4.0 PROBLEM IDENTIFICATION/WASTEWATER NEEDS

A. ON-SITE WASTEWATER DISPOSAL PROBLEMS

1. Development of Focus Areas

As mentioned in Chapter 2, Section B.5, approximately 13% of the Town's residents are connected or have access to the municipal sewer system. For the most part, these residents, and other commercial/ industrial sewer users, are found in the North Area, as identified on Figure 1-2. Another 3% of the Town's residents are connected to sewers in the ORSD.

This needs analysis focused on wastewater treatment and disposal options for those areas that currently utilize on-site wastewater disposal systems, and do not have access to sewers. Chapter 1, Section B describes how the three Focus Areas – North, Central and South Areas - were developed.

2. Data Reviewed

The Oxford Board of Health maintains the records for the Town's approximately 3,700 on-site wastewater disposal systems. Our analysis included review of the files for the 2,600 systems within the North, Central, and South Areas shown on Figures 1-2, 1-3 and 1-4, respectively. The analysis did not include the records for the remaining 1,100± systems in the community. Many of these systems are on parcels that are within 200 feet of a sewer, or are located in the very rural outskirts of Town. The expectation is that the parcels within 200 feet of a sewer will connect to the sewer system by 2030, and parcels in the most rural areas will handle wastewater successfully with individual onsite systems through 2030.

Board of Health records date back to the 1960s, with newer systems having more complete files. The files are arranged according to street name and contain Title 5 inspection reports, and often include an occupancy permit, house plans, site plan, and septic system permit. The septic system permit consists of the plan for the new and repaired/upgraded septic system, and includes data on soil characteristics, groundwater elevation, and percolation test results. For each parcel, we input into a computerized database file the street name, and, as available, map and lot number, type of disposal system, year installed/repaired/upgraded, number of pumpouts per year, presence of a private drinking water well, and Title 5 inspection report results. Appendix C contains a copy of the spreadsheet with the Board of Health information we gathered.

In addition to the Board of Health records, our data analysis included review of the following:

- Assessor's database.
- Pumpout records kept by the UBWPAD WWTP.
- U.S. Soil Conservation Service information on soil type and groundwater elevation.
- Aquarion's water supply and distribution system for the Town of Oxford.

- The Town wastewater collection system data.

- MassGIS for floodplain, wetlands, surface water, topographical and other data.

3. On-Site Wastewater System Performance

The ability of an on-site wastewater disposal system to function properly depends on a number of criteria, such as lot size, groundwater elevation and soil type. The average developed lot size in the three study areas included in this analysis is as follows:

- North Area – 1.95 acres

- Central Area – 0.79 acres

- South Area – 4.52 acres

Much of the land in the above study areas is zoned for commercial, industrial, and agricultural use, so the average lot size is relatively large. Residential lot sizes within these areas are much smaller; the median lot size is as follows:

- North Area – 0.93 acres

- Central Area – 0.34 acres

- South Area – 0.72 acres

The presence of private drinking water wells on lots containing on-site systems also influences the ability of an area to support such a system. Title 5 regulations require a 100-foot distance between a leach field and a private well, so lot sizes containing both a well and on-site system need to be larger. Many of the developed parcels in the three study areas have private drinking water wells.

The Soil Conservation Service of the U.S. Department of Agriculture reports that about 9% of the land in the three Focus Areas has severe soil limitations that restrict the use of Title 5 wastewater disposal systems.

For the three study areas, Board of Health records indicate that there have been 135 reported failures to septic systems between March 28, 1995 and July 2008.

4. Needs Analysis Discussion

The purpose of the needs analysis was to determine the ability of conventional Title 5 septic systems to effectively treat and dispose of wastewater for existing and future development within a particular focus area, throughout and beyond the 20-year planning period (2010 - 2030). The basis for this analysis was the Board of Health records and other data identified previously.

To obtain the most reliable results from the needs analysis, we subdivided the three large focus areas into smaller areas with similar characteristics. The main criteria used in defining the sub-area boundaries were changes in zoning. Figures 4-1 thru 4-3 depict the focus areas and their sub-areas. Once we defined the sub-areas, we removed one area from the needs analysis because it has sewers accessible to all parcels.

The needs analysis involved a three-stage approach. The first step was the development of a rating criteria matrix to establish or eliminate a sub-area as a needs area. Following this, we evaluated each sub-area according to soil classification, and combination of system age and lot size to confirm or eliminate a sub-area as a needs area. The third step was a review of overall data, additional information, such as Board of Health comments/knowledge, and other site characteristics that may lead to a recommendation where Board of Health data is lacking. This three-stage process led to the determination of whether or not a sub-area was a "needs area" (i.e., an area that could not support Title 5 septic systems for long-term wastewater management). **For all three stages of the needs analysis, we incorporated data for just the unsewered parcels in each sub-area.**

The following provides a detailed description of the three-stage analytical approach.

First-Stage Analytical Approach - Rating Criteria Matrix

The rating criteria matrix developed to determine the sub-areas' needs included four levels of criteria, as described below:

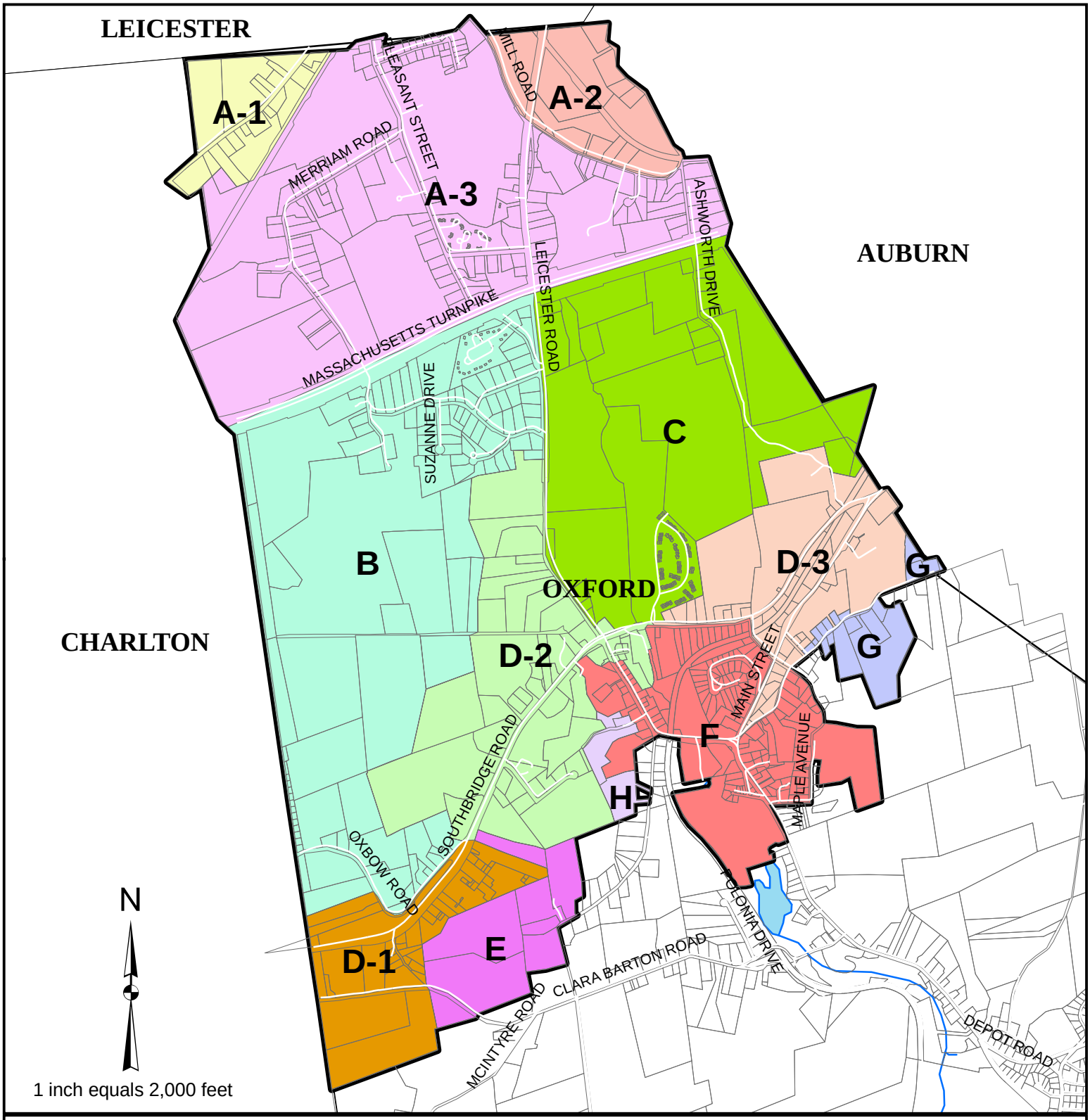
1. Actual septic system failure received the highest rating, which was four points. Each septic system repair or replacement, or failed Title 5 inspection report, resulted in a four-point assignment for the septic system.

2. Imminent septic system failures received the second highest rating, which was three points. This rating corresponded to septic systems that would categorically fail if subjected to a Title 5 inspection due to proximity to public/private drinking water supplies, parcels located within a Zone I aquifer recharge area, and parcels that are still served by cesspools.

3. The third highest rating - two points - went to septic systems with a high likelihood of imminent failure. This determination applied to septic systems in the following categories:

    - Subject to severe soil limitations.
    - Systems built before 1978.
    - Systems with two or more tank pump-outs in a calendar year.
    - Lot size less than or equal to one-half acre.

4. Septic systems with health/water quality issues received the fourth highest rating - one point. This assignment applied to systems located as follows:



Legend

- Parcels
- North Study Area
- Stream, River
- Water Bodies

North Sub-Areas

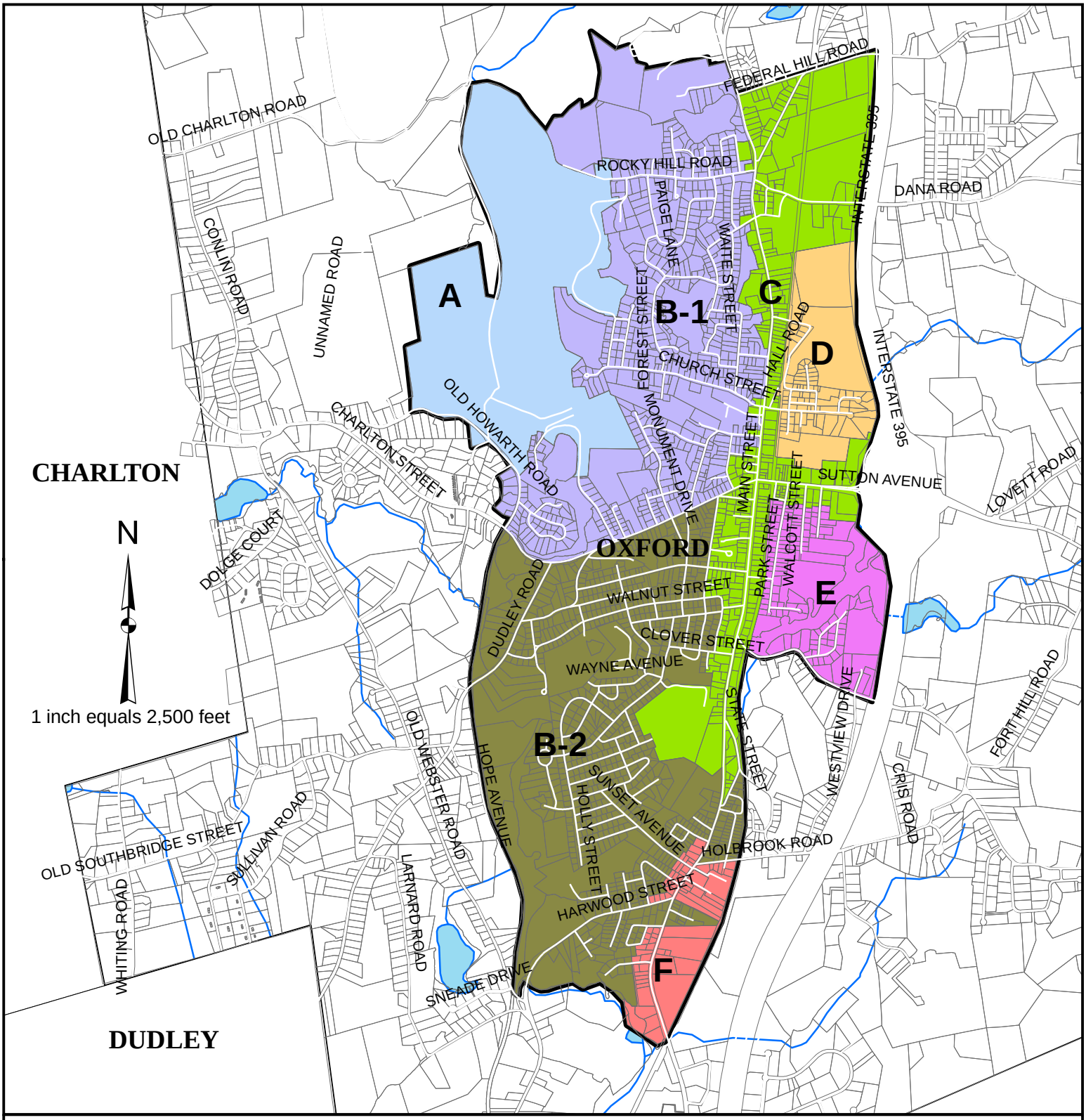
- A-1
- A-2
- A-3
- B
- C
- D-1
- D-2
- D-3
- E
- F
- G
- H

Town of Oxford, MA
Comprehensive Wastewater Management Plan
Phase 1 - Needs Analysis

FIGURE 4-1
NORTH SUB-AREAS

ENGINEERS FST Since 1914

Data compiled from MassGIS and FST



Legend

- Parcels
- Central Study Area
- Stream, River
- Water Bodies

Central Sub-Areas

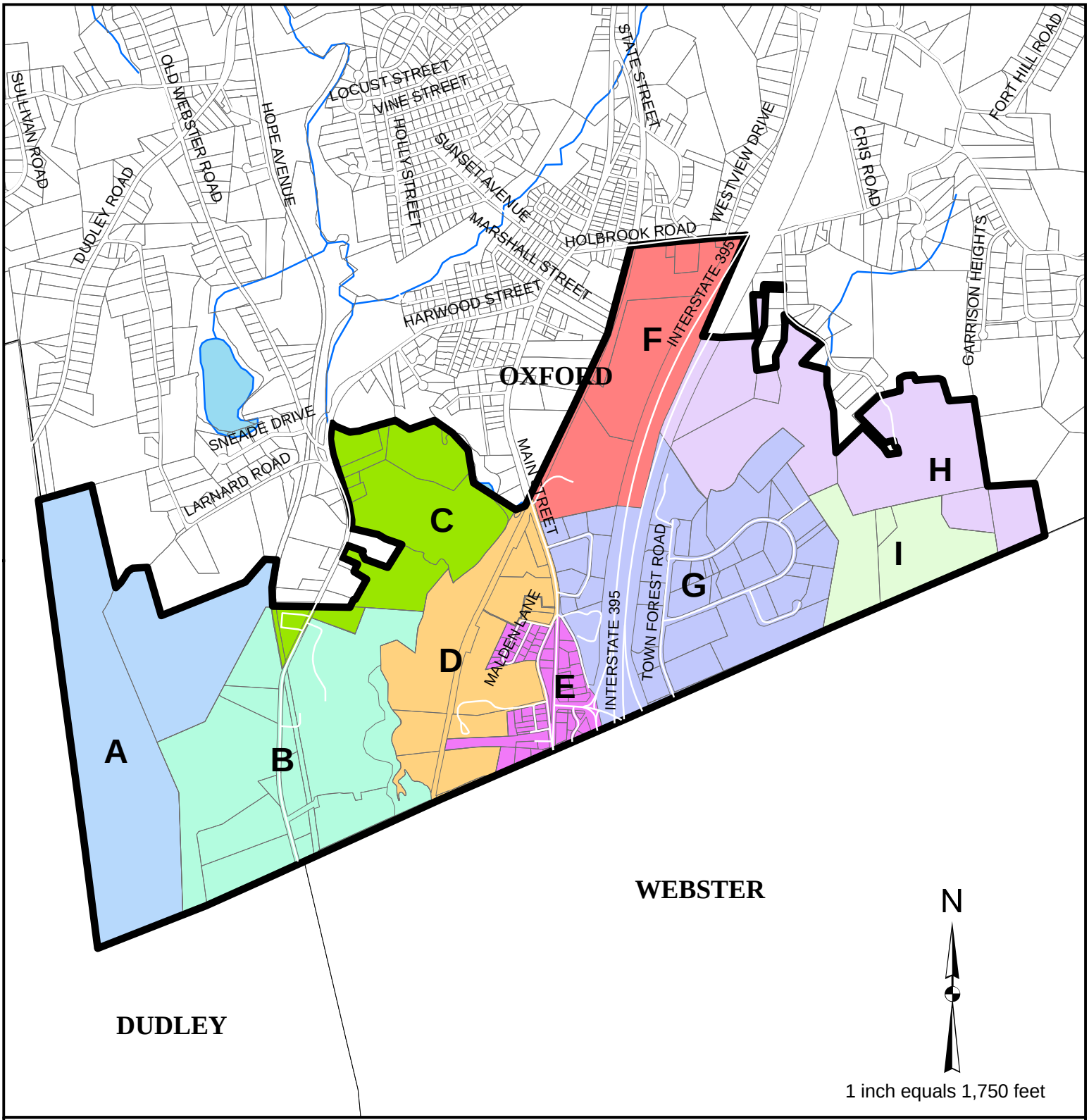
- A
- B-1
- B-2
- C
- D
- E
- F

Town of Oxford, MA
Comprehensive Wastewater Management Plan
Phase 1 - Needs Analysis

FIGURE 4-2
CENTRAL SUB-AREAS

ENGINEERS FST Since 1914

Data compiled from MassGIS and FST



Legend

- Parcels
- South Study Area

South Sub-Areas

- A
- B
- C
- D
- E
- F
- G
- H
- I
- Stream, River
- Water Bodies

Town of Oxford, MA, Comprehensive Wastewater Management Plan Phase 1 - Needs Analysis

FIGURE 4-3
SOUTH SUB-AREAS

ENGINEERS FST Since 1914

Data compiled from MassGIS and FST

- Within a study area with a density of septic systems greater than two per acre.
- Within 100 feet of a surface water body.
- Within a 100-year floodplain.
- Within a Zone II aquifer recharge area.

After making the above determinations, we divided the total points per sub-area by the number of lots to obtain a rating on a "per lot" basis. Section 5, *Summary of Wastewater Needs by Sub-Area*, presents these results.

Second-Stage Analytical Approach – Soils and Age/Lot Evaluation

The second stage of the analysis was evaluation of each sub-area on the basis of soil classification, and a combination of system age and lot size, utilizing the following criteria:

- 50 percent or more of the lots built before 1978 and having a lot size of one-half acre or less.

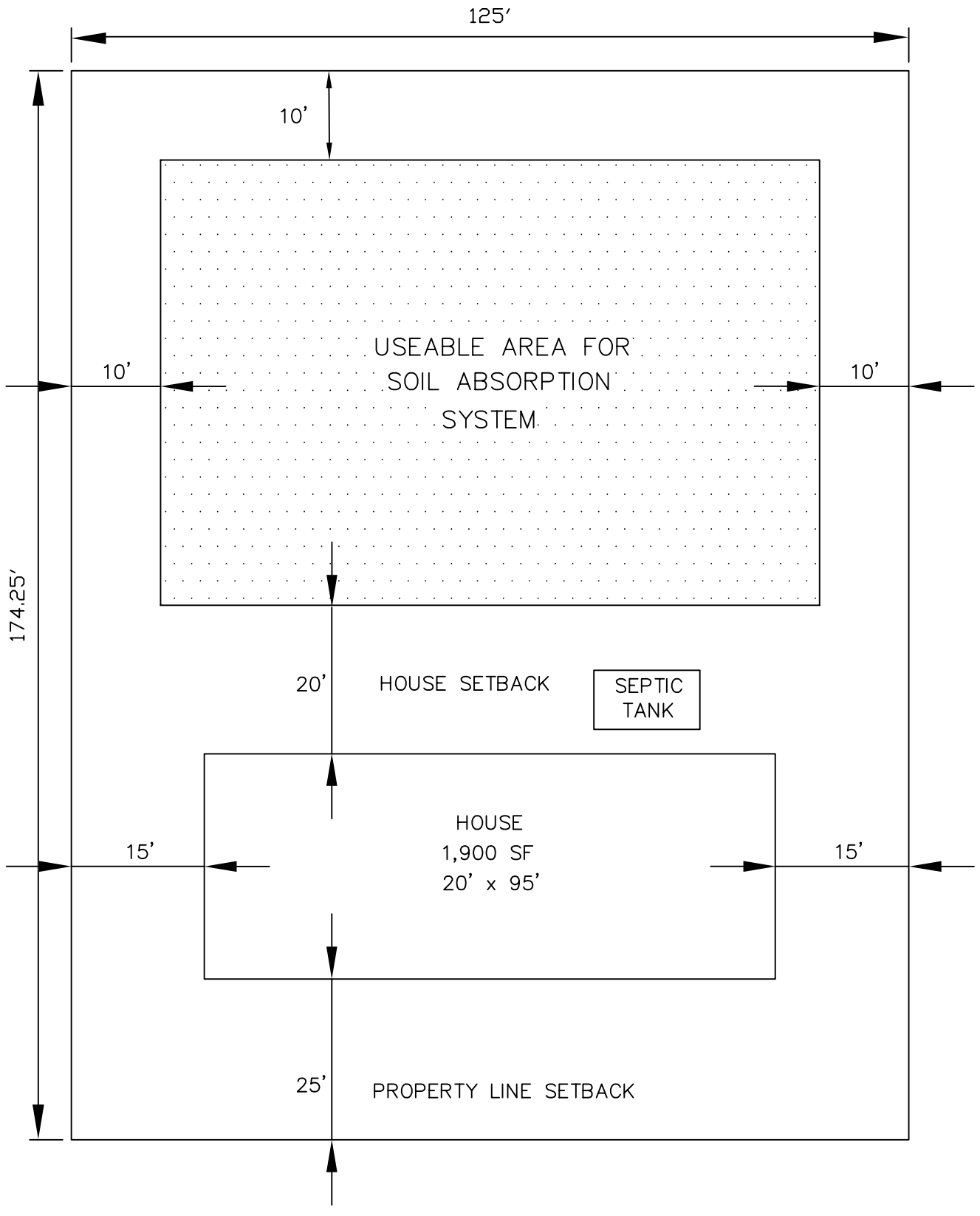
- 30 percent or more of the sub-area with severe soil limitations (hardpan, bedrock, steep slopes, flooding and wetness).

If the sub-area exceeded the percentages identified for one of the two criteria, it would be classified as a needs area (i.e., Title 5 septic systems would not be appropriate for long-term wastewater treatment and disposal). The following discusses the reasoning behind the above criteria.

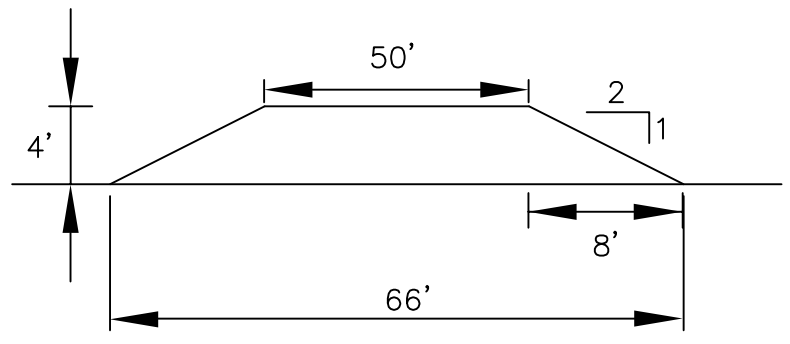
Septic systems built before 1978 have a very high likelihood of failure due to the lack of design and construction standards for these systems prior to this date. A septic system built before 1978 would likely fail a current Title 5 inspection. MassDEP promulgated Title 5 regulations in 1978 and required local Boards of Health to enforce them. Rules pertaining to the design, construction and monitoring of septic systems before 1978 were less stringent, and enforcement was not as effective.

Lot size has a direct impact on the ability to repair a failed septic system to meet current Title 5 criteria. Under less than ideal soil and groundwater conditions, residential lots less than or equal to one-half acre might require a variance to Title 5 in order to repair the on-site septic system.

Figure 4-4 illustrates the layout of a leach field on a typical one-half acre residential lot in an “R-3” zoning. With no soil or groundwater constraints, 10,421 square feet (sf) is available for the leach field. About 2,500 sf is necessary for a four-bedroom single- family residence generating 440 gpd of wastewater, assuming a percolation rate of 10 minutes per inch. If the leach field requires mounding due to high groundwater, the required land area is 4,400 sf. Reducing the leach field area by about 6,500 sf (30% of 21,781 sf) due to poor soils, leaves only about 3,900 sf for the leach field.



	AREA (SQ FT)
LOT SIZE (125' x 174.25')	21,781
SETBACK FROM PROPERTY LINE (10')	
10' x 125'	1,250
10' x (174.25' −75') x 2'	1,985
HOUSE	1,900
SETBACK FROM HOUSE (SIDE: 15')	
15' x 20' x 2'	600
SETBACK FROM HOUSE	
25' x 125' (FRONT)	3,125
20' x 125' (REAR)	2,500
USEABLE LAND	10,421
AVERAGE SYSTEM SIZE	
440 GPD	
PERC RATE – 10 IN/MIN	2,500
WITH A SEVERE GROUNDWATER LIMITATION, AREA REQUIRED = 4,400 +/− SF. (66' x 66')	4,400



TOWN OF OXFORD, MA
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
PHASE 1 – NEEDS ANALYSIS

S:\JD-018 Oxford,MA_CWMP\seal.gif

FIGURE 4 – 4
TYPICAL LOT CONFIGURATION

ENGINEERS FST Since 1914

LOTSIZE.DWG

In addition to the above constraint, it may also be difficult for one-half acre lots to locate the leach field 100 feet away from private drinking water wells that exist on many of the lots, as required by the State Environmental Code – Title 5.

Third-Stage Analytical Approach – Overall Data Review

The third and final stage of the needs analysis involved a review of all the data, plus additional Board of Health information, and other characteristics of the sub-area. Any trends or abnormalities in the data would be explored at this stage. This final review served to summarize, explain, and supplement the results of the first two stages, and bring discrepancies into focus, to the extent possible.

5. Summary of Wastewater Needs by Sub-Area

Table 4-1 presents the rating criteria matrix for the Focus Areas. The acreage and lot numbers in this table refer only to the unsewered areas. As this table indicates, the "per developed lot" rating for each focus area, going from the highest to the lowest rating, is as follows:

- South H – 5.00
- North G – 3.83
- Central F – 3.60
- Central B-2 – 3.53
- Central E – 3.15
- South E – 2.91
- Central C – 2.84
- Central D – 2.81
- North F – 2.78
- Central B-1 – 2.66
- Central A – 2.50
- South C – 2.40
- North D-1 – 2.30
- North E – 2.00
- South B – 1.67
- North A-3 – 1.45
- North D-3 – 1.16
- North B – 1.00
- North H – 1.00
- North C – 0.86
- South F – 0.75
- South G – 0.67
- North D-2 – 0.50
- North A-2 – 0.00
- South A – 0.00
- South D – 0.00
- South I – 0.00

Sub-area South H appears to have the greatest need on the basis of rating criteria, and sub-areas North A-2, South A, South D, and South I have the least. Exclusive of the ratings for these sub-areas, all of the rating criteria point values are fairly close, with the largest gap between Central B-2 (3.53) and Central E (3.15); and the second largest gap between North E (2.00) and South B (1.67). For this analysis, we adopted 2.00 as the "breakpoint"; we judged that each area with a rating of 2.00 or more qualifies as a wastewater needs area on a rating criteria basis. Fourteen of the twenty-seven sub-areas equaled or exceeded the "per developed lot" rating breakpoint of 2.00.

Table 4-1 also presents much of the raw data required for the second stage of the needs analysis, and Table 4-2 shows the percentages derived from the data in Table 4-1. Only three of the

TABLE 4-1
RATING CRITERIA - STAGE I ANALYSIS

CRITERIA NAME	DESCRIPTION	North A-2		North A-3		North B		North C		North D-1		North D-2		North D-3	
		Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points
	Total Number of Lots	6		105		143		25		48		42		42	
	Total Number of Developed Lots	2		38		80		7		10		18		25	
	Total Number of Developed Lots vs. Number of Total Lots	33%		36%		56%		28%		21%		43%		60%	
	Number of Acres of Severe Soils	5		119		67		50		41		14		2	
	Percent of Acres with Severe Soils to Total Acres	17%		54%		13%		25%		37%		6%		2%	
	Number of Acres per Study Area	30		222		507		202		112		246		107	
	Number of Acres of Developed Lots	13		89		128		22		28		98		61	
Actual Failure	3/31/95 to 7/8/08 Repairs	0	0	1	4	7	28	0	0	0	0	0	0	0	0
Imminent Failure	System within Zone I Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	System within 100 feet of Private Drinking Water Well	0	0	3	9	5	15	0	0	0	0	1	3	1	3
	Cesspool	0	0	2	6	1	3	0	0	1	3	0	0	2	6
		0	0	5	15	6	18	0	0	1	3	1	3	3	9
High Likelihood of Imminent Failure	Systems Built before 1978 (Title 5)	0	0	3	6	3	6	1	2	1	2	0	0	2	4
	Developed Lot Size less than or equal to 1/2 acre	0	0	2	4	3	6	0	0	2	4	0	0	7	14
	Developed Lots with Severe Soil Limitation	0	0	11	22	11	22	2	4	6	12	2	4	0	0
	Pumpouts Greater than 2 times per year	0	0	0	0	0	0	0	0	0	0	1	2	1	2
		0	0	16	32	17	34	3	6	9	18	3	6	10	20
Health / Water Quality Issue	Density of Systems Greater Than 2 per Acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	System within 100 feet of Surface Water Body	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	System located within 100-Year Floodplain	0	0	4	4	0	0	0	0	2	2	0	0	0	0
	System within Zone II Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	4	4	0	0	0	0	2	2	0	0	0	0
	Total Criteria Points for Study Area		0		55		80		6		23		9		29
	Rating Criteria Points Per Developed Lot		0.00		1.45		1.00		0.86		2.30		0.50		1.16
	RECOMMENDED AS A NEED AREA*		**NO**		**NO**		**NO**		**NO**		**YES**		**NO**		**NO**

(Conventional Title 5 System Not Feasible for Majority of Study Area)

*Based on rating criteria points

TABLE 4-1 (Continued)
RATING CRITERIA - STAGE I ANALYSIS

CRITERIA NAME	DESCRIPTION	North E		North F		North G		North H		Central A		Central B-1		Central B-2	
		Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points
	Total Number of Lots	8		137		18		4		2		671		979	
	Total Number of Developed Lots	3		121		12		2		2		581		941	
	Total Number of Developed Lots vs. Number of Total Lots	38%		88%		67%		50%		100%		87%		96%	
	Number of Acres of Severe Soils	38		1		9		2		0		0		0	
	Percent of Acres with Severe Soils to Total Acres	47%		1%		25%		14%		0%		0%		0%	
	Number of Acres per Study Area	81		157		36		14		389		556		670	
	Number of Acres of Developed Lots	15		105		9		6		389		319		508	
Actual Failure	3/31/95 to 7/8/08 Repairs	0	0	3	12	1	4	0	0	0	0	29	116	41	164
Imminent Failure	System within Zone I Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	System within 100 feet of Private Drinking Water Well	0	0	1	3	1	3	0	0	0	0	17	51	0	0
	Cesspool	0	0	17	51	0	0	0	0	0	0	30	90	71	213
		0	0	18	54	1	3	0	0	0	0	47	141	71	213
High Likelihood of Imminent Failure	Systems Built before 1978 (Title 5)	0	0	17	34	1	2	0	0	1	2	51	102	108	216
	Developed Lot Size less than or equal to 1/2 acre	0	0	78	156	8	16	0	0	0	0	380	760	794	1588
	Developed Lots with Severe Soil Limitation	3	6	2	4	7	14	1	2	0	0	0	0	0	0
	Pumpouts Greater than 2 times per year	0	0	3	6	0	0	0	0	0	0	5	10	8	16
		3	6	100	200	16	32	1	2	1	2	436	872	910	1820
Health / Water Quality Issue	Density of Systems Greater Than 2 per Acre	0	0	68	68	7	7	0	0	0	0	353	353	765	765
	System within 100 feet of Surface Water Body	0	0	1	1	0	0	0	0	1	1	34	34	1	1
	System located within 100 Year Flood Plain	0	0	1	1	0	0	0	0	1	1	22	22	80	80
	System within Zone II Aquifer Recharge Area	0	0	0	0	0	0	0	0	1	1	5	5	279	279
		0	0	70	70	7	7	0	0	3	3	414	414	1,125	1,125
	Total Criteria Points for Study Area		6		336		46		2		5		1,543		3,322
	Rating Criteria Points Per Developed Lot		2.00		2.78		3.83		1.00		2.50		2.66		3.53
	RECOMMENDED AS A NEED AREA*		**YES**		**YES**		**YES**		**NO**		**YES**		**YES**		**YES**

(Conventional Title 5 System Not Feasible for Majority of Study Area)

*Based on rating criteria points

TABLE 4-1 (Continued)
RATING CRITERIA - STAGE I ANALYSIS

CRITERIA NAME	DESCRIPTION	Central C		Central D		Central E		Central F		South A		South B		South C	
		Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points
	Total Number of Lots	349		80		125		67		2		15		8	
	Total Number of Developed Lots	308		68		109		60		0		3		5	
	Total Number of Developed Lots vs. Number of Total Lots	88%		85%		87%		90%		0%		20%		63%	
	Number of Acres of Severe Soils	42		2		0		0		17		3		1	
	Percent of Acres with Severe Soils to Total Acres	13%		2%		0%		0%		9%		2%		1%	
	Number of Acres per Study Area	328		117		146		70		193		172		89	
	Number of Acres of Developed Lots	232		30		66		58		0		69		56	
Actual Failure	3/31/95 to 7/8/08 Repairs	12	48	2	8	7	28	8	32	0	0	0	0	0	0
Imminent Failure	System within Zone I Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0	1	3
	System within 100 feet of Private Drinking Water Well	2	6	0	0	0	0	0	0	0	0	0	0	0	0
	Cesspool	37	111	3	9	9	27	5	15	0	0	0	0	0	0
		39	117	3	9	9	27	5	15	0	0	0	0	1	3
High Likelihood of Imminent Failure	Systems Built before 1978 (Title 5)	45	90	4	8	12	24	9	18	0	0	0	0	1	2
	Developed Lot Size less than or equal to 1/2 acre	190	380	54	108	79	158	40	80	0	0	0	0	0	0
	Developed Lots with Severe Soil Limitation	8	16	0	0	0	0	0	0	0	0	1	2	1	2
	Pumpouts Greater than 2 times per year	11	22	0	0	2	4	2	4	0	0	1	2	0	0
		254	508	58	116	93	186	51	102	0	0	2	4	2	4
Health / Water Quality Issue	Density of Systems Greater Than 2 per Acre	166	166	52	52	75	75	38	38	0	0	0	0	0	0
	System within 100 feet of Surface Water Body	3	3	0	0	16	16	2	2	0	0	0	0	1	1
	System located within 100-Year Floodplain	7	7	6	6	11	11	4	4	0	0	1	1	3	3
	System within Zone II Aquifer Recharge Area	26	26	0	0	0	0	23	23	0	0	0	0	1	1
		202	202	58	58	102	102	67	67	0	0	1	1	5	5
	Total Criteria Points for Study Area		875		191		343		216		0		5		12
	Rating Criteria Points Per Developed Lot		2.84		2.81		3.15		3.60		0.00		1.67		2.40
	RECOMMENDED AS A NEED AREA*		**YES**		**YES**		**YES**		**YES**		**NO**		**NO**		**YES**

(Conventional Title 5 System Not Feasible for Majority of Study Area)

*Based on rating criteria points

TABLE 4-1 (Continued)
RATING CRITERIA - STAGE I ANALYSIS

CRITERIA NAME	DESCRIPTION	South D		South E		South F		South G		South H		South I	
		Number	Points	Number	Points	Number	Points	Number	Points	Number	Points	Number	Points
	Total Number of Lots	11		50		6		40		6		3	
	Total Number of Developed Lots	2		43		4		24		2		0	
	Total Number of Developed Lots vs. Number of Total Lots	18%		86%		67%		60%		33%		0%	
	Number of Acres of Severe Soils	13		0		15		13		38		2	
	Percent of Acres with Severe Soils to Total Acres	13%		0%		20%		8%		26%		4%	
	Number of Acres per Study Area	100		26		76		153		146		52	
	Number of Acres of Developed Lots	27		20		29		83		106		0	
Actual Failure	3/31/95 to 7/8/08 Repairs	0	0	3	12	0	0	0	0	1	4	0	0
Imminent Failure	System within Zone I Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0
	System within 100 feet of Private Drinking Water Well	0	0	6	18	0	0	1	3	0	0	0	0
	Cesspool	0	0	1	3	0	0	0	0	0	0	0	0
		0	0	7	21	0	0	1	3	0	0	0	0
High Likelihood of Imminent Failure	Systems Built before 1978 (Title 5)	0	0	1	2	0	0	0	0	0	0	0	0
	Developed Lot Size less than or equal to 1/2 acre	0	0	31	62	1	2	0	0	0	0	0	0
	Developed Lots with Severe Soil Limitation	0	0	0	0	0	0	5	10	2	4	0	0
	Pumpouts Greater than 2 times per year	0	0	1	2	0	0	1	2	1	2	0	0
		0	0	33	66	1	2	6	12	3	6	0	0
Health / Water Quality Issue	Density of Systems Greater Than 2 per Acre	0	0	26	26	0	0	0	0	0	0	0	0
	System within 100 feet of Surface Water Body	0	0	0	0	0	0	0	0	0	0	0	0
	System located within 100 Year Flood Plain	0	0	0	0	1	1	1	1	0	0	0	0
	System within Zone II Aquifer Recharge Area	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	26	26	1	1	1	1	0	0	0	0
	Total Criteria Points for Study Area		0		125		3		16		10		0
	Rating Criteria Points Per Developed Lot		0.00		2.91		0.75		0.67		5.00		0.00
	RECOMMENDED AS A NEED AREA*		**NO**		**YES**		**NO**		**NO**		**YES**		**NO**

(Conventional Title 5 System Not Feasible for Majority of Study Area)

*Based on rating criteria points

TABLE 4-2
SOILS AND AGE/LOT EVALUATION - STAGE 2 ANALYSIS

DESCRIPTION	North A-2	North A-3	North B	North C	North D-1	North D-2	North D-3	North E	North F	North G	North H
Total Number of Developed Lots vs. Number of Total Lots	33%	36%	56%	28%	21%	43%	60%	38%	88%	67%	50%
Rating Criteria Points Per Developed Lot	0.00	1.45	1.00	0.86	2.30	0.50	1.16	2.00	2.78	3.83	1.00
Systems Built before 1978 (Title 5) and Lot Size less than or equal to 1/2 acre vs. Total Number of Developed Lots	0%	0%	0%	0%	20%	11%	8%	0%	12%	8%	0%
Severe Soil Limitation (Percent of Study Area Acreage)	17%	54%	13%	25%	37%	6%	2%	47%	1%	25%	14%
RECOMMENDED AS A NEED AREA*	**No**	**Yes**	**No**	**No**	**Yes**	**No**	**No**	**Yes**	**No**	**No**	**No**
(Conventional Title 5 System Not Feasible for Majority of Study Area)											

DESCRIPTION	Central A	Central B-1	Central B-2	Central C	Central D	Central E	Central F	South A	South B	South C	South D
Total Number of Developed Lots vs. Number of Total Lots	100%	87%	96%	88%	85%	87%	90%	0%	20%	63%	18%
Rating Criteria Points Per Developed Lot	2.50	2.66	3.53	2.84	2.81	3.15	3.60	0.00	1.67	2.40	0.00
Systems Built before 1978 (Title 5) and Lot Size less than or equal to 1/2 acre vs. Total Number of Developed Lots	0%	6%	10%	10%	6%	9%	12%	0%	0%	0%	0%
Severe Soil Limitation (Percent of Study Area Acreage)	0%	0%	0%	13%	2%	0%	0%	9%	2%	1%	13%
RECOMMENDED AS A NEED AREA*	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
(Conventional Title 5 System Not Feasible for Majority of Study Area)											

DESCRIPTION	South E	South F	South G	South H	South I
Total Number of Developed Lots vs. Number of Total Lots	86%	67%	60%	33%	0%
Rating Criteria Points Per Developed Lot	2.91	0.75	0.67	5.00	0.00
Systems Built before 1978 (Title 5) and Lot Size less than or equal to 1/2 acre vs. Total Number of Developed Lots	2%	4%	4%	0%	0%
Severe Soil Limitation (Percent of Study Area Acreage)	0%	20%	8%	26%	4%
RECOMMENDED AS A NEED AREA*	**No**	**No**	**No**	**No**	**No**
(Conventional Title 5 System Not Feasible for Majority of Study Area)					
***Based on rating criteria points**					

twenty-seven sub-areas exceeded the percentages for one of the two criteria considered for the second stage of the analysis.

Table 4-3 is a summary of the needs analysis results, including the third-stage analysis and final recommendations. The following text describes each study area and its associated needs analysis. At the back of this chapter are the figures referenced for each sub-area that graphically depict the data in Tables 4-1 to 4-3 (Figures 4-5A, 4-5B, 4-6A, 4-6B, 4-7A and 4-7B).

North A-1 (Figures 4-5A and 4-5B)

Sub-area North A-1 (Figure 4-1) is located in the northwestern corner of Oxford within the ORSD. The Town of Leicester borders this area to the north, and the Town of Charlton borders it to the west. Sub-area North A-3 forms the majority of its southern and eastern borders.

Sub-area North A-1 is fully sewered and therefore was not included in the needs analysis.

North A-2 (Figures 4-5A and 4-5B)

Sub-area North A-2 (Figure 4-1) is located in the northeastern corner of Oxford within the ORSD. The Town of Leicester borders this area to the north, the Town of Auburn borders it to the east, and Cumminsville and Mill Roads form its southerly and westerly boundaries.

North A-2 is fully sewered to the west of the railroad tracks. Therefore, for the needs analysis we only included the six parcels located to the east of the railroad tracks that do not have access to sewers.

As Table 4-1 shows, of the six unsewered lots in North A-2, only two are developed (Refer to Figure 4-5A for a graphical depiction.). The size of these developed lots is 13 acres, and they and the other four unsewered lots are zoned for industrial use (See Figure 2-7, *Zoning Map*.). Neither of the two developed, unsewered lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 13 acres, or 43% of the study area are developed, and approximately 17% of the entire area has severe soil limitations (Table 4-1 and Figure 4-5B).

North A-2 had a criteria point rating of 0.0 (Table 4-1), falling bellow the “breakpoint” for the first stage for the needs analysis. Likewise, this area did not fall into the “needs area” category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that, based on lot sizes, no history of failures and good soil conditions, this area would not be a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area’s wastewater.

North A-3 (Figures 4-5A and 4-5B)

North A-3 (Figure 4-1), the largest sub-area within the ORSD, is located in the northern part of Oxford and bordered to the south by the Massachusetts Turnpike. North A-3 is also bordered by North A-1 to the west and North A-2 to the east.

TABLE 4-3
OVERALL DATA REVIEW - STAGE 3 ANALYSIS

Sub-Area	Criteria Points	Recommended as a Needs Area Based on Stage 1 Analysis	Recommended as a Needs Area Based on Stage 2 Analysis	Results of Stage 3 Analysis	Recommended As A Needs Area Based on 3-Stage Analysis
North A-2	0.00	No	No	Large lots for industry with no history of system failures, and good soil conditions.	**NO** - Both Stage 1 & 2 indicate there is no Need, which is confirmed by the Stage 3 review of overall data.
North A-3	1.45	No	Yes	Large lots for suburban residential homes, some severe soils, and minimal history of system failures.	**NO** - Although Stage 2 indicates there is a Need, the relatively large lot sizes and few system failures indicate this sub-area can continue with septic systems.
North B	1.00	No	No	Large lots for suburban residential homes, minimal history of system failures and severe soil limitations.	**NO** - Both Stage 1 & 2 indicate there is no Need, which is confirmed by the Stage 3 review of overall data.
North C	0.86	No	No	Large lots for multi-family residential homes, minimal severe soils, and no history of system failures.	**NO** - Both Stage 1 & 2 indicate there is no Need, which is confirmed by the Stage 3 review of overall data.
North D-1	2.30	Yes	Yes	Large and small lots for business development with some severe soils. No history of system failures. Many lots adjacent to Route 20 are not developable due to wet soils, but more intense development of other lots is anticipated.	**YES** - Both Stage 1 & 2 indicate there is a Need, which is confirmed by the Stage 3 review of overall data.
North D-2	0.50	No	No	Mostly large lots for business and industrial development. No history of system failures and many lots adjacent to Route 20. More intense business and industrial development anticipated in future, which would require an alternative to septic systems.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but this area is slated for more intense business and industrial development, and is along a transportation corridor.
North D-3	1.16	No	No	Mostly large lots for business development. No history of system failures and both large and small lot sizes adjacent to Route 20. More intense business development anticipated in future, which would require an alternative to septic systems.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but this area is slated for more intense industrial development, and is along a transportation corridor.
North E	2.00	Yes	Yes	Large lots for suburban residential homes, some severe soils, and no history of system failures.	**NO** - Although Stage 1 & 2 Rating Criteria indicate there is a Need, the relatively large lot sizes and no history of system failures indicate this sub-area can continue with septic systems.
North F	2.78	Yes	No	Small lots for residential homes. Many existing cesspools, and majority of lots less than 1/2 acre in size.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
North G	3.83	Yes	No	Small lots and high density of septic systems for suburban residential homes.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
North H	1.00	No	No	Large lots for rural residential homes. No history of system failures and minimal soil limitations.	**NO** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, which is confirmed by the Stage 3 review of overall data.
Central A	2.50	Yes	No	Zoning is suburban residential, but the majority of the area is a conservation parcel. No history of system failure or severe soil limitations.	**NO** - Although Stage 1 indicates there is a Need, the large lot sizes, no history of system failures and little potential for growth indicate this sub-area can continue with septic systems.
Central B-1	2.66	Yes	No	Small lots for residential homes. Many existing cesspools and older systems, variances for proximity to drinking water wells, and lots less than 1/2 acre in size.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
Central B-2	3.53	Yes	No	Small lots for residential homes. Many existing cesspools, systems located within Zone II aquifer area, and lots less than 1/2 acre in size.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
Central C	2.84	Yes	No	Small lots for multi-family residential and business development. Numerous older systems, systems located within Zone II aquifer area, and lot areas less than 1/2 acre in size.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.

TABLE 4-3
OVERALL DATA REVIEW - STAGE 3 ANALYSIS

Sub-Area	Criteria Points	Recommended as a Needs Area Based on Stage 1 Analysis	Recommended as a Needs Area Based on Stage 2 Analysis	Results of Stage 3 Analysis	Recommended As A Needs Area Based on 3-Stage Analysis
Central D	2.81	Yes	No	Small lots for residential homes. Many lot areas less than 1/2 acre in size, and many systems in a density of greater than 2 per acre.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
Central E	3.15	Yes	No	Small lots for residential homes. Many lot areas less than 1/2 acre in size, many systems in a density of greater than 2 per acre, and several lots near a surface water.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
Central F	3.60	Yes	No	Smaller business lots with many being less than 1/2 acre in size and located within a Zone II aquifer area.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
South A	0.00	No	No	Large suburban residential lot and industrial lot, undeveloped with minimal severe soil limitations, and not near a transportation corridor.	**NO** - Both Stage 1 & 2 indicate there is no Need, which is confirmed by the Stage 3 review of overall data.
South B	1.67	No	No	Large lots for industrial development, and one residential lot. No history of failures, but one industry transports a portion of its wastewater to the UBWPAD WWTF on a regular basis.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but the large wastewater flow now in this area, and expected in the future, indicates a need.
South C	2.40	Yes	No	Large lots for suburban residential homes, minimal severe soils, no history of system failures, but one system within a Zone I aquifer area, and another system within a Zone II aquifer area.	**NO** - Although Stage 1 indicates there is a Need, the large lot sizes, no history of system failures and minimal severe soils indicate this sub-area can continue with septic systems.
South D	0.00	No	No	Large lots for industrial development adjacent to Route 12. No history of failures and minimal severe soil limitations. More intense industrial development anticipated in future, which would require an alternative to septic systems.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but this area is slated for more intense industrial development, and is along a transportation corridor.
South E	2.91	Yes	No	Smaller residential lots with single-family homes. Several systems located within 100' of private wells, large percentage of developed lots with an area less than 1/2 acre, and many septic systems in a density of greater than 2 per acre.	**YES** - Stage 1 indicates a Need, which is confirmed by the Stage 3 review of overall data.
South F	0.75	No	No	Large lots for industrial development. No history of failures and minimal severe soil limitations, but lots are near Route 12. More intense industrial development anticipated in future, which would require an alternative to septic systems.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but most of this area is slated for more intense industrial development, and is along a transportation corridor.
South G	0.67	No	No	Large lots for industrial development. No history of system failures and minimal severe soil limitations, but one system is within 100' of a private drinking water well, and several lots are near Route 12 and an Interstate Route 395 exit. More intense industrial development anticipated in future, which would require an alternative to septic systems.	**YES** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, but most of this area is slated for more intense industrial development, and is along a transportation corridor.
South H	5.00	Yes	No	Large residential lots for single-family homes. Some severe soils, one reported system failure, and one system pumped out more than twice/year.	**YES** - Stage 1 indicates there is a Need, which is confirmed by the Stage 3 review of the overall data.
South I	0.00	No	No	Large lots for industrial development. Undeveloped lots with minimal severe soil limitations. No lots adhacent to a transportation corridor, so future development is uncertain.	**NO** - Both Stage 1 & 2 Rating Criteria indicate there is no Need, which is confirmed by the Stage 3 review of overall data.

As Table 4-1 shows, North A-3 contains 105 lots, 38 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 2.3 acres, and the area is zoned for suburban residential use (See Figure 2-7, *Zoning Map*.). Two developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 89 acres, or 40% of the unsewered portion of the study area is developed. Approximately 54% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North A-3 contains some sewered lots. As explained previously, for the needs analysis we only considered the unsewered lots.

North A-3 had a criteria point rating of 1.45 (Table 4-1), falling below the breakpoint of 2.00. However, this area did fall into the "needs area" category in the second stage of the analysis because of the percentage of severe soils. An overall review of the data in stage three of the analysis showed that, based on the large lot sizes and history of good system performance, we do not recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

North B (Figures 4-5A and 4-5B)

North B (Figure 4-1) is located in the northwestern part of Oxford and is bordered to the north by the Massachusetts Turnpike. This sub-area contains all of the single-family residentially zoned parcels west of Leicester Road and north of Southbridge Road. North B is also bordered by North A-3 to the north and North C to the east.

As Table 4-1 shows, North B contains 143 lots, 80 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed, lot is 1.6 acres, and the area is zoned for residential use (See Figure 2-7, *Zoning Map*.). Three developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 128 acres, or 25% of the study area are developed. Approximately 13% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North B had a criteria point rating of 1.00 (Table 4-1), falling below the "breakpoint" for the first stage for the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that, based on large lot sizes, history of a small percentage of system failures, and minimum amount of severe soils, this area is not recommended as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

North C (Figures 4-5A and 4-5B)

North C (Figure 4-1) is located in the northwestern part of Oxford and bordered to the north by the Massachusetts Turnpike and North A-3, to the west by North B, and to the east by the Town of Auburn. This sub-area contains all of the multi-family residentially zoned parcels east of Leicester Road and North of Southbridge Road.

As Table 4-1 shows, North C contains 25 lots, 7 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 3.1 acres, and the area is zoned for multi-family residential use (See Figure 2-7, *Zoning Map*.). None of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 22 acres, or 11% of the study area is developed. Approximately 25% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North C had a criteria point rating of 0.86 (Table 4-1), far below the "breakpoint" for the first stage of the needs analysis. Likewise, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that there are large lot sizes, the majority of which have good soils, and there is no history of system failure. On the basis of these criteria, we do not recommend North C as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

North D-1 (Figures 4-5A and 4-5B)

North D-1 (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North B and to the east by North E and D-2. North D-1 is zoned entirely for general business (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North D-1 contains 48 lots, 10 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 2.8 acres. Two developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 28 acres, or 25% of the study area is developed. Approximately 37% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North D-1 had a criteria point rating of 2.30 (Table 4-1), above the "breakpoint" for the first stage of the needs analysis. Likewise, this area fell into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that the severe soil conditions in this area limit long-term use of septic systems. Also, intense business development is anticipated in part of this area along Route 20. On the basis of these criteria, we recommend North D-1 as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

North D-2 (Figures 4-5A and 4-5B)

North D-2 (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North B and C and to the south by North D-1, E, F and H. North D-2 area is zoned for general business and industrial usage (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North D-2 contains 42 lots, 18 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 5.4 acres. None of the developed lots in this area are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 98 acres, or 40% of the study area is developed. Approximately 6% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North D-2 had a criteria point rating of 0.50 (Table 4-1), far below the "breakpoint" for the first stage of the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that because of the larger lot sizes, and no history of system failure, this is not a needs area. However, this area is slated for more intense business and industrial development. Based on this predicted development as well as the area's proximity along a major transportation corridor – Route 20, we recommend North D-2 as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

North D-3 (Figures 4-5A and 4-5B)

North D-3 (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North C and to the south by North F and G. North D-3 contains only parcels zoned for General Business (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North D-3 contains 42 lots, 25 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 2.4 acres. Seven developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 61 acres, or 57% of the study area is developed. Approximately 2% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North D-3 had a criteria point rating of 1.16 (Table 4-1), below the "breakpoint" for the first stage of the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis indicated that because of the larger lot sizes, and no history of system failures, North D-3 should not be a needs area (Table 4-3). However, this area is slated for more intense business development. Based on this predicted development as well as the area's proximity along a major transportation corridor – Route 20, we recommend North D-3 as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

North E (Figures 4-5A and 4-5B)

North E (Figure 4-1) is located in the southwestern corner of the North focus area. It is bordered to the north by North D-1 and D-2, and contains all single-family residentially (R2) zoned parcels (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North E contains 8 lots, 3 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed, unsewered lot is 5 acres. None of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 15 acres, or 18% of the study area is developed. Approximately 47% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North E had a criteria point rating of 2.00 (Table 4-1), which is the "breakpoint" for the first stage for the needs analysis. Also, this area fell into the "needs area" category in the second

stage of the analysis because of the high percentage of severe soils. An overall review of the data in stage three of the analysis showed that because of the larger lot sizes and no history of system failures, we do not recommend North E as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

North F (Figures 4-5A and 4-5B)

North F (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North D-2 and D-3. North F contains single-family residentially (R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North F contains 137 lots, 121 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 0.9 acres. Seventy-eight of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B), and 68 of the septic systems are in the category of greater than two systems per acre. About 105 acres, or 67% of the study area is developed. Approximately 1% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North F had a criteria point rating of 2.78 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis because of the generally good soils and prevalence of septic systems built during or after 1978. An overall review of the data in stage three of the analysis showed that because of the high density of many of the septic systems, and the smaller lot sizes, we recommend North F as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

North G (Figures 4-5A and 4-5B)

North G (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North D-3. North G contains single-family residentially (R2) zoned lots along Prospect Street (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North G contains 18 lots, 12 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 0.7 acres. Eight of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B), and seven of the septic systems are in a density of greater than two per acre. About 9 acres, or 25% of the unsewered portion of the study area is developed. Approximately 25% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North G had a criteria point rating of 3.83 (Table 4-1), which is significantly above the "breakpoint" for the first stage for the needs analysis. However, with generally good soils and most septic systems constructed in 1978 or later, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis showed that because of the smaller lot sizes, high density of many of the septic systems, and severe soils in 25% of the area, we recommend North G as a needs area (Table 4-3). Thus,

conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

North H (Figures 4-5A and 4-5B)

North H (Figure 4-1) is located in the northern part of Oxford and bordered to the north by North D. North H contains single-family residentially (R2) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, North H contains 4 lots, 2 of which are developed (Refer to Figure 4-5A for a graphical depiction.). The average size of a developed lot is 3.0 acres. None of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-5B). About 6 acres, or 43% of the study area is developed. Approximately 14% of the total acreage has severe soil limitations (Table 4-1 and Figure 4-5B).

North H had a criteria point rating of 1.00 (Table 4-1), which is far below the "breakpoint" for the first stage for the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis determined that because of larger lot sizes, minimal amount of severe soils, and no history of system failures, this area does not meet the criteria of a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

Central A (Figures 4-6A and 4-6B)

Central A (Figure 4-2) is located in the center of Oxford and the northeast corner of the Central focus area. Central A contains one single-family residentially (R2 and R3) zoned lot as well as a large conservation parcel (See Figure 2-7, *Zoning Map*.). The conservation parcel, Hodges Village Dam, is owned by the ACOE and described in Chapter 2, Section A. The Hodges Village Dam property has outdoor recreation fields, access to municipal water, and no public restroom facilities.

As Table 4-1 shows, the two lots for this area are developed (Refer to Figure 4-6A for a graphical depiction.). As discussed above, one of the lots is owned by the ACOE and has recreation fields. This lot will not be developed further in the future. The size of the one residential lot is 1.6 acres. Neither of the lots are less than one-half acre in size, nor have severe soil limitations (Table 4-1 and Figure 4-6B). However, the conservation lot is within 100 feet of a surface water body, within the 100-year floodplain, and the Zone II Aquifer Recharge Area (Table 4-1 and Figure 4-5B).

Central A had a criteria point rating of 2.50 (Table 4-1), which is above the "breakpoint" for the first stage for the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis. An overall review of the data in stage three of the analysis determined that because of the large lot sizes, good soil conditions, and little potential for future growth, Central A does not fall into the category of a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

Central B-1 (Figures 4-6A and 4-6B)

Central B-1 (Figure 4-2) is located in the center of Oxford and is bordered by Main Street to the east, conservation land to the west and Charlton Street to the south. Central B-1 contains single-family residentially (R2 and R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, Central B-1 contains 671 lots, 581 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed, unsewered lot is 0.55 acres. Three hundred eighty of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 319 acres, or 57% of Central B-1 are developed.

None of the lots within Central B-1 have severe soil limitations (Table 4-1 and Figure 4-6B). However, there are 17 lots within 100 feet of private drinking water wells, 34 lots are within 100 feet of a surface water body, 22 lots are within the 100-year floodplain, and 5 lots are within the Zone II Aquifer Recharge Area (Table 4-1 and Figure 4-6B). Also, 353 septic systems are in a density of greater than two systems per acre.

Central B-1 had a criteria point rating of 2.66 (Table 4-1), which is just above the "breakpoint" for the first stage for the needs analysis. Conversely, this area did not fall into the "needs area" category in the second stage of the analysis due to the high percentage of good soils and low percentage of smaller lot sizes with older septic systems. An overall review of the data in stage three of the analysis determined that because of the smaller lot sizes, high septic system density, close proximity to drinking water wells, aquifer recharge areas, and water bodies, and number of older septic systems, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

Central B-2 (Figures 4-6A and 4-6B)

Central B-2 (Figure 4-2) is located south of Central B-1 in the center of Oxford and is bordered by Main Street to the east. Central B-2 contains single-family residentially (R2 and R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, Central B-2 contains 979 lots, 941 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed lot is 0.54 acres. Seven hundred ninety-four of the lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 508 acres, or 76% of Central B2 are developed.

None of the lots in Central B-2 have severe soil limitations (Table 4-1 and Figure 4-6B). However, there are 80 lots within the 100-year floodplain, and 279 within the Zone II Aquifer Recharge Area (Table 4-1). Also, 765 of the septic systems are in a density of greater than two per acre.

Central B-2 had a criteria point rating of 3.53 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. On the other hand, this area did not fall into the "needs area" category in the second stage of the analysis because of the good soils and relatively small

percentage of smaller developed lots with older septic systems. An overall review of the data in stage three of the analysis determined that because of the proximity to aquifer recharge areas, smaller lot sizes, and high septic system density, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

Central C (Figures 4-6A and 4-6B)

Central C (Figure 4-2) is located to the east of both Central B-1 and B-2 in the center of Oxford, and contains parcels bordering Main Street. Central C contains industrial, commercial, and multi-family residentially (R4) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, Central C contains 349 lots, 308 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed lot is 0.75 acres. One hundred ninety of the lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 232 acres, or 71% of the total parcel acreage in Central C are developed.

Forty-two acres, or 13% of the lots within the sub-area have severe soil limitations (Table 4-1 and Figure 4-6B). Additionally, there are 3 lots within 100 feet of a water body, 7 lots within the 100-year floodplain, and 26 lots within the Zone II Aquifer Recharge Area (Table 4-1). One hundred sixty-six septic systems are in a density of greater than two per acre.

Central C had a criteria point rating of 2.84 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis because of the good soils and relatively small percentage of older septic systems. An overall review of the data in stage three of the analysis determined that because of the prevalence of smaller lot sizes, high septic system density, and presence of many lots within the Zone II Aquifer Recharge Area, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

Central D (Figures 4-6A and 4-6B)

Central D (Figure 4-2) is located to the east of Central C in the center of Oxford and contains parcels between I-395 and the commercial, industrial and multi-family zoned lots along Main Street. Central D contains single-family residentially (R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, Central D contains 80 unsewered lots, 68 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed, lot is 0.44 acres. Fifty-four of the lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 30 acres, or 26% of Central D are developed. None of the lots within the sub-area has severe soil limitations (Table 4-1 and Figure 4-6B). There are, however, 6 lots within the 100-year floodplain (Table 4-1).

Central D had a criteria point rating of 2.81 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. On the other hand, this area did not fall into the "needs area" category in the second stage of the analysis because of the good soils and relatively few pre-1978 septic systems. An overall review of the data in stage three of the analysis determined that because of the small lot sizes and high septic system density, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

Central E (Figures 4-6A and 4-6B)

Central E (Figure 4-2) is located in the center of Oxford and contains parcels between I-395 to the east, Sutton Avenue to the North, Huguenot Street to the South, and the commercial, industrial and multi-family zoned lots along Main Street to the west. Central E contains single-family residentially (R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, Central E contains 125 lots, 109 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed lot is 0.61 acres. Seventy-nine of the lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 66 acres, or 45% of Central E are developed.

None of the lots within the sub-area have severe soil limitations (Table 4-1 and Figure 4-6B). However, there are 16 lots within 100 feet of a surface water body, and 11 located within the 100-year floodplain (Table 4-1). In addition, 75 septic systems are in a density of greater than two per acre.

Central E had a criteria point rating of 3.15 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis because of the area's good soil characteristics and minimal number of older septic systems. An overall review of the data in stage three of the analysis determined that because of the proximity of lots to water bodies and the 100-year floodplain, smaller lot sizes, and a large portion of the area having a density of systems greater than two per acre, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

Central F (Figures 4-6A and 4-6B)

Central F (Figure 4-2) is located in the southern tip of the Central focus area. It contains parcels bordering Main Street. Central F contains general business zoned lots (See Figure 2-7, *Zoning Map*).

As Table 4-1 shows, Central F contains 67 lots, 60 of which are developed (Refer to Figure 4-6A for a graphical depiction.). The average size of a developed lot is 0.97 acres. Forty of the lots are less than one-half acre in size (Table 4-1 and Figure 4-6B). About 58 acres, or 83% of Central F are developed.

None of the lots within the sub-area have severe soil limitations (Table 4-1 and Figure 4-6B). However, 23 of the lots in Central F are within a Zone II Aquifer Recharge Area, 2 are within 100 feet of a surface water body, 4 are within the 100-year floodplain (Table 4-1). Also, 38 of the septic systems are in a density of greater than two per acre.

Central F had a criteria point rating of 3.60 (Table 4-1), which exceeds the "breakpoint" for the first stage for the needs analysis. Alternatively, this area did not fall into the "needs area" category in the second stage of the analysis because of good soils and a relatively minor amount of pre-1978 septic systems. An overall review of the data in stage three of the analysis determined that because of the proximity of lots to the Zone II Aquifer Recharge Area, 100-year floodplain and water body, along with smaller lot sizes and a large portion of the area having a density of systems greater than two per acre, we recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South A (Figures 4-7A and 4-7B)

South A (Figure 4-3) is located in the southwest corner of the South focus area. It is bordered to the east by South B. This area contains two suburban residentially zoned lots (See Figure 2-7, *Zoning Map*.). As Table 4-1 shows, this area is undeveloped and 193 acres in size (Refer to Figure 4-7A for a graphical depiction.). The lots do have some severe soil limitations (Table 4-1 and Figure 4-7B).

South A had a criteria point rating of 0.00 (Table 4-1), which is well below the "breakpoint" for the first stage for the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis because the area possesses generally good soils and larger lot sizes. An overall review of the data in stage three of the analysis determined that because of the larger lot sizes and presence of adequate soils, we do not recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

South B (Figures 4-7A and 4-7B)

South B (Figure 4-3) is located in the South focus area and is bordered to the north by South C, to the east by South D, to the south by the Town of Webster, and to the west by South A. This area contains light industrially zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South B contains 15 unsewered lots, 3 of which are developed (Refer to Figure 4-7A for a graphical depiction.). The average size of a developed, unsewered lot is 23 acres. None of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-7B). About 69 acres, or 40% of the total parcel acreage in South B are developed.

South B contains no sewered parcels. One of the developed lots within the sub-area has severe soil limitations (Table 4-1 and Figures 4-7B), and one lot is within the 100-year floodplain. Table 3 also shows that one lot has pumpouts greater than twice per year. In reality, the property

owner of this lot has wastewater flows that exceed 10,000 gpd, and the owner has the flow exceeding this amount transported to the UBWPAD WWTF for treatment on a regular basis.

South B had a criteria point rating of 1.67 (Table 4-1), which is below the "breakpoint" for the first stage of the needs analysis. Also, with its larger lots and no history of system failures, this area did not fall into the "needs area" category in the second stage of the analysis. Our overall review of the data in stage three of the analysis indicated that because of the larger lot sizes, minimal amount of severe soils, and no history of system failures (Table 4-3), this area should not be a needs area. However, this area currently experiences large wastewater flows and is expected to see increased flows in the future. Based on the current high wastewater flow and the predicted increase in flow, we recommend South B as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South C (Figures 4-7A and 4-7B)

South C (Figure 4-3) is located between Old Webster Road and South Main Street, and to the north of South B and D in the South focus area. This area contains single-family residentially (R2) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South C contains 8 lots, 5 of which are developed (Refer to Figure 4-7A for a graphical depiction.). The average size of a developed, unsewered lot is 11 acres. None of the lots are less than one-half acre in size (Table 4-1 and Figure 4-7B). About 56 acres, or 63% of South C are developed.

One of the lots within the sub-area has severe soil limitations (Table 4-1 and Figure 4-7B). Also, one lot is within 100 feet of a water body, three lots are within the 100-year floodplain, one lot is within the Zone I Aquifer Recharge Area, and one lot is within the Zone II Aquifer Recharge Area (Table 4-1).

South C had a criteria point rating of 2.40 (Table 4-1), which is above the "breakpoint" for the first stage for the needs analysis. On the other hand, this area did not fall into the "needs area" category in the second stage of the analysis because the area possesses generally good soils and larger lot sizes. An overall review of the data in stage three of the analysis determined that because of the larger lot sizes, no history of system failures and minimal severe soil limitations, we do not recommend this area as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

South D (Figures 4-7A and 4-7B)

South D (Figure 4-3) is located on the northern border of the Town of Webster in the South focus area, and is bordered to the east by South E and G and to the west by South B and C. This area contains industrially (I) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South D contains 11 unsewered lots, 2 of which are developed (Refer to Figure 4-7A for a graphical depiction.). The average size of a developed, unsewered lot is 13.5

acres. None of the developed lots is less than one-half acre in size (Table 4-1 and Figure 4-7B). About 27 acres, or 27% of the total parcel acreage in South D are developed.

South D had a criteria point rating of 0.00 (Table 4-1), which is well below the "breakpoint" for the first stage of the needs analysis. Also, with its larger lots and generally good soils, this area did not fall into the "needs area" category in the second stage of the analysis. Our overall review of the data in stage three of the analysis determined that because of the larger lot sizes, minimal amount of severe soils, and no history of system failures (Table 4-3), this area should not be a needs area. However, this area is slated for more intense industrial development. Based on this predicted development as well as the area's proximity to major transportation corridors – Routes 12 and I-395, we recommend South D as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South E (Figures 4-7A and 4-7B)

South E (Figure 4-3) is located on both sides of South Main Street in the extreme southern portion of the South focus area. This area contains single-family residentially (R3) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South E contains 50 unsewered lots, 43 of which are developed (Refer to Figure 4-7A for a graphical depiction.). The average size of a developed, unsewered lot is 0.46 acres. Thirty-one of the developed lots are less than one-half acre in size (Table 4-1 and Figure 4-7B). About 20 acres, or 77% of the total parcel acreage in South C are developed.

South E contains no sewered parcels. None of the lots within the sub-area have severe soil limitations (Table 4-1 and Figures 4-7B), but six lots are within 100 feet of private drinking water wells, and 26 of the septic systems are in a density of greater than two per acre.

South E had a criteria point rating of 2.91 (Table 4-1), which exceeds the "breakpoint" for the first stage of the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis because of its good soils and relatively few older septic systems. An overall review of the data in stage three of the analysis determined that because of the smaller lot sizes, large portion of the area having a density of systems greater than two per acre, and the proximity of several systems to private drinking water wells, this area should be a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South F (Figures 4-7A and 4-7B)

South F (Figure 4-3) is located to the east of I-395 in the South focus area. It is bordered tot he south by South G. This sub-area contains industrially zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South F contains 6 unsewered lots, 4 of which are developed (Refer to Figure 4-7A for a graphical depiction.). About 29 acres, or 38% of the total parcel acreage in South F are developed.

South F contains no sewered parcels. Roughly 20% of the developed lots have some severe soil limitations (Table 4-1 and Figure 4-7B), one developed lot is less than one-half acre in size and one developed lot is located within the 100-year flood plain.

South F had a criteria point rating of 0.75 (Table 4-1), which is well below the "breakpoint" for the first stage of the needs analysis. Similarly, this area did not fall into the "needs area" category in the second stage of the analysis because of the larger lot sizes and presence of adequate soils throughout much of the area. An overall review of the data in stage three of the analysis determined that because of the large size of the lots, this area should not be a needs area. However, this area is slated for more intense industrial development. Based on this predicted development as well as the area's proximity along major transportation corridors – Route 12 and I-395, we recommend South F as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South G (Figures 4-7A and 4-7B)

South G (Figure 4-3) is located in the South focus area and is bordered to the north by South F, to the east by South H and I, to the south by the Town of Webster, and to the west by South D and E. I-395 cuts through this area, and the zoning is industrial (I) (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South G contains 40 unsewered lots, 24 of which are developed (Refer to Figure 4-7A for a graphical depiction.). The average size of a developed, unsewered lot is 3.4 acres. None of the developed lots is less than one-half acre in size (Table 4-1 and Figure 4-7B). About 83 acres, or 54% of the total parcel acreage in South G are developed, and five of the developed lots within the sub-area have severe soil limitations (Table 4-1 and Figure 4-7B). South G contains no sewered parcels.

South G had a criteria point rating of 0.67 (Table 4-1), which is below the "breakpoint" for the first stage of the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis because of the larger lot sizes and generally good soils. An overall review of the data in stage three of the analysis determined that this area should not be a needs area because of its larger lot sizes and minimal amount of severe soils. However, most of this area is slated for more intense industrial development. Based on this predicted development as well as the area's proximity along a major transportation corridor – I-395, we recommend South G as a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South H (Figures 4-7A and 4-7B)

South H (Figure 4-3) is located to the east of I-395 and north of South G and I in the South focus area. This sub-area contains single-family residentially (R1 and R2) zoned lots (See Figure 2-7, *Zoning Map*.).

As Table 4-1 shows, South H contains 6 unsewered lots, 2 of which are developed (Refer to Figure 4-7A for a graphical depiction.). One of the developed parcels is 50 acres in size, and the

other is 56 acres (Figure 4-7B). About 106 acres, or 73% of the total parcel acreage in South H are developed.

South H contains no sewered parcels. The two developed lots have some severe soil limitations (Table 4-1 and Figure 4-7B), one of the septic systems has been repaired, and one system has been pumped out more than twice a year.

South H had a criteria point rating of 5.00 (Table 4-1), which is the highest rating of all of the sub-areas in the first stage of the needs analysis. However, this area did not fall into the "needs area" category in the second stage of the analysis because of the larger lot sizes and presence of adequate soils throughout much of the area. An overall review of the data in stage three of the analysis determined that because of the presence of severe soils, reported system failure and system pump outs more than twice a year, this area should be a needs area (Table 4-3). Thus, conventional Title 5 septic systems are not a viable long-term solution for management of the area's wastewater.

South I (Figures 4-7A and 4-7B)

South I (Figure 4-3) is located in the South focus area and is bordered to the north by South H, to the south by the Town of Webster, and to the west by South G. This area contains industrially zoned lots (See Figure 2-7, *Zoning Map*.).

South I contains no sewered parcels and three undeveloped lots. The area has a minimal amount of severe soil limitations (Table 4-1 and Figure 4-7B).

South I had a criteria point rating of 0.00 (Table 4-1), which is below the "breakpoint" for the first stage of the needs analysis. Additionally, this area did not fall into the "needs area" category in the second stage of the analysis because of the larger lot sizes and generally good soils on the undeveloped lots. An overall review of the data in stage three of the analysis determined that this area should not be a needs area because of its larger lot sizes and minimal amount of severe soils (Table 4-3). Also, while the area is zoned for industrial development, it is not located adjacent to a major transportation corridor, so development should not be as intense as other industrially zoned areas in the South focus area. Thus, conventional Title 5 septic systems are a viable long-term solution for management of the area's wastewater.

6. Sub-Areas Exhibiting Wastewater Need

On the basis of the three-stage analysis presented in the previous section, the following sub-areas exhibit a wastewater need, and will require an alternative to conventional Title 5 septic systems:

- North D-1
- North D-2
- North D-3
- North F
- North G
- Central B-1

- Central B-2
- Central C
- Central D
- Central E
- Central F
- South B
- South D
- South E
- South F
- South G
- South H

Figures 4-8 through 4-10, included at the end of this chapter, present graphic illustrations of the wastewater needs areas, as determined from the three-stage analysis.

B. WASTEWATER FLOWS

The following presents the analysis for determining additional flows in 2030, which is the end of the 20-year planning period for this study. At this time the method for treating and disposing of the wastewater from the needs areas is not known. However, for the purpose of flow estimation, the assumption is that there will be some form of piped (sewer) discharge from individual lots to a treatment facility within or outside of the Town of Oxford.

As stated in Chapter 2, Section D of this report, the Town of Oxford delivered an average daily flow of 46,300 gpd to the Town of Auburn sewer system and 56,400 gpd to the Oxford-Rochdale WWTP in 2007.

Additional wastewater flows from sewered areas will result from both developed and undeveloped areas. Additional flows from sewered areas result when developed lots that have not yet connected to the sewer system decide to connect. Flows from undeveloped lots occur when they develop and connect to the sewer system. With the addition of sewers to unsewered areas (needs areas), wastewater flows result as developed lots connect, and as undeveloped lots become developed and connect to the sewers.

1. Review of Assessor's Information

To determine additional wastewater flows in the three Focus Areas, we first reviewed Assessor's information for each area and broke the data down into the following land use categories:

- Residential
- Commercial
- Industrial
- Municipal/public
- Open land
- Agricultural

For residential categories, we determined the total number of existing residential units according to the land use code (one residential unit for single-family, two residential units for two-family, etc.). We were also able to estimate future residential units according to available acreage, land use code and zoning requirements.

For the commercial and industrial categories, we obtained acreage information from Assessor's data, and developed wastewater flows on the basis of acreage, as described later. MassGIS indicates that there are 225 parcels, or 2,082 acres of developable land available for commercial/industrial use. To estimate the rate at which commercial/industrial use would develop through 2030, we looked at the number of permits issued in this category between 1998 and 2007. Table 3-4 in Chapter 3 shows that the Town issued 115 commercial permits (which include the industrial category) during this timeframe, or about 12 permits a year on average. If we adopt this number going forward through 2030, and assume each permit represents another parcel development, we establish the number of developed acres through 2030 on the basis of the current number of developable commercial/industrial parcels and associated acreage. We assigned commercial/industrial acreage to be developed in each sub-area and outside existing sewered areas according to the number of developable parcels in the area as compared to the total for the Town, the average developable acreage per parcel in each area, and the total number of commercial/industrial permits issued through 2030. With 225 parcels available for development in 2007, all commercial/industrial parcels would be developed before 2030 if 12 parcels were developed each year, and there was no parcel subdivision. Parcel subdivision is likely to occur, so this analysis is aggressive in terms of estimating future commercial/industrial growth and associated wastewater flows.

Town officials indicated there was no significant water use in the municipal/public category from users who are not already connected to the Town's sewer system. For the open land and agricultural categories, we assumed no flow contribution in terms of a piped discharge to a treatment and disposal facility.

2. Residential Flow Analysis

The analysis took the following approach to allocate residential flows. For currently developed lots, we assumed that 100 percent would connect by 2030.

For flows from undeveloped lots, we first determined available acreage in residentially zoned districts, and then developed the number of potential residential units according to land use codes and zoning criteria. In this analysis, we excluded undeveloped lots that did not meet zoning by-law requirements for square footage, or which would be undevelopable because of the presence of wetlands. The analysis did not consider additional residential units that might result from subdivision of existing developed lots, or subdivision of existing agricultural land or open space for future residential use. The basis for residential flows in 2030 is the population increase of 2,442 (the difference between the Town Clerk's population estimate for 2007 and the CMRPC's projected population estimate for 2030 [Table 3-2]), proportioned among the total number of residential units estimated for undeveloped lots throughout the community.

To estimate residential wastewater flows, we first assumed that future residential water consumption would be 65 gpcd. This value is similar to the current per capita water consumption, and is the goal adopted by MassDEP for conservative water use. According to Assessor's information from the Town, and the U.S. Census 2000 population estimate, the number of people per household in Oxford is 2.64. Applying this number and the water consumption estimate of 65 gpcd yields a water consumption figure per household of 171.6 gpd. To convert this estimate to wastewater flow, we have applied a factor of 0.9; this results in an average household wastewater flow of 154 gpd.

The Reserve at Ashworth Hill is a multi-family condominium project that is currently under construction in the North Focus Area. A portion of the wastewater generated from this project will discharge to the Town of Auburn for treatment at the UBWPAD WWTF, and a portion will discharge to the Oxford-Rochdale WWTP. To determine the future residential wastewater flow from this development, we established flows based on the proposed number of living units (or households) that will discharge to each facility, as contained in the development's sewer extension permit, rather than assessing flows based on the available number of undeveloped lots and the corresponding zoning. Also, we did not adopt the Title 5 flow estimates included in the development's sewer extension permit, as these would not be in line with our flow estimates for other residential parcels.

3. Commercial and Industrial Flow Analysis

For wastewater flow from the commercial and industrial categories, the analysis assumed that for developed lots within existing sewered areas and areas proposed for sewers, 100 percent of the commercial/industrial acreage would connect by 2030. In determining the acreage of new development in the sewered areas and areas proposed for sewers, we excluded lots that did not meet the minimum square footage zoning requirements, lots that had a significant amount of wetlands, and lots designated for electrical transmission rights-of-way.

Utilizing 2007 water usage data from Aquarion Water Quality Reports and GIS software, we calculated commercial/industrial water use to be 467 gal/acre/day. Applying a factor of 0.9 to this rate to account for water use that doesn't result in piped wastewater discharge results in a wastewater discharge from commercial/industrial properties of 420 gal/acre/day.

4. Total Additional Wastewater Flow

On the basis of the above analysis, Table 4-4 presents additional wastewater flows anticipated in 2030 from the existing sewered areas, both within and outside of needs areas, from developed and undeveloped lots that are within 200 feet of an existing sewer. Table 4-4 indicates that the additional flow that these areas will contribute is about 133,00 gpd in 2030. Table 4-5 presents projected flows in 2030 from the currently unsewered portions of the needs areas identified in Table 4-3; this total flow is about 946,000 gpd. Finally, Table 4-6 shows projected flows in 2030 from both the existing sewered areas and currently unsewered portions of the needs areas. In addition, Table 4-6 lists the I/I contribution anticipated from the various areas; the basis for this I/I is explained in the following section. When the total flow in Table 4-6 – 1,208,700 gpd - is added to the year 2007 wastewater flow of 46,300 gpd to the Town of Auburn, and 56,400 gpd to

TABLE 4-4
ADDITIONAL WASTEWATER FLOWS
FOR EXISTING SEWERED AREAS IN 2030 (GPD)

	Residential		Commercial/Industrial		
Area	**Developed**	**Undeveloped**	**Developed**	**Undeveloped**	**Total**
North A-2	0	0	0	14,465	14,465
North A-3	3,696	699	10,578	0	14,973
Ashworth Hill					19,250
Total to Oxford-Rochdale WWTP					**48,688**
North C	1,232	932	0	0	2,164
Ashworth Hill					30,030
North D-2	1,694	0	1,419	1,591	4,704
North D-3	154	0	0	1,333	1,487
North F	18,480	1,864	1,333	0	21,677
Areas Outside Focus Areas	19,250	2,564	2,455	0	24,269
Total to UBWPAD WWTF					**84,331**
Total to Both WWTFs	**44,506**	**6,059**	**15,785**	**17,389**	**133,019**

TABLE 4-5
ADDITIONAL WASTEWATER FLOWS
FOR NEEDS AREAS* IN 2030 (GPD)

	Residential		Commercial/Industrial		
Area	**Developed**	**Undeveloped**	**Developed**	**Undeveloped**	**Total**
North D-1	1,540	0	0	35,815	37,355
North D-2	308	0	39,001	55,702	95,011
North D-3	2,310	0	10,105	19,221	31,636
North F	23,716	932	12,685	0	37,333
North G	1,848	1,165	0	0	3,013
Central B-1	99,638	13,051	11,309	0	123,998
Central B-2	150,766	3,263	12,685	0	166,714
Central C	53,900	466	44,290	26,144	124,800
Central D	11,242	1,864	0	0	13,106
Central E	18,634	1,864	323	0	20,821
Central F	9,702	0	11,395	3,397	24,494
South B	154	0	29,141	44,247	73,542
South D	0	0	11,739	31,175	42,914
South E	6,622	1,631	559	0	8,812
South F	462	0	10,965	20,167	31,594
South G	0	0	35,604	30,014	65,618
South H	0	932	43,860	0	44,792
Total	380,842	25,169	273,661	265,882	945,553

* Needs areas are the unsewered portions of the sub-areas.

TABLE 4-6
ADDITIONAL WASTEWATER FLOWS
FOR EXISTING SEWERED AND NEEDS AREAS* IN 2030 (GPD)

	Residential		Commercial/Industrial			
Area	**Developed**	**Undeveloped**	**Developed**	**Undeveloped**	**I/I**	**Total**
North A-2	0	0	0	14,465	2,705	17,170
North A-3**	22,946	699	10,578	0	11,901	46,124
North C**	31,262	932	0	0	1,964	34,158
North D-1	1,540	0	0	35,815	3,295	40,650
North D-2	2,002	0	40,420	57,293	8,061	107,776
North D-3	2,464	0	10,105	20,554	8,295	41,418
North F	42,196	2,797	14,018	0	3,010	62,021
North G	1,848	1,165	0	0	530	3,544
Central B-1	99,638	13,051	11,309	0	15,597	139,595
Central B-2	150,766	3,263	12,685	0	26,749	193,463
Central C	53,900	466	44,290	26,144	17,193	141,993
Central D	11,242	1,864	0	0	1,675	14,781
Central E	18,634	1,864	323	0	2,488	23,309
Central F	9,702	0	11,395	3,397	2,607	27,101
South B	154	0	29,141	44,247	3,220	76,762
South D	0	0	11,739	31,175	2,614	45,528
South E	6,622	1,631	559	0	4,898	13,710
South F	462	0	10,965	20,167	341	31,935
South G	0	0	35,604	30,014	7,576	73,194
South H	0	932	43,860	0	0	44,792
Areas Outside Focus Areas	19,250	2,564	2,455	0	5,385	29,654
Total	474,628	31,228	289,446	283,271	130,104	1,208,677

* Needs areas are the unsewered portions of the sub-areas.

** Includes Ashworth Hill

the Oxford-Rochdale WWTP, this amounts to a total wastewater flow of about 1,311,000 gpd in 2030 from the Town of Oxford.

5. Infiltration/Inflow (I/I)

If conventional sewers are installed in the needs areas, a certain amount of flow associated with I/I will result. By the year 2030, both existing and proposed sewers would be considered "older sewers", and we assigned an I/I value of 500 gal/day/inch-diameter/mile of sewer to these pipelines. To calculate the I/I for each needs area, we assumed that all sewers would be 8 inches in diameter, except for sewers along Main Street, which would be 12 inches. We also assumed that sewer lengths approximate existing street lengths in these areas, as it did not seem appropriate to do a preliminary sewer layout at this stage of the CWMP.

Pollutant Loadings

The basis that we recommend for establishing the strength of residential wastewater is the *New England Interstate Water Pollution Control Commission Guide for the Design of Wastewater Treatment Works* (TR-16). This reference cites the following contributions for domestic wastewater (assuming garbage grinders are prevalent in the community), on a per capita basis:

Biochemical Oxygen Demand (BOD) - 0.22 pounds per day (lbs/day)
Total Suspended Solids (TSS) - 0.25 lbs/day
Total Nitrogen - 0.04 lbs/day
Total Phosphorus - 0.006 lbs/day

Commercial/industrial wastewater strength can vary greatly. For the purposes of this analysis, we have assumed a medium strength wastewater, with the following characteristics:

BOD - 220 mg/L
TSS - 220 mg/L
Total Nitrogen - 40 mg/L
Total Phosphorus - 8 mg/L

Application of the above per capita loadings and commercial/industrial concentration estimates to the population estimates and commercial/industrial flows that we determined in the flow portion of this analysis can be used to estimate additional loadings in the sewered and needs areas in 2030.

6. Effect of Water Conservation Measures

In Chapter 3, Section B of this report, we indicated that the Town is using a per capita water consumption estimate of 65 gpd for determining future water supply requirements. This is a goal that MassDEP has set for residential use, so we are not advocating for further water conservation measures at this time.

C. COLLECTION SYSTEM ISSUES

The projected additional wastewater flows from the Town of Oxford shown in Table 4-6 for the year 2030 show a significant increase over the 2007 average daily flow of 46,300 gpd to the Town of Auburn, and 56,400 gpd to the Oxford-Rochdale WWTP.

At this phase of the CWMP process, it is premature to investigate in depth how wastewater flow from a particular area will affect a sewer line or pump station, as there has been no determination of the means for handling the wastewater needs of the various study areas.

D. WASTEWATER TREATMENT FACILITY ISSUES

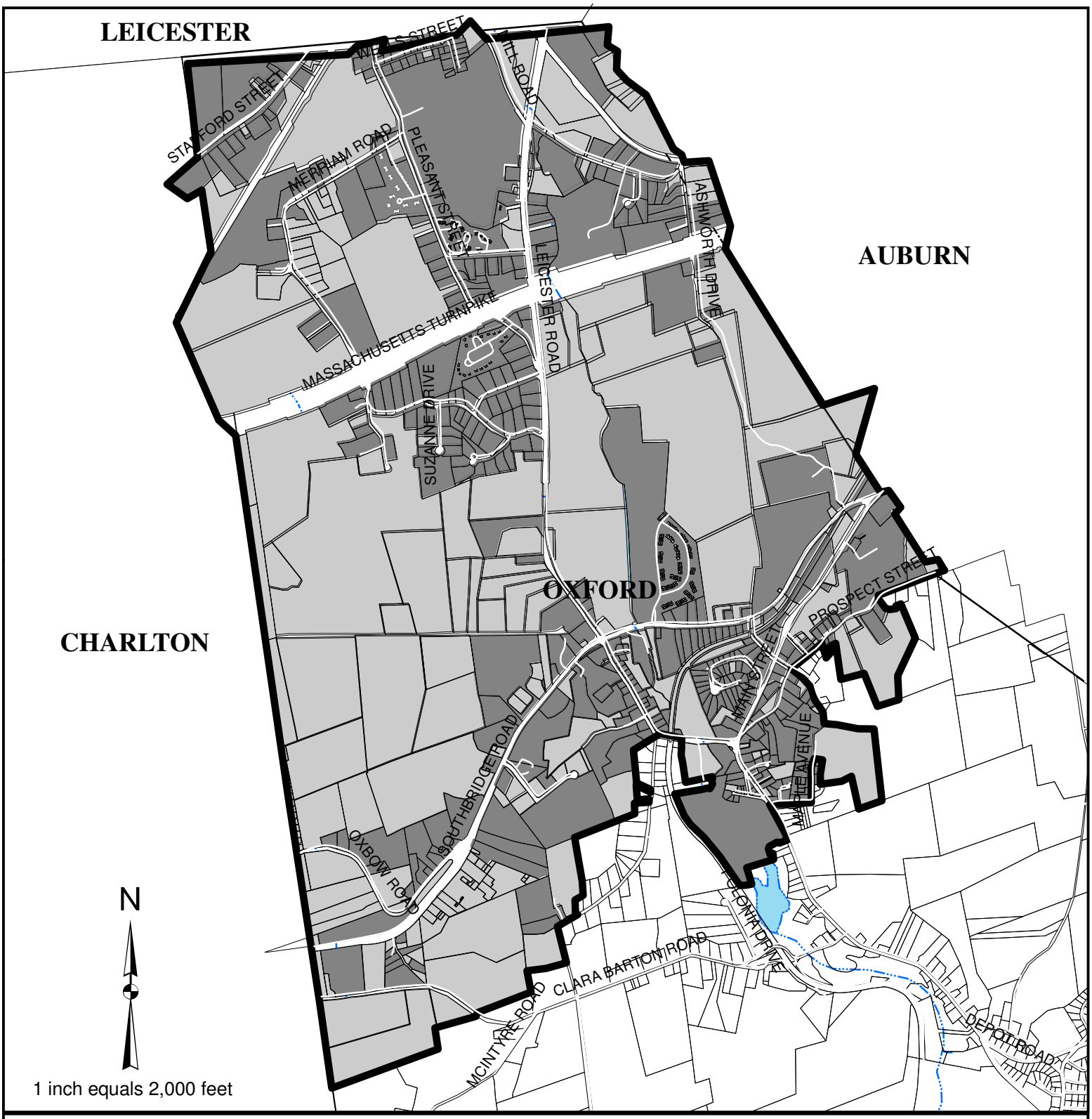
1. Webster-Dudley WWTF

The Town of Oxford currently sends its wastewater either to the Oxford-Rochdale WWTP in Oxford, or to the Town of Auburn, from where it flows to the UPWPAD WWTF in Millbury, MA. The service areas for these facilities are found in the north and north-central parts of Oxford. For sub-areas within the South focus area, and for some sub-areas within the Central focus area that will need offsite wastewater treatment in the future, a more viable option may be construction of sewers from those areas south to the Oxford-Webster town line, and then into the Town of Webster. Webster has designed sewers in the Worcester Road (Route 12) area near the Oxford-Webster town line, and the two towns have communicated regarding capacity allocation for possible wastewater flow from Oxford. From the Worcester Road area, the wastewater will travel to the Webster/Dudley Advanced WWTF (AWWTF) for treatment. This facility currently uses the following unit processes:

- Flow Equalization
- Septage Receiving
- Preliminary Treatment
- Secondary Treatment
- Single-Stage Nitrification
- Phosphorus Removal by Alum Addition
- Chlorination/dechlorination
- Activated Sludge Thickening
- Sludge Storage
- Offsite Sludge Disposal (Incineration)

The plant is designed for an average daily flow of 6.0 MGD, and is currently receiving about 3.5 MGD. There is available capacity for the Town of Oxford, as the industrial flow allocation for the original AWWTF design is now significantly diminished. Construction of new phosphorus removal facilities to achieve an effluent limit of 0.2 mg/L total phosphorus in warm-weather months is anticipated in the spring of 2009 at the AWWTF.

Appendix D contains a three-page flow diagram of the Webster/Dudley AWWTF. This diagram identifies the unit processes listed above, and others that were part of the 1987 plant upgrade but are not currently in use.



Legend

- North Study Area
- Parcels

Developed Parcels

- No
- Yes
- Stream, River
- Water Bodies

Town of Oxford, MA
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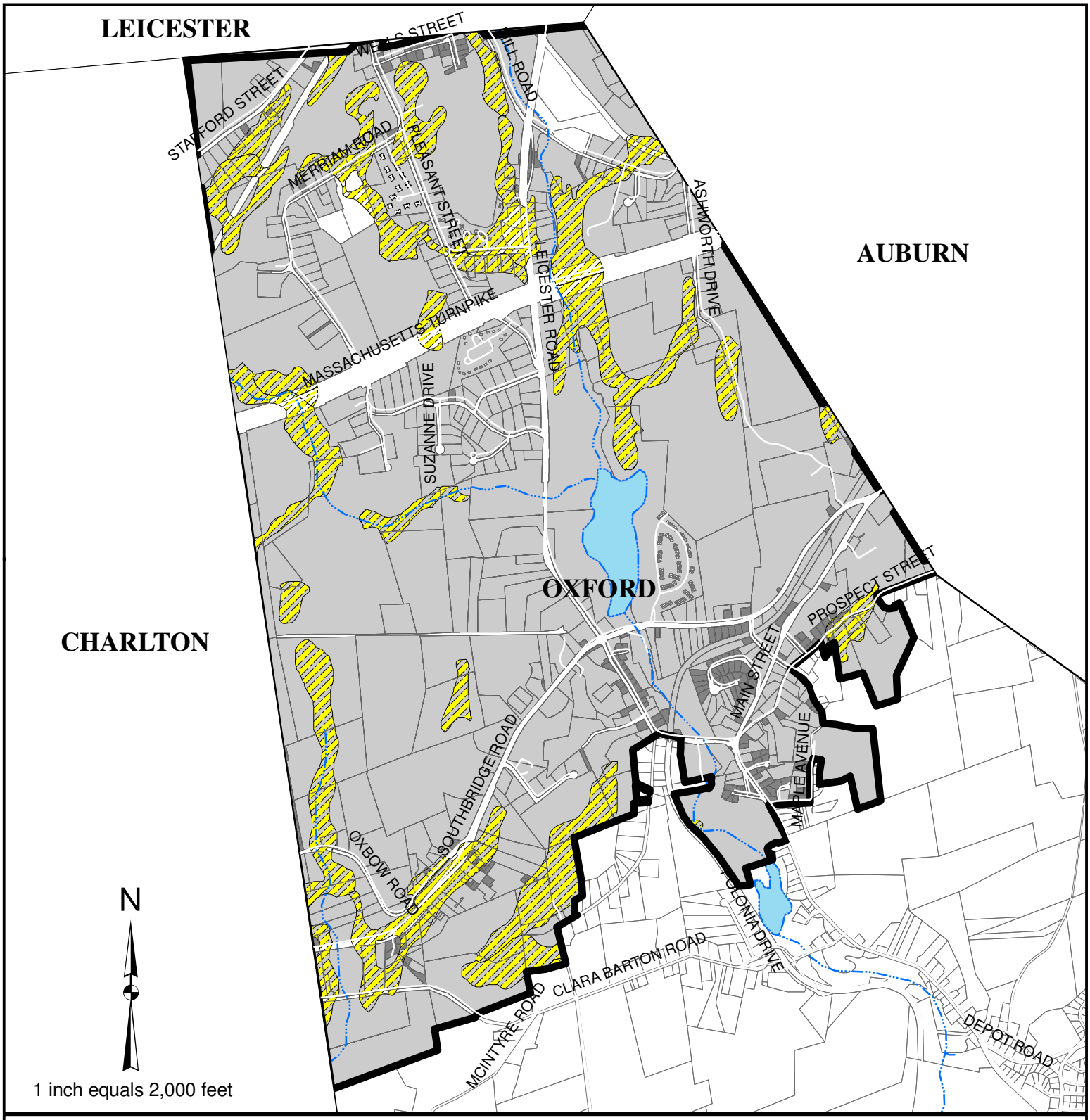
Phase 1 - Needs Analysis

FIGURE 4-5A
NORTH AREA
DEVELOPED PARCELS

ENGINEERS FST Since 1914

Data compiled from MassGIS and FST



Legend

- North Study Area
- Stream, River
- Water Bodies
- Parcels
- Oxford Severe Soils

Acreage

- < 0.5 Acres
- > 0.5 Acres

Data compiled from MassGIS and FST

Town of Oxford, MA
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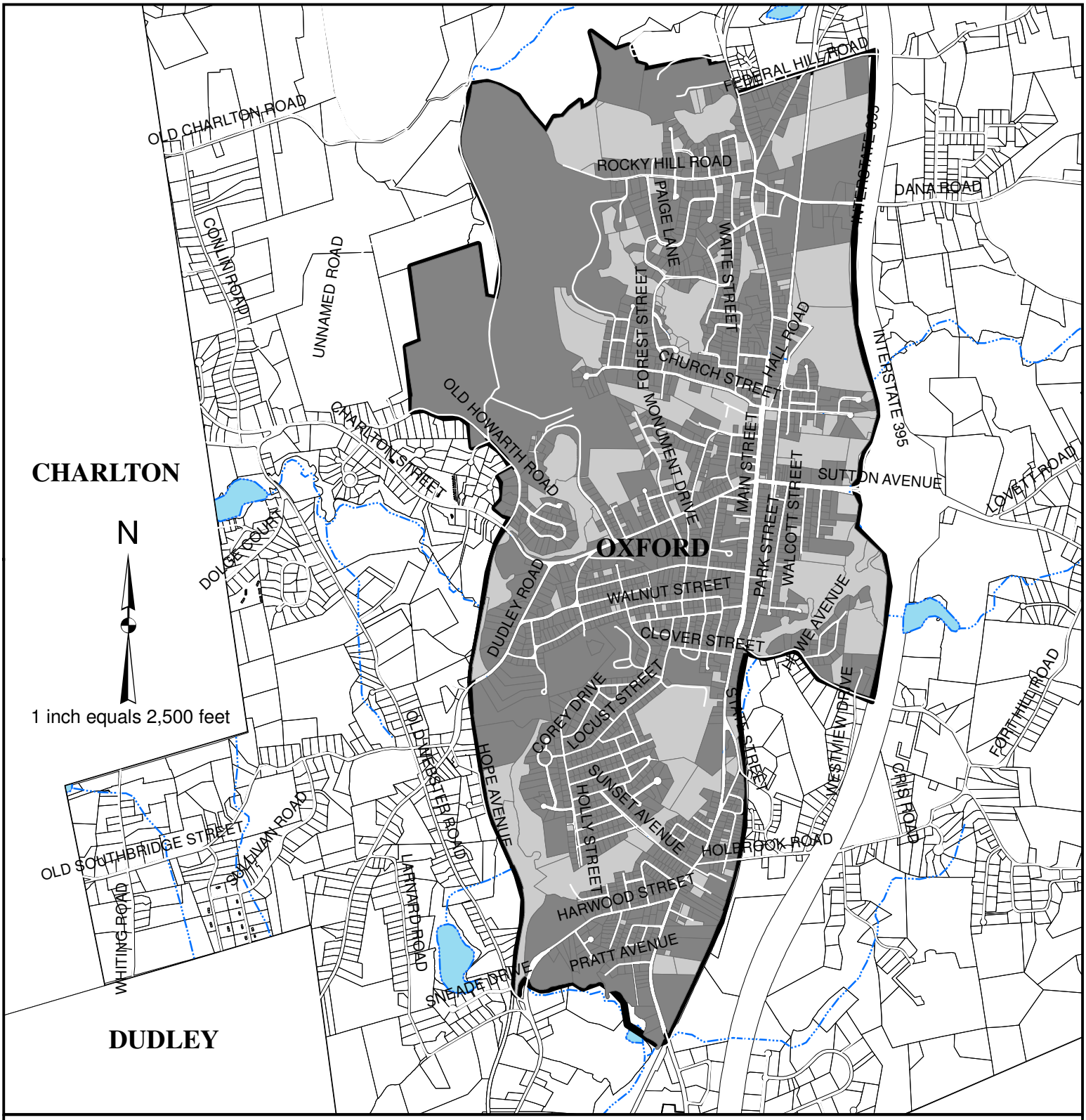
FIGURE 4-5B
NORTH AREA
PARCEL ACREAGE AND SEVERE SOILS

ENGINEERS FST Since 1914



Legend

- Central Study Area
- Parcels

Developed Parcels

- No
- Yes
- Stream, River
- Water Bodies

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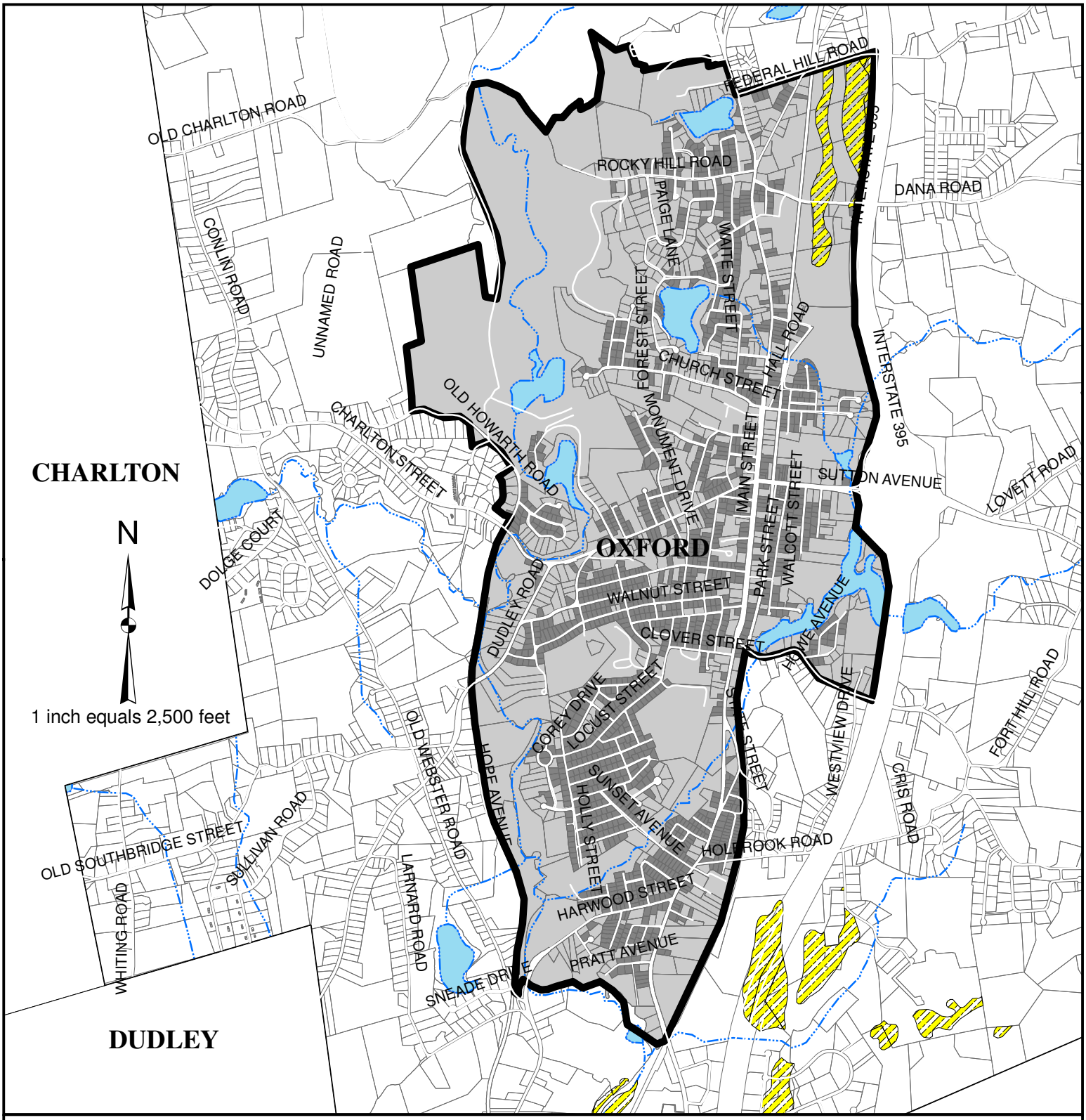
FIGURE 4-6A
CENTRAL AREA
DEVELOPED PARCELS

Data compiled from MassGIS and FST



Legend

- Central Study Area
- Stream, River
- Water Bodies
- Parcels
- Oxford Severe Soils

Acreage

- < 0.5 Acres
- > 0.5 Acres

Town of Oxford, MA
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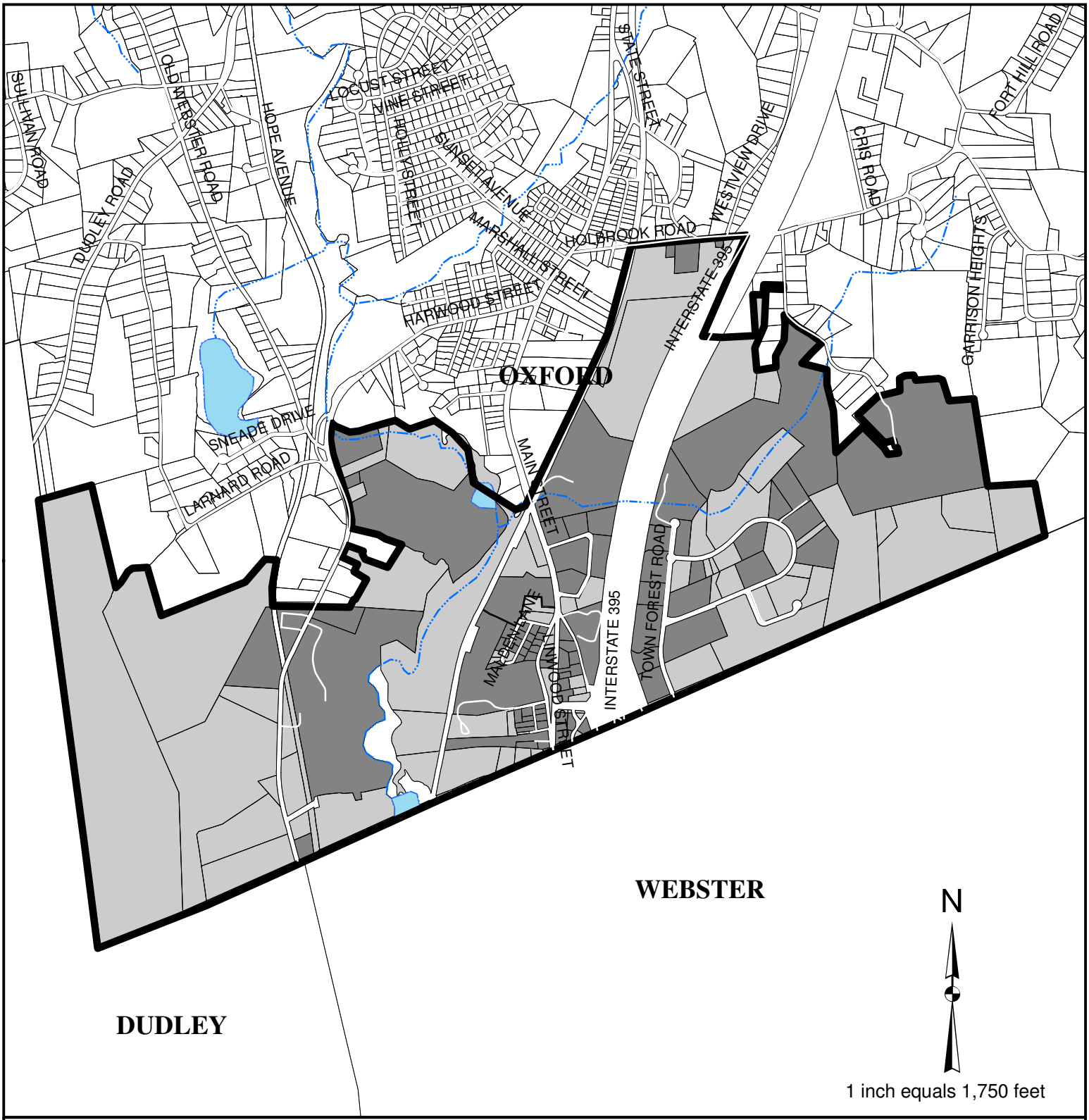
FIGURE 4-6B
CENTRAL AREA
PARCEL ACREAGE AND SEVERE SOILS

Data compiled from MassGIS and FST



Legend

- South Study Area
- Parcels

Developed Parcels

- No
- Yes
- Water Bodies
- Stream, River

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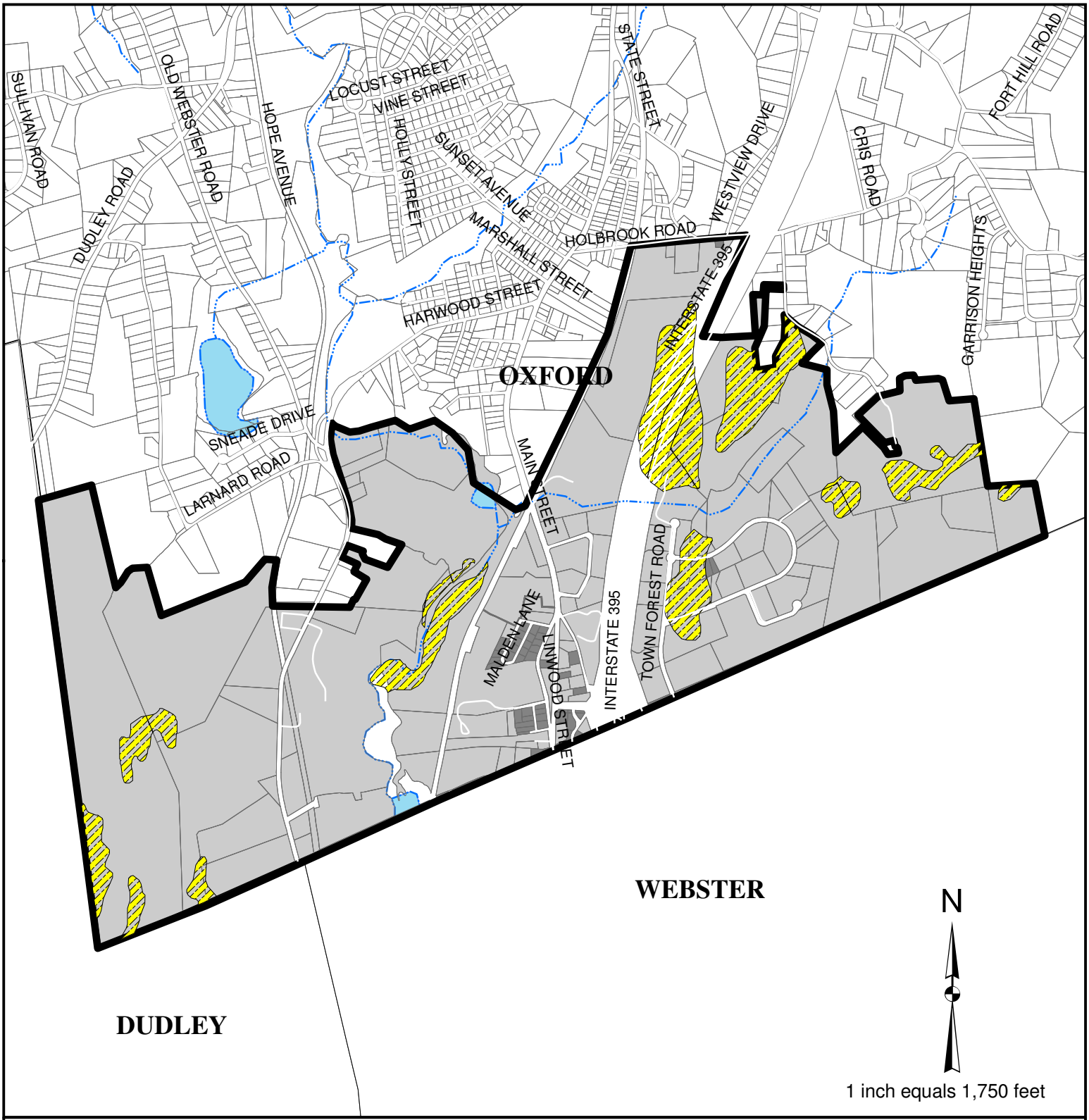
FIGURE 4-7A
SOUTH AREA
DEVELOPED PARCELS

ENGINEERS FST Since 1914

Data compiled from MassGIS and FST



Legend

- Oxford Severe Soils
- South Study Area
- Parcels
- Stream, River
- Water Bodies

Acreage

- < 0.5 Acres
- > 0.5 Acres

Data compiled from MassGIS and FST

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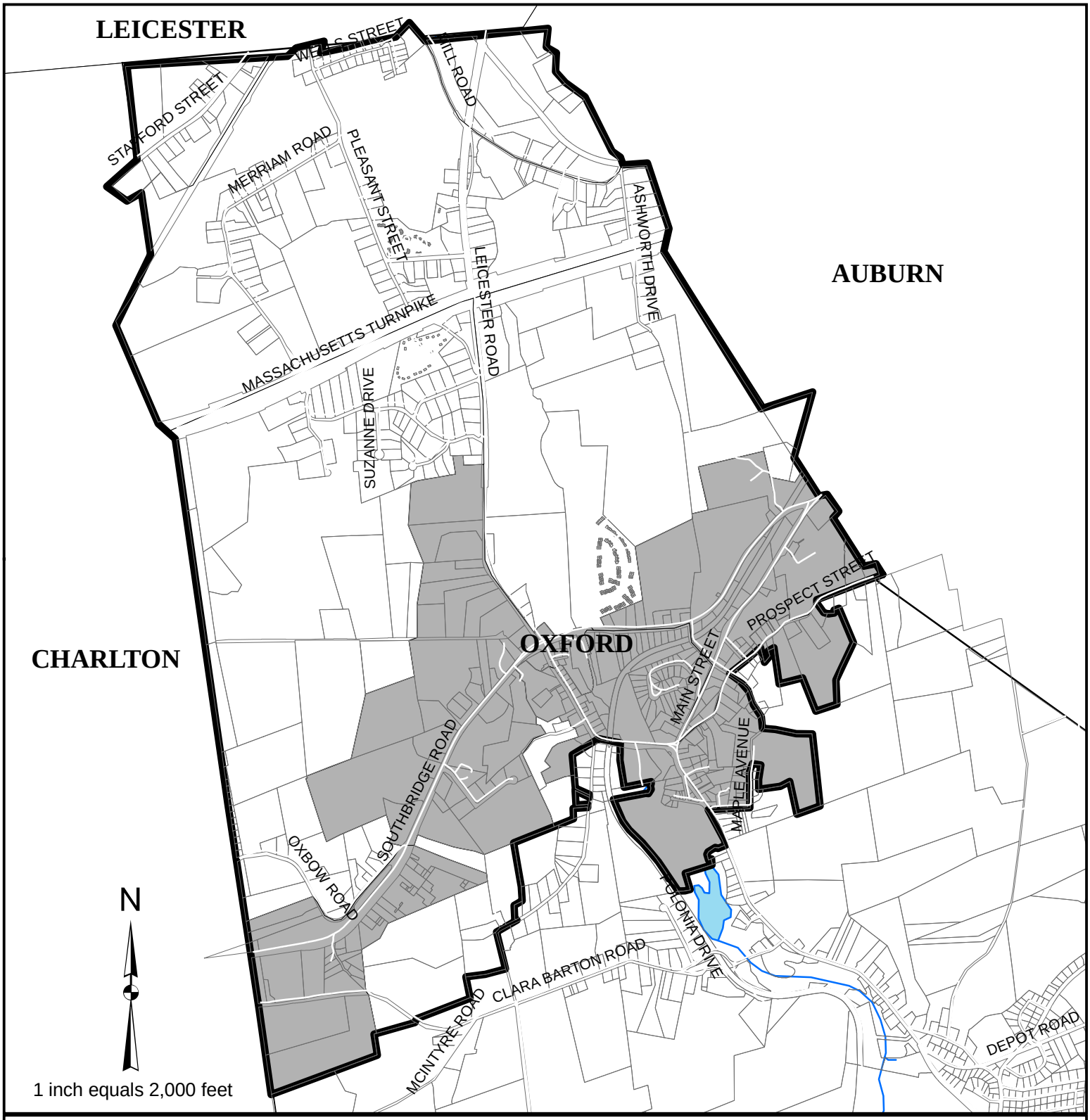
FIGURE 4-7B
SOUTH AREA
PARCEL ACREAGE AND SEVERE SOILS

ENGINEERS FST Since 1914



Legend

- Parcels
- North Study Area

Needs Area

- No
- Yes
- Stream, River
- Water Bodies

Data compiled from MassGIS and FST

Town of Oxford, MA
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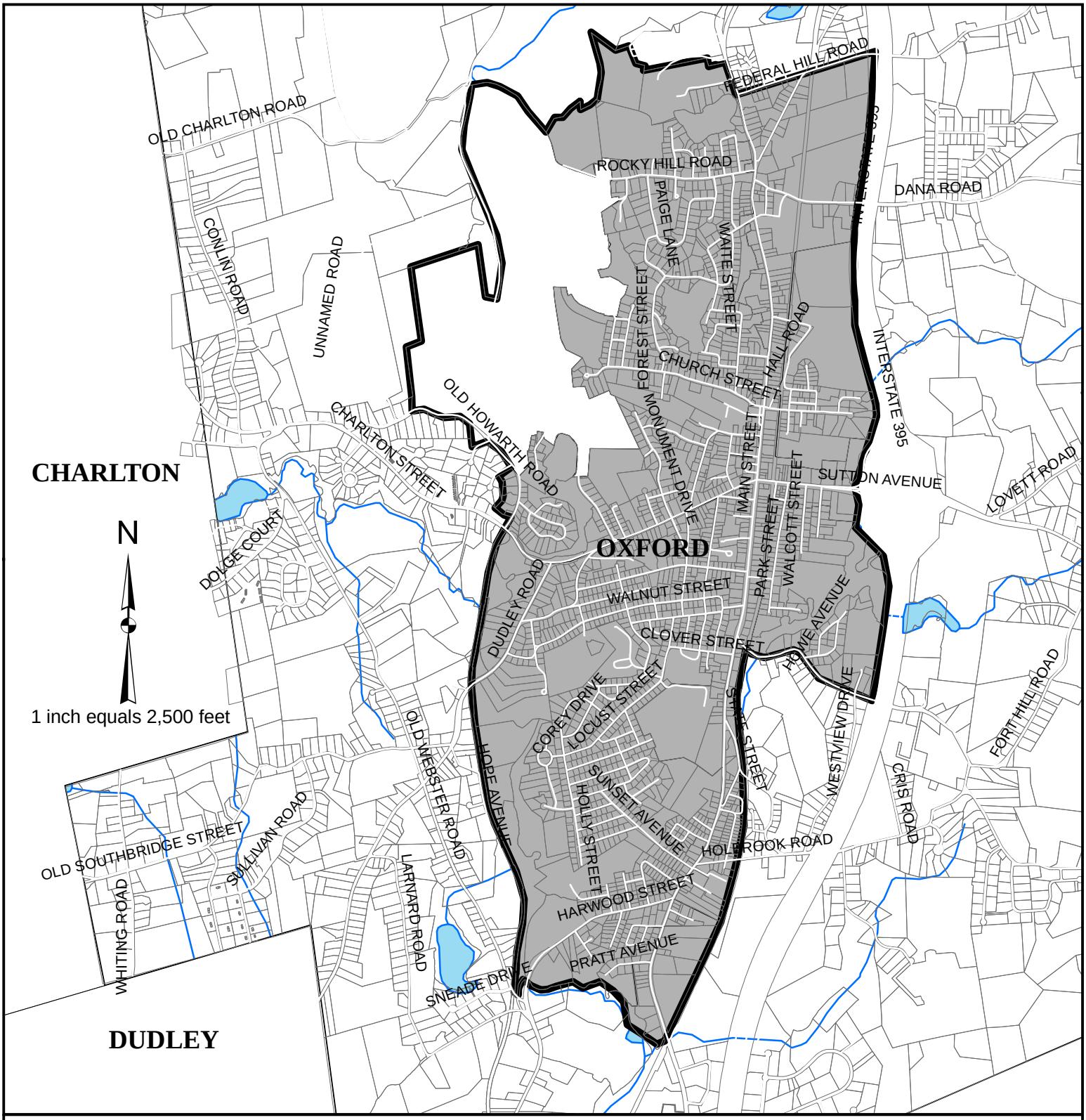
FIGURE 4-8
NEEDS AREAS - NORTH

ENGINEERS FST Since 1914



Legend

- Parcels
- Central Study Area

Needs Areas

- No
- Yes
- Stream, River
- Water Bodies

Town of Oxford, MA
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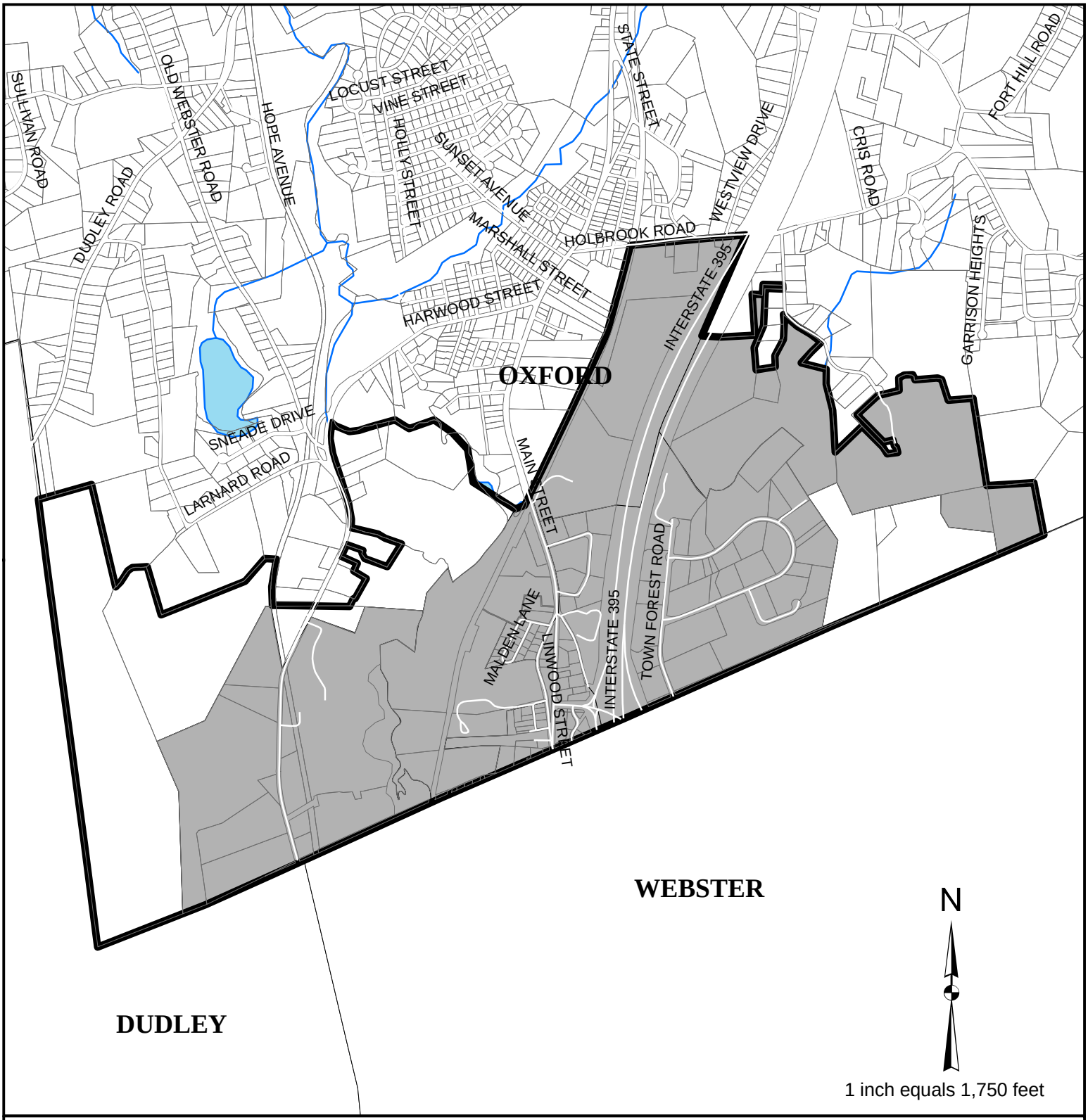
FIGURE 4-9
NEEDS AREAS - CENTRAL

Data compiled from MassGIS and FST



Legend

- Parcels
- South Study Area

Needs Areas

- No
- Yes
- Stream, River
- Water Bodies

Data compiled from MassGIS and FST

Town of Oxford, MA,
Comprehensive Wastewater Management Plan
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FIGURE 4-10
NEEDS AREAS - SOUTH

ENGINEERS FST Since 1914