City of Taunton, Massachusetts

Comprehensive Wastewater Management Plan

Final Draft Report

July 2006

Taunton, Massachusetts
Comprehensive Wastewater Management Plan

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1.0 INTRODUCTION

The city of Taunton is undertaking the development of a Comprehensive Wastewater Management Plan (CWMP) in order to plan for and address wastewater management needs. In accordance with the Massachusetts Department of Environmental Protection's (MA DEP) Guide to Comprehensive Wastewater Management, projections of future needs were made for a planning period through 2025. The preparation of the CWMP is more specifically intended to:

- Identify areas in Taunton with existing problems with on-site wastewater systems and areas where future problems with on-site systems may be anticipated.

- Identify areas of the existing collection system where capacity or physical condition issues exist.

- Develop alternatives and recommendations for addressing the town's wastewater needs.

The city retained Metcalf & Eddy, Inc. to provide engineering services to develop projections and prepare a CWMP.

1.1 Management Plan Background

Taunton is located in southeastern Massachusetts midway between Fall River and Brockton. The Taunton, Mill, and Three Mile rivers flow through the city and their watersheds are significant natural resources. Two major highways, Route I-495 and Route 24 are easily accessible in Taunton providing incentive for commercial/industrial development.

According to the U.S. Census, Taunton's population was approximately 56,000 in the year 2000, of which it is estimated less than 50 percent were connected to the city's wastewater collection system. The towns of Dighton and Raynham also contribute wastewater to the Taunton collection system, as well as small areas of Norton and Bridgewater.

Taunton's most recent Wastewater Facilities Plan was developed in 1981. This plan reviewed conditions and recommended sewer services in certain areas of the city. These problem areas were selected based on the results of an on-site wastewater system questionnaire survey, interviews with city personnel, subsurface soil investigation, and a water quality investigation. Further information in these problem areas was obtained through subsurface soil investigation and water quality testing. Based on these investigations certain problem areas were recommended for sewering or further investigation. Since that document was prepared, the city has:

- Expanded its sewage collection service area.
- Continued with infiltration and inflow (I/I) removal aimed at completely separating storm water connection from the sanitary system.
- Upgraded its Wastewater Treatment Facility (WWTF) and increased the peak pumping capacity of its Main Pump Station.

- Addressed CSO controls
- Implemented a Sewer System Evaluation Survey to assess the results of previous I/I removal work, identify additional sources of I/I and prioritize removal of cost-effective sources.
- Added Dighton and small areas of Bridgewater and Norton to its service area.

Although the city has implemented significant improvements to its wastewater collection and treatment system since the 1981 Facilities Plan, springtime flows to the WWTF have exceeded the permitted flow level of 8.4 mgd for extended periods of time, and peak wet weather flows in the system exceed 20 mgd. Coupled to this are demands for increased capacity within the city as well as from users outside the city. It is the objective of this Comprehensive Wastewater Management Plan (CWMP) to update the 1981 Facilities Plan and evaluate the city's wastewater collection and treatment needs projected through 2025 to determine, in conjunction with the city's I/I removal program, the most cost effective, environmentally acceptable approach to meeting these needs.

Further, the MA DEP has indicated that nitrogen limits may be imposed in the not-too-distant future. Taunton's renewed NPDES permit now requires monitoring of nitrogen at the plant outfall but does not establish limits. The requirement for nitrogen removal would have a significant impact on the WWTF process and operation.

1.2 Project Scope

This CWMP has been developed for the city of Taunton to evaluate the future demands that will likely be placed on their wastewater system so that appropriate actions may be taken in a timely manner. The CWMP was based on an assessment of known and projected needs, evaluation of Taunton's existing facilities, identification of feasible alternatives for satisfying various needs, evaluations of potential cost, operational and environmental impacts and selection of a recommended plan of action. Below is a summary of the tasks performed in preparation of the CWMP.

- Obtained and reviewed basic operating data related to wastewater characteristics and operational criteria including data on plant flow, water quality, septage, and sludge.

- Evaluated current sanitary collection system, water supply system, WWTF, and on-site wastewater systems.

- Developed population and economic growth projections for the city. Identified residential, commercial, and industrial development in the city over the 20-year planning period. Determined future sewering needs based on evaluation of on-site wastewater systems, WWTF, and projected flows.

- Evaluated existing WWTF for need for expansion or upgrade. Evaluated I/I removal program and determine future I/I removal needs.

- Evaluated alternatives based on cost effectiveness, ability to meet needs over design period, compatibility with existing systems, and environmental factors.

- Assessed alternatives for their potential short and long term environmental impacts. Evaluated the beneficial and adverse direct and indirect environmental impacts of each alternative.

- Conducted a public participation program including a public meeting and a public hearing.

In addition to these tasks an Environmental Notification Form (ENF) for the proposed actions will be prepared in accordance with MEPA. The ENF will include a summary of the project, describe the impacts of the alternatives, and identify thresholds and required permits. A public notice and distribution list will also be prepared. The ENF is anticipated to be submitted upon receipt of comments on the draft report and prior to the formal public hearing.

1.3 Planning Area

The entire area within the City boundaries has been included in the investigation. Within the City, developed areas were further scrutinized to establish the basis for evaluating and prioritizing needs. A map showing the existing sewer service area is provided in Figure 1-1. Although not part of the planning area under this project, the Towns of Raynham, Dighton, Norton, Bridgewater and Easton have an existing or future interest in utilizing capacity of the Taunton WWTF. Information concerning needs of these towns has been compiled from inter-municipal agreements and planning documents.

1.4 Sources and Reference Documents

Development of the Comprehensive Wastewater Management Plan progressed in stages in order to establish the criteria used to identify and prioritize areas of need. Involvement of various City Departments was a critical part of the development process and brought to focus the important criteria to be considered in decision making stages. City departments involved in the planning process have included:

Public Works
Board of Health
Engineering
Planning
Economic Development
Conservation Commission

Preparation of the Plan also relied, in part, on past studies, investigations and other documents prepared for the City. Following is a list of documents from which information utilized in the report was obtained:

1974 I/I Analyses
1981 Facilities Plan
1985 Sewer System Evaluation Survey

1996 WPCF Improvements Program
1992 Comprehensive Conservation and Management Plan
1989 Taunton River Conservation and Management Plan
1998 Comprehensive Master Plan
Septic System Management Study
Zoning and Assessor's Data
Raynham, Dighton and Norton Facilities Planning Documents
Contract Operation Agreement
EOEA 1999 Build-Out Analysis
Water System Master Plan
2001 Sewer System Evaluation Survey
Industrial Pretreatment Program
Water Quality Data
Current NPDES Permit
Intermunicipal Agreements
Water Resources Planning Reports (MA DEP, DEM)
MEPA filings
Storm Water Management Plan

Figure 1-1

2.0 GENERAL CITY CHARACTERIZATION AND EXISTING WASTEWATER COLLECTION AND DISPOSAL CONDITIONS

This section of the report provides a general characterization of the city of Taunton to provide a basis for discussion of the city's existing wastewater collection and disposal system. General information regarding existing conditions related to population, topography and geology, soils, surface water, groundwater, and the existing public water supply system is presented in this section. Details related to other environmental resource areas and concerns are presented in Section 5 of the report, which addresses specific characteristics of the wastewater needs areas.

2.1 Population

The City of Taunton is located in Bristol County in southeast Massachusetts. The city is approximately 50 square miles in area and is bordered by Raynham, Norton, Middleboro, and Easton to the north, Dighton and Berkley to the south, Lakeville to the east and Rehoboth to the west (see Figure 1-1). The city's population in 2000 was 55,976 (US Census, 2000). This represented an increase of approximately 12 percent over the population reported in 1990 of 49,832. A substantial portion of the population is located in medium and high density residential housing in and around the downtown area, however, low density housing, particularly recent housing developments, is located in the less dense, outlying areas of the city. More detailed discussion of land use patterns in the city is contained in Section 5 of the report.

2.2 Topography and Geology

The topography of the city varies from areas of low relief to bedrock hills (monadanocks) and drumlins. The average elevation for the city of Taunton is approximately 44 feet above sea level. The lowest area (elevation 10 feet) is at the confluence of the Threemile and Taunton River. The highest peak in Taunton is Prospect Hill, which is at elevation 200 feet.

Surficial geology within the city of Taunton is comprised primarily of various unconsolidated glacial deposits and organic peat deposits. These surface deposits contain mostly unstratified drift, tills, and stratified tills. Large outwash plains exist north and east of the Taunton River and form part of the Great Hockomock Swamp. Areas of surface bedrock, composed primarily of granite, siltstone, and sandstone, are located on the outskirts of the city as well as along the Taunton River (USGS,1992).

2.3 Soils

A variety of soil series exist within the city of Taunton. According to the soil survey for Bristol County Massachusetts, Northern Portion (USDA 1978), four main soil associations exist within the city boundaries: Hinkley-Medisaprist-Windsor association, Paxton-Whitman-Ridgebury soils, Paxton-Woodbridge-Ridgebury, and the Raynham-Scio-Birdsall soil association. The Hinkley-Medisaprist-Windsor association lies generally in the northeast and southern regions of the city in the vicinity of the Taunton River, as well as the vicinities of Threemile River and Mill River. This association is comprised of nearly level to steep, excessively drained soils that formed in glacial outwash and very poorly drained organic soils. The Paxton-Whitman-

Ridgebury association lies generally in the southeastern region of the city in the vicinity of the headwaters of the Segreganset River. The Paxton-Whitman-Ridgebury association contains nearly level to moderately steep, well drained to very poor drained soils on glacial uplands. The Paxton-Woodbridge-Ridgebury association lies generally in the northeastern and southeastern region of the city in the vicinity of Furnace Brook and south of Massasoit State Park. Paxton-Woodbridge-Ridgebury association contains nearly level to moderately steep, well drained to poorly drained soils on glaciated uplands. The Raynham-Scio-Birdsall association lies in the vicinity of the Taunton River. These soils contain nearly level to gently sloping, moderately well drained to very poorly drained soils that formed on old lakebeds. Agricultural soils are discussed in Section 5 of the report.

2.4 Surface Water

The City of Taunton is located in the Taunton River Basin. Several major surface water features exist within the city of Taunton, as shown on Figure 1-1. These include the Taunton River, which runs through the center of the City and forms part of the southern and northern boundary of the city, and the Threemile River located in the western portion of the city. Other prominent water bodies include: Mill and Snake Rivers, Sabattia Lake, Rico Lake, Watson Ponds, Oakland Mill Ponds, Black Pond, Thatcher Pond, Kings Pond, Big Bearhole Pond, and Barstow's Pond. The Massachusetts Water Resources Commission Report on stressed basins (2001) indicates that the northern and western portions of the Taunton river basin are considered moderately stressed. A stressed basin is defined as a basin or sub-basin in which the quantity of stream flow has been significantly reduced or quality of streamflow degraded or key habitat factors are impaired.

The water quality of a number of water bodies in Taunton has been assessed by the Massachusetts Department of Environmental Protection. As required by the Federal Clean Water Act, the Commonwealth of Massachusetts has developed a Year 2004 Integrated List of Waters (Commonwealth of Massachusetts, April , 2004). This proposed list, which combines the reporting requirements of §305(b) and §303(d) of the Clean Water Act, presents the status of the water quality of all assessed waters in the state. The list identifies the water quality by assigning each water body to one of the following five categories:

1. Unimpaired and not threatened for all designated uses;
2. Unimpaired for some uses and not assessed for others;
3. Insufficient information to make assessments for any uses;
4. Impaired or threatened for one or more uses but not requiring the calculation of a Total Maximum Daily Load (TMDL);
5. Impaired or threatened for one or more uses and requiring TMDL

Several of the existing water bodies in Taunton are included on the Integrated List. There are no water bodies listed as Category 2 waters, attaining the uses of secondary contact recreation and aesthetics. Segransett River, the Segransett River Ponds, portions of the Taunton River, Mill River, Snake River, Oakland Pond and Prospect Hill Pond are listed as Category 3, no uses assessed. Middle Pond, Richmond Pond, Lake Rico, Lake Sabbatia, Whittenton Impoundment, and Threemile River Impoundment are listed as Category 4, impairment not caused by a pollutant.

A segment of the Taunton River from the Route 24 Bridge in Taunton to the Berkley Bridge in Dighton, Big Bearhole Pond, Cain Pond, and Watson Pond are listed as Category 5, water requiring a TMDL. Big Bearhole Pond is listed as being impacted by organic enrichment, low dissolved oxygen, and exotic species. Cain Pond is listed as being impacted by organic enrichment, low dissolved oxygen, and turbidity. Watson Pond is listed as being impacted by nutrients, organic enrichment, low dissolved oxygen, noxious aquatic plants, turbidity, and exotic species.

The Taunton River is tidally influenced within the city of Taunton. The river is currently under consideration for designation as a Partnership Wild and Scenic River (Public Law 106-318). This designation would require federal agencies to protect the river's values as they permit or fund federal projects.

2.5 Groundwater

Significant groundwater resources exist within and along the Taunton River Basin within the northern and western sections of the city (USGS 1999). There are indications that groundwater resources within the Taunton River have been particularly stressed as development has increased.

2.6 Public Water Supply, Demand, and Distribution System

This section provides an overview of the city's current public water supply sources, current demand and city distribution system.

2.6.1 Public Water Supply and Demand

The city of Taunton receives its public water supply entirely from the Assawompset Ponds Complex (APC) and a small portion from Elders Pond. The APC is comprised of five ponds that are separated into two sub-basins. The first sub-basin is made up of Large Pond, Assawompset Pond, and Pocksha Pond. The second sub-basin is made up of Great Quittacas Pond and Little Quittacas Pond. The APC and Elders Pond are located in the communities of Lakeville, Freetown, Middleborough, Rochester, Dartmouth, and New Bedford. The rights to the APC waters are shared by New Bedford and Taunton. The associated water protection Zones A, B or C of these water supply areas are also located outside the boundaries of the city. The Assawompset Pond Pump Station, located on the west side of the Assawompset Pond, diverts approximately 6.8 million gallons per day (mgd) of water on average from the APC to Elders Pond in Lakeville where the Taunton Water Treatment Plant is located. The City of New Bedford Water Treatment Plant, located at the south end of Little Quittacas Pond, diverts a much more significant flow of approximately 15 mgd on average from the APC. The safe yield of the APC is 27.5 mgd with 20.79 mgd permitted for New Bedford and 6.71 mgd permitted for Taunton. Elders Pond provides an estimated safe yield of 0.58 mgd for Taunton. Together the APC and Elders Pond allow Taunton a total permitted withdrawal amount of 7.29 mgd. Total water usage in the past five years in the city of Taunton has been between 6.0 and 6.5 mgd (2004: 6.02 mgd; 2003: 6.0 mgd; 2002: 6.05 mgd; and 2001: 6.59 mgd; MA DEP, 2005).

The city completed a Water System Master Plan Study in 2000 (Fay, Spofford & Thorndike 2000). According to the study, public water within the city of Taunton is consumed by a variety of sources including: domestic, commercial, industrial, municipal, wholesale to other water systems, and unaccounted for water. According to annual statistical reports at the time of the study, domestic water consumption makes up approximately 46 percent of the total water production, as the city currently provides pubic water to 98 percent of its residents. Commercial, industrial and municipal water consumption has been approximately 25 percent of the total water consumption in past history. Approximately 8 percent of the total water consumption is allocated to wholesale to other water systems and unaccounted for water in the city has been approximately 20 percent of the total water production. However, more recent statistical reports indicate unaccounted for water to be averaging approximately 11 percent of total water production. The city does have measures in place to control seasonal water use. According to the Municipal Public Water Supply Water Use Restriction List, the City of Taunton has a voluntary restriction status on nonessential water use; and may include limitations on outside water use, such as odd/even days, hours of the day, hand-held hose, no automatic sprinklers, or total bans on outside watering (MADEP, 2002).

According to this Water Master Plan, the city will provide public water to approximately 99 percent of its residents by the year 2020. Based on domestic water consumption and population served in recent years, the plan projects a domestic water consumption of 60 gallons per capita per day (gpcd). Using a population growth rate of 0.6 percent the Water System Master Plan Study estimated a population of 60,162 for the year 2020. Based on this estimated population with 99 percent residents being served, an estimated domestic water demand of 3.57 mgd was projected for the year 2020.

The Master Plan projects an average daily commercial, industrial and municipal water consumption of 1.94 mgd through the year 2020, assuming that the current percentage of total water use for these activities remains fairly constant. The projected water consumption for wholesale to other public water systems is 0.62 mgd through the year 2020.

A five-year review of the city's water management act permit is currently underway by MA DEP in coordination with the city (MA DEP, 2005). The Water Master Plan predicts that total water demand in 2010 will be 7.33 mgd, exceeding the city's current water management authorization of 7.29 mgd. The demand is expected to increase to 7.77 mgd in 2020. There is also a potential that Lakeville may request additional 0.15 mgd. As a result of potential shortfalls in water supply, alternatives such as verifying safe yields, negotiating for increase in permitted withdrawals, reducing unaccounted for water, reducing water consumption, and developing additional supply have been considered. The additional supply alternatives reviewed include Paul A. Dever School Well Supply and the proposed Taunton River Desalination Plant in North Dighton. The Dever School is located in the northern section of Taunton near Watson Pond and would require rehabilitation of one of three wells located at the school to make approximately 2 mgd of water available to the city.

2.6.2 Public Water Distribution System

The city's public water distribution system consists of 254 miles of pipe consisting of unlined cast iron, asbestos cement, and reinforced concrete pipe in older installations, cement-lined (previously unlined) cast iron, ductile iron, and PVC pipe in the newer installations. Twenty percent (70 miles) of the water mains were installed prior to 1930 and consist of unlined cast iron pipes that are believed to be very tuberculated. Between 1926 and 1930 the city conducted a major water main replacement program. The program replaced approximately 119,000 linear feet of 8 and 12-inch mains with a type of pipe called "spun" cast iron pipe. In 1940 a large percentage of the water system leaks were located on these spun cast iron pipes, and by the 1970s the number of spun cast iron leaks grew significantly. In other areas of the city, the original pipe that was removed in the 1920s was later cleaned and re-laid. The locations of these salvaged pipes were not well documented, making it difficult to determine the actual age of some pipes.

A large part of the Taunton distribution system is located in a low service area. In this low service area a 30-inch pipe transmits finished water 7 miles by gravity from the Taunton Water Treatment Plant to the Harris Street Pump Station located east of downtown Taunton. Water from the treatment plant is also pumped for distribution in the low area.

Water from the Harris Street Pump Station is distributed to downtown Taunton and is also pumped to the Prospect Hill Reservoir. The Harris Street Pump Station was originally constructed in the 1870s to boost water from the Taunton River to the distribution system, but now only receives water directly from the treatment plant. This station contains two variable frequency drive electric motor driven pumps with capacities of approximately 1.5 and 5.25 mgd. The 5.25 mgd pump was installed in the 1950s and the 1.5 mgd pump was installed in the late 1980s. In 1999 a new diesel engine was installed at the pump station to power a 6 mgd pump in the event of a power outage.

The Prospect Hill Reservoir is a concrete lined storage reservoir consisting of two basins approximately 25 feet deep and separated by a reinforced concrete wall. The reservoir was originally constructed in 1955 as an open-air reservoir. As a result of the Safe Drinking Water Act, the reservoir was covered with a hypalon cover and liner in the 1970s, which was replaced in 1998 with a polypropylene liner and cover. The Prospect Hill Reservoir is used for storage of excess flow from the distribution system, which is then used to supply peak demands and to meet required fire flows.

A steel standpipe with a depth of 86 feet and a capacity of 2.1 MG was built in the Myles Standish Industrial Park in 1981. Currently the Industrial Park Standpipe helps support pressures and fire flow requirements in the area surrounding the Industrial Park.

There are two high elevation areas in Taunton referred to as the Westville High Service Area and the East Taunton High Service Area. The Westville High Service Area was established in the mid-1950s and provides water to customers in the area of Winthrop Street, South Walker Street, Burt Street and Glebe Street. This area is serviced by means of the Westville Booster Pump Station consisting of two 0.8 mgd capacity pumps with variable frequency drive. The pump station is used to fill the Westville Elevated Storage Tank located west of the pump station at the end of Winthrop Lane. This tank has an overflow elevation of 254.1 feet and a capacity of 300,000 gallons. Many improvements to increase available flow have been made to the distribution system in the Westville High Service Area since 1998.

The East Taunton High Service Area uses the County Street Booster Pumping Station to provide service to a small amount of customers at higher elevations on County Street. This pump station located at the intersection of Stevens Street and County Street consists of three 0.16 mgd domestic pumps and two 1.1 mgd fire pumps.

2.7 Wastewater Collection and Treatment System and Facilities

This section provides an overview of the components of the city's wastewater collection system and the city's WWTF.

2.7.1 Wastewater Collection System

Taunton's collection system, some parts of which are over 100 years old, consists of approximately 100 miles of sewer ranging in size from 6-inch to 36-inch diameter pipe, and brick-lined sewers up to 42-inch. The Taunton system also serves portions of the towns of Raynham, Dighton and Norton. The extent of the existing Taunton collection system can be seen on Figure 1-1.

The sanitary flow is conveyed to the Taunton WWTF where it receives advanced secondary treatment prior to discharge to the Taunton River. Within the Taunton wastewater collection system there are 25 pumping stations consisting of small single-pit submersible or packaged wet-dry pit pumping stations to serve small developments, and larger pumping stations located on major interceptors or receiving flow from larger service areas. The larger pump stations consist of the following:

Main Lift – Located on West Water Street this pump station receives the city's entire wastewater flow and pumps to the headworks of the WWTF. The station contains four 130 HP pumps each with a rated capacity of 5,200 gpm at 78 ft TDH.

Spring Street – Located along the Mill River this pump station receives flow from the Mill River Interceptor and service areas near the center of the city. The station contains two 36 HP pumps each with a rated capacity of 870 gpm at 85 ft TDH.

Dean Street – Located on Dean Street (Route 44) this station receives flow from the Dean Street Interceptor which also contains flow from the Raynham wastewater collection system. The station contains two 36 HP pumps each with a rated capacity of 1400 gpm at 55 ft TDH.

County Street – Located at County Street (Route 140) and Mazzone Boulevard this pump station receives flow from the Route 140 area and a small industrial park. The station contains two 7.5 HP pumps each with a rated capacity of 350 gpm at 39 ft TDH.

East Taunton (Red Lane) – Located off Middleboro Avenue this pump station receives flow from the East Taunton collection system and from areas of Raynham. The station contains two 66 HP pumps each with a rated capacity of 1,250 gpm at 119 ft TDH.

Myles Standish – Located in the Myles Standish Industrial Park, this pump station receives flow from the Industrial Park and a few areas in the vicinity of the park. The station contains two 7.5 HP pumps each with a rated capacity of 350 gpm at 45 ft TDH.

Warner Boulevard – Located on Joseph E. Warner Boulevard near Winthrop Street (Route 44) this pump station receives flow from the heavily developed commercial area along Route 44. The station contains two 10 HP pumps each with a rated capacity of 550 gpm at 42 ft TDH.

South Street – Located in the south end of Taunton along the Dighton border this pump station receives flow from the southern corner of the city and from the North Dighton wastewater collection system. The station contains three 50 HP pumps each with a rated capacity of 775 gpm at 130 ft TDH.

2.7.2 Wastewater Treatment Facilities

The Taunton WWTF, which is under city jurisdiction, has been in operation since the late 1940s. The plant initially provided primary treatment of sanitary sewage and was expanded and upgraded to provide advanced secondary treatment with ammonia nitrogen reduction in 1977. In 1998, Professional Services Group (now known as Veolia Water North America) entered an agreement with the city to operate and maintain the WWTF for a 20-year period. The agreement also included upgrades to improve the performance and operational reliability of the wastewater facilities for consistent compliance with the NPDES permit. These capital improvements, directed at satisfying an Administrative Order issued by the United States Environmental Protection Agency on January 26, 1996, were substantially completed in 2000. Veolia is also responsible for operating, maintaining, and monitoring other portions of the wastewater collection system including the West Water Street combined sewer overflow, pumping stations, and force mains.

The treatment facility located on West Water Street is authorized to discharge to the Taunton River under NPDES Permit No. MA0100897, for which the city of Taunton and Veolia are co-permittees. The permit allows 8.4 mgd of secondary effluent to be discharged on a 12-month rolling average basis. The plant is designed to treat an average daily flow of 8.4 mgd and a peak flow of 17.4 mgd. Flow records indicate that the average daily flow for the two year period from 2003 to 2004 was 7.6 mgd. The plant can hydraulically handle flows up to 22.4 mgd through the process systems. A bypass is available for operations to bypass flows above 17.4 mgd around secondary treatment. Bypassed flow combines with secondary effluent upstream of the chlorination facilities.

The three major liquid treatment steps at the treatment facility are preliminary treatment, primary treatment, and advanced secondary treatment with chlorination and dechlorination prior to discharge to the Taunton River. Sludge treatment includes thickening and centrifuge dewatering prior to disposal at the Taunton landfill. A site plan of the existing WWTF is shown in Figure 4-5. A description of the major facility components is given below.

2.7.3 Preliminary Treatment

Raw sewage is pumped to the WWTF via one 24-inch and one 20-inch raw sewage force main from the Main Lift Pumping Station. The two force mains are combined into one 30-inch raw sewage force main with a Y-connection in the WWTF yard. Preliminary treatment starts at the inlet works, which receives sewage from the 30-inch raw sewage force main. Sewage passes through two mechanically cleaned bar screens or the bypass bar rack, and flows through a distribution structure to the primary settling tanks.

2.7.4 Primary Treatment

Primary treatment is accomplished by three square primary settling tanks. Each tank is 55 feet by 53 feet and has a sidewall depth of 9 feet. Primary settling at the facility removes approximately 25 percent of the raw BOD_5 and 50 percent of the total suspended solids. The design average and maximum hour overflow rates of the tanks fall within recommended design criteria at 920 and 1,920 gpd/sf, respectively with all tanks in operation. Scum is pumped to a scum concentrator in the sludge handling building. The primary sludge is pumped to a cyclone degritter for grit removal prior to being sent to the gravity thickener. Down stream controls hydraulically limit flows to around 18 mgd without flooding the overflow weirs.

2.7.5 Aeration

After primary settling, the flow is distributed to the two aeration tank batteries for advanced treatment. A total of six aeration tanks are used (three in each battery). The 2000 plant upgrade included adding two new aeration tanks, one to each battery. The four original aeration tanks are each equipped with three mechanical aerators with variable speed drives, while the two new aeration tanks use diffused air. Return activated sludge (RAS) discharges directly into the aeration tanks and combines with primary effluent. Mixed liquor exits each tank at a concentration of 3500-4500 mg/l (or 4500-5500 mg/L during the nitrification season) and is directed to the secondary settling tanks. The aeration system is sized to provide sufficient oxygen to allow seasonal nitrification in the warmer months. Plant operators have control over the primary effluent distribution between the two batteries and to each aeration tank. RAS is automatically controlled as a ratio of the plant flow. The Battery 1 aeration tanks have approximately half the volume of Battery 2. Detention time through the aeration system, at an average daily flow of 8.4 mgd, is roughly 6.2 hours.

2.7.6 Secondary Settling

Four circular secondary settling tanks (two in each battery) separate solids in the mixed liquor. Each tank is 100-feet in diameter and 12 feet deep. Separate sludge pump stations are provided for the two settling tanks in each battery. Sludge from the bottom of the tanks discharges to the waste activated sludge (WAS) and RAS wetwells in each sludge pump station. RAS is pumped via two return sludge pumps in each station. Two WAS pumps in each station pump excess solids to the gravity sludge thickener. The RAS is reintroduced into the aeration basin to maintain an active biomass. The WAS is pumped to the gravity thickeners. The design overflow rates in the secondary settling tanks are conservative.

2.7.7 Disinfection

Secondary tank effluent is sent to the chlorine contact chamber where it is disinfected with the flow paced addition of liquid sodium hypochlorite and dechlorinated with sodium bisulfite to control the chlorine residual. The chlorine contact chamber consists of two tanks with each tank measuring 50 feet by 36 feet by 6.5 feet deep. The total chlorine contact time is 14.5 minutes at maximum hour (or 11.3 minutes at 22.4 mgd peak). The effluent is discharged through a reaeration cascade prior to discharge to the Taunton River.

The sludge handling facilities at the Taunton WWTF were upgraded in 2000. Primary sludge and waste activated sludge is pumped to one 50-foot diameter gravity thickener tank, which is covered for odor control. The second sludge thickener is available for use but is not covered. The thickened sludge (1.5-4% solids) is then pumped through a sludge grinder to two 2,500 lb/hour centrifuges for dewatering (a second standby centrifuge is installed). The dewatered sludge is hauled to the city landfill. Foul air from the sludge thickener, dewatering operation and headworks is collected and treated through a single stage scrubbing system for odor control.

2.7.8 Septage

Water Solutions Group (WSG) located on Mozzone Boulevard is a privatized septage treatment plant. WSG accepts hauled septage which is treated and discharge into the Taunton wastewater collection system. The current average daily flow from the WSG plant is 0.13 gpd. The WSG plant is considered a Significant Industrial User (SIU) and is monitored as part of the Taunton Industrial Pretreatment Program (IPP).

3.0 NEEDS ANALYSIS

As part of this CWMP a wastewater needs analysis was performed to evaluate future wastewater needs for the city through the 20 year planning period. Wastewater needs were determined based on projected city population growth and evaluation of current wastewater treatment in developed unsewered areas.

Annual population growth trends from historic U.S. Census data were used to estimate Taunton's population growth rate through the planning period and project the city's population in 2025. The majority of population growth is anticipated to occur in currently undeveloped areas of the city with some growth due to infilling of developed areas. Currently approximately 50 percent of the city's population is sewered. A majority of unsewered areas of the city currently treat wastewater using on-site septic systems. Existing on-site septic systems throughout the city vary considerably in age, size and design. Over the years, many of these systems have lost their ability to function properly and fail to adequately dispose of settled wastewater. Failure can be due to several causes such as seasonal high groundwater levels, plugging of cesspool openings, or plugging of leach fields. Failing systems are typically noticeable by backed up toilets, flooded basements or break-out of sewage at or above ground level. Strong odors generally accompany this condition, and public health issues and surface water contamination can become major concerns. As part of this needs analysis evaluation of currently developed unsewered areas of the city was performed to determine areas that were in need of wastewater alternatives other than on-site septic systems. Evaluation included gathering data from various sources to evaluate area soils, groundwater, lot sizes, and location of system repairs and system pumping frequency.

Using population projections and evaluation of current on-site wastewater treatment systems, future wastewater needs for the city were evaluated and needs areas were identified. The following sections describe this process of identifying wastewater needs.

3.1 Population Growth

Projections of future needs were made for a planning period through 2025 in accordance with the MA DEP *Guide to Comprehensive Wastewater Management Planning* issued in 1996, which prescribes a minimum planning period of 20 years. This section describes anticipated population growth and land use development over this planning period. Information used includes conversations with the City Planner, the city's historic growth rate based on the U.S. Census, population projections for 2010 and 2020 prepared by the Massachusetts Institute for Social and Economic Research (MISER), and the 1999 EOEA build-out analysis prepared by Applied Geographics, Inc.

The build-out analysis is a valuable tool in discussing future conditions given the project planning period. The build-out analysis was performed in conjunction with the Massachusetts Executive Office of Environmental Affairs and in compliance with *Assisting Communities in Addressing the Housing Shortage Executive Order* (EO 418) and the *Community Preservation Act*. It should be noted that the build-out analysis projects the future development of the city under current growth trends, zoning, and other regulations but does not attempt to predict a date for when complete build-out will occur. Also, the projections only account for "as of right now" development and do not include development by special or comprehensive permit. Given the largely undeveloped nature of portions of the city, particularly in the residential districts, it is not expected that Taunton will reach its potential build-out within the planning period of this CWMP. However, the build-out analysis is referenced to identify potential long-term future trends for the city.

3.1.1 Projections for the Planning Period

Continued growth of population and residential development in the city is expected. MISER's projected population for the city in 2010 is 62,222 (MISER, 2003). This estimate represents approximately a 1.1 percent annual population increase over the city's 2000 U.S. Census population. This population growth rate is slightly lower than the 1.2 percent historic annual population increase based on 1990 and 2000 U.S. Census data. In an effort to be conservative in estimating future population, the higher 1.2 percent annual population growth rate was used to project the city's population for the planning period. Using this 1.2 percent annual population increase the city's population was estimated to be 75,425 in the year 2025, representing almost a 35 percent increase over the city's 2000 U.S. Census population. As a result, the city's population density in year 2025 would be 1,595 people per square mile compared to the year 2000 population density of 1,184 people per square mile. A comparison of population projections for the city is presented in Table 3-1.

TABLE 3-1. EXISTING POPULATION ESTIMATES, COUNTS, AND PROJECTIONS FOR THE CITY OF TAUNTON

Year	Projected Population Using Historic Rate (based on U.S. Census)	MISER 2003	EOEA Build-Out Analysis, 1999
1990	49,832*	49,832*	49,832*
1995			
2000	55,976*	55,976*	55,976*
2005	59,416		
2010	63,068	62,222	
2015	66,944		
2020	71,058	69,493	
2025	75,425		
Build-Out			98,146

Sources: U.S. Census (1990 and 2000); Massachusetts Institute for Social and Economic Research (MISER) data, 2003; EOEA Build-Out Analysis, 1999, prepared by Applied Geographics, Inc.
*U.S. Census totals.

Based on 1990 and 2000 U.S. Census data a 1.3 percent historic annual housing unit increase was used to project the city's housing unit total for the planning period. This method results in a projected housing unit total of 31,639 in the year 2025. This would be approximately a 38 percent increase from the 2000 U.S. Census total of 22,908 housing units. Table 3-2 provides a comparison of housing unit projections for the city.

TABLE 3-2. EXISTING HOUSING UNIT ESTIMATES, COUNTS, AND PROJECTIONS FOR THE CITY OF TAUNTON

Year	Projected Housing Units Using Historic Rate (based on U.S. Census)	EOEA Build-Out Analysis, 1999
1990	20,281*	20,281*
1995		
2000	22,908*	22,908*
2005	24,436	
2010	26,066	
2015	27,805	
2020	29,660	
2025	31,639	
Build-Out		39,776

Sources: U.S. Census (1990 and 2000); City of Taunton Build-Out Analysis, 2000, prepared by Applied Geographics, Inc.
*U.S. Census totals.

3.1.2 City Build-Out Projections

The EOEA Build-Out Analysis for Taunton states that the city would have a total build-out population of approximately 98,146, or a 75.3 percent increase from the city's 2000 U.S. Census population (Applied Geographics, 2000). Using this build-out population, the city's population density would be 2,075 people per square mile. Applied Geographics estimates that an additional 16,868 housing units would be constructed in the city at build-out, bringing the total housing units to 39,776. Development within Taunton at build-out includes 4,017 units in areas zoned Rural Residential, 2,063 units in Suburban Residential, 2,638 units in Urban Residential/Single Family, 6,540 units in Urban Residential/Multi-Family, and 1,610 units in Business District Multi-Family. Based on the build-out analysis, this increase in housing units would lead to an increase of approximately 11,808 students and over 9,400 acres of new developed land as compared to year 2000 totals. The build-out analysis also estimates that 1,733 acres of land is available for commercial, retail, and industrial development. Broken down by zoning district, this total includes 4.4 acres in areas zoned Office, 4.4 acres in Retail, 38.2 acres in Business, 192.9 acres in Highway Business, and 1,493.5 acres in areas zoned Industrial.

A majority of the growth projected in the build-out analysis was identified to be in currently undeveloped areas. However, as stated previously it is unlikely that the city will reach build-out conditions within the project planning period. Table 3-3 provides the estimated 2025 population projections in developed and undeveloped areas based on a visual comparison of the build-out projection map of developable lands and partial constraints, with the map of developed areas in Taunton (Fig. 3-1).

TABLE 3-3. ESTIMATE OF 2025 BUILD-OUT VOLUME IN UNDEVELOPED AREAS

Zoning Designation	Estimate of New Units at Build-Out	Estimate of New Units in Year 2025[1]	Estimate of New Units Constructed in Undeveloped Areas in 2025 (%)[2]	Estimated Population Growth in Undeveloped Areas in 2025[3]	Estimated Population Growth in Developed Areas in 2025[3]
Rural Residential	4,017	1,848	100	4,620	0
Suburban Residential	2,063	949	90	2,135	237
Urban Residential, Single Family	2,638	1,213	85	2,579	455
Urban Residential, Multi-family	6,540	3,008	85	6,393	1,128
Business District, Multi Family	1,610	741	10	185	1,666
Total	16,868	7,759		15,912	3,486

(1) New units estimate based on ratio of 2025 population increase to total build-out increase (46%).
(2) Based on comparison of Build-Out Analysis with Plan of Developed Areas.
(3) Based on 2.5 persons per unit.

It's anticipated that a portion of the growth identified in developed areas by 2025 will contribute future wastewater flows to the existing WWTF. As such, wastewater flow from growth in developed areas of the city was accounted for in evaluating future wastewater treatment needs and capacities. The effects of this growth are further explained later in this section.

3.1.3 Potential Areas of Future Development

It is anticipated that existing residential development patterns will continue in the future, with high density residential development mostly concentrated in the center of Taunton and low density residential development more diffuse in nature. However, future sewer service expansion could introduce new areas of high density residential development in the city. Based on the results of the EOEA build-out analysis for Taunton, the majority of future residential development is anticipated to be located east and north of the Taunton River in areas zoned Urban Residential/Multi-Family, as well as in the western and eastern portions of the city in areas zoned Rural Residential (Applied Geographics, 2000).

The city anticipates that commercial and industrial development will continue to expand into East and West Taunton along Route 140 and Route 44, respectively. However, unless sewer service would be expanded by the city, future commercial and industrial growth for companies requiring substantial amounts of water in production processes would largely be limited to currently sewered areas (City of Taunton, 1998). Two areas that are anticipated to be the focus of future industrial development are located near the intersection of Route 140 and Route 24 and land south of Route 44 straddling Warner Boulevard (John Brown Associates, Inc., 1998).

A report titled *Land Use Study: Taunton, Massachusetts*, was included in the city's 1998 Comprehensive Master Plan. This report was prepared by John Brown Associates, Inc. and addresses, among other things, future land use and development strategies and policies for the city. It identifies key growth and development problems and opportunities, and it offers a series of growth management strategies to achieve a positive future for the city. One of the suggestions of the report is that the city should consider focusing new business and residential development in the historic village centers as a means to discourage sprawl and loss of historic identity in Taunton (John Brown Associates, Inc., 1998). The report also identifies specific sites in the city that should be considered for future reuse and redevelopment. One such site is the Taunton Expo Center/Rehoboth Fair Grounds. This underutilized site is located along Route 44 near the city's border with Dighton. Suggested future uses range from a new business park to a clustered housing development site (John Brown Associates, Inc., 1998). There are currently no proposed projects for this site (City of Taunton, 2005).

3.1.4 Proposed Developments

A number of proposed developments were identified in conversations with Taunton's City Planner. These include a mix of residential, commercial, and industrial use projects. Three residential comprehensive permit (MGL Ch. 40B) developments were identified. The first, Powhattan Estates, is located off Staples Street in East Taunton and will consist of 150 single family homes upon completion. Construction is underway for this development. The second comprehensive permit development is still under review. If approved, this proposed development would be located near the intersection of Hart and County Streets and would consist of 90 condominium units. The third comprehensive permit development is also currently under review. If approved, this proposed development would be located east of Joseph E. Warner Boulevard and would consist of approximately 114 single family homes (City of Taunton, 2005).

The City Planner has indicated that two retail developments have recently been approved in Taunton. The first is a retail complex located on the west side of Joseph E. Warner Boulevard between Winthrop and Cohannet Streets. This development is currently under construction and will consist of approximately 57,000 square feet of retail space upon completion. The second retail development that has been approved is called Northwoods Retail Plaza. Construction of this approximately 160,000 square foot development is nearing completion. It is located on Bay Street across from the Myles Standish Industrial Park entrance and will consist of a mixture of retail, service, and restaurant businesses. Also, four new restaurants and an 80,000 square foot retail complex are proposed near the intersection of Mozzone Boulevard and Route 140/County Street (City of Taunton, 2005).

Finally, two industrial use developments have been identified in the city. The first is Liberty and Union Industrial Park Phase I, which is located on the south side of Stevens Street near the Route 140 interchange. Initial tenants of this industrial park will include Jordan's Furniture (approximately 1.4 million square feet) and Cirelli Foods, Inc. (approximately 144,000 square feet). The City Planner indicated that an additional 250,000 to 350,000 square feet remains available in the industrial park. The second industrial use development is Liberty and Union Industrial Park Phase II, which is located on the north side of Stevens Street near the Route 140 interchange. According to the City Planner, this development is in the planning stages, and available square footage has not yet been determined (City of Taunton, 2003a). The primary use at these industrial parks is anticipated to be warehouse/distribution facilities, with associated office area and retail space.

3.1.5 Zoning

At time of preparation of this report, there is no indication of pending zoning changes that would significantly alter the projections discussed in the previous section (City of Taunton, 2005).

3.2 Evaluation of On-Site Septic Systems

As part of the CWMP evaluation, areas of the city that currently use on-site septic systems were broken down into 30 separate study areas. Delineations of the areas are shown on Figure 3-1 and are designated as study area A through EE. Using available information including Taunton Board of Health and Assessor's records these study areas were evaluated to identify locations experiencing problems with on-site septic systems and to determine the suitability for continued use of on-site septic systems under Title 5, 310 CMR of the Massachusetts Environmental Code. Study areas identified as not being suitable for continued use of on-site septic systems were considered wastewater needs areas and identified for further evaluation including assessment of alternative methods for wastewater treatment.

3.2.1 Typical On-Site Wastewater Systems and Regulations

Prior to the implementation of Title 5, 310 CMR of the Massachusetts Environmental Code subsurface wastewater disposal regulations in 1978, many on-site disposal systems were cesspools or septic tanks with capacities of less than 1,000 gallons. Since 1978, homeowners have been required to install septic systems of increased size in accordance with Title 5 requirements. As of March 31, 1995, Title 5 requires septic tanks with minimum capacities of 1,500 gallons and does not permit new construction of or repair of cesspools, as cesspools provide much less treatment and are more susceptible to clogging and failure than a conventional Title 5 system. A detailed description of a typical conventional Title 5 system can be found in Section 4.0.

The current Title 5 requirements related to design criteria, siting, construction and inspection are more stringent than the 1978 code. Table 3-4 compares the more stringent current Title 5 regulations with the 1978 code for on-site subsurface wastewater disposal.

Once an on-site wastewater system is properly installed in accordance with the Title 5 regulations the most important maintenance practices to extend the life of an on-site system is the frequent inspection and pumping of the septic tank. Removal of the floating scum and settled solids from the septic tank minimizes the possibility of clogging the leaching area. Various time intervals for pumping of septic tanks have been suggested, ranging from once per year to every three years. In an attempt to educate Taunton residents the city BOH department has hosted informational lectures on proper care and maintenance of on-site sewage disposal systems.

Although regular septic tank pumping will improve the efficiency and life of the system, pumping of septic tanks will not guarantee the permanent functioning of an on-site system, especially in areas where poor soil conditions inhibit system performance. Where existing systems have been in operation for many years, the impact of improved maintenance practices could be minimal due to previous solids accumulation. In development of this CWMP, study areas that have experienced problems with on-site systems have been identified for evaluation to determine suitability of continued, long term use of there systems.

3.2.2 Suitability of Continued Use of On-Site Septic Systems

In order to further evaluate designated study areas, information from various sources was compiled for each area and several Geographic Information Systems (GIS) based maps were created. The GIS based maps were comprised of datalayers including subsurface suitability, wetlands and surface water bodies, drinking water protection zones, and locations of system repairs and frequent system pumping. Copies of these maps are included in Appendix A. The following is a description of relative information used to evaluate each study area for its ability to sustain on-site septic systems.

3.2.2.1 Existing Lot Size

Existing lot sizes were evaluated to determine the site's ability to sustain an existing system and support upgrading or installing new on-site septic systems. Lot size is significant when considering long-term use of on-site wastewater systems due to limited reserve area for leach fields on small lots. With lots less than half acre, available space may be insufficient for periodic replacement of leach fields. Larger lot sizes are more suitable for on-site wastewater systems as there is greater likelihood to have available land for reserve areas to upgraded systems. Using assessor's information average lot sizes were determined for each study area.

For the purposes of evaluating the suitability of lot sizes, study areas with an average lot size less than half an acre were considered to be not favorable for continued use of on-site septic systems. Study areas with average lot sizes greater than a half acre were considered suitable for continued

TABLE 3-4. TITLE 5 REGULATIONS

Provision	1978 Code	Current Title 5
Water Supply Reservoirs	100 feet	400 feet
Tributaries to Reservoirs	100 feet	200 feet
Certified Vernal Pools	Not Addressed	100 feet (50 feet if vernal pool is upgradient)
Bordering Vegetated Wetland, Salt Marshes, Inland and Coastal Banks	50 feet	50 feet (100 feet if wetlands bordering surface water supply or tributary thereto)
Private Water Supply Well	100 feet	100 feet
Property Line	10 feet	10 feet
Cellar Wall	20 feet	20 feet
Slab Foundation	Not Addressed	10 feet
Reserve Area	Area between leaching pits, galleries, or trenches may be used.	Area between trenches may be used if greater then or equal to 6 feet apart; new systems shall include a reserve area sufficient to replace the primary soil absorption system
Minimum Design Flow	None	330 gpd (220 gpd allowed if 2-bedroom deed restriction)
Leaching Trenches	Minimum width: 1 foot Maximum length: 100 feet	Minimum width: 2 feet Maximum width: 4 feet Maximum length: 100 feet
Minimum Septic Tank Capacity	1,000 gallons	1,500 gallons
Distance from Maximum Groundwater	4 feet to bottom of leaching area; 1 foot from invert of septic tank outlet	4 feet to bottom of stone underlying absorption system if perc rate > 2 min/in. 5 feet if perc rate < 2 min/in.
Inspection of Existing System	Not Addressed	Except as provided in 310 CMR 15.301(2), 15.301(3), 15.301(4), a system shall be inspected at or within two years prior to the time of transfer of title to the facility served by the system.
Upgrade Standard	Required substandard systems be upgraded to meet requirements of code, or get a variance from the Board of Health and MA DEP	Where no expansion or change of use proposed, standard is "maximum feasible upgrade," with Board of Health approval needed if system cannot meet groundwater separation or drinking water supply setback requirements, or construction of a basic three-part system
Nitrogen Loading	Not Addressed	One acre of land required to build 4-bedroom house in: recharge areas of public wells, designated (through Surface Water Quality Standards) nitrogen sensitive areas and coastal embayments, and new developments served by well and septic system on same lot; no new system in these areas shall receive greater than 440 gpd per acre.
Large Systems	Defined as systems greater than 15,000 gpd	Defined as systems 10,000 gpd or greater but less than 15,000 gpd, or greater than 2,000 gpd in well recharge areas or within setbacks for water supplies.

use of on-site septic systems. However, average lot sizes less than an acre but greater than a half acre were considered less favorable than lot sizes greater than acre.

3.2.2.2 Wetlands and Surface Water

Wetlands and surface water are considered sensitive environmental receptors and can be subject to adverse impacts due to failing septic systems. Using Mass GIS mapping layers to identify areas of wetlands and surface waters, each study area was evaluated based on the percentage of wetlands and surface area within the study area. Study areas with a significant percentage of wetlands and surface water were considered less suitable for the continued use of on-site septic systems.

3.2.2.3 Drinking Water Supply

Interim Wellhead Protection Areas (IWPA) and Zone II groundwater protection areas were evaluated as they are considered nitrogen sensitive areas and regulations for on-site septic systems within these protection areas are more stringent. Systems within these areas require a higher level of treatment which may include advanced treatment or increased SAS size. Wellhead protection areas are important for protecting the recharge area around public water supply wells. A Zone II wellhead delineation identifies the source area which contributes water to a well as determined though hydrogeologic modeling. An IWPA is a protective radius around a well in such cases where hydrogeologic modeling has not been performed. The IWPA protective radius is determined based on well pumping rates or default values and is used until a Zone II wellhead delineation is established. IWPA and Zone IIs of public water supplies have been determined by the MA DEP to be particularly sensitive to the discharge of pollutants from on-site sewage disposal systems and are therefore designated nitrogen sensitive areas.

Surface water supplies are classified as Zone A, B, or C. Zone A protection areas represent the land area within a 400 foot lateral distance from the upper boundary of the bank of a Class A surface water source and the land area within a 200 foot lateral distance from the upper boundary of the bank of a tributary or associated surface water body. Zone B represents the land area within one-half mile of the upper boundary of the bank of a Class A surface water source, or the edge of a watershed, whichever is less. Zone B always includes the land area within a 400 ft lateral distance from the upper boundary of the bank of the Class A surface water source. Zone C represents the land area not designated as Zone A or B within the watershed of a Class A surface water source. Class A waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value and are designated for protection as outstanding resource waters. To restrict septic systems in close proximity to these protected areas, Title 5 regulations require set backs for system components from such areas.

In the interest of preserving environmental quality these protection areas, which require added restrictions to the use of on-site septic systems were evaluated. Study areas that contained a significant amount of these areas were considered less favorable for continued use of on-site septic systems.

3.2.2.4 Soils

Soil map units and soil descriptions from the Natural Resources Conservation Services (NRCS) an agency of the United States Department of Agriculture (USDA), as well as data obtained from Title 5 inspections, and soil borings performed as part of the 1981 Facilities Plan were used to evaluate areas of Taunton for soils ability to treat sewage effluent in accordance with the Massachusetts Environmental Code, Title 5. Soil characteristics such as permeability, depth to bedrock, and depth to seasonal high groundwater table were used to determine suitability for on-site septic systems. The soil groupings were based on the capability of soils to receive and pass wastewater. However, highly permeable soil may adequately receive the wastewater, but may not retain it long enough for adequate treatment. Therefore, vertical separation between system leach field and seasonal high groundwater must be considered. Using GIS mapping, soil units were combined into one of two groups; soils considered suitable for continued use of on-site septic systems and soils considered unsuitable for continued use of on-site septic systems.

3.2.2.5 Groundwater

Depth to seasonal high groundwater was evaluated because high groundwater can have a significant affect on the performance of on-site septic systems. There are many low lying areas of Taunton with wetlands or water bodies in close proximity to developed areas. As such, the high groundwater table in most areas makes it difficult for typical on-site systems to provide adequate vertical separation to groundwater. Data obtained from soil borings and Title 5 tests indicated that although some soils in these areas are suitable for on-site septic systems, high groundwater levels may adversely affect system performance and cause septage overflow, ponding, or partially treated wastewater mixing with groundwater. Based on the significant impact that groundwater can have on the performance of on-site systems, a higher rating system was used for preliminary analysis of study areas to allow for this category to be weighted more than other categories.

3.2.2.6 Title 5 Repair Records and Septic System Pumping

A detailed review of BOH records, including Title 5 testing, was conducted to determine on-site septic system problem areas. Board of Health records from January 1999 through November 2002 were reviewed to identify specific locations that have required system repairs or upgrades. Information was collected and tabulated for all repaired or upgraded on-site wastewater systems. Reference to a repaired or upgraded on-site wastewater system is defined as an existing system on a previously developed lot, which has been totally or partially replaced. An existing on-site system which has been repaired or upgraded may include installation of individual components such as a new septic tank, a new distribution box, new leaching field, or any combination of these components. Information collected from BOH data, where available, included street address, date of percolation test, percolation rate, type of repair, general soil type, depth to seasonal high groundwater and location on assessor’s maps. A total of 367 on-site system repair/upgrade records were evaluated in order to identify problem areas. According to the data a total of 132 repairs/upgrades were performed on lots half acre or less in size, 139 on lot sizes greater than half acre to one acre, and 84 on lots greater than one acre in size.

In addition to repairs and upgrades, another indicator of on-site septic system problems is frequent system pumping. Frequent system pumping can be an indication of improper system installation, high groundwater conditions or an aging system in need of repair. In order to further evaluate on-site wastewater systems, pumping records from January 1997 through November 2002 were obtained from the septage receiving facility operated by Water Solutions Group (WSG). Using these pumping records a total of 339 locations were identified that required pumping two or more times within a one year period.

Individual study areas were evaluated based on the amount of septic system repairs and frequent pumping identified within each study area. A cluster or problem rate was determined for each study area based on the percentage of houses within the study area that were identified as having either system repairs or frequent system pumping. The higher this percentage within a study area the more likely this area was not favorable for continued use of on-site septic systems. Based on the significance of this data and that a majority of the data was from testing/inspections overseen by the city, a higher rating system was used to allow for this category to be weighted more than other categories.

3.2.2.7 Availability of Municipal Sewer and Water Service

Availability of municipal sewer and water to each study area was evaluated as an indication of the feasibility and importance of upgrading wastewater systems. Study areas were evaluated based on their proximity to existing municipal sewer and water. Study areas that did not have municipal sewer readily available were considered to be more likely to continue the use of on-site septic systems. Study areas without municipal water rely on private water wells which could be affected by improperly functioning septic systems adversely affecting local groundwater. As such, these areas would have more of a priority to protect groundwater and would be less likely to continue the use of on-site septic systems if there were signs of system problems.

3.2.2.8 Criteria Rating System

For each of the above criteria a rating value was assigned based on its suitability to support a Title 5 system. Ratings for each evaluation category were totaled to determine a total rating for each study area. A summary of the criteria and rating values is provided in Table 3-5.

3.2.3 Evaluation Results

In order to identify areas for current and future needs in developed and partially developed areas served by on-site septic systems, pertinent information was collected and reviewed. As described in previous sections information used to evaluate areas served by on-site septic systems included lot size, extent of wetlands and surface water, drinking water protection areas, soil suitability based on NRCS soil descriptions, groundwater suitability, septic system repairs and frequent system pumping, and availability of municipal sewer and water.

In order to evaluate the continued use of on-site septic systems, study areas were developed for areas of Taunton that currently use on-site septic systems. Study areas were based on grouping streets and neighborhoods in a reasonable way such that areas could be evaluated equally for various wastewater alternatives. In total, thirty-one evaluation study areas were created and have been identified as study areas A through EE, as shown on Figure 3-1. Study area B was determined to contain the Sabbatia Lake Sewer Extension project currently under construction and was subsequently excluded from further evaluation as part of this CWMP.

Table 3-5

Figure 3-1

Based on the criteria rating system summarized in Table 3-5, a data matrix was developed for each study area to identify and prioritize wastewater disposal needs. The matrix is shown on Table 3-6 which evaluated the thirty study areas. Study area ratings ranged from low of 13 to a high of 23, with an average rating of 18. Based on this rating, initial wastewater needs areas were identified based on each study area's total rating. Areas with a total rating exceeding 18 were considered needs areas which require further evaluation of wastewater needs. A total of nine study areas were identified as wastewater needs areas with total ratings above 18. The nine study areas identified include study areas A, C, E, L, Q, R, U, V, and X. A majority of these study areas are located in areas with a high seasonal groundwater and with relatively high system repair/frequent pumping rates.

Upon completion of this preliminary study area evaluation a workshop discussion was held with city officials to review the ratings of all 30 study areas. As a result of this workshop, in addition to the nine identified priority needs areas, the city identified five additional areas that had total ratings of 18 or below, but where the city has experienced problems with on-site septic systems. The five additional study areas included study area H, I, K, Z, and AA. In total through the efforts of the rating system and workshop discussions, 14 wastewater needs areas were identified; study areas A, C, E, H, I, K, L, Q, R, U, V, X, Z, and AA. The rating system and identification of the wastewater needs areas is presented in Table 3-6. The location of these needs areas are identified on Figure 3-1.

The following sections provide a brief description of each of the needs areas.

Study Area Q – Somerset Avenue, Railroad Avenue

Characterization. Study area Q is located in the southern point of Taunton where the Three Mile River meets the Taunton River. Currently on-site septic systems are used in this area as the area is not serviced by a municipal wastewater collection system. However, the municipal wastewater system is located in an adjacent area to the north. The study area is partially serviced by municipal water and is zoned as suburban residential with average lot sizes between half an acre and an acre.

Soils and Groundwater. Area soils and groundwater are rated as limited and unsuitable for use of on-site sewage disposal, respectively. According to the NRCS soil classifications and Title 5 testing, portions of this study area contain restrictive soils and a high seasonal groundwater.

Drinking Water Protection Zone. Approximately 50% of study area Q is located within an IWPA. IWPA and Zone II's of public water supplies have been determined by the MA DEP to be particularly sensitive to the discharge of pollutants from on-site sewage disposal systems and are therefore designated nitrogen sensitive areas.

Table 3-6

Surface Water and Wetlands. Study area Q is located just north of the confluence of the Three Mile River and the Taunton River. The Three Mile River is located along the southern border of the study area and the Taunton River is located along the eastern border of the study area. The amount of surface water and wetlands in the vicinity of the study area is considered significant

for the purpose of this analysis. No water quality sampling was performed in the vicinity of the study area.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated on Railroad Avenue and Riverfield Road. Approximately 7% of study area Q has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area Q was given an on-site sewage disposal system suitable rating of 21 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area L – Burt Street, Glebe Street, Rocky Woods Street

Characterization. Study area L is located on the east side of Taunton along Burt Street, Glebe Street, Range Avenue, and Rocky Woods Street. Currently on-site sewage disposal systems are used in this area as this area is not serviced by a municipal wastewater collection system. The study area is partially serviced by municipal water and a majority of the area is zoned as rural residential with some highway business district along Winthrop Street. Average lot sizes are between a half acre and an acre.

Soils and Groundwater. Area soil and groundwater are rated as limited and unsuitable for on-site sewage disposal. According to NRCS soil classifications, Title 5 field testing, and soil borings, a majority of the soils within the study area are unsuitable for on-site sewage disposal systems due to saturated soils with slow permeability and high seasonal groundwater.

Drinking Water Protection Zone. Approximately 100% of study area L is located within a Zone C surface water supply protection area and approximately 10% of this study area is located within a Zone A surface water supply protection area and an IWPA. IWPAs and Zone IIs of public water supplies have been determined by the MA DEP to be particularly sensitive to the discharge of pollutants from on-site sewage disposal systems and are therefore designated nitrogen sensitive areas. Class A waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value and are designated for protection as outstanding resource waters.

Surface Water and Wetlands. The Segreganset River flows along the west edge of study area L and is within the boundary of the study area in some locations. The amount of surface water and wetlands in the vicinity of the study area is considered significant for the purpose of this analysis. The Segreganset River Pond is listed on the Massachusetts 303d stream list. Water quality samples were collected on two occasions from the Segreganset River Pond at the Laneway Street Bridge. Results of samples obtained from this location indicated fecal coliform counts of less than 9 and 11 col/100 ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of the area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated in the areas of Glebe Street, Rocky Woods Street, and Range Avenue, as well as several locations on Burt Street. Approximately 12% of study area L has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area L was given an on-site sewage disposal system suitability rating of 23 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area R – Berkley Street

Characterization. Study area R is located on the Taunton/Berkley border along Berkley Street. Currently on-site septic disposal systems are used in this area as the area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as urban residential with average lot sizes between half an acre and an acre.

Soils and Groundwater. Area soils and groundwater are rated as limited and unsuitable for on-site sewage disposal, respectively. According to the NRCS on-site sewage disposal classifications and Title 5 testing a majority of study area soils are limited with restrictive layers and high seasonal groundwater. However, there are some areas with soils that are generally well suited for on-site sewage disposal systems.

Surface Water and Wetlands. A portion of Silva's Pond is located within the study area and the Taunton River flows along the western border of the study area. The amount of surface water and wetlands in the vicinity of the study area is considered moderate for the purpose of this analysis. No water quality sampling was performed in the vicinity of the study area.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping location were located on Berkley Street. Approximately 15% of study area R has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area R was given an on-site sewage disposal system suitability rating of 22 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area C – Field Street, Lothrop Street, Prospect Hill Street

Characterization. Study area C is located in the northern section of Taunton south of Route 495 and east of Snake River along Field Street, Lothrop Street, and Prospect Street. Currently on-site sewage disposal systems are used in this study area as this area is not serviced by a municipal wastewater collection system. The study area is partially serviced by municipal water and is zoned as suburban residential with average lot sizes between half acre and an acre in size.

Soils and Groundwater. Area soils and groundwater are rated as slightly limited and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications a majority of soil types in this area are suitable to accept on-site sewage. However, NRCS classification and Title 5 inspections indicate that several locations in study area C have experience high seasonal groundwater and saturated soils which limit the effectiveness of on-site septic systems in these areas.

On-Site Septic Systems. Assessment of the area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated in the areas of Cypress Road, Hickory Road, Musket Road, Betsy Ross Road and Patriot Road, as well as some sections of Prospect Hill Road. Approximately 18% of study area C has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area C was given an on-site sewage disposal system suitability rating of 20 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area E – Norton Avenue, Freemont Street, Davis Street

Characterization. Study area E is located east of Oakland Mill Pond along Norton Avenue, Freemont Street, Davis Street, and Dunbar Street. Currently on-site sewage disposal systems are used in this study area as this area is not serviced by a municipal wastewater collection system. The study area is partially serviced by municipal water and is zoned as rural residential with average lot size greater than an acre.

Soils and Groundwater. Area soils and groundwater are rated as moderately limited and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications and Title 5 field testing, slightly more than half of this area contains soils suitable for on-site sewage disposal systems. Other areas within the study area contain saturated soils with slow permeability and high seasonal groundwater.

Surface Water and Wetlands. Study area E is located in proximity to Willis Pond, Oakland Mill Pond and Three Mile River. The amount of surface waters and wetlands in the vicinity of the study area is considered significant for the purpose of this analysis. The Three Mile River is listed on the Massachusetts 303d stream list. Water quality sampling was performed on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area E were collected from the Three Mile River at the Tremont Street Bridge. Results of samples collected from this location indicated fecal coliform counts of 54 and 360 col/100ml. Class B surface waters require that fecal coliform bacteria shall not exceed an arithmetic average of 200 organisms per 100 ml in any representative set of samples. Fecal coliform counts at the time of sampling in this location could be caused by failing on-site septic systems, however coliform counts at these levels could also be caused by various other sources including animal waste.

On-Site Septic Systems. Assessment of the area on-site septic systems indicated that system repairs and system pumping locations were concentrated near the intersection of Norton Avenue, Tremont Street, and Davis Street. Other smaller clusters are located on Joanne Drive and Devon Street. Approximately 9% of study area E has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area E was given an on-site sewage disposal system suitability rating of 19 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area A – Field Street, Dublin Drive, Woodview Drive

Characterization. Study area A is located in the northern section of Taunton along Field Street and Bay Street. Currently on-site septic systems are used in this study area as this area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as suburban residential with average lot sizes between a half acre and an acre in size.

Soils and Groundwater. Area soils and groundwater have been rated as slightly limited and limited for on-site septic system disposal, respectively. According to NRCS soil classifications and Title 5 field testing a majority of the soil types in this area are suitable to accept on on-site sewage. However, NRCS descriptions and Title 5 inspections indicate locations of high seasonal groundwater and saturated soils which limit the effectiveness of on-site septic systems in these areas.

Drinking Water Protection Zone. Approximately 50% of study area A is located within an Interim Wellhead Protection Area (IWPA). IWPAs and Zone IIs of public water supplies have been determined by the MA DEP to be particularly sensitive to the discharge of pollutants from on-site sewage disposal systems and are therefore designated nitrogen sensitive areas. Title 5 requires that no system serving new construction in nitrogen sensitive areas shall be designed to receive or shall receive more than 400 gallons of design flow per acre. This would require a new four bedroom home within an IWPA to have a minimum of one acre lot to limit the amount of nitrogen that is introduced to groundwater within the protection area.

Surface Water and Wetlands. Study area A is in the vicinity of Watson Pond, Snake River, and northern section of Lake Sabbatia. The amount of surface waters and wetlands in the vicinity of the study area was considered moderate for the purpose of this analysis. Watson Pond is listed on the Massachusetts 303d stream list which is an indicator list for the water quality of streams, ponds, and riverways in the state. Water quality sampling was performed on September 26, 2003 and October 22, 2003 as part of the CWMP. Samples associated with study area A were collected from the northeast corner of Watson Pond. Results of samples collected from this location indicated fecal coliform counts of 45 and 13 col/100ml. Class B surface waters require that fecal coliform bacteria shall not exceed an arithmetic average of 200 organisms per 100 ml in any representative set of samples. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs were located in the areas of Woodview Drive, Jaclyn Circle, Rachel Drive, and Dublin Drive. Other isolated repairs and frequent system pumping are located on Bayberry Lane, Leahy Drive and areas of Bay Street. Approximately 11% of study area A has experienced system repair or frequent system pumping.

Conclusions. Based on the above information, study area A was given an on-site sewage disposal system suitability rating of 19 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area V – Paul Revere Terrace, Williams Street

Characterization. Study area V is located in east Taunton along Paul Revere Terrace and Williams Street, just east of Highway 24. Currently on-site septic systems are used in this area as the area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as suburban residential with average lot sizes less than an acre.

Soils and Groundwater. Area soil and groundwater are rated as suitable and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications and Title 5 testing, a majority of area soils are generally well suited for on-site sewage disposal. However, there are some areas within the study area that experience high seasonal groundwater.

Surface Water and Wetlands. The Taunton River is located to the east of the study area and portions of Barstow's Pond are located within the southern portion of the study area. The amount of surface water and wetlands in the vicinity of the study area is considered moderate for the purpose of this analysis. Water quality sampling was performed on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area V were collected from the Taunton River at the end of Paul Revere Terrace. Results of samples collected from this location indicated fecal coliform counts of 63 and 48 col/100 ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were located in the Paul Revere Terrace area. Approximately 10% of the buildings in study area U have experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area U was given an on-site sewage disposal system suitability rating of 20 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area U – Williams Street

Characterization. Study area U is located in east Taunton along Williams Street. Currently this area is only partially serviced by the municipal wastewater collection system. The study area is serviced by municipal water and is zoned as urban and suburban residential with average lot sizes less than half an acre.

Soils and Groundwater. Area soil and groundwater are rated as slightly limited and unsuitable for on-site sewage disposal, respectively. According to the NRCS soil classifications and Title 5 testing, a majority of area soils are generally well suited for on-site sewage disposal. However, the study area experiences a high seasonal groundwater and saturated soils.

Surface Water and Wetlands. The Taunton River flows along the northern edge of study area U. The amount of surface water and wetlands in the vicinity of the study area is considered moderate for the purpose of this analysis. Water quality sampling was performed on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area U were collected from the Taunton River at Harris Street. Results of samples collected from these locations indicated fecal coliform counts of less than 140 and 21 col/100 ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were located in the Baylies Road and Duffy Drive area, near the Taunton River. Approximately 11% of the buildings in study area U have experienced repairs or frequent system pumping.

Conclusions. Based on the above information, study area U was given an on-site sewage disposal system suitability rating of 21 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area AA – South Precinct Street, Turner Road, Rhode Island Road

Characterization. Study area AA is located in western Taunton along the Taunton/Lakeville border and includes South Precinct Street, Turner Road, and Rhode Island Road. Currently on-site disposal systems are used in this area as the area is not serviced by a municipal wastewater collection system. The study area is partially serviced by municipal water and is zoned as rural residential with average lot sizes greater than an acre.

Soils and Groundwater. Area soil and groundwater are rated as suitable and unsuitable for on-site sewage disposal systems, respectively. According to NRCS soil classifications and Title 5 testing area soils are suitable for on-site sewage disposal. However, there are some areas within this study area that experience high seasonal groundwater.

Surface Water and Wetlands. The study area AA borders the west side of Big Bead Pond, Cain Pond, and several other smaller ponds located within the study area. The amount of surface water and wetlands in the vicinity of the study area is considered significant for the purpose of this analysis. The Cain Pond and Big Bearhole Pond are listed on the Massachusetts 303d stream list. Water quality sampling was performed on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area AA were colleted from Cain Pond, and Big Bearhole Pond at Bating Brook and Jumping Brook. Results of samples collected from Cain Pond indicated fecal coliform counts of less than 9 col/100 ml. Results of samples collected from Bating Brook indicated fecal coliform counts of 27 and 8 col/100 ml. Results of samples collected from Jumping Brook indicated fecal coliform of 9 and 81 col/100 ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that system repairs and frequent system pumping locations were not concentrated in one area. Approximately 6% of the buildings in study area AA have experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area AA was given an on-site sewage disposal system suitability rating of 17. However, based on workshop discussions with various city officials and the identification of problem areas, this area was considered a wastewater needs area.

Study Area Z – Kingman Street, Myricks Street

Characterization. Study area Z is located in western Taunton along Kingman Street and Myricks Street near the Taunton/Lakeville border. Currently on-site disposal systems are used in this area as the area is not serviced by a municipal wastewater collection system. The study area is partially serviced by municipal water and is zoned as rural residential with average lot sizes between half an acre and an acre.

Soils and Groundwater. Area soil and groundwater are rated as limited and suitable for on-site sewage disposal, respectively. According to NRCS on-site sewage disposal classifications and Title 5 testing soils in this study area vary from restrictive to well suited for on-site sewage disposal.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated in the areas of Birch Avenue, Claire Terrace and Kingman Street. Approximately 17% of the buildings in study area Z have experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area Z has been given an on-site sewage disposal system suitability rating of 15. However, based on workshop discussions with various city officials this area was considered a wastewater needs area.

Study Area X – Staples Street, Caswell Street

Characterization. Study area X is located in eastern Taunton along Staples Street and Caswell Street. Currently on-site disposal systems are used in this area as the area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as rural residential with average lot sizes between half an acre and an acre.

Soils and Groundwater. Area soil and groundwater are rated as suitable and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications and Title 5 testing a majority of the area soils are generally well suited for on-site sewage disposal. However, there are some areas that experience high seasonal groundwater.

Surface Water and Wetlands. Surface water and wetlands in the vicinity of the study area are considered moderate for the purpose of this analysis. No water quality sampling was performed in the vicinity of the study area.

On-Site Septic Systems. Assessment of area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated on Caswell Street, but not in one specific area. Approximately 11% of the buildings in study area X have experienced system repairs or frequent system pumping.

Conclusions. Based on the above information, study area X was given an on-site sewage disposal system suitability rating of 19 and was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area H – Three Mile River, Tremont Street, North Walker Street

Characterization. Study area H is located south of Three Mile River along Tremont Street, Alfred Lord Boulevard and North Walker Street. Currently on-site sewage disposal systems are used in this area as this area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as rural residential with average lot sizes greater than an acre.

Soils and Groundwater. Area soils and groundwater are rated as suitable and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications a majority of the soils within the study area are suitable for on-site sewage disposal system. However, Title 5 testing has indicated that some areas experience high seasonal groundwater.

Surface Water and Wetlands. Oakland Mill Pond is located to the north and the Three Mile River flows along the north east corner of study area H. The amount of surface waters and wetlands in the vicinity of the study area is considered significant for the purpose of this analysis. The Three Mile River and Oakland Mill Pond are listed on the Massachusetts 303d stream list. Water quality sampling was performed on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area H were collected from the Oakland Mill Pond at the end of Mill Street and from the Three Mile River at the Tremont Street bridge. Results of samples collected from these locations indicated fecal coliform counts of 18 and 10 col/100ml from the sample obtained from Oakland Mill Pond and fecal coliform counts of 54 and 360 col/100ml from the sample obtained from the Three Mile River. Class B surface waters require that fecal coliform bacteria shall not exceed an arithmetic average of 200 organisms per 100 ml in any representative set of samples. Fecal coliform counts at the time of sampling in this location could be caused by failing on-site septic systems, however coliform counts at these levels could also be caused by various other sources including animal waste.

On-Site Septic Systems. Assessment of study area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated in the area of Alfred Lord Boulevard and Worcester Street area as well as the Tremont Street and Walker Avenue area. Approximately 16% of study area H has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area H was given an on-site sewage disposal system suitability rating of 18. Based on this rating and workshop discussions with various city officials, this study area was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area K – Winthrop Street

Characterization. Study area K is located in the south west section of Taunton along Winthrop Street. Currently on-site sewage disposal systems are used in this area as this area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as rural residential with average lot sizes between a half acre and an acre.

Soils and Groundwater. Area soil and groundwater are both rated as moderately limited for on-site sewage disposal. According to NRCS soil classifications a majority of the soils within the study area are suitable for use of on-site sewage disposal systems. However, Title 5 testing indicated isolated areas that experience high seasonal groundwater.

Surface Water and Wetlands. The Three Mile River flows through the center of study area K crossing Winthrop Street and Cohannet Street. The amount of surface waters and wetlands in the vicinity of the study area is considered significant for the purpose of this analysis. The Three Mile River is listed on the Massachusetts 303d stream list. Water quality samples were collected on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area K were collected from the Three Mile River at the Cohannet Street bridge. Results of samples collected from this location indicated a fecal coliform count of 27 and 5 col/100ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of study area on-site septic systems indicated that multiple system repairs and frequent system pumping location were concentrated in the area of Winthrop Street near Harvard Street and the area of Cohannet Street near Nuthatch Lane and Parker Terrace. Approximately 9% of study area K has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area K was given an on-site sewage disposal system suitability rating of 17. Based on this rating and workshop discussions with various city officials, this study area was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

Study Area I – Norton Avenue, Worcester Street

Characterization. Study area I is located in the west side of the city near the Taunton/Norton line along Norton Avenue and Worcester Street. Currently on-site sewage disposal systems are used in this area as this area is not serviced by a municipal wastewater collection system. The study area is serviced by municipal water and is zoned as rural residential with average lot sizes greater than an acre.

Soils and Groundwater. Area soil and groundwater are rated as suitable and unsuitable for on-site sewage disposal, respectively. According to NRCS soil classifications a majority of the soils within the study area are suitable for continued use of on-site sewage disposal systems. However, Title 5 testing has indicated that some areas experience high seasonal groundwater.

Surface Water and Wetlands. Study area I is located in proximity to the Three Mile River north of Oakland Mill Pond. The amount of surface waters and wetlands in the vicinity of the study area is considered moderate for the purpose of this analysis. The Three Mile River is listed on the Massachusetts 303d stream list. Water Quality samples were collected on September 26 and October 22, 2003 as part of the CWMP. Samples associated with study area I were collected from the Three Mile River at the end of Rankin Road. Results of samples collected from this location indicated fecal coliform counts of 54 and 25 col/100ml. These results indicate that at the time of sampling, on-site septic systems in this area did not appear to be causing an impact on area surface water.

On-Site Septic Systems. Assessment of study area on-site septic systems indicated that multiple system repairs and frequent system pumping locations were concentrated in the area of Norton Road, Rankin Road, and Short Street. Approximately 12% of study area I has experienced system repairs or frequent system pumping.

Conclusions. Based on the above information study area I was given an on-site sewage disposal system suitability rating of 17. Based on this rating and workshop discussions with various city officials, this study area was considered a wastewater needs area. Wastewater needs areas will be further evaluated during the planning process to determine the need for upgrading wastewater disposal system methods.

3.3 Adjacent Communities Needs

Currently the adjacent communities of Raynham, Dighton, and Norton contribute flow to the Taunton WWTF at average rates of 0.6 mgd, 0.14 mgd, and 0.017 mgd, respectively. Present commitments to these communities through intermunicipal agreement are 0.6 mgd from Raynham, 0.6 mgd from Dighton, and 0.052 mgd from Norton. In order to provide a complete plan of future treatment needs, future flows from these communities as well as other communities (such as Easton) have been projected. Projected flows for the 20 year planning

period include 1.3 mgd from Raynham (including Bridgewater flow), 0.6 mgd from Dighton, 0.052 from Norton, and 0.4 mgd from Easton. The total projected flow to the Taunton WWTF from adjacent communities, including possible flow from the Aquaria desalination plant (0.045 mgd), is anticipated to be approximately 2.4 mgd.

3.4 Estimated Wastewater Flows

Estimated flows from the wastewater needs areas were developed in order to assess alternative disposal options. For options based on Title 5 systems, flows are prescribed in 310 CMR 15.00. For options based on satellite wastewater treatment plants (WWTP)s or disposal at Taunton's central WWTF, flows are developed based on population with allowances for inflow/infiltration and associated peaking factors.

A summary of the estimated flows projected to the year 2025 from each of the wastewater needs areas as well as from those areas which are currently known to be in need of sewering is provided in the Table 3-7. The table includes projected average and peak flow estimates which would apply to satellite systems as well as the central WWTF alternatives. These new service areas are zoned for residential development with the exception of Winthrop St., which is commercially zoned. Where appropriate, flows from adjacent needs areas were combined to develop a continuous area for evaluation.

Projected flows as presented in the table are based on the following criteria and assumptions:

1. The number of existing homes to be sewered represents the current number of developed lots in each study area. Projected development of remaining lots within the study areas (infilling) has been estimated based on the ratio of the City-wide population projection over the next 20 years compared to the build-out population. This analysis indicates that approximately 80% of the vacant lots will be built on in the next 20-25 years.

2. The year 2000 census for the City indicates there to be an average of 2.5 persons per household. This value is used to estimate existing and future population figures in the study areas.

3. In conjunction with population figures, a per capita water consumption value of 60 gallons per day has been used to estimate wastewater flows. This value was developed in the City's Water Management Plan.

4. With the exception of Winthrop St., wastewater flows from the 14 wastewater needs areas and those areas which the City has identified for sewering are based on residential development. As Winthrop St. is zoned for commercial development, estimated projected flows were calculated using an allowance of 1,000 gal./acre/day.

5. Allowances are included for infiltration which, historically, increases over time due to deterioration of the collection system and service connections. The rates used are based on a 20 year planning period.

6. Peak wastewater flow rates can be estimated from service area population or average flow estimates. For this analysis, data from Guides for the Design of Wastewater Treatment Works (TR-16) published by the New England Interstate Water Pollution Control Commission was used. Based on a total wastewater flow of 7.6 mgd, the peaking

Table 3-7

factor was estimated to be 2.7. Additionally, TR-16 recommends consideration of wet weather flow in existing sewered areas due to I/I. As flow estimates were based on a 20 year projection, I/I associated with the study areas was also accounted for based on existing Taunton I/I data. An infiltration rate of 800 gpd per inch-mile of sewer was used to estimate future infiltration and a peaking factor of 1.7 was used to estimate peak I/I flow. These factors approximate wet weather I/I in the study areas and compare to average accepted rates as established by MA DEP.

As indicated in the table, the projected additional flow from newly sewered areas in Taunton is estimated to be about 1.2 mgd of which approximately 85% is from existing development. During the 20 year planning period, it is expected that development will also continue in currently sewered areas except at a much lower rate than in the new service areas. Although this increase is difficult to estimate, it has been assumed that population in these areas will increase at about one quarter of the rate projected in other areas or by about 20%. Based on this assumption, the projected increase in flow from sewered areas was estimated to be about 0.2 mgd. Further, the allowable discharge from Water Solutions Group Septage Treatment Facility has recently been increased from 100,000 gpd to 200,000 gpd bringing the total projected flow estimate to 1.5 mgd. Future development in areas currently undeveloped outside of the existing service area and the wastewater needs areas was not included in this projection.

In 2003 and 2004 the WWTF recorded annual average daily flows (which do not reflect seasonal variations) of 7.9 mgd and 7.3 mgd respectively for an average flow of 7.6 mgd over the last two years. Based on the City’s metering data from Raynham, Dighton and Norton, average daily flow from Taunton for that two year period was estimated to be 6.8 mgd.

A summary of the estimated future flows is provided in Table 3-8 and represents the estimated flow to Taunton’s WWTF should all wastewater needs areas and adjacent communities connect to the collection system.

Based on this scenario, where all future flow will discharge to the WWTF, the projected year 2025 flow from Taunton is therefore estimated to be around 8.3 mgd. Adding projected flows from adjacent communities (1.3 mgd for Raynham, 0.6 mgd for Dighton, 0.052 mgd for Norton, 0.4 mgd for Easton, and 0.045 mgd from Aquaria) would then bring the total allocated WWTF capacity to about 10.7 mgd.

3.5 Estimated Build-Out Wastewater Flows

For informational purposes, flow projections under build-out conditions have been estimated and are provided in Table 3-9. The projections include the estimated 2025 flows, flows from the other CWMP study areas and the build-out of currently undeveloped areas. No time frame is provided for this condition however, it is assumed to be well beyond the 20 year planning period covered in this CWMP.

Table 3-8

Table 3-9

4.0 WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

The methodology for determining which of the thirty study areas in Taunton are considered a priority for wastewater disposal needs is described in Section 3. In this Section, alternative wastewater treatment systems capable of meeting these needs are described and evaluated. In general, the alternatives considered include:

- Continued use of existing on-lot treatment systems
- Individual Title 5 systems
- Community/cluster Title 5 Systems
- Small, satellite wastewater treatment systems
- Centralized treatment (Taunton WWTF)

4.1 Continued Use of Existing On-lot Treatment Systems (No Action Alternative)

This alternative is essentially considered a “no action alternative”. Existing on-lot systems in Taunton include a wide variety of designs, flow capacities, ages and efficiencies. Older systems may utilize cesspools which, as they age, require more frequent pumping in order to prevent backups and overflows. Newer systems typically consist of a septic tank, distribution chamber and leach field however, depending upon when they were installed, these components may be substandard when compared with current regulations.

Continued use of existing systems without repairs or upgrades is likely to result in ground and surface water degradation from failing systems which would pose a risk to public health and safety as well as aesthetics. Such conditions are in violation of the Massachusetts Clean Water Act, M.G.L. c.21. Sections 26-53, which is administered by the Massachusetts Department of Environmental Protection (MA DEP) within its various regulations. Briefly, the “no action alternative” is detrimental to public health and the environment and in violation of Massachusetts General Laws. Consequently, this alternative is not a viable choice.

Currently, individual on-lot treatment systems are regulated under 310 CMR 15.000 commonly referred to as Title 5 of the Massachusetts State Environmental Code. Within the framework of Title 5 are the requirements for new construction and for repair and upgrade of existing systems. Continued use of on-lot treatment systems in Taunton includes both categories.

4.2 Individual On-lot Title 5 Systems

The most recent version of 310 CMR 15.000 was issued in 1996. Conventional Title 5 systems can be used to treat sanitary sewage flows of less than 10,000 gallons per day and pertains to individual systems as well as multi-family or community systems. Under Title 5, provided that the regulations are adhered to, the program is regulated by local authority for system capacities under 10,000 gallons per day. In Taunton, as in most municipalities, the local authority is the Board of Health. This report, therefore, refers to the Taunton Board of Health as the local authority.

Title 5 regulations address enforcement, design, construction, repair/replacement, inspection and maintenance of systems. Local bylaws may institute more stringent requirements.

4.2.1 Title 5 Enforcement

Whether for a new system or for repair to an existing system, an Application for Disposal System Construction Permit, including all pertinent design information and details, must be filed with the Board of Health for review in conformance with Title 5 requirements. System designs which do not conform to the requirements or involve enhanced treatment processes are also reviewed by MA DEP.

Under the regulations, the Board of Health is responsible for enforcing repair or upgrade of failing systems which are a potential threat to public health, safety or the environment. Aside from obvious nuisance conditions, failing systems may be detected from tanker pumping frequency or unexplained surface water pollution. Septic system inspections are required when:

- The title to the property changes hands.
- Additions are made to existing buildings.
- The intended use of the facility changes.

Inspections are conducted by MA DEP approved professionals for the primary purpose of determining if the system is performing without evidence that it has or is in the process of failing. Criteria generally considered includes:

- Backup of sewage in the facility being served by the system.
- Evidence of discharge to the ground surface.
- Effluent retained in the distribution chamber (upstream from the soil absorption system).
- System pumping frequency more than four times per year.
- Evidence that the ground water level is at or above the soils absorption system
- Proximity of surface water supplies, drinking water wells and wetlands.
- Type of system
- Age of septic tank

The Board of Health considers any system utilizing a cesspool as a failure. Septic tanks older than 10 years are also required to be replaced in an upgrade or repair situation.

Based upon the system inspectors report, the Board of Health determines the need for and extent of a system upgrade and issues the appropriate orders.

It is intended that upgrades bring the system into full compliance with Title 5. In situations where the lot is unable to accommodate all Title 5 requirements certain variances are allowed. Where a failing system cannot physically meet regulations, the standard becomes “the maximum feasible upgrade” as determined by the Board of Health. In such instances the Board of Health is allowed to vary requirements of the regulation to the extent necessary to achieve a feasible upgrade. Variances to property line and building set-backs, soil absorption system area, wetland and surface water setbacks and groundwater separation are allowed. In some instances, "maximum feasible upgrade" may require use of innovative/alternative treatment methods as described later in this section.

4.2.2 Design

The basic elements of the Title 5 system are the septic tank, distribution chamber and the soils absorption system (SAS). Figure 4-1 shows a plan and section view of a typical Title 5 system. Design of these components is covered in 314 CMR 15.000.

Septic Tanks: The septic tank receives raw sewage and is sized to allow settling of solids and floatation of lighter materials such as grease. The outlet is baffled to retain floating materials and solids in the tank. "Tee" filters on the tank outlet are used to improve the effluent quality. The primary purpose of the septic tank is to protect the SAS. Therefore, proper maintenance, consisting of periodic pumping, to remove solids and floatable material before they can exit the tank, and inspections, is an extremely important duty of the property owner to extend the life of the SAS.

System capacities are dictated according to criteria stipulated in 310 CMR 15.000 for various types of establishments. For single-family homes the capacity is based on the number of bedrooms multiplied by the stipulated flow of 110 gallons per day (gpd) per bedroom. Therefore, a three-bedroom house would require a system sized to treat 330 gpd or 440 gpd for a four-bedroom house. Septic tanks are sized based on double the daily design flow volume with a minimum liquid capacity of 1,500 gallons. Larger systems (over 1,000 gpd) must use two compartment tanks or tanks in series.

Distribution Chamber: Effluent from the septic tank is evenly distributed to the SAS through this structure. The chamber is constructed such that flow is evenly separated and directed to the trenches or beds which make up the SAS. In a properly operating system, no water should stand in the downstream end of the chamber. The presence of standing water in the chamber may indicate that plugging of the SAS is occuring and replacement is imminent. The chamber therefore serves as an important indicator of the health of the SAS.

Soils Absorption System (SAS): The physical size and type of SAS is determined by several factors including percolation rates, soils classification, design flow, depth to ground water and degree of treatment required. Generally, for siting a Title 5 system, the regulations require:

- Percolation rates of 30 minutes per inch or less.
- A minimum of four feet separation between the highest observed ground water elevation and the bottom of the soils absorption system (leach field, trenches, etc.).
- A minimum of four feet of naturally occurring permeable soil below the bottom of the soils absorption system.

It should be noted that, although MA DEP amended its regulations, effective January 1, 2004, to allow percolation rates as high as 60 minutes per inch, the Taunton Board of

Figure 4-1

Health has not recognized the lower rate and requires new systems be based on 30 minutes per inch.

Site evaluations must be conducted by a MA DEP approved soils evaluator who has the proper training and credentials, including test scores, to determine soils classifications and ground water hydrology of the SAS site. Evaluations involve excavation of at least two deep (10 feet minimum) test pits and a percolation test conducted in the presence of a Board of Health representative.

Sandy, sandy-loam and loam soils (Classes I and II) are suitable for soil absorption systems. As silt content in the soils increases (Class III), the less suitable they become. Clay soils (Class IV) are unacceptable for these systems. For each soils classification, Title 5 regulations prescribe allowable SAS effluent loading rates for percolation rates up to 60 minutes per inch although the City's standard of 30 minutes per inch is more stringent. The effluent loading rate determines the physical size of the SAS.

The range of application rates varies from 0.74 gallons per day per square foot in Class I soils with percolation rates less than five minutes per inch to 0.29 to gallons per day per square foot in Class III soils with percolation rates of 30 minutes per inch. The percolation rate, therefore, has a significant impact on the size and cost of the system.

Designs for new construction are required to provide a suitable reserve SAS area on the building lot.

Various types of absorption systems are permitted including beds, trenches, chambers and pits. Systems with capacities over 2,000 gallons per day are required to employ leaching beds in conjunction with a pressure (pumped) distribution system to provide an even distribution of flow over the entire leaching bed area. Where a four foot separation between the highest groundwater elevation and the bottom of the SAS cannot be maintained, Title 5 allows suitable borrow material to be used to satisfy this requirement. Generally, this results in a mounded system which may require effluent from the septic tank be pumped to the SAS. A detail of a typical mounded system is shown on Figure 4-2.

In Taunton, it is anticipated that high ground water will be a factor in the disposal needs areas and that mounded systems will be required for new construction as well as to upgrades to existing on-lot systems. For cost comparison purposes for Title 5 systems (discussed in Section 6), we have estimated costs based on use of mounded systems with the following typical site conditions:

Depth to ground water: Two feet
Site Topography: Generally level
Soils classification: Class II
Percolation rate: 5-10 minutes per inch

Figure 4-2

4.2.3 Nitrogen Sensitive Areas

Interim Wellhead Protection Areas and Zone II areas of public water supplies are of concern with respect to the accumulation of nitrogen in the ground water and its influence on drinking water supplies. The maximum allowable concentration of nitrogen in public water supplies, as established under the federal Safe Drinking Water Act, is 10 milligrams per liter (mg/l). Typical Title 5 systems afford minimal treatment for removal of nitrogen which ranges around 35 to 45 mg/l in the septic tank effluent-primarily as ammonia.

Under Title 5, design flow from septic systems in these areas is limited to 440 gallons per acre unless some form of enhanced treatment is employed to reduce the effluent nitrogen concentrations. Alternative treatment methods are discussed later in this section.

4.2.4 Construction

Whether for a new system or for repair to an existing system, an Application for Disposal System Construction Permit, including all pertinent design information and details, must be filed with the Board of Health. Upon completion of its review, the Board issues a Permit to Construct Disposal System along with conditions pertaining to the approval. It should be recognized that, should subsurface conditions evident from construction activities, differ from the soil evaluators description, construction must stop and a new application prepared and submitted.

A Disposal System Installer who holds a permit from the Board of Health must install Title 5 systems. The permit signifies that the installer has the necessary equipment, capacity and knowledge to properly construct the system and maintain compliance with Title 5 criteria as well as local Board requirements. During construction, the Board of Health has inspection responsibilities to assure the system is installed per the approved plans. The inspections generally occur when the surface material is removed from the SAS exposing the underlying permeable soil layer, when the SAS stone layer is installed, during backfilling operations and upon completion of the SAS.

The designer of the system and the installer are required to certify that the system has been constructed in compliance with 310 CMR 15.000. Once the Board of Health is satisfied that all conditions have been met and the work completed, a Certificate of Compliance is issued and the system may be placed in service.

4.2.5 Repairs, Replacement and Upgrades

It is generally presumed that full compliance with Title 5 requirements provide the acceptable level of protection of the public health, safety and environment over the long term. It is therefore incumbent upon owners of a failed system to bring it into full compliance with the regulations. In these cases, the requirements for design and construction are as outlined above. It is not always possible or feasible, however, to comply with all aspects of Title 5.

4.2.5.1 Variances

In situations requiring system repair or upgrade where certain Title 5 siting criteria are impossible to meet or create an undo hardship, the Board of Health may consider an application for a variance. Variances must be substantiated as being necessary in order to achieve a reasonable design. In general, preference is given to variances for non-technical aspects of the regulations (for example, setbacks) rather than technical adjustments (such as reduction of SAS area). Specific variances allowed under the regulations in order of preference are:

a) Property line setback.
b) Building setback.
c) Relocation of SAS to an area within the lot which percolates at acceptable rate
d) Reduction in the SAS area by up to 25%.
e) Relocation of potable water well.
f) Reduction of wetlands setbacks.
g) Reduction in surface water setbacks.
h) Reduction in surface water supply setback.
i) Reduction in the vertical separation from the highest ground water elevation to the bottom of the leach field by a maximum of 12 inches (under certain conditions).

A variance from the requirement for four feet of permeable soil below the SAS is typically only considered in conjunction with additional treatment of the septic tank effluent using innovative/alternative processes as described later in this section. Variances are applied for through the Board of Health and are subject to the public hearing process and MA DEP review. Generally, reserve SAS areas are not required for system upgrades..

Where a failing system cannot physically meet Title 5 regulations, the standard becomes “the maximum feasible upgrade” as determined by the Board of Health. To accommodate these situations, MA DEP permits use of innovative/alternative treatment technology to improve the quality of effluent prior to subsurface disposal. The increased level of treatment allows for a higher effluent loading rate on the SAS.

4.2.5.2 Alternative Systems

Conventional Title 5 systems provide minimal treatment of wastewater. Their primary function is removal of solids and grease from the waste stream prior to application to the soils absorption system (SAS). Effluent filters are increasingly being used as a further safety measure against premature plugging of the SAS. Because of the minimal treatment afforded the wastewater, application rates as established in the Title 5 regulations, are extremely low.

To enhance performance of Title 5 systems, MA DEP approved alternative treatment processes may be employed on both system repairs and new systems. All on-site systems proposing to use alternative treatment processes must be reviewed and approved by MA DEP.

Upgrading or replacing failed systems in most cases can be accomplished by installation of a conventional Title 5 on-site system. However, in some areas with high seasonal groundwater, unsuitable soils, lot size restrictions, environmentally sensitive areas, or nitrogen sensitive areas, upgrades and replacements with conventional systems still may not meet Title 5 requirements. In these cases, alternative on-site systems may be utilized to allow MA DEP to deviate from Title 5 requirements in the review/approval process. Generally, these systems provide a higher degree of treatment for BOD, TSS, fecal coliform reduction which would allow MA DEP to approve higher SAS application rates, reduced separation from high ground water or other deviations to the regulations. Many systems are also capable of reducing effluent nitrogen levels.

Title 5 prescribes approval procedures for alternative systems and maintains listings for systems certified for:

- Remedial Use-can be used to expedite repair of a failed system without seeking a variance.
- General Use-demonstrated performance at least equal to standard on-site system.
- Pending General Use-application for MA DEP certification under review.
- Provisional Approval-not certified but accepted on the basis of piloting or operating data from installations outside of MA.
- Piloting-conducted with MA DEP approval to demonstrate system performance as part of the certification procedure.

As of September, 2003 alternative technologies approved for use in Massachusetts and under review are listed below. It should be noted that, under Title 5, these systems are approved for use on system capacities of less than 10,000 gallons per day and therefore can be used on the shared community systems as well as individual systems. The overall objective in utilizing alternative systems is to obtain relief of certain Title 5 requirements in view of the improved effluent quality. In their review of the proposed system, MA DEP will establish the allowable deviations based on level of treatment and other factors.

Certified for Remedial Use:

- Geoflow Subsurface Drip
- Biolet
- Recirculating Sand Filter
- Piranaco
- Puraflo
- Biocylce
- Jet Home Aerobic
- Norweco
- Bioclere
- Waterloo Biofilter
- Composting Toilets
- Amphidrome
- Ecoflo
- Orenco
- AdvanTex
- FAST
- SeptiTech
- Cromaglass

Certified for General Use:

- Composting Toilet
- Biolet
- Recirculating Sand Filter
- RUCK
- Intermittent Sand Filters
- Bioclere
- Cromaglass WWT Systems
- Jet Aerobic
- FAST
- Norweco
- Amphidrome
- Waterloo Biofilter
- BioDiffuser Chambers
- Cultec Chambers
- Eljen In-Drain Systems
- Eljen Xpandable Chamber
- Infiltrator Chambers

Approved for Provisional Use

- Amphidrome
- Bioclere
- FAST
- Waterloo Biofilter
- Cromaglass WWT System
- Amphidrome
- MicroSeptic EnviroServer

- Norweco
- SeptiTech
- Nitrex
- RID
- RUCK
- OAR System
- Waterloo Biofilter

For general information, a description of several of the systems approved for remedial use and general us is provided below. As the descriptions below indicate, mechanical equipment (i.e. pumps and blowers) are utilized in these processes which equates to higher maintenance costs than a conventional Title 5 system.

Bioclere

The Bioclere system is a modular system consisting of a modified trickling filter and clarification to provide advanced on-site wastewater treatment. The system utilizes a biological fixed film process which can adjust to varying flows and loads. Bioclere provides advanced treatment for removal of BOD and nitrogen. The Bioclere system is installed in line between the septic tank and the distribution box. Wastewater flows to the clarifier from which it is applied over the trickling filter media. Here organic material is reduced by organisms which attach to the filter media and form a biological layer which develops aerobic, anoxic, and anaerobic zones. Eventually portions of this biological layer will slough off and new biological growth will continue. The sloughed biomass settles to the bottom of the clarifier as sludge and is pumped back to the septic tank for storage and later removal. Treated effluent is distributed to the soil absorption system.

FAST

FAST or Fixed Activated Sludge Treatment consists of a modified two compartment septic tank that treats wastewater using a fixed film, aerated system that combines attached and suspended growth for removal of BOD and nitrogen. Wastewater flows directly to the first tank compartment which acts as a primary settling tank and anaerobic zone. The second compartment contains the FAST treatment module with aerobic and anoxic zones. Within the treatment compartment air is blown and diffused through submerged plastic media where nitrification of the primary effluent occurs. A portion of the nitrified effluent is recycled back to the anoxic settling tank to achieve denitrification. The remaining system effluent is distributed to the soil absorption system.

Jet Aerobic

Jet Aerobic is an aerobic treatment system which utilizes a motor driven aspirator shaft that thoroughly mixes and disperses fine air bubbles to provide advanced treatment. The system consists of three compartments providing pretreatment, treatment, and settling. The pretreatment compartment receives wastewater and treats it physically and biologically, similar to a septic tank. The treatment compartment is an activated sludge system with the Jet Aerator providing mixing to inject fresh air into system during treatment. Effluent then goes to a settling compartment where solids are settled out and returned to the treatment compartment. System effluent from the settling compartment is then distributed to the soil absorption system.

Waterloo Biofilter

The Waterloo Biofilter is a trickling filter system using an open cell foam medium to provide microbial degradation of organic pollutants. Septic tank effluent is sprayed on to the medium where it is treated by microorganisms growing on the medium. Recirculation of approximately half of the filter effluent to the septic tank typically reduces nitrogen levels through denitrification in the septic tank. The remaining effluent is discharged to the soil absorption system.

Recirculating Sand Filter

Septic tank effluent is pumped to a distribution manifold which discharges to sand filter beds. The wastewater percolates through the sand bed where microorganisms break down organic contaminants. Treated effluent discharges to the soil absorption system. After passing through the sand filter a portion of the flow (up to 3 to 5 times the inlet volume) is recycled back to the septic tank for denitrification.

4.2.5.3 Tight Tanks

In some locations systems cannot be upgraded with either conventional or I/A systems due to site restraints or subsurface conditions. In these areas consideration may be given to the use of tight tanks. Double wall tanks with leak detection are required for underground installations. A tight tank is essentially a temporary holding tank that eliminates discharge to the ground. As such, these systems require frequent pumping which results in high maintenance costs. Tight tanks are allowed by the MA DEP as a last resort for replacing failing systems and are usually considered for use as a temporary solution to wastewater management.

4.2.6 Maintenance Requirements

Septic system failures generally occur when the SAS becomes overloaded with solids accumulation that effluent can not percolate into the soil. Protection of the SAS is of prime importance in maintaining an on-lot system.

By design of the septic tank influent and effluent piping solids and floating material (such as grease), are retained and accumulate in the tank. Since the tanks have limited capacity for storage of this material, it must be periodically removed or it will begin to discharge to the SAS along with the clarified effluent. Depending upon the demand on the system, septic tanks need to be pumped at intervals of one to three years in order to avoid loss of the solids.

Most of more recent Title 5 systems incorporate effluent Tee filters on the septic tank discharge which also need to be cleaned whenever the septic tank is pumped.

The effectiveness of the SAS can usually be determined by inspection of the distribution chamber. Standing water in the chamber is indicative that the SAS is at least partially plugged and may be into a failure mode. Water slowly moving out of the chamber may indicate a partially plugged system and measures should be taken to minimize further plugging. These measures could entail more frequent pumping of the septic tank and retrofitting an effluent filter to the tank.

Careful monitoring of wastes discharged to the system is also important. A grease trap upstream of the septic tank may be appropriate in certain instances. Use of garbage grinders should be discouraged unless the septic tank is specifically sized to handle the additional solids loading.

4.2.6.1 Septage Management Plan

In order to establish performance requirements for on-lot systems, a septage management plan should be implemented to establish minimal maintenance requirements such as pump out frequency, distribution chamber inspections and effluent filter service. The plan should incorporate an educational segment to inform property owners of the functions of the treatment system and importance of routine maintenance. Monitoring of systems located in sensitive areas should also be a consideration.

4.2.7 Assistance Programs

The Commonwealth has developed 3 programs to assist homeowners with wastewater management problems.

Homeowner Septic Loan Program: Designed to meet the demand for funds by homeowners whose systems will not pass Title 5 inspection.

Comprehensive Community Septic Management Program: Provides funding for long term community/regional, or watershed-based solutions to address a comprehensive approach to on-site disposal failure in areas of high environmental impact.

Tax Credit: Provides a tax credit of up to $4,500 over 3 years to defray the cost of septic repairs to a primary residence.

4.2.7.1 Homeowner Septic Loan Program

This program provides below market rate loans to homeowners upgrading systems. Loans are administered by banks and are then purchased by the Massachusetts Housing Finance Agency (MHFA).

4.2.7.2 Comprehensive Community Septic Management Program

The Community Septic Management Program was developed by the state to provide financial assistance for homeowners to comply with Title 5 requirements. This program will have two options for communities to choose from to receive subsidized loans to make repairs for homeowners through the betterment process. The betterment loans will be available at an interest rate of either 2% or 5%, a decision made by the community.

Option 1. Community proposes a Comprehensive Community Septic Management Program on either a community-wide basis, or for a portion of the town, targeted sensitive areas (such as shellfish beds, recreational lake, or water supply) and high failure rates. Under this option, a $20,000 pre-loan assistance payment is awarded to assist communities in identifying priority areas and establishing a comprehensive approach. Upon approval of the plan, loans of $20,000 are available. Communities proposing a comprehensive inspection program that meets MA DEP’s requirements for the Time of Transfer exclusion contained in Title 5, and communities that join other communities, will be eligible for larger loans.

Option 2. Community opts to target known or suspected failures. Under this option, loans up to $100,000 are available.

Under the Community Inspection Plan septic system inspections are performed a least every seven years, relieving property owners of their obligation to have the septic system inspected upon transfer of ownership. In contrast, a Local Septic Management Plan does not require the periodic inspection of systems but rather implements septic system monitoring and management. Under the Local Septic Management Plan property owners are not relieved of the obligation to have septic systems inspected at the time of property transfer. As the Local Septic Management Plan does not require regular system inspection it is considered less stringent and less effective than the Community Inspection Plan. As such, for the purpose of this CWMP it is recommended that a Community Septic Management Program consist of a Community Inspection Plan. A Community Inspection Plan will help to further identify septic system problem areas and provide greater environmental protection from septic system contamination. Minimum requirements for MA DEP approval of a Community Inspection Plan include the following:

- Scope and basis for the plan
- Prioritization of areas to be inspected
- Proposed schedule for system inspections
- Interim maintenance measures
- Implementation and Administration of the Plan

After the plan has been established and put into operation, the community is required to submit annual status reports to the MA DEP summarizing the results of system inspections. In addition, after the completion of first time inspection of all systems covered by the plan the community must submit a report evaluating the effectiveness of the plan.

4.2.7.3 Tax Credit

Forms are available from the Department of Revenue to enable homeowners to claim up to $4,500 in tax credits for septic upgrades. The credit cannot exceed $1,500 in any year and may be spread out over 3 years. The tax credit is limited to work done on a primary residence only.

4.2.8 Individual On-lot Systems in Wastewater Needs Areas

The criteria used to determine the suitability for continued use of individual septic systems in various sub-areas was described in Section 3. Of the eight parameters considered, the following five parameters must be addressed in the design of new or repaired on-lot Title 5 systems:

- Lot size
- Proximity of wetlands
- Drinking water protection zones
- Soil suitability
- Groundwater elevation

Over time, theoretically, all on-lot systems would eventually be brought up to present Title 5 standards. In the sub-areas in Taunton identified as having wastewater disposal needs however, because some or all of the above parameters were indicated to be limited or unsuitable for on-lot systems, the continued use of Title 5 systems in the needs areas is seen as problematic over the long term and other alternatives need to be considered.

4.3 Community (Shared) Title 5 Systems

Where conditions are not favorable for individual on-lot systems due to soil, groundwater, or space constraints, combining the flow from a group of buildings to a single on-site system can be considered as an alternative treatment option for either new construction or systems repair.

4.3.1 Planning Considerations

Consideration of an on-site community system will depend on suitable land available in the vicinity of the homes to be served and the amount of flow to be treated. Title 5 systems are limited to capacities under 10,000 gallons per day which generally equates to a maximum of 20 to 30 homes depending on the number of bedrooms. In general, community or shared systems are subject to the same Title 5 regulations as described previously for individual on-lot systems however, in addition to complete design documents, applications for construction must also include:

- Proposed operation and maintenance plan.
- Description of form of ownership along with legal documentation.
- Description of financial assurance for long term operation and maintenance of the facility including proposed insurance policy covering upgrades in the event of system failure.
- Copy of proposed Grant of Title 5 Covenant and Easement.

In addition, although community systems under 10,000 gallons per day capacity fall within jurisdiction of the Board of Health, MA DEP retains final approval of these systems and requires that applications, along with the local letter of approval, be submitted for review. Failure by MA DEP to respond in writing within 60 days of receipt of the application is deemed as an approval.

4.3.2 Community System Design

The design criteria for community systems are similar to that described previously for individual Title 5 systems for capacities under 2,000 gallons per day. For system capacities between 2,000 and 9,999 gallons per day, the regulation requires use of a pressure dosing system for the SAS.

A section view of a typical larger system is shown on Figure 4-3. For new systems, Title 5 requires septic tanks in series with the first one having twice the average daily flow volume and the second having at least one day average flow volume. The dosing pump station is required to have one day emergency storage capacity above the pump operating levels. Since the dosing cycle occurs four to eight times a day, the water in the force main and distribution manifold is allowed to drain back to the pump chamber to minimize potential for freezing.

In keeping with the probability for high ground water conditions suspected in the needs areas, this detail indicates use of a mounded SAS. Area requirements to accommodate community systems are primarily driven by the size of the SAS. Approximate area requirements for various size systems assuming percolation rates between 5 and 10 minutes per inch are provided below.

System Capacity	Approximate Area
2,000 gpd	0.75 Acres
5,000 gpd	1.3 Acres
10,000 gpd	2.5 Acres

Dosing systems are typically sized to discharge septic tank effluent to the SAS four to eight times daily. Larger systems may divide the SAS into two or more separate leaching fields to reduce the capacity of the dosing pump. Where multiple leach fields are used, automatic valving may be used to sequence the dosing cycles to each field.

4.3.3 Community Systems Operations

Routine maintenance of community systems involves monitoring of the dosing pump system and septic tank pumping. Visual and audible alarms typically alert users of pump system problems. Since dosing pump chambers are usually designed with capacity to contain one days average flow volume, power outages which extend beyond that period could require emergency pumping. Septic tanks are typically pumped on an annual basis.

Figure 4-3

Dosing pumping rates should be monitored over the life of the system. Extended pumping cycles could signal that the SAS is beginning to plug up and replacement will be necessary.

4.4 Satellite Wastewater Treatment Facilities

Where required treatment capacities equal or exceed 10,000 gallons per day, a groundwater or surface water discharge permit is required and the systems are regulated by MA DEP under 314 CMR.

4.4.1 Surface Water Discharge Permitting

In Massachusetts. surface water discharge permits are regulated at both the state and federal level. 314 CMR 3.00 and 4.00 establishes the Surface Water Discharge Permitting Program and Surface Water Standards for discharge of treated wastewater to surface waters in the Commonwealth. At the federal level, the Environmental Protection Agency (EPA) regulates surface water discharges through the National Pollution Discharge Elimination System (NPDES) under the Federal Clean Water Act. The NPDES permit is issued jointly by MA DEP and EPA and both agencies have enforcement authority.

Anti-degradation policies enacted by both agencies have resulted in extremely difficult and time consuming procedures for both the permit application and review process. Given that Taunton has an existing NPDES permit for discharge from its central WWTF and its combined sewer overflow, it is highly unlikely that another surface water discharge permit would be issued. Therefore, for this report, only ground water discharge alternatives were considered for satellite systems.

4.4.2 Ground Water Discharge Permitting

Ground water discharge permits are solely under the jurisdiction of MA DEP and are regulated under:

- 314 CMR 5.00 Ground Water Discharge Permit Program
- 314 CMR 6.00 Ground Water Standards

Under the program, all ground water is considered Class I, suitable for use as potable water, except brackish waters (Class II) and specific degraded areas (Class III). Discharge standards for Class I ground water requires secondary level of treatment as a minimum. Plant capacities of 150,000 gallons per day or more require advanced treatment to reduce nitrogen levels to within 10 mg/l.

Permit applications must include a detailed engineering report and hydrogeological report, certification of final plans and specifications, operations and maintenance plan, staffing plan, documentation of ownership and financial resources and operational services agreement. The hydrogeological investigation is required to determine the impacts of the treated waste discharge on the ground water. Under the regulations, the discharge must meet criteria for Class I (suitable for potable water use) groundwater. Ongoing monitoring for groundwater degradation after the facility is placed in operation is also required. The review includes the public notification and hearing process. The permit will contain all the conditions for operation and performance of the system including permitted capacity, discharge limits and reporting requirements. Renewal of the permit is required every ten years.

Once the treatment facility is constructed and operational, discharge monitoring reports will be required by the MA DEP in accordance with the facility discharge permit. Further, the MA DEP will require that operation of the facility be under the direction of a State certified operator. Monitoring is generally required for flow volume and influent and effluent pollutant concentrations. The discharge permit will prescribe the allowable pollutant loadings in the treated waste discharge. MA DEP must be notified if the permit limits are exceeded. Monitoring and reporting of the site groundwater quality will also be required.

4.4.3 Design Considerations

Typical satellite systems incorporate the same processes as do larger wastewater treatment plants. Because the smaller systems generally experience a wider fluctuation in diurnal flows, equalization tanks are usually employed upstream of the process systems. There is a wide variety of packaged systems on the market which utilize different variations of biological treatment processes. Piloting programs are frequently employed to determine which process best suits the wastewater being treated.

Processes incorporated into a satellite plant would likely include:

- Equalization tank with mixer and outlet flow control
- Preliminary treatment for removal of large/heavy solids
- Primary settling
- Biological reactor
- Secondary settling
- Filtration
- Effluent disinfection and disposal

Process systems are typically housed in a building which would include the auxiliary systems required for operation and control. Typically, the building would provide space for an electrical room, control room, odor control, chemical storage and feed equipment and office space for records storage. Larger plants may also include a laboratory for testing and control purposes. A typical schematic layout of a satellite WWTP is shown in Figure 4-4.

Treated effluent may be discharged to open sand beds or to approvable leaching systems for ultimate disposal.

4.4.4 Effluent Disposal

MA DEP allows the use of sand filter beds or soils absorption systems similar to Title 5 systems. Because of the advanced degree of treatment, loading rates higher than those established under Title 5 are allowed. Design loading rates for these systems have been established by the MA DEP and presented in their April 2004 Guideline for the Design, Construction and Operation and Maintenance of Small Wastewater Treatment Facilities. The loading Rates are shown in

Figure 4-4

Table 4-1. In this Table, the lower loading rates apply to percolation test results. Where infiltration rate testing has been performed in lieu of percolation testing, the higher loading rates can be used.

TABLE 4-1. TREATMENT PLANT EFFLUENT GROUNDWATER DISPOSAL SYSTEMS DESIGN LOADING RATES (Gallons/Day/Square Foot)

Percolation Rate	Less Than 2 min./in.	2 to 5 min./in.	5 to 10 min./in.	10 to 20 min./in	Greater than 20 min./in.
Open Sand Bed	5	5	4.0-4.5	2.0-3.0	0.3-0.4
Leaching Pit	3.0-4.0	3.0-3.5	2.5-3.0	1.5-2.0	0.2-.03
Leaching Chamber		3.0-4.0	3.0-3.5	1.5-2.0	0.2-0.3
Leaching Trench		2.5-3.0	2.5-2.75	1.5-2.0	1.0-1.5

4.4.4.1 Sand Beds

Generally, higher application rates are allowed for sand beds. The beds must be continually maintained, however, and since they are exposed, the area must be fenced. Factors to consider for employing this method of disposal are:

- Dosing rates are determined by percolation testing or infiltration testing
- The maximum ground water table must be minimum of 4 ft. below the floor of the sand bed.
- A minimum of two beds are required plus a reserve area.
- Disinfection of the treated effluent is required prior to application to the beds.

4.4.4.2 Soils Absorption Systems

Leaching pits, trenches, chambers and other approvable systems may be employed. With the higher degree of treatment provided by the systems, leaching system dosing rates are significantly higher than allowed for Title 5 systems.

The following need to be considered for utilizing this type of system:

- Dosing rates are determined by percolation testing or infiltration testing
- The maximum ground water table must be minimum of 4 ft. below bottom of excavation

- Requires minimum of 4 ft. of naturally occurring pervious material below the excavation
- Disinfection of the treated effluent may be required prior to application to the beds (MA DEP determination).

4.4.5 Area Considerations

Satellite wastewater treatment systems require space for the equalization tank, process systems and groundwater disposal. A summary of approximate area requirements for various size systems is provided in Table 4-2 along with the estimated population served. This table is base on percolation rates of five to ten minutes per inch.

TABLE 4-2. SATELLITE WASTEWATER TREATMENT SYSTEMS APPROXIMATE AREA REQUIREMENTS AND DESIGN POPULATION SERVED

Capacity, Gal./Day	Approximate Area (Acres)(1)	Design Population(2)	Approximate Number of Housing Units Served(3)
10,000	0.75	90	36
25,000	1.3	230	92
50,000	2.1	450	180
100,000	3.5	900	360
250,000	5	2250	900
500,000	8	4500	1800
1,000,000	14	9000	3600

(1) Trench leaching system used for WWTP capacities up to 100,000 gal./day, Filter beds used for WWTPs with capacities over 100,000 gal/day.
(2) Based on 110 gal/capita/day including infiltration.
(3) Based on 2.5 persons per unit.

4.4.6 Satellite Wastewater Treatment Systems Operations

Because of the complexity of the facilities, the operation must be under the direction of a MA DEP licensed operator. The license grade depends upon the capacity and complexity of the system. Actual operator attendance at the plant is also a function of the size and type of plant. Many satellite plants have the capability to be monitored off site and require attendance for routine process control functions and regular maintenance. Automatic alarm systems are typically employed to notify off site operating personnel of problems.

In addition to labor, annual expenses for satellite systems operations include power, chemicals, maintenance, repairs, laboratory testing and sludge disposal.

4.5 Preliminary Site Screening for Community Systems

As part of the evaluation of wastewater needs areas, windshield surveys were conducted by M&E in March and April of 2005 to identify potential sites for community Title 5 systems and small satellite WWTPs. Windshield surveys included field observations from public roads and did not include a comprehensive assessment of site conditions, but rather a general preliminary assessment. As such, GIS maps were created and used to refine the selection of sites. The GIS maps incorporated data layers including building footprints, surface water bodies, wetlands, velocity zones and floodways, soil and groundwater suitability for subsurface wastewater disposal, and MassGIS Title 5 setbacks identifying setbacks for surface waters, wetlands, and bordering vegetated wetlands. Using these GIS maps and information gathered during windshield surveys a preliminary assessment initially identified 53 potentially viable sites for community Title 5 systems and/or satellite WWTPs. The general location of the sites where preliminary assessment was conducted is shown on the detailed maps included in Appendix A.

As part of the preliminary assessment several screening criteria were applied to the 53 sites identified. Screening criteria included impacts to land use, proximity to known sensitive resources, proximity to wellhead protection zones, soil and groundwater suitability, and landscape position. As preliminary assessment was conducted through windshield surveys and GIS maps, it was not possible to conduct a comprehensive assessment of conditions throughout an entire site. Also, land availability and/or ownership were not taken into consideration for this preliminary site assessment.

Application of the above preliminary assessment criteria to the 53 potential sites resulted in the identification of several sites that would not be suitable for these alternative systems. Twenty four sites were determined to be unsuitable for community Title 5 systems and ten sites were determined to be unsuitable for satellite WWTPs.

If community Title 5 systems or small satellite WWTPs are determined to be the best wastewater disposal alternative for a given area, then these sites will need to be further assessed to determine suitability for that alternative. This more extensive assessment would take into consideration system design flows and required land areas based on a detailed alternative system design.

4.6 Centralized Treatment

Taunton's WWTF is located on West Water St., as shown on Figure 1-1, with its outfall located on the Taunton River approximately 1.6 miles downstream from the confluence with the Mill River and 1.7 miles upstream from Three Mile River.

Since originally constructed in 1947 to provide primary treatment for wastewater and storm water from the City's combined sewer system, the WWTF has gone through a series of upgrades. In 1978 the facility was upgraded and expanded to provide advanced secondary treatment utilizing a two stage, pure oxygen nitrification process. A program to separate the sanitary sewer system from the storm drain system was initiated in the early 1970's to eliminate a number of combined sewer overflows (CSO). Currently, there is one permitted CSO remaining in the City.

In August 1998, the City executed a 20 year service agreement with PSG (now Veolia) for the operation and maintenance of its WWTF, Main lift station and remote pumping stations. Incorporated in the Agreement was a specific scope of work for upgrading the then existing WWTF (the initial capital improvements) for the purpose of improving performance and process reliability. Major improvements included:

- Upgrade of the main lift station and increasing its capacity from 17.4 to 22.4 mgd.
- Upgrade of major remote pumping stations with new equipment and controls.
- Convert advanced secondary process from two stage system to single stage system.
- Replace the pure oxygen system with ambient air aeration system.
- Provide new WWTF distributed control system and SCADA system covering the main lift station, the CSO, major remote pumping stations and the WWTF.
- Upgrade the CSO to comply with EPA regulations.
- Add odor control facilities to the headworks, gravity thickener and sludge dewatering systems.
- Replace the gaseous chlorine disinfection system with sodium hypochlorite system.

The major portion of the upgrade was completed in 2000.

The capacity of the main lift pumping station was increased from 17.4 mgd to 22.4 mgd with the objective of reducing the frequency of wet weather overflows at the permitted combined sewer overflow structure. Up to 22.4 mgd receives primary treatment of which up to 5 mgd can be bypassed around the secondary treatment process. The flow streams are blended upstream of the chlorine manhole. Sludge is dewatered and landfilled along with grit and screenings at the municipal landfill. Septage wastes from Taunton and other communities are taken to the Water Solutions Group (WSG Facility) located in Taunton. Treated effluent from the WSG Facility is discharged to the WWTF.

A description of the existing WWTF processes is provided in Section 2. Basic data for the WWTF is included in Appendix C. The site plan showing the existing WWTF is provided in Figure 4-5

The most recent permit was issued in 2001 and is included in Appendix E which lists discharge limits for seasonal **(**April through October) and non-seasonal (November through March) treatment. Effluent limits for ammonia nitrogen (1 mg/l) are prescribed for June through September.

The MA DEP has indicated that nitrogen and possibly, phosphorous, limits may be imposed in the future regardless of any plans to expand the WWTF (Appendix D). Taunton's current NPDES permit requires monitoring of total nitrogen at the WWTF outfall during June through September but does not establish limits. The requirement for nitrogen removal would have a significant impact on the WWTF processes and operation.

Figure 4-5

4.6.1 Projected WWTF Flows

As developed in Section 3, the projected average flow to Taunton's central WWTF is estimated to 10.7 mgd assuming all identified needs areas in the City are sewered and projections from existing and new outside communities are accepted. Table 4-3 lists the projected average flows in conjunction with estimated peak flows for each of the sources. These estimates are used to identify systems and processes which will likely require modifications to accommodate the additional flows.

TABLE 4-3. ESTIMATE OF PROJECTED WWTF FLOWS THROUGH 2025 (mgd)

Community	Avg. Flow	Max. Hourly Flow(1)
Taunton	8.2	20.5
Raynham	1.3	3.25
Dighton	0.6	1.5
Norton	0.05	0.13
Easton	0.4	1.00
Bridgewater	w/Raynham	-
Aquaria	0.05	0.13
Estimated Totals	10.7	26.51

1. Peaking factor estimated at 2.5 x Average Flow

The increased flow projections will require modifications to the Main Lift Station as well as the WWTF.

4.6.2 Main Lift Station Modifications

In 2000 the capacity of the Main Lift Station was increased from 17.4 mgd to 22.4 mgd with the installation of 4 new dry pit submersible pumps. The objective of this modification was aimed at reducing the frequency of CSO events as well as providing primary treatment and disinfection for the additional 5 mgd which is bypassed around the secondary treatment process.

With the increased flow from Taunton and adjacent communities estimated to total 10.7 mgd by the year 2025 and assuming little or no flow reduction due to I/I removal, the peak flows will also increase. For evaluation purposes it is projected that the peak flow will increase from 22.4 mgd to 26.5 mgd.

The pumping capacity of the main lift station is limited by the physical size of the station and the wet well capacity. It is proposed that the pump station building be expanded to accommodate two additional pumps as well as controls, engine generator and related equipment.

The lift station discharges to the WWTF through 20 and 24-inch force mains. With the increased flow it is recommended that the 20-inch cast iron main be replaced with a 24-inch ductile iron force main. The length of the pipeline from the lift station to the WWTF headworks is approximately 1,650 linear feet. The 20-inch main was constructed in the 1940's and is in questionable condition.

4.6.3 Central Wastewater Treatment Facilities

Utilizing a similar design operating scenario for handling peak flows to the WWTF, approximately 5.0 MGD would be bypassed around the secondary system to the chlorination manhole. Maximum flow to the secondary processes is estimated at 21. 6 MGD.

4.6.3.1 Existing WWTF Design

The existing WWTF was originally designed as a two stage nitrification system with a hydraulic capacity of 8.4 MGD average and 17.4 mgd maximum hour flow. The plant was hydraulically designed to take 17.4 MGD through each of the two stages (Battery One and Battery Two). With the plant upgrade in 2000, the process was converted to a single stage operation with approximately 35% of the flow directed to Battery One aeration system and 65% to Battery Two. To maintain the plant processes during peak flow events, the design provided for bypassing 5.0 mgd around the secondary process.

4.6.3.2 Proposed Modifications to WWTF

Increasing the capacity of the existing facility from 8.4 MGD to 10.7 MGD would require expansion of the primary settling tanks, aeration tanks and chlorine contact tanks. This would entail construction of a fourth primary settling tank, two additional aeration tanks in Battery One and a third chlorine contact tank. Under this alternative, each battery would have the same treatment capacity and flow to each could be split evenly. Improvements to the solids handling system would include rehabilitation of existing Thickener Tank No. 1, addition of a blending tank and increased dewatering capacity. The following details modifications that would be required at the WWTF in order to accommodate the higher average and peak flows:

1. Addition of a fourth primary settling tank (PST) consisting of the following:
   a. Construct new 55 ft x 55 ft tank adjacent to PST No.3, extend pipe gallery and add stairway. Gallery designed to accommodate chemical storage and feed equipment for phosphorous removal if required in future.
   b. Install new sludge and scum pumps, valves and piping. Connect to existing piping in gallery.
   c. Connect primary tank effluent (PTE) to existing 36-inch PTE.
   d. Relocate roadway, lime slurry piping, 6-inch plant water (PW) and 6-inch foam spray water (FSW) around new tank.
   e. Add lighting, electrical service, unit heaters etc. in gallery extension.
   f. Construct new 24-inch primary influent line from distribution chamber.

2. Add two new aeration tanks, 3A and 3B, to Battery One
   a. Construct tanks 23 ft x 108 ft x 15 ft side water depth similar to Aeration Tank No. 3.
   b. Extend existing 36-inch PTE to new aeration tanks. Add new inlet flow control chamber and rework piping/valving in existing Chamber No.1.

c. Install fine bubble diffusers, replace existing 10-inch air line with 12-inch line.
d. Connect new aeration tank effluent (ATE) line to existing 42-inch ATE. Replace section of 30-inch ATE.
e. Add electrical and instrumentation equipment.
f. Extend lime slurry and PW lines.
g. Relocate roadway.

3. Blower Building
a. Add fourth aeration blower, piping and controls. Blower to be located where existing storage room is now situated.
b. Electrical/instrumentation modifications.

4. Add additional chlorine contact tank (15 min. detention at max. flow condition)
a. Construct tank adjacent to existing tank 50 ft x 30 ft x 12 ft deep with serpentine baffling. Extend effluent channel.
b. Will need to sheet entire excavation due to proximity of existing structures and wetland boundary.
c. Connect inlet piping to existing 42-inch stub at distribution chamber. Install sluice gate on inlet into new tank.

5. Rehabilitate existing gravity thickener No. 1
a. Replace collector, drive, weirs etc.
b. Provide dome cover and connect to odor control system.
c. Provide blending for primary and waste activated sludges up stream of gravity thickeners.

6. Upgrade sludge dewatering system to accommodate larger volume of sludge.

The proposed additions to the WWTF are shown on Figure 4-6.

4.6.4 Advanced Treatment Facilities

At the May 25, 2005 Project Review Meeting with MA DEP, the City was advised that discharge limits may be imposed in the future for reduction of total nitrogen and phosphorous (Appendix D). This requirement will be driven based on further evaluation of water quality in the Taunton River and not by increases in wastewater flows to the facility. Although this is a potential future requirement, the proposed plant expansion should consider the additional process systems and facilities which may be employed to satisfy new or more stringent permit limits. Further, the cost impacts of adding advanced treatment facilities to the WWTF along with the plant expansion should be evaluated in the cost effectiveness analysis for comparison with other alternatives considered for the needs areas.

4.6.4.1 Advanced Treatment Process Systems

Since no limits for total nitrogen or phosphorous have been proposed, we have considered use of anoxic effluent filters for nitrogen removal and chemical addition for phosphorous removal as a possible worst case scenario. These processes would provide a high degree of treatment with corresponding high capital and operating costs. Obviously, if and when nitrogen and

Figure 4-6

phosphorous limits are imposed, a thorough cost effectiveness analysis of alternative treatment processes is needed to determine the most advantageous system for the City. The proposed location for the advanced treatment systems are also shown on Figure 4-6.

Denitrification System
The denitrification system described herein is based on the anoxic, upflow filter type utilizing methanol as a carbon source to support the biological activity. As with many advanced treatment technologies, upflow filter systems are proprietary with various manufacturers.

For design criteria we have assumed an average total nitrogen loading in the secondary effluent of 20 mg/l with an average hydraulic loading rate on the filters of 4.0 gallons per minute per square foot. The denitrification system, on which our cost effectiveness analysis is based, would include an influent wet well with filter feed pumps, upflow filter cells, clearwell with flushing water pumps and a spent washwater tank with pumps to meter spent wash water to the plant headworks. Blowers would be required as part of the filter wash system. It is envisioned that the entire facility will be housed in a building approximately 80 ft. wide by 100 ft. long and approximately 30 ft. high. The influent wet well, clearwell and spent wash water equalization tank would be located at or below grade and under the filter structure to the extent feasible.

Nitrified effluent from the secondary settling tanks would be piped to the denitrification facility influent wet well from where it would be pumped through the upflow filters. Denitrified effluent will discharge to the clearwell. The clearwell would be designed to retain a sufficient volume of water to provide for washing two filters in sequence. Over flow from the clearwell would be piped to the chlorination man hole upstream of the chlorine contact chambers.
Flushing water pumps would be sized to provide a high rate of flow which, in combination with air, would fluidize the media for washing purposes. The spent wash water would discharge to a separate equalization tank from which flow would be metered to the head of the plant.

Methanol will be added to the nitrified effluent upstream of the filters in order to provide a carbon source to support biological growth within the filter media. It is estimated that storage for approximately 30,000 gallons would be necessary to maintain a thirty day supply.

The facility would be automated with local controls. Process system monitoring would be tied into the plant SCADA system.

Phosphorous Treatment
Chemical addition upstream of the primary clarifiers has been considered for reducing total phosphorous levels in the plant effluent. For the purpose of evaluating cost impacts, we have assumed alum is fed at a dose of 80 milligrams per liter into the discharge from the Screen Building. The chemical storage and feed facilities would be located in the extension of the primary gallery constructed in conjunction with the fourth primary settling tank.

In order to handle the additional volume of solids generated by the addition of alum, primary sludge pumping system replacement has been included. Likewise, replacement of the centrifuges and feed systems would also be included to handle the larger volume of sludge.

4.6.5 WWTF Operations

Expansion of the WWTF from 8.4 MGD to 10.7 MGD would require additional staff to operate and maintain the new primary settling tank, additional aeration system components and sludge handling operations. Power costs would increase due to additional aeration and pumping requirements. Chemical costs would proportionally increase due to the flows and addition of polymer.

Incorporation of processes for denitrification and phosphorous removal would have a significant impact on plant operations which, in addition to labor and power, chemical costs would be significant. In the cost effectiveness analysis, these additional O&M costs are applicable to all users of the WWTF as the need for advanced treatment would be driven by factors unrelated to projected flow increases.

4.7 Wastewater Conveyance Alternatives

There are several alternatives that can be considered for conveying wastewater flow to the existing municipal sewer system or to one of the alternative treatment systems discussed above. Alternatives for wastewater conveyance included conventional gravity and force main sewers, small diameter sewers, and low pressure sewers. Alternatives have been considered based on anticipated flows, topography, operation and maintenance, and cost effectiveness.

4.7.1 Conventional Sewers

Gravity sewers are the preferred method of transporting wastewater and a majority of the existing city's system is comprised of gravity sewers in conjunction with pump stations and force mains. Gravity sewers are installed with a straight alignment from manhole to manhole and continuously slope downward to convey flow. Typical conventional gravity sewers are constructed with a minimum pipe diameter of 8 inches and a slope to provide a flow velocity of at least 2 feet per second to avoid solids settling. With sewer systems that serve large communities with varying topography it is likely that gravity sewers will not be used in all areas due to elevation changes. In areas where gravity sewers can not be used the installation of pumping stations and force mains is necessary.

Pumping stations with force mains are used to convey flow from a low point to the desired location within the gravity system. Pump stations and force mains are designed to handle peak wastewater flows from a service area. They typically contain an emergency power supply and two pumps, each capable of handling the entire flow demand. Conventional gravity sewers in combination with pump stations are used to transport wastewater for densely populated areas with significant flow, however the costs of installation along with operation and maintenance costs can be significant. As such, smaller communities may be better suited with a more cost effective wastewater conveyance alternative.

4.7.2 Small Diameter Gravity Sewers

Similar to conventional sewers, small diameter gravity sewers use sloping pipe and gravity to convey wastewater. However, small diameter sewers do not require manholes but rather contain cleanouts at locations along the pipe for maintenance access. These sewers are used in conjunction with septic tanks located at each individual house. Settling within the septic tank reduces solids in the wastewater and allows the use of a smaller diameter sewer pipe and a more gradual slope. Because this alternative still requires the use of a septic tank, maintenance including routine tank pumping is still required to avoid solids from entering the small diameter sewer. Small diameter gravity sewers are typically used where an effluent with minimum solids is needed as in a community leaching field.

4.7.3 Low Pressure Sewers

In areas where gravity sewers can not be used due to elevation changes, wastewater must be pumped to a desired location. For smaller communities where there is not enough wastewater flow to justify a conventional pump station, a low pressure sewer system can be used as an alternative for conveying flow. Low pressure sewer systems include the use of septic tank effluent pumps (STEP) or grinder pumps to convey flow from individual homes to a desired location within the sewer system or to a community system. These two low pressure systems are discussed below.

4.7.4 STEP System

The STEP system combines the use of a septic tank and an effluent pump at each individual home. The septic tank settles out the solids which allows for the use of smaller diameter piping. The septic tank effluent pump then provides the necessary pressure to convey the clarified effluent wastewater to a desired location. A drawback to this alternative is that it still requires the use of a septic tank with routine maintenance and pumping. In addition the individual pumps require operation and maintenance with the availability of a trained operator.

4.7.5 Grinder Pump System

The grinder pump system consists of a collection tank with a pump that has blades for grinding up any solids. This solids and liquids mixture is pumped from the tank to the desired location within the sanitary system. Because this wastewater contains high solids the diameter of the effluent pipe must be slightly larger than other similar systems. Using grinder pumps eliminates the need for a septic tank and routine septic tank pumping. However, similar to the STEP system the individual pumps do require operation and maintenance with the availability of a trained operator.

5.0 ENVIRONMENTAL BASELINE CONDITIONS

This section presents a more detailed presentation of the existing and future conditions for key environmental parameters in the city of Taunton, and particularly in the wastewater needs areas. These parameters include land use, historic and archaeological resources, traffic, air quality, noise, floodplains, wetlands, rare and endangered species habitat, agricultural soils and land, and aesthetic resources. Some parameters are very similar among all the needs areas, or very little site specific data exists to differentiate among the needs areas. However, some environmental characteristics vary depending on location in the city; in these cases, additional information is provided by needs area location. City-wide figures are shown with needs areas overlaid.

5.1 Land Use/Aesthetic Conditions

5.1.1 Overview of Key Policies/Regulations

Executive Order 385. Concerns for induced growth due to improvements in infrastructure provided the basis for Executive Order (EO) 385. EO 385, which was issued in 1996 by then Governor William Weld, declares that the policy of the commonwealth is to actively promote sustainable economic development in the form of a) economic activity and growth which is supported by adequate infrastructure and which does not result in, or contribute to, avoidable loss of environmental quality and resources and b) infrastructure development to minimize the adverse environmental impact of economic activity. The Policy's directive is to implement new rules and regulations, incentives, and assistance to facilitate economic activity consistent with the intent of the policy. Section 6 of the EO stipulates that agencies responsible for planning, funding, constructing, or permitting infrastructure facilities such as transportation, water supply, wastewater treatment and disposal, and solid waste management facilities must actively engage in the development of regional infrastructure plans, if not already in place, in coordination with other agencies and with other local and regional planning agencies. Section 7 of the EO notes that agencies responsible for siting, designing, funding, constructing or permitting of infrastructure projects must seek to minimize unnecessary loss or depletion of environmental quality and resources that might result from such activity.

Commonwealth Capital Program. A program that has been implemented under the current administration is the Commonwealth Capital Program, which reflects the governor's major priorities for new development and redevelopment within the commonwealth. These priorities are housing growth, economic development and environmental sustainability. To achieve these priorities, the Office for Commonwealth Development coordinates state spending programs to help ensure that state investments promote projects consistent with the state's sustainable development principles and partnerships with municipalities seeking to advance the state's development interests. The Commonwealth Capital programs encourage redevelopment and new development in areas already served by infrastructure; preserve and protect historic structures and critical lands; and reward and encourage local land use planning that supports the sustainable development practices. Applicants for the commonwealth capital program funds must complete a Commonwealth Capital Application. The municipality's score on the application represent 20 percent of its overall score on any application to a Commonwealth Capital program.

5.1.2 Existing Conditions

This section provides a discussion of baseline conditions for land use and zoning conditions, as well as aesthetic character, in the City of Taunton. Specifically, descriptions of existing land use patterns including the distribution of major commercial and industrial centers, zoning, and population density are provided. Sources used in this section include discussions with the city planner, Massachusetts Geographical Information Systems (MassGIS) datalayers, EOEA 1999 build-out analysis for Taunton, Massachusetts Institute for Social and Economic Research (MISER) Population Projections for 2010 and 2020 (MISER, 2003), U.S. Census Bureau data, and local planning documents.

The city of Taunton is divided into several neighborhoods, including five primary neighborhoods: Weir, Whittenton, Oakland, Westville, and East Taunton. The predominant land use in Taunton is residential, which constitutes approximately two-thirds of the city's developed land area (Figure 5-1). Most of the residential dwellings consist of single-family homes. Medium and high density residential use is concentrated in and around the downtown portion of the city, and compact residential areas are located in the city's numerous village centers. However, low density residential development has been geographically widespread since the 1950s and has led to suburbanization of portions of the city. The locations of recent residential development (1990 to 2000) are also depicted on Figure 5-1 (by hatching overlay). This figure illustrates that the majority of recent residential development has taken place in less dense, outlying areas as opposed to the densely developed central portion of the city.

Commercial development is located primarily in the downtown area and along major transportation routes (e.g., Routes 44, 138, and 140), as well as in the neighborhood centers. General industrial uses in the city, such as manufacturing and warehousing facilities, are concentrated in Whittenton and Weir neighborhoods, located north and south of the city's downtown, respectively. Office and industrial park uses are predominantly located in the Myles Standish Industrial Park located near the northwest border with Norton, and the Route 140 Industrial Park near the intersection of Route 140 and Route 24 (MassGIS, 2002). The Myles Standish Industrial Park is the largest concentration of industrial uses in the city, consisting of approximately 655 acres.

Taunton has experienced a recent growth surge, which has in part led to the development of some open space resources. Increased growth rates over the past few decades are attributed, in part, to the expansion of the Boston metro market and the completion of Interstate 495, which passes through the city (John Brown Associates, Inc., 1998). While the city historically had densely developed urban and village centers, its outlying areas have experienced a large amount of change as land has been converted from forested areas and agricultural use to suburban residential, commercial, and industrial use. For instance, from 1971 to 1999, agricultural and forest/wetland/open space land use decreased by 53 and 13 percent, respectively, while urban

Figure 5-1

land use expanded by 70 percent (SRPEDD, 2003). Although much of the city's growth is occurring on previously undeveloped land, the build-out analysis shows that there is a considerable amount of developable land in the city that remains undeveloped (Applied Geographics, 2000).

The City of Taunton is divided into eleven zoning districts as established in the Taunton Zoning Ordinance: Rural Residential District (RRD), Suburban Residential District (SRD), Urban Residential District (URD), Central Business District (CBD), Business District (BD), Office District (OD), Highway Business District (HBD), Industrial District (ID), Open Space (OSC), Flood Plain District (FPD), and Airport District (AD). The majority of the city (approximately 80 percent) is zoned for open space or residential development. The RRD districts are located primarily in the western and eastern portions of the city and contain the majority of remaining developable land zoned for residential use.

The remaining 20 percent of the city is zoned for office, business and industrial uses. Land zoned for office and business uses is primarily located along major routes of transportation in the city, including Route 44 and Route 138. The city's industrial districts are mostly located in the northern and southern parts of Taunton. The Myles Standish Industrial Park, located south of Interstate 495 and west of Sabbatia Lake, is within the largest single area zoned for industrial use in the city. Figure 5-2 illustrates the locations of the city's zoning districts. In addition to zoning districts, the city has Water and Aquifer Resource Protection Districts. The purpose of these overlay districts is to protect the aquifers and ground water wells located in the city by imposing additional regulations on the area within the district. These districts are located in the northernmost (Sabbatia) and easternmost (East Taunton and Bear Hole Village) portions of the city.

The predominant land uses and zoning designations within the needs areas and the vicinity of the existing Taunton WWTF are summarized in Table 5-1.

The city has an urban/semi-rural setting. Throughout its development, Taunton has maintained a dense, urban downtown and quiet residential neighborhoods. The city's downtown is an active shopping district and contains a number of historic landmarks. A number of radial transportation arteries converge in downtown around the Taunton Green, adding to the congestion of the central portion of the city. These transportation routes include Routes 44, 138, and 140. Outlying neighborhoods, such as East Taunton, Oakland, and Westville, maintain a largely rural character. The city contains numerous open spaces, recreational locations, and natural resources that add to the city's rural character, including Massasoit State Park, Watson State Park, Boyden Park, Sabbatia Lake, and the Taunton River. Agricultural land in Taunton also contributes to the scenic appeal in semi-rural areas of the city (City of Taunton, 1998).

Recent large-scale industrial and commercial projects have altered the rural character of certain portions of the city and impacted the city's economic profile. These projects include the Myles Standish Industrial Park, Silver City Galleria, and Taunton Depot (City of Taunton, 1998). Industrial and commercial uses are defining characteristics for the Wittenton and Weir neighborhoods, located to the north and south of the city's downtown, respectively. Commercial development is also a significant feature in the downtown area and along major traffic routes

Figure 5-2

TABLE 5-1. SUMMARY OF PREDOMINANT EXISTING LAND USES AND ZONING DESIGNATIONS WITHIN THE IDENTIFIED NEEDS AREAS AND IN VICINITY OF THE TAUNTON WWTF

Needs Area	Predominant Existing Land Uses	Zoning (i.e. Allowed Use)
A	Residential – larger than ½ acre lots: 55% Forest: 24% Residential – ¼ to ½ acre lots: 8%	Entirely Suburban Residential
C	Forest: 38% Residential – larger than ½ acre lots: 31% Residential – smaller than ¼ acre lots: 23%	Entirely Suburban Residential
E	Residential – larger than ½ acre lots: 50% Forest: 25% Residential – smaller than ¼ acre lots: 7%	Primarily Rural Residential, with some Urban Residential and Open Space/Conservation in south
H	Forest: 33% Residential – larger than ½ acre lots: 27% Residential – ¼ to ½ acre lots: 23%	Primarily Rural Residential, with some Open Space/Conservation in south
I	Residential – larger than ½ acre lots: 56% Forest: 40% Open Land: 3%	Entirely Rural Residential
K	Forest: 31% Residential – ¼ to ½ acre lots: 20% Residential – larger than ½ acre lots: 17%	Mostly Highway Business and Suburban Residential, some Industrial and Open Space/Conservation
L	Forest: 45% Residential – larger than ½ acre lots: 28% Residential – ¼ to ½ acre lots: 8%	Primarily Rural Residential; Highway Business in south
Q	Residential – larger than ½ acre lots: 58% Forest: 26% Cropland: 9%	Entirely Suburban Residential
R	Residential – ¼ to ½ acre lots: 32% Residential – larger than ½ acre lots: 22% Forest: 16%	Entirely Urban Residential
U	Residential – ¼ to ½ acre lots: 51% Forest: 16% Residential – larger than ½ acre lots: 15%	Primarily Urban Residential with some Suburban Residential
V	Residential – ¼ to ½ acre lots: 67% Forest: 30% Industrial: 2%	Primarily Suburban Residential with some Industrial to the south
X	Residential – larger than ½ acre lots: 41% Forest: 31% Residential – ¼ to ½ acre lots: 16%	Primarily Rural Residential, some Suburban Residential and Airport District
Z	Forest: 41% Residential – ¼ to ½ acre lots: 26% Residential – larger than ½ acre lots: 21%	Primarily Rural Residential, some Open Space/Conservation
AA	Residential – larger than ½ acre lots: 58% Forest: 28% Wetland: 5%	Primarily Rural Residential, some Open Space/Conservation
WWTF	Waste Disposal, surrounded by forest, open space, and industrial uses	Within Open Space/Conservation

Source: Existing Land Use derived from MassGIS, 2002
Current Zoning derived from Applied Geographics, 2000

throughout the city. A recent increase in dense residential development has detracted from the rural character typically associated with outlying portions of the city (City of Taunton, 1998).

Land use and aesthetic conditions are summarized below for the wastewater needs areas and WWTF.

Needs Areas A and C. Needs areas A and C are primarily developing residential areas that continue to maintain their rural character, but they are quickly becoming more densely developed. New residential developments have occurred in recent years. However, the areas maintain some wooded areas and open spaces, and are in close proximity to natural resources that add to the rural character of the needs areas, including Watson Pond State Park, a 13-acre picnicking, fishing and swimming area, and Hockomock Swamp Wildlife Management Area.

Needs Areas E and H. Needs areas E and H are developing residential areas that continue to maintain their rural character. The areas contain some wooded areas and open spaces and are in close proximity to natural resources that add to the rural character of the needs areas, including Oakland Mill Pond and the Three Mile River.

Needs Area I. Needs area I is a residential/forested area that is largely rural and undeveloped and is in close proximity to natural resources that contribute to the rural character of the area, including the Three Mile River and Woodward Spring, a picnicking, fishing and canoeing area.

Needs Area K. Needs area K is largely a commercial area with some open spaces and forest that contribute to some rural character for the area. Natural resources adding to the rural character of the area include the Gertrude M. Boyden Wildlife Refuge, maintained by the Taunton Conservation Commission, which is located in the more residential southeastern section of the needs area.

Needs Area L. Needs area L is largely undeveloped, with forested areas comprising a significant area and rural residential pockets interspersed throughout the area. The rural character of the area is compromised closer to Route 44, where commercial development encroaches on the undeveloped areas. Natural resources that contribute to the rural character of the area include Segreganset River in the southwest portion of the needs area.

Needs Area Q. Needs area Q is a residential/forested area that has maintained its rural character. Open space and close proximity to natural resources, including the Three Mile River and the Taunton River, contributes to the rural character of the area.

Needs Area R. Needs area R is a more urbanized residential area in the heart of Weir Village, with parks and residential developments comprising most of the area. The area maintains a rural/urban character, with outdoor landscapes such as Weir Park and Memorial Park combined with natural resources, including the Taunton River.

Needs Area U. Needs area U is a more urbanized residential area due to its close proximity to the center of Taunton. Few open spaces or forested areas remain in the area. Neighborhoods still maintain a community atmosphere, as there are no commercial developments in the area.

Needs Areas V, Z, X, and AA. Needs areas V and X are residential/forested areas that have maintained their rural character. Close proximity to natural resources, including Barstows Pond and Cotley River in needs area V, cranberry bogs in needs area X, Hutt Forest in needs area Z, and Massasoit Park in needs area AA, contributes to the rural character of the areas.

Wastewater Treatment Facility. The WWTF is located in a rural/industrial area comprised of open space, forest and industrial areas. The adjacent Taunton River contributes to the rural character of the area, but the industrial areas detract from it.

5.1.3 Future Conditions

Anticipated trends in population growth, as well as development/build-out projections and potential areas of future development have been described in Section 3.0 Needs Analysis. As described in that section, the anticipated growth in population and housing inventory is expected to occur east and north of the Taunton River in areas zoned Urban Residential/Multi-Family, as well as in the western and eastern portions of the city in areas zoned Rural Residential.

Several of the potential areas of future development or proposed development currently known to the Taunton Planning Board (as described in Sections 3.1.3 and 3.1.4) occur within, or in close proximity to, the identified wastewater needs areas.

The southeastern portion of Needs Area K encompasses a potential area of future industrial development on the land south of Route 44 straddling Warner Boulevard. The eastern portion of Needs Area K includes a retail development on the west side of Warner Boulevard, between Winthrop and Cohannet Street; construction has already been initiated for this 57,000 square foot retail complex.

The southern portion of Needs Area L includes the Taunton Expo Center/Rehoboth Fair Grounds. This area is perceived as underutilized, and has been suggested for various future uses ranging from a business park to a clustered housing development site; however, no definitive projects are currently proposed for this parcel.

The southern portion of Needs Area X includes part of the Powhattan Estates, a 150-unit residential development currently under construction off Staples Street in east Taunton.

In addition to the known projects listed above, localized infilling is anticipated to occur throughout a majority of the needs area where development is not otherwise restricted. Efforts to maintain rural character within the city include the encouragement of “cluster zoning,” which uses land more efficiently and preserves open space. There are allowances in Taunton’s zoning ordinance to include benefits for “cluster zoning” (City of Taunton, 1998).

5.2 Historic and Archaeological Resources

5.2.1 Existing Conditions

Taunton has many historical areas of interest. In response to a request for information on existing resources in the city, the Massachusetts Historical Commission (MHC) identified the historical and archaeological resources within the city of Taunton in a letter dated May 27, 2003. These resources are on MHC's inventory of the Historic and Archaeological Assets of the Commonwealth (MHC, 2003). The inventory of resources includes:

- More than 250 properties listed in the National and State Registers of Historic Places
- More than 100 recorded archaeological sites, among which several are listed in the National and/or State Registers of Historic Places

The MassGIS datalayer of MHC's State Register of Historic Places (MassGIS, 2000) was reviewed to determine type and location of historic sites within the city. Archaeological location information is not public record and therefore is not included. No historic sites were identified in the immediate vicinity of the WWTF or within needs areas I, L, U, X, Z, and AA. Descriptions of historic resources in the remaining needs areas are provided in Table 5-2.

TABLE 5-2. SUMMARY OF HISTORIC SITES WITHIN THE WASTEWATER NEEDS AREAS

Needs Area	Historic Site	Location
A	North Taunton Baptist Church and Ambrose Lincoln Jr. House	Both on Bay Street in the western portion of needs area A
C	General Thomas Lincoln House	Field Street within the westernmost section of the needs area
E	Brow's Tavern	Tremont Street in the southern portion of the needs area
H	Hodges House and Joseph Willis House	Both on Worcester Street in the northern section of the needs area
K	Westville Congregational Church	Winthrop Street in the central portion of the needs area
Q	Peter Walker House	Somerset Avenue in the southwestern portion of needs area Q
R	Francis D. Williams House, Captain David Vickery House, Walker School, and Theodore L. Marvel House	Plain Street Plain Street Berkley Street Berkley Street
V	Dean-Barstow House	Williams Street in the southern portion of needs area V

Source: MassGIS, 2000

5.2.2 Future Conditions

According to the City of Taunton 1998 Comprehensive Master Plan, city residents value dense downtown development with historic landmarks. It is therefore expected that in areas that are developable, preservation of historic sites will remain a priority. As stated in the Taunton 1998 Master Plan, however, historic area zoning is required to protect historic sites, and this type of ordinance does not currently exist within the city.

5.3 Traffic

5.3.1 Existing Conditions

Taunton's road network consists of over 1,000 streets (City of Taunton, 1998). Taunton's proximity to a number of primary roads has aided in the city's recent growth surges in population and commercial, retail, and industrial developments. These primary roads include Route 24, Route 44, Route 138, Route 140, and Route I-495. A swell of industrial development followed the completion of the extension of Route I-495 through Taunton in the early 1980s, particularly in the Myles Standish Industrial Park, which is located immediately south of I-495. The area surrounding the intersection of Route 140 and Route 24 has also experienced significant commercial, retail, and industrial growth as a result, in part, of ease of access to these roadways.

Several roads and highways of regional importance meet in Taunton's central business district and downtown area. These transportation routes include three state highways: Route 44, Route 138, and Route 140. The convergence of these highways significantly adds to traffic congestion in the central business district.

Public transportation in Taunton is provided by the Greater Attleboro and Taunton Regional Transit Authority (GATRA). This regional, state-subsidized public transportation system operates approximately 20 routes in Taunton, Norton, and Attleboro. The main bus station for this system is located on Oak Street in the center of Taunton. A few private companies also provide bus service in the city. Currently, Taunton does not provide much of a network for alternate modes of transportation, such as bicycling. There are no designated bike paths or routes in the city (City of Taunton, 1998).

Freight service in the city is provided by Bay Colony Railroad and CSX freight line (formerly ConRail). The city's freight service network consists of one "core-rail" and four rail spurs that serve industrial areas within the city, including the Myles Standish Industrial Park (City of Taunton, 1998).

Eleven intersections in Taunton were listed by the Southeastern Regional Planning & Economic Development District (SRPEDD) as some of the top 100 high crash intersections in southeastern Massachusetts between 1999 and 2001 (SRPEDD 2003). None of these intersections were located within needs areas or near the WWTF all were primarily located within the center of the city.

5.3.2 Future Conditions

The Massachusetts Bay Transportation Authority (MBTA) has proposed an extension of its commuter rail service by adding the New Bedford/Fall River Commuter Rail Extension, which would pass through Taunton and result in the construction of two new passenger rail stations in the city. This project has been hampered and delayed by increasing costs and opposition from officials and residents in towns on the route, however.

Regional and city-wide population growth will contribute to traffic generation on major routes and within developing residential communities. New industrial areas, such as the Route 140 and Myles Standish Industrial Parks, and commercial developments including the Silver City Galleria, will also contribute to traffic volume.

5.4 Air Quality

5.4.1 Existing Conditions

Table 5-3 provides ambient air quality standards for six air pollutants that are regulated by the U.S. Environmental Protection Agency (EPA): sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM-10) and 2.5 micrometers (PM-2.5), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). The EPA establishes primary and secondary standards. While primary standards focus on public health, secondary standards concern general public welfare such as protection against decreased visibility. The state regulates air quality using EPA's standards (310 CMR 6.00).

MA DEP regulates volatile organic compounds (VOCs). VOCs are regulated based on two standards: 24-hour ceiling threshold exposure limits (TELs) values; and annual average allowable ambient limits (AALs). The state's air pollution regulations also qualitatively regulate odor, by stating that excessive amounts of odor are prohibited.

The MA DEP monitoring stations record the highest concentration or the mean concentration of regulated air pollutants. The highest concentration is measured over 1-hour, 3-hour, 8-hour, or 24-hour time periods, while the mean concentration is recorded over a quarterly or yearly basis. Some stations monitor only one pollutant, while others monitor more than one. The air monitoring stations closest to Taunton are located in Fall River (Globe Street) and Fairhaven (Leroy Wood School). Table 5-4 shows the pollutants monitored at each station and the recorded results.

Prior to the mid-1980s, Massachusetts was in violation of the carbon monoxide (CO) standard. However, with the adoption of numerous control programs, CO emissions across the state have decreased. In 2000, MA DEP formally requested that EPA redesignate the cities of Lowell, Springfield, Waltham, and Worcester to attainment for CO, since the monitoring data indicated these cities had been below the standard for many years. With the redesignation of these cities to CO attainment in April 2002, the entire state is now in attainment of the CO standard (MA DEP, 2003).

TABLE 5-3. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Primary Standard	Secondary Standard
Sulfur dioxide (SO_2)		
Annual arithmetic mean	0.03 ppm (80 $\mu g/m^3$)	N/A
Maximum 24-hour average	0.14 ppm (365 $\mu g/m^3$)	N/A
Maximum 3-hour average	N/A	0.5 ppm (1300 $\mu g/m^3$)
Particulate Matter (PM-10)		
Annual arithmetic mean[1]	50 $\mu g/m^3$	Same as primary
24-hour average[2]	150 $\mu g/m^3$	Same as primary
Particulate Matter (PM-2.5)		
Annual arithmetic mean[3]	15.0 $\mu g/m^3$	Same as primary
24-hour average[4]	65 $\mu g/m^3$	Same as primary
Carbon Monoxide (CO)		
8-hour average	9 ppm (10 mg/m^3)	Same as primary
1-hour average	35 ppm (40 mg/m^3)	Same as primary
Ozone (O_3)		
1-hour average[5]	0.12 ppm (235 $\mu g/m^3$)	Same as primary
8-hour average[6]	0.08 ppm (157 $\mu g/m^3$)	Same as primary
Nitrogen Dioxide (NO_2)		
Annual arithmetic mean	0.053 ppm (100 $\mu g/m^3$)	Same as primary
Lead (Pb)		
Calendar quarter arithmetic mean	1.5 $\mu g/m^3$	Same as primary

Notes:

1. The annual standard is met if the estimated annual arithmetic mean does not exceed 50 $\mu g/m^3$.
2. The 24-hour standard is attained if the estimated number of days per calendar year above 150 $\mu g/m^3$ does not exceed one per year.
3. The annual standard is met when the annual average of the quarterly mean $PM_{2.5}$ concentrations is less than or equal to 15 $\mu g/m^3$ (3-year average).
4. The 24-hour standard is met when 98th percentile value is less than or equal to 65 $\mu g/m^3$ (3-year average).
5. The 1-hour standard is met when the daily maximum 1-hour concentration does not exceed 0.12 ppm at any one monitor on more than three days over any three year period.
6. The 8-hour standard is met when the 3-year average of the 4th-highest daily maximum 8-hour average does not exceed 0.08 ppm at any one monitor.

N/A = not applicable
ppm = parts per million
Source: US EPA, 2005.

TABLE 5-4. AMBIENT AIR QUALITY

Pollutant	Station	Measurement	Year	Concentration[1]
NO_2	Leroy Wood School, Fairhaven	1st/2nd highest 1-hour	2002	0.026 / 0.026
		Mean	2002	0.004
SO_2	Globe St., Fall River	1st/2nd highest 24-hour	2002	0.027 / 0.027
			2003	0.024 / 0.021
			2004	0.021 / 0.015
		1st/2nd highest 1-hour	2002	0.126 / 0.114
			2003	0.130 / 0.100
			2004	0.048 / 0.035
		Mean	2002	0.004
			2003	0.003
			2004	0.004
O_3	Leroy Wood School, Fairhaven	1st / 4th highest 1-hour	2002	0.115 / 0.098
			2003	0.127 / 0.108
			2004	0.092 / 0.066

Notes:
1. Units in ppm.
Source: US EPA, 2002, 2003, 2004.

Massachusetts has violated the 1-hour ozone standard for many years, but with the adoption of numerous control programs, the number and severity of exceedances has declined in recent years (MA DEP, 2003). Although improvements have been made, Eastern Massachusetts remains in violation of the 1-hour ozone standard. For example, the ozone monitor in Fairhaven recorded one exceedance in 2003. The entire state of Massachusetts, including the Taunton area, is in attainment for the remainder of the criteria pollutants (i.e. SO_2, NO_2, PM_{10}, and Pb).

Air quality information specific for each needs area location and within the vicinity of the WWTF is not available. Existing air quality for these areas is characterized by the city-wide information presented above.

5.4.2 Future Conditions

Future air quality within the city, inclusive of the needs areas and the WWTF, may be affected by future population increases and the potential for future commercial, industrial, and residential development in the region.

5.5 Noise

5.5.1 Existing Conditions

The City of Taunton does not have a stand-alone noise ordinance that contains performance standards for noise levels or specific provisions for construction activity. Rather, the city addresses noise for construction projects on a case-by-case basis and determines guidelines based on the type and magnitude of proposed activities for a given project.

Since the principal land use in Taunton is residential, the majority of the city is expected to experience noise levels typical of residential areas. Less-developed, low-density residential areas of the city, such as the eastern and western portions of the city, generally exhibit lower noise levels than the more active and highly developed residential areas located in and around the city's downtown and central business district.

Increased noise levels are experienced along the major transportation routes located throughout the city due to increased traffic levels and associated commercial and industrial developments and land uses. These primary roads include I-495, Route 24, Route 44, Route 138, and Route 140, which are discussed in more detail in the Land Use and Traffic sections. Bay Colony Railroad and CSX freight trains also cause periodic increases in noise levels along their routes. Elevated noise conditions exist at the Taunton Municipal Airport and surrounding areas. However, landscape features surrounding the airport provide natural screening and noise reduction. Noise abatement practices have also been developed and implemented for the city's airport (City of Taunton, 2003a).

5.5.2 Future Conditions

Future noise levels within the city, inclusive of the needs areas and the WWTF, may be affected by future population increases and the potential for future commercial, industrial, and residential development within the city and in the region.

5.6 Floodplain

5.6.1 Existing Conditions

The majority of the city is located outside the 100-year floodplain, as shown on Figure 5-3. However, areas within and adjacent to the Taunton River, Mill River, Three Mile River, Big Bearhole Pond, Cain's Pond, Segreganset River Ponds, Watson Pond, Sabbatia Lake, Cobb Pond, Barstow Pond, and Prospect Hill Pond are located within the 100-year floodplain. (MassGIS, 1997; FEMA, 1981).

The MassGIS FEMA Q3 Flood datalayer (MassGIS, 1997) was used to determine locations of the 100-year floodplain, and descriptions are provided below for each needs area and within the vicinity of the WWTF. There are no floodplains within needs area Z.

Needs Area A. South of Field Street, areas surrounding the northernmost section of Sabbatia Lake lie in the 100-year floodplain.

Needs Area C. An area surrounding a wooded swamp east of Sabbatia Lake, in the southwestern section of needs area C, is located in the 100-year floodplain.

Figure 5-3

Needs Areas E, H, and K. Areas adjacent to the Three Mile River are located within the 100-year floodplain in the western section of needs area E, the eastern and southern sections of needs area H, and the central portion of needs area K.

Needs Area I. A strip of land surrounding a small tributary of the Three Mile River in the southeastern portion of needs area I is located in the 100-year floodplain.

Needs Area L. The Segreganset River runs through the western section of needs area L, and the 100-year floodplain surrounds the river in this area.

Needs Area Q. The Three Mile River meets with the Taunton River just south of needs area Q. The 100-year floodplain extends between the two rivers over the lower quarter of the needs area.

Needs Area R. The northern and southern sections of needs area R, adjacent to the Taunton River and an area of open water respectively, are located in the 100-year floodplain.

Needs Area U. The 100-year floodplain extends slightly into the northern section of needs area U, where the Taunton River borders the needs area.

Needs Area V. The Taunton River runs along the eastern portion, and the Cotley River runs through the southern section of the needs area. The 100-year floodplain buffers both rivers, although the floodplain around the Taunton River only extends slightly into the needs area.

Needs Area X. The 100-year floodplain does not extend into needs area X.

Needs Area AA. A 100-year floodplain surrounds a stream and wetland area near Big Bearhole Pond.

Wastewater Treatment Facility. The WWTF is located adjacent to the Taunton River and the 100-year floodplain (MassGIS, 1997; FEMA, 1981). The floodplain comprises the southern and southeastern sections of the WWTF property.

5.6.2 Future Conditions

Development within the 100-year floodplain is restricted under a number of different federal, state, and local regulations and policies. Excavation, grading, paving, mining, dredging, or filling are prevented within the 100-year floodplain, which is part of the city's Flood Plain District, unless special permission is granted (City of Taunton, 1998).

5.7 Wetlands

5.7.1 Existing Conditions

According to the MassGIS DEP Wetlands datalayer (MassGIS, 2005), numerous wetlands and aquatic habitats are located within the city of Taunton. Many of these wetlands are located coincident with waterways, ponds, and other low-lying areas located throughout the city. Types of wetlands and aquatic habitats present include: wooded and shrub swamp, shallow marsh meadow or fen, deep marsh, and cranberry bog. Refer to Figure 5-3 for the locations of wetlands within the city.

Wetland locations and types within needs areas and in the vicinity of the WWTF were determined using the MassGIS DEP Wetlands datalayer (MassGIS, 2005) and are described below. Locations of wetlands were compared with the National Wetlands Inventory (NWI) map (MassGIS, 2001) to ensure that each wetland area was accounted for.

Needs Area A. Wetlands located throughout needs area A include mixed and deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. A large deciduous swamp is located in the eastern central section of needs area A. Needs area A is located just south of Hockomock Swamp, which is part of the largest freshwater wetland system in Massachusetts.

Needs Area C. Wetlands located throughout needs area C include mixed and deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. A large mixed trees and deciduous swamp is located in the central section of needs area C. Needs area C is located just south of Hockomock Swamp.

Needs Area E. Wetlands located throughout needs area E include deciduous wooded swamp, shallow marsh meadow or fen, and shrub swamp. A deciduous swamp is located in the central section of needs area E. Crapo Bog is located immediately outside of the needs area to the east and wetlands around the Three Mile River border the southwestern half of needs area E.

Needs Area H. Wetlands located throughout needs area H include mixed trees and deciduous wooded swamps, shallow marsh meadow or fen, and shrub swamp. Deciduous wooded swamps are are located in larger parcels in the northeastern and south central sections of needs area H. The Three Mile River borders the entire eastern portion of the needs area.

Needs Area I. Wetlands located throughout needs area I include mixed trees, coniferous, and deciduous wooded swamps, shallow marsh meadow or fen, deep marsh, bog, and shrub swamp. The Three Mile River is located near the entire eastern portion of the needs area.

Needs Area K. Wetlands located throughout needs area K include deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. Deciduous wooded swamps form the larger wetland parcels. The Three Mile River flows through the center of the needs area crossing Winthrop Street and Cohannet Street.

Needs Area L. Wetlands located throughout needs area L include mixed trees and deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. Deciduous wooded swamps form the larger wetland parcels. The Segreganset River crosses through the western section of the needs area and is surrounded by small parcels of deciduous wooded swamp and deep marsh within the needs area.

Needs Area Q. Wetlands located throughout needs area Q include deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. Deciduous wooded swamps form the larger wetland parcels. The Three Mile River runs along the southern section of needs area Q and shrub swamp borders the river within the needs area. The Taunton River flows near the eastern portion of the needs area, but there are no wetlands immediately adjacent to the Taunton River within the needs area.

Needs Area R. Wetlands located throughout needs area R include deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, and shrub swamp. The Taunton River runs along the western section of the needs area, but there are no wetlands immediately adjacent to the Taunton River within the needs area. A portion of Silva's Pond is located within the needs area.

Needs Area U. Wetlands located throughout needs area U include mixed trees and deciduous wooded swamp, shallow marsh meadow or fen, deep marsh, bog, and shrub swamp. Deciduous wooded swamp and shrub swamp form the larger wetland parcels. The Taunton River runs along the northern section of the needs area, but there are no wetlands immediately adjacent to the Taunton River within the needs area.

Needs Area V. Wetlands located throughout needs area V include mixed trees and deciduous wooded swamp, deep marsh, bog, and shrub swamp. The Taunton River runs along the eastern portion, and Barstow's Pond and the Cotley River are located in the southern section of the needs area. Deciduous wooded swamp lines portions of both rivers within the needs area.

Needs Area X. Wetlands located throughout needs area X include mixed trees and deciduous wooded swamp, deep marsh, shallow marsh meadow or fen, and shrub swamp. Cranberry bogs lie just outside the needs area to the southeast. Drainage from the Taunton Municipal Airport extends into the needs area in the east.

Needs Area Z. Although there are few wetland parcels within this needs area, wetlands located throughout the Needs area include mixed trees and deciduous wooded swamp, deep marsh, and shrub swamp. The southern section of needs area Z extends slightly into Casual Swamp.

Needs Area AA. Wetlands located throughout needs area AA include mixed trees and deciduous wooded swamp, deep marsh, shallow marsh meadow or fen, shrub swamp and cranberry bog. Cain's Pond, several small ponds, and a small section of Big Bearhole Pond are also located in the needs area.

Wastewater Treatment Facility. Wetlands located in the vicinity of the WWTF, primarily to the north and west of the property, include deciduous wooded swamp, deep marsh, and shallow marsh meadow or fen. An additional bordering vegetated wetland (BVW) is located along the southern boundary of the WWTF in the vicinity of aeration tank No. 6 and the chlorine contact chamber (Metcalf & Eddy, 1998).

5.7.2 Future Conditions

Development in the needs areas and in the vicinity of the WWTF could encroach upon existing wetlands in the future. According to the 1998 City of Taunton Comprehensive Master Plan, there are no local wetland protection measures currently in place within the city, although wetlands in Taunton are protected by national and statewide regulations. Developments encroaching upon jurisdictional wetlands require review under the Massachusetts Wetlands Protection Act or under Section 404 of the Clean Water Act.

5.8 Rare and Endangered Species Habitat

5.8.1 Existing Conditions

Several Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife are located within the city of Taunton according to the Massachusetts Natural Heritage & Endangered Species Program (Figure 5-4; MA NHESP, 2003). Three endangered, seven threatened, and nine species of special concern are listed for the city of Taunton as shown in Table 5-5 (MA NHESP, 2004). No federally-listed or proposed, threatened or endangered species under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur within the city of Taunton, with the exception of occasional transient bald eagles (USFWS, 2003).

TABLE 5-5. RARE SPECIES LIST FOR THE CITY OF TAUNTON, MA

Taxonomic Group	Common Name	Scientific Name	State Rank
Fish	Atlantic Sturgeon	*Acipenser oxyrhynchus*	E
Amphibian	Eastern Spadefoot	*Scaphiopus holbrookii*	T
Amphibian	Marbled Salamander	*Ambystoma opacum*	T
Reptile	Spotted Turtle	*Clemmys guttata*	SC
Reptile	Wood Turtle	*Clemmys insculpta*	SC
Reptile	Blanding's Turtle	*Emydoidea blandingii*	T
Reptile	Eastern Box Turtle	*Terrapene carolina*	SC
Mussel	Triangle Floater	*Alasmidonta undulata*	SC
Mussel	Tidewater Mucket	*Leptodea ochracea*	SC
Mussel	Eastern Pondmussel	*Ligumia nasuta*	SC
Dragonfly/Damselfly	Comet Darner	*Anax longipes*	SC
Dragonfly/Damselfly	Pine Barrens Bluet	*Enallagma recurvatum*	T
Vascular Plant	Eaton's Beggar-Ticks	*Bidens eatonii*	E
Vascular Plant	Cat-Tail Sedge	*Carex typhina*	T
Vascular Plant	Three-Angled Spike-Sedge	*Eleocharis tricostata*	E
Vascular Plant	Philadelphia Panic-Grass	*Panicum philadelphicum*	SC
Vascular Plant	Pale Green Orchid	*Platanthera flava var herbiola*	T
Vascular Plant	Plymouth Gentian	*Sabatia kennedyana*	SC
Vascular Plant	Long's Bulrush	*Scirpus longii*	T

State rank category SC = Special Concern, T = Threatened, E = Endangered
Source: MA NHESP, 2004

Figure 5-4

The lower reaches of the Taunton River are subject to diurnal tidal variation in water levels. Currents are bi-directional, flowing northward on a flooding tide and southward on an ebbing tide. As a result, numerous species of resident, estuarine, and diadromous fish frequent the Taunton River. Approximately 36 different species of fish are believed to occur in the Taunton River near the WWTF (Metcalf & Eddy, 2002). Of these species the Massachusetts Division of Marine Fisheries has identified seven species that are considered Representative Important Species (Table 5-6).

TABLE 5-6. REPRESENTATIVE IMPORTANT SPECIES WITHIN THE TAUNTON RIVER

Common Name	Scientific Name
Alewife	*Alosa pseusoharengus*
Blueback herring	*Alosa aestivalis*
White perch	*Morone americana*
American eel	*Anguilla rostrasta*
Rainbow smelt	*Osmerus mordax*
American shad	*Alosa sapidissima*
Menhaden	*Brevoortia tyrannus*

NHESP indicated that the following species have been identified in the Taunton River corridor: Atlantic sturgeon (endangered), triangle floater mussel (special concern), spotted turtle (special concern), and northern diamondback terrapin (threatened). Atlantic sturgeon (*Aciperser oxyrhynchus*), a Massachusetts endangered species, have been documented in the spring, summer and fall in the Taunton River feeding where the fresh and salt water intermingle. No spawning individuals have been observed during May and June; therefore, it is unlikely that a spawning population exists in the Taunton River (Burkett and Kynard, op. Cit., 1993). Additionally, the wood turtle and Blanding's turtle have been identified in the Three Mile River and may be within the Taunton River corridor.

Two Areas of Critical Environmental Concern (ACEC) exist within Taunton, namely the Canoe River Aquifer and the Hockomock Swamp (MassGIS, 2003). The Canoe River Aquifer is approximately 17,200 acres in size and is located within the Taunton River basin in six communities. Only a small portion of this ACEC is located within Taunton, at the northern part of the city (Figure 5-4). The Canoe River Aquifer is generally defined by the Canoe River watershed basin and the underlying aquifer, which also connects to surface and ground waters in the Mulberry Brook and Snake River basins. The Hockomock Swamp and associated wetlands and water bodies comprise the largest vegetated freshwater wetland system in Massachusetts. The boundaries of the Hockomock Swamp ACEC include approximately 16,950 acres, of which a portion is located within the northern section of the city.

MassGIS datalayers, including NHESP 2003 Priority Habitats for State-Protected Rare Species, NHESP 2003 Estimated Habitats for Rare Wildlife, NHESP 2003 Certified Vernal Pools, and 2003 ACEC, were reviewed and are described below for the individual needs areas. According to the Certified Vernal Pool datalayer, there are no vernal pools located within any of the needs areas or in the vicinity of the WWTF.

Needs Areas A and AA. There is no Priority Habitat for State-Protected Rare Species or Estimated Habitat for Rare Wildlife within needs areas A or AA. All of needs area A is located within the Canoe River Aquifer.

Needs Area C. The western portion of needs area C, which is near Sabbatia Lake, is within Priority Habitat for State-Protected Rare Species and within Estimated Habitat for Rare Wildlife. All of needs area C is located within the Canoe River Aquifer.

Needs Areas E, H, and I. The southern and western portions of needs area E, the northern and eastern portions of needs area H, and the northeastern portion of needs area I, which are near the Three Mile River, are within Priority Habitat for State-Protected Rare Species and within Estimated Habitat for Rare Wildlife.

Needs Area K. The section of needs area K surrounding the Three Mile River and a section of wetlands in the southeastern portion of needs area K are within Priority Habitat for State-Protected Rare Species and within Estimated Habitat for Rare Wildlife.

Needs Area L. A Priority Habitat for State-Protected Rare Species and an Estimated Habitat for Rare Wildlife parcel is entirely within the southeastern portion of needs area L near the Segreganset River.

Needs Areas Q, R, and V. The eastern portion of needs area Q, the western portion of needs area R, and the northern portion of needs area V, which are near the Taunton River, are within Priority Habitat for State-Protected Rare Species and within Estimated Habitat for Rare Wildlife.

Needs Area U. The western portion of needs area U, which is located near a small tributary to the Taunton River, is within Priority Habitat for State-Protected Rare Species and Estimated Habitat for Rare Wildlife.

Needs Area X. The entire eastern half of needs area X along Staples Street is within Priority Habitat for State-Protected Rare Species. There are no Estimated Habitat for Rare Wildlife parcels in this area.

Needs Area Z. The southeastern portion of needs area Z spanning Casual Swamp and Barstow's Pond is within Priority Habitat for State-Protected Rare Species and Estimated Habitat for Rare Wildlife.

Wastewater Treatment Facility. The southern and eastern portions of the WWTF property are located within Priority Habitat for State-Protected Rare Species and within Estimated Habitat for Rare Wildlife, according to the MassGIS datalayers.

5.8.2 Future Conditions

The EOEA 1999 build-out analysis map series was reviewed to determine developable land within the needs areas and in the vicinity of the WWTF to identify the potential for future impacts on NHESP areas. Development in the needs areas and in the vicinity of the WWTF could encroach upon existing NHESP areas in the future. A copy of a Notice of Intent must be filed with NHESP for projects that are within Estimated Habitat of Rare Wildlife. NHESP then has the opportunity to provide comments to the local community and to the Massachusetts Department of Environmental Protection regarding protective measures that may be required.

5.9 Agricultural Land

5.9.1 Existing Conditions

Executive Order 193 of the Commonwealth of Massachusetts, signed into effect in March 1981, addresses the preservation of state-owned agricultural land. The Executive Order (EO) directs all relevant state agencies to seek to mitigate against the conversion of state-owned agricultural land to non-agricultural uses. In addition to noting various policies that promote preservation of state-owned agricultural land, the EO indicates that state funds and federal grants administered by the state should not be used to encourage the conversion of agricultural land to other uses when feasible alternatives are available. The EO defines agricultural land as land classified as unique or farmland of state and local importance by the USDA Soil Conservation Service, now known as the Natural Resources Conservation Service (NRCS), as well as land characterized by active agricultural use.

Federal law also provides for the protection of agricultural land. The Federal Farmland Protection Act of 1981 requires that federal agencies evaluate the adverse effects of federal programs on the preservation of farmland and to consider alternative actions that could lessen such adverse effects. The Act also requires that federal programs be compatible with state, local and private programs and policies to protect farmland. The definition of farmland is based on inventories developed by the USDA Soil Conservation Service.

The following sections describe the agricultural conditions in the city of Taunton. Soils characterized as agricultural soils, land in active agricultural use within the city, and Chapter 61A lands are identified.

5.9.1.1 Agricultural Soils

Prime farmland is defined by the NRCS as having the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. Review of the Soil Survey of Bristol County North, Massachusetts indicates that approximately 13 different types of prime farmland soils are located within the city (USDA, 1978). These soils are primarily concentrated in the southern and western portions of the city and are listed in Table 5-7 and depicted on Figure 5-5.

Figure 5-5

TABLE 5-7. PRIME FARMLAND IN THE CITY OF TAUNTON

Soil Map Symbol	Soil Name
AgA	Agawam Fine Sandy Loam, 0 to 3 Percent Slopes
AgB	Agawam Fine Sandy Loam, 3 to 8 Percent Slopes
AmA	Amostown, Fine Sandy Loam, 0 to 5 Percent Slopes
MeA	Merrimac Fine Sandy Loam, 0 to 3 Percent Slopes
MeB	Merrimac Fine Sandy Loam, 3 to 8 Percent Slopes
Ng	Ninigret Fine Sandy Loam, 0 to 3 Percent Slopes
PaB	Paxton Fine Sandy Loam, 3 to 8 Percent Slopes
ScA	Scio Silt Loam, 0 to 3 Percent Slopes
StA	Sudbury Fine Sandy Loam, 0 to 3 Percent Slopes
StB	Sudbury Fine Sandy Loam, 3 to 8 Percent Slopes
UnA	Unadilla Very Fine Sandy Loam, 0 to 3 Percent Slopes
WrA	Woodbridge Fine Sandy Loam, 0 to 3 Percent Slopes
WrB	Woodbridge Fine Sandy Loam, 3 to 8 Percent Slopes

Source: USDA, 1978

Soils of state and local importance are those that fail to meet one or more of the requirements of prime farmland, but are important for the production of food, feed, fiber, or forage crops. They include soils that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. Numerous types of soils of state and local importance are located within Taunton. Soils meeting this criteria and found in one third of the city include Deerfield loamy sand, Hinckley sandy loam, and Windsor loamy fine sand.

5.9.1.2 Active Agricultural Land

MassGIS has identified active agricultural land in the city. MassGIS has two classifications of active agricultural land based on interpreted use from aerial photography: cropland and pasture. According to MassGIS's Land Use datalayer (MassGIS, 2002), as of 1999 there were approximately 1,060 acres of cropland and 456 acres of pasture in Taunton. Cropland is primarily located in the western portion of the city while pastureland is dispersed throughout the city. Refer to Figure 5-1 for the location of active agricultural land in the city. Also, note that the data from MassGIS may not be entirely accurate in reflecting current conditions, since portions of the city have been recently developed.

5.9.1.3 Chapter 61A Land

One of the oldest state farm preservation programs is based on M.G.L. Chapter 61A. Chapter 61A land is defined in M.G.L. Chapter 61A Sections 1 and 2 to be land that is primarily and directly used for agricultural or horticultural purposes. Parcels with Chapter 61A leases have specific tax considerations due to their continued use for agricultural or horticultural purposes.

Taxes are calculated against assessments based on usage and not market value. Chapter 61A parcels are assessed by their usage (hay, pasture, etc.) based on the range of values published annually by the Farmland Valuation Advisory Commission (MA DOR, 1997). The valuations applied to Chapter 61A parcels are lower than for other types of land in the city. Once assessed, the Chapter 61A parcels are taxed at a commercial rate, due to their income potential. In exchange for this tax benefit, the municipality has the right to recover some of the tax benefits and a right of first refusal to purchase the property if that land is sold or used for purposes other than agricultural (MA DOR, 1997).
Using a list of Chapter 61A parcels provided by the city and the Massachusetts Department of Revenue's State Class Tax Codes, it is estimated that there are 57 Chapter 61A parcels in the city totaling roughly 906 acres (City of Taunton, 2003b; MA DOR, 1998).

MassGIS's Soils and Land Use datalayers were used to determine the types and locations of agricultural soils and land respectively within each needs area and in the vicinity of the WWTF. There are no prime farmland soils located within needs areas A, E, H, I, K, V, and AA. Soils of state and local importance are located in every needs area but are not located within the vicinity of the WWTF. There are no active agricultural lands in needs areas U, V, Z, and AA or within the vicinity of the WWTF. Additional information is provided by needs area below.

The list of Chapter 61A parcels provided by the city was used to determine locations of Chapter 61A land. Exact street addresses were not always available, however. There are no Chapter 61A parcels in needs areas A, C, H, I, K, Q, U, V, Z, and AA or within the vicinity of the wastewater treatment facility. Additional information is provided by needs area below.

Needs Area A. One parcel of pastureland is located in the western sections, and areas of cropland are located in the eastern portion of needs area A.

Needs Area C. A section of prime farmland soil, StB, is located in the eastern section of needs area C. Small parcels of pastureland are located throughout needs area C.

Needs Area E. Areas of pastureland and cropland are located in the northern sections of needs area E. Two Chapter 61A parcels are located in the northernmost section of needs area E on Norton Avenue.

Needs Area H. Parcels of pastureland and cropland are located in the northern and southern sections of needs area H.

Needs Area I. There is one parcel of pastureland that extends into the southwestern section of needs area I.

Needs Area K. One parcel of pastureland and two areas of cropland are located in the central portion of needs area K.

Needs Area L. Areas of prime farmland soil, WrA and StA, are located in the westernmost and southern sections respectively of needs area L. One area of pastureland is located in the southern region and two areas of cropland are found in the center and southern portion of needs area L. Two Chapter 61A parcels are located on Burt Street in needs area L.

Needs Area Q. Three parcels of prime farmland soil, including AmA, ScA, and UnA, are located in the central and eastern sections respectively of needs area Q. Three parcels of cropland are located within the areas of prime farmland soil in the eastern half of needs area Q.

Needs Area R. One parcel of prime farmland soil, AgB, extends into the southeastern section of needs area R. Two parcels of pastureland and four areas of cropland are found in the center and southern areas of needs area R. Of these parcels, one larger plot of pastureland and one area of cropland are located on Pratt Street. One Chapter 61A parcel is located on Pratt Street in needs area R.

Needs Area U. Three parcels of prime farmland soil, including AgB, Ng, and PaB, are located in the central and southernmost sections respectively of needs area U.

Needs Area X. One parcel of prime farmland soil, PaB, extends into the southern section of needs area X. Two parcels of cropland extend into the northeastern and southeastern portions of needs area X. Five Chapter 61A parcels are located on Caswell Street and one is located on Staples Street in needs area X.

Needs Area Z. Two parcels of prime farmland soil, MeA and StA, are located in the northern sections of needs area Z.

Wastewater Treatment Facility. One parcel of prime farmland soil, UnA, is located on the eastern border of the WWTF property along the Taunton River.

5.9.2 Future Conditions

The EOEA 1999 build-out map series was reviewed to determine developable land within the needs areas and in the vicinity of the WWTF to identify the potential for future impacts on active agricultural lands and areas of prime farmland soil. Development in the needs areas and in the vicinity of the WWTF could encroach upon these areas. Privately-owned agricultural areas in Taunton are not protected and face more development pressures than undeveloped land because of accessibility, according to the 1998 City of Taunton Comprehensive Master Plan.

6.0 ALTERNATIVES EVALUATION

This section describes the evaluation of alternatives based on cost effectiveness and environmental evaluations within each of the wastewater needs areas. Cost effectiveness and environmental evaluations were preformed for the alternatives of community Title 5 systems, small satellite WWTP, and conventional sewer extension with expansion of the WWTF. The following sections describe the evaluation of these alternatives in more detail.

6.1 Cost Effectiveness Analysis

A cost effectiveness analysis was developed to compare the costs of selected alternatives in each of the 14 wastewater needs areas. The analysis included cost estimates for each alternative including capital costs, operation and maintenance costs, salvage values, and land acquisition. In order for costs to be evaluated equally, the costs for each alternative were estimated as though the alternative would be used throughout the entire study area. Various combinations of the three selected alternatives within an area were not evaluated as part of this analysis.

As annual O&M costs and salvage value are costs realized throughout the project 20 year design life, the present worth of these costs was determined allowing all costs to be evaluated at the current dollar value. The following sections provide a description of the development of the costs for the selected alternatives.

6.1.1 Capital Costs

Capital costs for selected alternatives included estimated costs for materials, construction, and land acquisition. Capital costs were developed using construction bids from similar projects, quotations from vendors and materials suppliers, regional labor costs, and developed cost estimates using an Engineering News Record (ENR) Construction Cost Index. Capital cost also accounted for engineering and construction allowances.

6.1.1.1 Community Title 5 Systems and Small Satellite WWTP

Capital costs associated with the alternatives of community Title 5 systems and small satellite WWTP include the installation of treatment systems, installation of piping associated with each system, and land acquisition. With the exception of low-pressure pumping systems for community Title 5 systems, piping and pumping costs associated with community Title 5 and small satellite systems were estimated to be the same as for the conventional sewer extension costs outlined in the section below. Costs of low-pressure pumping systems for community Title 5 systems do not include the removal of existing septic systems, as the existing septic tank would still be used for this alternative. As such, low-pressure pumping systems for community Title 5 systems were estimated to be approximately $6,000 per system installation.

Capital costs were estimated for various sizes of community Title 5 and small satellite systems. Using a linear relationship between the different sizes of these systems, graphs were developed for these alternatives to compare treatment capacity to system capital cost. The capital cost graphs are presented as Figures 6-1 and 6-2. Estimated capital costs for community Title 5 systems varied from approximately $200,000 for a 2,000 gpd system to approximately $600,000 for a 10,000 gpd system. Estimated capital costs for small satellite WWTP varied from approximately $1,000,000 for a 10,000 gpd system to approximately $4,700,000 for a 100,000 gpd system.

Figure 6-1

Figure 6-2

6.1.1.2 Conventional Sewer Extension

Extension of the existing sewer system to convey sewage from the identified needs areas to the central WWTF would require installation of gravity sewers, pump stations, force mains and low-pressure systems with individual pumps. The estimated costs used to determine capital costs for the conventional sewer extension alternative are outlined below.

- Collection system gravity sewers and appurtenances were assumed to be 8-inch to 10-inch PVC and were estimated to cost $160 per linear foot of installation including manholes, excavation, backfilling, and paving.
- Installations of individual low-pressure pumping systems including the abandonment of existing on-site septic systems were estimated to cost $9,000 per system.
- Piping and appurtenances associated with low-pressure systems were assumed to be 2-inch PVC and were estimated to cost $85 per linear foot of installation.
- Pumping stations were estimated to cost between $475,000 and $650,000 per pump station depending upon the required pumping capacity.
- Force main sewers associated with the pumping stations were assumed to be 6" PVC and were estimated to cost $100 per linear foot of installation.
- Engineering and construction contingency costs have been estimated to be 40% of the project capital costs
- Land acquisition was estimated to be $200,000 per acre; each pump station was assumed to require half an acre of land.

As discussed in Section 4, conveying wastewater flow from all of the needs areas to the existing WWTF would require expansion of the facility to provide increased treatment capacity. The cost for the additional facilities is estimated at $15,000,000 which includes providing the following:

- Increased capacity of the Main Lift Station.
- New 24 in. force main from main Lift Station to WWTF.
- New primary tank and gallery extension.
- New aeration tanks and increased blower capacity.
- New chlorine contact tank.
- Rehabilitate and cover Thickener Tank No.1
- New centrifuges and feed system.

These estimated costs primarily relate to the facilities required to treat the additional 2.3 MGD of wastewater flow and do not include other costs related to equipment replacement or administrative/maintenance needs which may be determined to be necessary in the future. The amount of the estimated $15,000,000 attributable to the needs areas is allocated on the basis of flow and is estimated to be around $6,650,000. This value is utilized in the cost effectiveness analysis for the sewer extension/centralized WWTF alternative.

Capacity analysis of the existing collection systems serving these additional flows identified that relief of some sewers would be necessary to properly convey projected flows. Sections of pipe that are anticipated to require capacity upgrade due to upstream sewer extensions include pipes on Winthrop Street, Clifford Street and First Street. The costs of collection system capacity upgrades have been included in the conventional sewer extension capital cost estimates for the appropriate wastewater needs areas. Estimated capital costs for each of the three alternatives in each priority area are presented in Table 6-1.

In addition to the costs for plant expansion, the centralized treatment alternative should also take into consideration the potential impacts if construction of advanced treatment processes becomes necessary in the future. For the facilities described in Section 4 we have estimated capital costs for denitrification facilities at approximately $16,000,000 and approximately $4,000,000 for phosphorous removal facilities. These facilities would be designed to treat flows associated with the total projected plant flow of 10.7 MGD. Of the total estimated cost, the capital cost attributable to the needs areas would be proportional to the estimated flow of 1.02 MGD or about $2,000,000. The impact additional capital costs of the advanced treatment facilities have on each of the needs areas is provided in Table 6-2.

6.1.2 Operation and Maintenance Costs

Operation and maintenance (O&M) costs were estimated for community Title 5 systems, small satellite WWTPs, pump station and force mains, low-pressure systems, and expansion of the WWTF. O&M costs include the costs for manhours, electrical power, equipment, parts, and supplies.

6.1.2.1 Community Title 5 Systems and Small Satellite WWTP

O&M costs for pump stations and low-pressure sewers associated with conveying flow to community Title 5 and small satellite systems were estimated using the same cost information outlined below under conventional sewer extensions. Annual O&M costs were estimated for various sizes of community Title 5 and small satellite systems. Using a linear relationship between the various sizes of systems, graphs were developed to compare system treatment capacity to annual system O&M costs. These O&M cost graphs are presented as Figure 6-3 and Figure 6-4. Estimated annual O&M costs for community Title 5 systems included costs for pump station operation and septic tank pump out and varied from approximately $500 for a 2,000 gpd system to approximately $2,000 for a 10,000 gpd system. Estimated annual O&M costs for small satellite WWTPs included labor, power, chemicals, maintenance, testing and sludge disposal and varied from approximately $39,000 for a 10,000 gpd system to approximately $190,000 for a 100,000 gpd system. Collection system O&M costs associated with community Title 5 and small satellite systems were estimated to be the same as for the conventional sewer extension O&M costs outlined in the section below. Using these annual costs through the 20 year planning period and the EPA recommended 7% discount rate, the present worth of O&M costs was determined for the selected alternatives in each priority area.

6.1.2.2 Conventional Sewer Extension

O&M costs associated with the extension of existing sewers to convey all wastewater flow to the central WWTF include operation and maintenance of pump stations, force mains, and low-pressure systems, as well as the expanded WWTF. The O&M costs for conventional sewer extensions were determined using the following.

- Pump stations and force mains were estimated to have an annual O&M cost of approximately $7,800 per pump station.

- Low-pressure pump systems were estimated to have an annual O&M cost of approximately $500 per pump system.

O&M costs associated with expansion of the WWTF were based primarily on estimated costs for additional operator and maintenance labor, power, chemicals and sludge disposal. For the initial year of operation of the expanded WWTF, the total additional annual O&M cost is estimated at $400,000 based on the additional 2.3 MGD capacity provided. The share of this cost attributable to the needs areas is based on the 1.02 MGD projected flow from those areas and is estimated at about $180,000.

Using these annual costs through the projected 20 year planning period and a 7% discount rate, the present worth of O&M costs were determined for the selected alternatives in each priority area. Estimated O&M costs for each of the three alternatives in each priority area are presented in Table 6-1.

Estimated annual O&M costs for the advanced treatment facilities have been estimated at $1,800,000 which includes primarily labor, power, chemicals and additional sludge disposal costs. Of this cost, approximately 55% is related to estimated chemical usage. As with the capital costs, the portion of the annual O&M cost attributable to the needs areas is prorated on the basis of flow and is estimated to be about $175,000. This value has been incorporated into the present worth of O&M cost for each of the needs areas and included in Table 6-2.

6.1.3 Salvage Value

System components that have a design life that exceeds the project design life will have a salvage value at the end of the project design life. For the selected alternatives salvage values were determined for system piping. Typical system piping has a design life of 50 years which is 30 years beyond the project design life. Salvage values were determined using straight line depreciation. The salvage value determined at 20 years was then discounted to a present worth

and deducted from the project cost to provide a basis for comparison of alternatives. Estimated present worth salvage values for each of the three alternatives in each priority area are presented in Table 6-1.

6.1.4 Summary of Cost Effectiveness Analysis

The total present worth cost of each alternative includes capital costs, present worth of O&M costs, and present worth of salvage value. Total estimated present worth costs for the selected alternatives in each priority study area are summarized in Table 6-1. Total estimated present worth costs for conventional sewer extensions ranged from approximately $2,400,000 for study area X to approximately $24,300,000 for the combined study areas of E, H and I. Total estimated present worth costs for the community Title 5 systems ranged from approximately $4,800,000 for study area V to approximately $60,700,000 for the combined study areas of K and L. Total estimated present worth costs for the small satellite WWTPs ranged from approximately $5,600,000 for study area R to approximately $47,900,000 for combined study areas K and L.

Figure 6-3

Figure 6-4

Table 6-1

Table 6-2

For all needs areas, the total estimated present worth costs for conventional sewer extensions including costs for plant expansion were less than the costs for community Title 5 systems and small satellite WWTPs. Comparison of the costs of selected alternatives indicated that community Title 5 system estimated costs were between 20 and 220 percent greater than the costs for conventional sewer extensions. Small satellite WWTP estimated costs were between 10 and 150 percent greater than the costs for conventional sewer extension. The area with the smallest variance between alternative costs was identified to be the combined area of Z an AA. Community Title 5 systems and small satellite WWTPs in this area were estimated to be 20 percent and 10 percent greater than conventional sewer extension costs. This is a difference of approximately $1,600,000 and $1,500,000 more than the conventional sewer extension costs of approximately $8,700,000. This cost analysis in combination with environmental evaluation of each area will be the basis for determining the most appropriate alternative for each priority needs area.

Present worth values for the central WWTF alternative with advanced treatment facilities are provided in Table 6-2 for each of the needs areas. Although the total estimated project costs associated with the advanced treatment facilities is significant, its impact on the individuals needs areas is relatively minor since the needs areas would use only 1.02 mgd of the total 10.7 mgd or about 9.5%. The resulting present worth costs shown in Table 6-2 remain significantly lower than the on-site alternatives shown in Table 6-1 even with the advanced treatment facilities.

6.2 Environmental Considerations

The following sections provide an analysis of the environmental effects of implementing the three proposed alternatives, as well as the No-Action alternative in the 14 priority needs areas. The alternatives were assessed for their potential short and long-term environmental impacts. Short-term impacts include the environmental effects of the collection, conveyance, and treatment system installation. Long-term impacts include the benefits and adverse environmental effects of operation of each alternative. Environmental factors considered included land use, historic resources, traffic, air quality, noise, topography and geology, soils, surface water, groundwater, floodplains, wetlands, rare and endangered species, agricultural land, and aesthetic resources. The following sections are organized by alternative. For those environmental parameters where short or long-term effects would be similar regardless of needs area, impacts are presented generally for the alternative. When impacts vary by needs area, a discussion by needs area is provided.

6.2.1 No Action

Under the No-Action alternative, no changes would be made to the current disposal practices within any of the needs areas. Development would continue to occur under current zoning regulations, provided that soils and groundwater conditions allow for the installation/upgrading of individual septic systems. However, in the absence of any corrective action, periodic septic system failures have the potential to contribute excess nutrients and bacteria to local surface waters, groundwater, and wetlands, which could harm aquatic species and vegetation.

6.2.2 Community Title 5 Systems

As described in Chapter 4, the principle components of a Community Title 5 System would be a two compartment septic tank linked in series to a one compartment septic tank, a dosing pump station, valve chamber, and ultimate discharge to a soil absorption system. These components would all largely be below-grade. The septic tanks would likely have manholes at grade and may have narrow-diameter above grade vents. The dosing pump station and valve chamber would also be below ground but have somewhat larger access hatches at the surface. The dosing station may also require a small single-story above ground control building, having dimensions approximately 8-feet by 10-feet. If standby power is necessary, the dimensions of this control building could increase to approximately 10-feet by 15-feet. The leaching fields would be below ground, as well, however, it is anticipated that in most locations it will be necessary to employ a mounded system. The size of the leaching fields, and thus the size of the parcel required for such a system, is dependent upon the volume of flow to be treated as well as the soil condition. Smaller systems (2000 gpd) would likely require 0.75 acres, while the largest systems (10,000 gpd) would likely require 2.5 acres including sufficient area reserved for future replacement of the field.

Land Use/Aesthetic Resources. In the short-term, construction related to the installation of Community Title 5 Systems and their associated conveyance/piping may result in temporary disruptions to land uses adjacent to the construction activities. These disruptions are anticipated to relate primarily to noise and dust; it is expected that construction would maintain adequate access to the surrounding parcels.

In the long-term, construction of Community Title 5 Systems, including the above ground control building and below ground leaching fields, would require the permanent taking of parcel(s) of land within each needs area where such local community systems would be the recommended alternative. The number and size of parcel(s) to be acquired would be dependent of the flow/volume to be treated within the needs area. Undeveloped land (generally forested or agricultural) would be the most likely candidates for siting the community systems. Thus, operation of these systems would result in a permanent change in land use; forested areas would need to be cleared and agricultural land would be precluded from pasture/crop production. However, the community systems generally would not be expected to affect the aesthetic character of the various needs areas, since nearly all the components would be located below-grade or within a grass-covered mound.

While the use of community systems would result in the direct loss of a few parcels (to accommodate the infiltration beds), such an alternative may indirectly protect other undeveloped parcels by limiting the ease in which future growth could occur. In areas where community systems are employed, there would be a finite capacity to the treatment system, which in turn would limit the number of possible future connections to the system. Such an alternative would provide a temporary form of growth management in needs areas that contain a number of undeveloped parcels or sensitive resource areas the city would like to protect. For example, needs areas A and C are located within the Canoe River Aquifer ACEC. While the build-out analysis showed that needs area A has very little remaining developable land and future growth may be limited, more than half of needs area C was identified as “future developable land”.

Historic/Archaeological Resources. Construction of the Community Title 5 Systems may occur in the vicinity of the various existing historic/archaeological resources located throughout the city of Taunton. If historic resources are located in proximity to areas identified for the community systems, and their associated collection and piping system, potential short-term impacts from construction dust, noise, and vibration are possible. Similarly, existing archaeological resources, if located within the footprint/alignment of community systems, have the potential be uncovered, damaged, or destroyed; however, it is anticipated that efforts will be made during the siting and design of these facilities to avoid areas with potential impact to significant archaeological resources.

In some circumstances, such as mounded systems, the ground elevation will be slightly increased; however, the Community Title 5 Systems will generally have no, or very limited above ground permanent facilities. Therefore, this alternative would not be expected to substantially affect the historical integrity of any proximate cultural resources. Any above ground facilities would be relatively small and could be at least partially screened from historic sites, if necessary; any resulting visual impact would be anticipated to be minor.

Traffic. Construction of the Community Title 5 Systems may require bringing heavy equipment onto local roads that more commonly see primarily passenger vehicle traffic. At times when large equipment or construction supplies are being brought to the location of a proposed Community Title 5 System, there may be short-term disruptions or interruptions of traffic flow. However, for the most part, construction of the systems themselves would have minimal impact on local traffic conditions. Construction of the associated collection system and piping would likely require excavation within local roadways. Depending on the widths of these roads, there may be temporary lane/road closures and local detours during construction. Most of this construction would occur, however, within primarily residential streets with low traffic volumes; therefore traffic delays are anticipated to be minimal.

The Community Title 5 Systems would not be permanently staffed, although the facilities would be somewhat routinely inspected by a certified operator and occasionally by maintenance staff. The facilities are anticipated to generate no more than 3-5 vehicle trips per week; therefore, no long-term adverse effect on local traffic is expected.

Air Quality. Equipment used to construct the Community Title 5 Systems would produce engine emissions that could temporarily affect air quality in localized areas in the vicinity of the construction. Construction vehicles and excavation would also generate fugitive dust during the construction activities. However, the extent of these impacts can be minimized by use of best management practices, such as proper engine maintenance, covering stockpiles, and wetting disturbed areas. Therefore, short-term impacts to air quality in the vicinity of the Community Title 5 Systems are anticipated to be minor.

Operation of the community systems is similarly not anticipated to result in adverse impacts to air quality. The only potential source of emission, if necessary, is anticipated to be the small vent structures. These vents may release small concentrations of gasses, such as hydrogen sulfide; however, the concentrations generated by a properly operating system would be minimal and would rapidly disperse. Although the dosing pump stations would be sized to contain approximately 24 hours of flow in the event of a power outage, the design in some locations may call for an additional safety factor, i.e. standby generator. Operation of, and thus emission from, this standby generator is expected to be infrequent. Therefore, no long-term air quality impacts related to the Community Title 5 Systems are anticipated.

Noise. Construction of the Community Title 5 Systems, including their associated conveyance and piping network, would require the use of some heavy machinery, resulting in periodic elevated noise levels that may cause a noise impact. The potential for noise impact is largely dependent upon the proximity of sensitive resources to the locations selected for siting Community Title 5 Systems. Since noise levels attenuate relatively quickly over distance, and can also be reduced by features such as vegetation and terrain, the greater potential for noise impact would occur if a community system is constructed in close proximity to existing residences or other sensitive receptors with no existing vegetative or topographic buffer. Additionally, construction traffic associated with removing excavation or hauling equipment could result in noise impacts in the vicinity of the work and along access routes.

Operation of the Community Title 5 Systems is not anticipated to result in a long-term noise impact, since these systems operate somewhat passively with little machinery or moving parts, and most of the components are located below-grade. As noted above, some locations may require a standby generator to power the dosing pump station in the event of an extended loss of primary power. The generator would either be located within an enclosed building or located outside the building, depending on design. However, it would be expected to operate infrequently and be equipped with sound attenuating devices; thus, long-term noise impacts would be minimal.

Topography and Geology. In the short-term, construction related to the installation of the on-site system and associated piping may have a slight effect on topography due to earth moving and re-grading by large construction-related equipment. Over the long term, above ground buildings may alter the local topography, although any required permanent structures such as control buildings would be small. In those locations where it is necessary to construct a mounded system, there would be a small corresponding alteration to the existing topography; however, these mounds are expected to be no more than 3-4 feet above existing relief/contours.

With regard to surficial geology, the short term impacts of excavation would be local, and the underlying geology would remain the same. Areas comprised of bedrock may require blasting, which may have long-term impacts as the surficial geology of the area could be altered. Blasting may be necessary in needs areas K, L, and Z, which are comprised of till or bedrock according to the MassGIS 1999 Surficial Geology datalayer.

Soils. Short-term and long-term impacts on soils include the permanent removal of soil for piping and system installation. Vegetation removal and vehicular traffic, when necessary, may contribute to soil erosion. Similar to area surficial geology, the impacts of excavation would be local, and the underlying soils would remain the same. While the Community Title 5 System would be equipped with pre-screening/filtration to remove oil, grease, and floatables prior to discharge to the soil absorption system, the underlying soils may be subject to increased nutrient loading and potential contamination from bacteria, viruses, or other constituents in the effluent over the long-term. However, natural biological processes are expected to result in the decomposition of most constituents, rather than long-term accumulation in the soil layer.

Surface Water. Potential short-term construction-related impacts to surface water include the effects of stormwater runoff. Sediments disturbed by construction and carried by stormwater can alter benthic habitat, increase turbidity, and subsequently reduce light penetration in surface waters. Sediment controls, such as silt fences and other erosion control best management practices (BMPs), would be employed during construction to prevent such impacts. In addition, stormwater volume may increase very slightly due to increases in impervious surfaces. Impervious cover limits stormwater infiltration and contributes to increases in stormwater flow. Impervious surfaces could increase very slightly in the short-term due to construction-related equipment/activities and in the long-term due to the control buildings necessary for the treatment system. Impervious cover, surface runoff volume, and contaminant concentrations, may also increase indirectly in the long-term due to the potential for subsequent development that may occur in areas where septic system expansions were previously restricted and development was limited. The 10,000 gpd Community Title 5 System capacity would limit future development, therefore the indirect effect of the presence of the Community Title 5 System on development and subsequently surface waters would be somewhat limited. Positive long-term impacts include improved surface water quality within needs areas, as the proposed alternative eliminates the potential for individual septic system failures.

Groundwater. Short-term impacts such as groundwater contamination due to subsurface disturbance during construction could occur, although turbidity would be filtered as groundwater flows downgradient through the subsurface. Construction-related BMPs would be installed to limit such impacts. In the long-term, below ground system components may divert groundwater locally, but the ultimate direction of flow would not be expected to change as groundwater would flow around subsurface obstructions. Wastewater filtered through the system would be discharged locally, thus providing beneficial recharge to subbasins in the project area.

There could be minimal contamination impacts over the long-term to groundwater as the soils absorption system may not completely remove nitrogen. Although it is expected that the system would assimilate the small amount of nitrogen as it percolates through the soil, nitrogen inputs may need to be periodically monitored in needs areas A, L, and Q, which are located within Interim Wellhead Protection Areas and Zone II areas.

Floodplains. Construction of above grade structures or fill may have short-term impacts in areas that are located in the 100-year floodplain. Construction equipment located within the 100-year floodplain could potentially pose an obstacle to floodwaters and displace a small amount of flood storage capacity. Above ground structures within the 100-year floodplain, such as control buildings, may become obstacles to floodwaters and impact flood storage capacity in the long-term. Where structures are erected or topography is altered, compensatory flood storage may be required. If a system or facility is sited within the 100-year floodplain, potential impacts would need to be addressed during local/state permitting under the Wetlands Protection Act (WPA) and construction would need to comply with Massachusetts Building Codes.

Wetlands. It is unlikely that a Community Title 5 System would be sited within a wetland, since wetland soils are generally saturated and not practical for wastewater filtration. It may be necessary, however, to install collection and conveyance systems through wetland areas. If construction activities do occur within a wetland, or if a system or facility is sited within the 100-foot buffer zone to wetland resource areas, direct short-term impacts may include excavation and fill, and potential indirect impacts may include drainage and/or hydrologic modifications. Such impacts would need to be addressed during local/state permitting under the Wetlands Protection Act (WPA) and potentially under federal permitting programs as well.

Indirect long-term impacts to wetlands include the potential for subsequent development that may occur in areas where septic system expansions were previously restricted and development was limited. Additional development could lead to loss of wetlands due to filling for residential expansions. To the extent that the capacity of the community systems is limited, however, additional development would also be somewhat restricted. Positive long-term impacts of this alternative on wetlands include the elimination of individual septic system failures and subsequent excess nutrient loading.

Rare and Endangered Species. Natural heritage & endangered species program (NHESP) areas are more likely to be impacted where they extend into a significant portion of needs areas, such as K, X, V and Z. NHESP areas that are located within construction areas may be potentially impacted in the short and long-term by the removal of trees and vegetation during the construction phase, which could eliminate habitats and hinder species survival. Elevated noise levels may temporarily deter wildlife from using habitat in the areas surrounding construction. Additionally, sedimentation and erosion due to construction are possible, and soil-laden runoff to surface waters could increase turbidity and affect aquatic resources. Sediment controls, such as silt fences, would need to be employed during construction to minimize such construction-related impacts. As previously mentioned, a copy of a Notice of Intent must be filed with NHESP for projects that are within Estimated Habitats of Rare Wildlife.

Positive long-term impacts of this alternative on protected species include the elimination of individual septic system failures and subsequent excess nutrient loading.

Agricultural Land. It is possible that some agricultural land or areas with prime farmland soils may be disturbed within some needs areas during the construction stages of Community Title 5 Systems or permanently lost for use in soil absorption systems. Agricultural lands are susceptible to development because of accessibility, especially in needs areas containing several active agricultural parcels of land, such as H, L, Q, and R. Areas with prime agricultural soils, such as needs areas L and U are already developed, however, there is undeveloped prime farmland soil in needs areas Q, R, X, and Z that could potentially be impacted.

Indirect long-term impacts to agricultural land, similar to impacts on wetlands, includes the potential for subsequent future development that could occur in areas where septic system expansions were previously restricted and development was limited. Additional development could lead to loss of land available for, or dedicated to, agriculture due to residential expansions. To the extent that the capacity of community systems is restricted, however, the conversion of agricultural lands may be somewhat limited.

6.2.3 Small Satellite WWTP

As described in Chapter 4, the principle components of a Small Satellite WWTP would be a below ground equalization tank and pump station, a wastewater treatment process building encompassing various components including primary clarifier, biological reactor, secondary clarifier, tertiary treatment (if required), disinfection, as well as odor control, standby power, control room, and electrical room. Effluent from the small WWTP would be conveyed to a soil absorption system which would either be a leaching field similar to Community Title 5 Systems or a sand filter bed. Sand filter beds would be exposed at the surface, and thus surrounded with exclusion fencing. Because of their ability to handle higher flow, sand filter beds would likely be utilized for those WWTPs treating greater than 50,000 gpd. Both the size of the process building and the soil absorption system would be dependent upon the volume of flow to be treated. A smaller WWTP (10,000 gpd) would likely have a process building approximately 30-feet wide, 75-feet long, and 20-feet tall; the total lot size required would be approximately 1.0 acre. Larger WWTPs (100,000 gpd) would have a process building approximately 60-feet wide, 195-feet long, and 25-feet tall; the total lot size required would be approximately 3.75 acres. As with Community Title 5 Systems, area requirements are dependent upon soil conditions.

Land Use/Aesthetic Resources. Construction impacts related to installation of the below grade elements of the Small Satellite WWTPs would be similar to those described for the Community Title 5 Systems. However, above grade construction activity to support the treatment process buildings would be more extensive due to the size of the facilities. This would result in potentially longer term construction period with associated disturbances to adjacent land uses.

In the long-term, construction of a Small Satellite WWTP would require the permanent taking of a parcel of land within each needs area where such local small WWTP(s) would be the recommended alternative. The size of parcel to be acquired would be dependent of the flow/volume to be treated within the needs area. Undeveloped land (generally forested or agricultural) would be the most likely candidates for siting the community systems. Thus, operation of these systems would result in a permanent change in land use; forested areas would need to be cleared and agricultural land would be precluded from pasture/crop production. A building housing the wastewater treatment processes would be permanently located on the parcel and could affect the aesthetic character of the more rural needs areas. However, some measures could be implemented during design to partially screen or blend the small WWTP into the surrounding neighborhood.

Similar to Community Title 5 Systems, the Small Satellite WWTP(s) would be restricted in capacity and thus this alternative may indirectly limit future development in the needs areas.

Historic/Archaeological Resources. Construction of the Small Satellite WWTP(s) may also occur in the vicinity of the various existing historic/archaeological resources located throughout the city of Taunton. Short-term construction effects would be similar to those described for Community Title 5 Systems.

Small Satellite WWTP(s) would require a permanent above ground building. The size of the building is dependent upon the flow/volume to be treated, and the potential for impact to historic resources is dependent upon the location of these Small Satellite WWTP(s) to sensitive cultural resources. It is anticipated, however, that these above ground facilities could be at least partially screened from historic sites. If additional mitigation is necessary to reduce the impact to proximate cultural resources, design considerations would be implemented to incorporate architectural features into the WWTP, allowing it to better blend with the surrounding historical context.

Traffic. Short-term impacts on traffic to construct Small Satellite WWTP(s) would be similar to those described for Community Title 5 Systems. The Small Satellite WWTP(s) would be minimally staffed (part-time for 2-4 hours/day), although they would be somewhat routinely inspected by a certified operator and occasionally by maintenance staff; chemical deliveries would occur 1-2 times per month. The facilities are anticipated to generate no more than 4-5 vehicle trips per day; therefore, no long-term adverse effect on local traffic is expected.

Air Quality. Short-term construction effects on air quality would be similar to those described for Community Title 5 Systems although construction period may be of longer duration. Operation of the Small Satellite WWTP(s) would not be anticipated to result in adverse impacts to air quality. The biological and chemical processes used to treat the wastewater would occur within an enclosed building. Exhaust air from these processes would be passed through an odor control system, such as an activated carbon vessel, prior to venting to the outside area. Such odor control vessels generally achieve greater than 90 percent removal of hydrogen sulfide and other odor-causing compounds. This level of treatment, coupled with dispersion, is anticipated to substantially reduce the potential for off-site odor-related impacts. The Small Satellite WWTP(s) would also be equipped with a standby generator. This generator would operate only during loss of primary electrical power to the WWTP, as well as routine testing/exercising of the generator to maintain it in reliable working condition. Therefore, emissions from the generator would be minimal and are not anticipated to result in long-term adverse effects on air quality.

Noise. Short-term construction effects on noise levels would be similar to those described for Community Title 5 Systems, although construction of above grade structures may require a longer construction period with associated elevated noise levels. Operation of the Small Satellite WWTP(s) is not anticipated to result in a long-term noise impact. The biological and chemical processes used to treat the wastewater would be enclosed within a building, thereby considerably attenuating noise levels that would be audible outside the building. The odor control system may include an exhaust fan, which has the potential to result in noise emissions beyond the building. However, there are a number of design conditions, such as the shape/number of blades and positioning/direction of the fan, which can be implemented to reduce the potential for long-term noise impacts to adjacent parcels. As noted above, the Small Satellite WWTP(s) would be equipped with a standby generator which would require periodic testing, thus elevated noise levels would be heard by nearby residents during these short periods.

Topography and Geology. Short-term construction-related impacts to topography would be similar to those described for Community Title 5 Systems. Buildings housing the treatment process may be larger than control buildings used for Community Title 5 Systems depending on capacity of the system and would thus have slightly greater long-term impacts on topography, although the alteration of topography is still not anticipated to be significant.

Short-term and long-term impacts to surficial geology would be similar to those described for Community Title 5 Systems.

Soils. Short-term construction-related impacts on needs area soils would be similar to those described for Community Title 5 Systems. Long-term impacts on soil would be minimal, as wastewater would be treated prior to discharging to soils. However, the underlying soils may still be subject to increased nutrient loading and potential microbial contamination in the effluent, as the treatment process does not completely remove all contaminants. Similar to Community Title 5 Systems, natural biological processes are expected to result in the decomposition of most constituents, rather than long-term accumulation in the soil layer.

Surface Water. Similar to those described for Community Title 5 Systems, potential short and long-term impacts to surface water include the effects of increased contaminants carried by, and increased volumes of, stormwater runoff. If paved access driveways or parking areas are necessary for Small Satellite WWTP operation, this would also contribute slightly to increases in stormwater runoff over the long term. Indirect long-term impacts to surface water quality include the potential for subsequent future development to occur in those areas where septic system expansions were previously restricted and development was limited. Densely developed areas typically have higher percentages of impervious cover and consequently create higher stormwater runoff volumes. To the extent that the capacity of the Small Satellite WWTP(s) is restricted, however, development would also be limited. Similar to Community Title 5 Systems, positive long-term impacts include improved water quality due to the elimination of the potential for individual septic system failures. As mentioned previously, Small Satellite WWTP(s) would not discharge directly to surface waters, therefore no direct adverse impact to surface water would occur over the long-term.

Groundwater. Similar to those described for Community Title 5 Systems, short-term impacts such as groundwater contamination due to subsurface disturbance during construction could occur, and it is expected that turbidity would be filtered as groundwater flows downgradient through the subsurface. Effluent conveyed to the soil absorption system and subsequently to groundwater may alter groundwater levels in the vicinity of the discharge location and could potentially increase groundwater discharge to streams. This issue would be evaluated during the design phase of the project in light of specific siting characteristics if this alternative is recommended for any of the needs areas. Contamination impacts over the long-term to groundwater would be minimal, as effluent discharged would have to meet Class I groundwater standards, as discussed in Chapter 4.

Floodplains. Construction related short-term impacts of Small Satellite WWTP(s) on the 100-year floodplain would be similar to those described for Community Title 5 Systems. The collection/conveyance portion of WWTP(s) would be located primarily below ground and would not have a long-term impact on the floodplain, while buildings above ground may displace floodwaters and impact the floodplain over the long-term. Buildings erected for the Small Satellite WWTP(s) would be larger in size than structures/buildings required for Community Title 5 Systems and would therefore have a greater potential impact on flood storage capacity if siting within a floodplain is necessary. Additional compensatory flood storage would need to be provided.

Wetlands. Construction related short-term impacts of Small Satellite WWTP(s) on wetlands would be similar to those described for Community Title 5 Systems. Long-term effects would be dependent on siting of the facility and proper management of stormwater discharges if the facility is proximate to any resource areas. Indirect long-term impacts to wetlands are similar to those described for the Community Title 5 System alternative, as the impacts would be related to development potential.

Rare and Endangered Species. Short and long-term positive and negative impacts of Small Satellite WWTP(s) on rare and endangered species and the Canoe River Aquifer would be similar to those described for Community Title 5 Systems.

Agricultural Land. Short and long-term positive and negative impacts of Small Satellite WWTP(s) on agricultural land and prime farmland soils would be similar to those described for Community Title 5 Systems. Slightly greater acreage would be required to support the WWTPs depending on capacity requirements.

6.2.4 Conventional Sewer Extension and WWTF expansion

As described in Chapter 4, this alternative encompasses two primary activities: expansion of the sewage collection system and expansion of the existing WWTF. Expansion of the sewer network would entail the installation of gravity sewers of varying diameters throughout much of the needs areas. The sewers would primarily be installed within existing roads or rights-of-way; overland routes would largely be avoided. Depending on the topography, small pump stations may be required to transport wastewater to the WWTF. These pump stations would be relatively small (approximately 20-feet by 20-feet) single-story buildings. Expansion of the central WWTF would require expansion of the pump station building at the existing main lift station on West Water Street to accommodate two additional pumps and related equipment required to handle increased flows. The remainder of the expansion would occur within the existing WWTF parcel, and would consist of adding a primary settling tank (including associated sludge/scum pumps and piping), new aeration tanks, expanded chlorine contact tank, and rehabilitation of the existing gravity thickener.

Land Use/Aesthetic Resources. The extension of sewers would require construction in local roadways, and potentially the construction of pump station(s) along portions of the sewer alignments. Construction of these components would result in temporary disruptions to land uses adjacent to the construction activities. These disruptions are anticipated to relate primarily to noise and dust; it is expected that construction would maintain adequate access to the adjoining land uses, including residential, commercial, and open space. The presence of construction equipment, such as bulldozers, backhoes, and excavators, may temporarily affect the aesthetic character of those less urbanized needs areas. The extended sewer network would not directly impact land uses in the long-term, as the pipes would, for the most part, be constructed within existing roadways. Pump station(s), if required, would represent a permanent alteration of land use, although these structures and their associated land requirements are anticipated to be small.

Expansion of the WWTF and the main lift station would occur within parcels currently occupied by the WWTF and main lift station. Both parcels are within a somewhat isolated industrial area, remote from sensitive receptors. Thus, typical construction activities at the main lift station or at the WWTF itself are not anticipated to result in short-term land use impacts. In the long-term, expansion of the main lift station and the WWTF would not directly impact land use of the existing sites or adjoining parcels. While the WWTF site is zoned for open space/conservation, the land use of the site would remain the same as currently used, i.e. to support waste treatment/disposal for public purposes.

The primary purpose of the sewer extension is to provide relief to existing residences and businesses experiencing problems with on lot wastewater disposal systems. In this regard, the extension of sewers and expansion of the WWTF is compatible with Executive Order 385. Through its various memorandums of understanding (MOUs) with adjoining municipalities, the city is participating in a regional solution to wastewater collection and treatment in accordance with the Order, and is minimizing impacts to environmental resources in those areas of the city where sewers will be extended. Sewers would be provided to those areas of the city where development already exists and where on-lot systems are not adequate. The intent of the project is to serve existing development in the city of Taunton, and not to provide infrastructure improvements to induce growth in the city. Because sewers would be extended to serve primarily existing population, no substantial impact on water or other utilities, roadways or community services is expected. The project is also compatible with the Commonwealth Capital policy and several of the state's sustainable development principles since it involves planning regionally to address wastewater collection and treatment, improving infrastructure for existing development, and protecting environmental resources by removing failing on-lot systems.

The city will need to address potential indirect impacts that may result from the sewer extension. Extension of sewers to previously unsewered areas has the potential to induce growth within areas that might previously have been restricted due to on site wastewater disposal limitations. A primary factor in predicting the likelihood for induced growth is the amount of developable land remaining in the vicinity of the proposed needs area. For example, needs areas AA and Z are located in the easternmost portion of Taunton, at considerable distance from the existing sewer system, and the EOEA build-out analysis shows that there is very little future developable land remaining in these areas; i.e. those parcels which are not otherwise constrained by wetlands, steep slopes, and other environmental factors have already largely been developed. Somewhat closer to the existing sewer network in east-central Taunton, needs area X also contains relatively little developable land. However, extending the sewers to these remote areas may contribute to secondary growth in the intermediate areas along the sewer route, i.e. between the end of the current sewer system and the limits of needs areas. Of the needs areas being considered for the sewer extension, areas C, E, H, I, L, and R contain varying amounts of developable land, and these are areas the city may want to address in planning for future growth.

Historic/Archaeological Resources. Portions of the sewer collection system may require construction in the vicinity of the various existing historic/archaeological resources located throughout the city of Taunton. If historic resources are located in proximity to areas identified for sewer extension, including pump stations, potential short-term impacts from construction dust, noise, and vibration are possible. The new sewer pipelines would largely be constructed within existing roadways, where subsoils have been previously disturbed; therefore, the potential for intact archaeological resources within the construction corridor is minimal. Where the collection system will not be a gravity-system, it may be necessary to construct pump station(s). Construction of these pump stations may also occur in the vicinity of existing cultural resources. Existing archaeological resources, if located within the footprint/alignment of the pump stations, have the potential to be uncovered or disturbed; however, it is anticipated that efforts will be made during the siting and design of these facilities to avoid areas with potential impact to significant archaeological resources.

Potential long-term impacts related to siting pump stations are dependent upon the location of these pump stations(s) relative to sensitive cultural resources. It is anticipated, however, that these above ground facilities could be at least partially screened from historic sites. If additional mitigation is necessary to reduce the impact to proximate cultural resources, design considerations would be implemented to incorporate architectural features into the pump station(s), allowing them to better blend with the surrounding historical context.

There are no known historic/archaeological resources within the vicinity of the existing WWTF or the main lift station; therefore, expansion of the WWTF and the main lift station is not anticipated to impact cultural resources.

Traffic. Construction of the associated sewer extensions/collection system would likely require excavation within local roadways. Depending on the widths of these roads, there may be temporary lane/road closures and local detours during construction. In the long-term, this alternative would not have an adverse effect on local traffic; if pump stations are required along the sewer extension route(s), these facilities would be unmanned and only generate infrequent trips for periodic inspection or maintenance.

Construction to expand the WWTF and the main lift station may require bringing heavy equipment onto local roads; however, due to the industrial setting of these facilities, these roads (such as West Water Street) are accustomed to truck traffic. At times when large equipment or construction supplies (such as pre-cast tanks) are being brought to the construction sites, there may be short-term disruptions or interruptions of traffic flow. However, for the most part, construction at the WWTF and the main lift station would have minimal impact on local traffic conditions. The expansion of the WWTF is not anticipated to result in substantial increases in permanent staffing levels; therefore, no long-term increase in traffic to/from the WWTF is expected.

Air Quality. Equipment used to construct the sewer extension, associated pump stations when necessary, and various new structures/buildings at the central WWTF has the potential to produce engine emissions that could temporarily affect air quality in localized areas in the vicinity of construction. Additionally, construction vehicles and excavation would generate fugitive dust during construction activities. However, the extent of these impacts can be minimized by use of best management practices, such as proper engine maintenance, covering stockpiles, and wetting disturbed areas. Therefore, short-term impacts to air quality in the needs areas and in the vicinity of the WWTF are anticipated to be minor.

Similar to Community Title 5 Systems and the Small Satellite WWTP(s), pump stations, (including the main lift station), would also be equipped with a standby generator. Emissions from the generator would similarly be minimal and would not be anticipated to result in long-term adverse effects on air quality. Venting may also be required, although no odor emissions are anticipated.

Continued operation of the central WWTF, after expansion, is similarly not anticipated to result in adverse impacts to air quality. While there would be the addition of several open tanks, as described above, these components when properly maintained are generally not considered odorous. Additionally, the rehabilitation of the existing gravity thickener includes the installation of a dome cover over this component and connection to the existing odor control system which will also be upgraded. These improvements are anticipated to further reduce the potential for operation of the WWTF to result in odors that could impact adjacent parcels.

Noise. The sewer extension would require work within roadways, to which houses or other sensitive receptors may be closely situated. Additionally, construction traffic associated with removing excavation or hauling equipment/supplies could result in noise impacts in the vicinity of the work and along access routes. However, the construction would be limited to daytime hours, and would be of relatively short-duration for any one location.

The sewer pipelines would be located below grade and not be a source of noise, other than noise potentially emitted from pump station(s). However, like the small satellite WWTP(s), noise generating equipment (primarily pumps) would be located within a building that would substantially attenuate noise levels. As described above, the pump station(s), including the main lift station, would be equipped with a standby generator which would require periodic testing, thus elevated noise levels would be heard by nearby residents during these short periods.

Construction of the proposed expansion of the main lift station and central WWTF would require the use of some heavy machinery, resulting in periodic elevated noise levels. However, both are located in somewhat isolated locations with no immediately proximate sensitive resources, other than residences across the Taunton River in Berkley. Since noise levels attenuate relatively quickly over distance, and can also be reduced by features such as vegetation and terrain, construction noise from the WWTF is expected to substantially blend with ambient noise levels prior to reaching most sensitive receptors.

Continued operation of the central WWTF, after expansion, is not anticipated to result in a substantial increase in noise levels. While there would be the addition of tankage, most noise generated from the equipment within these tanks is directed upwards and therefore does not reach adjacent parcels. For these reasons, expansion of the WWTF is not expected to cause long-term operation noise impacts.

Topography and Geology. Short and long-term impacts to topography and surficial geology would be similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). However, these latter alternatives required buildings in each needs area, and the conventional sewer extension would only require a building in needs areas where pump stations are necessary. No alteration of topography would be required in needs areas where pump stations are not constructed. Building expansions at the main lift station and at the central WWTF may have an impact on topography and the local surficial geology.

Soils. Short-term construction-related impacts on soils due to the installation of the sewer extensions and the WWTF and main lift station expansions would be similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). There would be no additional long-term impacts to soils due to the presence of sewer extensions in needs areas, as wastewater would be transported offsite for treatment. In the vicinity of the WWTF, long-term impacts to soils would also be minimal, as treated wastewater would be discharged to the Taunton River.

Surface Water. Potential short-term construction-related impacts due to the construction of the sewer extensions and the WWTF and main lift station expansions are similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). Discharge from the expanded WWTF would be maintained at levels set in the NPDES discharge permit established by the US EPA and the MA DEP. Thus, no degradation of surface water quality is anticipated. There would be positive effects in the needs areas due to the elimination of individual failing septic systems.

Groundwater. Potential short-term construction-related impacts due to the construction of the sewer extensions and the WWTF and main lift station expansions would be similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). In the long-term, wastewater currently discharged locally through on lot systems would be diverted away from sub-basins. There may be some impacts on local groundwater elevations and eventually surface water levels in subbasins due to the transport of wastewater from subbasins to the WWTF. Discussions with the MA DEP have indicated that this is not expected to represent a significant effect as total volume per needs area is relatively minor, and needs areas are not concentrated in one area of the city.

Floodplains. Construction related short-term impacts of the conventional sewer extension and the WWTF and main lift station expansions on the 100-year floodplain would be similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). Similar to Community Title 5 Systems and Small Satellite WWTP(s), the piping would be located primarily below ground and would not have a long-term impact on the floodplain. Above ground structures, such as pump stations for the conventional sewer extension and buildings added during the WWTF extension that are also located within the 100-year floodplain, may impact flood storage capacity. The main lift station is located within the 100-year floodplain; therefore, the pump station building expansion may impact flood storage capacity and compensatory storage would be required. As previously mentioned, the 100-year floodplain extends into the southern and southeastern portion of the WWTF property. Proposed WWTF expansions located in the northern and western portions of the property would not impact the 100-year floodplain, however, the proposed chlorine contact tank expansion in the southeastern portion of the WWTF site may encroach on the 100-year floodplain and compensatory storage would be required.

Wetlands. Construction related short-term impacts of the conventional sewer extension and the WWTF and main lift station expansions on wetlands would be similar to those described for

Community Title 5 Systems and Small Satellite WWTP(s). Wetlands would be avoided to the maximum extent possible when siting pump stations within needs areas. The proposed chlorine contact tank expansion in the southeastern portion of the WWTF property may encroach on the 100-foot Buffer Zone to wetland resource areas. Indirect long-term impacts include the possible loss of wetlands across the city of Taunton due to secondary growth.

Rare and Endangered Species. Construction related short-term impacts of the conventional sewer extension on rare and endangered species and the Canoe River Aquifer (an Area of Critical Environmental Concern) in needs areas would be similar to those described for Community Title 5 Systems and Small Satellite WWTP(s). While there may be some minor reduction in groundwater recharge from on site wastewater disposal systems in the needs areas located in the Canoe River Aquifer, this minimal reduction is not expected to significantly alter habitat. The city may want to monitor development in this area to maintain adequate local recharge conditions.

As previously mentioned, areas of Priority Habitat for State-Protected Rare Species and Estimated Habitat for Rare Wildlife are also located in the eastern and southern section of the WWTF, as well as the vicinity of the main lift station. Coordination with NHESP would be necessary to avoid potential construction-related or operational impacts.

Agricultural Land. Short-term construction-related impacts of the conventional sewer extension on agricultural land and prime farmland soils would be similar to installing the conveyance portions of Community Title 5 Systems and Small Satellite WWTP(s). The intent of the project is to serve existing development in the city of Taunton experiencing problems with on lot wastewater disposal systems, and not to provide infrastructure improvements to induce growth in the city. In this respect, the extension of sewers and expansion of the WWTF is compatible with Executive Order 193 since it is not anticipated that the project would result in conversion of agricultural land to other uses due to induced growth. There are prime farmland soils to the east of the WWTF and south of the main lift station, but no agricultural lands would be impacted by the expansion of these facilities. Thus, no adverse impacts to agricultural lands are anticipated due to the WWTF and main lift station expansions.

6.3 Permitting Requirements

Table 6-1 summarizes the permits and approvals that are anticipated to be needed to implement the various alternatives. There would be slight differences in permit/jurisdictional authority depending on the alternatives selected, as described in Chapter 4, e.g. local Board of Health would be the jurisdictional agency for Title 5 Community Systems, whereas MA DEP would be the permitting entity for Small Satellite WWTPs or expansion of the central Taunton WWTF. Additionally, local permits, such as building permits would be required, and street opening/ street occupancy permits would be required for the installation of piping in roadway rights-of-way.

TABLE 6-3. ANTICIPATED PERMITS/APPROVALS

Permit/Approval	Review Agency	Applicable Threshold	Anticipated Review Time	Comments
Environmental Impact Report (EIR)	MEPA	Mandatory preparation of EIR if construction of one or more new sewer mains ten or more miles in length	3 months	Requires initial preparation of an ENF, with scoping for the EIR provided by MEPA based on public and agency comments.
Environmental Notification Form (ENF)	MEPA	ENF required if exceed following thresholds: - Expansion of existing WWTF by the greater of 100,000 gpd or 10% existing capacity - Construction of one or more new sewer mains five or more miles in length (threshold reduced to ½ mile if off-road) - New discharge to groundwater of 10,000 or more gpd of sewage within an area identified for protection of a public drinking water supply	2 months	Determination of need for EIR, and associated scope, would be made by Secretary and noted in the Certificate.
Sewer Extension Permit	MA DEP	Sewer extension greater than 2,500 feet, including pump stations	6 months	Must demonstrate sewer extension will not exceed capacity of proposed WWTF expansion
NPDES Surface Water Discharge Permit – Modification	US EPA and MA DEP	For discharge related to WWTF expansion.	4-6 months	Must coordinate with MA DEP and USEPA regarding concentration limits to avoid degradation of water quality in Taunton River.
Groundwater Discharge Permit	MA DEP	Community Title 5 Systems and Small Satellite WWTPs with design flow greater than 10,000 gpd discharge to groundwater	4-6 months	Advanced treatment (nutrient removal) may be required in sensitive areas
Taunton Board of Health Review	Taunton Board of Health	Community Title 5 Systems with less than 10,000 gpd discharge to groundwater	3-5 months	Advanced treatment (nutrient removal) or alternate design may be required in sensitive areas
Wetlands Protection Act Notice of Intent	Taunton Conservation Commission and MA DEP	Construction within wetland resource areas such as BVW, Bordering Land Subject to Flooding, and/or the 100-foot Buffer Zone	2-3 months	Compliance with MA Stormwater Policy Required; compensatory storage required if facilities permanently sited in floodplain
NPDES General Permit for Construction Dewatering	US EPA and MA DEP	Dewatering during construction activity if site is less than one acre	30 days	Assumes groundwater is not contaminated (other than TSS and pH)
NPDES General Permit for Stormwater Discharges from Construction Activities	US EPA	Stormwater discharges from, and certain non-stormwater discharges (such as construction dewatering) if site is larger than one acre	30 days	Assumes groundwater is not contaminated (other than TSS and pH); requires preparation of Stormwater Pollution Prevention Plan
NPDES Remediation General Permit (or Exclusion)	US EPA	Treatment of contaminated groundwater dewatering effluent during construction	30 days	Final RGP not yet issued by EPA but anticipated to be available prior to implementation of CWMP; otherwise obtain Exclusion letter

7.0 RECOMMENDED PLAN AND IMPLEMENTATION

The wastewater management plan recommended for the City of Taunton is based on a phased approach aimed at addressing the City's needs on a priority basis in conjunction with related activities which could affect the overall plan.

7.1 Recommended Plan

As discussed in Section 6, sewering of the 14 needs areas to convey sewage to Taunton's WWTF is the most cost effective and environmentally sound alternative and, therefore, it is recommended that the city proceed on that basis. As described in Section 6, the plan involves construction of approximately 50 miles of sewers and system pumping stations in conjunction with expansion of the WWTF. A description of the proposed expanded sewer service area is provided in Section 3 and shown on the mapping contained in Appendix A for each of the needs areas.

As discussed in Section 4, WWTF expansion will require the following facilities:

- Addition of primary settling tank No. 4.
- Addition of new aeration basins 3A and 3B in battery one.
- Addition of a fourth blower in the blower building.
- Provisions for chemical feed to secondary clarifiers.
- Expansion of the chlorine contact tank to include a third section.
- Expansion of the sludge handling facilities to include rehabilitation of gravity thickener No. 1 and increasing sludge dewatering system capacity.
- Expansion of the odor control system to include covering and ducting odors from gravity thickener No. 1.
- Increase capacity of the main lift station

It is anticipated that any increase in the permitted capacity of the WWTF will be conditioned on not increasing the mass loadings for BOD, total suspended solids and ammonia in the plant effluent. Chemical addition (polymer) to the final clarifiers is proposed in order to maintain current mass loading rates.

With an estimated cost of approximately $90 million it is recommended that the project be developed in phases to address the highest priority needs areas initially. Further, the results of Taunton's I/I removal program may have an impact on available system capacity. At this point in time, other undecided issues which could affect the ultimate capacity of Taunton's wastewater system include:

- Whether DEP will require NPDES permit limits for total nitrogen and, possibly, phosphorous.
- The potential for the town of Easton to discharge wastewater to Taunton.
- Aquaria's potential wastewater flow to Taunton.
- Increased flows from the town of Raynham.

Scheduling of the overall project should allow sufficient time for Taunton to determine the effectiveness of its I/I removal program as well as define final flows and treatment requirements.

7.2 Phased Implementation Program

It is recommended that the initial sewering program be aimed at addressing high priority needs areas. Unsewered areas within the existing service area are also included. The extent to which sewering can progress is, to some degree, dependent upon the success of the city's I/I removal program.

7.2.1 I/I Removal

Under the April 15, 2005 Administrative Consent Order, the city has agreed to the following schedule:

> Item V.6: by November 30, 2005 implement a program to eliminate cost effective sources of I/I identified in Taunton's Sewer System Evaluation Survey (SSES). Sources to be corrected by November 30, 2006
>
> Item V.7: By November 30, 2005 submit a report to DEP on additional areas identified in the SSES that should be evaluated for I/I removal.
>
> Item V.8: By June 15, 2005 implement local regulations prohibiting sources of I/I from private sources. Within 60 days of implementation, notify all owners where sources were identified and require correction within 6 months of notification.

Based on this schedule, with the I/I removal effort under way in 2006, the effectiveness of the program would not be determined until 2007 at the earliest.

7.2.2 System Priorities

As described in Section 3, the developed, unsewered areas of Taunton were subdivided into 30 study areas and analyzed as to their ability to support continued use of on-site wastewater disposal systems. The analysis focused on Title 5 criteria for siting on-site systems as well as Taunton Board of Health historical evidence of reported problems. The criteria included:

- Lot size.
- Proximity of wetlands and surface water.
- Drinking water protection areas.
- Soil suitability.
- Ground water elevations.
- History of septic system repairs and pump-out frequency.
- Proximity of municipal sewage collection system.
- Proximity of municipal water system

The scoring system applied to each of the criteria served to numerically rank all 30 study areas as shown in Table 3-6. Although the numerical ranking identified areas considered potentially unsuitable for long term use of on-site disposal systems, the city's knowledge of the severity and nature of problems within various study areas also factored into the selection of the 14 needs areas.

Further discussions were held with city department staff relative to prioritizing the 14 needs areas. Table 7-1 provides a priority listing of the needs areas based on these discussions along with public input. Areas at the top of the list are considered, due to soil or ground water conditions, to have little choice but to dispose of wastewater off site. Areas with lowest priority have demonstrated somewhat satisfactory results from system repairs, however, over the long term, these areas are not considered suitable for on-lot systems.

TABLE 7-1. PRIORITIZATION OF WASTEWATER NEEDS AREAS

Study Area	Projected Average Daily Flow (gal)	Estimated Capital Cost for Sanitary Sewers
Q	25,200	$ 2,864,000
L	213,900	$ 15,605,000
R	30,200	$ 2,313,000
C	111,200	$ 11,350,000
E	102,300	$ 9,871,000
A	41,600	$ 4,506,000
V	22,600	$ 2,882,000
U	66,700	$ 5,469,000
AA	21,400	$ 4,292,000
Z	29,800	$ 4,478,000
X	35,400	$ 2,330,000
H	79,300	$ 7,200,000
K	181,500	$ 5,798,000
I	57,600	$ 6,530,000

7.2.3 Near Term System Flow Increases

The average annual 2003-2004 flow measured at the Taunton WWTF is 7.6 mgd. As discussed in Section 3, subtracting metered flows from Raynham, Dighton and Norton the flow from the City during this period averaged 6.8 mgd.

Currently, sewering of the eastern side of Lake Sabbatia is under construction. This system, which is outside the present sewer service area, is scheduled to be placed in service late 2005. The estimated average flow from this area, as indicated in Table 3-8, is about 0.1 mgd including sanitary flow and an allowance for infiltration. This area along with other potential sewer extensions and development within the existing service area could increase Taunton's average flow to about 7.0 mgd within two to three years.

Plant capacities allocated for Raynham, Dighton and Norton under inter-municipal agreement and their current (2003-2004) flows are listed below.

Town	Allocated Capacity	2003-2004 Average Flow
Raynham	0.6 mgd	0.6 mgd
Dighton	0.6 mgd	0.14 mgd
Norton	0.05 mgd	0.02 mgd
Totals	1.25 mgd	0.76 mgd

Based on the above, the demand on the WWTF, including currently allocated capacities, would be around 8.25 mgd leaving capacity for about 150,000 gallons per day of the permitted 8.4 mgd plant capacity. Without a significant reduction of I/I in Taunton's collection system, very little WWTF capacity is available for expansion within the city and there is virtually no additional capacity available for surrounding towns. Based on estimated flows provided in Table 3-8, capacity remains for sewering only two of the three highest priority areas (study areas Q and R).

Although the actual total metered flow from these towns is currently less than their allocated capacity, we don't recommend that Taunton utilize any of the unused capacity unless the associated intermunicipal agreement is formally modified.

7.3 Wastewater Treatment Facility Expansion

Factors affecting the WWTF expansion are the potential for collection system I/I reduction, additional wastewater flow from outside sources and the likelihood that the MA DEP will impose more stringent effluent standards when the NPDES permit is reissued in 2006 or in 2011. DEP has advised that limits for total nitrogen and, possibly, phosphorous may be incorporated into the plant's discharge permit (see Appendix E).

To a certain extent, the WWTF can be expanded (by about 25%) without significant disruption to the existing processes. Expansion of the plant in conjunction with more stringent nutrient removal will be more complicated and considerably more expensive.

It is anticipated that between 2006 and 2011, issues regarding the above will become clearer. Because of the size of the overall project an EIR will be required to assess the overall impact of the proposed expansion. The EIR review process is anticipated to be extensive.

7.4 Program Schedule

Based on the present and projected demands on Taunton's wastewater collection and treatment systems, the City needs to move forward with a plan which :

- Addresses the needs within the City
- Evaluates the ability for the system to accept additional flows from outside sources
- Provides for future regulatory changes which may affect capacity of the wastewater Treatment Facility

Toward these objectives, it is recommended that the City:

1. Submit this Comprehensive Wastewater Management Plan and Environmental Notification Form to the Massachusetts Department of Environmental Protection and the Massachusetts Department of Environmental Quality.
2. Continue efforts to identify and remove excessive public and private inflow/infiltration sources from Taunton's collection system.
3. Pursue the Town of Dighton to determine if their allocated capacity can be reduced or, alternatively, if use of unused capacity can be used on an interim basis.
4. Continue the City's current program for infilling unsewered areas within the present wastewater service area.
5. Initiate steps to secure funding for sewer construction under DEP's state revolving fund (SRF) program.

Respectfully Submitted,

METCALF & EDDY, INC.

H.G. Langstroth, PE
Associate
Registered Professional Engineer
Massachusetts License No. 33478

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Appendix A

CWMP Maps A-G

Appendix B

Administrative Consent Order

April 15, 2005

Appendix C

Taunton WWTF and Remote Pump Stations

Basic Data

Appendix D

Memorandum for the Record

May 25, 2005 MA DEP Meeting

Appendix E

NPDES Discharge Permit

September 19, 2001