as providing a separate, visible office for the Economic Development Department.

5. Continue to upgrade and update the City's management information system (MIS) to allow City departments to share common data.

6. Continue to maintain, upgrade and expand the City's website to provide efficient access to City information and the availability of services for Dover's citizens as well as other individuals interested in finding out more about the City.

Community Services

Several years ago the City reorganized the department structure and established a Community Services Department (CSD) that combines a number of City divisions including Public Works (streets, sidewalks, drainage systems), Utilities (water and sewer), Engineering, Fleet Maintenance, Wastewater Treatment, Environmental Programs, Waste Management, Facilities and Grounds, and Recreation (See Figure 1). For purposes of this Master Plan, these services are discussed in various chapters or sections of chapters. Streets and sidewalks will be handled under the Transportation Chapter. Utilities and drainage, along with wastewater treatment, are discussed in the Utility Section of this Chapter. Waste management is discussed below. Pertinent sections of Facilities and Grounds, as well as Recreation, are handled in the Conservation and Recreation Chapter.

There are approximately 82 full-time CSD employees. Up to another 135 are employed on a part-time or seasonal basis primarily in the Recreation Division.

The majority of the CSD operates out of the River Street Facility referred to as the "City Barns". For years this site has been inadequate to handle the number of personnel in the department and the necessary operations to have an efficient program of services. The facilities consist of a 21,000 sf masonry block/metal building and an adjacent 7,500 sf former bus storage building. An additional 4200 sf "Butler" building is located at the far end of the site. The service yard contains a temporary salt/sand shed, material storage piles, cold patch, barricades, plows, miscellaneous attachments/equipment and the recycling operation. The City maintains approximately 148 vehicles including sedans, light utility trucks, dump trucks, police vehicles, some fire and rescue vehicles and miscellaneous pieces of equipment. See Appendix A for a full inventory of CSD fleet vehicles.

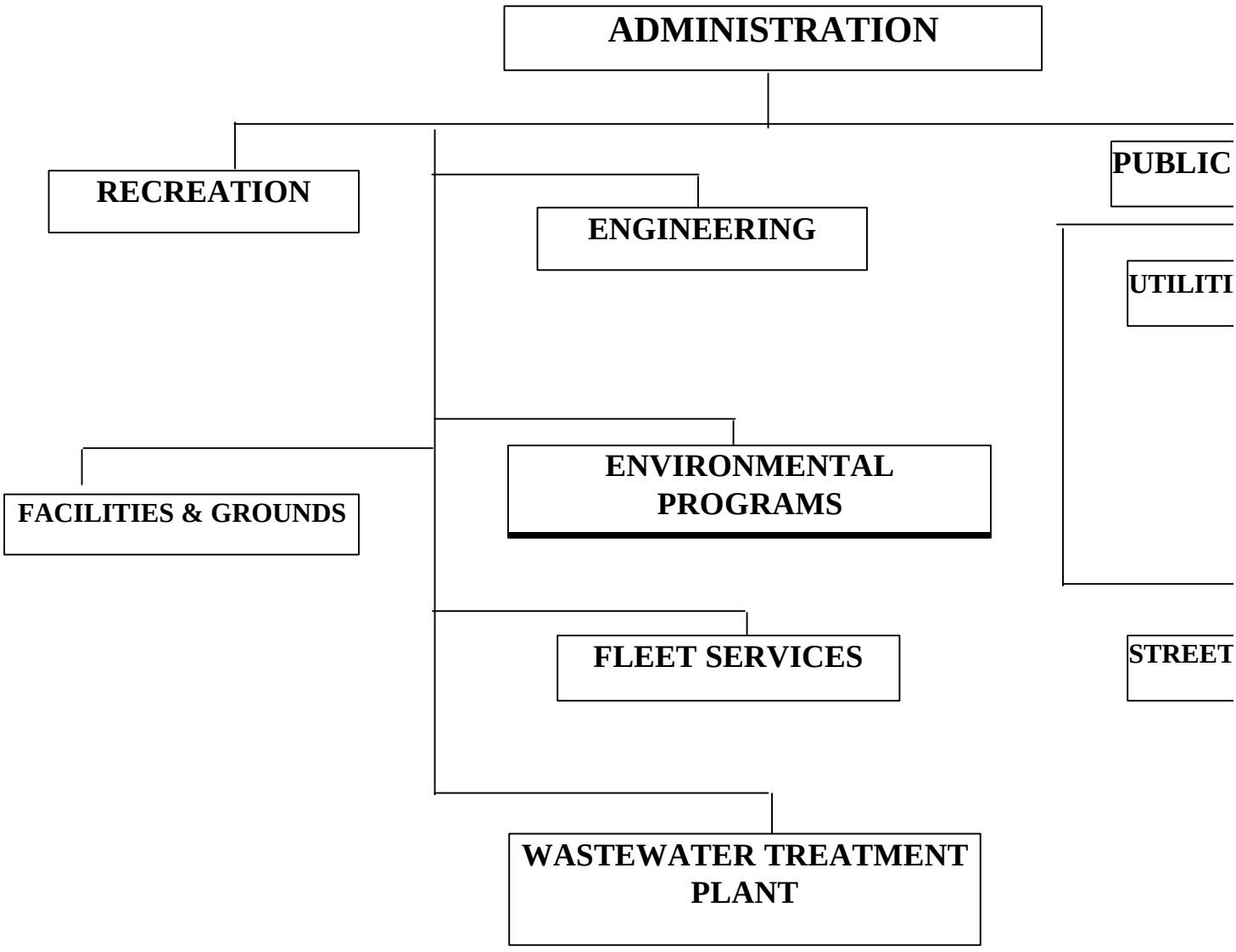
The Facilities and Grounds Division administrative offices are now located in the former chapel at the Pine Hill Cemetery. In addition, some of the division's equipment is also stored at this facility.

According to a recent *Space Needs Analysis* report conducted by the Maguire Group of Portsmouth, New Hampshire, all of the buildings have far exceeded their useful life cycles. In essence this report comes to the following conclusions:

- The Community Services Building ("City Barns") has insufficient space for vehicle storage, inventory control, shop and supervisory meetings, offices and fleet operations
- The building also has inadequate ventilation, lighting, and employee amenities (primarily restrooms)
- The service yard is for the most part unpaved, unsecured (except for recycling) and in need of organization.
- Fleet maintenance procedures reveal that the CSD fleet is older than the normal, average fleet age.

The space needs report proposes a new facility that totals 54,625 sf compared to the current 36,515 sf. This facility would meet all state and federal codes and standards and provide for a secure, organized yard. It would provide areas for: wash & cold vehicle storage, fleet maintenance, warm vehicle storage, an administration area with employee amenities, an inventory & parts area, and a shop area. It would also include covered areas for large part (pipe, barricades) storage and salt/sand storage. A site for recycling is also provided.

Figure 1 – Community Services Department Organization -



Waste Management

The waste management program is under the jurisdiction of the Community Services Department with active involvement from the Solid Waste Advisory Committee. Waste management is controlled under Chapter 97 of the City's Code. At present the City is under contract with Waste Management of Rochester to haul and manage the City's residential waste. Large industrial and commercial generators are responsible to contract for their own waste collection. The City has instituted a curb-side Bag & Tag and recycling program whereby residents purchase trash disposal bags for waste that is collected and disposed of in Waste Management's Turnkey Landfill in Rochester. In addition, the City has provided recycling bins for a variety of recyclable materials including glass, cans, newsprint, plastic and paperboard. Residents are responsible for placing the recyclable materials at curbside for the once-a-week collection by Waste Management that also picks up the bags of waste. By prior arrangement with the City, individuals can also have used appliances picked up at curbside.

Annually the City disposes of approximately 4100 tons of residential waste and recycles approximately 6200 tons of material. The City also supports a recycling center that accepts any recycled materials that can be placed in the residential bins as well as waste oil, scrap metal, and yard debris.

The City also sponsors a household hazardous waste collection program involving collection on two specified dates each year. In 1998 the City collected 20 tons of hazardous materials.

The Environmental Programs Division of the Community Services Department, in cooperation with the Solid Waste Advisory Committee, prepared an *Integrated Waste Management Plan* in May of 1999. **This plan is incorporated by reference as part of this Master Plan**. The plan lays out the City's strategy for the following: bag and tag, construction and demolition debris, curbside recycling, appliances and large metal items, recycling drop-off center, yard waste and composting, leaf and brush collection, automotive waste, household hazardous waste, illegal dumping and contract negotiation.

Recommendations

A number of separate recommendations for the Community Services Department are provided in the Master Plan Sections for water, sewer, storm water, and recreation. These are not repeated here.

1. Continue to work toward the relocation of the existing Community Services facilities on River Street. Design and construct a facility that meets the current and projected needs of the department. It will also be necessary to design and construct a facility for the City's recycling program.

2. Consider relocating the Facilities and Grounds administrative offices and associated equipment from its current location at the former chapel building at Pine Hill Cemetery, possibly in conjunction with the new Community Services Facility.

3. Implement the recommendations in the recently approved City Capital Improvement Program including:

    - General street and sidewalk improvements
    - Major repair to the Cochecho Dam retaining wall near Cochecho Dam
    - Reconstruction of Sixth Street including water, sewer, and drainage.
    - Broadway area drainage
    - Tolend Landfill improvements
    - Various roadway drainage improvements
    - Henry Law Avenue reconstruction including utilities

4. Establish a vehicle and heavy equipment replacement program based upon the expected life cycle and consistent with City budgeting programs.

5. Continue, and improve and expand where possible, the Bag & Tag/Recycling Program under its current administrative structure. Cooperate with the School Department to continually improve the recycling and waste management programs at all department facilities.

6. Update the Integrated Waste Management Plan to recognize the limited life expectancy of the current Waste Management Landfill in Rochester.

7. Establish an ad hoc committee, under the direction of the School Board and City Council to evaluate the potential benefits of combining City and School building and grounds maintenance.

8. Consider adopting an impact fee ordinance for the Community Services Department that would enable the City to collect fees to offset the fiscal impact of new development.

Public Utilities

Introduction

Dover's municipal utilities include water, sewer and storm water drainage. Each of these is discussed in more detail below. Water and Sewer are managed through the Community Services Water and Sewer Division while storm water is managed through the Drains and Division. Water and sewer service operates financially outside the City's general fund through an enterprise fund that is paid for by user fees. Capital funding for large projects are planned for and implemented through the City's Capital Improvement Planning process, but approved projects are paid for by the enterprise fund.

In the 1988 Master Plan there was a detailed description of the City's water and sewer assets as well as current capacity and future demand of each system. In addition, the plan also identified maintenance and capacity problems that needed to be addressed. In 1991 the City contracted with the civil engineering consulting firm, Hoyle, Tanner & Associates (HTA) of Bedford, New Hampshire, to prepare an analysis of the water and sewer systems and to conduct a rate setting study. This study, *Water and Sewer Capital Project Management and Rate Setting Study*, provided an inventory of the City's water and sewer assets and problems that expanded upon the 1988 Master Plan. It also proposed a capital improvement plan for both systems.

At present, the City has no schedule for expansion of the water and sewer system outside the current service areas. Any recent expansions have been to address a significant issue of public health and safety or to promote economic development. At present the division is improving existing capacity and undertaking maintenance projects within the constraints of its budget. Any sewer or water extensions required as a result of new development are currently being paid for by the developer.

Until recently, there has been no City-wide plan for storm water management and drainage. As of December, 1999, the City has prepared such a plan, which is referenced and summarized in this Master Plan. At present, the City is under contract with Wright-Pierce Engineers of Topsham, Maine to conduct a study to determine how to manage storm water to mitigate the problem of inflow and infiltration (I/I) into the City's sewer system.

Water System

The City of Dover has municipal water service available to almost 68% of the City's land area and over 85% of the households and businesses. The area of service is shown on the attached map –Water and Sewer Service Areas—and is generally the central two-thirds of Dover. Service is provided by the City of Dover Water and Sewer Division that is self-funded through fees charged to the users. The 1988 Master Plan provided a brief history of the public water supply in Dover as well as an extensive explanation of the system. Although much of the same system is in place today, it has been upgraded. This plan will provide an update to the discussion in the previous plan.

The existing system consists of seven deep, gravel-packed wells, approximately 70 miles of water main, as well as a water treatment plants at Lowell Avenue and the Griffin Well and a 4 million gallon concrete tank on Garrison Hill. One additional well, the Bouchard Well, currently under development, is scheduled to become part of the municipal system in 2002.

Since the 1988 Master Plan, the City has begun to add a number of chemicals to the water to the benefit of the users. In 1988 fluoride at the rate of one part per million (ppm) was introduced to the water supply. In 1996 the City began to add two-three ppm of zinc polyphosphate to reduce the amount of lead and copper that might leach out of household plumbing. Finally, in 1997 the water was disinfected with chlorine at 0.2-0.6 ppm to prevent any bacterial problems.

Water Drawn from Seven Wells

Water supply in the City is provided entirely from groundwater withdrawal, although there are withdrawals from the Bellamy and Isinglass Rivers at certain times of the year that are used to supplement the recharge of two aquifer areas—the Pudding Hill and Hoppers Aquifers. The following is a brief description of the City's wells. A more detailed explanation can be found in the 1988 Master Plan that provides specifications for each well. Each of these wells is protected through primary and secondary groundwater protection zones that establish appropriate uses within a specified area of the well (See attached map).

Griffin Well

Developed in the late 1960's, the Griffin Well is located in the Pudding Hill Aquifer near the Bellamy River and just over the Madbury Line. This well has the ability to produce sustained yields of 500 gallons per minute (gpm). Because of the iron and manganese problems that have developed in the well, a treatment facility was constructed in 1990 to remove these metals. In addition, the City has had to install air stripping equipment in 1998 to remove Volatile Organic Compounds (VOCs) that have been traced to Madbury Metals on Knox Marsh Road.

Ireland Well

Developed in the early 1960's, this well is also located in the Pudding Hill Aquifer betweenMast Road and Knox Marsh Road south of the Bellamy River. This well is supplemented by recharge from the Bellamy River and has sustained yields of 600 gpm. Unlike the Griffin Well the water quality is excellent and the well is pumped year round unless it is taken out of service for maintenance and repairs. The pH is adjusted with an alkali additive prior to being pumped into the system. In 1996 the City began to add phosphate to stabilize the high iron and manganese in the water.

Calderwood Well

On line since 1972 this well is located in the Hoppers Aquifer off Glen Hill Road near the Barrington line. This well has sustained yield of 500 gpm, although it may produce up to 700 gpm for short periods of time. It has excellent water quality, requiring only additions of alkali prior to being pumped into the system. This well is generally used as a back up to the Ireland and Campbell Wells during the high demand period of the summer months.

Campbell Well

In the previous Master Plan this well was referred to as the 8" Test Well since it had not been fully put on line. This well, located in the Hoppers aquifer near the Calderwood Well, has sustained yield of 400 gpm. With recharge from the Isinglass River, the yield can be increased up to 600 gpm. It runs year round and is only taken out of service for maintenance and repairs.

Smith & Cummings Wells

These two wells were developed in 1958 and 1967, respectively, and are approximately 100 feet apart. They are located in the Willand Pond Aquifer between Glenwood Avenue and the Exit 9 connector road (Indian Brook) to Weeks Crossing. Together they have a sustained yield of 535 gpm. In the past, benzene becomes apparent in the water if higher yields are attempted. The water is pumped to the Lowell Avenue treatment plant where it is treated with an air stripper to remove contaminants and then transmitted to the Garrison Hill reservoir tank for distribution to the system.

Hughes Well

The Hughes Well in the Barbadoes Aquifer is located off Old Stage Road just inside the City line with Madbury. It has been on line since 1969 and has the capacity to yield 300 gpm. Since the well water contains iron and manganese, it was used as a back-up well during high demand periods or when the Campbell or Ireland Wells were out of service. In 1996 the City began to add phosphate to stabilize the high iron and manganese, allowing the well to be used for up to eight months of the year. A treatment plant would further reduce the level of these metals in the water.

Bouchard Well

The Bouchard Well is located off French Cross Road near the Bellamy Reservoir. It has been developed as an additional water supply source for the City and is scheduled to come on line in 2002. This well is currently 180 feet deep and has a yield of 700 gpm. Because there are elevated levels of iron and manganese, the City would prefer to combine the pump and treatment with the nearby Hughes Well in order to treat the water from both wells with a single facility.

Well Capacity and Long Term Yield Projected at Over 5 Million GPD

The long-term well yield (safe yield) represents the amount of water that may be pumped from a well for a sustained period without depleting the capacity of the aquifer or introducing high levels of contaminants into the water system. The long term combined well yield of the seven existing wells is over 3.5 million gpd. See Appendix B for well yield records for the period 1994-98. The short-term yield (maximum yield) represents the maximum amount of water that may be pumped from a well for a brief period. Dover's maximum yield is over 4.5 million gpd. With the addition of the Bouchard Well to the system by 2002, close to another one million gpd safe yield can be expected.

Current Water Demand Approximately 2.2 Million GPD

Average daily demand represents the amount of water a community would consume in 24 hours if daily consumption were averaged through the year. During the period between 1960 and 1980 the average daily use of water remained relatively stable—between 2.0 million gallons per day (mgd) and 2.2 mgd. Between 1980 and 1990 the average daily consumption increased about 400,000 gpd to between 2.2 and 2.6 mgd. This increase is directly attributable to Dover's population increase and non-residential growth during this period.

Appendix B illustrates the average daily water production for each well by month and year between the period of 1994 and 1998. There was a marked decrease from 1994 to 1997 from approximately 2.39 mgd 2.15 mgd. These volumes are less than those of the previous decade in part due to the loss of some industrial users. 1998 saw a small increase over 1997 to 2.19 mgd.

The maximum amount of water entering the water system during the course of one day within a particular year is the maximum day demand. Such a day is usually a direct result of weather conditions that result in increased use of water, typically during a hot dry summer period. During the past five years the maximum day demand ranged from 3.37 mgd to 3.66 mgd in 1998. The 1998 figure represents 1.67 times the average demand compared to 1.48 times in 1994 and only 1.41 times in 1998. It would appear that while the average daily demand has been stable over the past ten years, the maximum daily demand has increased proportionally.

At present, both the average daily and maximum daily demand can be met with the existing well system. Future demand appears likely to be accommodated by the addition of the Bouchard Well.

Exploration for Additional Water Sources

Subsequent to the 1988 Master Plan, the City contracted with several hydrogeological consultants to conduct searches for additional water supplies. This exploration program resulted in the development of the Bouchard Well and ongoing exploration at the Cotton Farm site for a bedrock well. The City is hoping to achieve a yield of 500-600 gpm from this site. Two other sites have also been selected for further testing—the so-called Gabriel Property on County Farm Cross Road and an area off upper Sixth Street near the Rochester line in the Blackwater Brook watershed.

Capital Projects Completed Since the 1988 Master Plan

The 1988 Master Plan recommended a number of water capital projects to improve the system. The following list identifies which of these projects were completed.

1. A combination of 8" and 12" lines were installed on Henry Law Avenue from Central Avenue to Browning Drive to replacing the existing 6" line

2. A new 12" line was installed on Sixth Street from Glenwood Avenue to the Reyner's Brook subdivision beyond County Farm Road for added capacity to the system.
3. Replaced 2,400 feet of 6" line with a new 12" main from Alumni Drive to the Bellamy River on Durham Road (Route 108).

4. Installed new 12" line on Watson Road from Tolend Road to County Farm Road. Recent hydrant tests confirm that this area no longer has flow problems.

5. Replaced 6" main on Spruce Lane with 12" main from Back River Road to the existing 12" line on Garrison Road in Morningside Park area.

6. Replaced 6" line with 12" line on Boston Harbor Road from Hilton State Park to Spur Road in Wentworth Terrace area..

7. Replaced 6" line with 8" lines on New York Street between Broadway and Central Avenue as part of overall roadway improvement project.

8. Replaced 6" line with 8/12" lines on Sixth Street between Horne and Whittier Streets as part of overall roadway improvement project.

9. Installed an 8" main on Fifth Street from Grove to Chestnut Street.

10. Replaced The 4" water line on Lincoln Street with a 12" line.

11. Installed recharge system for the Hoppers Aquifer.

12. Upgraded the 8" test well in the Hoppers Aquifer to a regular well—the Campbell Well.

13. Located and installed a new test well in the French Cross Road area known as the Bouchard Well. Adjacent property acquired. Development of an exploratory test well program was initiated at the Cotton Farm property

14. Installed a small water treatment plant adjacent to the Griffin Well to remove iron and manganese.

Existing Problem Areas

ISO Fire Flow Problems

Many of Dover's water system problems stem from variable pressure and change in elevation from one part of the system to another. Consequently, the City needs to provide water mains large enough to provide adequate fire flows. Minimum fire flow standards are established by the Insurance Service Organization (ISO) to establish insurance rates for a city. These standard includes both pressure and volume and is based in part upon the minimum flow necessary between buildings at various distances. The 1988 Master Plan identified seven areas within the City that did not meet the ISO standards. Since then, three of the projects have been completed and three more are in the current Capital Improvement Plan. The three projects that were completed are identified in the section above as Numbers 4 (Tolend Road), 5 (Morningside Park area), and 6 (Wentworth Terrace). The items in the CIP include improved fire flows to: 1) Old Rochester Road and the Indian Village area; 2) Country Club Estates (as part of the Atlantic Avenue/Gulf Road Upgrade); and 3) Fourth Street and Snow's Court area. Still to be addressed are the fire flow problems on Westwood Circle.

Capacity Problems

Several of the capacity problems that were identified in the 1988 Master Plan have been addressed—identified as Numbers 1 (Henry Law Avenue) and 2 (Sixth Street) in the previous section. The following problem remain from that plan:

1. The existing 6"and 8" mains on Old Rochester Road need to be replaced with a 12" main from Weeks Crossing to Indian Village. The section from Weeks Crossing to Sullivan Drive has been completed through agreements with developers.

The following projects were identified as major flow or condition problems after the 1988 Master Plan in the HTA study.

2. Existing 6" and 8" mains on Fourth Street and Washington Streets from Whittier Street to Central Avenue need to be replace with 16" mains.

3. Dover Point water main needs replacement.

4. Existing 12" line on Broadway area needs repair and/or replacement between Garrison Hill and Florence Street.

5. Need to install 12" main along Atlantic Avenue/ Gulf Road to Country Club Estates.

The 1991 HTA study also identified a number of capital improvement projects that are of lower priority than the previous problem areas, but still need to be addressed. These needed improvements are identified on Table 3 below.

Water Treatment

The City treats water at several location prior to its discharge into the municipal system. At present the Lowell Street facility filters out iron and manganese and discharges the residue into the City's sewer system. Further study of this situation is needed to determine whether or not it is more cost effective to install a small filtering system on site instead of discharging this effluent to the sewer system.

Table 3. Additional Water Line Capacity Problems

Street	From	To	Existing Main	Proposed Main
Central Avenue	Washington Street	Silver Street	10	16
Silver Street	Central Avenue	Arch Street	10	16
Rutland/Cataract St.	Silver Street	Central Avenue	6/8	12
Court Street	Central Avenue	Watson Street	6	16
Arch Street	Fourth Street	Silver Street	8	16
Littleworth Road	Old Stage Road	Madbury line	6	12
Portland Avenue	Atlantic Avenue	Hancock Street	6	8
Park Street	Hill Street	New York Street	6	8
Florence Street	Oak Street	Broadway	4/6	8
Everett Street	Baker Street	Ham Street	4	8
Redden Street	Horne Street	Oak Hill Drive	None	8
Snows Court	Prospect Street	Fourth Street	4	8
Cushing Road	Dover Point Road	Spaulding Tpk.	6	8
Hawthorn Road	Kent Road	6" on Hawthorn	None	12
Crosby Road	12" on Crosby	8" on Crosby	None	12

Radon

The Environmental Protection Agency (EPA) has issued revised rules for radon levels in drinking water in accordance with the Clean Water Drinking Act, as amended. The City will need to investigate this issue and be prepared to install the necessary equipment to reduce radon levels to acceptable standards within the next several years.

Future Water Demand

In order to assess the future demand for water in Dover, the projected residential and non-residential growth from the Land Use Section of the Master Plan was used. In that section growth was projected to the year 2005. Using 1995 as the base year, Dover's population is expected to increase from approximately 25,950 to 28,700 or an 11 % increase in ten years. In addition, business employment is

expected to increase over 30%. These figures were converted to numbers of units of different types of housing and to square foot increases for non-residential growth. These figures were used with water demand multipliers for each activity. Table 4 shows the projected increased water demand for the period 1995 to 2005.

Table 4. Projected Water Demand 1995-2005

Land Use	Average Daily Water Use (Gal)	10 Year Growth Units or SF	Additional Demand (GPD)
Single Family Detached	160 per unit	1450	232,000
Single Family Attached	105 per unit	425	44,625
Multi-Family	113 per unit	110	124,300
Office	.078 per sf	1,065,000	83,070
Retail/Commercial	.095 per sf	292,000	27,740
Industrial	.052 per sf	1,275,000	66,300
Total Additional Demand		**578,035 GPD**	

Source: Economic and Land Use Analysis, AER, July 1998

Based upon these numbers, total future water demand, even using the higher 1995 figure for average daily demand, will be approximately 2,788,000 gpd by 2005. This figure is much lower than the amount projected in the 1988 Master Plan that predicted demand for over 3.5 million gpd by 2000.

The New Hampshire Office of State Planning (NHOSP) projects somewhat slower growth in the City's population for the beginning of the next century and predicts Dover's population to reach 29,205 by 2010, 30,389 by 2015 and 31,704 by 2020. Incremental demand for water will also be expected, but the apparent yields of the existing wells as well as the addition of the Bouchard Well provides Dover with the capacity for the next 10-20 years. However, exploration for additional water sources, as well as programs to protect the existing wells from potential contamination, should be continued, especially for the Cotton Well off Blackwater Road.

Recommendations

1. Continue to develop and test the City's groundwater wells that have been identified as potential water sources, including the Cotton Farm well.

2. Acquire any remaining land within the Well-Head Protection Zone of all existing wells.

3. Establish a policy and program to negotiate with land owners, whose properties are projected to produce water yields of appropriate quality suitable for municipal use, a right of first refusal if the land becomes available for sale.

4. Continue to educate all citizens about the necessity to protect the existing water supplies and to use water wisely through school educational programs, workshops and public awareness articles and announcements.

5. Implement a System Control and Data Acquisition (SCADA) monitoring system on all water system equipment to ensure real-time monitoring and control of water levels and flows consistent with recommendations in the SCADA Study.

6. Continue the Water Division's program of water meter replacement until all users have updated models.

7. Continue to develop the Bouchard Well and Treatment Plant to ensure that it comes on line by 2002. The treatment facility can also service the Hughes Well in the Barbadoes Aquifer.

8. Study the feasibility of installing a sand filter treatment system at the Lowell Avenue Treatment Plant for removal of iron and manganese.

9. Install the necessary air stripping equipment to remove radon from the municipal water supply in order to meet new EPA standards.

10. Investigate the feasibility of instituting a program of life-cycle costing for all Water Division assets to determine the annual expenditures required to maintain an efficient system of water service to the citizens of Dover.

11. Based upon the results of the life-cycle costing program, prioritize and schedule the repair, maintenance, and, when necessary, the construction of those water facilities as part of the City's capital improvement planning process.

12. Review, and revise accordingly, City ordinance for the protection of municipal groundwater supplies and to ensure that new development and construction implement water conserving building programs.

13. Create an emergency conservation ordinance which may be implemented during period of severe drought in order to conserve water to the greatest extent possible.

14. Continue to replace all water mains that are deteriorated or that have restricted flows. Such projects include:

High Priority

- Install 12" main on Old Rochester Road from Sullivan Drive to Indian Village to complete a section already done from Weeks Crossing.
- Replace existing 6/8" mains on Fourth Street and Washington Streets from Whittier to Central Avenue with 16" mains.
- Replace Dover Point water main.
- Repair/replace existing 12" line on Broadway between Garrison Hill and Florence Street.
- Install 12" main along Atlantic Avenue/ Gulf Road to Country Club Estates.

Medium Priority

- Replace existing 6/8" mains on Washington Streets from Whittier to Central Avenue with 16" mains.

Low Priority

Street	From	To	Existing Main	Proposed Main
Central Avenue	Washington St.	Silver Street	10	16
Silver Street	Central Avenue	Arch Street	10	16
Rutland/Cataract St.	Silver Street	Central Avenue	6/8	12
Court Street	Central Avenue	Watson Street	6	16
Arch Street	Fourth Street	Silver Street	8	16
Littleworth Road*	Old Stage Road	Madbury line	6	12
Portland Avenue	Atlantic Avenue	Hancock Street	6	8
Park Street	Hill Street	New York Street	6	8
Florence Street	Oak Street	Broadway	4/6	8
Everett Street	Baker Street	Ham Street	4	8
Redden Street	Horne Street	Oak Hill Drive	None	8
Snows Court	Prospect Street	Fourth Street	4	8
Cushing Road	Dover Point Road	Spaulding Tpk.	6	8
Hawthorn Road	Kent Road	6" on Hawthorn	None	12
Crosby Road	12" on Crosby	8" on Crosby	None	12

*This action would also relieve fire flow problem at Westwood Circle.

Sewer System

History

The first sewers in the City of Dover were constructed in the 1840's and consisted of wood. Gradual expansion of this wooden system took place until the late 1860's when the construction of the first brick sewer began on Court Street. By 1870 brick sewers on Washington Street and Central Avenue were started and by 1874 the first cement pipe was laid into the ground.

Use of the sewers for the conveyance of storm water began around 1880. Within five years the capacity of the system was insufficient and emergency relief sewers had to be constructed to reduce the load in many areas. The City continued to allow the connection of drainage lines to the Municipal Sewer System as recent as the mid 1960's. Even today significant amounts of infiltration into the sewerage treatment system occur during periods of heavy rain. The consulting firm of Wright-Pierce is currently conducting an inflow and infiltration study for the City to identify specific problem areas.

Historically, industrial waste received little or no treatment prior to being dumped directly into the river. Several shoe and leather companies dumped waste containing dyes, oils, solvents, and various chemicals into the system. Industries producing insecticides, meat by-products, plastic, and paper products also contributed toxic material to the system.

Between 1975 and 1980 the Cochecho Separation Project connected the entire sewer system north of the Cochecho River to the sewage treatment plant. During this same period the South Side Sewer Project expanded the system to the Dover Point area.

Dover replaced the primary treatment plant located at the end of River Street and operated from the early 1960's to 1990. The current secondary treatment plant, located off Middle Road, came on line in 1991. A pump station was constructed near the River Street site to transfer sewage, previously routed to the primary plant, to the new secondary plant via a 36" force main.

Existing System

There are approximately 100 miles of sewer lines existing in the City of Dover—of these 15 miles are force mains. The lines vary in size from 8" to 36" in diameter and service approximately 38% of the area of the City and 85% of its residents. The lines generally consist of vitrified clay, reinforced concrete, cement asbestos, and more recently polyvinyl chloride (PVC). These facilities are mapped and available through the GIS Office of the City's Environmental Services Division.

The 1991 report prepared by HTA for the City, *Water and Sewer Capital Project Management and Rate Setting Study*, documents all of City's fixed assets for sewer including pipes, pump stations and the treatment facility.

In addition there are 14 pump stations located throughout the City to pump sewage to the waste treatment plant. The capacities and location of each of these are identified in Table 5.

Table 5
Pumping Stations

Station	Capacity	Year Built	Location
1. Varney Brook	1800 GPM	1979	Cushing Road
2. Charles Street	3750 GPM (1985)	1963	Charles Street
3. Piscataqua	800 GPM	1980	Wentworth Terrace
4. Mill Street	485 GPM (1985)	1963	Mill Street
5. Mast Road	480 GPM	1986	Mast Rd./Spruce Ln
6. Cochecho	300 GPM	1976	Cochecho Street
7. Boston Harbor	243 GPM (1987)	1980	Boston Harbor Rd
8. Cranbrook	200 GPM (1979)	1957	Cranbrook Lane
9. Strafford	200 GPM	1950 (1980)	Rt. 16 near Strafford Farms
10. Crosby Road	200 GPM	1983	Crosby Road Industrial Park
11. Spruce Drive	200 GPM	1978	Spruce Drive
12. Mount Pleasant	100 GPM	1986	Intersection of Back Rd/Henry Law
13. Leighton	60 GPM	1979	Leighton Way
14. Brickyard	220 GPM	1987	Brickyard Estate
15. River Street	13,700 GPM	1991	River Street

Note: Dates in parenthesis indicate year of upgrade.
GPM = gallons per minute

Source: *Water and Sewer Capital Project Management and Rate Setting Study, 1991*

Secondary Treatment Plant

In the early 1970's federal regulations mandated through the Clean Water Act upgrading Dover's primary treatment facility on River Street to a secondary facility. Since that site did not have sufficient space for an upgraded facility, in 1987 the City contracted to have a new site selected and a new treatment plant designed. The new plant, located off Middle Road, was completed in 1991 and also included a sludge treatment and composting facility.

A new 18,700 gpm capacity pump station was constructed on River Street. Sewage is collected at River Street from the existing interceptors and pumped 19,400 feet to the new facility. The pump station contains four 3,300 gpm pumps with 300 HP motors and screening and grit removal facilities. A 36-inch force main was installed between the River Street pump station and Huckleberry Hill along Back Road and Middle Road.

The average daily flow capacity of the new plant is 4.7 million gallons per day (mgd) with a maximum 24 hour flow of 13.8 mgd and a peak hour flow of 16.8 mgd. The plant was designed to meet sewage flows through the year 2005 based on population projections from the New Hampshire Office of State Planning (NHOSP). Population for the year 2005 was estimated to be 31,300 and it was assumed that 90% of the City would be serviced by the system. The design of the plant, as well as the size of the parcel on which it was constructed (36 acres), allow for a 33% increase in future capacity. Since that time the population estimates for Dover have been revised. In 1995 Dover's population was 25,950 and the projected population for 2005 is now 28,700, or 8% less than was projected for the project. Population projections from the NH OSP in 1997 indicate that Dover will reach a population of 31,704 in 2020. Given this projection, it would appear that the plant will have sufficient capacity to a period between 2015 and 2020.

Existing Treatment Plant Flow Rates

Because of Dover's past history of allowing a combined drainage/sewer system significant infiltration and inflow exists today. In its 1986 report on a design for the new treatment plant, Camp Dresser and McKee of Boston, Massachusetts, stated that the plant experiences an inflow of 5.2 mgd as the result of a 2-inch rain storm. Instantaneous peak flows exceeding 10 mgd occurred on many occasions during periods of heavy rain. These inflow rates are 53% greater than the standard established by the Merrimack Curve (Industry Standard).

Average daily flow to the treatment plant during 1999 was 2.36 mgd. (See Table 6). For the past five years—1995-1999—the average daily flow was 2.38 mgd. This flow was actually lower than the average of 2.4 mgd during the mid-1980's. The highest average daily flow during the 80's was in 1987, reaching 2.61 mgd. During the driest months of 1999, when infiltration was lowest, the average daily flow was 1.75 mgd and 1.76 mgd, respectively. The lowest daily average flow during the past five years was in August and September of 1996—1.61 mgd for each month. The highest average and maximum flows to the plant were during June of 1998—4.01 mgd and 12.42 mgd respectively. The relatively lower average daily flows during the 1990's may be attributable to the loss of several large business, such as Textron, as well as the use of water saving plumbing fixture in new development.

Table 6
Daily Sewer Treatment Plant Flows—1995-1999
Millions of Gallons Per Day

	1995		1996		1997		1998		1999	
	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.
JAN	2.82	4.41	3.33	7.78	2.35	3.25	2.47	4	2.7	5.72
FEB	2.08	3.02	2.69	5.01	2.27	3.46	3.41	7.76	3.05	5.11
MAR	2.8	5.06	3.05	5.81	2.82	4.23	3.51	7.85	3.36	4.64
APR	2.23	2.64	3.51	10.99	3.8	10.55	2.59	3.33	2.44	3.15
MAY	2.04	2.46	2.61	3.5	2.4	3.16	2.95	5.98	2.24	3.14
JUNE	1.86	2.06	1.75	1.97	1.8	1.94	4.01	12.42	1.94	2.21
JULY	1.71	2.11	2.13	7.66	1.7	2.51	2.41	3.42	1.77	2.27
AUG	1.82	2.36	1.61	1.84	1.69	2.94	2.07	3.14	1.76	1.87
SEP	1.67	2.17	1.61	2.25	1.69	2.11	1.98	2.35	2.32	6.22
OCT	1.85	2.3	3.17	15.25	1.52	1.71	2.36	5.24	2.24	3.99
NOV	2.96	6.6	2.13	3.29	2.08	4.45	2.08	2.37	2.16	2.53
DEC	2.08	2.52	3.34	6.27	1.96	3.17	2.03	2.17		
	2.16	3.14	2.58	5.97	2.17	3.62	2.66	5.00	2.36	3.71

Source: Dover Treatment Plant Operator, December, 1999

Capital Projects Completed Since the 1988 Master Plan

Since the adoption of the 1988 Master Plan a number of capital projects have been completed that were recommended in the plan. In addition to the completion of the secondary treatment plant and the decommissioning of the primary treatment facility a number of smaller projects were completed. The following is a list of these projects.

1. Acquisition of a new sewer jetting vehicle to allow the City to clean City sewers.

2. Completion Colonial Park Feasibility Study to determine the cost to provide sewer service to an area with failing septic systems.

3. Replacement of a portion of deteriorating sewer on Henry Law Avenue from Nile Street to Tennyson Avenue.

4. Replacement of sewer line on Horne Street from Hough to Ash Streets.

5. Design of sewer extension for County Farm Road as well as survey and subsurface investigation along preferred route.

6. Initiation of Inflow/Infiltration (I/I) Study to determine the magnitude, nature and location of infiltration into the City's sewer system.

7. Replacement of deteriorated line on Nelson Street from Locust Street to Atkinson Street

8. Separation of storm water drainage on Third and Chestnut Streets.

9. Replacement of inadequate 8” line on corner of Sixth and Whittier Streets.

Maintenance Projects Completed Since the 1988 Master Plan

Since the adoption of the 1998 Master Plan a number of maintenance projects have been completed that were recommended in the plan. These include the following:

Location	Problem
1. Belknap and St. Thomas Streets	Separate drainage
2. Horne Street	Deteriorated Line
3. Nelson Street	Deterioration
4. Henry Law Avenue	Deterioration
5. Whittier Street	Roots in line
6. Cochecho Street	Deterioration
7. Bellamy Road & Cataract Street	Deterioration
8. Ham Street	Deterioration
9. Central Avenue	Deterioration
10. Strafford Road	Separate drainage
11. Prospect Street	Separate drainage
12. Old Rochester Road	Separate drainage
13. Third and Chestnut Streets	Separate drainage
14. Central Avenue from Reservoir St. to Ash St.	Replace 8” line with a 15" line
15. Whittier Street from Glenwood Ave. to Dowaliby Ct.	Replace line

Existing Problem Areas

Existing problems can be broken into two categories: maintenance and capacity.

Maintenance Problems

The existing sewer system has a number of areas in need of maintenance. Typical maintenance problems include: separation of drainage lines; blockage of lines; roots growing into the system; and old age. Table 7 outlines a list of maintenance problems.

Table 7
Sewer Maintenance Problems

Location	Problem
1. Most lines in Morningside Park Area	Deteriorated lines, High infiltration
2. Durham Road*	Blockage; Line Replacement Needed
3. Applevale area	Infiltration
4. Stark Ave. near Elliot Circle	Deteriorated lines
5. Glennwood Ave.*	Roots in line
6. Richmond St.	Deterioration
7. Hanson St.	New line & separate drainage
8. Hill St.	Deteriorated lines
9. Central Avenue (City Hall to Dover Catholic)	New Line & separate drainage
10. Page Ave.	Deteriorated lines
11. Hull Ave. and Hough St.	Roots in line
12. Hancock St.	Deteriorated lines
13. Mill St.**	Deteriorated lines
14. Smith Rd.	Roots in line
15. Industrial Park Dr., Progress and Summer Drives	Infiltration
16. Rose St.	Roots in line; treated, grew back
17. Pearl St. to Broadway	Infiltration

The following were additional problems identified in the HTA Report of 1991.

18. Broadway Area	Infiltration
19. Bellamy Rd.	Roots in line
20. Cataract/Rutland	Roots in line
21. Woodland & Beech Roads	Grit problems
22. Fairfield Dr.	Eliminate easement
23. Merry, Hall & Gilman Streets	Roots in line
24. Hospital area	Grease and roots in line
25. Abbot St.	Line deterioration & roots
26. Arcola St.	Manholes required
27. Weeks Circle	Install sleeve
28. Fisher St.	Extra manhole required
29. Ham St. (Concord to East)	Deteriorated lines
30. Lisa Beth Circle	Infiltration
31. Parker St.	4 inch pipe
32. Rutland St.	Sump pump & roof gutter
33. Cataract Ave.	Deteriorated lines
34. Fourth Street*	Deterioration & Roots in line
35. G.E. Sewer Line Extension	Infiltration

* In current City Capital Improvement Program (CIP)

** In process of repair

Note: Not listed in priority order

Existing or Projected Capacity Problems

Capacity problems are caused by either inadequate size or too shallow a slope of any given line. Table 8 outlines the existing capacity problems in the sewer system. Table 9 identifies problems that will be significant in the future if the city continues to grow, requiring greater sewer capacity.

Table 8
Sewer Line Capacity Problems

Location	Problem
- Corner of Portland Ave. & Rogers St.	Inadequate slope
- Portland St. across to River St.	Inadequate slope
- B & M Bridge over Cochecho	Inadequate slope
- Waldron Street along Cochecho	Inadequate slope
- Henry Law Ave.-Washington to River St.	Inadequate slope and size
- River St. near Henry Law Ave.	Inadequate slope
- Maple St. from Ash to Hough St.	Inadequate slope
- Broadway from Hill to Ham St.	8" line inadequate, poor slope
- Glenwood Ave. to Roosevelt Ave.	Inadequate slope
- Snow's Ct. to corner of Fourth St.	Inadequate slope
- Wellington to Cranbrook Lane	Inadequate slope
- Cedarbrook Dr.	Inadequate slope
- Hillcrest Drive to Oak Hill Drive	Inadequate slope
- Hayes Lane.	6 inch pipe

* In current CIP

Table 9
Existing or Projected Sewer Capacity Problem Areas

Location	Problem
-Portland Ave. from Atlantic Ave. to Rogers St.	8" line inadequate
-Atlantic Ave.	8" line inadequate
-Rogers St.	8" line inadequate
-Cocheco St.	10" line inadequate
-Cocheco St. pump station	Over Capacity
-Court St. at Niles St.	Inadequate pipe size
-Spruce Lane	Inadequate slope
-Varney Brook pump station	Over capacity
-Locust Street	Inadequate slope
-Mill St.	18" line inadequate
-Charles St. Pump Station	Over capacity
-Crosby Rd. flowing to Knox Marsh Rd.	Inadequate slope and size
-Toftree Lane and Dover Point Rd.	8" line inadequate
-Cross country line between Middle Rd and Dover Point Rd	Inadequate slope
-Along Cocheco River from "East Coast Autocraft" to downtown	Inadequate slope
-Lowell Ave. near pond	Inadequate slope
-Maple St. between Ash St. and Hough St.	Inadequate slope
-Morningside Dr.	Inadequate slope, size/ infiltration
-River St. at entrance	Inadequate line
-Cochecho River between First St. and Waldron Ct.	Inadequate slope

Projected Sewer Demand

In the 1988 Master Plan projections for sewer demand were based upon population projection estimates that were either higher than realized or that have been modified by updated projections in the Land Use Section of this master plan as well as more recent projections from the NH OSP. The previous plan projected the average daily wastewater flow for the year 1995 to be 3.4 mgd with a maximum 24 hour flow of 14.3 mgd. With an additional increase from infiltration into the system of 0.3 mgd of wastewater, the average daily wastewater flow during periods of higher infiltration were projected to be 3.7 mgd with a peak of 15.2 mgd. Furthermore, the 1988 plan projected average daily sewerage flow for the year 2020 was 6.5 mgd with a peak hour flow of 26.6 mgd. In these previous projections for 1995 and the year 2020 it was assumed that 100% of the City was being serviced by the sewer system.

These estimates are quite a bit higher than the current usage of 2.4 mgd per day. In addition the projected sewer demand in the 1988 plan was significantly higher than the projected water demand since different land use multipliers were applied to the residential categories. The EPA standard for per residential unit was also extremely high (167 gpd per residential unit) and did not reflect Dover's per unit usage of 97 gpd. For purposes of this plan, it is recommended that the water demand projections previously calculated be used for the sewer demand with a modification to allow for infiltration into the system. Although the City intends to reduce infiltration into the sewer system, it appears that eliminating infiltration altogether may be a challenging task. To be conservative, an infiltration modifier should be included.

The Land Use Chapter projected an 11% growth in population—from 25, 950 to 28,700—between 1995 and 2005. Projections beyond this point were not given, although the NH OSP projects Dover's population to reach 31,704 by the year 2020. In the previous Master Plan the state's projection had Dover reaching 31,300 by 1995. In addition the Dover Planning Department projected a somewhat higher rate of growth than the NHOSP based in part on the high rate of residential growth in the middle 1980's. Based upon the projected water usage to the year 2005 there will be an additional demand in the sewer system of 578,035 gpd.

Even though the City is projected to grow at a slower rate than projected in 1988, there are a number of capacity problems that currently exist or are projected to exist. These areas are listed in Table 9 and are also illustrated on maps available at the City's Engineering Office that were produces as part of the HTA Report in 1991.

Recommendations

The City needs to continue to upgrade the existing system. Many of the capacity problems are interrelated and need to be addressed comprehensively. Detailed engineering will be needed for many of the problems.

Specific recommendations include:

1. Reconstruct the deteriorated Fourth Street line in order to alleviate existing capacity problems.

2. Upgrade G.E. sewer line (Littleworth Road area) to eliminate infiltration.

3. Install Spur Road sewer line—a 1400 foot line to serve 12 existing residences adjacent to the Bellamy River

4. Continue the City's program for correcting inflow/infiltration (I/I) problems into the sewer system. Establish future priorities based upon the results of the current I/I study to be completed in 2000.

5. Upgrade sewer for Berry Brook area.

6. Investigate the feasibility of instituting a program of life-cycle costing for all Sewer Division assets to determine the annual expenditures required to maintain an efficient system of sewer service to the citizens of Dover.

7. Based upon the results of the life-cycle costing program, prioritize and schedule the repair, maintenance, and, when necessary, the construction of those sewer facilities as part of the City's capital improvement planning.

8. Implement a SCADA monitoring system on all sewer system equipment to ensure real-time monitoring and control of sewer levels and flows consistent with recommendations in the SCADA Study.

9. Begin a program to upgrade the City's sewer pump stations as funding permits starting with the Glenwood Avenue station as per the City's CIP and the Charles Street station.

10. Replace the Glenwood Avenue sewer as identified in the City's current CIP.

11. Rehabilitate Durham Road sewer from Sawyer's Bridge to the Mast Road intersection as identified in the City's current CIP.

12. Prioritize and schedule the repair and maintenance of those sewer facilities with capacity and maintenance problems as identified in the tables in this section.

13. Consider mitigating the odor problem or re-locating the River Street Pump Station when the City undertakes re-development of the Cochecho Riverfront as per the Cochecho Waterfront Design Charrette of July 1996.

14. Consider re-routing the force mains from the existing sewer pump stations directly to the wastewater treatment plant.

Storm Water Management

As part of the City's utility system the Community Services Department is also responsible for the storm water system. However, storm water management also incorporates proper land use management procedures to protect and maintain the quality of the City's water resources. Much of the storm water management relative to land use practices is covered in the Water Resources section of the Natural and Historical Resources Chapter of this Master Plan. In addition the City has recently prepared a storm water management plan as part of its compliance with EPA's storm water management program**. The City of Dover—Storm Water Management Plan, December, 1999 as amended is hereby incorporated into this Master Plan by reference**. A summary of that plan follows.

The U. S. EPA has adopted Phase II storm water rules under the provisions of the Clean Water Act, which the City of Dover must implement by 2004. The new storm water Phase II rule is a key action under the Administration's Clean Water Action Plan. A primary goal of the Clean Water Action Plan is to strengthen controls for polluted runoff, the leading remaining cause of water pollution today.

The storm water management plan addresses storm water quantity and quality. The City's storm water system is a complex network of natural and manmade features that store and transport runoff from precipitation events and protect the public and property from flooding. Natural features include intermittent and perennial streams, lakes, rivers and wetlands. Manmade features include swales, road ditches, culverts, storm sewers, and impoundments such as detention and retention ponds and dams.

Runoff over a naturally vegetated surface such as grass or forest allows some absorption and moves more slowly than runoff over an impervious surface such as a building, parking lot or street. Runoff may carry pollutants into the environment and adversely impact water quality through several pathways. Roads and parking lots are sources of gasoline, oil, antifreeze from leaks and spills. Heavy metals come from auto emissions and tire wear. Fertilizers, herbicides and pesticides when applied or disposed of inappropriately can impact surface water and groundwater quality. Sand and salt from snow removal and ice control operations must be swept from streets and parking lots and removed from catch basin sumps. Failure to do so introduces sediment into the storm water system and adversely affects water quality, stream beds, and important habitat. Construction activity, which strip vegetation and disturb soil, is a major potential source of sediment. Sediment can reduce capacity in the storm water system, smother vegetation, and increase turbidity of water bodies impacting the survival of flora and fauna. Animal feces, illicit sewer connections to the storm drainage system, failing septic systems and cracked, leaky sanitary sewer pipes contribute bacteria to water bodies degrading water quality.

Outreach and Education

The public can provide valuable input and assistance to a regulated municipal storm water management program. Consequently the public should be given opportunities to play an active role in both the development and implementation of the program. Having an active and involved community is crucial to the success of a storm water management program.

Current Practices

The Community Services Department has been actively involved in initiating and fostering community participation, outreach and education with respect to storm water management. The Department has used

many media forms and venues to involve and educate the community. The following is a list of recent initiatives:

- Cooperative storm drain stenciling and education program called "Yellow Fish Road"
- Presentation of a storm water educational program for Dover sixth graders
- Presentation at N H Coastal Program Workshop on Dover's storm water
- Articles in "Community Notes", the departmental newsletter distributed semi-annually to all Dover residents
- Cooperative effort with NH Department of Environmental Services (DES) to detect and eliminate bacterial illicit connections to the separated storm sewer
- Local involvement of shore line clean up organized by N H Coastal Program

Recommendations

1. Dover should continue and expand its current practices to educate and involve the community. The Storm Water Management Plan should be presented at public meetings for review and be modified appropriately to reflect the public's views. The plan should then be presented to the Dover City Council for endorsement.

2. Convene a cooperative effort of Phase II communities, NH DES professionals, University of New Hampshire staff and Cooperative Extension personnel, and other natural resource professionals to produce educational resources satisfying Phase II educational requirements. The materials could be in the form of school curriculums; video tapes suitable for public access TV; power point slide shows for presentation at public meetings, brochures or material suitable for posting on local community web pages.

Flood Management

Flood management is necessary during extended heavy rains that cause flooding under current conditions as well as with future development to ensure that it does not create or exacerbate flooding conditions.

Current Practices

The City has undertaken the following for flood and storm water management:

- Sophisticated weather forecasting and weather advisory services, improving the community's ability to anticipate a potential flooding event.

- Establishment of an emergency command structure and response plan that includes the Fire, Police, and Community Services Department.

- Instituting a program within the Community Services Department to train personnel to respond to emergencies within the City, including flooding.

- Mapping flood prone areas on Federal Emergency Management Administration (FEMA) maps and monitoring roads prone to flooding and closing those as necessary.

The City also has a number of regulations in place to minimize flooding and excess storm water runoff. These include:

- Chapter 113 of the Dover Code entitled *Floodplain Development* restricts and regulates proposed development within the FEMA designated flood zone.

- Dover Chapter 170.27.1 establishes a "Wetland Protection District" which restricts and regulates development in wetlands.

- Dover Chapter 155 entitled "Subdivision of Land" and specifically subsections 155-27, 155-35 and 155-41 addresses drainage and potential flooding in proposed subdivisions.

- Chapter 149-14 entitled "Site Development Design Criteria" addresses drainage and flooding for proposed development which are regulated under Dover's Site Review Regulations Chapter 149.

Recommendations

1. Initiate a review within the Community Services Department of its responsibilities and its preparedness to respond to a flood emergency and modify procedures accordingly.

2. Where necessary, incorporate capital projects to mitigate flooding in the City's Capital Improvement Project list.

Pollution Prevention/Good Housekeeping

Pollution Prevention/Good Housekeeping for municipal operations is a key element of a storm water management program. It requires that Dover examine and subsequently modify its actions to help ensure a reduction in the amount and type of pollution that (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and (2) results from actions such as environmentally damaging land development and flood management practices or poor maintenance of storm sewer systems.

While the EPA Phase II requirement is meant primarily to accomplish the goal of improving or protecting the quality of receiving waters by altering the performance of municipal or facility operations, it also can result in a benefits for the City, since proper and timely maintenance of storm sewer systems can help avoid repair costs from damage caused by age and neglect.

Current Practices

The Dover Streets and Drains Division of the Community Services Department is responsible for the maintenance of the storm water system. The City Engineer assists the Streets and Drains Division with the analysis and design of improvements to the storm water system. The larger improvements are included in the Capital Improvement Projects process.

The City's GIS maintains the mapping of the entire closed storm water drainage system. The maps (available through the Community Services Department) show the location of all catch basins, drain manholes, piping, and discharge points. Culverts, detention and retention structures and open drainage swales and ditches are not currently mapped

Detailed data associated with each of the structural elements has been partially collected. The storm water mapping is maintained by the Environmental Programs Division. As-built plans are required of all development projects in the city. The plans are delivered in both hard copy and in digital format for import to the GIS. The plans must be on the same geographic coordinate system as the City's GIS system to facilitate importation.

The existing storm water drainage system network is composed of:

- Catch Basins (2047)
- Drain Manholes (534)
- Miles of Pipe (50.2)
- Discharge Locations (204)
- Culverts (140)
- Detention and Retention Ponds (14)
- Miles of open Street drainage (100.8)
- Dams (3)

There are three major dams located in Dover, two on the Cochecho River at the Pacific Mills in downtown Dover and at Watson Road. A third one is located at the intersection of Mast Road and Spruce Lane on Johnson Creek. This structure acts as a storm water control for several recently constructed residential developments in the area.

The Streets and Drains Division also has equipment at its disposal to maintain the storm water drainage system. Specialized equipment and services are leased and/or contracted on an "as needed" basis such as a grade-all or large excavator.

Dover's existing storm water system management practices do not include a comprehensive inspection program. Consequently, routine maintenance such as catch basin sump cleaning and infrastructure repairs occur only as problems are identified. Documentation of existing problem areas are maintained by both Engineering and the Drainage foreman.

Annual maintenance includes: street and sidewalk sweeping, catch basin cleaning, routine repairs to structures and pipes, drainage ditch improvements and culvert cleaning. Small projects are performed annually by the Division. The installation of closed and open storm water drainage in problem areas is often undertaken with Division staff and contracted services as necessary. Larger scale capital projects are usually planned, designed, and contracted with specifications and bids under the oversight of the Engineering Division.

Dover's current practice with regard to privately owned storm water drainage facilities places inspection and maintenance responsibility with the property owner or property owner's association There is no procedure established that ensures that the inspection and necessary maintenance on privately owned storm water drainage systems is being performed.

The City utilizes two locations for snow dumping. One is located at Maglaras Park and the other is at the Dover Ice Arena. The snow melt water is not treated and eventually is discharged into the Cochecho River.

Recommendations

1. Establish a program to clean each catch basin in the City once every 5 years.

   The current level of catch basin cleaning is 50-60 annually. At the current rate, it would take between 30 and 40 years to clean all 2047 catch basins in the City one time. A more reasonable time period is 5 years between cleaning. That would require the Streets and Drains Division to clean at least 400 catch basins annually.

2. Establish a comprehensive program to inspect the condition of the storm water system.

3. Review and modify the current method of disposal for catch basins spoils to meet EPA Phase II requirements.

4. Implement a training program for staff so that Best Management Practices such as installing silt fences, protecting inlet structures, and re-vegetation of swales and slopes are employed where appropriate.

5. Establish a procedure to inspect and enforce maintenance of privately owned storm water facilities.

6. Complete mapping of the storm water system, culverts, ditches, and detention/retention ponds should be added to the mapping database.

7. Develop an operations plan that documents practices and procedures at the Community Services Department (CSD) facility. The plan should include all operating procedures such as proper location to store materials such as piping, sand, gravel, and refuse material as well as where to clean and store vehicles and equipment. The plan will result in a more efficient and environmentally friendly CSD facility.

8. Adopt the storm water quality standards for new developments as a long range goal for the entire storm water sewer system. See Recommendation 1 under the Storm Water Impacts Associated with Development section in this chapter.

Illicit Discharge Detection and Elimination

Municipal separated storm sewer systems are permitted only to convey storm water. Illicit discharges are considered "illicit" because municipal separated storm water sewers are not designed to accept, process or discharge such non-storm water wastes. Illicit discharges include such discharges as effluent from septic systems, sanitary wastewater, improper oil disposal, radiator flushing disposal, improper disposal of hazardous materials and sump pump discharges.

Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and to threaten aquatic, wildlife, and human health.

Recognizing the adverse effects illicit discharges can have on receiving waters, the Phase II regulations require that Dover develop and implement an illicit discharge detection and elimination program.

Current Practices

Dover has initiated and implemented many aspects of the illicit connection detection and elimination requirements. The infrastructure mapping was completed during 1997 and 1999. Catch basins, drain manholes, pipes and discharge points have been mapped.

The Utilities Division, in cooperation with NH DES Non-Point Pollution staff have been actively identifying and eliminating illicit sewer services from the storm water drainage system for the past three years. Dry weather water sampling of storm water outlets in the downtown have been screened for fecal coliform bacteria. The storm water mapping was used to track the bacterial source in combination with additional water samples, smoke testing, and dye testing to pinpoint the sewerage source.

The Community Services Department in cooperation with concerned local businesses and civic groups and schools implemented the "Yellow Fish Road Program". The program includes a catch basin stenciling effort, bumper stickers, and articles in the local media and *Community Notes*. Such a program needs to continue.

Dover has an extensive recycling program that includes waste motor oil collection, waste antifreeze recycling, and a semiannual household hazardous waste collection in the spring and fall. The household hazardous waste collection includes paints, solvents, pesticides and other hazardous materials.

The Dover waste water treatment plant oversees an industrial pretreatment program that inspects businesses for proper pretreatment processes before discharging to the sanitary sewer, but also insures discharges (such as floor drains in garages) go to the sanitary sewer systems and not the storm water sewer.

Recommendations

1. Continue the effort initiated with NH DES to identify and eliminate illicit discharges. It is recommended that a designated portion of the storm sewer system be identified for illicit connection detection annually and that any illicit connections identified are removed.

2. Continue the Yellow Fish Road Program working with schools and civic groups.

3. As part of the public outreach, information articles should be published in *Community Notes* and the local media including public access TV and the City's web page.

4. The household hazardous waste program should be expanded to a full time year round program operated at the Recycling Center.

5. Amend the Dover Code to address illicit connections and the dumping of wastes into the system via catch basins in order to be compliant with Phase II.

6. Review and update the policy and procedures for emergency response to an accidental spill through the Fire, Police, and Community Services Departments.

7. The storm water system mapping should continue to be updated as it is modified and expanded. The mapping should be expanded to include culverts, and open road ditches.

Storm Water Impacts Associated with Development

New development and redevelopment projects can adversely impact the storm water drainage system and downstream waterbodies. The impact can occur during the construction process or as a result of inadequate storm water facility, design or the lack of maintenance after the project is completed. During a short period of time, construction sites can contribute more sediment and pollutants to streams than can be deposited naturally during several decades. The resulting siltation and the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our local waters.

Post-construction storm water management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly effect receiving waterbodies. The Nationwide Urban Runoff Program study (*Final Report of the Nationwide Urban Runoff Program*, U.S. EPA, Office of Water, 1983) and more recent studies indicate that prior planning and design for the minimization of pollutants in post-construction storm water discharges is the most cost-effective approach to storm water quality management.

The Phase II Regulations require Dover to develop, implement, and enforce a program to reduce pollutants in storm water runoff to the storm water system from construction activities that result in a land disturbance of greater than or equal to one acre. Erosion and sediment control at construction sites is best accomplished with proper planning, installation, and maintenance of controls.

Current Practices

Dover does not have an ordinance that requires the submission of a plan for construction projects that disturb one acre or more. Many projects are reviewed for erosion control and sedimentation during the existing regulatory review process. The Site Review, Subdivision, Wetland Protection, Conservation District and the Groundwater Protection Ordinances all trigger a review of projects based on established thresholds. Developers are required to include erosion and sediment control plans for all projects with potential impacts.

Dover has several ordinances in place that address project location and design for water resource management.

- Chapter 113 "Flood Plain Development" regulates development in the flood plain and establishes design criteria for work within flood prone areas.

- Chapter 170 of the Dover Zoning Ordinance contains several sections that address protection of natural storm water features that include:

    - Chapter 170-27 Conservation District

    - Chapter 170-27.1 Wetlands Protection District

    - Chapter 170-28.1 Riverfront Residential Overlay District

    - Chapter 170-28.3 Groundwater Protection Ordinance

- Chapter 149-14A "Site Development Design Criteria" and Chapter 155-41 "Storm Sewers and Drainage Appurtenances" Establishes authority in the City Engineer to insure that drainage from

proposed development does not adversely affect the public safety, private property and the environment.

The NH Wetlands Bureau requires permitting of all wetland impacts and NH DES require a site specific permit for all projects which disturb more than 100,000 square feet.

The City Engineering Division inspects all projects during construction and conducts a final inspection to insure all structures meet the plans and specifications on the approved plan including the establishment of vegetation and re-vegetation.

Recommendations

1. Adopt written standards and procedures to address the specified one acre of disturbed land threshold in the Phase II regulations as well as formalizing the construction site runoff plant; review and inspection process. A formalization of minimum water quality standards should be considered for adoption which apply to all proposed development in Dover.

2. The proposed Community Services Department work order system should have the ability to log complaints from the public regarding potential violations on projects which may be causing water quality impacts.

3. Adopt formal erosion and sediment control provisions that would provide needed enforcement options to insure compliance during construction.

4. Create a site inspection check sheet for use at each site for inspection by the Engineering Division. Items relating to temporary erosion and sediment control measures should be noted for inspection and compliance.

5. Investigate funding alternatives to support the maintenance and operation of the City's storm water system.

General Recommendation for Public Utilities

Establish an Ad Hoc Committee on Public Utility Policy to investigate options for managing utility growth in areas of the City outside the existing water/sewer service areas. This committee should be composed of members of the Planning Board, School Board, City Council and City staff. This Committee should make its report to the Planning Board and subsequently to the City Council within six months of the adoption of this updated Master Plan Chapter. This committee should, at a minimum, consider the following options:

Impact Fees - consider establishing a system of fees for new development that are directly related to the fiscal impacts to City facilities such as water and sewer.

Community Septic Systems – investigate the feasibility of strengthening the standards for community septic systems including the possibility of local control through adoption of a local health ordinance.

Water/Sewer Extension Policy – consider establishing a policy with specific criteria for the expansion of water and sewer.

Private Utilities

Natural Gas

The City of Dover is serviced by Northern Utilities/Bay State Gas for natural gas. At present there is 400 per square inch (psi) major transmission line that services Dover, Somersworth and Rochester that runs along the eastern edge of Dover from Dover Point to the Somersworth municipal boundary. There are two locations where the City taps into this line through regulator stations. At these stations the pressure is reduced to 60 psi to feed the high pressure system that supplies gas to much of the City. Four additional regulator stations take the pressure from 60 psi to a 9 psi low pressure system that serves most of the downtown area. This low pressure system is adequate for the demand in this area, but would not be suitable for high demand industrial use. The system is currently in good shape and can accommodate substantial growth. The industrial areas—Crosby Road and Enterprise Park—have plenty of capacity.

Northern Utilities is currently updating its maps of Dover's systems and is putting it into digital format. The City should request a digital file of this information when it becomes available.

At present Northern Utilities has no plans to expand the system in Dover. The supplier typically responds to growth and development as it occurs.

Electricity

Dover is served by Public Service of New Hampshire (PSNH) for electrical service. At present there is plenty of electrical capacity to serve Dover for the present and future. Public Service is a subsidiary of Northeast Utilities of Connecticut that was recently acquired by Consolidated Edison of New York. The Seacoast area is part of the New England power grid.

Dover is serviced by two 345 kilovolt (KV) lines—one from Newington Station and the other from Seabrook Station. The Newington line feeds the Dover substation on Cochecho Street near the Cochecho River while the Seabrook line feeds the Madbury substation which is located near the Elliot Rose Farm. These two substations are linked by a 115 KV line. A third major substation in Rochester also feeds the Dover electrical grid and receives power from the Dover substation via two parallel 43.5 KV lines. Each of these stations is interconnected to provide redundancy and back-up to the system to provide continuous service in the event of a failure in one location.

The Cochecho substation also provides power via a 34.5 KV line the urban core of Dover and a 33KV line to Dover Point and the Knox Marsh area. The northern portion of Dover is serviced from the Rochester substation as well as from a switching station in Somersworth that receives power from one of the north-south 34.5 KV lines from the Cochecho substation. Off these main lines electrical service is further distributed to the City by several substations that step down the 34.5 KV lines to 4 KV lines. These substations are located on Stark Avenue near Toftree Lane, Drew Road near Back River Road, North Dover near the hospital and Littleworth Road near Columbus Road.

PSNH is currently rebuilding to provide 34.5 KV power to the area along the Miracle Mile, Weeks Crossing and the highway commercial area in Somersworth. In the future PSNH plans to relocate its facilities in Somersworth to High Street when it is widened that will combine circuits and eliminate a substation. This project will not only improve back-up service in that area, but will also provide the

infrastructure necessary to supply a 34.5 KV line across Weeks Crossing to upper Sixth Street to serve Liberty Mutual, Enterprise Park and the projected additional growth in that area of the City.

PSNH continues to maintain and upgrade its system in an effort to serve existing and future customers. In the downtown area it has upgraded its underground system by replacing three pieces of switching gear. Circuit upgrades were also recently made to the Dover Point area. PSNH's long-term policy is to continue to upgrade its services to serve existing and future customers, create back-up capability and locate higher voltage lines to areas that are projected for growth.

Municipalization of the Electric Utility

Over the past 4-5 years there have been two committees appointed by the City Council to consider the possibility of having a municipal utility for electrical service. This approach to delivery of electric service is currently possible under state law, however, there has been delay in initiating the process until the state and PSNH reach an agreement on the process of deregulation. To date the City Council has minimal interest in the possibility of having the City of Dover operate a local utility.

There are two levels of municipal involvement in the delivery of electricity that the City could choose to undertake. The first is aggregation. This service would involve acting as a "broker" by aggregating all residents into a single pool to obtain electrical service from a supplier through a bidding process. The second is full municipalization that requires the City to not only supply electricity, but also to purchase the wires and poles that make up the electrical infrastructure.

The first committee—the Ad Hoc Committee for Alternatives to Natural Gas and Electric Services undertook a consultant study that indicated that a municipal utility could save residents money over the current suppliers. After unproductive discussions with PSNH, the Committee was disbanded. The second ad hoc Committee considered the option of having a third party share the risk of establishing a municipal utility. Several entities came forward with proposals, but it was decided that such a venture was not in the best interest of the City due the potential cost and the fact that the state is still in discussion with PSNH regarding de-regulation.

For the City to reconsider this option there needs to be state level actions to enhance deregulation as well as greater effort at the local level to ensure that the City would not be exposed to significant risk if it were to undertake municipalization.

Telephone

Bell Atlantic currently has the franchise responsibility to provide telephone services in Dover. All the company's basic telephone services are available to anyone in Bell Atlantic's 740, 742, 743 and 749 exchanges.

Existing System

Bell Atlantic's central office in Dover currently provides dial tone service to some 25,000 lines in the 603-742 exchange. Since the telephone exchange boundaries do not follow municipal boundaries, there are some residents from adjacent towns that are also serviced by this exchange. The central office is fully digital and has the ability to provide telecommunication services that are available in other urban areas of the state. The system also includes state-of-the art fiber optic cables on the major feeder routes—Route 16 (Spaulding Turnpike) north and south, Route 9 and Route 108. The fiber optic network provides a

strategic system that allows Bell Atlantic to expand its system as demand requires—including both residential and business growth.

Projected Growth

To project future growth, Bell Atlantic forecasters use current statewide and local growth data, trends in the industry, changes in residential calling patterns and historical growth in telephone access lines. Based on trends over a three-to-five year period, Bell Atlantic plans its network growth accordingly. Although the growth forecasts have historically been fairly accurate, Bell Atlantic may have to respond to unforeseen customer requirements such as the location of a large firm or facility. Bell Atlantic has established a support organization that can respond to such demands as needed.

Industry Trends

The single most significant trend in the telecommunications industry during the next few years will be continued deregulation and the introduction of widespread competition both in long distance and local services. Dover's residents currently have a choice of more than 200 long distance carriers and will soon have choices in providers for local service. A few of these companies will have their own facilities and wires, but others will use Bell Atlantic facilities to resell local telephone service. In addition, wireless service is becoming more popular as a means of providing local service without new wires or leased land lines. In the Seacoast more and more summer residents are not reconnecting to their land line system and are relying solely on their cellular phones. As this segment of the industry grows and the technology becomes more powerful, fewer and shorter transmission towers than those on line today should be needed.

Cable Television

Dover is serviced by Media One Communications for delivery of cable television services. The company holds a non-exclusive franchise with the City. It services over 85% of the City's households and only a small portion of Gulf Road and areas of very low density are not covered at present. By the year 2001 Media One plans to have cable available to 100% of the households. Over the last year, Media One invested over $3 million in the cable infrastructure in Dover, upgrading the system to 750mHz, one of the best in the country.

The cable uses a hybrid fiber/coaxial architecture know as "broadband" which increase system reliability, limits outages and improves the overall quality of the signal. The system now offers expanded channel capacity and high-speed data transmission services. In the near future the company intends to introduce telephony services.

Recommendations for Private Utilities

1. Continue to monitor the state Public Utilities Commission (PUC) negotiations with Public Service relative to de-regulation. Should appropriate de-regulation be implemented, the City should re-examine the potential for municipalization of electricity

2. On at least an annual basis communicate with each of the City's private utilities to determine their plans for any service changes or changes to their existing infrastructure to ensure that it is consistent with this Master Plan. At this time the City could also provide appropriate information to the utilities about its plans or other issues of concern.

Appendix A – Community Services Fleet Inventory

Equip. #:	Description:	Model #:
#13--Sewer	Royer Screener	Screener/OMI
#14--Misc/CS	Sewer Lifting Device	Lifting Device
#39--Sewer	1990 Chevy Astro Van	CM10905/Camera
#40--Sewer	1990 Chevy Astro Van	CS
#41--Sewer	1989 GMC Platform Trk.	TR31001
#42--Sewer	1992 Ford Sewer Jet	L8000
#56--Sewer	1991 Ford Mnt'd Mixer	K84
#61--Sewer	1985 Chevy Dump	CC7D042
#64--Sewer	1997 Chevy Pick-up	K3500
#66--Sewer	1991 Autocar Dump	ACM64
#67--Sewer	1983 Internat'l Dump	1600
#69--Sewer	1967 Chevy Platform	C-40
#87--Sewer	1987 Lindsay Air Comp.	*****
#88--Sewer	1999 Ford	Ranger
#115--Sewer	1989 Chevy Astro Van	*****
#T6--Sewer	1986 Homemade	8' Utility Trailer
#T9--Sewer	1998 Pequea Landscape	6 X 12
#02--Water	1991 Chevy	3/4 Ton
#07--Water	1998 Dodge	2500 Pick-Up
#09--Water	1984 Chevy Van	Step Van
#19--Water	1985 Dodge Pick-up	D31
#20--Water	1986 Chevy Dump Trk.	C-70
#21--Water	1985 Chevy 4X4	K30
#22--Water	1979 GMC	C-70
#32--Water	1980 Mack	Mack RD688
#33--Water	1998 Dodge	Ram BR2L62
#34--Water	1999 Ford F250	Service Body
#59--Water	1984 Case Loader	Front End Loader
#65--Water	1999 Ford F150	Pick-up
#80--Water	1999 International	Dump
#92--Water	1988 Lindsay Comprsr.	175-OD
#94--Water	1985 Plymouth Reliant	Sedan
#107--Water	1988 Chevy P/U 1-Ton	CC30903
#111--Water	1991 Ford 4X4 Pick-up	F250
#116--Water	1987 Case Backhoe	580K
#117--Water	1984 Chevy Blazer	
#118--Water	1987 Chevy P/U 3/4-Ton	3500
#119--Water	1982 Ford Dump 1-Ton	F-350
#122--Water	Case 590SLIII	
#123--Water	1995 Case	580SL
#T1--Water	1985 Snowco	Utility Trailer
#T3--Water	1988 Chillicothe Trailer	Mtl. Enc. 15L106
#T5--Water	1996 Northern Bay Util	4 x 6 2,000 GVW

#T7--Water	1986 Homemade	6' Utility Trailer
#T8--Water	1974 Military Tank Trlr.	Tank Trailer
#04--Engineer'g	1993 Chevy	4-Door Sedan
#05--Engineer'g	1985 Chevy	Suburban
#44--Engineer'g	1989 Chevy Astro Van	Van
#44--Engineer'g	1989 Chevy Astro Van	Van
#01--Assessor	1986 Chevy	Celebrity
#01--Plan'g/B.I.	1990 Chevy	Caprice, Bldg Insp
#02--Plan'g/B.I.	1990 Chevy	Caprice, Bldg Insp
#03--Plan'g/B.I.	1990 Chevy Sedan	
#06--Garage	1992 Ford	F150
#08--Recreation	1989 Chevy	SDN(4)
#26--Recreation	1993 Chevy Bus	P30 Bus
#38--Recreation	1985 Dodge Van	Passenger Van
#38--Recreation	1985 Dodge Van	Passenger Van
#10--Arena	1985 Chevy UN Truck	Pick-Up M1008
#23--Arena	1993 Zamboni	Ice Resurfacer
#25--Wst & Rec	1990 Ford	Escort
#51--Wst & Rec	1984 Chevy Pick-up	M-1008
#T2--Wst & Rec	1991 Tesco Trailer	Waste Oil
#15--Fac & Gr	1985 Chevy	S-10
#27--Fac & Gr	Dodge Truck	
#28--Fac & Gr	1998 Ford Ranger	112 Pick-Up
#29--Fac & Gr	1972 International	1700
#45--Fac & Gr	1988 GMC Platform Trk.	TV31003
#50--Fac & Gr	1987 Chevy Pick-up	3/4-Ton
#52--Fac & Gr	1987 Chevy Dump	1-Ton
#86--Fac & Gr	1991 Egr Bvr Brsh Chpr	M-290
#89--Fac & Gr	1988 Chevy Pick-up	3/4-Ton
#95--Fac & Gr	1989 Chevy Pick-up	*****
#109--Fac & Gr	1980 Int'l Tractor	1184/Low-Boy
#T4--Fac & Gr	1987 U-Haul Trailer	1.5M Trailer
#T10--Fac & Gr	1987 Custom Trailer	SSJR612R15
#T12--Fac & Gr	1999 Peque	616 Utility
#T14--Fac & Gr	1988 John Deere	Tractor
#T15--Fac & Gr	1986 John Deere	Tractor
#T16--Fac & Gr	Kubato Tractor	Lawn Trac/B7200

#31--Cemetary	1998 Ford Ranger	112 Pick-Up
#43--Cemetary	1998 Dodge Truck	1-Ton Cab & Chas
#62--Cemetary	1989 Chevy P/U	S-10
#114--Cemetary	1998 Mustang Unildr.	2070 Uniloader
#57--WWTP	1991 Fiat Allis Ldr.	FR128
#58--WWTP	1999 Chevy Van	
#60--WWTP	1999 Ford Ranger	Pick-up
#112--WWTP	1986 Chevy P/U 3/4-Ton	CC20903
#113--Recyc	Hyster Forklift	*****
#11--Sts & Dr	Gold Blat	Mixer
#12--Misc/CS	Plow	Plow
#16-Sts & Dr	1998 Dodge	Ram 2500
#17--Sts & Dr	1999 Int'l Truck	DT466E
#18--Sts & Dr	1996 GMC	Top Kick
#24--Sts & Dr	1987 Chevy	1/2 Ton
#37--Sts & Dr	1994 Swpr/J.Vanguard	2-V3000
#53--Sts & Dr	1985 Snow Blower	Blanchet
#54--Sts & Dr	1987 John Deere Ldr.	544E
#55--Sts & Dr	1999 Ford 1 ton	Dump
#63--Sts & Dr	1976 Dodge Stake Bdy.	M-D-500
#68--Sts & Dr	1963 Galio Grader	118
#70--Sts & Dr	1988 GMC Dump	TC7D042
#71--Sts & Dr	1990 Internat'l Dump	4900
#72--Sts & Dr	1973 Internat'l Dump	1600
#73--Sts & Dr	1983 GMC Dump	*****
#75--Sts & Dr	1982 GMC Dump	TC7D042
#76--Sts & Dr	1989 Chevy Dump	C70
#77--Sts & Dr	1985 Chevy Dump	CC7D042
#78--Sts & Dr	1987 Chevy Dump	CC7D042
#81--Sts & Dr	2000 International	Dump
#82--Sts & Dr	1988 Holder Sdwlk Trctr	MTC-500
#83--Sts & Dr	1984 Holder Sdwlk Trctr	C-500
#84--Sts & Dr	1979 Trackless Tractor	MT Series 111
#90--Sts & Dr	1974 Rockwell Flxble	Sewer Rodder
#91--Sts & Dr	1989 Lindsay Comprsr.	175-OD
#110--Sts & Dr	1988 Ford Asph. Patchr	K74
#120--Sts & Dr	1988 Volvo Contnr. Trk.	WX-64
#121--Sts & Dr	1984 Hough Loader	*****
#T11--Sts & Dr	1999 Hudson	HD10 Utility Trl
Sts & Dr	Gold Blat Mixer	

Appendix B – Average Daily Well Water Production

City of Dover Water Dept.
Total gallons of water produced at each well or treatment plant per month

1998	Campbell	Calderwood	Hughes	T/P Griffin	Ireland	T/P Lowell Ave.	Total gal pumped	D
Jan	19,722,840	19,801,100	2,817,950	0	17,368,790	0	59,710,680	
Feb	18,165,250	18,173,180	0	0	18,159,740	0	54,498,170	
Mar	20,053,800	19,993,350	0	0	20,116,410	0	60,163,560	
Apr	17,491,920	16,828,070	10,351,938	0	19,663,170	0	64,335,098	
May	20,883,780	20,536,330	1,112,200	0	21,752,390	8,420,150	72,704,850	
Jun	17,955,630	13,208,460	670,210	0	19,473,330	19,478,550	70,786,180	
Jul	19,962,045	18,882,640	14,817,530	0	2,900,790	19,911,300	76,474,305	
Aug	19,655,720	17,182,240	4,666,740	0	15,828,250	20,104,900	77,437,850	
Sep	16,899,350	15,127,220	0	0	19,472,950	19,394,950	70,894,470	
Oct	15,971,600	11,662,000	1,652,180	0	18,359,300	20,214,050	67,859,130	
Nov	17,058,150	6,011,290	497,370	0	20,555,090	19,328,020	63,449,920	
Dec	18,625,330	12,648,050	756,860	566,496	15,143,260	14,758,330	62,498,326	

1997	Campbell	Calderwood	Hughes	T/P Griffin	Ireland	T/P Lowell Ave.	Total gal pumped	D
Jan	17,421,530	7,046,380	0	0	20,607,290	16,122,940	61,198,140	
Feb	15,782,320	6,124,230	0	0	18,141,290	16,122,930	54,026,300	
Mar	12,380,880	12,776,120	0	0	17,787,240	15,583,420	58,527,660	
Apr	18,771,210	15,100,310	4,651,380	0	20,445,110	1,836,630	60,804,640	
May	17,985,240	13,134,500	570,320	0	20,203,610	10,910,640	62,804,310	
Jun	18,222,090	15,818,940	5,820,460	0	20,018,760	18,686,290	78,566,540	
Jul	19,123,940	15,792,180	2,798,700	0	19,960,930	19,895,520	77,571,270	
Aug	18,346,510	15,961,040	2,388,410	0	22,094,150	19,953,000	78,743,110	
Sep	16,570,410	8,703,430	0	0	19,824,710	19,345,740	64,444,290	
Oct	11,156,060	15,645,910	2,577,060	0	20,173,310	19,629,910	69,182,250	
Nov	14,323,160	14,486,020	0	0	19,385,990	11,811,880	60,007,050	
Dec	19,266,290	20,114,500	0	0	19,901,770	0	59,272,560	

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