Town of Hingham, Massachusetts

Comprehensive Wastewater Management Plan (CWMP)

Recommended Plan – Phase II

July, 2011

Report

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ES-1 Introduction

The Town of Hingham, Massachusetts, through its Sewer Commission and Comprehensive Wastewater Management Planning Committee, has developed a Comprehensive Wastewater Management Plan (CWMP). The objective of the plan is to assess existing wastewater disposal practices in Hingham (Phase 1) and to identify and recommend a plan for future disposal needs in the future (Phase 2).

Phase 1 of this project presents needs analysis including an evaluation of the existing conditions in Hingham. Existing population and wastewater flows were developed to establish current baseline conditions. Population and wastewater projections were also developed for the 20 year planning period. A set of criteria were developed in order to evaluate the wastewater needs of individual areas of town. Criteria included lot size, soil and groundwater conditions, proximity to sensitive areas such as public water supplies, wetlands and areas of critical environmental concern. Metrics were developed under each of these criteria to permit a quantification of need. Nineteen individual study areas were evaluated based on the set of criteria. Areas with existing wastewater collection and disposal systems and areas with private on-site disposal systems were evaluated and ranked based on need. The Phase 1 Needs Analysis Report summary is included in Section 2 and a full copy of the report is bound under a separate cover as Appendix A.

This Phase 2 Report, the Recommended Plan, develops alternatives to address the wastewater disposal needs identified in Phase 1. Selected area alternatives include expansion of the existing collection and treatment facilities, use of de-centralized systems, and continued use of on-site disposal including enhanced management practices. Two baseline alternatives are also developed: construction of sewers to serve the entire town, and a no-action alternative. Over the course of completing this project, the needs and desires of the town have evolved. This evolution is also reflected in this report, specifically in Sections 3, 4 and 5, where evaluations were performed on several alternatives. The culmination of the process is presented in Section 5, the Recommended Plan, which presents the desire of the town to install sewers in the industrial needs area with a packaged treatment facility and allow the remainder of town in the presently unsewered areas to remain with onsite sewage disposal systems with enhanced management. The town would like to move forward with implementation of the portion of the Industrial Park area south of Route 3. Steps to begin this implementation phase are presently underway.

ES-2 Summary of Phase 1 CWMP

ES-2.1 General

The Town of Hingham is a suburban coastal community located approximately 15 miles southeast of Boston, MA and covers an area of approximately 22.5 square miles. Hingham is bordered by the communities of Weymouth, Rockland, Norwell, Hull, and Cohasset. An area map of Hingham is shown on Figure ES-1.

COHASSET

NORWELL

HULL

ROCKLAND

WEYMOUTH

3A

3

Legend
- Limited Access Highway
- Numbered Routes
- Major Road - arterials and collectors
- Minor Street or Road

Town of Hingham
Comprehensive Wastewater Management Plan

CDM

0 2,000 4,000 8,000 12,000 Feet

Figure ES-1

Hingham Area Map

ES-2.1.1 Population

The 2000 census lists Hingham's population at 19,882. The official Hingham website shows that the population in 2004 was listed as 20,720 persons. Population growth is expected throughout the planning period of this study, and it is important to establish this baseline population as a starting point for comparison with later parts of this study.

ES-2.1.2 Existing Wastewater Treatment and Disposal Methods

The Master Plan identifies wastewater disposal as an issue to be resolved especially in South Hingham. Northern Hingham, including much of the downtown area, is connected to wastewater collection systems operated by the Massachusetts Water Resources Authority (MWRA), or the Town of Hull. The MWRA connection serves the majority of properties within the North Sewer District (NSD) located in the northwest portion of Hingham. The wastewater from properties within the Weir River Sewer District (WRSD) is conveyed to Hull.

The developed areas within the remainder of Hingham rely on individual on-site sanitary disposal systems (SDSs) for wastewater treatment and disposal. A large portion of this area also serves as water recharge areas for Hingham and for neighboring communities of Weymouth, Abington, and Rockland. The existing water and wastewater divides are shown in Figure ES-2.

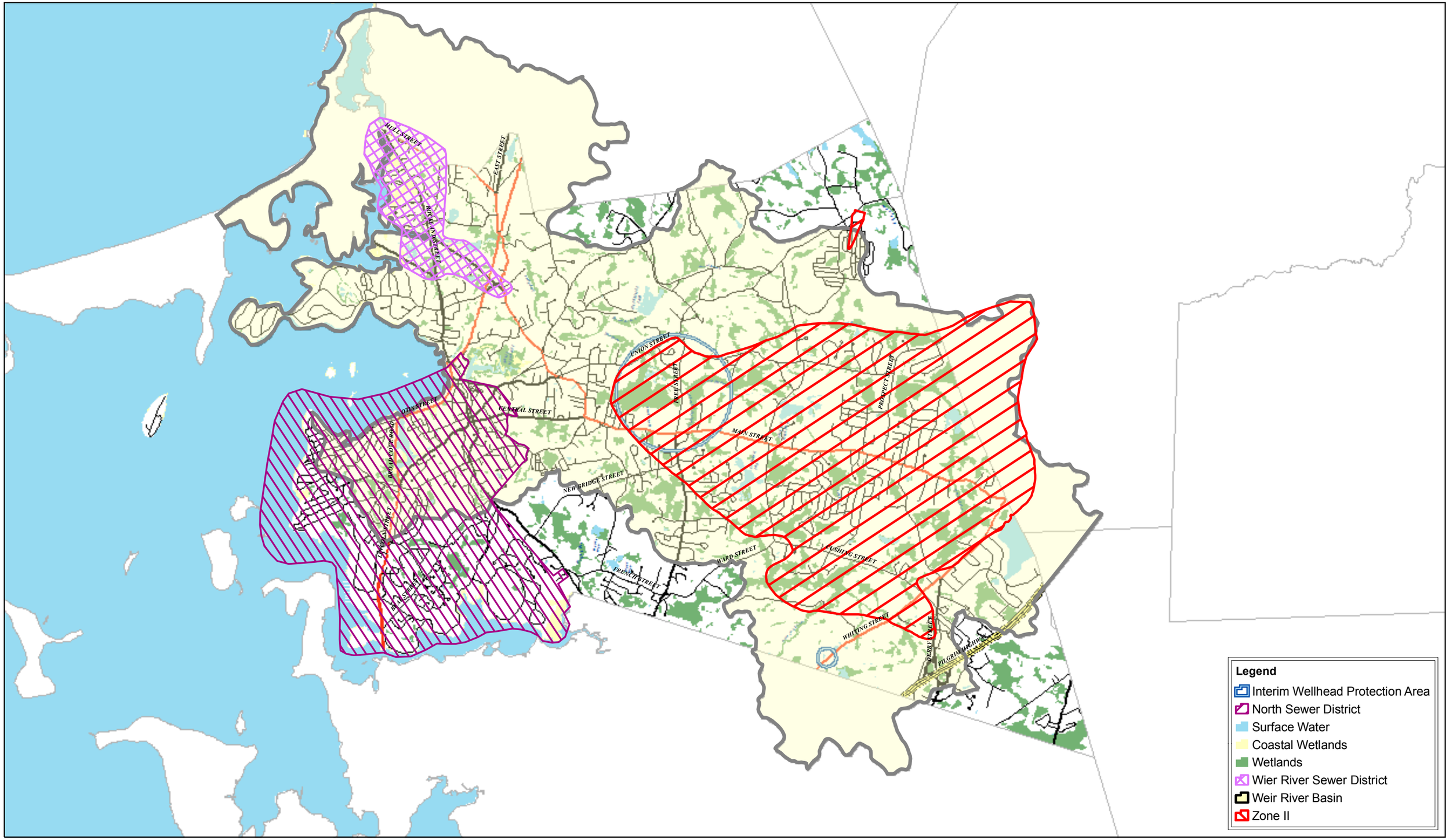
The existing conditions for the Baseline flows are summarized in Table ES-1:

Table ES-1
Summary of Existing Conditions and Baseline Wastewater Flows

Component of Wastewater Flow	*Total Flow (gpd)*
Total North Sewer District flow (existing):	991,054
Total Weir River Sewer District flow (existing):	47,610
Total flow for unsewered Hingham (existing):	2,017,422
Total Town of Hingham flow (existing):	**3,056,087**

ES-2.1.3 Existing Water Supply

The Hingham public water supply comes from two major sources; groundwater wells and surface supplies. There are six groundwater wells identified as Free Street Wells #2 through #5, Scotland Street, Downing Street, and Prospect Street wells. The three surface water sources are the Accord Pond, Accord Brook, and Fulling Mill Basin.



Town of Hingham
Comprehensive Wastewater Management Plan

CDM

N W E S

0 2,000 4,000 8,000 12,000 Feet

Figure ES-2

Water and Wastewater Divides

The Aquarion Water Company is the registered Public Water Supplier for the Hingham-Hull water district which includes all of Hingham and Hull and parts of Cohasset and Norwell. The aquifer that is the source of the public water supply is located largely within Hingham and within the Weir River Basin. Water that leaves the basin (through MWRA or Hull sewer systems) is not available to recharge the aquifer.

ES-2.1.4 Surficial Geology

Subsurface areas with sands and gravels exist in central and southern Hingham within the Weir River basin. These subsoils allow the aquifer to recharge quickly. A significant portion of the remainder of Hingham is underlain by till and bedrock. Till and bedrock deposits are poor soils that limit long-term use of on-site disposal systems.

ES-2.1.5 Future Conditions

Population Projections

The population growth rate for Hingham, as estimated by the Metropolitan Area Planning Council (MAPC), averages approximately 0.8% per year. The population projections for Hingham in year 2025 is 25,432.

Projected Wastewater Flow

CDM has projected town-wide wastewater flow volume for the year 2025. The total volume determined below represents wastewater flow from all sources, including development, projected to the year 2025. The summary of Town-wide wastewater flows at the end of the planning period is 3.72 mgd.

ES-2.2 Needs Analysis

The purpose of this section is to identify and prioritize areas of need in the Town of Hingham for wastewater management solutions. The analysis divided Hingham into smaller study areas based on geography, topography, soil characteristics, groundwater conditions and other criteria An evaluation and ranking of each study area was then performed based on a set of criteria developed to assess the need for wastewater management. The results of this needs analysis will be used to develop recommendations to address these wastewater management needs in Phase II of this study.

ES-2.2.1 Study Areas

Delineation of the Study Areas was intended to create manageable sections of Hingham, with relatively homogenous characteristics, to be assessed against criteria for determining wastewater management need. The Study Area boundaries are shown in Figure ES-3.

COHASSET

NORWELL

HULL

WEYMOUTH

ROCKLAND

1 North Sewer District

2 Summer Street

3 Weir River Sewer District

4 Brewer Pond

5 Hingham Center

6 Foundry Pond

7 Accord Brook

8 Bouve Pond

9 Cushing Pond

10 Fulling Mill Brook

11 Plymouth River

12 Liberty Pole

13 Prospect Street

14 Whiting Street

15 Gardner Street

16 McKenna Marsh

17 Industrial

18 Accord Pond

19 Wompatuck Park

Legend
- Study Areas
- Parcels
- Water Bodies

Town of Hingham
Comprehensive Wastewater Management Plan

CDM

N W E S

0 2,000 4,000 8,000 12,000 Feet

Figure ES-3

Study Area Map

ASE CAMDFGMDP31 Projects\Hingham_Sewer\GWMP\MXDs\Figure_ES-3.mxd 11/6/2006

ES-2.2.2 Needs Analysis

Specific criterion was developed to evaluate individual study areas within the town. The assessment included the preparation of a "Needs Evaluation Matrix" including a score for each criterion. The fourteen criterion were chosen to evaluate each study area.

The total point score for each Study Area is the sum of the Category Scores and will determine the "priority of need" for wastewater management in Hingham. Determination of wastewater disposal need is assessed by assigning a point value to the individual criteria in each of the Study Areas.

The overall Study Area scores and their corresponding priority ranking are shown in Table ES-2. These Study Area scores and the priority ranking will be used in subsequent evaluations and assessments of alternatives to formulate an overall wastewater management program for the Town of Hingham. (A "T" in the needs ranking indicates a tie in priority).

Table ES-2
Study Area Score and Priority Ranking

Study Area Name	*Final Score*	*Priority Ranking*
Fulling Mill Brook	**36**	**1**
Weir River Sewer District	**35**	**2**
Gardner Street	**32**	**3**
Hingham Center	**31**	**T4**
Accord Pond	**31**	**T4**
Prospect Street	**29**	**T5**
McKenna Marsh	**29**	**T5**
Cushing Pond	**26**	**6**
Whiting Street	**25**	**T7**
Foundry Pond	**25**	**T7**
Industrial	**24**	**T8**
Liberty Pole	**24**	**T8**
North Sewer District	**23**	**9**
Summer Street	**22**	**T10**
Plymouth River	**22**	**T10**
Accord Brook	**21**	**11**
Bouve Pond	**19**	**12**
Brewer Pond	**18**	**13**
Wompatuck State Park	**18**	**14**

ES-3 Alternatives Evaluation

A "desktop screening" analysis was used to review preliminary wastewater management options and identify the alternatives with the potential to provide reliable, cost effective, long-term wastewater management solutions for the Town of Hingham. The alternatives surviving this preliminary screening process are subjected to a detailed analysis. The detailed analysis includes an assessment of environmental, technical, financial, and institutional considerations. Additional analysis factors include reliability, complexity, ability to implement, along with capital and operating costs. The recommended plan resulting from this evaluation is a combination of elements from more than one alternative.

The Hingham Comprehensive Wastewater Master Planning Committee considers all study areas as a priority, however, the committee identified a need to further classify the study areas. The consensus of the group was to classify areas with a score of 36 to 29 as " High Priority", areas with a score of 26 to 21 as " Priority" and areas with scores below 21 as "Low Priority".

Neglecting the North Sewer District ("NSD") & Weir River Sewer District ("WRSD") study areas, and combining adjacent study areas due to relative priority and location to take advantage of economy of scale considerations, the top five needs areas (and the 7th) are located in the central portion of Hingham. These study areas are (in descending order of priority):

- Fulling Mill Brook
- Gardner Street
- Hingham Center
- Accord Pond
- Prospect Street
- McKenna Marsh, and
- Foundry Pond

Since it is unlikely that this Comprehensive Wastewater Management Plan (CWMP) will result in a structural solution for the entire community, the screening and detailed alternatives analysis will focus on the priority needs areas (identified above) with the remainder of the study areas continuing to rely on individual Sanitary Disposal Systems (SDSs) along with a form of enhanced management. The alternatives for wastewater management include:

- No Action
- On-Site systems with enhanced management
- De-centralized Treatment and Disposal
- Centralized Treatment and Disposal

For alternatives other than the "No-Action" alternative, continued use of on-site systems is considered feasible for the study areas ranked below the "high-priority" needs areas, either with or without enhanced management. For the "high-priority" needs areas, it is likely that the recommended plan of action will include a combination of more than one management alternative due to the options that are available to the Town of Hingham. These various alternatives are applied to the high-priority needs areas as discussed with the Hingham Sewer Commission to form the basis for further evaluations.

Alternative 1 – "High Priority" Needs Areas to North Sewer District (NSD), continue current extent of WRSD, and the remainder of Town relies on continued use of on-site SDSs with enhanced management.

Alternative 2 – "High Priority" Needs Areas connected to a De-Centralized Treatment and Disposal system, continue current extent of NSD & WRSD, and the remainder of Hingham relies on continued use of on-site SDSs with enhanced wastewater management. (Same as Alternative 1 except using de-centralized treatment and disposal for high priority needs areas)

Alternative 3 – Maximize Hull Treatment Facility. Examine potential for connecting Hingham Center, Summer Street ("Worlds End") and Foundry Pond study areas through WRSD, continue current extent of NSD, and remainder of Town relies on continued use of on-site SDSs with enhanced wastewater management.

Alternative 4 - Maximize use of Rockland Treatment Facility. Examine potential for connecting Accord Pond & Industrial study areas as part of a regional wastewater management solution. Continue current extent of NSD and WRSD. The remainder of town relies on continued use of SDSs.

Alternative 5 – Foundry Pond to be served by a De-Centralized treatment and disposal system, North Sewer District remains at its current extent, and remainder of Hingham relies on continued use of on-site SDSs w/enhanced wastewater management.

Alternative 6 – Sewer the "unsewered" portion of Hingham through expansion of the North Sewer District (MWRA).

Alternative 7 – "No Action".

A comprehensive evaluation of each of the alternatives is presented in Section 3 including a review of impacts and mitigation, advantages and disadvantages and costs. The following table presents a summary of the costs of each of the alternatives evaluated in this section. Costs range from a low of $65.08M to a high of $224.03M.

Alternatives

No.	Description	Opinion of Probable Cost
1	Sewer High-Priority Needs Areas through MWRA, WRSD remains at current extent, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$146.62M
2	De-Centralized Treatment and Disposal for High-Priority Needs Areas, WRSD remains at current extent, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$224.03M
3	Expand WRSD to include Foundry Pond Needs Area, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$86.25M
4	No Further Review	-----
5	De-Centralized Treatment and Disposal for Foundry Pond Needs Area, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$85.65M
6	Expand NSD and Sewer all of Hingham through MWRA	$195.2M
7	No-Action (continued use of on-site SDSs.	$65.08M

ES-4 Selected Wastewater Management Alternatives

The Hingham Sewer Commission and the Comprehensive Wastewater Management Committee jointly decided that a refined set of area sensitive alternatives be developed and evaluated. These alternatives were selected based on both historical knowledge of the areas, citizen input, perceived implementability, economic benefit and other pertinent information.

A combination of alternatives which were included in Section 3 was modified to address the needs of certain areas in Hingham. Alternatives are evaluated to identify the most promising alternatives based on established criteria, direct and indirect environmental impacts, likelihood of implementation from a regulatory and public acceptance point of view, cost, and institutional issues required to implement the

proposed plan. The listing of alternatives presented below is listed in order of priority. The following areas were brought forward for this refined evaluation:

Central Street – This area includes portions of two of the "high-priority" needs areas as well as another "priority" area. The location of the Central Street project adjacent to the North Sewer District (NSD) makes this area of Hingham a candidate for investigating the potential to expand the NSD and sewer this area through the Massachusetts Water Resources Authority (MWRA).

Foundry Pond – Expand the Weir River Sewer District (WRSD) to include this needs area or implement a De-centralized solution. Residents of this area have been seeking a solution to wastewater management issues.

Summer Street (Northern) Martin's Lane – This area has been identified by the Hingham Board of Health and both Hingham planning groups as requiring an off-site structural wastewater management solution. Detailed Evaluation of this needs area will include expansion of the WRSD, connection to MWRA, and implementation of a De-Centralized Solution.

Liberty Pole – The Needs Assessment found this area demonstrated significant need for a wastewater management solution. The scoring system initially positioned this study area as a "priority" needs area. This study area scored very highly in categories of Lot Size, Nitrogen Loading, Stressed Basin, and prevalence of Aquifers and Floodplain. Detailed evaluation of a De-Centralized Solution will be evaluated for this needs area.

Industrial Park– This area of Hingham contains a significant portion of Hingham's Industrial zoned properties and currently experiences difficulties with on-site system operation. For socioeconomic reasons, this area is included for detailed evaluation of centralized sewer through Weymouth (and MWRA), and implementation of a De-Centralized program for the Industrial Park.

Areas Outside the Selected Areas - The remainder of Hingham outside of the five selected areas outlined above will be considered for continued use of on-site systems with enhanced management.

A detailed description of the alternatives and the analysis is presented in Section 4. A summary of the costs of each option is presented in the following table.

Alternative	Opinion of Probable Cost
Central Street Area	$10M
Foundry Pond Area	$15-22M
Summer Street (Martin's Lane)	$10M
Liberty Pole	$25M
Industrial Park	$22M

ES-5 Recommended Plan

The recommended plan presented below balances wastewater management needs along with economic and other factors to best suit Hingham's future. The recommended plan consists of installing a centralized wastewater collection system in the Industrial Study Area. The limits of the area have been modified slightly from the boundaries identified in previous sections of this report with the primary intent of including all industrial and commercially zoned land in this portion of Hingham south of Route 3. In general terms the Industrial Park Sewer District is a commercial and industrial zoned area in the southwest corner of Hingham located adjacent to Weymouth and Rockland along Route 3. The remainder of Hingham not in the current or proposed sewer districts will continue to be served by on-site sewage disposal systems with an enhanced management program.

The existing base flow for the area is approximately 150,000 gallons per day. Estimates of proposed flow include future development and redevelopment of the area. When created, the proposed Industrial Park Sewer District will discharge to a new wastewater treatment facility in the proposed sewer area. The facility will include a treatment plant with a groundwater discharge.

ES-5.1 Industrial Area Collection System

The proposed industrial park area collection system consists of a network of gravity sewers, pump stations and force mains. The collection system includes approximately 10,500 linear feet of 8-inch gravity sewer, 5 pump stations, and 11,100 linear feet of force main. A separate Phase 2 may be constructed in the future in the industrial park area north of Route 3. Figure ES-4 show the industrial park area and the proposed collection system.

A potential wastewater disposal site has been identified by the town within the industrial area. The 4.1 acre site is presently undeveloped and is located adjacent to Route 3. Some initial investigations performed by the town have indicated that the site may be appropriate for wastewater disposal, however additional investigations are recommended. A proposed packaged treatment facility will be constructed on this lot. The facility will meet treatment levels as required for a ground water discharge including a nitrogen limit of less than 10 mg/L.

ES-5.2 Impacts and Mitigation

Potential impacts and mitigation of the recommended plan, construction of a decentralized sewer system to serve the industrial sewer area with a treatment facility and groundwater discharge have been assessed. Impacts include environmental and institutional impacts such as Surface and Groundwater Quality, water supply, air quality, noise levels, wetlands and floodplain, water balance, other sensitive environmental areas, connection to MWRA, and growth management. The majority of the institutional impacts will be addressed as part of the ENF submission and project implementation.

Town of Hingham Industrial Park Conceptual Sewer Plan

CDM

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Basemap: USGS Color Ortho Imagery (2008); 30cm
Source:MassGIS and the Town of Hingham
Coordinate System: NAD83 Mass. State Plane
Mainland (meters)

0 450 900 1,800 Feet

Figure ES-4

Hingham Industrial Park Study Area

ES-5.3 Summary of Implementation Costs

The estimated costs for implementation are summarized below for the recommended plan. Costs include construction of the new sewer district, implementation and mitigation costs, and other estimated costs. An estimated cost has also been included for on-site soil disposal system (SDS) repairs and management. The cost for on-site systems has been developed in detail earlier in this report and includes costs for construction and repair of systems (including innovative/alternative systems) and a present worth cost to operate and maintain all on-site systems in areas that will not be served by the sewer system.

Industrial Park Collection System – Estimate of Probable Cost

Item	*Unit*	*Unit Cost*	*Cost*
Sharp Street Pumping Station	1	$150,000	$150,000
Sewer (lf)	1,665	$150.00	$249,750
FM (lf)	2,475	$100.00	$247,500
Abington Street Pumping Station (to Ind. Park Rd.)	1	$150,000	$150,000
Sewer (lf)	3,690	$150.00	$553,500
FM (lf)	1,900	$100.00	$190,000
Pond Park Road Pumping Station (to Commerce)	1	$150,000	$150,000
Sewer (lf)	960	$150.00	$135,000
FM (lf)	2,160	$100.00	$216,000
Industrial Park Rd Pumping Station (to Commerce)	1	$250,000	$250,000
	3,285	$150.00	$492,750
FM (lf)	1,170	$100.00	$117,000
Commerce Rd. Pumping Station (to WWTP)	1	$250,000	$250,000
Sewer (lf)	900	$150.00	$135,000
FM (lf)	3,400	$100.00	$340,000
Construction (rounded)			$3,626,500
20% Contingency			$725,000
Subtotal			**$4,351,500**
Engineering & Implementation (30% of Subtotal)			$1,300,000
Total			**$5,651,500**
Total with Escalation 3%/yr for 3 yrs			**$6,200,000**

Phase 1 Treatment Facility – Estimate of Probable Cost

Item	Cost
Decentralized Treatment Facility	
Equipment, tanks, and appurtenances	$6,500,000
Subsurface Disposal System Allowance	$300,000
Subtotal	$6,800,000
Construction Contingency (25%)	$1,700,000
Total Construction Cost	$8,500,000
Escalation to midpoint of construction	$9,300,000
Engineering and Implementation (20% of Subtotal)	$1,900,000
Land Acquisition / Easements (Allowance)	$300,000
Total	**$11,500,000**

ES-5.4 Financial and Implementation Plan

A preliminary review has been performed to present options for financing the proposed project including betterments and property taxes. The range of options includes a 100percent betterment for area properties to a mix of betterement and town participation. The final financial plan will be developed in the next phase of this project.

A plan has also been developed for implementation of the recommended plan that follows submission of this CWMP report. Major elements of the plan include submission of the Environmental Notification Form (ENF), performing hydrogeological investigations at the proposed disposal site, submission of a funding application to the DEP and other preliminary design related tasks.

ES-6 Steering Committee Comment & Recommendations

The Comprehensive Wastewater Management Plan (CWMP) has been produced through extensive deliberation by a broad cross-section of town boards and committees (as well as the general public) over a discrete period of time. The Wastewater Master Planning Committee "the Steering Committee" is proud of the work and dedication from the Hingham residents and consultants that went into developing this plan. Hingham's unique composition, which includes two distinct municipal sewer systems, isolated business regions, state parklands, a mix of historic, clustered and stately residential neighborhoods, and recognized environmental challenges, exemplified the true nature of 'comprehensive' that permeates this plan.

The CWMP is a reflection of analysis and priorities associated with town development and development policy within this time frame. The Steering Committee recognizes that there may be future circumstances where decisions that affect the town's wastewater management posture arise, but which have not

specifically been anticipated at this time. The various jurisdictional responsibilities involved in implementing wastewater-related policies, a set of core wastewater principles, and a number of targeted recommendations that may assist town officials and the general public in framing, evaluating and reaching such decisions in the future. Town agencies that are responsible for items in the implementation include the Sewer Commission, Planning Board, Board of Health, Conservation Commission, and the Public Water Supplier.

Section 1
Introduction to the Recommended Plan

1.1 Background

The Town of Hingham, Massachusetts, through its Sewer Commission and Comprehensive Wastewater Management Planning Committee, has developed a Comprehensive Wastewater Management Plan (CWMP). The objective of the plan is to assess existing wastewater disposal practices in Hingham (Phase 1) and to identify and recommend a plan for future disposal needs in the future (Phase 2).

Phase 1 of this project presents needs analysis including an evaluation of the existing conditions in Hingham. Existing population and wastewater flows were developed to establish current baseline conditions. Population and wastewater projections were also developed for the 20 year planning period. A set of criteria were developed in order to evaluate the wastewater needs of individual areas of town. Criteria included lot size, soil and groundwater conditions, proximity to sensitive areas such as public water supplies, wetlands and areas of critical environmental concern. Metrics were developed under each of these criteria to permit a quantification of need. Nineteen individual study areas were evaluated based on the set of criteria. Areas with existing wastewater collection and disposal systems and areas with private on-site disposal systems were evaluated and ranked based on need. The Phase 1 Needs Analysis Report summary is included in Section 2 and a full copy of the report is bound under a separate cover as Appendix A.

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Section 2
Summary of Phase 1 Comprehensive Wastewater Management Plan

2.1 Introduction

The Phase 1 Comprehensive Wastewater Management Plan (Phase 1 CWMP) was prepared by CDM and submitted to the Sewer Commission in March 2007. A copy of that report was also submitted to the Massachusetts Department of Environmental Protection (DEP) for review and comment. This section summarizes the pertinent information presented in that report that is necessary for understanding the concepts and recommendations of Phase 2 of the CWMP. This summary includes a description of the existing and future conditions, an assessment of needs for wastewater disposal, and a ranking of the needs areas based on several environmental criteria. The full Phase 1 CWMP is included in Appendix A bound under a separate cover.

2.2 Assessment of Current and Future Conditions

2.2.1 General

The Town of Hingham is a suburban coastal community located approximately 15 miles southeast of Boston, MA and covers an area of approximately 22.5 square miles. Hingham is bordered by the communities of Weymouth, Rockland, Norwell, Hull, and Cohasset. An area map of Hingham is shown on Figure 2-1. Hingham is considered to be residential in nature but does have a vibrant commercial and economic zone centered around the downtown area and the harbor front. With 21 miles of coastal shoreline, the town actively maintains its seaside character and its proud history. Hingham's 2001 Master Plan was used as a source of information during the preparation of this portion of the report. The Master Plan was prepared by John Brown Associates Inc. and was presented to the Town in December, 2001. The Master Plan is a statement of public policy to guide decision-making for future development of the town, and represents a shared vision for the town's future.

2.2.2 Population

The 2000 census lists Hingham's population at 19,882. The official Hingham website shows that the population in 2004 was listed as 20,720 persons. Population growth is expected throughout the planning period of this study, and it is important to establish this baseline population as a starting point for comparison with later parts of this study.

2.2.3 Existing Wastewater Treatment and Disposal Methods

The Master Plan identifies wastewater disposal as an issue to be resolved especially in South Hingham. Northern Hingham, including much of the downtown area, is connected to wastewater collection systems operated by the Massachusetts Water Resources Authority (MWRA), or the Town of Hull. The MWRA connection serves the majority of properties within the North Sewer District (NSD) located in the northwest portion of Hingham. The wastewater from properties within the Weir River Sewer District (WRSD) is conveyed to Hull.

COHASSET

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228

228

228

53

3

Legend

- Limited Access Highway
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Town of Hingham
Comprehensive Wastewater Management Plan

CDM

N W E S

0 2,000 4,000 8,000 12,000 Feet

Figure 2-1

Hingham Area Map

The developed areas within the remainder of Hingham rely on individual on-site sanitary disposal systems (SDSs) for wastewater treatment and disposal. A large portion of this area also serves as water recharge areas for Hingham and for neighboring communities of Weymouth, Abington, and Rockland.

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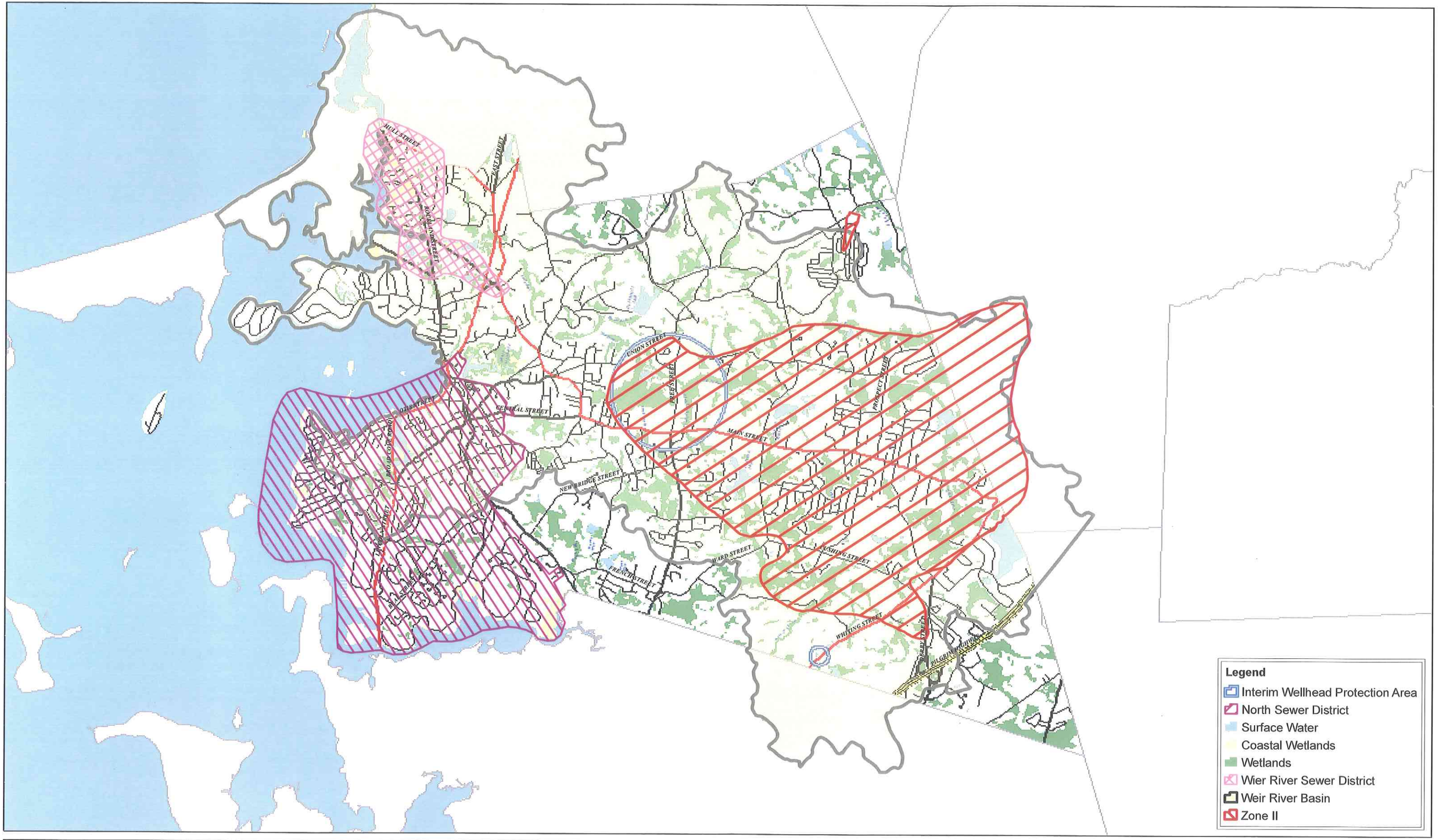
The Aquarion Water Company is the registered Public Water Supplier for the Hingham-Hull water district which includes all of Hingham and Hull and parts of Cohasset and Norwell. The aquifer that is the source of the public water supply is located largely within Hingham and within the Weir River Basin. Water that leaves the basin (through MWRA or Hull sewer systems) is not available to recharge the aquifer. A significant portion of Hingham is located within the Weir River Basin as defined in 310 CMR 4.00 Massachusetts Surface Water Quality Standards. The Weir River and Accord Brook are both included in this designation. The Weir River is classified as a High Stressed Basin by the Massachusetts Water Resources Commission.

Figure 2-2 shows the two sewer districts in Hingham, the aquifer and water supply sources and the boundary of the Weir River Basin.

2.2.4.1 Water Supply and Distribution Summary

Aquarion Water Company completed a Water Supply and Distribution Study in 2007. A summary of the report and recommendations has been provided by Aquarion and is included below.



Town of Hingham
Comprehensive Wastewater Management Plan

CDM

0 2,000 4,000 8,000 12,000 Feet

Figure 2-2

Water and Wastewater Divides

Adequacy of Existing Water Supply Sources

In 1987, the Water Management Act (WMA) program was implemented by MassDEP to regulate withdrawal of water from the state's watershed basins. Under this program, all new and existing sources withdrawing more than 100,000 gpd are required to obtain a withdrawal permit under the WMA. When the WMA was first implemented, existing water systems were allotted a "registered amount" they could withdraw. This amount was the average amount the water supplier had withdrawn during the 1980-1985 period. Any withdrawals above that "registered amount" would require a permit. The Hingham- Hull Water district's maximum DEP approved withdrawal rate is 6.71 mgd but it cannot withdraw more than its registered amount of 3.51 mgd without a separate permit. In 2007 Average Daily Demand (ADD) was 3.72 and Maximum Daily Demand was 5.96. Projected ADD and MDD for 2025 are 4.12 mgd and 7.25 mgd. Since that average would exceed the allowed registered amount, Aquarion would need to obtain a permit withdraw sufficient water to satisfy anticipated demand over its current Registered Amount of 3.51 mgd. In considering applications for permits, the WMA looks at both environmental impact and requirements for continued and sustainable economic development.

The current Hingham/Hull system is comprised of seven supply sources and one emergency source. The total allowable withdrawal rate from existing sources is approximately 6.71 mgd without the emergency source Free Street Well No. 4. The Average Day Demand (ADD) and Maximum Day Demand (MDD) in 2007 were 3.72 mgd and 5.96 mgd, respectively. The projected ADD and MDD for the year 2025 are 4.12 mgd and 7.25 mgd, respectively.

According to Ten State Standards, suppliers must be capable of meeting two components in order to be considered adequate; the maximum pumping rate of the active sources must be greater than or equal to (1) the projected MDD and (2) the projected ADD with the largest source off-line. The system's total combined yield of the active supply sources is approximately 6.33 mgd, compared to the projected MDD in 2025, a deficit of 0.92 mgd is estimated. Free Street No. 2 is the largest source based on sustainable yield, therefore, the available pumping rate while the largest source is off-line is 4.53 mgd. Compared to the projected ADD, a surplus of 0.41 mgd is estimated.

In order to eliminate this predicted deficit, the 2007 Water Supply and Distribution System Study recommended a phased approach to maximize production of existing supply sources and augment the current supply with new sources or water purchase. The first phase, to maximize production at several wells to satisfy current demands, has been completed. The second and third phase will improve source management and augment the current supply through potential new source development and water purchase.

Phase I
Several higher capacity supply wells within the system have experienced a gradual reduction in pumping capacity over the years. In an effort to restore capacity to these wells, Aquarion recently installed replacement wells at the Scotland Street Well, Free Street No. 2 Well and the Fulling Mill Well. As a result, each well site capacity was restored to the MassDEP approved withdrawal rate. Prior to the installation of the replacement wells, the total available capacity of the existing sources was approximately 3.85 mgd. The current total available yield was increased to 6.33 mgd with the additional of the replacement wells.

Phase II
Following the maximization of existing sources, additional supply must be obtained to satisfy the projected demands in 2025. The goal of Phase II consists of exchanging production between Free Street No. 2 and Free Street No. 4. MA DEP approved this exchange in November 2008.

Free Street No. 4 has an approved safe yield of 0.81 mgd for emergency production only. Historical records indicate better water quality at Free Street No. 4 than Free Street No. 2. This may be due to Free Street No. 4 being constructed to a greater depth than Free Street No. 2. Aquarion is now utilizing Free Street No 4 and the new Free Street 2A as permanent sources and has increased the yield to 1.3 mgd. Free Street #2 has been made an emergency source. This approach does not increase the withdrawal rate from the sub-basin, only changes the point of withdrawal to Free Street No. 4 and 2A, rather than Free Street No. 2 and 2A. However, changes to the existing infrastructure, installation of new pumps and completion of various permits would be required to complete this portion of Phase II.

Phase III
Phase III incorporates longer term alternatives to supplement current system capacity. The following alternatives include the development of a new source and water purchase from adjacent and nearby water wholesale sellers. Each water purchase alternative would require an agreement between Aquarion and another utility or private entity to meet the projected system demands. Further, new infrastructure and potentially water treatment would be required to transport and treat purchased water to the Hingham-Hull system.

New Source Development
In accordance with MassDEP guidelines, the development of a new source consists of four stages. The exploratory stage is for review of existing available information, evaluation of potential sites and installation of test wells. The second stage includes preparation and submittal of the request for site exam, alternatives analysis, land use survey and pumping test proposal. After approval by the MassDEP, the third stage is to complete a five-day pump test and accompanying pump test report to be submitted to the MassDEP for review. The final stage consists of the design of the pump and associated water main from the source well to the system. A Water Management Act permit is required when the total withdrawal volume is greater than 100,000 gpd. In

addition, all new sources will require the completion of an Environmental Notification Form (ENF) to be submitted to the Massachusetts Environmental Policy Act Office for review and public comment.

Permitting for new source development is a time consuming and costly process depending on the location and potential impact on the environment. In addition, the process does not guarantee that sufficient yield and quality will be found or that Aquarion can obtain ownership of the Zone I radius. In general, the permitting and development process could take up to five years to complete. In addition, water treatment may be required, which will increase the time and cost of the project.

The United States Geological Survey (USGS) potential aquifer yield potential maps were reviewed to identify potential well site locations within town boundaries. The areas of reasonable yield currently host one or more active supply wells. Additional gravel packed wells in these subbasins could strain these areas. Therefore, a fracture trace analysis was conducted to identify potential bedrock well locations. This type of well would withdraw water from a deeper aquifer, not immediately connected to the shallower aquifer supplying current gravel packed wells. A new bedrock supply well is permitted in the same manner as sand and gravel sources, and is constrained by the results of pump testing and MassDEP approval.

Several sites were identified during the fracture trace analysis as potential supply well locations, however, a pumping test would be required to determine the yield. The sites are located within the South Coastal Basin and the property is owned by the Massachusetts Department of Conservation and Recreation (DCR). Obtaining access to these areas may prove extremely difficult as DCR does not favor development on agency owned land. Additional evaluation will be conducted on potential sand and gravel sources and bedrock wells at existing well sites as well as appropriate locations within the service area.

MWRA Connection

The MWRA currently provides wholesale water to approximately 50 communities throughout Massachusetts. The closest area for Aquarion to connect to the MWRA system is the City of Quincy, Massachusetts. This would require the construction of approximately two miles of water main along Route 3A and a new pump station.

Interconnection to Cohasset

All current supply sources should be maximized and potential sites investigated prior to seeking water sources across town boundaries. The Town of Cohasset currently operates and maintains the Aaron Reservoir as a water supply source. Currently, system demands only require the Town to utilize a portion of the permitted withdrawal rate. In addition, preliminary estimates indicate that a surplus of approximately 1.0 mgd may exist through 2025 based on projected demands in Cohasset.

Desalination Plants
Currently, the Town of Hull is conducting a feasibility study regarding the construction and operation of a desalination plant. This improvement would reduce the demands on Aquarion system and offer a potential long-term option for supplement supply. However, this option is still in the planning and discussion phase.

A desalination plant is also proposed by Aquaria Corporation and Bluestone Energy Services in the Town of Dighton, Massachusetts. In order for Aquarion to obtain water from this plant, approximately one mile of new 20-inch diameter water main would need to be constructed from Dighton to Brockton. Brockton would then transmit the water through existing infrastructure to Hingham.

2.2.5 Surficial Geology

Subsurface areas with sands and gravels exist in central and southern Hingham within the Weir River basin. These subsoils allow the aquifer to recharge quickly. A significant portion of the remainder of Hingham is underlain by till and bedrock. Till and bedrock deposits are poor soils that limit long-term use of on-site disposal systems.

The November 2002 Massachusetts Department of Environmental Protection (DEP) Source Water Assessment and Protection Report (SWAP) indicates the water supply aquifer has a high vulnerability to contamination due to the absence of a hydrogeologic barrier. Although glacial till and bedrock are common subsoils in Hingham, existing subsoils in the Weir River basin are mostly sand and gravel that allow for rapid contaminant migration.

2.2.6 Future Conditions

2.2.6.1 Population Projections

The population growth rate for Hingham, as estimated by the Metropolitan Area Planning Council (MAPC), averages approximately 0.8% per year. Table 2-2 shows the population projections for Hingham up to year 2025.

Table 2-2
Residential Population Projection to the Year 2025

Residential Population Projections						
Year	1990[1]	2000[1]	2004[2]	2010[3]	2020[3]	2025[4]
Population	19,821	19,882	20,720	24,692	25,228	25,432
Increase % (from previous)		0.3	4.2	19.2	2.2	0.8

1. Source: 1990 and 2000 data from US Census.
2. Source: 2004 data from Town of Hingham Website
3. Source: 2010 and 2020 data from MAPC projection data released Jan. 31, 2006
4. Source: 2025 data derived from MAPC projections of 2020 and 2030.

2.2.6.2 Projected Wastewater Flow

CDM has projected town-wide wastewater flow volume for the year 2025. The total volume determined below represents wastewater flow from all sources, including development, projected to the year 2025. The summary of Town-wide wastewater flows (3.72 mgd) at the end of the planning period is shown in Tables 2-3 and 2-4 below:

Table 2-3
Town-wide Projected Wastewater Flow (2025)

Study Year Projection Entire Town of Hingham	*Source*	*SF*	*Housing Units*	*Population*	*Flow Factor (gpd)*	*Total Flow (gpd)*
Residential (Single-family)	MAPC Population		7,586	22,455	330 per h.u.	2,503,429
Residential (Multi-family)	Master Plan		1,488	2,977	220 per h.u.	327,426
Institutional	Master Plan			5,900	varies	92,326
Industrial	Master Plan	4,230,948			36 per 1,000 sf	152,314
Commercial	Master Plan	8,593,691			75 per 1,000 sf	644,527
TOTAL ESTIMATED TOWN OF HINGHAM WASTEWATER FLOW PROJECTION (2025)						**3,720,022**

1. Residential growth based on MAPC population projections and 2.96 people per housing unit.
2. Multi-family residential projected at 10 percent increase due to limited appropriately zoned land.
3. Institutional includes schools and municipal structures. School growth based on 15 percent increase in school aged children. Allowance made for municipal structures with 24 percent growth.
4. Industrial and Commercial growth based on 1 percent per year for 24 years.
5. Entire town of Hingham included in this flow projection summary.

Table 2-4
Summary of Future Wastewater Flows

Component of Wastewater Flow	*Total Flow (gpd)*
Total North Sewer District wastewater flow projection (year 2025)	1,230,959
Total Weir River Sewer District wastewater flow projection (year 2025)	101,280
Total wastewater flow for remainder of Hingham (year 2025)	2,387,783
Total Town of Hingham wastewater flow projection (Year 2025)	**3,720,022**

2.3 Needs Analysis

2.3.1 Introduction

The purpose of this section is to identify and prioritize areas of need in the Town of Hingham for wastewater management solutions. The analysis divided Hingham into smaller study areas based on geography, topography, soil characteristics, groundwater conditions and other criteria An evaluation and ranking of each study area was then performed based on a set of criteria developed to assess the need for wastewater management. The results of this needs analysis will be used to develop recommendations to address these wastewater management needs in Phase II of this study.

2.3.2 Study Areas

Delineation of the Study Areas was intended to create manageable sections of Hingham, with relatively homogenous characteristics, to be assessed against criteria for determining wastewater management need. The Study Area boundaries follow property boundaries or include developed portions of lots so these areas may be analyzed with the goal of formulating a long-term wastewater solution for those properties. In this way, roadways generally do not form study area boundaries. The division into study areas was the result of visual review of information already accumulated, and no detailed analysis was used to complete this step. The North Sewer District, Weir River Sewer District, and Wompatuck State Park were assigned their own Study Areas for consistency with the remainder of the community as part of a comprehensive wastewater management solution. Table 2-5 shows the list of Study Areas, and Figure 2-3 shows the boundaries of the Study Areas in Hingham.

Table 2-5
Hingham Study Areas

Study Area #	*Study Area Name*
1	North Sewer District
2	Summer Street
3	Weir River Sewer District
4	Brewer Pond
5	Hingham Center
6	Foundry Pond
7	Accord Brook
8	Bouve Pond
9	Cushing Pond
10	Fulling Mill Brook
11	Plymouth River
12	Liberty Pole
13	Prospect Street
14	Whiting Street
15	Gardner Street
16	McKenna Marsh
17	Industrial
18	Accord Pond
19	Wompatuck State Park

2.3.3 Needs Analysis Criteria

Specific criterion was developed to evaluate individual study areas within the town. The assessment included the preparation of a "Needs Evaluation Matrix" including a score for each criterion. The fourteen criterion chosen to evaluate each study area are presented below:

- Distribution and prevalence of small lot size
- Nitrogen Loading
- Zone I of public water supply
- Zone II/Aquifer Protection Zone of public water supply
- Interim Wellhead Protection Areas (IWPA)
- Within 200' Buffer zone of surface water supply
- Prevalence of wetlands

COHASSET

NORWELL

HULL

1
North Sewer District

2
Summer Street

3
Weir River
Sewer District

4
Brewer Pond

5
Hingham Center

6
Foundry Pond

7
Accord Brook

8
Bouve Pond

9
Cushing Pond

10
Fulling Mill Brook

11
Plymouth River

12
Liberty Pole

13
Prospect Street

14
Whiting Street

15
Gardner Street

16
McKenna Marsh

17
Industrial

18
Accord Pond

19
Wompatuck Park

WEYMOUTH

ROCKLAND

Legend
- Study Areas
- Parcels
- Water Bodies

Town of Hingham
Comprehensive Wastewater Management Plan

CDM

N W E S

0 2,000 4,000 8,000 12,000 Feet

Figure 2-3
Study Area Map

ASE CAMDFSNGP31 Projects\Hingham_Sewer\GIS\MPW\DsrFigure_ES-3.mxd 11/6/2006

- Prevalence of 100-Year Floodplain
- Area of Critical Environmental Concern (ACEC)
- Stressed Basin
- Prevalence of Sand & Gravel
- Prevalence of Fine Silty Material
- Prevalence of Till/Bedrock
- Prevalence of Title 5 repairs/inspection failures

Small lot size and nitrogen loading were chosen from review as small lot size can restrict or limit the ability of a parcel to allow design and construction (or repair) of an on-site system in full compliance with state and local regulations. Further, the density of development is also a function of lot size. Densely developed areas, with large numbers of on-site systems, are a potential threat to groundwater supplies. Even when performing correctly, increased nitrogen loads from on-site systems in densely developed areas can degrade groundwater quality. High nitrate levels in drinking water can have serious health affects in infants less than 6 months of age if they ingest the water. Therefore, extra protections are built into regulations governing areas surrounding drinking water wells and aquifer protection zones.

Using the Hingham Zoning By-Law as a starting point, five lot size ranges were selected for this part of the needs analysis.

Conditions for Grouping Existing Lots by Size

Study Area Condition
Up to and including 10,000 sf
Between 10,001 sf and 20,000 sf
Between 20,001 sf and 30,000 sf
Between 30,001 sf and 40,000 sf
40,001 sf or greater

A goal of this CWMP is to protect and preserve environmental resources and public health. Degradation of these resources can be minimized by protecting the following areas related to public water supply:

- Public water supply Zone I Areas
- Public water supply Zone II Areas

- Interim Wellhead Protection Areas
- Private Well Areas
- Town Aquifer Protection Zones

Prevalence of these environmental resources within each of the study areas can serve to measure the relative importance of these areas to the protection of the water supply.

- Other sensitive environmental receptors are categorized as follows:
- Surface Waters
- Wetlands and Swamps
- Floodplains
- Areas of Critical Environmental Concern (ACEC)
- Stressed Basins

Each resource and associated protective buffer zones have been mapped town-wide and overlaid with Study Area boundaries. The prevalence of these receptors will indicate higher levels of protection needed through the use of an overall wastewater management program.

Determination of wastewater needs cannot be made without understanding the subsurface conditions within those Study Areas. Subsurface conditions that were assessed include general soil permeability and depth to groundwater based on soil type; and prevalence of On-Site system repairs. After mapping the subsurface conditions in Hingham that limit the successful long-term function of an on-site disposal system, the percentage distribution coverage of each condition was scored for each Study Area. Higher scores for these criteria indicate higher limitations due to subsurface conditions.

The assessment of on-site systems with poor performance is also a measurable criterion. While many repairs to on-site systems are driven by property sales and some neighborhoods experience this transition faster than others, this criteria is an indicator of subsurface conditions. Conversely, areas lacking significant numbers of repairs cannot be assumed to possess favorable conditions for continued reliance on on-site systems. Property owners may be simply unaware of the condition of their system.

To categorize the Study Areas for the prevalence of system repairs, Board of Health records were used to determine the type and location of on-site system repairs. Poor system performance was measured by dividing the number of reported repairs by the total number of systems (or existing developed properties).

2.3.4 Needs Assessment Matrix

The total point score for each Study Area is the sum of the Category Scores and will determine the "priority of need" for wastewater management in Hingham. Determination of wastewater disposal need is assessed by assigning a point value to the individual criteria in each of the Study Areas. Points are assigned based on the applicability of the criteria on a scale from one (1) to four (4). A score of one indicates a slight limitation or problem. A score of four indicates severe limitations or problems. A score of zero (0) is used to indicate no problems in a particular category.

The individual criterion scores from this needs evaluation are entered into the Needs Assessment Matrix, Table 2-6, and these scores have been tabulated to obtain a sum for each Study Area.

These Study Area scores are then evaluated in the matrix to determine the areas with the greatest need for wastewater management by overall score and ranking. It is also useful to review the criteria scores individually to identify the regulatory and environmental conditions requiring wastewater management protections. The overall Study Area scores and their corresponding priority ranking are shown in Table 2-7.

These Study Area scores and the priority ranking will be used in subsequent evaluations and assessments of alternatives to formulate an overall wastewater management program for the Town of Hingham. (A "T" in the needs ranking indicates a tie in priority).

Table 2-6
Needs Assessment Matrix

Hingham Comprehensive Wastewater Management Plan

Study Area #	Study Area Name	Lot Size Score	Nitrogen Loading Score	IWPA Score	Zone I Score	Zone II/ Town Aquifer Protection Zone Score	Surface Water Supplies (200' buffer) Score	Wetlands (100' buffer) Score	100- Year Flood Plains Score	ACEC Score	Stressed Basins Score	Prevalence of Sand & Gravel Score	Prevalence of Fine/Silty Material Score	Prevalence of Till/Bedrock Score	Prevalence of System Repairs Score	Total Score
1	North Sewer District	4	3	0	0	0	2	1	2	2	2	2	1	2	2	**23**
2	Summer Street	2	2	0	0	0	1	2	3	1	4	2	1	2	2	**22**
3	Weir River Sewer District	3	3	0	0	0	4	4	4	4	4	4	0	4	1	**35**
4	Brewer Pond	2	1	0	0	0	3	2	2	4	2	0	1	0	1	**18**
5	Home Meadows	4	3	1	1	1	4	2	3	0	4	2	4	0	2	**31**
6	Foundry Pond	2	2	0	0	0	3	1	2	1	4	4	1	4	1	**25**
7	Accord Brook	1	1	0	0	0	1	2	2	0	4	4	1	3	2	**21**
8	Bouve Pond	3	2	0	0	1	2	2	3	1	2	0	1	0	2	**19**
9	Cushing Pond	2	4	1	0	3	3	2	4	0	4	0	1	0	2	**26**
10	Fulling Mill Brook	2	4	4	4	4	3	1	4	0	4	2	1	2	1	**36**
11	Plymouth River	2	1	1	1	2	2	4	4	0	3	0	1	0	1	**22**
12	Liberty Pole	3	4	0	0	4	1	2	3	0	4	0	1	0	2	**24**
13	Prospect Street	2	4	0	3	4	2	1	2	0	4	2	1	2	2	**29**
14	Whiting Street	2	1	1	2	2	3	1	1	0	4	3	0	2	3	**25**
15	Gardner Street	2	4	0	0	4	4	2	4	0	4	3	1	3	1	**32**
16	McKenna Marsh	2	3	0	4	4	2	3	4	0	4	0	1	0	2	**29**
17	Industrial	2	1	0	0	2	1	1	3	0	2	4	1	3	4	**24**
18	Accord Pond	2	2	0	3	1	3	2	4	0	4	4	1	3	2	**31**
19	Wompatuck State Park	0	0	0	1	1	1	2	1	0	3	4	1	4	0	**18**

Table 2-7
Study Area Score and Priority Ranking

Study Area Name	*Final Score*	*Priority Ranking*
Fulling Mill Brook	**36**	**1**
Weir River Sewer District	**35**	**2**
Gardner Street	**32**	**3**
Hingham Center	**31**	**T4**
Accord Pond	**31**	**T4**
Prospect Street	**29**	**T5**
McKenna Marsh	**29**	**T5**
Cushing Pond	**26**	**6**
Whiting Street	**25**	**T7**
Foundry Pond	**25**	**T7**
Industrial	**24**	**T8**
Liberty Pole	**24**	**T8**
North Sewer District	**23**	**9**
Summer Street	**22**	**T10**
Plymouth River	**22**	**T10**
Accord Brook	**21**	**11**
Bouve Pond	**19**	**12**
Brewer Pond	**18**	**13**
Wompatuck State Park	**18**	**14**

Section 3
Alternatives Evaluation

3.1 Preliminary Screening

A "desktop screening" analysis was used to review preliminary wastewater management options and identify the alternatives with the potential to provide reliable, cost effective, long-term wastewater management solutions for the Town of Hingham. The alternatives surviving this preliminary screening process are subjected to a detailed analysis. The detailed analysis includes an assessment of environmental, technical, financial, and institutional considerations. Additional analysis factors include reliability, complexity, ability to implement, along with capital and operating costs. The recommended plan resulting from this evaluation is a combination of elements from more than one alternative.

3.2 Study Area Priority Ranking

The Needs Assessment revealed that many of the higher priority study areas share similar conditions. These study areas were noted to be similar by location, by environmental conditions, and by conditions resulting from developed areas (nitrogen loading and lot density).

Many of the higher scoring study areas are located in the central-south area of Hingham and as such, share common prevalence of wetlands and floodplains, water supply protection areas (Interim Wellhead Protection Areas, Zone I, Zone II, and protective buffers surrounding surface water supplies) and prevalence of nitrogen sensitive areas (relate back to water supply protection areas). These similarities played a role in developing the list of preliminary alternatives.

The Hingham Comprehensive Wastewater Master Planning Committee considers all study areas as a priority, however, the committee identified a need to further classify the study areas. The consensus of the group was to classify areas with a score of 36 to 29 as " High Priority", areas with a score of 26 to 21 as " Priority" and areas with scores below 21 as "Low Priority".

Neglecting the North Sewer District ("NSD") & Weir River Sewer District ("WRSD") study areas, and combining adjacent study areas due to relative priority and location to take advantage of economy of scale considerations, the top five needs areas (and the 7th) are located in the central portion of Hingham. These study areas are (in descending order of priority):

- Fulling Mill Brook
- Gardner Street
- Hingham Center

- Accord Pond
- Prospect Street
- McKenna Marsh, and
- Foundry Pond

These study areas are shown on Figure 2-3.

Since it is unlikely that this Comprehensive Wastewater Management Plan (CWMP) will result in a structural solution for the entire community, the screening and detailed alternatives analysis will focus on the priority needs areas (identified above) with the remainder of the study areas continuing to rely on individual Sanitary Disposal Systems (SDSs) along with a form of enhanced management. The alternatives for wastewater management include:

- No Action
- On-Site systems with enhanced management
- De-centralized Treatment and Disposal
- Centralized Treatment and Disposal

For alternatives other than the "No-Action" alternative, continued use of on-site systems is considered feasible for the study areas ranked below the "high-priority" needs areas, either with or without enhanced management. For the "high-priority" needs areas, it is likely that the recommended plan of action will include a combination of more than one management alternative due to the options that are available to the Town of Hingham. These various alternatives are applied to the high-priority needs areas as discussed with the Hingham Sewer Commission to form the basis for further evaluations.

Alternative 1 – "High Priority" Needs Areas to North Sewer District (NSD), continue current extent of WRSD, and the remainder of Town relies on continued use of on-site SDSs with enhanced management.

Alternative 2 – "High Priority" Needs Areas connected to a De-Centralized Treatment and Disposal system, continue current extent of NSD & WRSD, and the remainder of Hingham relies on continued use of on-site SDSs with enhanced wastewater management. (Same as Alternative 1 except using de-centralized treatment and disposal for high priority needs areas)

Alternative 3 – Maximize Hull Treatment Facility. Examine potential for connecting Hingham Center, Summer Street ("Worlds End") and Foundry Pond study areas

through WRSD, continue current extent of NSD, and remainder of Town relies on continued use of on-site SDSs with enhanced wastewater management.

Alternative 4 - Maximize use of Rockland Treatment Facility. Examine potential for connecting Accord Pond & Industrial study areas as part of a regional wastewater management solution. Continue current extent of NSD and WRSD. The remainder of town relies on continued use of SDSs.

Alternative 5 – Foundry Pond to be served by a De-Centralized treatment and disposal system, North Sewer District remains at its current extent, and remainder of Hingham relies on continued use of on-site SDSs w/enhanced wastewater management.

Alternative 6 – Sewer the "unsewered" portion of Hingham through expansion of the North Sewer District (MWRA).

Alternative 7 – "No Action".

As Phase II of the study concludes, cost recovery models will be prepared for the leading one or two alternatives to illustrate financial impacts to the homeowner. In other projects, cost recovery models include all betterments; and an option where 10 percent is covered by the tax base, 90 percent on betterments; and 30 percent is covered by the tax base, 70 percent on betterments. The latter options are applicable where an overriding public benefit (i.e. protection of public water supply) results from the program. Environmental and secondary growth impacts will be also be discussed to characterize the effectiveness of the alternatives during Phase II of this study.

3.3 Evaluation Criteria

This section includes a discussion of each alternative relative to the following evaluation criteria. Each alternative is evaluated based on a comparison of criteria that are consistent with DEP's Guide to Comprehensive Wastewater Management Planning:

- Environmental Impact and Mitigation Measures;
- Regulatory Compliance;
- Flexibility;
- Reliability; and
- Cost

3.3.1 Environmental Impacts and Mitigation Measures

The adverse and beneficial environmental impacts in the high priority needs areas were evaluated for each alternative. As recommended in the 1996 DEP Guide to Comprehensive Wastewater Management Planning, impacts are divided into direct and indirect categories. Direct impacts are defined as "those directly related to the construction and operation of the wastewater facilities." Indirect impacts are defined as "1.) Induced changes in the patterns of land-use and population growth, and 2.) Effects resulting from those changes in land-use and population growth". Both of these types of impacts can be adverse or beneficial.

Adverse impacts can be mitigated through modifying how an alternative is implemented, instituting a change in an existing by-law, or through coordination with impacted parties. Examples of such mitigation measures for adverse impacts are described below for each alternative.

3.3.1.1 Direct Impacts – Onsite Systems

On-Site Systems - Adverse

Systems that are not regularly inspected or maintained have a greater potential to fail than those receiving regular maintenance. Failing systems pose a threat to public health and the environment. However, implementation of an SDS management program will help to identify poorly functioning or noncompliant systems.

Regardless of a management plan, the Board of Health will need to continue consideration of waivers or variances for many upgraded systems due to lot size limitations, poor soils, and high groundwater.

Because of the high seasonal groundwater level and the required vertical separation under Title 5, many of the repaired systems will include mounded/raised on-site systems with or without retaining walls. These systems are often found to be visually displeasing. In practice, mounded systems are not prevalent in Hingham, which favors the use of I/A technology. Adverse cost impacts are likely in either case.

On-Site Systems - Beneficial

Continued use of on-site system use would continue the status quo and there would be no known direct benefits. A wastewater management program would enforce maintenance, Title 5 and local regulations, and track upgrades for all properties thereby minimizing unknown failures and reducing potential threats to public health and the environment.

3.3.1.2 Direct Impacts – Off-site with a Sewer Collection System

Off-Site with a Sewer Collection System - Adverse

If a sewer collection system is constructed, the possible temporary adverse impacts include local inconvenience and traffic detours, construction noise and dust, soil erosion during excavation, and cutting of trees and vegetation.

Wetland buffer zones could be temporarily impacted during construction if facilities are installed in areas near wetlands or waterways, areas of critical environmental concern (ACEC), and other resource areas.

Off-Site with a Sewer Collection System - Beneficial
Central collection systems will provide a single location for wastewater disposal resulting in a higher level of treatment than on-site systems. Point- and non-point source pollution from on-site systems would be eliminated.

Removing the need for mound systems and retaining walls, property views and aesthetically pleasant landscaping are preserved. Collection system piping is all underground and pumping stations will require attention to siting details.

Abandoning on-site disposal practices, sewage odors caused by poorly performing or failed on-site systems can be eliminated.

3.3.1.3 Indirect Impacts – Onsite Systems

On-Site Systems - Adverse
Soil and site limitations associated with on-site systems will prevent indirect adverse impacts due to growth and expansion of existing infrastructure.

Continued use of on-site systems will prevent growth or expansion in areas where positive growth may be desired (i.e., commercial properties and Hingham Industrial Park).

During the project lifespan additional residential lots could be constructed with current zoning laws and development rates potentially adding to Hingham's population. Commercial and industrial development could also increase. Hingham would see a commensurate increase in traffic generation from this development.

On-Site Systems - Beneficial
Consumers will continue their self imposed water conservation and management due to inherent flow limitations of existing on-site systems.

This alternative will not allow development of vacant property currently considered "unbuildable" because it cannot support a Title 5 septic system, thus preserving private open space.

3.3.1.4 Indirect Impacts – Off-site with a Sewer Collection System

Off-Site with a Sewer Collection System - Adverse
Vacant lots currently unsuitable to support Title 5 disposal systems could be developed.

There would be a loss of existing privately owned open space due to development or increased value of open space properties thus making it harder for the Town to out-bid private developers.

This option would likely encourage expansion of existing homes or even "tear down and build-up" practices thus potentially increasing population.

Additional growth could add to the amount of impervious area thus increasing stormwater runoff volumes. Water quality impacts associated with stormwater runoff would also be of concern in the study area. Furthermore, contaminants associated with automobile use and storage and lawn fertilizers would negatively impact receiving waters. Stormwater mitigation is further discussed in Section 6.

New development resulting from sewer installation would place additional demands on town services including schools and utilities (water, solid waste, electric, etc.).

Future development would also impact traffic congestion. The trip generation rate for single family homes can be as much as 10 vehicle trips per weekday each (as published in Institute of Transportation Engineers "*Trip Generation Handbook*", 7th Edition).

It is possible that new residential housing allowed with the sewer option would further offset the ratio of high to low income housing in Hingham. New development could decrease the percentage of low income housing further below the 10% state threshold and continue to make Hingham more susceptible to the comprehensive permit projects associated with Massachusetts General Laws, Chapter 40b.

Off-Site with a Sewer Collection System - Beneficial
New dwellings and/or commercial and industrial development will add to the tax base and user fee collections that will be used to support facilities and utilities, although tax revenue could be offset by larger municipal expenditures required to sustain services to a larger population.

3.3.1.5 Mitigation Measures

On-Site Systems
There are no mitigation measures for the adverse impacts if the status quo is chosen. However, an SDS management plan would inventory all septic system maintenance; guarantee regular pumping, and other required maintenance activities. The program could then use the information database to identify poorly functioning systems and monitor on-site systems in general. The program would include a public education component to inform participants and encourage compliance with the management plan. Compliance with the management plan can protect the public health and local water resources, protect property values and improve groundwater conservation.

Off-Site with a Sewer Collection System
Many of the direct adverse environmental impacts of collection systems are related to construction. These inconveniences can be greatly reduced through dust reduction measures, work hour restrictions with noise level limitations, advertising and advanced scheduling of detours, and phasing construction areas. Additionally, temporary wetland impacts during construction can be mitigated through

coordination with the local Conservation Commission and the use of specific construction controls such as installation of haybales and silt fences in buffer areas and other erosion and sedimentation control activities.

One way to secure that open spaces are maintained for environmental and recreational use is to continue the Town purchase of available open space land.

Another way to ensure the growth does not exceed current rates is to modify zoning requirements regarding expansion of existing approved structures and development of vacant parcels. The Town may want to explore legal ways to modify zoning to accomplish this, such as re-zoning the open space areas for "estate lots". As an example, in the Town of Fairhaven, zoning was modified to require that no new development could connect to the sewer system unless it could be demonstrated that a Title 5 system could be approved on the parcel; however, this by-law was specifically for FEMA defined "velocity zones" (100-year coastal flood zones subject to velocity or wave action) and not for general zoning. A more liberal application of this type could be investigated for Hingham with the help of legal counsel.

An indirect adverse impact of collection systems is a possible increase in water consumption. The Town and Aquarion can continue to increase water conservation awareness through public education and participation programs and implement a water conservation program.

Increased stormwater volumes due to increased growth could be minimized because unsubdivided parcels would need to comply with MDEP stormwater standards, Conservation Commission regulations, and Planning Board requirements for stormwater detention and prevention of impacts to flood areas and receiving waters.

3.3.2 Regulatory Compliance

Each wastewater alternative will be evaluated against current regulations and standards. The ability of each alternative to meet existing or new regulatory requirements is investigated.

On-Site Systems

The viability of on-site SDSs in the study area being the long-term solution under Title 5 is heavily dependent on:

- Soils Suitability;
- Seasonal High Groundwater Conditions;
- Existing On-Site Disposal System Problems and Pump outs; and
- Required Buffer Areas.

Soils Suitability

The examination of soil types and percolation rates to predict the expected performance of on-site disposal systems is a critical element of Title 5 regulations. The

study area surficial geology and soil types were presented in the Phase I CWMP and are summarized in Section 2.

Groundwater Conditions
Areas with high groundwater conditions would potentially have problems with on-site disposal systems. Title 5 requires a minimum at least four feet between the bottom of an on-site SDS and the seasonal high groundwater level. Five feet of separation is required in locations with rapid permeability (Percolation rates of 2 minutes per inch).

Existing On-Site Disposal System Problems and Pump Outs
One failure criteria identified in Title 5 includes those systems that are pumped out more than four times per year. Based on a review of the pumping records, several systems are pumped out frequently, and some systems may meet the failure criterion.

The Executive Health Officer estimates that approximately 20-percent of existing SDSs consist of cesspools. (Cesspools are not allowed by regulation and are not considered a viable long-term option for wastewater management.

Current conditions suggest that the no-action alternative would not be an optimal solution based on resident problems and unidentified failures. Between 2000 to 2005, at least 167 SDSs have been upgraded or repaired. These repairs or upgrades include significant repairs and/or replacement of the leaching system. Minor repairs such as distribution box leveling or replacement, or piping repairs are not included in this tabulation. Therefore, keeping these systems functional and implementing a management program to identify other systems in need is a viable solution.

Required Buffer Area
Title 5 has established buffer zones for locating on-site disposal systems in the area of surface water bodies, public drinking water wells, and wetlands. The intent is to reduce the impact of on-site SDSs on these areas and, as a result, eliminate the potential for environmental pollution and contamination of drinking water supplies. The regulations require that all new disposal systems be located 50 feet or more from any surface water, and more than 400 feet from a surface water supply reservoir.

The Hingham Board of Health has required several property owners to use Innovative or Alternative ("I/A") systems when upgrading in areas where high groundwater conditions exist. Enhanced treatment protects the groundwater quality in these areas.

The number of systems within the setback limitation of wetlands is unknown.

Off-Site with a Sewer Collection System

Except for sewer use regulations, individual users of a sewer collection system will not have to meet any wastewater disposal requirements such as Title 5. However, Hingham (or other legal entity) must comply with the requirements of a groundwater discharge permit issued by the Massachusetts Department of Environmental

Protection for any De-Centralized systems designed and constructed for use as part of this program.

3.3.3 Flexibility

An alternative is considered flexible if it has the capability to facilitate future development, as well as being capable of modification to meet the needs of the user.

On-site systems, with or without a management plan, do not offer much flexibility. Capacity and flow requirements per bedroom are likely not to be reduced under Title 5. Because of this, additions to homes are difficult, if not impossible to construct without upgrading an on-site system.

Off-site disposal options are a flexible option as they would provide the ability to build additions to homes without the cost of an on-site SDS upgrade. Also, off-site disposal relieves property owners from maintenance, inspections and potential failing on-site SDSs. If regulations changed and additional treatment was needed at the treatment facility, homeowners would not each have to construct or upgrade their system, although they would incur the cost increase of any facility upgrades.

3.3.4 Reliability

On-site systems have an average of a 30-year life span according to vendors and septic system installers. Pumps used in on-site systems usually last seven to ten years before needing replacement. The reliability of on-site systems, primarily cesspools and leaching fields, to perform in poor soils and high groundwater, may be diminished and result in system replacement prior to a systems' design lifespan.

Off-site disposal and treatment is a long-term solution to wastewater disposal problems. Typical life for gravity sewer collection systems and pumping stations structures is approximately 100 plus years and mechanical pumping equipment is approximately 25 to 50 years depending on maintenance and the particular component.

Another benefit is the operation and maintenance. It is presumed that the Town of Hingham (or Sewer District or other legal entity) would be responsible for the operation of the pump stations and sewer collection systems. Homeowners would only be concerned with their connections, and not the treatment and disposal.

3.3.5 Costs

Costs elements in the evaluation of alternatives include construction costs, operation and maintenance costs, and indirect costs such as connection fees and mitigation costs. Some costs such as construction of new collection and treatment systems are readily quantifiable using standard estimating techniques. Other costs such as repair and operation and maintenance of on-site systems, and mitigation costs are more difficult to determine. This section includes information regarding assumptions used for on-site system and mitigation related costs.

On-site Systems

Currently, on-site system repairs are funded privately by each individual owner. The costs of repairs can vary significantly, based on site-specific conditions. Depending on the level of innovation required to site a Title 5 system on a particularly challenging lot, current installation costs can range from $20,000 to $60,000. This allows for significant variability of costs for upgrades, installations, and maintenance throughout the community. Furthermore, there is no cap to the frequency or cost of repairs over the life of ownership. Operational costs for an on-site system include septage pumping and electricity to run pumps (if required).

For septic system construction and repair costs we will consider the following:

New systems (construction cost $25,000)

System Replacement and repairs (construction cost $25,000)

Over the planning period, 30 percent of the new systems will be considered as requiring replacement. One half of these repairs will be considered as requiring Innovative or Alternative (I/A) technology. Tabulation of I/A systems will include construction costs of $35,000. Approximately 30 percent of the recently repaired systems (267 throughout the town over the period of record – 5 yrs.) are also expected to require repeat repairs, with one half of those requiring I/A.

O&M Costs will include pump-out and septage disposal every three years. I/A Systems will also require enhanced monitoring and maintenance, and contracts with licensed operators.

MWRA Entrance Fees and Mitigation Costs

Expansion of the current North Sewer District or connection of any other areas of town outside of the district will require approval from MWRA. The procedure for this connection is extensive and includes many requirements such as special legislation. There is also an entrance fee associated with connection. The entrance fee is intended to cover the new user's fair share of the costs of the sewer system in place at the time of the request for service. In this manner, the entrance fee recovers the proportional share of the sewer system's asset base already paid by the existing system users.

Simple formula as follows:

$$\frac{\text{New Flow}}{\text{Total System Flow}} \times \text{Sewer System Net Asset Value} \quad \text{(3-Year Average)}$$

CDM has reviewed entrance fees from recent connections to identify the likely fee for any new MWRA expansion in Hingham. The entrance fee used in this report is $4.00 per gallon per day of wastewater flow. Flow is computed based on standard DEP approved rates.

The town will also incur other indirect costs associated with connection to the MWRA system. Costs include addressing inflow removal requirements and likely requirements to offset flow transfer out of the Weir River basin.

Inflow reduction is part of the MWRA connection process. Currently MWRA requires a 4 for 1 reduction in inflow for each gallon of new wastewater flow that is added to the system. Depending on the scope of the alternative, the quantity of inflow reduction could be quite high and it may not be possible to completely identify and remove inflow within the town. In some cases it may be necessary to identify and remove inflow in other communities adjacent or downstream to Hingham. The cost of inflow removal is not readily quantifiable. Generally, a community must first identify sources of inflow to be removed and then estimate the cost to perform the necessary work. Hingham has completed several inflow reduction projects in recent years including elimination of sump pump connections and redirection of outdoor drains.

Any new wastewater flow tributary to MWRA from outside the North Sewer District, will be considered an interbasin transfer and will require a permit from the Water Resources Commission. Offset of this transfer is generally required as compensation of this flow. Compensation can include infiltration and inflow reduction, reduction in water use in existing properties, and groundwater recharge.

Allowances for these mitigation costs will be included with each alternative based on assumptions and experience from similar projects. For this report, inflow removal will be estimated at $5 / gallon per day and offset for interbasin transfer will be assumed to be $1/gpd. Actual costs for this mitigation may vary depending on the final outcome.

3.4 Alternatives Evaluation

This section discusses the evaluation criteria as applied to each of the wastewater management alternatives identified in Section 3.1.

3.4.1 Alternative 1 – "High-Priority" Needs Areas to North Sewer District (NSD), continue current extent of WRSD, and the remainder of Town relies on continued use of on-site SDSs with enhanced management.

This alternative is a town-wide wastewater management solution. This section discusses how the "high-priority" needs areas are to be added to the NSD. The service

area of WRSD is to remain at its current extent, and the remainder of Hingham will rely on continued use of on-site SDSs for wastewater treatment and disposal.

North Sewer District (NSD)

The NSD is located in the northwest area of Hingham and is connected to the MWRA sewer collection system through Weymouth. One of the challenges to this alternative is any proposed change to the District boundary requires legislative action and approval from the MWRA and advisory board. This alternative will increase flows to MWRA, and reduce groundwater recharge to the Aquifer.

Weir River Sewer District (WRSD)

The boundaries of the Weir River Sewer District remain at the present extent. At the end of the planning period, flows from WRSD to the Hull system are projected to be 65,000 gpd. All of the homes within the District are considered to be connected at this time, and commercial development within the boundaries of the district has been completed.

Remainder of Hingham

The remainder of Hingham will rely on continued use of on-site SDSs.

Increased development throughout the planning period will not likely compensate for the reduction in flows transferred to the NSD.

Capital costs for this alternative will include construction costs for SDS installations and repairs. Operational and maintenance (O&M) costs will also be considered for existing SDSs and for the large septic systems governed by groundwater discharge permits and DEP. The current system inspection failure rate is approximately 30 percent; this ratio will be used throughout the planning period.

"High-Priority" Needs Area Wastewater Flows

Needs Area	*# of developed residential properties*	*Length of Sewers (ft.)*	*Wastewater Flow (gpcd)*
Fulling Mill Brook	354	29,000	69,000
Gardner Street	219	14,500	49,000
Hingham Center	616	45,510	142,000
Accord Pond	281	24,700	109,000
McKenna Marsh	234	21,150	45,000
Prospect Street	364	32,400	72,000
Totals	**2,068**	**167,260**	**486,000**

Environmental Impacts and Mitigation Measures

The "high-priority" needs areas (Fulling Mill Brook, Gardner Street, Hingham Center, Accord Pond, McKenna Marsh, and Prospect Street) proposed for sewer collection and conveyance to MWRA with this alternative are located within the aquifer and hydraulically upgradient of the water supply wells used for the town's water supply. Failing and poorly functioning septic systems in this area may have potential to adversely affect the water quality within this aquifer. The lot density, small lot size, and shallow depth to groundwater within these needs area will continue to require multiple Title 5 variances for properties seeking to upgrade or repair their SDSs. The threat to the public health and environment will remain unchanged without a plan of action to address wastewater treatment and disposal. For these reasons, this alternative addresses the perceived need to sewer the "high-priority" needs areas as part of a regional solution. A sewer collection system with the enhanced wastewater treatment offered by a centralized treatment facility reduces the need for continued reliance on individual SDSs on small lots.

The sewer collection systems and "off-site" treatment included with this alternative would also reduce the contributions to groundwater recharge to the aquifer.

Regulatory Compliance Factors

The "high-priority" needs areas generally consist of soils with limitations for suitability of SDS construction, most notably the shallow depth to groundwater. The frequency of reported failures and system replacement within these needs areas underscores the recommendation of providing an off-site solution.

Flexibility

On-site systems do not offer much flexibility. With limiting factors such as poor soils, and high groundwater within these "high-priority" needs areas, Title 5 waivers and variances will continue to be required. Centralized treatment and disposal relieves the individual homeowner from inspections and maintenance of failing on-site systems.

Reliability

A centralized treatment system is an effective long-term solution to wastewater disposal problems in the "high-priority needs areas. As previously discussed, the sewer collection system lifespan exceeds the expected operational lifespan of on-site SDSs. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Sewer Commission and MWRA, and not the individual homeowner should this option be implemented.

Costs

Cost elements of this alternative include:

- Construction Cost for Sewer Collection System for "high-priority" Needs Areas
- MWRA Connection Fee

- Mitigation Costs including inflow reduction and offset from interbasin transfer
- Construction, repairs and maintenance costs for continued use of SDSs in the remainder of Hingham

The estimated construction cost to provide a sewer collection system serving the "high-priority" needs areas is presented in the table below. This estimated cost includes excavation, trenching, pipe installation and backfill, trench width paving replacement, and an allowance for ledge and rock removal expected within this needs area. A total of five submersible pumping stations (with emergency generators) are proposed in the preliminary layout. The opinion of probable cost includes allowances for engineering and contingencies consistent with planning level estimates. The projected cost to construct the sewer collection system for this alternative is approximately $85M. Sewer collection piping required for this alternative includes approximately 2,100 linear feet of force main, and approximately 167,000 linear feet of gravity sewer (between 8-in and 24-in. in diameter).

Alternative 1
Sewer Collection System – Opinion of Probable Cost

Item	*Cost (rounded)*
Fulling Mill Brook	$8,758,000
Gardner Street	$2,769,000
Hingham Center	$19,314,000
Accord Pond	$3,537,000
Prospect Street	$5,834,000
McKenna Marsh	$3,055,000
Subtotal	$43,267,000
Contractor's Overhead & Profit (20%)	$8,650,000
Subtotal	$51,917,000
Construction Contingencies (25%)	$12,979,000
Total Construction Cost	$64,896,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs.)	$70,914,000
Engineering and Implementation Costs (20%)	$14,183,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$85,097,000**

Downstream impacts to the MWRA sewer system have not been reviewed at this planning level. Upgrades to the downstream sewer system must be reviewed should elements of this alternative become part of the recommended plan. The proposed sewer collection system connection point for this alternative is the existing upstream endpoint of the MWRA system at the intersection of Water and Main Streets.

Construction costs included in this alternative include all excavation & backfill, piping and bedding materials, pumping station(s) (with standby generator) trench width paving replacement, with allowances for engineering and contingencies consistent with planning level estimates. Operation & Maintenance costs for the new and existing sewer collection systems are paid through user's fees and are not included here.

MWRA Entrance Fee and Mitigation

The MWRA entrance fee for this alternative is estimated to be approximately $1,950,000. In addition to the fee, there will be an inflow reduction requirement based on 4 to 1 reduction. The estimated inflow reduction is 1,944,000 gallons per day. It is not likely that this quantity of inflow reduction is available within the Town of Hingham. The allowance for inflow mitigation is $9,700,000. A 1 to 1 offset for interbasin transfer is estimated a 486,000 gallons per day and an allowance of $490,000 has been included for this work.

SDS Construction and Repair Costs

With this alternative, the unsewered portion of Hingham will continue to rely on individual SDSs for wastewater treatment and disposal. These areas are largely residential (with the exception of the Industrial study area), and include the majority of the available undeveloped land. Using GIS information, there are approximately 2,637 existing residentially developed properties within the unsewered study areas. Residential growth (or ERUs – equivalent residential units) within these unsewered study areas will account for the growth over the planning period. Using current growth trends, 1,084 new SDSs are expected to be constructed over the planning period. These new construction sites are considered to include an individual on-site sanitary disposal system (SDS) in substantial conformance to Title 5 and local board of health regulations. For cost tabulation purposes, the construction cost for a new SDS is considered to be $20,000 each.

From interviews with Board of Health officials, the overall inspection failure rate is approximately 30 percent. Over the planning period covering the next twenty years, an equivalent rate of repairs is considered to continue (as systems will be reaching the end of their useful life) such that 791 more repairs are anticipated over the project lifespan. Of those 791, an additional 30 percent may require repeat repairs (approximately 237 more) or repairs involving more enhanced treatment. For the

repeat repairs one-half (118) will be considered as requiring enhanced treatment or Innovative or Alternative (I/A) treatment and disposal systems.

For the purpose of estimating a capital cost and O&M value, the total number of system repairs equals 1,027 on 3,721 properties. As described above, costs for these repairs are apportioned as follows:

Item	Number	Cost
I/A Technology Systems	118	$4,130,000
System Repair or Replacement	909	$18,180,000
New Construction	1,084	$21,680,000
No Repairs Required (next 20 yrs.)	1,846	$ 0
Total (rounded)		**$43,990,000**

Operation & Maintenance of On-Site Systems
Operational expenses must be considered for the maintenance of systems in the areas to continue with on-site SDSs. The on-site SDSs will require the following costs (shown in the Table below) to operate and maintain these systems.

Annual Operation and Maintenance for Individual On-Site Systems

Item	Number	Cost
I/A Technology Systems[(1)]	118	$70,800
All Other Systems[(2)]	3,603	$360,300
Total (rounded)	**3,721**	**$431,000**

[(1)]$600/yr for treatment and septage disposal every two years.
[(2)]Septage disposal every two years at $200 per pump out and disposal.

Repairs of new construction systems are not included in the repairs tabulation. The on-site SDS O&M cost ($431,000) has a present worth cost of $5.37M (rounded).

Advantages

- WRSD boundaries are not expanded and no new IMAs with Hull and or Cohasset will be required.
- Areas within the Aquifer Protection Zones will have a reliable method of wastewater treatment and disposal.

Disadvantages

- Continued reliance on SDSs will increase potential for increased loads within aquifer of water supply.

- Poorly functioning or substandard SDSs will continue to deteriorate groundwater quality due to lack of treatment and increased nitrogen loading from densely developed properties.
- Removal of SDSs will reduce groundwater recharge to the Aquifer.
- Any proposed change to the NSD boundary requires legislative action for changes to the MWRA system. Additionally, MWRA requires a 4:1 ratio of inflow reduction prior to admittance.
- Interbasin transfer offsets must be considered.

Opinion of Probable Cost

Cost Item	Cost
Sewer Collection System	$85.1M
MWRA Entrance Fee & Mitigation	$12.16M
Individual SDS Construction & Repairs	$43.99M
Individual SDS O&M (Present Worth)	$5.37M
Alternative 1 – Opinion of Probable Cost (rounded)	$146.62M

3.4.2 Alternative 2 – "High Priority" Needs Areas connected to a De-Centralized Treatment and Disposal system, continue current extent of NSD & WRSD, and the remainder of Hingham relies on continued use of on-site SDSs with enhanced wastewater management

This alternative is a town-wide wastewater management solution. This alternative is similar to Alternative 1, however, the "high-priority" needs areas for this alternative will use de-centralized treatment and disposal for wastewater management. This alternative provides for a structural solution for the "high-priority" needs areas". This option includes sewer collection and conveyance, with treatment and effluent disposal at a beneficial site (to be determined). The service areas of NSD & WRSD remains at the current extent, and the remainder of Hingham will rely on continued use of on-site SDSs for wastewater treatment and disposal.

North Sewer District (NSD)

The NSD is located in the northwest area of Hingham and is connected to the MWRA sewer collection system through Weymouth. The boundaries of the North Sewer District remain at the present extent. At the end of the planning period, flows from NSD to the MWRA system are projected to be 757,000 gpcd. All of the homes within

the District are considered to be connected at this time, and commercial development within the boundaries of the district has been completed.

Weir River Sewer District (WRSD)

The boundaries of the Weir River Sewer District remain at the present extent. At the end of the planning period, flows from WRSD to the Hull system are projected to be 65,000 gpd. All of the homes within the District are considered to be connected at this time, and commercial development within the boundaries of the district has been completed.

"High-Priority Needs Areas"

A sewer collection and conveyance system will be provided for the "high- priority needs areas" with this alternative. Suitable site(s) will be evaluated to allow for effective treatment and groundwater disposal of effluent to provide groundwater recharge. It is assumed that the Town of Hingham will be responsible for operation and maintenance of the proposed sewer collection and treatment facilities.

Capital costs for this alternative will include construction costs for sewer collection and conveyance; and treatment and disposal systems. O&M costs will include expenses for operating the treatment facility and collection systems.

Remainder of Hingham

The remainder of Hingham will rely on continued use of on-site SDSs.

Capital costs for this alternative will include construction costs for SDS installations and repairs. Operational and maintenance (O&M) costs will also be considered for existing SDSs and for the large septic systems governed by groundwater discharge permits and DEP. The current system inspection failure rate is approximately 30 percent; this ratio will be used throughout the planning period.

Needs Area	*# of developed residential properties*	*Length of sewer collection System Piping (ft.)*	*# of Pumping Stations*	*Wastewater Flow (gpcd)*
Fulling Mill Brook	354	26,600	2	69,000
Gardner Street	219	14,900	0	49,000
Hingham Center	616	45,800	3	142,000
Accord Pond	281	24,900	0	109,000
McKenna Marsh	234	21,000	0	45,000
Prospect Street	364	30,850	1	72,000
Totals	**2,068**	**164,050**	**6**	**486,000**

The length of the sewer collection system for this alternative differs slightly from the Sewer Collection system for Alternative 1, even though the piping network serves identical areas. For this de-centralized approach, the sewer collection system is designed to collect and convey wastewater to a location within or adjacent to a particular study area. Therefore, the number of pumping stations may differ, and the overall length of the sewer collection system network may also differ from those presented in Alternative 1. This difference will also be reflected in the opinion of probable construction cost.

De-centralized Systems

Potential de-centralized treatment and disposal sites were selected based on three main criteria.

Each needs area was reviewed for likely candidate sites based on whether it was undeveloped, property size, and location. GIS data was used during this screening process. Initial screening criteria used a minimum lot size of 3 acres. This area was chosen based on the estimates for required size of the disposal system, an allowance for the treatment building and reserving buffer areas. Substantially undeveloped properties were also considered meaning a large parcel with either an accessory structure or a building located in the outer periphery of the property. Treatment and disposal is desirable on or proximal to each other for cost purposes.

Using the above criteria, potential sites were reduced to approximately one to three per study area. Secondary screening included more refined criteria for selection as a treatment and disposal site. These criteria include:

- Topographic setting
- Expected soil conditions (suitability of soils and groundwater conditions)
- Proximity to environmental or water supply resources

Topographic setting refers to a site location that allows wastewater conveyance by gravity. Sites located along ridges are likely to be discarded from consideration. Preference is given to sites where sewer collection system(s) convey wastewater by gravity rather than pumping.

Potential disposal sites were compared on the general soil conditions map prepared during Phase 1.

Preference was given to sites further from environmental or water supply resources. For instance, sites within water supply Zone 1 were excluded from further consideration, and preference was given to potential sites that are farther hydraulically from a receiving waterway, wetlands or water supply.

This pcreening process for potential effluent disposal sites resulted in five potential locations. Four of these are used for this alternative, namely in Fulling Mill Brook, Gardner Street, Hingham Center, and Prospect Street.

De-Centralized Treatment & Disposal Site Location	Needs Areas Served	Design Flow (MGD)*
Fulling Mill Brook	Fulling Mill Brook	0.095
Gardner Street	Accord Pond, Gardner Street, and a portion of McKenna Marsh	0.24
Hingham Center	Hingham Center	0.18
Prospect Street	Prospect Street and remainder of McKenna Marsh (not already served in Gardner Street)	0.10

Environmental Impacts and Mitigation Measures

An off-site system is an effective long-term solution to wastewater disposal problems in the study area.

De-Centralized systems can provide effective treatment and replenish the aquifer.

Regulatory Compliance Factors

Permits for the De-Centralized treatment and disposal systems will be administered through DEP.

Flexibility

Continued use of on-site systems is not a flexible alternative.

Reliability

As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham and not the individual homeowner should the off–site option be implemented.

Costs

Cost elements of this alternative include:

- Construction Cost for Sewer Collection System for the "high-priority" Needs Areas
- Construction Cost for De-centralized Treatment and Disposal Facilities
- Construction, repairs and maintenance costs for continued use of SDSs in the remainder of Hingham

Sewer Collection System Costs

Construction costs included in this alternative include all excavation & backfill, piping and bedding materials, pumping station(s) (with standby generator) trench width paving replacement, with allowances for engineering and contingencies consistent with planning level estimates. The projected cost to construct the sewer collection system for this alternative is approximately $79.3M.

Alternative 2
Sewer Collection System – Opinion of Probable Cost

Item	*Cost (rounded)*
Fulling Mill Brook	$9,805,000
Gardner Street	$2,097,000
Hingham Center	$15,614,000
Accord Pond	$3,401,000
Prospect Street	$6,595,000
McKenna Marsh	$2,801,000
Subtotal	$40,313,000
Contractor's Overhead & Profit (20%)	$8,063,000
Subtotal	$48,376,000
Construction Contingencies (25%)	$12,094,000
Total Construction Cost	$60,470,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$66,077,000
Engineering and Implementation Costs (20%)	$13,215,000
Land Acquisition/Easement Costs	TBD
Opinion of Probable Cost	**$79,292,000**

De-Centralized System Construction Costs

De-centralized treatment alternatives include systems or technologies that serve areas or groups of homes where the total flow is in excess of 10,000 gpd. These systems are not within the jurisdiction of Title 5, and are administered by the Massachusetts

Department of Environmental Protection (DEP) Groundwater Discharge Permit Program, that requires a high level of treatment (e.g. nitrogen removal) and therefore requires approval of the treatment system. Issues that must be addressed when looking at de-centralized treatment systems include siting, operation and maintenance, effluent discharge, level of treatment required, environmental effects, and permitting.

The term "De-centralized" (or Package) refers to the assembly of various individual treatment process components such as; settling tanks, aerators, and disinfection methods, into a compact sometimes pre-assembled and pre-packaged system. Package plants involve installation of pre-assembled equipment in buried tanks or small buildings. These plants can achieve a high degree of treatment provided their operation and maintenance is monitored effectively. The major differences between package plants and municipal Wastewater Treatment Facilities (WWTFs) are capacities and treatment processes. Package plants cover a typical range of wastewater flow from 10,000 to 200,000 gpd capacity. Municipal WWTF flows can range up to several millions of gallons per day. Package plants may use pre-manufactured process equipment (often patented) whereas a WWTF may involve more conventional treatment processes and is custom-designed. Also, package plants are usually automated so an operator only checks performance and conducts maintenance periodically, unlike municipal facilities that have greater staffing requirements. Package plants are often referred to as de-centralized facilities reflecting their smaller size versus a larger, centralized facility.

A major consideration for the feasibility of package plants is finding a permittable disposal site for the treated effluent. Typically, either open infiltration beds, or subsurface leaching fields are used. These require appropriate, permeable subsurface soils and adequate depth to groundwater, as well as distance from environmentally sensitive features such as wetlands.

Cost for package plants vary considerably depending on whether the plant is constructed above or below ground, the type of process, degree of automation, treatment level, and effluent disposal method.

The following table summarizes De-Centralized Treatment System Costs for this alternative:

Alternative 2
De-Centralized Treatment & Disposal System – Opinion of Probable Cost

Item	*Cost*
De-Centralized Treatment System Equipment	
Fulling Mill Brook (95,000 gpcd)	$1,806,000
Gardner Street (240,000 gpcd)	$4,526,000
Hingham Center (180,000 gpcd)	$3,400,000
Prospect Street (100,000 gpcd)	$1,900,000
(incl. Installation)	
Subtotal	$11,630,000
Allowance for Support Equipment, Tanks, Enclosure, etc.	$6,979,000
Emergency Generators	$120,000
Equipment Subtotal	$30,363,000
Allowance for Electrical (15%)	$4,555,000
Allowance for Site Work (10%)	$3,036,000
Allowance for Yard and Piping Work (10%)	$3,036,000
Allowance for Instrumentation & Controls (5%)	$1,518,000
Subsurface Disposal Systems	
Fulling Mill Brook	$164,000
Gardner Street	$413,000
Hingham Center	$310,000
Prospect Street	$172,000
Subtotal	$43,567,000
Contractor's Overhead & Profit (20%)	$8,713,000
Subtotal	$52,280,000
Construction Contingencies (25%)	$13,070,000
Total Construction Cost	$65,350,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$71,410,000
Engineering and Implementation Costs (20%)	$14,282,000
Land Acquisition/Easement Costs	
Fulling Mill Brook	$548,000
Gardner Street	$1,375,000
Hingham Center	$1,033,000
Prospect Street	$573,000
Opinion of Probable Cost (rounded)	**$89,221,000**

SDS Construction and Repair Costs

With this alternative, the unsewered portion of Hingham will continue to rely on individual SDSs for wastewater treatment and disposal. These areas are largely residential (with the exception of the Industrial study area), and include the majority of the available undeveloped land. Using GIS information, there are approximately 2,637 existing residentially developed properties within the unsewered study areas. Residential growth (or ERUs – equivalent residential units) within these unsewered study areas will account for the growth over the planning period. Using current growth trends, 1084 new SDSs are expected to be constructed over the planning period. These new construction sites are considered to include an individual on-site sanitary disposal system (SDS) in substantial conformance to Title 5 and local board of health regulations. For cost tabulation purposes, the construction cost for a new SDS is considered to be $20,000 each.

From interviews with Board of Health officials, the overall inspection failure rate is approximately 30 percent. Over the planning period covering the next twenty years, an equivalent rate of repairs is considered to continue (as systems will be reaching the end of their useful life) such that 791 more repairs are anticipated over the project lifespan. Of those 791, an additional 30 percent may require repeat repairs (approximately 237 more) or repairs involving more enhanced treatment. For the repeat repairs one-half (118) will be considered as requiring enhanced treatment or Innovative or Alternative (I/A) treatment and disposal systems.

For the purpose of estimating a capital cost and O&M value, the total number of system repairs equals 1027 on 3721 properties. As described above, costs for these repairs are apportioned as follows:

SDS Construction and Repair Costs

Item	Number	Cost
I/A Technology Systems	118	$4,130,000
System Repair or Replacement	909	$18,180,000
New Construction	1,084	$21,680,000
No Repairs Required (next 20 yrs.)	1,846	$ 0
Total (rounded)		**$43,990,000**

De-Centralized System Operation & Maintenance Costs

Annual operation and maintenance costs for the proposed package treatment facility include:

- Labor;

- Power;
- Major Maintenance;
- Chemicals (e.g., NaOH, and chemicals needed for cleaning); and
- Sludge removal & disposal.

Labor costs include a licensed operator estimated at approximately $60,000 per year. Sludge removal includes costs of $670 per dry ton for disposal. The present worth calculations for annual O&M and major maintenance are based on a 20-year planning period and a 5 percent discount rate. Because this is a planning-level estimate, a 25 percent miscellaneous contingency is included in the annual operation and maintenance costs.

The O&M costs for the De-Centralized system are shown in the Table below:

O&M Costs for De-Centralized Systems

Cost Category	*O&M Cost*
Labor	$240,000
Power	$4,900
Chemicals	$14,000
Sludge Disposal	$138,000
Subtotal	$396,900
Miscellaneous	$99,000
Total (rounded)	**$495,000**

The annual De-Centralized treatment system O&M cost for this revised option has a present worth (rounded) of $6.17M.

Total Project Costs for implementation of the De-Centralized Treatment system are shown in the Table below;

Project Costs for De-Centralized Systems

Item	*De-Centralized Treatment Cost*
Hingham High Priority Needs Areas Treatment Facilities (Total 620,000 gpcd)	
Construction (Total)	$89.2M
Present Worth of O&M*	$6.17M
Total Present Worth (rounded)	**$95.37M**

Note: Present Worth Calculations Assume a 20 – Year Planning Period and 5 percent Interest.

Opinion of Probable Cost

Cost Item	Cost
Sewer Collection System	$79.3M
De-centralized Treatment and Disposal Systems	$89.2M
De-centralized Treatment and Disposal O&M (Present Worth)	$6.17M
Individual SDS Construction & Repairs	$43.99M
Individual SDS O&M (Present Worth)	$5.37M
Alternative 2 – Opinion of Probable Cost (rounded)	$ 224.03M

Advantages

- WRSD boundaries are not expanded and no new IMAs with Hull and or Cohasset will be required.
- NSD boundaries are not expanded and no legislative action will be required.
- Areas within the Aquifer Protection Zones will have a reliable method of wastewater treatment and disposal.
- De-Centralized Treatment and effluent disposal allows for groundwater recharge.

Disadvantages

- Continued reliance on SDSs will increase potential for nutrient loading within aquifer of water supply.
- Poorly functioning or substandard SDSs will continue to deteriorate groundwater quality due to lack of treatment and increased nitrogen loading.
- Potential difficulty siting treatment facilities and disposal area.

3.4.3 Alternative 3– Maximize Hull Treatment Facility (Foundry Pond), continue current extent of NSD, and the remainder of Town relies on continued use of on-site SDSs with enhanced wastewater management.

This alternative is a town-wide wastewater management solution. This alternative includes maximization of regional wastewater facilities in Hull to accommodate a priority needs area in Hingham that is adjacent to the Weir River Sewer District (WRSD). This maximization of resources is part of an overall regional wastewater management strategy that benefits from existing infrastructure adjacent to Hingham. Areas served by the North Sewer District (NSD) through MWRA remains unchanged from the present condition, and the remainder of Hingham will continue to rely on

on-site SDSs for wastewater treatment and disposal along with an enhanced management program.

The Hull WPCF is a secondary treatment facility designed to accommodate Hull's population of 12,000, an average daily flow of 3.07 million gallons per day (mgd). Disinfection is provided through chlorination. Effluent is discharged through a diffuser located 2,700 feet offshore at a depth of 35 feet below mean sea level.

Hull has Inter-Municipal Agreements (IMAs) with the communities of Hingham and Cohasset to accept and treat wastewater from these communities. (Wastewater generated from a portion of Cohasset is also conveyed through the WRSD to the Hull sewer collection system). The contractual flow limits for these IMAs are defined below:

Hingham's flow limit

Average Daily Flow: 65,000 gallons per day (gpd)
Peak Flow Rate: 173,000 gpd

Cohasset's flow limit

Average Daily Flow: 80,000 gpd
Peak Flow Rate: 213,000 gpd

Limited flow capacity exists from WRSD for expansion of the district over the planning period without exceeding the contractual limit. The possibility exists where the flow limit could be increased through negotiation with Hull (and Cohasset) officials.

North Sewer District (NSD)

The NSD is located in the northwest area of Hingham and is connected to the MWRA sewer collection system through Weymouth. The boundaries of the North Sewer District remain at the present extent. At the end of the planning period, flows from NSD to the MWRA system are projected to be 757,000 gpcd. All of the homes within the District are considered to be connected at this time, and commercial development within the boundaries of the district has been completed.

Remainder of Hingham

The remainder of Hingham will rely on continued use of on-site SDSs.

Capital costs for this alternative will include construction costs for SDS installations and repairs. Operation and maintenance (O&M) costs will also be considered for existing SDSs and for the large septic systems governed by groundwater discharge permits and DEP. The current system inspection failure rate is approximately 30 percent; this ratio will be used throughout the planning period.

Environmental Impacts and Mitigation Measures

Providing sewer service to a "priority" needs area (Foundry Pond) and conveyance to the Hull WPCF has potential to help protect public health. This needs area is located outside of the aquifer for the water supply wells used for the town's (Hull and Hingham) water supply. Failing and poorly functioning septic systems in this area may have potential to adversely affect the water quality within this aquifer. The lot density, small lot size, and shallow depth to groundwater within these needs area will continue to require multiple Title 5 variances for properties seeking to upgrade or repair their SDSs. The threat to the public health and environment will remain unchanged without a plan of action to address wastewater treatment and disposal. For these reasons, this alternative addresses the perceived need to sewer the "priority" needs areas as part of a regional solution. A sewer collection system with the enhanced wastewater treatment offered by a centralized treatment facility reduces the need for continued reliance on individual SDSs on small lots.

An enhanced wastewater management plan for those areas remaining on SDSs will preserve groundwater recharge to the aquifer, and has potential to improve groundwater quality.

Needs Area	*# of developed residential properties*	*Length of sewer collection System Piping (ft.)*	*# of Pumping Stations*	*Wastewater Flow (gpcd)*
Foundry Pond	215	24,900	2	42,000
Totals	**215**	**24,900**	**2**	**42,000**

Regulatory Compliance Factors

The "priority" needs areas generally consist of soils with limitations for suitability of SDS construction, most notably the shallow depth to groundwater. The frequency of reported failures and system replacement within this needs area underscores the recommendation of providing an off-site solution.

Flexibility

On-site systems do not offer much flexibility. With limiting factors such as poor soils, and high groundwater within these "priority" needs areas, Title 5 waivers and variances will continue to be required. Centralized treatment and disposal relieves the individual homeowner from inspections and maintenance of failing on-site systems.

Reliability

A centralized treatment system is an effective long-term solution to wastewater disposal problems in the "priority" needs areas. As previously discussed, the sewer collection system lifespan exceeds the expected operational lifespan of on-site SDSs. Additionally, operation and maintenance responsibilities within the Foundry Pond

needs area for the treatment and disposal systems would shift to the Sewer Commission as part of the WRSD, and not the individual homeowner should this option be implemented.

Costs

Cost elements of this alternative include:

- Construction Cost for the Foundry Pond Sewer Collection System.
- Entrance Fee to WRSD
- Construction, repairs and maintenance costs for continued use of SDSs in the remainder of Hingham.

Sewer Collection System Costs

Construction costs included in this alternative include all excavation & backfill, piping and bedding materials, pumping station(s) (with standby generator) trench width paving replacement, with allowances for engineering and contingencies consistent with planning level estimates. The projected cost to construct the sewer collection system for this alternative is approximately $13.7M. These costs are shown in the Table below:

Alternative 3
Sewer Collection System – Opinion of Probable Cost

Item	*Cost*
Foundry Pond	$6,970,000
Subtotal	$6,970,000
Contractor's Overhead & Profit (20%)	$1,394,000
Subtotal	$8,364,000
Construction Contingencies (25%)	$2,091,000
Total Construction Cost	$10,455,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$11,424,000
Engineering and Implementation Costs (20%)	$2,285,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$13,709,000**

Hull/WRSD Entrance Fee

The Town of Hingham will have to buy additional capacity at the Hull wastewater treatment facility. The cost of this additional capacity is not fully known and should be negotiated with the Town of Hull. The previous cost for capacity as part of the Weir River Sewer District was approximately $7.22 per gpd. Preliminary discussions with Hull have indicated that this number will be considerable larger than the previous cost. For this analysis, we have included an allowance based on $30/gpd.

SDS Construction and Repair Costs

With this alternative, the unsewered portion of Hingham will continue to rely on individual SDSs for wastewater treatment and disposal. These areas are largely residential (with the exception of the Industrial study area), and include the majority of the available undeveloped land. Using GIS information, there are approximately 2,464 existing residentially developed properties within the unsewered study areas. Residential growth (or ERUs – equivalent residential units) within these unsewered study areas will account for the growth over the planning period. Using current growth trends, 1,066 new SDSs are expected to be constructed over the planning period. These new construction sites are considered to include an individual on-site sanitary disposal system (SDS) in substantial conformance to Title 5 and local board of health regulations. For cost tabulation purposes, the construction cost for a new SDS is considered to be $20,000 each.

From interviews with Board of Health officials, the overall inspection failure rate is approximately 30 percent. Over the planning period covering the next twenty years, an equivalent rate of repairs is considered to continue (as systems will be reaching the end of their useful life) such that 1287 more repairs are anticipated over the project lifespan. Of those 1287, an additional 30 percent may require repeat repairs (approximately 374 more) or repairs involving more enhanced treatment. For the repeat repairs one-half (187) will be considered as requiring enhanced treatment or Innovative or Alternative (I/A) treatment and disposal systems.

For the purpose of estimating a capital cost and O&M value, the total number of system repairs equals 1,621 on 4,161 properties. As described above, costs for these repairs are apportioned as follows:

SDS Construction and Repair Costs

Item	*Number*	*Cost*
I/A Technology Systems	187	$6,545,000
System Repair or Replacement	1,434	$28,680,000
New Construction	1,066	$21,320,000
No Repairs Required (next 20 yrs.)	1,661	$ 0
Total (rounded)		**$56,545,000**

Operation & Maintenance of On-Site Systems

Operational expenses must be considered for the maintenance of systems in the areas to continue with on-site SDSs. The on-site SDSs will require the following costs (shown in the Table below) to operate and maintain these systems.

Annual Operation and Maintenance for Individual On-Site Systems

Item	Number	Cost
I/A Technology Systems[1]	187	$112,000
All Other Systems[2]	3,974	$397,400
Total (rounded)	**4,161**	**$509,400**

[1]$600/yr for treatment and septage disposal every two years.
[2]Septage disposal every two years at $200 per pump out and disposal.

Repairs of new construction systems are not included in the repairs tabulation. The on-site SDS O&M cost ($509,400) has a present worth cost of $6.35M (rounded).

Advantages

- IMAs already exist between Hingham and the receiving community for wastewater treatment and disposal.
- Optimizes available existing infrastructure as part of a regional wastewater management approach.
- Expansion of sewer collection systems (reduced groundwater recharge) occurs outside of the aquifer zones.

Disadvantages

- Limited treatment capacity is available from Hull sources without re-negotiation of IMAs. Costly connection fees may also be prohibitive.
- Continued reliance on SDSs will increase potential for increased loads within aquifer of water supply.
- Poorly functioning or substandard SDSs will continue to deteriorate groundwater quality due to lack of treatment and increased nitrogen loading from densely developed properties.
- Slight reduction in groundwater recharge through expansion of sewer collection systems.

Opinion of Probable Cost

Cost Item	Cost
Foundry Pond Sewer Collection System	$13.7M
WRSD/Hull Entrance Fee	$1.3M
Individual SDS Construction & Repairs	$56.5M
Individual SDS O&M (Present Worth)	$6.35M
Alternative 3 – Opinion of Probable Cost (rounded)	$ 86.25M

3.4.4 Alternative 4 - Maximize Rockland Wastewater Treatment Options

This alternative includes maximization of regional wastewater treatment facilities in Rockland to accommodate needs areas adjacent to that community as part of an overall regional wastewater treatment strategy. Remaining needs areas in Hingham would be served through continued use of individual on-site SDSs.

The Town of Rockland is located at the southwest corner of Hingham adjacent to the commercially and industrially zoned areas along the Rtes. 3/53/228 corridor. Rockland is served by a municipal treatment facility located off Summer Street at the southern end of Concord Street. Rockland has a population of approximately 18,000 people and is nearly 100 percent sewered.

The Rockland Wastewater Treatment Plant (WWTP) was designed as a secondary treatment facility using a 2-stage suspended growth activated sludge system. It was designed to accommodate an average daily flow of 2.5 million gallons per day (mgd) with a peak flow of 6.0 mgd. The WWTP has been in operation since 1980 and receives wastewater from a variety of industrial, commercial and residential sources. Since 1985 the first stage process tanks have been by-passed and the facility employs a single stage activated sludge/nitrification process with nitrification and phosphorous removal is performed seasonally. Disinfection is provided through chlorination (with dechlorination). Effluent is re-aerated over a cascade and then flows to a man-made channel into the French Stream, then to the Indian Head River, and eventually into Massachusetts Bay.

An interview with the plant operator, Mr. Tony Olivadesa, revealed that the plant is currently receiving 2.5 mgd and has no capacity to make available to Hingham. Mr. Olivadesa also reports that there is an EPA order prohibiting out-of-town connections to the system.

Other Options in Rockland

A portion of Rockland is sewered to Brockton's Advanced Water Reclamation Facility through an Inter-Municipal Agreement (IMA) with the Town of Abington. This IMA

includes an allotment of up 100,000 gallons per day (gpd) to be discharged to the sewer collection system in Abington, and then conveyed to Brockton as allowed by an IMA between those communities. This allotment is currently maximized.

The former South Weymouth Naval Air Station (NAS) is undergoing redevelopment and is located partially in Rockland (Weymouth, Rockland, and Abington). The headwaters of the Rockland WWTP receiving waterway (French Stream) are located at this redevelopment site. The NAS sewer collection system is connected to Weymouth's sewer system and is conveyed to MWRA.

During the environmental review process, the South Shore Tri-Town Development Corporation (SSTTDC) evaluated numerous wastewater treatment and disposal options. Three regional options included connections to:

- Rockland WWTP,
- Direct dedicated line to Massachusetts Water Resources Authority (MWRA),
- MWRA through Weymouth collection system,

Other Options included

- New advanced wastewater reclamation facility,
- Combination of regional and treatment at advanced wastewater reclamation facility.

The SSTTDC chose to pursue construction of an on-site wastewater reclamation facility to take advantage of water re-use and promote "smart growth" for the redevelopment project.

The on-site system is designed to accommodate flows from the project only and will have no additional capacity for other projects.

Advantages

- None.

Disadvantages

- No treatment capacity is available from Rockland sources. Expansion of the WWTP is possible, but not without significant time delays and costly expansion.

Finding/Conclusion

Connection to Rockland as a regional alternative is not a viable option for Hingham.

3.4.5 Alternative 5 – Foundry Pond to be served by a De-Centralized treatment and disposal system, North Sewer District (NSD) remains at its current extent, and the remainder of Hingham relies on continued use of on-site SDSs with enhanced wastewater management

This alternative serves as a test case to evaluate using one or more de-centralized treatment and disposal systems as part of a local strategy for town-wide wastewater management in Hingham. The remainder of Hingham relies on the continued use of SDSs with enhanced wastewater management.

Foundry Pond

Foundry Pond will be served through a de-centralized treatment and disposal system.

North Sewer District (NSD)

The NSD is located in the northwest area of Hingham and is connected to the MWRA sewer collection system through Weymouth.

Remainder of Hingham

The remainder of Hingham will rely on continued use of on-site SDSs.

Capital costs for this alternative will include construction costs for SDS installations and repairs. Operational and maintenance (O&M) costs will also be considered for existing SDSs and for the large septic systems governed by groundwater discharge permits and DEP. The current system inspection failure rate is approximately 30 percent; this ratio will be used throughout the planning period.

De-Centralized Treatment & Disposal Site Location	*Needs Areas Served*	*Design Flow (MGD)**
Foundry Pond	Foundry Pond	0.068

Environmental Impacts and Mitigation Measures

An off-site system is an effective long-term solution to wastewater disposal problems in the study area.

De-Centralized systems can provide effective treatment and replenish the aquifer.

The Foundry Pond needs area is not particularly distinctive in any one particular category of environmental conditions, soil suitability or poor system performance, but does rate consistently high enough across all areas of the needs evaluation matrix to be considered a "priority" needs area.

Regulatory Compliance Factors

Permits for the De-Centralized treatment and disposal systems will be administered through DEP.

Flexibility

Continued use of on-site systems is not a flexible alternative.

Reliability

As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham, and not the individual homeowner should the off–site option be implemented.

Costs

Cost elements of this alternative include:

- Construction Cost for Sewer Collection System for the Foundry Pond Needs Area
- Construction Cost for De-centralized Treatment and Disposal Facilities
- Construction, repairs and maintenance costs for continued use of SDSs in the remainder of Hingham

Sewer Collection System Costs

Construction costs included in this alternative include all excavation & backfill, piping and bedding materials, pumping station(s) (with standby generator) trench width paving replacement, with allowances for engineering and contingencies consistent with planning level estimates. The projected cost to construct the sewer collection system for this alternative is approximately $10.5M.

Alternative 5
Sewer Collection System – Opinion of Probable Cost

Item	*Cost*
Foundry Pond	$5,370,000
Subtotal	$5,370,000
Contractor's Overhead & Profit (20%)	$1,074,000
Subtotal	$6,444,000
Construction Contingencies (25%)	$1,611,000
Total Construction Cost	$8,055,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$8,800,000
Engineering and Implementation Costs (20%)	$1,760,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$10,560,000**

De-Centralized System Construction Costs

Cost for package plants vary considerably depending on whether the plant is constructed above or below ground, the type of process, degree of automation, treatment level, and effluent disposal method.

The following table summarizes De-Centralized Treatment System Costs for this alternative:

Alternative 5
De-Centralized Treatment & Disposal System – Opinion of Probable Cost

Item	*Cost*
De-Centralized Treatment System Equipment	
Foundry Pond (68,000 gpcd)	$1,300,000
(incl. Installation)	
Subtotal	$1,300,000
Allowance for Support Equipment, Tanks, Enclosure, etc.	$780,000
Emergency Generators	$30,000
Equipment Subtotal	$3,410,000
Allowance for Electrical (15%)	$511,500
Allowance for Site Work (10%)	$341,000
Allowance for Yard and Piping Work (10%)	$341,000
Allowance for Instrumentation & Controls (5%)	$170,500
Subsurface Disposal Systems	
Foundry Pond	$117,000
Subtotal	$4,891,000
Contractor's Overhead & Profit (15%)	$978,000
Subtotal	$5,869,000
Construction Contingencies (25%)	$1,467,000
Total Construction Cost	$7,340,000
Construction Cost at Mid-Point of Construction (3% per year)	$8,020,000
Engineering and Implementation Costs (20%)	$1,604,000
Land Acquisition/Easement Costs	
Foundry Pond	$390,000
Opinion of Probable Cost (rounded)	**$10,014,000**

SDS Construction and Repair Costs

Identical to the methodology described in Alternative 3, the following paragraph and tables summarize construction and repair costs.

For the purpose of estimating a capital cost and O&M value, the total number of system repairs equals 1,621 on 4,161 properties. As described above, costs for these repairs are apportioned as follows:

SDS Construction and Repair Costs

Item	Number	Cost
I/A Technology Systems	187	$6,545,000
System Repair or Replacement	1,434	$28,680,000
New Construction	1,066	$21,320,000
No Repairs Required (next 20 yrs.)	1,661	$ 0
Total (rounded)		**$56,545,000**

Operation & Maintenance of On-Site Systems

Operational expenses must be considered for the maintenance of systems in the areas to continue with on-site SDSs. The on-site SDSs will require the following costs (shown in the Table below) to operate and maintain these systems.

Annual Operation and Maintenance for Individual On-Site Systems

Item	Number	Cost
I/A Technology Systems[(1)]	187	$112,200
All Other Systems[(2)]	3,794	$397,400
Total (rounded)	**4,161**	**$509,600**

[(1)]$600/yr for treatment and septage disposal every two years.
[(2)]Septage disposal every two years at $200 per pump out and disposal.

Repairs of new construction systems are not included in the repairs tabulation. The on-site SDS O&M cost ($509,600) has a present worth cost of $6.35M (rounded).

De-Centralized System Operation & Maintenance Costs

Annual operation and maintenance costs for the proposed package treatment facility include:

- Labor;
- Power;
- Major Maintenance;
- Chemicals (e.g., NaOH, and chemicals needed for cleaning); and
- Sludge removal & disposal.

Labor costs include a licensed operator estimated at approximately $60,000 per year. Sludge removal includes costs of $670 per dry ton for disposal. The present worth calculations for annual O&M and major maintenance are based on a 20-year planning

period and a 5 percent discount rate. Because this is a planning-level estimate, a 25 percent miscellaneous contingency is included in the annual operation and maintenance costs.

The O&M costs for the De-Centralized system are shown in the Table below:

O&M Costs for De-Centralized Systems

Cost Category	*O&M Cost*
Labor	$60,000
Power	$600
Chemicals	$1,800
Sludge Disposal	$15,000
Subtotal	$77,400
Miscellaneous	$19,400
Total (rounded)	**$97,000**

The annual De-Centralized treatment system O&M cost for this revised option has a present worth (rounded) of $1.2M.

Total Project Costs for implementation of the De-Centralized Treatment system are shown in the Table below;

Project Costs for De-Centralized Systems

Item	*De-Centralized Treatment Cost*
Foundry Pond Needs Area Treatment Facilities (Total 68,000 gpcd)	
Construction (Total)	$9.1M
Present Worth of O&M*	$1.2M
Total Present Worth (rounded)	**$10.3M**

Note: Present Worth Calculations Assume a 20 – Year Planning Period and 5 percent Interest.

Advantages

- De-Centralized treatment and effluent disposal allows for groundwater recharge.

Disadvantages

- Continued reliance on SDSs will increase potential for increased loads within aquifer of water supply.
- Poorly functioning or substandard SDSs will continue to deteriorate groundwater quality due to lack of treatment and increased nitrogen loading from densely developed properties.
- Potential difficulty siting treatment facilities and disposal area.

Opinion of Probable Cost

Cost Item	Cost
Foundry Pond Sewer Collection System	$10.6M
De-centralized Treatment and Disposal Systems	$10.0M
De-centralized Treatment and Disposal O&M (Present Worth)	$1.2M
Individual SDS Construction & Repairs	$56.5M
Individual SDS O&M (Present Worth)	$6.35M
Alternative 5– Opinion of Probable Cost (rounded)	$ 84.65M

3.4.6 Alternative 6 – Sewer the "Unsewered" Portion of Hingham through expansion of the North Sewer District

This alternative provides for sewer collection and treatment for the entire Town of Hingham through expansion of the North Sewer District (NSD). The Weir River Sewer District (WRSD) is considered to remain unchanged as part of this alternative.

The NSD is located in the northwest area of Hingham and is connected to the MWRA sewer collection system through Weymouth. This alternative is expected to be cost-prohibitive, but does represent the extreme end of the spectrum from a cost standpoint. One of the challenges to this alternative is any proposed change to the District boundary requires legislative action and MWRA approval. This alternative will increase flows to MWRA, and reduce groundwater recharge to the Aquifer.

Environmental Impacts and Mitigation Measures

The proposed area for sewer collection and conveyance to MWRA with this alternative includes the entire Town of Hingham, part of which is located within the aquifer and hydraulically upgradient of the water supply wells used for the town's water supply. Failing and poorly functioning septic systems in this area may have potential to adversely affect the water quality within this aquifer. The lot density, small lot size, and shallow depth to groundwater within these needs area will continue to require multiple Title 5 variances for properties seeking to upgrade or repair their SDSs. The threat to the public health and environment will remain unchanged without a plan of action to address wastewater treatment and disposal. For these reasons, this alternative addresses the perceived need by construction of a collection system. A sewer collection system with the enhanced wastewater treatment offered by a centralized treatment facility eliminates the need for continued reliance on individual SDSs on small lots.

The sewer collection systems and "off-site" treatment included with this alternative would also reduce the contributions to groundwater recharge to the aquifer.

Flexibility

Centralized treatment and disposal relieves the individual homeowner from inspections and maintenance of failing on-site systems. Continued use of on-site systems is not a flexible alternative.

Reliability

A centralized treatment system is an effective long-term solution to wastewater disposal. As previously discussed, the sewer collection system lifespan exceeds the expected operational lifespan of on-site SDSs. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Sewer Commission and MWRA, and not the individual homeowner should this option be implemented.

Sewer Collection System Costs

This is a baseline alternative and costs are presented for discussion only at this time. Construction costs included in this alternative include all excavation & backfill, piping and bedding materials, pumping station(s) (with standby generator) trench width paving replacement, with allowances for engineering and contingencies consistent with planning level estimates.

Advantages

- WRSD boundaries are not expanded and no new IMAs with Hull and/or Cohasset will be required.
- Areas within the Aquifer Protection Zones will have a reliable method of wastewater treatment and disposal.

Disadvantages

- Any proposed change to the NSD boundary requires legislative action for changes to the MWRA system. Additionally, MWRA requires a 4:1 ratio of inflow reduction prior to admittance.
- Interbasin transfer offsets must be considered
- Capital costs are expected to be prohibitive with this alternative.
- Removal of SDSs will reduce groundwater recharge to the Aquifer.

Alternative 6
Sewer Collection System – Opinion of Probable Cost

Item	*Cost*
Fulling Mill Brook	$8,229,000
Gardner Street	$1,847,000
Hingham Center	$8,880,000
Accord Pond	$3,188,000
Prospect Street	$5,241,000
McKenna Marsh	$2,809,000
Foundry Pond	$5,962,000
Cushing Pond	$4,233,000
Whiting Street	$4,303,000
Liberty Pole	$7,848,000
Summer Street	$9,480,000
Industrial	$10,711,000
Plymouth River	$2,299,000
Accord Brook	$6,693,000
Bouve Pond	$6,295,000
Brewer Pond	$3,346,000
Subtotal	$91,364,000
Contractor's Overhead & Profit (20%)	$18,272,800
Subtotal	$110,000,000
Construction Contingencies (25%)	$27,500,000
Total Construction Cost	$137,500,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$150,250,000
Engineering and Implementation Costs (20%)	$30,050,000
MWRA Entrance Fee and Mitigation Allowance	$14,900,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$195,200,000**

3.4.7 Alternative 7 – "No Action"

This alternative serves as the baseline condition to compare other alternatives and measure their relative effectiveness. This alternative considers growth throughout the town but leaves existing wastewater management systems and service boundaries intact.

North Sewer District (NSD)

The boundaries of the North Sewer District remain intact. At the end of the planning horizon in 2025, the NSD contribution to MWRA is 0.76 mgd. This projected flow includes the following:

- Shipyard project is complete,
- Some presently unsewered residences have connected to the system,
- Development of a limited number of vacant residential property,
- Re-development of existing commercial/industrial property,
- Re-development of residential properties to multi-family use.

Weir River Sewer District (WRSD)

The boundaries of the Weir River Sewer District remain at the present extent. At the end of the planning period, flows from WRSD to the Hull system are projected to be 65,000 gpcd. All of the homes within the District will be considered to be connected at this time, and commercial development within the boundaries of the district will be completed.

Remainder of Hingham

Increased development throughout the planning period is expected to increase wastewater flows by approximately 207,000 gpcd (or converting to dwelling units is equivalent to 1066 residences). The increase in the remainder of Hingham is expected to be due largely to residential growth. This represents approximately 30% of available developable residential land.

Capital costs for this alternative will include construction costs for SDS installations and repairs. Operational and maintenance (O&M) costs will also be considered for existing SDSs and for the large septic systems governed by groundwater discharge permits and DEP. The current system inspection failure rate is approximately 30 percent; this ratio will be used throughout the planning period.

Environmental Impacts and Mitigation Measures

This alternative includes the entire Town of Hingham part of which is located within the aquifer and hydraulically upgradient of the water supply wells used for the town's water supply. Failing and poorly functioning septic systems in this area may have potential to adversely affect the water quality within this aquifer. The lot density, small lot size, and shallow depth to groundwater within these needs area will continue to require multiple Title 5 variances for properties seeking to upgrade or repair their SDSs. The threat to the public health and environment will remain unchanged without a plan of action to address wastewater treatment and disposal. For these reasons, this alternative will not address the perceived need.

Flexibility

Continued use of on-site systems is not a flexible alternative.

Reliability

This no-action alternative will not significantly improve the long term reliability of wastewater disposal in these needs areas since there will be a continued reliance on SDS throughout the project area, although enhanced management of on-site systems may have a slight improvement in SDS reliability.

Costs

Identical to the methodology described earlier, the following paragraph and tables summarize construction and repair costs. This is a baseline alternative and costs are presented for discussion only at this time.

From interviews with Board of Health officials, the overall inspection failure rate is approximately 30 percent. Over the planning period covering the next twenty years, an equivalent rate of repairs is considered to continue (as systems will be reaching the end of their useful life) such that 1313 more repairs are anticipated over the project lifespan. Of those 1313, an additional 30 percent may require repeat repairs (approximately 394 more) or repairs involving more enhanced treatment. For the repeat repairs one-half (197) will be considered as requiring enhanced treatment or Innovative or Alternative (I/A) treatment and disposal systems.

For the purpose of estimating a capital cost and O&M value, the total number of system repairs equals 1707 on 4376 properties. As described above, costs for these repairs are apportioned as follows:

SDS Construction and Repair Costs

Item	*Number*	*Cost*
I/A Technology Systems	197	$6,895,000
System Repair or Replacement	1510	$30,200,000
New Construction	1066	$21,320,000
No Repairs Required (next 20 yrs.)	3063	$ 0
Total (rounded)		**$58,415,000**

Operation & Maintenance of On-Site Systems

Operational expenses must be considered for the maintenance of systems in the areas to continue with on-site SDSs. The on-site SDSs will require the following costs (shown in the Table below) to operate and maintain these systems.

Annual Operation and Maintenance for Individual On-Site Systems

Item	Number	Cost
I/A Technology Systems[1]	197	$118,200
All Other Systems[2]	4179	$417,900
Total (rounded)	**4376**	**536,000**

[1]$600/yr for treatment and septage disposal every two years.
[2]Septage disposal every two years at $200 per pump out and disposal.

Repairs of new construction systems are not included in the repairs tabulation. The on-site SDS O&M cost ($536,000) has a present worth cost of $6.68M (rounded).

Advantages

- NSD boundaries are not extended, therefore no action of legislature is required.
- WRSD boundaries are not expanded and no new IMAs with Hull and or Cohasset will be required.

Disadvantages

- Continued reliance on SDSs will increase potential for increased loads within aquifer of water supply.
- Poorly functioning or substandard SDSs will continue to deteriorate groundwater quality due to lack of treatment and increased nitrogen loading from densely developed properties.

Alternative 7
No-Action Alternative Opinion of Probable Cost

Cost Item	Cost
Individual SDS Construction & Repairs	$58.4M
Individual SDS O&M (Present Worth)	$6.86M
Alternative 7 – Opinion of Probable Cost (rounded)	$ 65.08M

3.5 Summary of Costs

The following table presents a summary of the costs of each of the alternatives evaluated in this section. Costs range from a low of $65.08M to a high of $224.03M.

Alternatives

No.	*Description*	*Opinion of Probable Cost*
1	Sewer High-Priority Needs Areas through MWRA, WRSD remains at current extent, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$146.62M
2	De-Centralized Treatment and Disposal for High-Priority Needs Areas, WRSD remains at current extent, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$224.03M
3	Expand WRSD to include Foundry Pond Needs Area, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$86.25M
4	No Further Review	-----
5	De-Centralized Treatment and Disposal for Foundry Pond Needs Area, and remainder of Hingham uses on-site SDSs with enhanced wastewater management	$85.65M
6	Expand NSD and Sewer all of Hingham through MWRA	$195.2M
7	No-Action (continued use of on-site SDSs.	$65.08M

Section 4
Selected Wastewater Management Areas

4.1 Introduction

The Hingham Sewer Commission and the Comprehensive Wastewater Management Committee jointly decided that a refined set of area sensitive alternatives be developed and evaluated. These alternatives were selected based on both historical knowledge of the areas, citizen input, perceived implementability, economic benefit and other pertinent information.

A combination of alternatives which were included in Section 3 was modified to address the needs of certain areas in Hingham. Alternatives are evaluated to identify the most promising alternatives based on established criteria, direct and indirect environmental impacts, likelihood of implementation from a regulatory and public acceptance point of view, cost, and institutional issues required to implement the proposed plan. The listing of alternatives presented below is listed in order of priority. The following areas were brought forward for this refined evaluation:

Central Street – This area includes portions of two of the "high-priority" needs areas as well as another "priority" area. The location of the Central Street project adjacent to the North Sewer District (NSD) makes this area of Hingham a candidate for investigating the potential to expand the NSD and sewer this area through the Massachusetts Water Resources Authority (MWRA).

Foundry Pond – Expand the Weir River Sewer District (WRSD) to include this needs area or implement a De-centralized solution. Residents of this area have been seeking a solution to wastewater management issues.

Summer Street (Northern) Martin's Lane – This area has been identified by the Hingham Board of Health and both Hingham planning groups as requiring an off-site structural wastewater management solution. Detailed Evaluation of this needs area will include expansion of the WRSD, connection to MWRA, and implementation of a De-Centralized Solution.

Liberty Pole – The Needs Assessment found this area demonstrated significant need for a wastewater management solution. The scoring system initially positioned this study area as a "priority" needs area. This study area scored very highly in categories of Lot Size, Nitrogen Loading, Stressed Basin, and prevalence of Aquifers and Floodplain. Detailed evaluation of a De-Centralized Solution will be evaluated for this needs area.

Industrial Park– This area of Hingham contains a significant portion of Hingham's Industrial zoned properties and currently experiences difficulties with on-site system operation. For socioeconomic reasons, this area is included for detailed evaluation of

centralized sewer through Weymouth (and MWRA), and implementation of a De-Centralized program for the Industrial Park.

Areas Outside the Selected Areas

The remainder of Hingham outside of the five selected areas outlined above will be considered for continued use of on-site systems with enhanced management.

These areas for this evaluation are shown on Figure 4.1-1.

Table 4.1-1
Needs Area Wastewater Flow Projections

Needs Area Name	No. of Developed Properties (Future Condition)	Average Wastewater Flow (gpd)	Average Wastewater Flow (gpd) (Including I/I)
Central Street	406	80,000	107,000
Foundry Pond	215	42,000	68,000
Martins Lane	183	54,000	63,000
Liberty Pole	600	87,000	122,000
Industrial Park	68	50,000	70,000

I/I (or Infiltration and Inflow) is tabulated at 500 gpd/in-mi.

4.2 Evaluation Criteria

A detailed discussion of the following evaluation criteria was previously presented in Section 3. Discussion is not repeated here, however evaluation of each alternative against these criteria is presented later in this section since some of these needs areas have not been evaluated using the preliminary stage criteria.

Each alternative is evaluated based on a comparison of criteria that are consistent with DEP's Guide to Comprehensive Wastewater Management Planning:

- Environmental Impact and Mitigation Measures;
- Regulatory Compliance;
- Flexibility;
- Reliability; and
- Cost

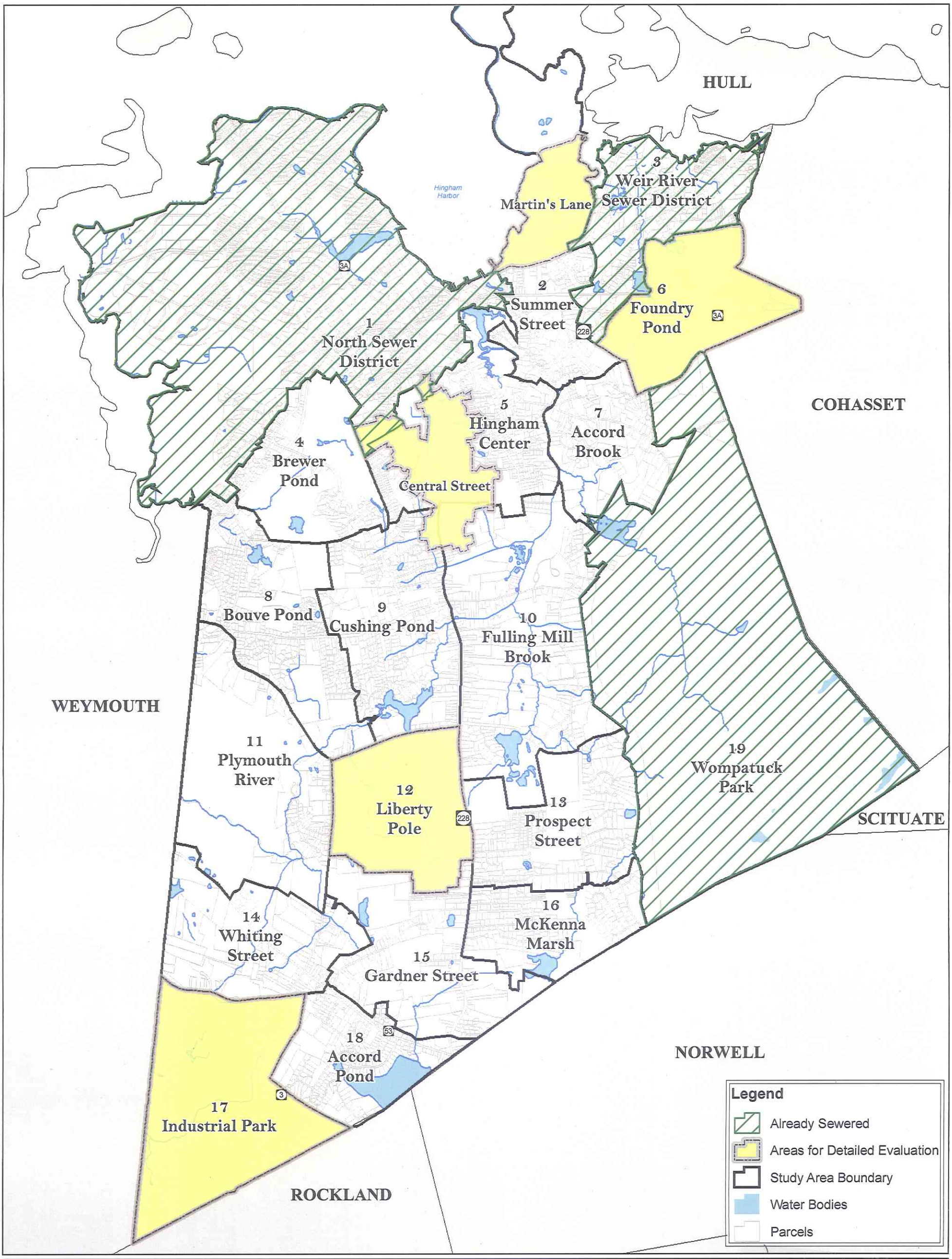


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Figure 4.1-1

Areas for Detailed Evaluation

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4.3 Alternatives Evaluation by Needs Area

As discussed above, the alternatives presented below are listed in order of priority for implementation. The listing of alternatives includes some alternatives carried over from the previous analysis, as well as new alternatives developed by combining and or modifying portions of alternatives. Efforts have been made in this section to not repeat detailed discussion and evaluation developed in previous sections of this report.

4.3.1 Central Street Project Area

Environmental Impacts and Mitigation Measures

The Central Street project area includes most of the Hingham Center study area, and portions of the North Sewer District, Cushing Pond and Fulling Mill Brook study areas. This project area is shown on Figure 4.3-1. This hybrid project area was developed by the town in the 1980's and was most recently reviewed in 2001 and was recommended for sewers at that time in a report by CDM entitled "Preliminary Study of Treatment Plant Effluent Disposal at Beal Cove Park with Reclaimed Water Use at the South Shore Country Club".

The Hingham Center needs area was included as a "high-priority" needs area following the needs analysis performed in the Phase 1 CWMP. The Central Street project was identified as an area that may need an off-site solution as evidenced by the 2001 study. Since a majority of Hingham Center study area is comprised of the Central Street project area, general conditions exhibited by Hingham Center in the needs analysis are described here. Hingham Center scored high for small lot size and nitrogen loading, and for prevalence of fine or silty soils (the highest score of any study area). These conditions will continue without an action plan to address these environmental concerns. The majority of this area consists of existing developed parcels and the area abuts the North Sewer District.

Regulatory Compliance Factors

Small lot size and the fine or silty soils prevalent in this area will continue to be problematic for long-term use of on-site SDSs in compliance with Title 5 and Hingham Board of Health regulations.

Flexibility

On-site systems do not offer much flexibility. With limiting factors such as poor soils and high groundwater within this needs area, Title 5 waivers and variances will continue to be required. Off-site disposal relieves the individual homeowner from inspections and maintenance of failing poorly functioning on-site systems.

Reliability

An off-site system is an effective long-term solution to wastewater disposal problems in the study area. As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham (or other responsible entity), and not the individual homeowner should the off–site option be implemented.

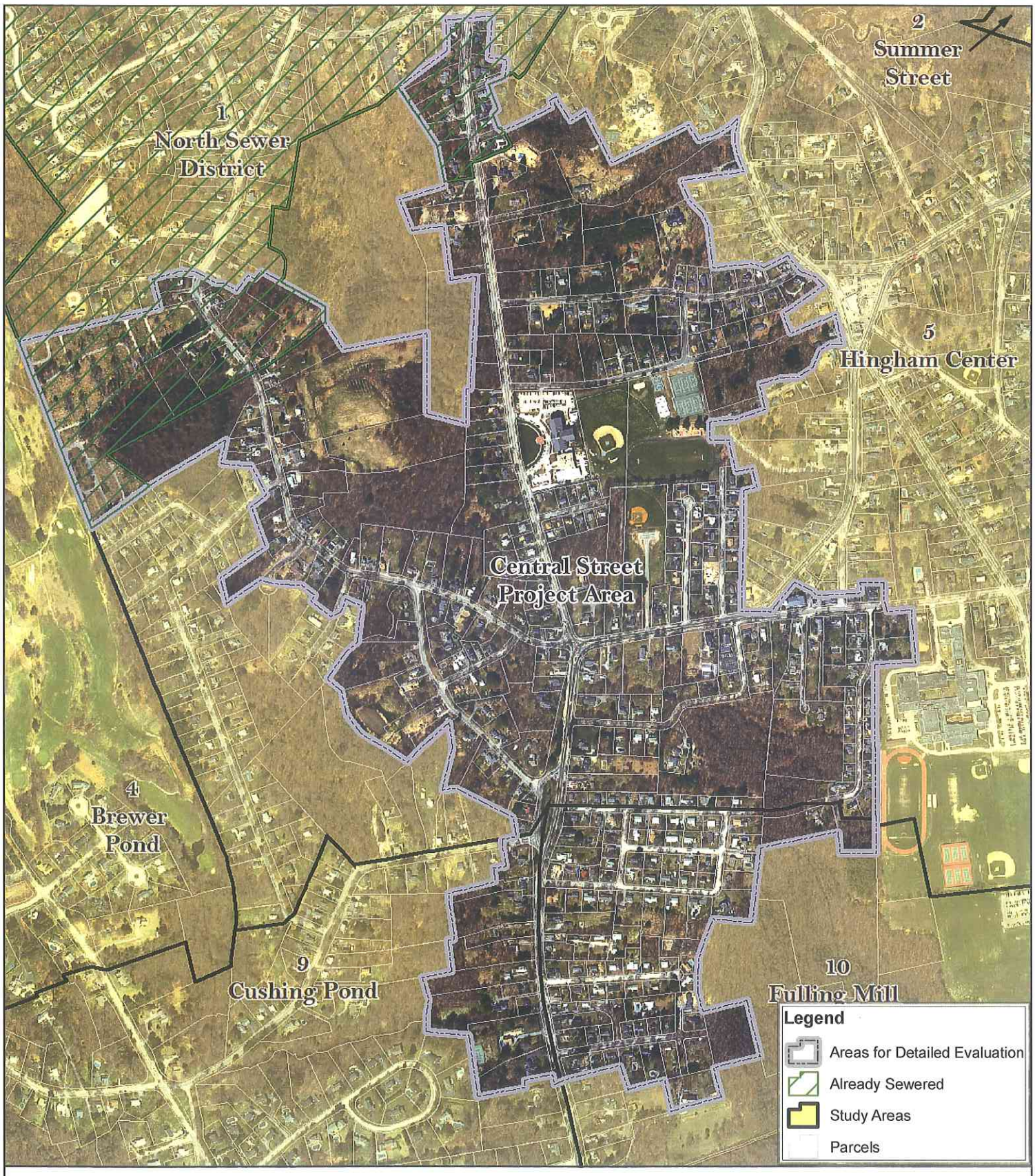

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Figure 4.3-1

Central Street Project Area

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Potential for Decentralized System

As part of the analysis for this area, an evaluation of potential sites for decentralized wastewater disposal was performed. For this alternative, and for subsequent alternatives, a screening was performed for potential available disposal sites. In general, acceptable sites are within or adjacent to the study area, have good permeable soils, and ideally would consist of town-owned land. Figure 4.3-2 shows a review of the project area with an overlay showing wetlands, conservation land, town owned parcels and other pertinent constraints.

The most promising location for a De-Centralized system is the large area surrounding town hall. Much of this area, shown in Figure 4.3-3 consists of open space recreation area including sports fields. Location of a De-Centralized treatment and disposal system in this area will be challenging. The majority of the area is fully utilized making siting new facilities very difficult. The area is also in the midst of dense residential development which will further complicate implementation of a de-centralized solution. For these reasons, a de-centralized option will not be pursued for this area.

Costs

The opinion of probable cost to provide a sewer collection system serving the Central Street project area as presented in Table 4.3-1. This estimated cost includes trenching and pipe installation; engineering and contingencies. Two submersible pump stations (with emergency generators) are proposed in the preliminary layout.

Table 4.3-1
Central Street - Sewer Collection System Summary

Item	*Cost*
Central Street Collection System	$4,670,000
Subtotal	$4,670,000
Contractor's Overhead & Profit (20%)	$934,000
Subtotal	$5,604,000
Construction Contingencies (25%)	$1,401,000
Total Construction Cost	$7,005,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$7,655,000
Engineering and Implementation Costs (20%)	$1,530,000
MWRA Entrance Fee and Mitigation Allowance	$800,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$9,985,000**

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Figure 4.3-2

Central Street Project Area Overview
Potential Effluent Recharge Sites

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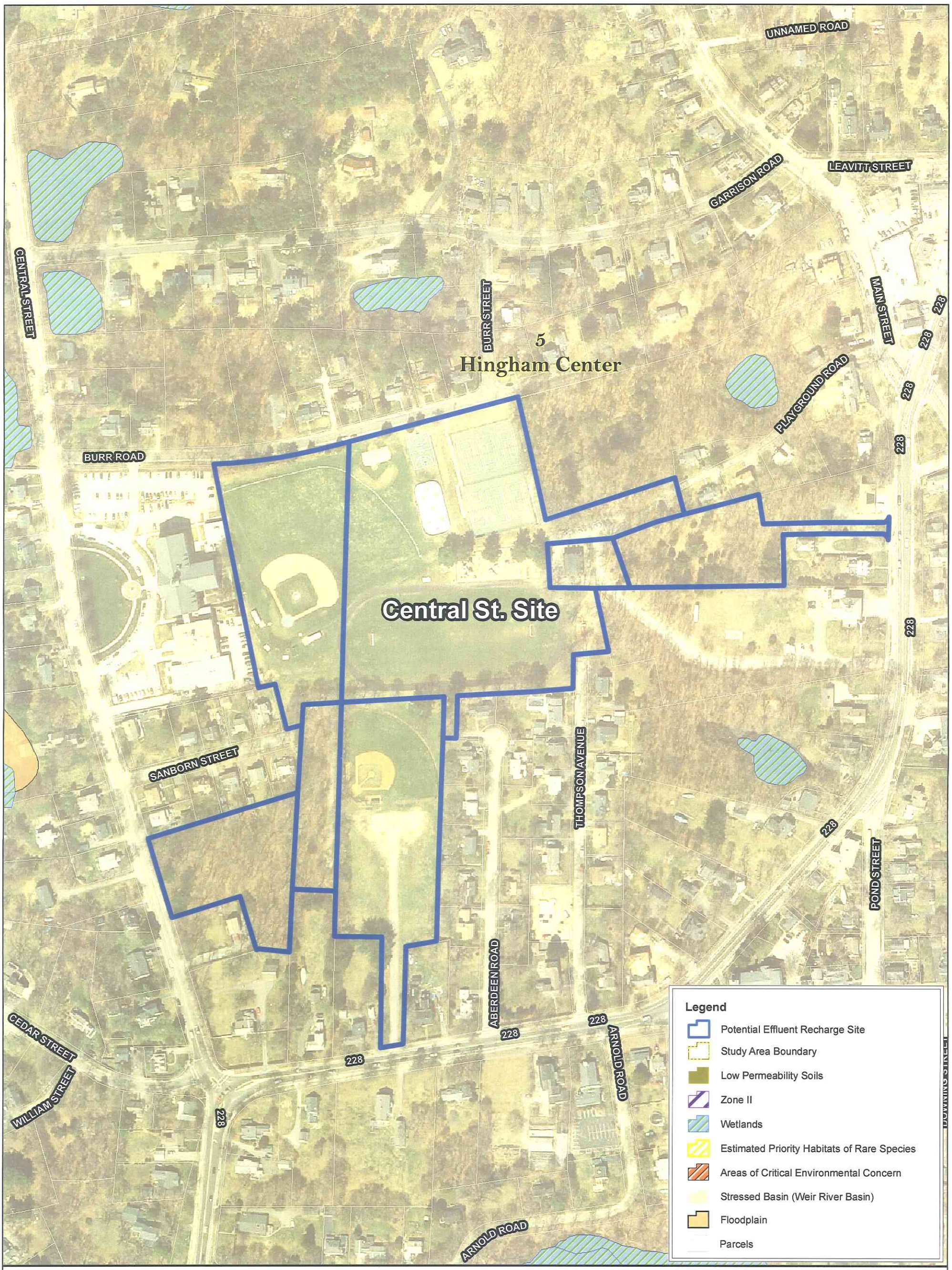

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Figure 4.3-3

Central Street Site
Potential Effluent Recharge Sites

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4.3.2 Foundry Pond

Environmental Impacts and Mitigation Measures

The Foundry Pond needs area is located in the northeastern portion of Hingham, immediately to the south of the Weir River Sewer District. The Foundry Pond needs area is shown on Figure 4.3-4. This needs area is dominated by till soils and shallow bedrock conditions. Groundwater depths in these areas are typically three to five feet below the ground surface. The threat to water quality and public health will remain unchanged without an action plan to address wastewater treatment and disposal in this area.

For these reasons, the Foundry Pond needs area was identified as a candidate for sewer collection system with centralized treatment through expansion of the WRSD (by Hull) – Option A, or a De-Centralized treatment and disposal system – Option B. Both of these options offer opportunities to enhance wastewater treatment.

The prevalence of shallow ledge and rock in this area is a concern. Rock excavation and removal will be required during construction. An allowance for this additional cost is included in the opinion of probable cost of construction.

Regulatory Compliance Factors

The Foundry Pond needs area generally consists of subsurface conditions with limitations for long-term use or construction of SDSs.

Flexibility

Continued use of on-site SDSs does not offer much flexibility. With the limiting factor of poor soils within this needs area, mounded systems and/or Title 5 waivers will continue to be required. Off-site treatment and disposal relieves the individual homeowner from inspections and maintenance of poorly functioning on-site SDSs.

Reliability

An off-site system is an effective long-term solution to conditions that exist within the study area. As previously discussed, the sewer collection system lifespan exceeds the expected operational lifespan of on-site SDSs. Additionally, operation and maintenance responsibilities for the collection and treatment facilities would shift to the Town of Hingham (or other responsible authority) and not the individual homeowner should the off-site solution be implemented.

Potential for Decentralized System

As part of the analysis for this area, an evaluation of potential sites for decentralized wastewater disposal was performed. A screening was performed for potential available disposal sites. In general, acceptable sites are within or adjacent to the study area, have good permeable soils, and ideally would consist of town-owned land. Figure 4.3-5 shows a review of the project area with an overlay showing wetlands, conservation land, town owned parcels and other pertinent constraints. There are no town owned sites that are suitable for wastewater disposal in the Foundry Pond needs area.

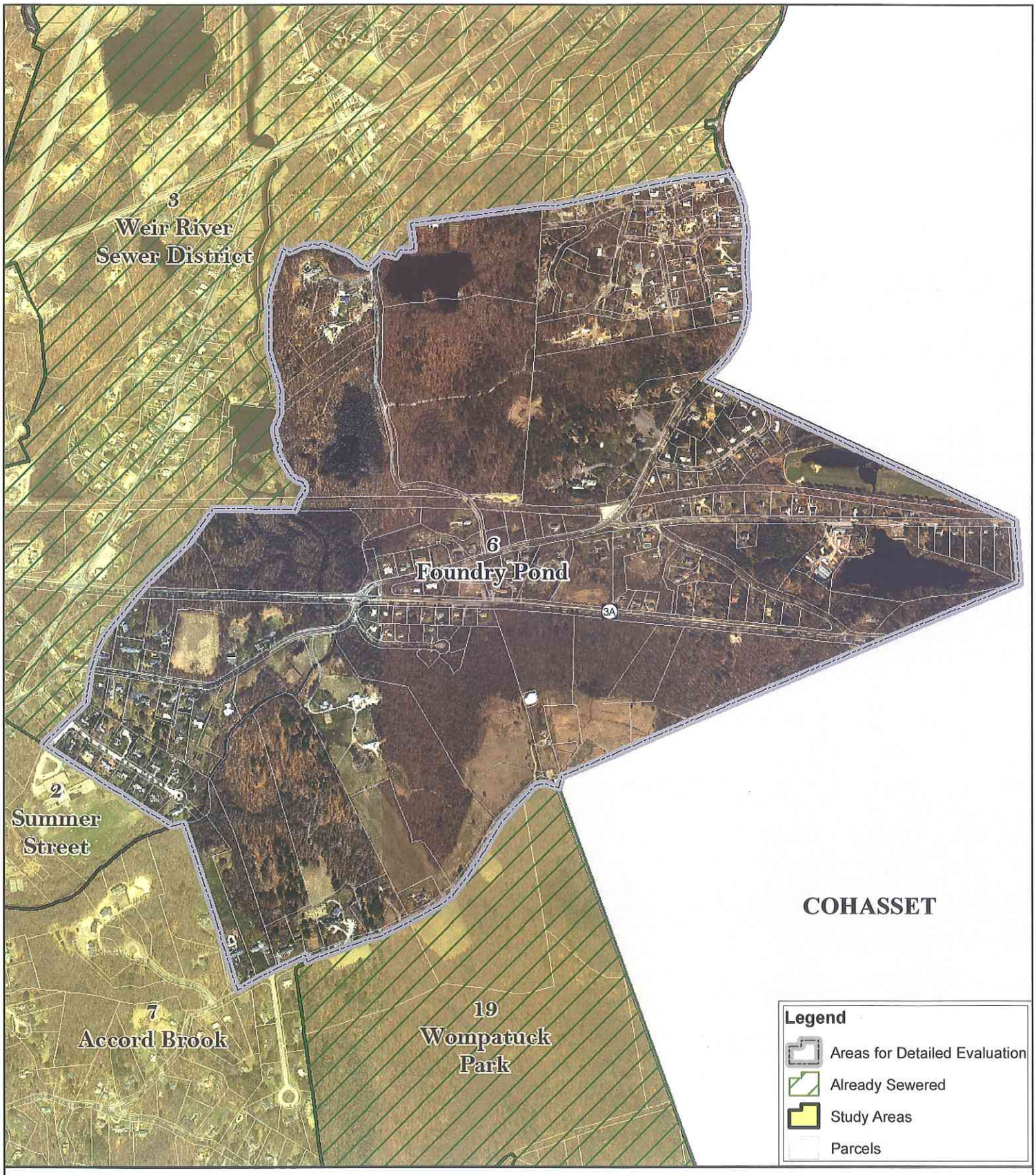

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Figure 4.3-4

Foundry Pond Needs Area

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Figure 4.3-5

Foundry Pond Area Overview
Potential Effluent Recharge Sites

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The most promising location for a De-Centralized system is a large privately owned parcel located off Weir Street. Much of this area, shown in Figure 4.3-6 consists of open space although there are several pockets of wetland area on and adjacent to the parcel. The cost for acquiring all or a portion of the roughly 29 acre parcel has not been determined and is not included in the costs presented below. Land acquisition costs will increase the disparity between the two options, making the De-Centralized system less attractive.

Costs

The opinion of probable costs to provide a sewer collection system (for expansion of the Weir River Sewer District – "WRSD" – Option A, and for a De-Centralized System – Option B) serving the Foundry Pond needs area is $15,000,000 and $21,800,000, respectively. Detailed descriptions of the development of these costs were presented in Section 3 under Alternatives 3 and 5 respectively. The estimated cost includes trenching and pipe installation; engineering and contingencies; and an allowance for ledge and rock removal expected within this needs area. Two submersible pump stations (with emergency generators) are proposed in the preliminary sewer collection layouts for both options (A and B).

4.3.3 Martin's Lane (Northern portion of Summer Street Study Area)

Environmental Impacts and Mitigation Measures

The Martin's Lane project area is located within the "Summer Street" study area, between what is known locally as "World's End" and the roadway of Summer Street. This project area is shown on Figure 4.3-7 and also shows the "Cedar Gables" neighborhood at the southern boundary of World's End. This area was identified for detailed evaluation due to concerns raised by the Board of Health, the Sewer Commission and the Comprehensive Wastewater Management Committee. This area consists of till and bedrock soils and several on-site SDSs have been upgraded or repaired in this project area. The "Cedar Gables" area consists of small lots that contribute to nitrogen loading of Hingham Harbor, and the Weir River ACEC. The remainder of the Martin's Lane area includes considerably larger lots that are sized adequately for on-site disposal systems.

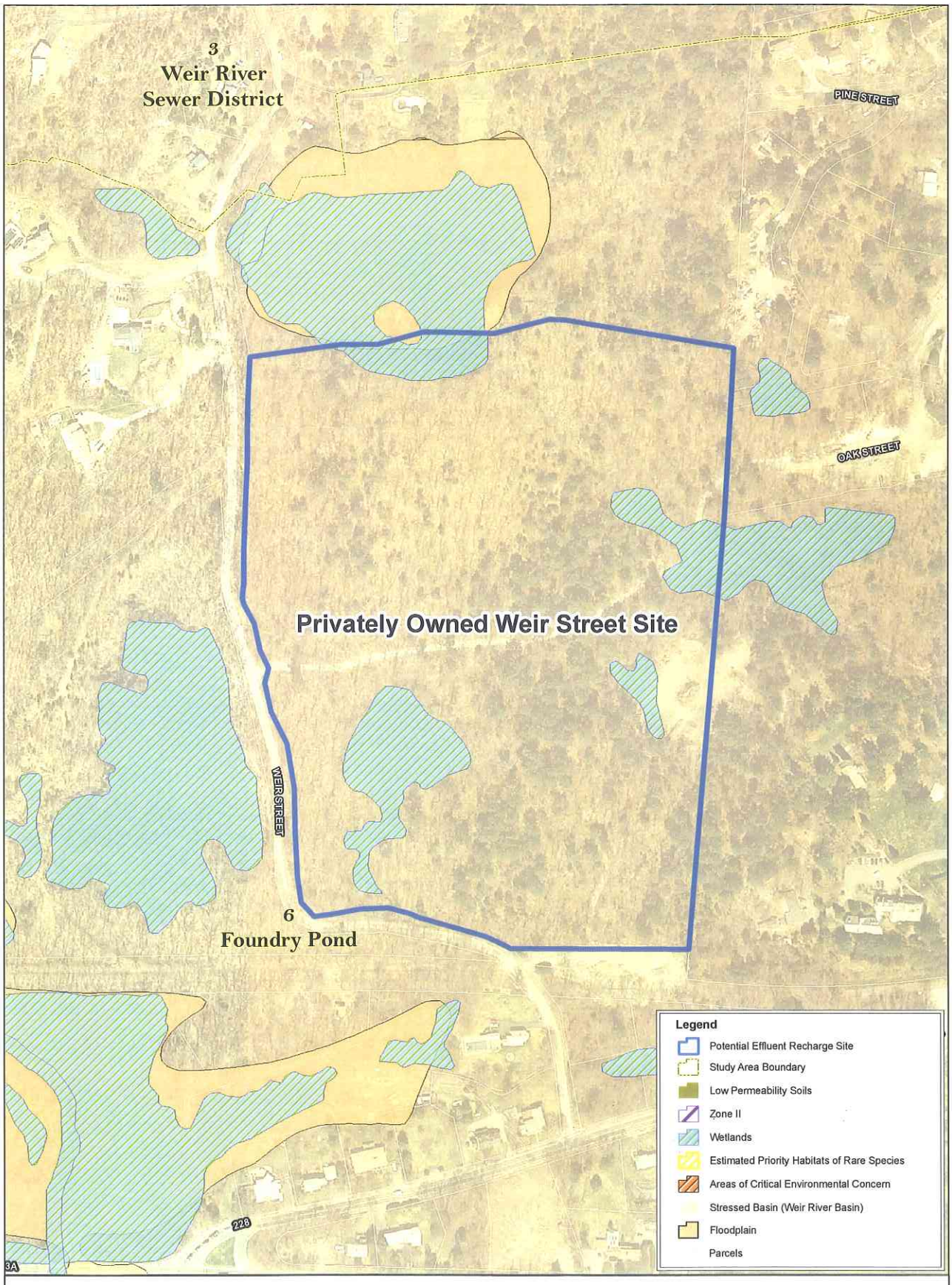

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Figure 4.3-6

Privately Owned Weir Street Site
Potential Effluent Recharge Sites

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Figure 4.3-7

Martin's Lane Project Area

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If a solution is to be implemented for this area, the town must decide whether to develop a solution for just Cedar Gables or for the entire Martin's Lane project area. Any collection system to serve Cedar Gables must run through the Martin's Lane area. Given the density of development in this area, there is no option for construction of a De-Centralized solution. The area does abutt the North Sewer District and the downtown area of Hingham so extension of sewer service to this area is feasible. Any connection to the NSD will be at the extremity of the system, and depending on the amount the Martin's Lane area to be sewered, improvements to portions of the NSD may be required. Improvements may include increasing capacity of existing gravity sewers, pumping stations, force mains and other appurtenances. The area also abuts the Weir River Sewer District and sewers have been extended out as far as the Hingham Court House located across a marsh from Cedar Gables. The collection system in the Weir River Area is a pressure sewer system consisting of small diameter sewers with individual grinder pumps for each home and building. Sewers in the vicinity of the court house and George Washington Boulevard have been sized only for the buildings currently connected to the system. Connection of any additional homes will require installation of a larger pressure sewer or construction of a new pumping station and force main discharging into the WRSD.

Regulatory Compliance Factors
The Martin's Lane project area generally consists of subsurface conditions with limitations for long-term use or construction of SDSs. The Cedar Gables area is particularly limited.

Flexibility
On-site systems do not offer much flexibility. With limiting factors such as poor soils and high groundwater within this needs area, Title 5 waivers and variances will continue to be required. Off-site disposal relieves the individual homeowner from inspections and maintenance of failing poorly functioning on-site systems.

Reliability
An off-site system is an effective long-term solution to wastewater disposal problems in the study area. As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham and not the individual homeowner should the off–site option be implemented.

Costs
The opinion of probable cost to provide a sewer collection system serving the Martin's Lane needs area can vary considerably depending on the option chosen and the area that is included for sewering. The estimated cost for connection of the Martin's Lane area to the North Sewer district is approximately $10,000,000. Further refinement of this estimate can be performed once additional direction for installation of sewers in this area is determined.

4.3.4 Liberty Pole

Environmental Impacts and Mitigation Measures

Liberty Pole is located in south central Hingham and is shown on Figure 4.3-8. Small lot size and limiting groundwater conditions will continue to create hardships for those who upgrade their SDSs. Liberty Pole is also an isolated area with no easy access to existing sewer systems in either Hingham or neighboring Weymouth. Construction of a centralized sewer system would require a very long force main or similar sewer passing through other needs areas, thus construction of a sewer alternative for just Liberty Pole without inclusion of adjacent areas is impractical.

The entire Liberty Pole area is located in the Zone II for Hingham's drinking water wells. Any wastewater management solution that would minimize transfer of water out or this zone would certainly mitigate environmental impact by maximizing groundwater recharge.

Regulatory Compliance Factors

During the needs analysis, the Liberty Pole study area scored high in the nitrogen loading criteria and is located entirely within the town's aquifer protection zone.

Flexibility

On-site systems do not offer much flexibility. With limiting factors such as poor soils and high groundwater within this needs area, Title 5 waivers and variances will continue to be required. Off-site disposal relieves the individual homeowner from inspections and maintenance of failing poorly functioning on-site systems.

Reliability

An off-site system is an effective long-term solution to wastewater disposal problems in the study area. As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham and not the individual homeowner should the off–site option be implemented.

Potential for Decentralized System

As part of the analysis for this area, an evaluation of potential sites for decentralized wastewater disposal was performed. A screening was performed for potential available disposal sites. In general, acceptable sites are within or adjacent to the study area, have good permeable soils, and ideally would consist of town-owned land. Figure 4.3-9 shows a review of the project area with an overlay showing wetlands, conservation land, town owned parcels and other pertinent constraints. The majority of undeveloped land in the Liberty Pole area is wetlands. There is one town owned site located behind the Hingham South Elementary School. Space at the site, shown on Figure 4.3-10, is limited due to the presence of wetlands and flood plain areas. Approximately 1 acre of this parcel may be available for a potential disposal site which will disqualify this location.

Town of Hingham
Comprehensive Wastewater Management Plan

CDM

Figure 4.3-8

Liberty Pole Needs Area

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Town of Hingham
Comprehensive Wastewater Management Plan

CDM

Figure 4.3-9

Liberty Pole Area Overview
Potential Effluent Recharge Sites

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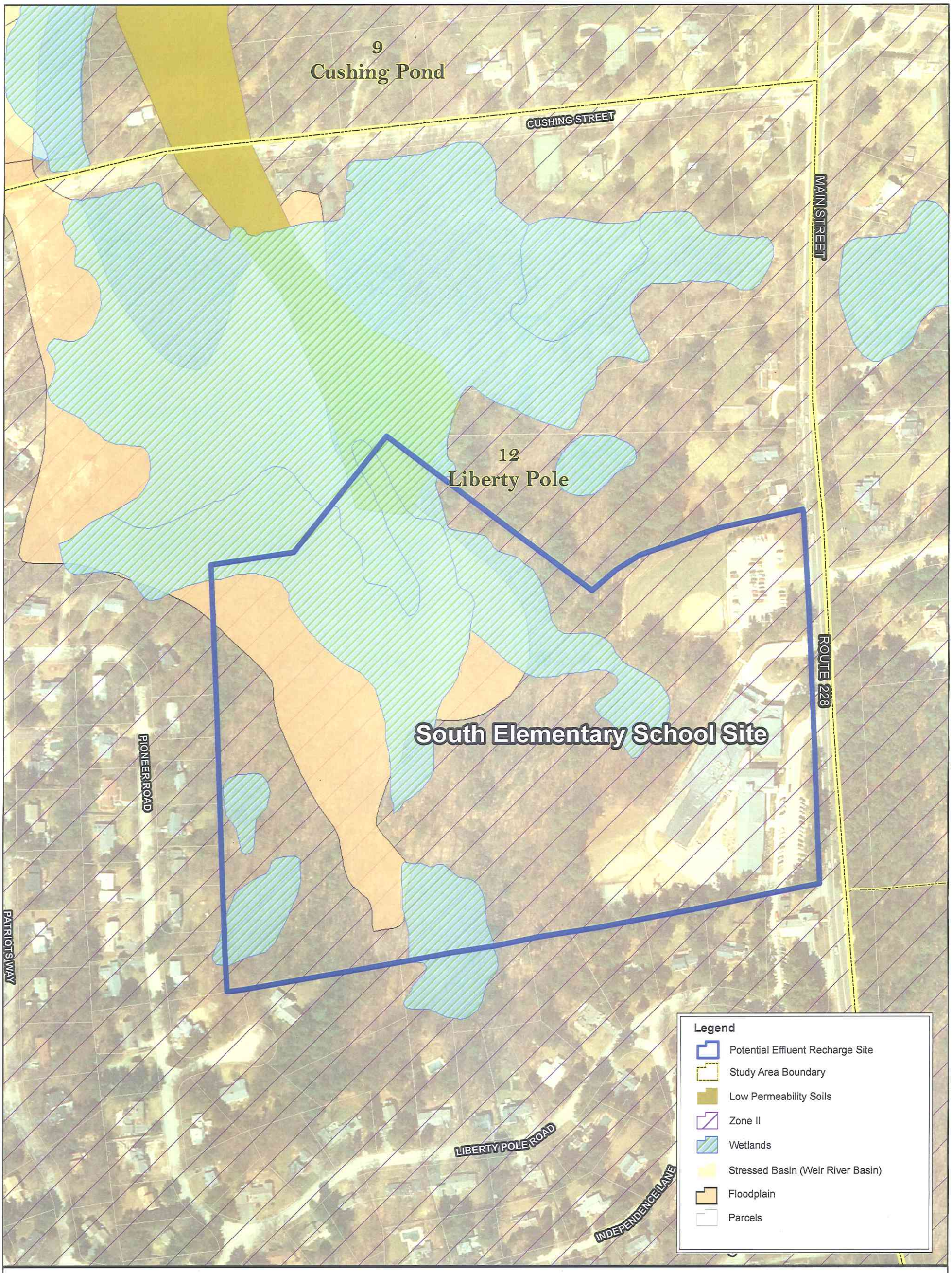

Town of Hingham
Comprehensive Wastewater Management Plan

CDM

Figure 4.3-10

South Elementary School Site
Potential Effluent Recharge Sites

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There may be other potential private sites that can be explored in the area adjacent to Liberty Pole. Boston Golf Club is immediately adjacent to the needs area and may have irrigation needs that can be served by a De-Centralized system. Black Rock Country Club is also in close proximity to the Liberty Pole area. Either of these locations hold the highest promise for wastewater disposal in this area.

Costs

The opinion of probable cost to provide a sewer collection system serving the Liberty Pole needs area is estimated to be $15,400,000. This estimated cost includes trenching and pipe installation; and engineering and contingencies. One submersible pump station (with an emergency generator) is proposed in the preliminary layout. Sewer collection piping within this needs area includes 1,000 linear feet of force main (6-in. diameter), and 34,500 linear feet of gravity sewer (all 8-in. diameter). Additional costs will be required to implement the De-Centralized solution for this area. Using estimates for De-Centralized treatment and disposal systems prepared for other alternatives in this study, an additional allowance of approximately $10,000,000 should be carried.

4.3.5 Industrial Park

The Industrial Park needs area was another part of Hingham identified by the Steering Committee for implementation of a wastewater solution. Increased commercial development in this area, located adjacent to Weymouth, Rockland and Route 3 could result in economic benefit for the town. Similar to the Liberty Pole area, the Industrial Park area is remote compared to the remainder of Hingham. The area is far removed from the North Sewer District, making a connection to the sewered portion of Hingham improbable. Solutions to provide a wastewater solution for this area include development of a De-Centralized solution or connection into the neighboring Town of Weymouth sewer system for ultimate disposal at MWRA.

Environmental Impacts and Mitigation Measures

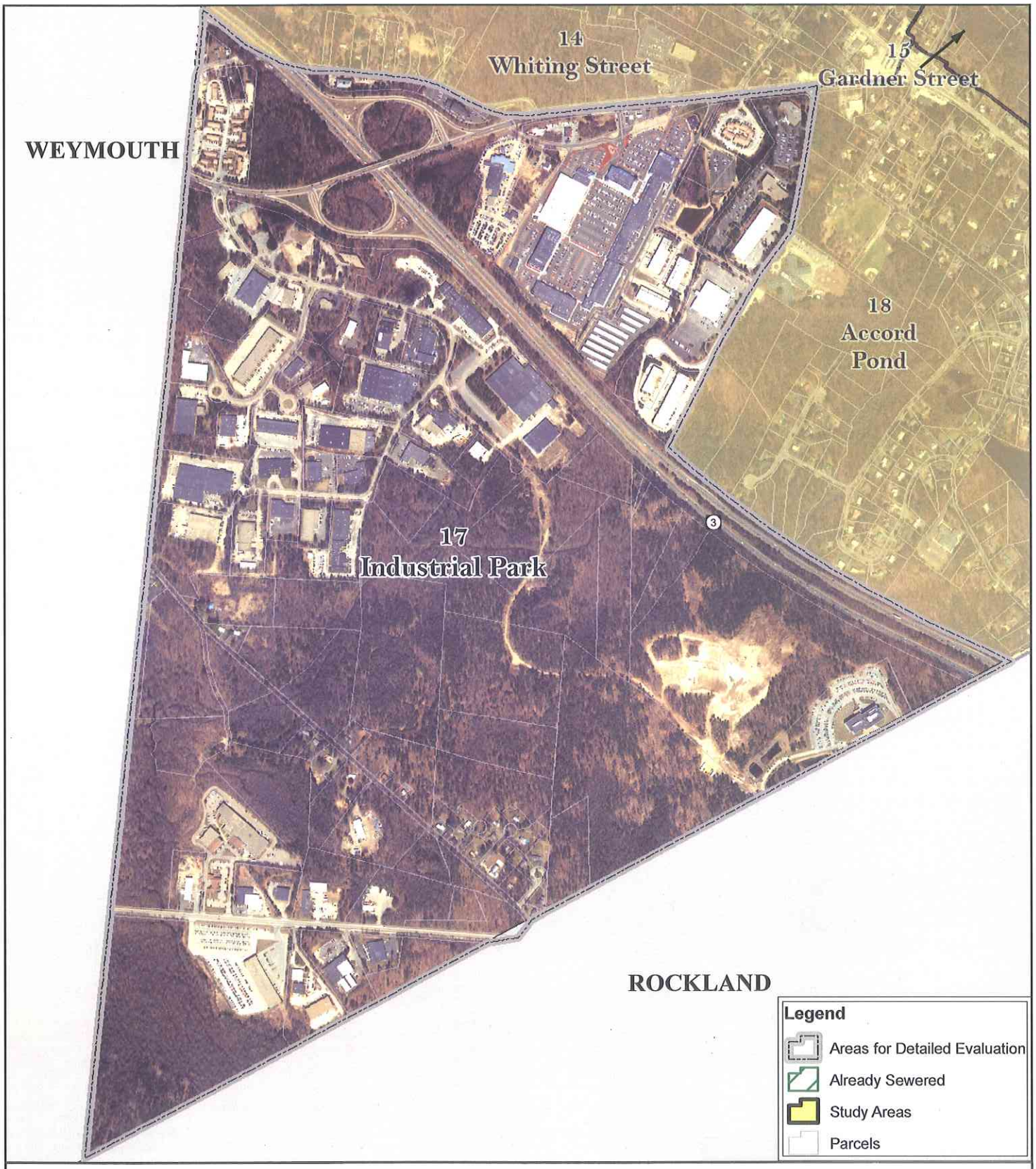
The Industrial Park study area is located in the southwestern corner of Hingham adjacent to the towns of Rockland and Weymouth. This needs area is shown on Figure 4.3-11. Soil conditions in the Industrial Park are dominated by till soils and shallow bedrock conditions. This study area also has the highest percentage of repairs or upgrades to SDSs in all of Hingham.

Regulatory Compliance Factors

For socioeconomic reasons, this area is included for detailed evaluation of an off-site wastewater management solution.

Flexibility

On-site systems do not offer much flexibility. With limiting factors such as poor soils and high groundwater within this needs area, Title 5 waivers and variances will continue to be required. Off-site disposal relieves the individual homeowner or business owner from inspections and maintenance of failing poorly functioning on-site systems.



Town of Hingham
Comprehensive Wastewater Management Plan

CDM

Figure 4.3-11

Industrial Park Needs Area

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Reliability

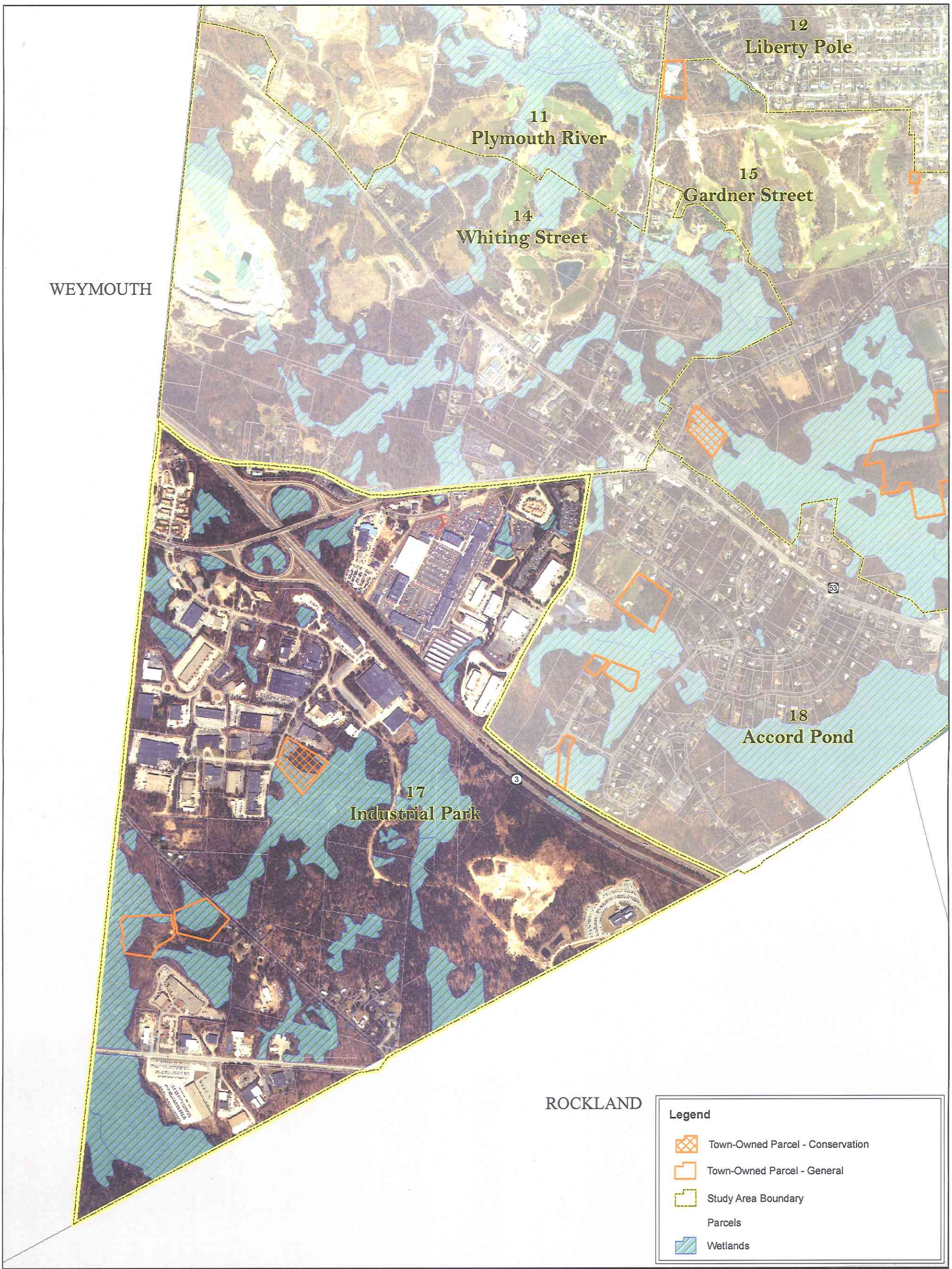
An off-site system is an effective long-term solution to wastewater disposal problems in the study area. As previously discussed, the sewer collection system lifespan exceeds the expected operational duration of on-site systems. Additionally, operation and maintenance responsibilities of the treatment and disposal systems would shift to the Town of Hingham and not the individual homeowner should the off–site option be implemented.

Potential for Decentralized System

CDM performed an analysis of this area for potential sites for decentralized wastewater disposal. A screening was performed for potential available disposal sites and is shown in Figure 4.3-12. There are no town owned sites within the project area that are suitable for wastewater disposal. There appear to be privately owned parcels that may be suitable, however, issues with cost of purchasing land and a reduction in developable commercial property may these private sights un appealing.

Costs

The opinion of probable costs to provide a sewer collection system (for connection to the MWRA system through Weymouth is $21,600,000. This estimated cost includes trenching and pipe installation; engineering and contingencies; and an allowance for ledge and rock removal expected within this needs area. Two submersible pump stations (with emergency generators) are proposed in the preliminary layout for each option. Sewer collection piping within this needs area includes 3,600 linear feet of force main (6-in. diameter), and 22,500 linear feet of gravity sewer. Costs for MWRA entrance fees and mitigation costs have been estimated consistent with other needs areas developed in this report. It should be noted that the Town of Weymouth may have additional fees and mitigation costs applicable to connection to its collection system.



Town of Hingham
Comprehensive Wastewater Management Plan

CDM

Figure 4.3-12

Industrial Park Overview
Potential Effluent Recharge Sites

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Table 4.3-2
Industrial Park - Sewer Collection System Summary

Item	*Cost*
Industrial Park Area Collection System	$10,700,000
Subtotal	$10,700,000
Contractor's Overhead & Profit (20%)	$2,200,000
Subtotal	$12,900,000
Construction Contingencies (25%)	$3,200,000
Total Construction Cost	$16,100,000
Construction Cost at Mid-Point of Construction (3% per year for 3 yrs)	$17,600,000
Engineering and Implementation Costs (20%)	$3,500,000
MWRA Entrance Fee and Mitigation Allowance	$500,000
Land Acquisition/Easement Costs	$TBD
Opinion of Probable Cost	**$21,600,000**

Section 5
Recommended Plan

5.1 Introduction

The recommended plan presented in this section is a culmination of extensive efforts by the Town of Hingham to evaluate and finalize a course of action for wastewater management. In developing the recommended plan, the Town (acting primarily through its Comprehensive Wastewater Master Planning Committee) reviewed and discussed many alternatives and variants as presented in prior sections of this report. In the end, the recommended plan, which focuses on the creation of a new Industrial Park Area (IPA) Sewer District, balances wastewater management needs with economic development and other factors to best suit Hingham's future. This alternative was further endorsed by the 2010 Hingham Town Meeting through an affirmative vote on Article 32, which resulted in the creation of a new sewer district encompassing all of the land in the Office Park and Industrial Park zoning districts in South Hingham.

This section presents a summary of the recommended plan area, a review of impacts and proposed mitigation measures, estimated costs, and a proposed implementation plan. Other high-priority areas outside of the Industrial Park Area were also evaluated in this CWMP but did not fit with the desired direction of the Town at this time. For areas that will continue to use on-site disposal of wastewater, an improved management plan is recommended to be developed and implemented.

5.2 Recommended Plan

The recommended plan consists of installing a centralized wastewater collection system in the Industrial Park Area. The limits of the area have been modified slightly from the boundaries identified in previous sections of this report with the primary intent of including only the areas zoned Industrial Park and Office Park located on either side of Route 3 in South Hingham. Limits of the district are shown in the attached Figure 5-1. A large scale map of the study area is included in Appendix B.

The area's wastewater can be categorized as primarily sanitary wastewater from bathroom facilities and building maintenance. The sources of non-sanitary flow are unknown at this time. Based on assessor's information for this area, approximately 30% of the industrial park has a "manufacturing" use designation. Further research on the nature of these manufacturing operations will need to be performed during design, as the type of discharge could impact the types of permits required for such an operation. The possible need for pretreatment can also be evaluated during design. It should be noted however that all existing facilities in the project area already currently utilize on-site wastewater disposal.

Town of Hingham
Industrial Park
Conceptual Sewer Plan

CDM

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W E
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Basemap: USGS Color Ortho Imagery (2008); 30cm
Source: MassGIS and the Town of Hingham
Coordinate System: NAD83 Mass. State Plane
Mainland (meters)

0 450 900 1,800 Feet

Figure 5-1

Hingham Industrial Park
Study Area

Soil conditions in the area are predominantly till with underlying bedrock. The area currently experiences the highest rate of repairs to on-site subsurface disposal systems in all of Hingham. The elimination of marginal on-site disposal systems can only be addressed through the provision of a large-scale, shared wastewater collection system. The removal of constraints on wastewater capacity would benefit local businesses by reducing the cost of expensive repairs, and allowing for growth and expansion which would, in turn, provide economic benefits to the Town. This area is not in close proximity to other sewered areas in the northern part of Hingham, so a direct gravity tie-in or expansion of an existing local sewer district is not feasible. Three possible alternatives have been identified to serve the Industrial Study Area: 1) connection to the MWRA sewer system through a new transmission main to the existing Hingham North Sewer District; 2) connection to the MWRA system through the neighboring Town of Weymouth; or 3) creation of a new decentralized wastewater treatment plant and subsurface disposal system.

5.3 Industrial Study Area Alternatives

Each of these three alternatives is explored further in this section including details of each option, potential impacts, and estimated construction, implementation and mitigation costs. A final recommended alternative is then selected and an implementation plan is presented for moving forward.

5.3.1 Wastewater Flows

Wastewater flow estimates for the Industrial Study Area are consistent regardless of the chosen alternative. The methodology and estimated current and build-out flows are described below.

Existing Flows

Based on existing building usages and square footages provided by the Town Assessor's Office, Title 5 flows for the proposed sewer district were developed. Title 5 flows were estimated for each of the approximately 75 addresses within the proposed district. Data and assumptions for these calculations are shown on Table No. 1 in Appendix C. The existing base Title 5 flow for the area is approximately 141,277 gallons per day.

It should be noted that a portion of the study area will not be included in the wastewater flow calculations and will remain on its existing on-site disposal system. This area consists primarily of the Derby Street Shops site that was recently developed and includes its own packaged wastewater treatment facility sized to treat 50,000 gpd. Any future expansion of this popular shopping area, including a possible second level of retail space, would necessitate additional treatment capacity. This expansion may require supplemental off-site treatment through the Town's proposed municipal sewer system. It may also be possible to expand this existing plant to serve the Industrial Study Area; however, this option has not been explored.

Future Build-Out Flows

The Town has been contacted by a group of corporate partners that own property within the district that are interested in developing currently undeveloped and under-developed property contingent upon the provision of expanded wastewater processing capacity. With the provision of expanded wastewater processing capacity, it may be assumed a certain percentage of the property owners will expand existing buildings and operations.

Currently, further development of existing buildings is restricted by their limited on-site treatment systems. An increase of the base flow is being assumed for existing development (1% per year for a 20 year build out). An allowance is also being carried (100,750 gpd) for potential development of lots that are currently vacant within the study area.

Below is a summary of estimated flows for Industrial Study Area. The flows presented in the table will be used for all permit applications, mitigation, fees, and other similar uses. It is generally accepted that the flows computed using Title 5 represent the maximum day flows and consist of typical average daily wastewater flow times a factor of 2. However, these flows were used as design flows for the purposes of this analysis, adding a layer of conservatism. Peak flows for design of wastewater facilities are presented in the next section.

Flow Source	Average 2020 Flow (gpd)
Existing Title V Base Flow	141,277
Proposed Future Development	100,750
Estimated Redevelopment	68,256
Total	310,283
Design Flow (based on Title 5)	**311,000**

Peak Flows
Peak flow from the study area is typically computed for the purpose of designing new sewer conveyance facilities. An additional factor is applied to average flows using standard tools such as the Merrimack Curve to compute a peak flow for design of sewer and pumping facilities. The peak flow is considered the peak hour flow on the maximum day. Estimated peak hour flow for the project area is 809,000 gpd (311,000 gpd max day flow divided by 2 equals average day flow times a peaking factor of 5.2 from the Merrimack Curve).

5.3.2 Industrial Area Collection System

The proposed Industrial Park Area Sewer District would discharge to either the MWRA system or a new decentralized package treatment facility, as described above. For the MWRA connection options, it would be necessary to connect to MWRA through the existing collection system in the Town of Weymouth or by construction of a new transmission sewer to the North Sewer District. Both alternatives are explored below along with the likely mitigation and fees for each alternative approach.

For a new decentralized treatment plant, the Town has identified and acquired a potential site for new treatment and disposal facilities. The potential site is located south of Route 3 and includes approximately 4.14 acres of land. A preliminary collection system layout has been developed to convey wastewater to this proposed location.

For any of the three alternatives, the proposed Industrial Park Area collection system will consist of a network of gravity sewers, pump stations and force mains. The collection system would include approximately 17,150 linear feet of 8-inch sewer, 6 pump stations, and 11,200 linear feet of force main. Varying sewer alignments would be required to connect to the MWRA system or a new decentralized wastewater treatment facility. These sewers will be further described in the following sections.

Phasing of the Industrial Park Area collection system is also possible to suit the development needs of the area. For example, the first phase of the project could include the existing industrial areas south of Route 3 and the second phase could be the Office Park District north of Route 3, which is currently undeveloped. Phasing will be further addressed for the selected alternative later in this section.

Below is a summary of the conceptual planning level costs for the collection system infrastructure required to serve the proposed sewer district. The collection system is composed of six pumping stations, with gravity sewer and force main associated with each. The unit prices listed include trenching, pipe, manholes, backfill, paving and all other associated materials. The costs are summarized by station. Note that some stations will collect local flow and others (Pond Park Road and Derby Street) will collect more regional flow before ultimately being pumped to the final disposal location. This fact is reflected in the price difference of these stations.

Industrial Park Collection System – Estimate of Probable Cost

Item	*Unit*	*Unit Cost*	*Cost*
Sharp Street Pumping Station	1	$150,000	$150,000
Sewer (lf)	1,665	$150.00	$249,750
FM (lf)	2,475	$100.00	$247,500
Abington Street Pumping Station	1	$150,000	$150,000
Sewer (lf)	3,690	$150.00	$553,500
FM (lf)	1,575	$100.00	$157,500
Pond Park Road Pumping Station	1	$250,000	$250,000
Sewer (lf)	2,160	$150.00	$324,000
FM (lf)	1,080	$100.00	$108,000
Industrial Park Road Pumping Station	1	$150,000	$150,000
	3,060	$150.00	$459,000
FM (lf)	1,170	$100.00	$117,000
Derby Street Pumping Station	1	$250,000	$250,000
Sewer (lf)	3,915	$150.00	$587,250
FM (lf)	3,105	$100.00	$310,500
Recreation Park Drive Pumping Station	1	$150,000	$150,000
Sewer (lf)	2,655	$150.00	$398,250
FM (lf)	1,800	$100.00	$180,00
Construction (rounded)			$4,800,000
20% Contingency			$960,000
Subtotal			**$5,760,000**
Engineering & Implementation (30% of Subtotal)			$1,700,000
Total			**$7,460,000**

5.3.3 Discharge Alternatives

5.3.3.1 Weymouth Discharge Alternative (MWRA)

Hingham Officials met with Weymouth officials to discuss the possibility of serving as the receiving community for the proposed Hingham flow. Based on the conceptual sewer layout, three connection points have been identified to enter the Weymouth sewer collection system.

- ***Pleasant Street Connection*** – This connection would accept flow from the existing Derby Street area and any future development that might occur on the 77-acre Bristol property. The flow would be delivered to Pleasant Street via a force main through an easement on the Bristol property running parallel to Route 3. This connection would accept approximately 150,000 gpd at build-out (48% of the district flow).

- ***Oak Street Connection*** – This connection would accept flow from the exiting Industrial Park Road area and the proposed South Shore Hospital and Casey & Hayes developments. The flow would be delivered to Oak Street via a force main on Industrial Park Road and Oak Street. This connection would accept approximately 124,000 gpd at build-out (40% of the district flow).

- ***Pine Street Connection*** – This connection would accept flow from the existing Sharp Street area. The flow would be delivered to Pine Street via a force main on Abington Street. This connection would accept approximately 37,000 gpd at build-out (12% of the district flow).

Approximately 4,150 linear feet of sewer force main would be required to connect the proposed project area to the Weymouth system. Weymouth has run approximations of these conceptual flows through their existing sewer model. Although the system can physically handle the introduction of this volume, significant upgrades and diversion of flow would be required to not adversely affect Weymouth's system. Based on discussions to date, likely improvements would consist of flow diversion strategies and pump station upgrades. A line item has been included in the cost estimate to account for these improvements.

Mitigation and Estimated Costs

Weymouth's I/I mitigation measures call for a 7 to 1 removal rate or a fee of $17/gallon. With an estimated flow of 311,000 gallons per day from the Industrial Park Sewer District, the estimated fee for Hingham is approximately $5,300,000. Weymouth Officials identified approximately $8,500,000 in additional fees for system improvements to increase capacity in the collection system. I/I removal projects could be identified within Weymouth's system to account for the volume of added flow; however it is unlikely that 2,200,000 gallons of I/I can be identified and removed.

In addition, the MWRA has an inflow reduction requirement for all new connections made from outside the current system. Inflow is generally classified as stormwater that enters the wastewater collection system through direct connections such as catch basins, roof leaders and sump pumps. The requirement is presently 4 gallons of inflow reduction per gallon of new flow added. In the case of the industrial area, the estimated inflow reduction is 1,244,000 gallons. Hingham can identify and remove the required inflow from its existing wastewater collection

system or from other collection systems downstream in the MWRA service area. It is unlikely that Hingham can readily identify the required inflow from its own system and will have to look elsewhere to meet the requirements. If inflow can be identified in Weymouth, it may be possible to get credit to satisfy both Weymouth and MWRA's requirements with the same reduction. The cost of inflow reduction is highly variable depending on the identified sources and the action required to eliminate them. Previously in this report, a per gallon allowance for inflow reduction was developed at $5/gallon. The allowance for the industrial park area is approximately $6,200,000; however, actual costs will vary.

Connection to the MWRA system would result in an interbasin transfer. The Interbasin Transfer Act ensures that the river basins of the Commonwealth are not adversely affected by the transfer of water recourses from one basin to another. Any new connection to the MWRA sewer system is considered an interbasin transfer since flow will ultimately be discharged to the Massachusetts coastal basin. Typically, an offset of 1 to 1 is required under the Interbasin Transfer Act. Based on the flow from the industrial area, 311,000 gallons of flow will be transferred. Offsets can include infiltration and inflow reduction, water conservation, groundwater recharge and other similar action to mitigate the transferred flow. The cost of offset is difficult to estimate; however, previously in this report, the cost has been approximated at roughly $1/gallon.

MWRA also has an entrance fee for new wastewater flows, which is estimated for the Industrial Park Sewer District to be $1.3 million.

A summary of the costs to connect to MWRA's system via Weymouth's collection system are presented in Section 5.3.3.4. Costs include physical costs to connect the systems, as well as anticipated mitigation fees, engineering and implementation costs and contingencies.

5.3.3.2 Hingham Alternative (MWRA)

The Industrial Park Area is isolated from the remaining portions of the Hingham collection system, which is predominantly in the northern portion of town. In order to connect this area to the existing system, a long (approximately 5-mile) force main would be required. The force main would discharge to the existing gravity sewer system tributary to the South Street pumping station. Potential connection points to the existing sewer system include Central Street and South Street. Depending on the ultimate sewer route and connection point, flow would be conveyed by the existing gravity sewers to the South Street pumping station where it would be pumped via the existing 10-inch force main and conveyed to the MWRA system. Minimal improvements would be required to this existing sewer network. Large diameter gravity sewers presently exist from the proposed discharge location to the South Street Station. Similarly, a significant amount of flow was removed from the South Street station when the Greenbush Line was constructed. This capacity is available to convey this proposed flow to the MWRA. It is recommended that cleaning and inspection be performed in the sewers that would convey this flow to the South Street Station to confirm that they are in good condition. Minor improvements may also be required at the station itself including installation of odor control and other internal improvements. An allowance has been included for this work in the summary of costs. Finally some modification of the proposed Industrial Park Area sewer network will be required to consolidate flow for transmission to the North Sewer District.

In this alternative a long sewer force main will pass through the town of Hingham through several sewer needs areas that are currently not recommended as a high priority for connection to a centralized sewer system. The challenge relative to this alternative is that due to concerns about increased development, provisions would need to be made to prevent connections that would result in potentially controversial residential growth in the areas through which the sewer would pass on its way from the Industrial Park Area to the North Hingham Sewer District. Another more potentially critical concern is the effect on local neighborhoods of the disruptive nature of the construction and, possibly in conjunction with this factor, the inability of local abutting residents to gain direct benefit from the construction of the force main. Precedent has been established to limit connections in several other areas of the town.

Similar to connection to the MWRA system via the Town of Weymouth, this alternative will also require various connection and mitigation costs beyond the construction of the wastewater collection system. Costs include the MWRA entrance fee, inflow mitigation, and an Interbasin Transfer Offset allowance.

A summary of the costs to connect to the Hingham North Sewer District are presented in Section 5.3.3.4 below. Costs include physical costs to connect the systems, mitigation and other associated costs.

5.3.3.3 Hingham Alternative (Decentralized)

This alternative includes construction of a sewer system in the Industrial Park Area with discharge to a new decentralized wastewater treatment facility. Potential facility sites should ideally be large enough to contain the treatment facility and infiltration areas for disposal of treated effluent; depending on soil conditions this could range from 2 to 10 acres for recharge. The Town has identified and acquired a 4-acre site in the area and it investigating its suitability to serve all or a portion of the project's land needs. Specific analysis of disposal options including conventional infiltration systems (open sand beds or underground leaching fields) and potential alternative technologies will be developed if this alternative is implemented. There is precedent for decentralized treatment and disposal facilities in Hingham including the aforementioned facility at the Derby Street Shops and a 300,000 gpd facility at the nearby Linden Ponds development.

There are advantages and disadvantages to a decentralized facility. Advantages are primarily related to elimination of mitigation and connection costs to the MWRA system including buy-in fees, I/I reduction, and connection fees in Weymouth. The decentralized option will also eliminate the need for mitigation of interbasin transfer, since wastewater will be treated and discharged largely from same basin from which it originated, and entirely within Town lines. Disadvantages of a decentralized option include finding and acquiring a suitable location for the facility, and capital and long term operation and maintenance costs relative to the plant, leaching fields and collection system. The 2011 Annual Town Meeting made a major step towards implementation of this alternative by voting to fund the acquisition of a 4.5 acre parcel in the Industrial Park District with the intent of developing a treatment plan and leaching facilities at this location. Prior to this commitment a preliminary site assessment was performed which includes soils analysis and test borings. An expanded testing program would be required to definitively determine the site's suitability. A preliminary evaluation of the costs to construct

a decentralized facility is presented below. An estimate of this alternative to service the entire Industrial Park Area is included in Section 5.3.3.4.

Hingham Treatment Facility – Estimate of Probable Cost

Item	*Cost*
Decentralized Treatment Facility	
Equipment, tanks, and appurtenances	$10,000,000
Subsurface Disposal System Allowance	$500,000
Subtotal	$10,500,000
Construction Contingency (25%)	$2,600,000
Total Construction Cost	$13,100,000
Escalation to midpoint of construction	$14,300,000
Engineering and Implementation (20% of Subtotal)	$2,900,000
Land Acquisition / Easements (Allowance)	$1,000,000
Total	**$18,200,000**

5.3.3.4 Summary of Implementation Costs

The estimated costs of implementation for the three options are presented below, including all implementation and mitigation costs and fees.

Alternative 1 - Industrial to MWRA via Weymouth

Cost Item	*Cost*
Industrial Park Sewer Collection System	$7.5 M
Sewers in Weymouth to Connect Industrial Park	$2.2 M
Subtotal Construction	$9.7 M
Escalation (3%/yr for 3 yrs)	$0.9 M
Total Construction	$10.6 M
Weymouth Connection Fee	$5.3 M
Allowance for Modifications to Weymouth's System	$8.5M
MWRA Entrance Fee (estimated)	$1.3 M
Inflow Mitigation Allowance	$6.2 M
Interbasin Transfer Offset Allowance	$0.5 M
Land Acquisition / Easements	TBD
Opinion of Probable Cost (rounded)	$32.4 M

Alternative 2 – Industrial to MWRA via North Sewer District

Cost Item	*Cost*
Industrial Park Sewer Collection System	$7.5 M
Sewers / Improvements in Hingham	$8.5 M
Subtotal Construction	$16.0M
Escalation (3%/yr for 3 yrs)	$1.5 M
Total Construction	$17.5 M
Weymouth Connection Fee	N/A
MWRA Entrance Fee	$1.3 M
Inflow Mitigation Allowance	$6.2 M
Interbasin Transfer Offset Allowance	$0.5 M
Land Acquisition / Easements	TBD
Opinion of Probable Cost (rounded)	$25.5 M

Alternative 3 – Industrial to a Decentralized WWTP

Cost Item	*Cost*
Industrial Park Sewer Collection System	$7.5 M
Sewers / Improvements in Hingham (allowance)	-
Subtotal Construction	$7.5 M
Escalation (3%/yr for 3 yrs)	$0.7 M
Total Sewer System Construction	$8.2 M
Decentralized WWTP Construction	$ 18.2 M
Land Acquisition / Easements (not including WWTP site)	TBD
Opinion of Probable Cost (rounded)	$26.4 M

The estimated costs presented above for the three options to serve the Industrial Park Area, do not include other estimated costs for continued use of private on-site systems by the remaining portions of Hingham not served by sewers. These costs would be equal for each alternative and include estimated costs for system replacement, upgrade and operation and maintenance.

5.4 Impacts and Mitigation

This section will address potential impacts of the three options presented above, including construction of a centralized sewer system to serve the Industrial Park Area with discharge to MWRA system through either Weymouth or Hingham or to a decentralized wastewater treatment facility in Hingham. Many of the impacts and mitigation measures presented below are common to more than one of the options. The discussion for each criterion will identify the applicable areas that are impacted. Impacts may be temporary, permanent, or a combination of both.

5.4.1 Environmental Impacts

5.4.1.1 Surface Water and Groundwater Quality

This section will assess the impact to surface and groundwater quality. The impacts will be essentially the same regardless of the ultimate discharge location of the proposed sewer system.

There are no surface water bodies in the Industrial Park Area, although it does have some wetlands and streams. It is anticipated that the impact to surface water from implementation of the recommended plan will be minimal. Any likely impact will be temporary and related to construction of the proposed sewer system. Mitigation measures such as proper handling of dewatering and drainage during construction will be performed using standard construction techniques. Since the majority of work is in existing roadways, anticipated impacts are minimal.

Implementation of any alternative will have a positive impact on groundwater quality. Improvements to groundwater quality will primarily be due to elimination of existing on-site wastewater disposal systems that may be performing poorly. The Industrial Park Area was found to have a very high prevalence of on-site system repairs. Improvements to groundwater quality will be permanent once the new collection system is operational and fully on-line.

Decentralized treatment versus one of the MWRA options will not adversely impact groundwater quality. Treatment requirements for the decentralized facility would require very high quality effluent prior to discharge to infiltration beds.

5.4.1.2 Water Supply Impacts

The Industrial Park Area includes vacant properties that are currently available for development as well as those that are already developed but could see more intense development with the elimination of septic constraints. An objective of the recommended plan to provide sewer service to the Industrial Park Area is to increase commercial development in Hingham overall to bring additional tax revenue with minimal impact on other town services such as schools, public works or other town provisioned resources. The privately owned Aquarion Water Company, which serves this area, will need to support this development unless and until another water source(s) can be located.

Using projections developed in this study based on Title 5 flows, the water system will need to supply approximately 170,000 gpd of additional water under full development maximum day conditions. The need for this additional water will not be immediate, and will depend on economic and other conditions, including the availability of other water sources. The Town of Hingham and its current water supplier, the Aquarion Water Company, should work closely to coordinate increased service and supply in this area. A phased plan should be coordinated based on projected need, current available supply and other factors, such as permitting. While mitigation in this area is difficult, potential measures include water conservation by existing users, maximizing exiting permitted withdrawals, obtaining water from external sources, or combinations of these measures.

From a groundwater recharge standpoint, only a very small portion of the Industrial Park Area is located in the Zone II well head protection area. The area located in the Zone II consists of 2 developed lots on Derby Street adjacent to the intersection of Cushing Street. Based on this

review, it is determined that implementation of either of the MWRA options will have no impact on the recharge area for the existing Hingham water supply. If the decentralized alternative is selected, ground water recharge in the Zone II could be increased depending on the location of the treatment facility and discharge basins.

5.4.1.3 Air Quality

Implementation of any of the three options will have very limited temporary impact on air quality. Impacts will not be affected by either discharge to MWRA through Weymouth or Hingham, or to a decentralized facility. Likely impacts will primarily be due to construction activity required to install the proposed sewer system. Mitigation measures planned to minimize this temporary impact are consistent with the current Mass DEP requirements to reduce emissions from construction vehicles.

There will be a very minor increase in emissions from the standby generators that will be constructed at the proposed sewer pumping stations and treatment facility, if applicable. Since these are standby generators, the actual operation of the units will be typically limited to only a few hours a week to exercise the equipment. Natural gas generators will be used whenever possible and cost-effective in the project area.

5.4.1.4 Noise Levels

Temporary noise impacts will be primarily the result of construction activity. Noise levels will not be appreciably different for the Weymouth or Hingham options; however the impacted population will vary slightly. Mitigation measures for temporary impacts will be primarily the limitation of work hours of construction. There are no significant long term noise level impacts with the MWRA options.

The decentralized option may have some additional noise impact due to the operation of the treatment facility. Impacts will be long term; however the significance of the impacts is anticipated to be minor given the likely location of the facility adjacent to Route 3, as described further below.

5.4.1.5 Wetlands and Floodplains

The proposed options will not impact wetlands or alter flood plain. Proposed work, including construction of the centralized wastewater collection system, will be mostly performed in existing roadways and easements. Provisions will be implemented during construction to prevent damage to wetlands due to temporary construction activities. Similarly, the proposed project does not include installation of fill or modification of terrain, therefore no impact to flood plain is anticipated. During design, a more detailed review of wetland resource areas in the project vicinity will be conducted and the need for permit applications to the Hingham Conservation Commission will be assessed.

5.4.1.6 Other Environmentally Sensitive Areas

Preliminary assessment has also been performed to review potential impacts to other environmentally sensitive areas such as endangered species, historical and archeological sites, conservation land, and agricultural land. Since the majority of the work will take place in existing roadways there are not anticipated to be any significant impacts to these areas from

construction of the recommended alternative. Further development and redevelopment in the Industrial Park Area will need to be managed under existing planning and permitting controls. Further review by the applicable agencies will be performed as part of the Environmental Notification Form process. In terms of the decentralized option, the 4.5 acre site proposed as the location of the plant and leaching field was screened using the 2008 Priority and Estimated Habitat layers created by the Priority and Endangered Species Program. Estimated Habitat MassGIS maps have been reviewed and there appear to be no potential impacts to state-listed rare species or habitats.

5.4.1.7 Water Balance

Compiling a comprehensive water balance requires the analysis of several input and output streams. This task is most appropriately done during the Water Resource Commissions Inter-basin transfer process. For this plan, the water balance can be greatly simplified and focused. Essentially all of the water supplied to the area is distributed through the Aquarion system. Any water from private wells is considered insignificant. Sewage generated from existing and future development will be collected and conveyed either out of the area to an ultimate discharge in the MWRA system or to a decentralized facility.

For the MWRA options, the flow projections for both water distributed and wastewater conveyed to MWRA are essentially equal with the exception of a small allowance for outdoor water uses and sewer infiltration. Almost all of the Industrial Park Area Sewer District is located outside of the existing Zone II recharge area that is located in the central section of Hingham; therefore there will be limited impact to the water supply wells.

Additionally, approximately half of the Industrial Park Area is located outside of the Weir River drainage basin. Therefore under existing conditions, almost all water supplied to the area from Aquarion is presently discharged outside of the recharge area for this stressed river basin.

For the decentralized option, the water balance will remain essentially unchanged.

5.4.2 Institutional Impacts

Should one of the two "MWRA alternatives" be selected, institutional impacts would be primarily centered on admission of the project area into the MWRA. Some specific requirements were outlined in detail in the description of alternatives presented earlier in this section. Representatives of the Town have also met on several occasions with representatives of MWRA and other state agencies such as MassDEP, DCR, MEPA, and the Water Resources Commission, the Town of Weymouth and other stakeholders in the industrial project area.

5.4.2.1 MWRA Application Process

MWRA has in place a detailed procedure for those communities outside the MWRA sewer service area who would like to request admission into the system. This policy, MWRA Policy # OP.11, contains a comprehensive outline of the admission process and the protocol for advancing through each step of the process. Either of the MWRA connection options would require the MWRA application process, which could be very difficult due to system capacity issues.

5.4.2.2 Growth Management

The recommended plan includes construction of sewers to serve the Industrial Park Area, leaving the current North Sewer District and Weir River Districts as is, and implementing an enhanced management system for on-site disposal systems elsewhere in Town. Whichever alternative is selected, once expanded wastewater treatment is provided, appropriate growth in the Industrial Park Area will be encouraged to the limits described previously to generate economic growth for Hingham. Indeed, once Title 5 restrictions are lifted in the Industrial Park Area, zoning will become the primary growth control for the area. In this way, it is anticipated that all three alternatives will result in the growth of commercial development in the Industrial Park Area.

The "Hingham-MWRA" alternative, which envisions connecting the Industrial Park Area to the existing North Hingham Sewer District via a long force main, could have significant impacts on growth management. Currently residential development in much of the area through which the connecting force main would run is restricted by Title V and local Board of Health requirements relative to septic systems. When considering this option, concerns were raised that it would "open the door" to the possibility of new and expanded residential development in this area, which would, in turn result in increased population and increased demand for Town services. The extent of construction required to implement this option was also considered. Although legal processes are available to restrict opportunities to tie in to new sewers in this scheme, community opposition to this scheme due to potential growth management impacts, as well as (on the other hand) the extent of the construction disruption without a viable means of deriving value from such construction through providing connections to those who desired them, were seen as two of the primary reasons that this alternative was not ultimately selected.

5.4.2.3 Other Community Impacts

The effect on vehicular traffic is a concern that the town would face during the construction phase for each alternative. The Hingham MWRA alternative has the largest potential for adverse traffic impact due the extensive length of road excavation required to install the force main between the Industrial Park area and the North Sewer District. The state recently completed a multi-year rebuilding and resurfacing of Route 288, a state highway and significant commuter thoroughfare, which resulted in prolonged traffic delays and detours. The prospect of a new round of traffic disruptions would likely be greeted unfavorably by the public. The Weymouth MWRA option would not likely result in significant adverse traffic or commuting issues.

The decentralized option will essentially have no effect on traffic and commuter travel. In addition, the state is scheduled to install traffic control signaling at the Derby St./Route 3 interchange as part of the Town's plan to encourage more development within the commercially zoned industrial and office park areas. Signaling will help to improve the flow and safety of vehicular traffic in this busy corridor.

5.5 Final Recommended Alternative and Implementation

This section presents the final selected alternative for the recommended plan to expand wastewater treatment capacity in the Industrial Park Area. The final recommended alternative

was selected based upon review of the cost, mitigation requirements, ease of implementation and environmental and institutional impacts of the three possible alternatives explored in this section. Based on this review, it is recommended that Hingham pursue Alternative 3 (Hingham Alternative-Decentralized) which entails the construction of a decentralized packaged wastewater treatment and disposal facility along with associated collection system to serve the Industrial Park Area.

Initially in the preparation of this CWMP, it appeared that an MWRA option, either through Weymouth or Hingham, was the best and most likely scenario for ultimate discharge of sewage from the Industrial Park Area. After further discussions with both Weymouth and MWRA, however, it has now become apparent that connection to the MWRA will be costly, very difficult and potentially not feasible due to system capacity issues with both entities along with environmental restrictions and costs. The Hingham-MWRA alternative presented additional concerns relative to potential impacts on growth. Given the lack of a feasible MWRA option, during late 2010 and early 2011 the Town refocused its efforts towards provision of a decentralized wastewater treatment option to serve the Industrial Park Area. At the 2012 Annual Meeting, voters overwhelmingly supported articles to 1) purchase suitable land to serve as a location for a treatment plant and leaching fields, and 1) proceed with study, engineering, and permitting to support the decentralized alternative. The remainder of this section develops and presents a final recommended course of action for implementation of this alternative.

5.5.1 Description of the Recommended Alternative

The recommended alternative includes construction of a new wastewater collection system in the Industrial Study Area along with a separate treatment and disposal facility. Given the current needs of the area, costs and other factors, the Town has elected to proceed with a phased implementation. The highest priority and greatest need is in the area south of Route 3, which has an estimated flow of 150,000 based on the same calculations determined previously in this section. The area north of Route 3 will continue to utilize current wastewater disposal practices. It should be noted that a very large portion of this area is currently served by a packaged treatment facility for Derby Street Shops while the remaining area is largely undeveloped. The proposed phasing is shown on Figure 5-1.

Critical to implementation of this recommended alternative, is the selection of a site for location of wastewater treatment and disposal facilities. A potential site adjacent to Route 3 in the area south of Route 3 (see Figure 5-1) has recently been acquired by the Town. The site is currently landlocked from existing roadways and is undeveloped. The proposed site and its suitability for wastewater disposal will be discussed later in this section.

5.5.1.1 Collection System

A proposed layout for the Industrial Park Area Phase 1 collection system was developed and is include in Figure 5-1. The proposed layout serves properties in the Industrial Park Area south of Route 3. The collection system is comprised a series of gravity sewers, pumping stations and force mains. Sewers were located in existing roadways or rights-of-way whenever possible. The system includes 10,500 linear feet of gravity sewer, 5 pumping stations and 11,100 linear feet of force main. The terminus of the proposed system is located at the site of the proposed

treatment and disposal facility adjacent to Route 3. The estimated cost of the collection system is $6.2 million, refined for Phase 1 from the estimate provided in Section 5.3.2.

Industrial Park Collection System – Estimate of Probable Cost

Item	Unit	Unit Cost	Cost
Sharp Street Pumping Station	1	$150,000	$150,000
Sewer (lf)	1,665	$150.00	$249,750
FM (lf)	2,475	$100.00	$247,500
Abington Street Pumping Station (to Ind. Park Rd.)	1	$150,000	$150,000
Sewer (lf)	3,690	$150.00	$553,500
FM (lf)	1,900	$100.00	$190,000
Pond Park Road Pumping Station (to Commerce)	1	$150,000	$150,000
Sewer (lf)	960	$150.00	$135,000
FM (lf)	2,160	$100.00	$216,000
Industrial Park Rd Pumping Station (to Commerce)	1	$250,000	$250,000
	3,285	$150.00	$492,750
FM (lf)	1,170	$100.00	$117,000
Commerce Rd. Pumping Station (to WWTP)	1	$250,000	$250,000
Sewer (lf)	900	$150.00	$135,000
FM (lf)	3,400	$100.00	$340,000
Construction (rounded)			$3,626,500
20% Contingency			$725,000
Subtotal			**$4,351,500**
Engineering & Implementation (30% of Subtotal)			$1,300,000
Total			**$5,651,500**
Total with Escalation 3%/yr for 3 yrs			**$6,200,000**

5.5.1.2 Treatment Facility Alternatives

A preliminary evaluation of wastewater treatment systems for the Phase 1 area has been performed. Three of the most common and proven treatment technologies have been reviewed and are presented herein. These technologies were selected based on the anticipated design flow of the project area (150,000 gpd) and their ability to meet groundwater discharge standards including a total Nitrogen limit of less than 10 mg/l. These technologies are:

- Membrane bioreactor (MBR)
- Rotating biological contactor (RBC)
- Sequencing batch reactor (SBR)

A description of each technology along with a discussion of the advantages and disadvantages of each option are presented below.

Membrane bioreactor
A membrane bioreactor (MBR) consists of a suspended-growth biological reactor integrated with membranes. Mixed liquor/suspended growth from the aerobic zone then flows into the membrane tanks where solids are separated from the treated wastewater. The ultra filtration membranes, employing a reinforced structure to handle a high solids environment, are immersed directly into the mixed liquor, thereby precluding the need for a secondary clarifier. Coarse bubble aeration is used to scour the external surface of the hollow fiber membranes to keep them clean and also provides process aeration. Supplemental oxygen for biological treatment is provided by a separate diffused aeration system.

The Zee Weed® MBR process, a product of Zenon Environmental Inc., was considered here for the purposes of preliminary sizing and costs. There are hundreds of ZeeWeed® MBR installations in the US. A 300,000 gpd ZeeWeed® has been in operation in the neighboring town of Cohasset, Massachusetts since 2000. Other vendors of MBR processes include Enviroquip, Ionics, and US Filter.

Rotating biological contactor
A rotating biological contactor (RBC) consists of a series of closely-spaced plastic disks attached to a horizontal shaft. Mechanical drives are used to slowly rotate the units at 1.0 to 1.5 revolutions per minute. As wastewater flows down through the disks, biological growth and treatment occurs on the surface of the disks. Excess growth is continuously shed from the surface of the disks. To achieve carbon oxidation and nitrification, the disks are partially (usually 40 to 45 percent) submerged in wastewater. The aeration required for biological treatment occurs via contact with the air, although supplemental diffused air can also be provided. RBC systems require pretreatment with primary clarification or fine screens, as well as secondary clarifiers.

The Envirex® RBC was considered here for the purposes of preliminary sizing and costs. There are over 125 Envirex® RBC installations in the US, including approximately 40 in Massachusetts. Other vendors of RBC systems include RBC Services and Walker Process Equipment.

Sequencing batch reactor
In a sequencing batch reactor (SBR), a series of wastewater treatment steps are carried out in the same reactor. Therefore, aeration and clarification are done in a single tank operating on time-controlled cycles. Return activated sludge for mixed liquor control and internal recycle for nitrogen removal are not required because solids never leave the tank. Generally, at least two reactors – each operating in a predetermined operation sequence – are used to attain optimum treatment results.

The steps utilized in an SBR are: (1) fill, (2) react, (3) settle, (4) decant, and (5) idle. The fill step can be mixed or mixed and aerated, or a combination of both, depending on whether nitrogen or phosphorus removal is required. The react phase is typically mixed and aerated, although intermittent anoxic periods can be used if needed. Sludge wasting occurs during the idle phase.

The Aqua-Aerobic Systems, Inc. AquaSBR® process was considered for the purposes of preliminary sizing and cost estimates. Other SBR vendors include ABJ/Sanitaire, Fluidyne, and JetTech.

Implementation Issues

Implementation issues include cost, footprint, complexity of operation, susceptibility to process upsets, and the nature of common problems associated with the technology, among others. Given the similarity and relatively small size of the proposed facility, the cost for each of these options is assumed to be equal. There will likely be some cost difference between the options; however, this will be best explored in the preliminary design phase of this project. More important for this project is the relative size of the facility given the limited land area available at the proposed treatment and disposal site. The anticipated footprint required for each technology is shown in the table below. Advantages and disadvantages that should be considered with each treatment option are also presented below.

Approximate Minimum Area Required for Wastewater Treatment Technologies

Treatment Technology	*Required Area*
MBR: ZeeWeed®	80' by 80'
RBC: Envirex®	100' by 120'
SBR: Aqua-Aerobic Systems	120' by 140'

Non-Cost Advantages and Disadvantages of Treatment Technologies

Treatment Technology	*Advantages*	*Disadvantages*
MBR: ZeeWeed®	■ Smaller footprint ■ Produces high quality effluent with low BOD, TSS, coliform and potentially low nitrogen ■ Modular system is easily expandable ■ Can be automated ■ Produces reuse quality effluent	■ Membranes need to be replaced every 7 to 10 years ■ Complex instrumentation and control system
RBC: Envirex®	■ Simple operation ■ Stable operation – resistant to changes in hydraulic or organic loading ■ No return activated sludge pumping	■ Larger footprint ■ Shaft bearings and mechanical drives require frequent maintenance ■ Required filtration
SBR: Aqua-Aerobic Systems	■ Operational flexibility ■ Tolerates peak flows and loads well ■ Simple to expand or upgrade ■ No return activated sludge pumping	■ Larger footprint ■ Complex instrumentation and control system ■ Some sludge might be discharged during draw or decant phases with some SBRs ■ Aeration devices might become plugged during some operation cycles ■ Requires filtration

At this time, any of these technologies is deemed feasible, and selection of a preferred technology is recommended to be performed during preliminary design based on a detailed comparative evaluation.

5.5.1.3 Wastewater Disposal

The Town has identified a potential wastewater disposal site within the limits of the project area. The approximately 4.1 acre site is located on a presently undeveloped parcel adjacent to Route 3. When evaluating a site for wastewater disposal, several factors must be considered including, topography, soils and subsurface conditions, depth to groundwater, proximity to wetlands, surface waters, etc., available land area, and proximity to sensitive receptors. The

type of disposal system should also be considered. The proposed site was deemed the most appropriate of the sites examined based on these factors.

The Town has commissioned some preliminary investigations at the site including soil borings and test pits. A report has been prepared by Polaris Consultants LLC to summarize the investigations performed to date. The Town has also commissioned a review from Weston & Sampson Engineers to assess the suitability of the site for wastewater disposal. In general the site has a very variable topography, including varying depth to bedrock and groundwater. The site consists primarily of till which is typically not conducive to loading at high infiltration rates. The presence of high groundwater and shallow bedrock could also be problematic. The site has potential for use as a disposal site for the industrial park area; however additional investigations and modeling are required to fully determine the capacity and configuration required to meet the needs of the project. It is also very likely that significant re-grading of the site will be required to properly construct a soil disposal facility.

It is expected that that a hydro-geologic investigation will be conducted at the site to better understand the subsurface conditions and to better model wastewater disposal and its impact on surrounding properties and wetland areas. A Phase I Environmental Site Assessment was performed by Tetra Tech Rizzo in conformance with the scope and limitations of American Society for Testing and Materials (ASTM) Standard Practice E1527-05. This investigation included a review of the site history, a site reconnaissance visit, interviews, and a review of local and regulatory files pertaining to the site and surrounding area of the property off Route 3 in Hingham, Massachusetts. This assessment has revealed no evidence of recognized environmental conditions in connection with the property. Therefore, at this time, we recommend no further action. It is also anticipated that a pilot loading test will be performed to better assess the site's capacity for infiltration. This loading test would be performed at the highest rate possible and for the longest duration possible. Groundwater levels and other parameters should be monitored before, during and after the test, and a model developed to simulate the proposed disposal facility.

There are two types of infiltration basins that will be considered for this project: open bed and subsurface. In general, open bed systems have a greater capacity for infiltration and are less costly to construct compared to subsurface systems. The primary advantage of subsurface systems is that the land above the infiltration area can serve alternate uses such as parks, parking areas, etc. In the case of this site and its relative isolation, the use of the land above the infiltration area is most likely not worth the additional cost. A more formal presentation of the disposal area schemes, capacities and costs will be developed along with the hydro-geologic analysis in the next phase of the project.

A summary of the treatment and disposal facility costs is presented below. These costs are based on the Phase 1 project flows (150,000 gpd). Phase 1 includes only the commercially zoned region within the Industrial Park Area located south of Route 3.

Phase 1 Treatment Facility – Estimate of Probable Cost

Item	*Cost*
Decentralized Treatment Facility	
Equipment, tanks, and appurtenances	$6,500,000
Subsurface Disposal System Allowance	$300,000
Subtotal	$6,800,000
Construction Contingency (25%)	$1,700,000
Total Construction Cost	$8,500,000
Escalation to midpoint of construction	$9,300,000
Engineering and Implementation (20% of Subtotal)	$1,900,000
Land Acquisition / Easements (Allowance)	$300,000
Total	**$11,500,000**

5.5.2 Financial Plan

Several alternatives are available to finance the proposed sewer district. These alternatives include financing through taxes, betterments or a combination of both. Each alternative has advantages and disadvantages. For this project, two financing alternatives are presented: 100 percent betterments, or a combination of betterment / property taxes.

Betterments are frequently used to assess property owners for the cost of a project. All or a portion of the project costs, including financing costs, can be included in a betterment. Betterments are assessed to properties that are directly benefiting from the construction of the work. In the case where the project is funded by 100 percent betterments, only the direct beneficiaries will pay. While this approach has some advantages, there are a number of potential disadvantages including a smaller group of payers (therefore a larger per unit betterment cost). Depending on the project economics, the betterment cost could be more that the actual users can support. It is also important to note in this discussion that all residents of Hingham will have some benefit from this project even though they are not served by the sewers. These indirect benefits could include lower residential taxes caused by an increase in commercial development and associated taxes, and an improved environment.

There are many potential scenarios for financing via a combination of betterments and taxes. Often a simple percentage is utilized, such as 25% taxes and 75% betterments. In other cases portions of the project could be funded from taxes and other portions from betterments. The Hingham Sewer Commission will need to examine the varied possibilities and develop policies regarding the establishment of workable betterment values for this new sewer district.

The other issue with financing that must be addressed is the need to determine how betterments will be assessed to individual properties. In the case of this project, the area is predominantly commercial and light industrial; however there are a small number of residential properties. An approach to dealing with this situation is to assess betterments on the basis of an equivalent dwelling unit. An equivalent dwelling unit can be defined as a typical 3-bedroom home with an estimated average daily wastewater flow of 330 gallons per day. Then

any commercial type property would be assessed on a flow basis in equivalent dwelling units. For example, a commercial property with an estimated usage of 1,000 gpd would be assessed at 3 equivalent dwelling units (1,000 gpd / 330 gpd per EDU = 3 EDU).

The total estimated project cost for the Industrial Park Sewer District (excluding O&M costs) is approximately $17.7 million, including approximately $6.2 million for the collection system and $11.5 million for the treatment and disposal facilities. Estimated 20 year present worth operation and maintenance costs are $2.0 million and the recovery of these costs will be from the district's sewer user fees. Several assumptions have been made for the purpose of computing estimated betterments for the proposed project. Project financing and betterments will be for a twenty year period and it is assumed that a 2% interest rate will be available through the DEP State Revolving Fund (SRF) program. Using these assumptions the total project cost including interest is approximately $21,500,000. Based on a total flow rate of 150,000 gallons per day and an equivalent dwelling unit of 330 gallons per day, the project would include approximately total 455 EDU's. At a 100 percent betterment, the cost per EDU is $21,500,000 / 455 or $47,250. This amounts to roughly $2,360 per year when paid over 20 years. This cost will likely be prohibitive and is considerably higher than similar betterment charges for other sewer projects in Hingham and for similar projects in Massachusetts. The estimated betterment could be reduced to approximately $31,500 by putting one third of the estimated project cost on the tax rate. The high per unit cost for this project is primarily due to the limited number of users among which the costs can be apportioned. Reducing the per unit betterment cost further will likely require a combination of moving additional project costs on to the tax rate and attempting to find ways of reducing the overall project costs.

5.5.3 Implementation Plan

An implementation plan and schedule have been developed to move forward with the proposed Industrial Park Sewer District. The plan includes all projected implementation tasks including approval of this plan, future investigations, design, permitting and implementation.

Finalize CWMP Report

The first step in the implementation of this project is completion and approval of the CWMP report. The report will require approval from DEP and additional approval through the Massachusetts Environmental Policy Act (MEPA) process. DEP will also review the report as part of the MEPA process; however, the Town may engage in discussions with DEP be held prior to the formal MEPA review to allow for any significant comments to be addressed. DEP will likely be the major regulatory reviewer moving forward.

As the project is currently defined, the anticipated MEPA process will include completion of an Environmental Notification Form (ENF). The project does not currently meet the criteria for a mandatory Environmental Impact Report (EIR), although the Secretary of Environmental Affairs could require an EIR following the ENF review process. In general, the ENF review process takes approximately 45 days from submission of the ENF. Filing deadlines are generally the 1st and 15th of each month. Once the MEPA process is complete, the project can move forward.

Preliminary Design Tasks

Once the MEPA approval process is complete, the Town can begin to proceed with preliminary design of the proposed facilities and other tasks to finalize the implementation of the project. A proposed schedule for implementation is presented at the end of this section in Figure 5-1, although the Town may wish to modify this schedule to meet its needs. The schedule has been developed to utilize funds recently appropriated at town meeting to perform preliminary design for the district. In general terms the recommended approach will be to use the approved funds to perform evaluations on the proposed treatment and disposal site to confirm its suitability. These tasks included a hydro-geological investigation and other due diligence at the site. It is also recommended that the Town will begin the process of seeking SRF loans for construction of the proposed facilities. The SRF program will allow the Town to borrow funds at a reduced interest rate.

Hydro-Geologic Evaluation and Due Diligence

The Hydro-geologic Evaluation Report is a requirement to obtain a DEP Groundwater Discharge permit and is the first part of the permitting process. The scope of this evaluation is typically developed in conjunction with the DEP. The main purpose of this evaluation is to determine what capacity a particular site has to accept treated wastewater and to evaluate potential impacts to surrounding sites and the environment. The evaluation typically consists of field investigations including soil borings, installation of monitoring wells, infiltration testing, water quality monitoring, modeling, an evaluation of potential impacts, and preparation of the evaluation report.

The preliminary budget for this evaluation is approximately $100,000. The Town may budget additional funds if this analysis shows that the current site is not suitable for the quantity of wastewater required for this project or if other investigations find the site unacceptable.

State Revolving Fund Loan Process

As noted above, it may be possible for the Town to obtain funding for the construction of the proposed Industrial Park Sewer District through Massachusetts DEP's SRF loan program. The SRF program offers below market rates (currently 2%) to wastewater collection and treatment projects similar to this project. The SRF program is competitive and projects compete annually for available funds based on the environmental benefit of the projects and other factors. The annual SRF process begins with submission of a Project Evaluation Form (PEF) typically due in the end of August. The form describes the project, anticipated costs, and environmental benefits, and is used by DEP to rate the project versus other submissions. Sufficient information is currently available to complete this form. DEP generally completes the review of the submitted projects and issues a draft list of projects that will receive funding in late fall – the Intended Use Plan (IUP). A Final Intended Use Plan is issued by January following a public comment period. If the project is listed on the IUP, it can receive funding through the SRF program.

If the T0wn desires to move forward with the project, an appropriation for construction funds must be made by June 30th of the year the IUP was issued. A separate appropriation must also be made to proceed with the design of the improvements. Design costs are not eligible for funding under the SRF program. The Town should know if the project is on the intended use

plan by 2012 Spring Town Meeting, which will allow for subsequent Town Meeting approval of the necessary funds to meet the June 30th deadline.

Other Preliminary Engineering Tasks
Depending on the outcome of the tasks above, availability of SRF funding and the desire to further advance the project, the town may want to complete some additional tasks to advance the design of the wastewater collection and treatment systems. Performance of these preliminary design tasks will allow the Town to comply with the timeframes required by the SRF process. Potential tasks include topographic survey of the proposed pipeline routes and WWTP site, soil borings, and preliminary layout of the sewer and treatment facilities.

Final Design and Construction
To maintain eligibility for the SRF program the Town will need to move forward with final design and preparation of an SRF Application. The SRF Application is typically submitted along with plans and specifications on or around October 15th annually.

Given the complexity of the project the Town expects to proceed with this project in phases. As described earlier, Phase 1 involves the portion of the project area located south of Route 3. A subsequent Phase 2 would potentially encompass the Office Park District that is located north of Route 3. It is presently unclear if the undeveloped office park area would be more suitable for inclusion in this project, or whether the property owners will pursue their own system. Phasing the project will allow the Town to secure the SRF funds in the initial year and continue eligibility in subsequent years. The size of the project and expected duration will require a multi-year carryover with the SRF depending on the number of phases that the Town may eventually establish for completing this project.

Section 6
Steering Committee Comment and Recommendations

6.1 Introduction

The Comprehensive Wastewater Management Plan (CWMP) has been produced through extensive deliberation by a broad cross-section of town boards and committees (as well as the general public) over a discrete period of time. The Wastewater Master Planning Committee "the Steering Committee" is proud of the work and dedication from the Hingham residents and consultants that went into developing this plan. Hingham's unique composition, which includes two distinct municipal sewer systems, isolated business regions, state parklands, a mix of historic, clustered and stately residential neighborhoods, and recognized environmental challenges, exemplified the true nature of 'comprehensive' that permeates this plan.

The CWMP is a reflection of analysis and priorities associated with town development and development policy within this time frame. The Steering Committee recognizes that there may be future circumstances where decisions that affect the town's wastewater management posture arise, but which have not specifically been anticipated at this time. The entirety of Section 6 outlines the various jurisdictional responsibilities involved in implementing wastewater-related policies, describes a set of core wastewater principles, and provides a number of targeted recommendations that may assist town officials and the general public in framing, evaluating and reaching such decisions in the future.

6.2 Wastewater Management Jurisdictional Responsibilities

This section lays out the jurisdictional responsibilities of the various boards, committees and certain entities which affect the implementation and further development of wastewater management practices. Because the Town of Hingham operates on a somewhat decentralized governance structure, understanding the specific legal roles and responsibilities of each of these boards, committees, and entities is essential to understanding how changes to wastewater management practices are most efficiently implemented.

The following outlines the roles and responsibilities of each of Hingham's town boards, committees, and associated entities in terms of their impact on wastewater management practices and related issues. Of these, the Sewer Commission and the Board of Health are the two boards that have a direct and greatest responsibility for wastewater management. Other boards and committees create policy and operational standards within their jurisdiction that may impact wastewater management policy and practices. And finally, because of the intimate relationship between the public water supply and wastewater generation, the public water supplier for the Town of Hingham is also included.

6.2.1 Hingham Sewer Commission

The Hingham Sewer Commission is empowered by state statute (Chapter 82 of the Acts of 1946, copy included in Appendix A on Phase 1 CWMP report) to make and enforce all policy relative to all sewer districts in Hingham (currently North and Weir River). A general list of operational policies includes, but is not limited to:

a) Sewer operations policy;

b) Connection policy for all households and businesses within the Town's sewer districts;

c) Usage standards;

d) Rate setting and financial relationship with the MWRA and the Town of Hull;

e) System Inflow & Infiltration mitigation policy, planning and enforcement;

f) Sewer planning and public outreach; and

g) Management and maintenance of the CWMP.

Sewer Connection Policy:
The Sewer Commission connection policy centers on the principle of majority-rule, where any expansion within a sewer district must have a majority of homeowners along a particular unsewered roadway request a conversion to town sewers. Once the sewer main is installed, 100% of the homeowners on that section of roadway must then tie into the system within a specified period.

Expansion Policies & Procedures:
The Sewer Commission's policy for allowing additional residential sewage volume is simply through a connection fee based on wastewater flow. The model of equating flow volume to specific uses is based on State Title-5 regulations and a per gallon fee is assessed on 4 times the projected Title 5 flow. The Sewer Commission does not limit the number of additional bedrooms a homeowner may choose to pay for in the North District, although there is a limited purchased capacity in the Weir River District. Properties outside of these districts are not permitted to connect without special admission to MWRA (North District) or for the "common good" subject to available capacity (Weir River District)

The Sewer Commission employs two different expansion policies within Hingham, unique to each sewer district. The North Sewer District has a stated policy of "certified need" relative to additional development and hook-ups within the district. The Weir River Sewer District has a less stringent and more interpretive policy of "common good" relative to additional development and hook-ups.

The administrative process for expansion within the North Sewer District initially requires the approval of the Sewer Commission, followed by the Hingham Advisory Committee, Selectmen and finally, Town Meeting.

The Board of Selectmen is the only entity that can amend the inter-municipal agreement with Hull to allow for expansion of the Weir River Sewer District beyond the current purchased flow as outlined in the inter-municipal agreement. Sewer Commission and Town Meeting approvals are still required, but the Selectmen alone hold the policy for initiating the formal process.

6.2.2 Hingham Board of Health

The Hingham Board of Health is empowered by state statute to make and enforce all policy relative to on-site wastewater (septic) management. These legal policies, through enforceable regulation, include:

a) Septic system design, review and approval; and

b) Establishment of septic design and implementation standards.

State Policy & Regulations:
Within the Commonwealth, local boards of health administer the state statute and regulations, known as State Title-5, relative to on-site septic wastewater issues. Among other things, Title-5 contains a number of physical and environmental setback requirements, soil condition requirements (for percolation), and a formula describing the maximum number of bedrooms allowed within a dwelling proportional to the total number of rooms within the dwelling.

Local Policy & Regulations:
The Board of Health has promulgated regulations specific to Hingham, that in addition to State Title-5 includes an additional regulatory limit on the number of bedrooms within a particular dwelling based on the overall square foot area of the lot where the dwelling is located (for effluent de-nitrification).

The Board of Health holds all proposed new construction septic system design, with very few exceptions, to the strict regulatory standard. Existing residential homes that have failed Title-5 are often afforded variances from certain regulations, employing a more lax standard of "maximum feasible compliance".

6.2.3 Hingham Planning Board

The Planning Board conducts Site Plan Review, administers the Town of Hingham Subdivision Regulations, and plays a statuatory role in the creation of the Town Master Plan, and the Town's Zoning By-Law. The Board is also the Special Permit Granting Authority for Flexible Residential Developments and Waivers from the Off Street Parking Regulations. These regulations and policies affect land use and

development patterns which are both influenced by wastewater capacity and influence the need for wastewater services.

6.2.4 Conservation Commission

The Conservation Commission has the statutory responsibility for enforcement of the laws and regulations under the Massachusetts Wetlands Protection Act and the local Town of Hingham Wetlands Protection Bylaw. These controls are in respect to twelve different wetland values including public and private water supplies, surface water and groundwater, the prevention and abatement of water pollution and storm-water management. The Conservation Commission regulates any activity which would alter any resource within two-hundred feet of a river or one-hundred feet of a wetland resource area considered significant to any of the listed wetland values. Regulated activities may include wastewater treatment systems.

6.2.5 Public Water Supplier

The Public Water Supplier for Hingham, currently the Aquarion Water Company (Aquarion), has an indirect, but distinctive, influence on Hingham's wastewater management, via central sewers, due to the regulatory construct of interbasin transfer. As Hingham's Public Water Supplier, Aquarion is responsible to uphold state regulation relative to the Massachusetts Water Management Act. Aside from that, non-regulatory policy decisions, planning and operations are under the domain of Aquarion.

The Hingham Water Supply Committee (WSC) is charged by Town Meeting to oversee the town's water supply activity through the establishment and monitoring of a Hingham water supply policy statement, and serve as a liaison between Aquarion and Hingham town government. The WSC is strictly an advisory-based committee.

6.2.6 Board of Selectmen

The Hingham Board of Selectmen functions as the administrative and fiduciary entity for the Town. The town's budget originates from the Selectmen including the budget of the Sewer Commission. The Selectmen coordinate activity among the various town boards and also implement Town Meeting decisions. The Selectmen serve as the town's principle liaison with state and federal agencies where the town's interest is involved. This includes acting as the Town's principle negotiator with the MWRA in sewer-related matters. And as mentioned earlier, the Selectmen administer the intermunicipal agreement with the Town of Hull relative to the Weir River Sewer District.

6.3 Sewer Principles and Guidelines

This section provides a set of shared but non-binding wastewater-related guidelines to provide unanimity and consistency in basic wastewater management principles. These principles, indentified by the Steering Committee, provide "checklist" guidance

as specific project proposals are developed and evaluated by the boards and committees involved with the wastewater management process.

6.3.1 Sewering Criteria

A proposed sewer project should fulfill many of the following principle attributes.

a) Projects that improve or enhance residential wastewater services;

b) Projects that enhance economic development because of wastewater services;

c) Projects that provide a significant per capita benefit from wastewater services;

d) Projects that eliminate or significantly mitigate negative environmental impacts;

e) Projects that encourage wastewater recharge, and

f) Projects that are in densely populated areas.

6.3.2 Governance and Process

Hingham town government boards and committees should consider to the following principles when addressing sewer-related matters involving issues of governance.

a) Wastewater planning and development initiatives should be designed, evaluated and integrated with the Town of Hingham Master Plan and the CMWP.

b) Every town board should respect the jurisdiction of another board and defer to the particular expertise of that board.

c) A cooperative policy stance to achieve common wastewater goals shall be assumed, wherever possible, between all town boards.

d) The principles of fairness and equity will be adhered to in the provision of wastewater services.

e) Where feasible and preferable, public control over utility infrastructure should be retained.

6.3.3 Public Participation/ Project Guidelines

Sewer project decision-making should consider to the following principles.

a) Public involvement will be incorporated in wastewater policy and investment decisions to the maximum practicable extent.

b) Extension of existing districts to service proposed projects are preferred to the establishment of new districts, where practicable.

c) Interbasin wastewater transfer should be avoided unless extraordinary public benefit is derived from the project.

6.3.4 Financial and Budget Guidelines

Sewer management should consider to the following budgetary principles.

a) There should be coordination of wastewater related operating and capital expense planning during the annual budget process.

b) The debt capacity impact on future sewer projects should be reviewed and addressed during the project proposal process.

c) Public subsidy for a sewer project should be limited to situations when there is a clear public interest and benefit.

d) There should be a full recovery of MWRA capital buy-in costs, unless there is a clear public interest and benefit to do otherwise.

6.4 CWMP Administration, Management and Update

The CWMP serves as a literary blueprint that is expected to drive Hingham's future sewer-related discussions and decisions. As such, any long-term plan may require periodic amendment to reflect significant changes that will undoubtedly transpire over time. The Steering Committee hopes that the CWMP will enjoy updating as necessary and be managed as a living document. The following procedures should be considered in maintaining the CWMP.

a) The CWMP should be managed and maintained by the Sewer Commission.

b) Development board that are considering to modify a particular policy that affects wastewater generation or disposal should take the time to review the CWMP, and any subsequent amendments, as an integral and important step in their decision-making process.

c) If the jurisdiction of any development board changes (relative to sewer issues), or if a sewer-related policy were to change, the CWMP should be modified by the Sewer Commission to reflect those change(s).

6.5 Steering Committee Policy Recommendations

This section provides information and proposed recommendations relative to developing new wastewater-related policies in Hingham.

Land Use Related Policies

(1) The Town should develop a new By-law that addresses the maximum size of a residential dwelling relative to the size of the lot that the dwelling is located upon.

(2) The Town should develop a new By-law placing reasonable limits on impervious surfacesrelative to the lot's ability to percolate rainwater.

(3) The Planning Board (and others) should develop a new By-law (and regulations) that establishes a guideline for determining the maximum number of bedrooms that a residential dwelling may have, relative to the square-foot size of a residential dwelling.

Sewer management-related policies:

(1) The Sewer Commission should host a joint meeting with all of the appropriate Hingham land-use boards, on a periodic basis, for the purpose of reviewing and updating the CWMP.

(2) The Sewer Commission should establish a single standard of "certified need" for all Hingham sewer districts relative to additional hook-ups, thereby eliminating the ill-defined "common good" policy currently employed within the Weir River Sewer District.

Water supply-related policy:

(1) The Board of Selectmen should work directly with the Aquarion Water Co. to develop a mutual strategy to mitigate any significant additional amounts of additional water that will be supplied to the new Hingham Industrial Park Sewer District with appropriate offsets and/or interbasin transfers, if necessary.

Appendix A

Phase I – Needs Assessment – March 2007

Bound Under a Separate Cover

Appendix B

Town of Hingham
Industrial Park
Conceptual Sewer Plan

CDM

N
W E
S

Basemap: USGS Color Ortho Imagery (2008); 30cm
Source: MassGIS and the Town of Hingham
Coordinate System: NAD83 Mass. State Plane Mainland (meters)

0 450 900 1,800 Feet

Hingham Industrial Park
Study Area

Legend

- Town-Owned Parcel - Conservation
- Town-Owned Parcel - General
- Study Area Boundary
- Parcels
- Wetlands
- Surficial Water
- Weir River Basin

SEWER

- WWTP
- Pump Stations
- Force Main
- Gravity Main
- Site Parcel

WEYMOUTH
NORWELL
ROCKLAND

14 Whiting Street
11 Plymouth River
12 Liberty Pole
14 Whiting Street
15 Gardner Street
17 Industrial Park
18 Accord Pond

WINTHROP ROAD
OLD COUNTY ROAD
CUSHING STREET
ROSEMARY LANE
KNOLL ROAD
OLD DERBY STREET
DERBY STREET
RECREATION PARK DRIVE
GARDNER STREET
COUNTRY DRIVE
KEITH WAY
HAZELWOOD DRIVE
ACCORD LANE
WINFIELD ROAD
FARM HILLS LANE
ACCORD POND DRIVE
DEERFIELD ROAD
DEVON TERRACE
HARVEST LANE
MALLARD RUN
INDUSTRIAL PARK ROAD
POND PARK ROAD
COMMERCE ROAD
ABINGTON STREET
HICKEY ROAD
SHARP STREET

Phase 1
Phase 2

PUMP STATION 1
PUMP STATION 2
PUMP STATION 3
PUMP STATION 4
PUMP STATION 5

Wastewater Treatment and Disposal Facility Site

\\camgissvr1\Projects\laura_k\Hingham_Sewer\MXDs_LEK\Individual_Sites\Abington_Street_Site_Overview24x36_v2.mxd mb 06/24/11

Appendix C

Table No. 1
Industrial Park Sewer District
Title V Flow Calculations

Pleasant Street Connection

Address	Street	Usage Code	Use	Square footage	Unit (person/bedroom	Flow unit	Gal/day	Comment
167	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
169	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
173A	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
173B	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
175	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
179	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
183	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
187	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
190	Old Derby Street	340	General Office Building	12096		75 gpd/1000 sq ft.	907	
191	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
195	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
199	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
203	Old Derby Street	101	Single Family	N/A	3	110 gpd/bedroom	330	
62	Derby Street	343	Office Condo	23080		75 gpd/1000 sq ft.	1,731	
99	Derby Street	340	General Office Building	47982		75 gpd/1000 sq ft.	3,599	
101	Derby Street	340	General Office Building	20786		75 gpd/1000 sq ft.	1,559	
102	Derby Street	334	Gasoline Station	1288			400	87 Derby Sunoco
114	Derby Street	325	Small Retail	4052	4.052	50 gpd/1000 sq ft.	203	
128	Derby Street	330	Automotive Sales	31401			1,725	
175	Derby Street	343	Office Condo	74285		75 gpd/1000 sq ft.	5,571	
2	Keith Way	401	Warehouse	1120	2	15 gpd/person	30	
4	Keith Way	405	Manufacturing Condo	53400	267	15 gpd/person	4,005	
24	Old Derby Street	101	Single Family	N/A	2	110 gpd/bedroom	220	
160	Old Derby Street	340	General Office Building	21544		75 gpd/1000 sq ft.	1,616	
25	Recreation Park Drive	340	General Office Building	82920		75 gpd/1000 sq ft.	6,219	25 & 50 Bare Cove
55	Recreation Park Drive	376	Gymnasium	52200	500	25 gpd/person	12,500	
75	Recreation Park Drive	371	Ice Skating	55416	1000	5 gpd/seat	5,000	
125	Recreation Park Drive	401	Warehouse	76043	15	15 gpd/person	225	
150	Recreation Park Drive	405	Manufacturing Condo	43816	220	15 gpd/person	3,300	
200	Recreation Park Drive	401	Warehouse	4000	2	15 gpd/person	30	
						Sub Total	52,800	
						Future Development	75,000	
						Revelopement	10,560	
						Total	138,359	

Oak Street Connection

Address	Street	Usage Code	Use	Square footage	Unit (person/bedroom	Flow unit	Gal/day	Comment
35	Commerce Road	401	Warehouse	10000	2	15 gpd/person	30	
45	Industrial Park Road	402	Manufacturing Office	9366	47	15 gpd/person	705	
55	Industrial Park Road	400	Manufacturing	10065	51	15 gpd/person	765	
65	Industrial Park Road	400	Manufacturing	23900	120	15 gpd/person	1,800	
75	Industrial Park Road	400	Manufacturing	30375	152	15 gpd/person	2,280	
90	Industrial Park Road	400	Manufacturing	48556	243	15 gpd/person	3,645	
99	Industrial Park Road	400	Manufacturing	116600	583	15 gpd/person	8,745	
100	Industrial Park Road	400	Manufacturing	185484	928	15 gpd/person	13,920	
110	Industrial Park Road	400	Manufacturing	38896	195	15 gpd/person	2,925	
120	Industrial Park Road	401	Warehouse	1800	2	15 gpd/person	30	
125	Industrial Park Road	400	Manufacturing	68970	345	15 gpd/person	5,175	
10	Old Mine Way	340	General Office Building	16464		75 gpd/1000 sq ft.	1,235	
1	Pond Park Road	401	Warehouse	3744	2	15 gpd/person	30	
3	Pond Park Road	401	Warehouse	10000	2	15 gpd/person	30	
4	Pond Park Road	340	General Office Building	21540		75 gpd/1000 sq ft.	1,616	
5	Pond Park Road	401	Warehouse	3040	2	15 gpd/person	30	
20	Pond Park Road	402	Manufacturing Office	12800	64	15 gpd/person	960	
30	Pond Park Road	401	Warehouse	7500	2	15 gpd/person	30	
35	Pond Park Road	405	Manufacturing Condo	47557	238	15 gpd/person	3,570	
40	Pond Park Road	351	Educational (office)	1000		75 gpd/1000 sq ft.	75	
45	Pond Park Road	401	Warehouse	33200	7	15 gpd/person	105	
50	Pond Park Road	401	Warehouse	5576	2	15 gpd/person	30	
55	Research Road	400	Manufacturing	20700	104	15 gpd/person	1,560	
60	Research Road	400	Manufacturing	71170	356	15 gpd/person	5,340	
70	Research Road	400	Manufacturing	32802	164	15 gpd/person	2,460	
75	Research Road	400	Manufacturing	21600	108	15 gpd/person	1,620	
80	Research Road	401	Warehouse	1500	2	15 gpd/person	30	
85	Research Road	401	Warehouse	7755	2	15 gpd/person	30	
90	Research Road	401	Warehouse	14993	3	15 gpd/person	45	
100	Research Road	400	Manufacturing	99075	496	15 gpd/person	7,440	
105	Research Road	401	Warehouse	4000	2	15 gpd/person	30	
						Sub Total	66,285	
						Future Development	25,750	
						Revelopement	13,258	
						Total	105,293	

Pine Street Connection

Address	Street	Usage Code	Use	Square footage	Unit (person/bedroom	Flow unit	Gal/day	Comment
28	Abington Street	401	Warehouse	2000	2	15 gpd/person	30	
Various	Abington Street	101	Single Family	N/A	3	110 gpd/bedroom	6,600	Approx 20 homes on Abington
40	Sharp Street	316	Storage/Distribution	4400	2	15 gpd/person	30	
41	Sharp Street	401	Warehouse	17030	4	15 gpd/person	60	
51	Sharp Street	400	Manufacturing	49000	245	15 gpd/person	3,675	
55	Sharp Street	401	Warehouse	2700	2	15 gpd/person	30	
60	Sharp Street	400	Manufacturing	23445	118	15 gpd/person	1,770	
67	Sharp Street	401	Warehouse	44000	9	15 gpd/person	135	
70	Sharp Street	401	Warehouse	11132	3	15 gpd/person	45	
72	Sharp Street	343/405	Office/Industrial Condo	129493		75 gpd/1000 sq ft.	9,712	
80	Sharp Street	401	Warehouse	21007	5	15 gpd/person	75	
100	Sharp Street	316	Storage/Distribution	9000	2	15 gpd/person	30	
						Sub Total	22,192	
						Future Development	0	
						Revelopement	4,438	
						Total	26,630	

Pleasant Street	138,359
Oak Street	105,293
Pine Street	26,630
Vacant Lot Allowance	40,000
Sub Total	310,283
Design Flow	311,000

Assumptions:

Warehouse	Assume 1 person per 5000 sq ft (minimumum of 2)
Single family home	Assume 3 bedrooms per home
Manufacturing	Assume 5 persons per 1000 sq ft
102 Derby Street	2 service bays with 2 gas islands
128 Derby Street	Auto Dealership - Assume 10 service bays and 15 person sales staff
55 Recreation Park Dr.	Gymnasium - assume 500 participants
75 Recreation Park Dr.	Ice Skating - assume 1000 seats

Appendix D

TOWN OF HINGHAM
OFFICE OF SELECTMEN

January 13, 2010

Mr. Frederick A. Laskey
Executive Director
Massachusetts Water Resource Authority
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Subject: Request for "Sewer Service to Locations Outside MWRA Sewer Service Area"
Town of Hingham Industrial/Office Park District
Request for Review and Application

Dear Mr. Laskey:

On behalf of the Town of Hingham (Town) please accept this letter as the Town's request for a meeting to further review extending sewer service to the southwest corner of Hingham generally known as the Industrial/Office Park District. At present, the area is either undeveloped land or developed land served by individual on-site treatment systems. However, due to site conditions in the area, further development is severely limited. The Town and the development community challenging for any potential development to occur without a new sewer network for wastewater collection.

In August 2009, we had an opportunity to meet informally with MWRA to discuss the Town's intentions to develop the Industrial/Office Park District. The meeting included MWRA staff, the Advisory Board's Executive Director, Hingham's Town Planner, one of the land owners, and me. One of the outcomes from the meeting was that MWRA needed additional information to consider a connection. Specifically, the Town needed to provide estimates of the potential flows to MWRA. It was also suggested that the Town initiate discussions with the Town of Weymouth as the host town. Initial discussions with the Town of Weymouth have been favorable, and Weymouth is open to a connection through its system.

The Town has since retained Camp Dresser McKee (CDM) to further the application requirements to connect to MWRA's sewer system. As requested, CDM has prepared preliminary flow estimates for the Industrial/Office Park District, Based on existing metered water consumption and potential build-out, CDM estimates a planning level average flow of approximately 200,000 GPD with peak flow rates more than three times as high possible. Flows would be directed through the Town of Weymouth to the MWRA Braintree/Weymouth sewer branch.

To support and accommodate development of this area, the Town desires to formally commence the approval process for a connection to the MWRA system to serve this area. The Town's project team would like to meet with you and/or representatives of the Authority to discuss the application process.

210 Central Street, Hingham, MA 02043-2757 • Telephone (781) 741-1400 • Fax (781) 741-1454

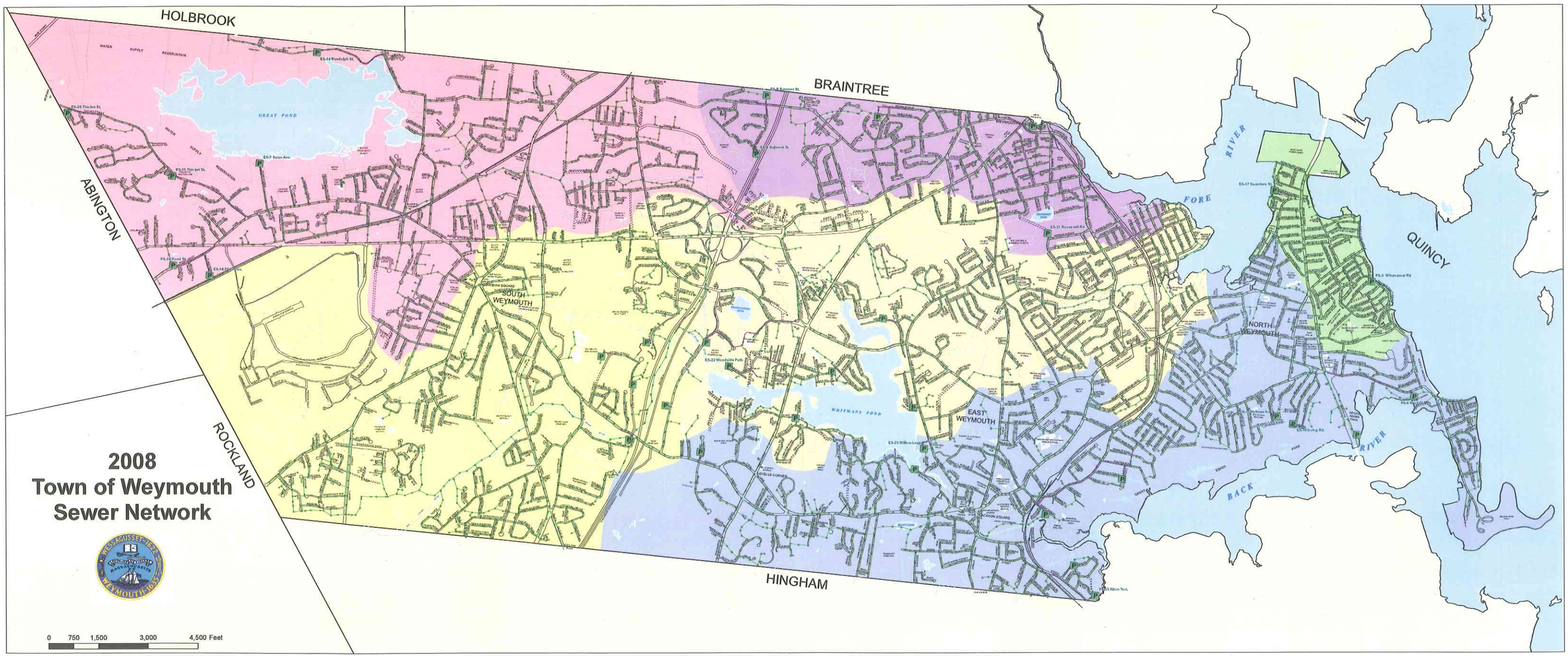
The Town looks forward to working closely with MWRA to extend sewer service to its Industrial/Office Park District. Please contact me directly with possible meeting dates and any questions or concerns you may have with regard to this request.

Very truly yours,

Kevin Palcos,
Town Administrator

cc: Hingham Board of Selectmen
Hingham Planning Board
Hingham Board of Health
Hingham Sewer Commission
James Bristol, President, Bristol Bros. Development Corp.
William Constable, Executive Vice President, A.W Perry, Inc.
Thomas Morgan, CDM

Appendix E



2008
Town of Weymouth
Sewer Network