SECTION 3

WASTEWATER MANAGEMENT NEEDS

3.1 APPROACH

Many communities rely exclusively on private on-site systems for wastewater treatment and disposal. The state sanitary code, Title 5, provides a thorough regulatory framework (with a few important exceptions) for such systems. Under ideal circumstances, on-site systems can provide cost-effective and environmentally-sound wastewater management. Those circumstances include favorable soils, adequate depth to groundwater, reliable and protected water supplies, absence of sensitive downgradient receiving waters, and absence of high-intensity water users.

In assessing Orleans' needs for improved wastewater management, the fundamental question is:

> **On which properties is an on-site wastewater system an adequate means of providing for sanitation and environmental protection, and on which properties is an off-site solution needed?**

One way to answer this question is to identify areas where the above-noted ideal circumstances do not exist. For the purposes of this report, wastewater management needs have been evaluated in the following 5 categories:

- **Ensuring Sanitary Conditions**--correction or avoidance of unsanitary conditions (that is, public health problems) such as effluent surfacing over a leaching field, inadequate set-back from a private well, or direct discharge of sanitary wastewater to a watercourse.
- **Water Supply Protection**--preventing contaminants (such as bacteria, viruses or nitrates) from reaching private or public drinking water sources.
- **Protecting Surface Waters from Nutrient Enrichment**--reducing nutrients that can cause accelerated degradation of freshwater ponds (typically phosphorus) or estuarine waters (typically nitrogen).
- **Addressing Convenience and Aesthetic Issues**--avoiding unsightly mounded septic systems or individual treatment systems that may be the only way to achieve compliance

with Title 5 if off-site options do not exist, or avoiding frequent septage pumping that creates odor and disruption (particularly in the downtown area).

- **Enabling Sustainable Economic Development**--providing off-site wastewater treatment and disposal so that on-site conditions (such as impermeable soils or shallow groundwater) are not the limiting factors to community growth and development.

The overall approach for needs assessment is the categorization of all lots in Orleans according to these five general categories. The specific approach is different for each category, and is presented in the paragraphs that follow. Each category has been evaluated separately, and then the results compiled town-wide to address the fact that some lots fall into more than one category of need.

Where off-site disposal is necessary, the reasons must be well documented and defensible. For cost reasons alone, it is critical to accurately determine the sewer needs. However, it is also important to fairly assess the reasons for public sewers so costs can be equitably allocated. For some property owners, the requirement to connect to a public sewer is a significant financial burden; for other property owners, unlimited access to public sewer may be viewed as an economic windfall. Wastewater solutions based on documented needs, and with appropriate growth controls, can be tailored to optimize the costs, benefits and impacts.

It is important to note that wastewater management in the future may also require consideration of contaminants of emerging concern (such as pharmaceuticals and personal care products). At the present time, the research community is striving to determine the threshold values where these compounds have either human or ecological impacts and how these compounds can be removed from wastewater. See Section 3.3.3 for consideration of these contaminants in the protection of public water supplies. Research findings should be closely monitored and, if necessary, Orleans' wastewater management needs should be re-addressed in the future.

3.2 SANITARY NEEDS

Correction or avoidance of public health problems (sanitary needs) was addressed by considering three factors:

- Properties that have required variances from Title 5 to install or repair an on-site system;
- Properties that use a large amount of water per acre of land; and

- Properties near receiving waters where high bacterial counts have been recorded with no other apparent cause.

3.2.1 Title 5 Variances

Methodology

Title 5 is a thorough sanitary code with respect to sanitary issues. If significant variances from Title 5 have been required to allow an on-site system to be constructed or repaired, then there may be benefits to providing that property with an off-site wastewater solution.

The Health Department provided its records spanning 11 years: 1995 through 2005. An evaluation was conducted of records of Board of Health meetings during 100 months in that period, the equivalent of eight and one-third years. For each variance that was granted, key information was tabulated, such as the name and address of the applicant, and the nature of the variance that was granted. Points were then assigned to each variance based on the environmental significance of that type of variance.

It is important to distinguish between procedural variances and those of environmental significance when evaluating the need to provide off-site wastewater disposal. Table 3-1 summarizes an additive points system for assigning a score to each lot based on the type and severity of the variance granted. Variances that are minor or procedural in nature received a single-point score. Variances that could significantly impair public or environmental health, such as a variance for setback to a private water supply, would add 3 to 10 points to a lot's rating. In the case where multiple minor variances have been granted on a single lot, the cumulative impact can be considered, even if each individual variance would be insignificant on its own.

Using this additive system, scores could range from 0 to 10 points depending on the type and severity of the variance granted. To convert this scoring process into a rating system for needs assessment, properties were grouped into one of three categories: little or no environmental significance (1 or 2 points), moderate environmental significance (3 or 4 points), and major environmental significance (5 points or more). This additive system provides a consistent and graduated method for identifying individual needs, and is central to this assessment of sanitary needs town-wide.

TABLE 3-1

ENVIRONMENTAL SIGNIFICANCE RATING SYSTEM FOR TITLE 5 VARIANCES

	Nature of Variance	Points
1	**Setback From Wetlands (100-ft local requirement)**	
	Setback greater than 50 feet	**2**
	Setback less than 50 feet	**4**
2	**Setback From Well (100 feet required)**	
	Potable Well Setback greater than 75 feet	**5**
	Setback of 50 to 75 feet	**7**
	Setback less than 50 feet	**10**
	Non-Potable Well	
	Setback less than 100 feet	**1**
3	**Setback From Property Lines**	**1**
4	**Setback From Structures**	**1**
5	**Depth to Groundwater (4 feet required)**	
	Depth of 3 to 4 feet	**3**
	Depth less than 3 feet	**5**
6	**Thickness of Underlying Pervious Soil**	
	Thickness of 3 to 4 feet	**3**
	Thickness less than 3 feet	**5**
7	**Depth of Cover Over Disposal System**	
	Depth greater than 3 feet	**1**
8	**Inadequate Reserve Area**	
	Reserve area less than 50%	**1**
	No reserve area	**2**

Findings

There are approximately 4,500 Title 5 systems in Orleans according to the Health Department. Table 3-2 (pg 3-6) is a summary of the analysis of approximately 2,100 permits granted between 1995 and 2005. Key findings are as follows:

1. On an annual basis, 220 to 260 requests for new systems or system modifications come before the Health Department, with an average of 250 per year. Of the total 2,075 permits granted, 210 (about 10% or roughly 25 applications per year) have required one or more variances.

2. During the period of analysis, 323 variances were granted, an average of about 1.5 variances per applicant.

3. Of the 25 applicants that needed variances in the typical year, only about 10 of them required variances of environmental significance.

4. The types of variances are as follows, in order of frequency

   - ❖ Setback to wetlands 34%
   - ❖ Setback to property lines 17%
   - ❖ Setback to structures 16%
   - ❖ No reserve area 9%
   - ❖ Depth of cover over system 9%
   - ❖ Depth to groundwater 5%
   - ❖ Thickness of underlying permeable soil 5%
   - ❖ Setback from non-potable well 5%

   No variances were granted for inadequate setback to potable wells. The February 2007 Draft Needs Assessment Report contains a listing of the specific variances for all 210 properties for which variances were granted in the 1995-to-2005 period.

5. On average, 90% of the applications to the Health Department did not require variances, and only 4% required variances of environmental significance. Therefore 96% of the properties can be viewed as having no significant sanitary need.

6. The properties with variances are fairly uniformly spread across town; no one watershed seems to have a disproportionate number of variances. See Figure 3-1.

7. Over the period of record, 210 variances were granted, of which 85 (40%) have enough environmental significance to indicate a potential sanitary need for off-site wastewater disposal. Said another way, if public sewers (leading to a cluster, satellite or centralized system) were available at the time the application was filed with the Health Department, there may have been justification for the Board of Health to require a sewer connection.

8. The average wastewater flow associated with the 210 variance applications is 240 gallons per day (gpd). This figure compares with the town-wide average residential flow of 143 gpd, and the average commercial flow town-wide of 563 gpd. Therefore the properties that have required significant variances are not just the very-high water users, and are not disproportionately commercial.

9. A total of 73 properties were granted the 85 environmentally significant variances. Those properties generate about 15,000 gpd of wastewater on an annual average basis.

Table 3-2 describes a rating system for individual lots using categories A through E, where Category A and B lots are quite acceptable for on-lot wastewater disposal, through Category E lots that are unsuitable. Table 3-2 shows how the point system for Title 5 variances is related to

these categories. Based on 11 years of records, 90% of the permit requests to the Health Department fall in Categories A and B; 6% fall in Category C, and 4% fall in Categories D and E. The category C, D and E lots are shown in Figure 3-1. The Category D and E parcels are considered to have a sanitary need.

TABLE 3-2
SUMMARY OF TITLE 5 VARIANCE ANALYSIS

1. Over 8.3 years, 2,075 Title 5 permits were issued.
210 of those applications required a variance.

2. Determination of Site Suitability--Rating in 5 Categories

A. Suitable for current and future use without variances
B. Suitable for current use without variances
C. Suitable for current use with variances
D. Suitable for current use with significant variances
E. Not suited for onsite disposal

3. What is environmental significance of variances that were granted?

Score	Rating	# of Permits	% of Permits
N/A	A	1,865	90
N/A	B		
1 to 2	C	124	6
3 to 4	D	51	2
5 or more	E	35	2
	Total	2,075	100

4. Where are properties with variances located?

Cape Cod Bay	25%
Nauset/Atlantic Ocean	40%
Pleasant Bay	35%

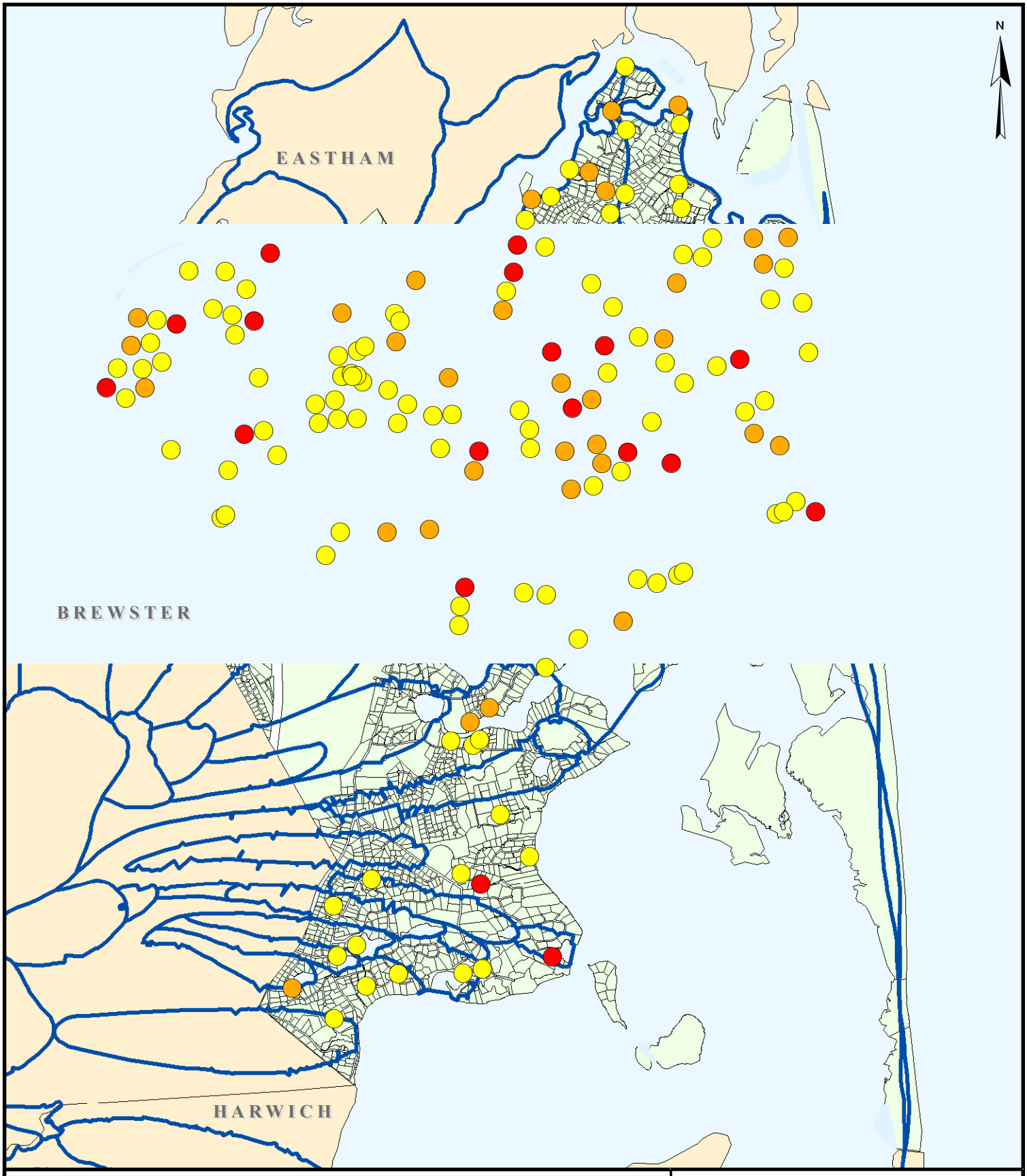
5. What was the basis for the variance request?

Repair	65%
New Construction	25%
Flow Increase	5%
Miscellaneous	5%

Note: Variance data from 1995 to 2005
Source: Orleans Health Department

Conclusions

During the period of analysis, about 40% of the septic systems in Orleans required permits for repair, increase in flow, or new construction. If these 11-year findings are extrapolated to a 20-



Title 5 Variances
Lot Suitability Rating

- C
- D
- E

Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept. Watershed boundaries from MEP.

0 4,000 8,000 Feet

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Title 5 Variances 1995-2005

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year period, or to all of the 4,500 systems in town, it can be estimated that about 150 to 200 properties, generating 35,000 to 45,000 gpd of wastewater, might benefit from off-site disposal. These extrapolated flows represent only 5 to 6% of the current town-wide wastewater generation rate. This low percentage indicates that on-site wastewater disposal under Title 5 (and supplemental local regulations) is quite effective from a strictly sanitary perspective. Favorable soils and generally large lots are important factors in this conclusion. The thorough approach of the Health Department and Board of Health has resulted in very good compliance with applicable requirements.

3.2.2 Intensive Water Use

The greater the water use per unit lot area, the greater the potential difficulties with on-lot wastewater disposal. The Planning Department's GIS database, including water use records and assessors records, was used to identify lots with potential sanitary needs based on the intensity of water use.

The Orleans GIS includes water use records for the period of 2002 to 2005. Annual average water use was calculated as the average of eight consecutive 6-month periods divided by 182. Parcel size was calculated based on overall property boundaries, without deduction for wetlands. For example, a parcel that has an annual daily water use of 200 gpd and a total lot area of 50,000 sq. ft. has a water use intensity of 40 gpd per 10,000 sq. ft.

This evaluation revealed the following breakdown of water use intensity:

Greater than **200** gpd per 10,000 sq. ft:	131 lots
100 to **199** gpd per 10,000 sq. ft:	412 lots
50 to **99** gpd per 10,000 sq. ft:	1,058 lots
25 to **49** gpd per 10,000 sq. ft:	1,191 lots
Less than **25** gpd per 10,000 sq. ft:	1,212 lots

(Title 5 uses a similar approach to determine if a project warrants nitrogen control in the recharge areas of public water supply wells. In Title 5, the nitrogen control threshold is 110 gpd per 10,000 sq.ft. (This threshold is based on the Title 5 wastewater flow, which is typically much

greater than the annual average water use.) The Orleans water use data shown above have been compiled to look at water use intensity as an indicator of potential sanitary needs, not as an indicator of water supply protection with respect to nitrogen loading.)

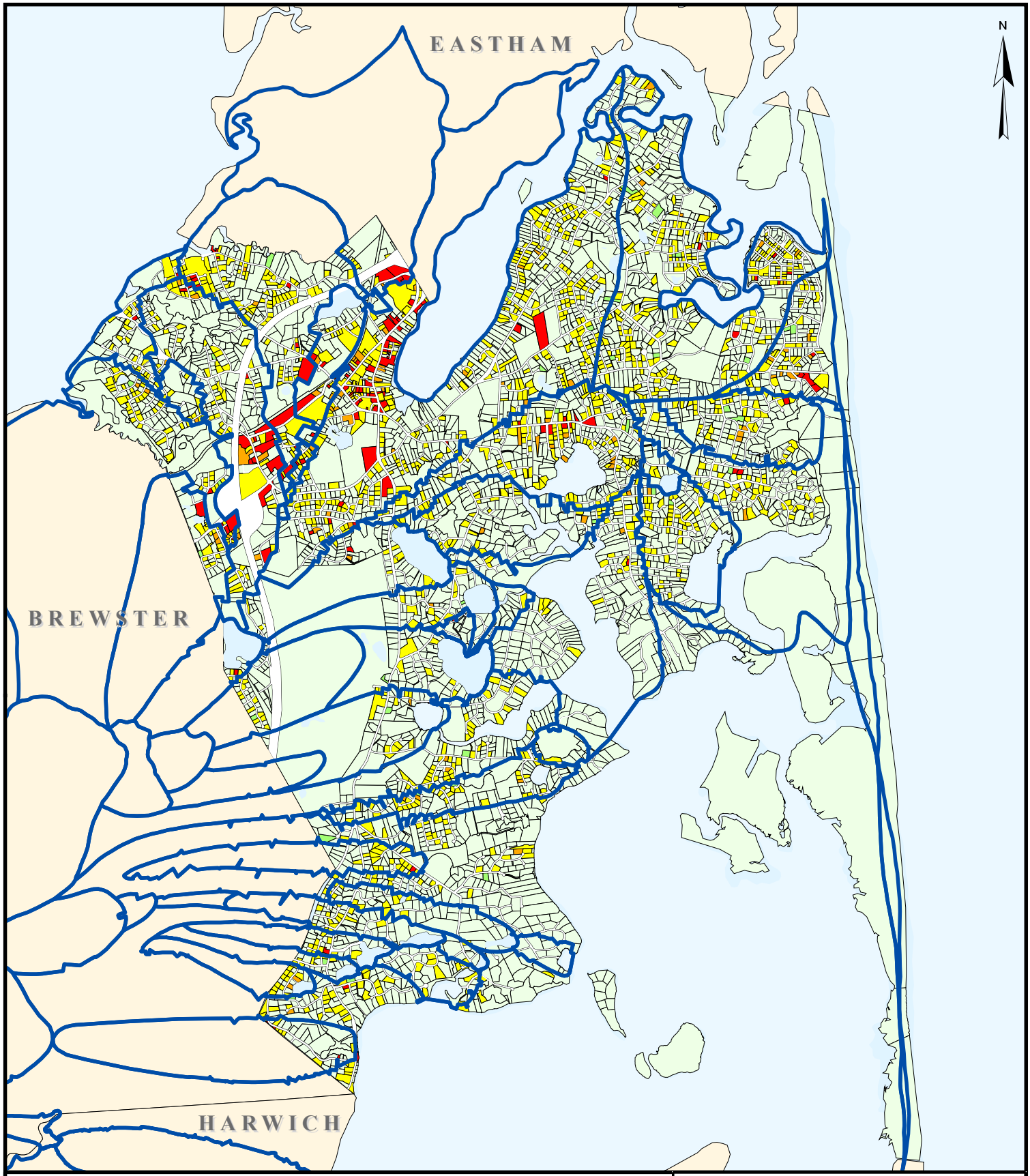
Figure 3-2 shows the water use intensity for all developed parcels in Orleans. Shown in red are the parcels with water use greater than 200 gpd/10,000 sq.ft. Note that most of these properties are in the commercial areas of town. Some of these parcels have received one or more Title 5 variance; others may not have come before the Board of Health during the period of analysis, but would be expected to require variances based on the intensity of water use.

3.2.3 Receiving Water Impacts

In areas of failing septic systems, it is not unusual to find high coliform concentrations in nearby receiving waters. Therefore, information was obtained from the Harbormaster/Shellfish Warden on documented water quality problems that may be associated with septic systems.

Water quality issues of concern to the Harbormaster/Shellfish Warden include the incidence of red tide and the presence of fecal coliform in Orleans' receiving waters. The Harbormaster/Shellfish Warden attributes the red tide outbreaks to an historic open-ocean "wash-in" that continues to affect Mill Pond in the Nauset system on an annual basis. He provided a map highlighting the areas of town where fecal coliform have been reported at concentrations that would cause a closure. Figure 3-3 depicts the sampling stations that have tested positive for the presence of fecal coliform.

The Harbormaster/Shellfish Warden believes that surface water runoff is responsible for the presence of bacteria at sampling stations located in Paw Wah Pond, Meetinghouse Pond, Town Cove, and Rock Harbor. Pochet Creek, with no major convergence point for runoff, is the only location where it appears that no direct link exists between stormwater events and the presence of bacteria. However, one or more other factors can contribute to bacterial contamination of surface waters. A wash-over from Nauset Beach could bring with it bacteria from activities at the beach. Waterfowl can also be a source of bacteria. Failed septic systems could be another source of contamination. Septic system leach fields located near steep slopes, especially in areas of clay and perched groundwater (not uncharacteristic for the area around Pochet Creek) could



Water Use Intensity

gpd/10,000 SF

- 0 - 49
- 50 - 99
- 100 - 149
- 150 - 199
- 200 +

Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept. Water use data from Orleans Water Dept. Watershed boundaries from MEP.

0 4,000 8,000 Feet

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Water Use Intensity

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Sampling Stations

Locations where Elevated Fecal Coliform have been Reported

Watershed Boundaries

Source: Sample data obtained from the Orleans Harbormaster. Aerial imagery provided by MassGIS. Watershed boundaries from MEP.

0 4,000 8,000 Feet

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Receiving Water Quality

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conceivably leach wastewater to the surface water. If groundwater is breaking out on the side of a slope, wastewater (recently reaching the groundwater from a leach field) could quickly reach the surface. This type of event could occur following an extended wet period. Overall, the slow flushing rate of the creek would allow bacterial contamination to persist. While the Health Department is currently not aware of any failed septic systems within the Pochet Creek watershed, it was not possible to completely rule out wastewater as a source of bacteria in Pochet Creek without an intensive review of on-site septic systems.

Over a two-day period in the fall of 2006, an environmental engineer inspected all 55 homes that are located within 300 feet of Pochet Creek. No evidence was found of any septic system malfunction that might be causing high coliform counts in the Creek.

On the basis of these inspections, it has been concluded that the high coliform counts are not related to existing septic systems.

3.2.4 Combined Indicators of Sanitary Needs

Table 3-3 shows how the three indicators of sanitary needs were combined. The record of Title 5 variances is the most definitive indicator and the one that deserves the most weighting. However, it covers a period of only 11 years. To try to address the fact that some other properties may be coming to the Board of Health in the next few years, the sanitary need category also includes those properties with water use intensity greater than 200 gpd per 10,000 sq.ft. that were not granted significant variances during the past 11 years. This is a conservative approach. Figure 3-4 shows all 198 properties that have a sanitary need using these criteria.

3.3 WATER SUPPLY PROTECTION

3.3.1 Private Wells

Figure 3-5 depicts the extent of the public water supply system in Orleans. According to Town records, over 90% of the developed lots in Orleans are connected to the public water system. Most of the lots that rely on private wells are located at the ends of peninsulas extending into

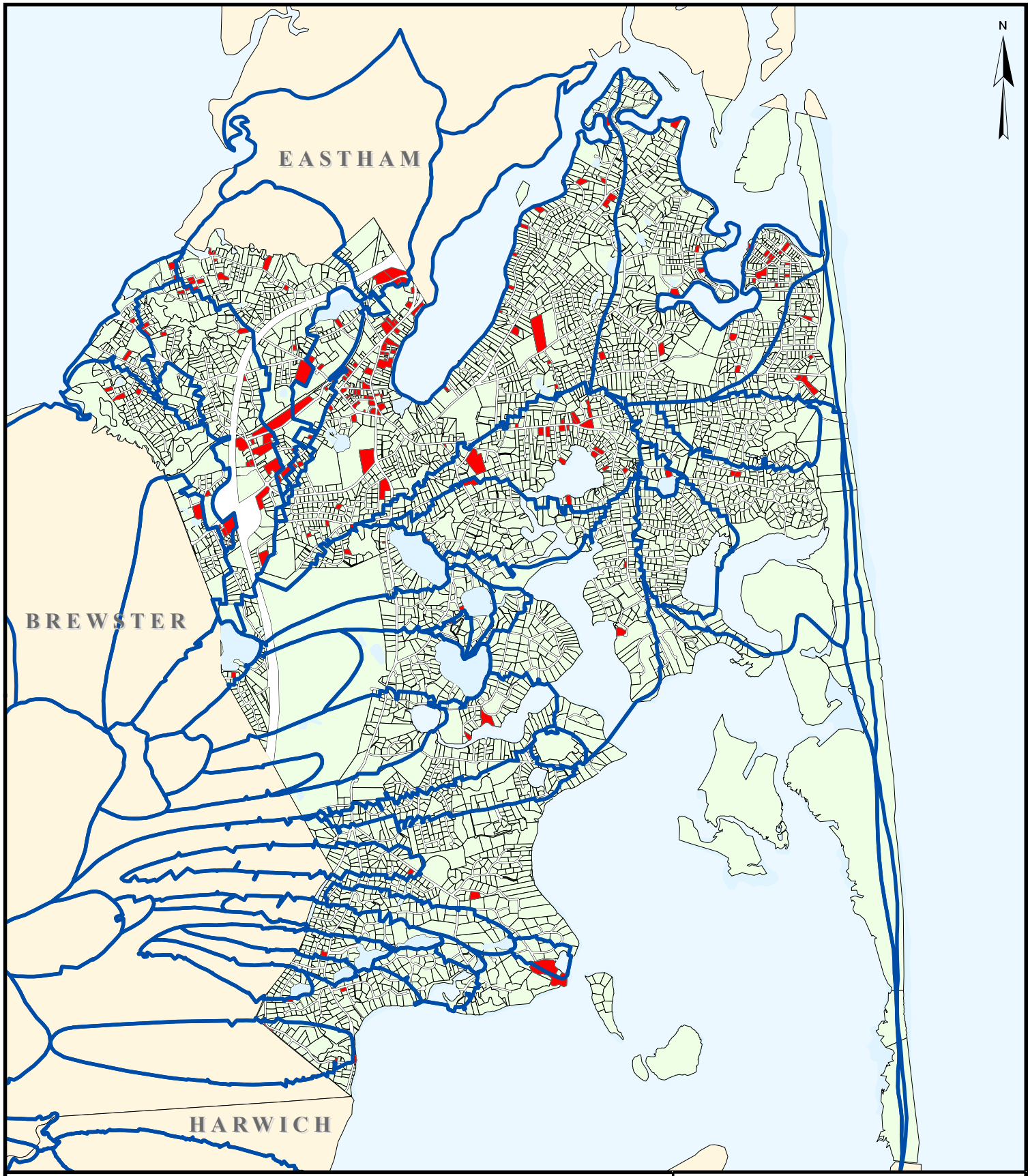
Pleasant Bay, in the Pochet Inlet and Paw Wah Pond sub-watersheds, and east of the Quanset Pond sub-watershed.

When private wells are installed for potable purposes, the Board of Health requires that an analysis of water quality be submitted prior to occupancy. There is no requirement for homeowners to continue to document water quality after initial occupancy, nor is there information available on wells installed prior to the Board's adoption of this policy. Although there is no readily-accessible database of water quality in private potable wells, the Health Department is not aware of any widespread problems, whether related to nearby septic systems or other causes.

TABLE 3-3
SUMMARY OF SANITARY NEEDS

	MAJOR WATERSHED				
	PLEASANT BAY	**NAUSET SYSTEM**	**ATLANTIC OCEAN**	**CAPE COD BAY SYSTEMS**	**TOWN-WIDE**
Title 5 Variances					
Number of Parcels	24	30	1	18	73
Current Flow, gpd	3,200	6,900	200	4,600	14,900
Intensive Water Use					
Number of Parcels	27	50	4	50	131
Current Flow, gpd	13,500	59,600	3,700	76,900	153,700
Receiving Water Quality					
Number of Parcels	0	0	0	0	0
Current Flow, gpd	0	0	0	0	0
Total					
Number of Parcels	48	79	5	66	198
Current Flow, gpd	16,100	63,500	3,900	78,900	162,400

Note: Town-wide totals are additive across the row. Totals by major watershed are not additive by column. The category total by watershed accounts for parcels that have more than one need.
Source: See text for data sources and analysis.



Lots with Sanitary Needs

Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept.

0 4,000 8,000

Feet

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Lots With Sanitary Needs

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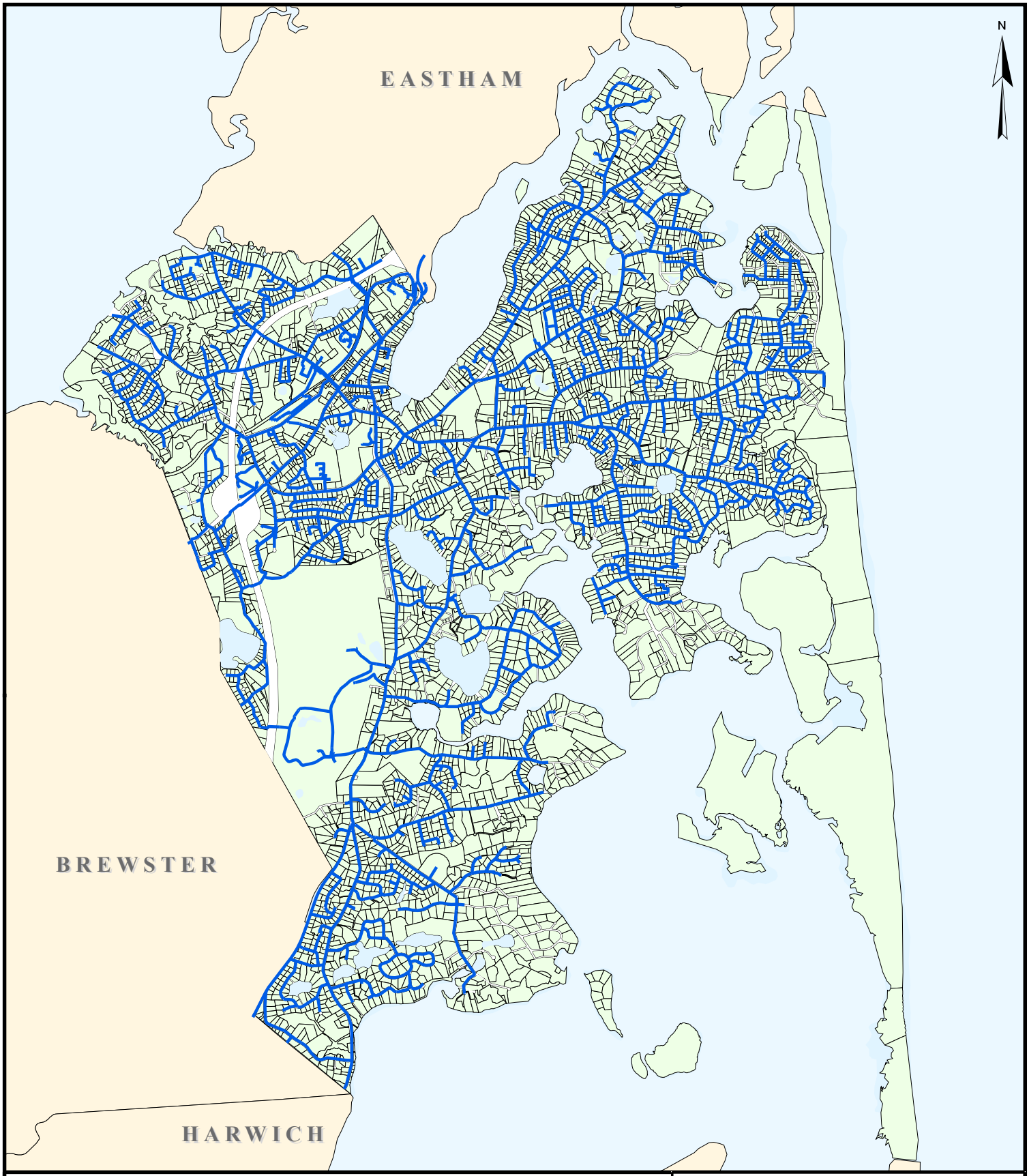

Public Water Supply Lines

Source: Parcels and Water Supply Lines data obtained from Orleans Planning Dept.

0 4,000 8,000 Feet

Orleans CWMP

Extent of Public Water Supply Lines

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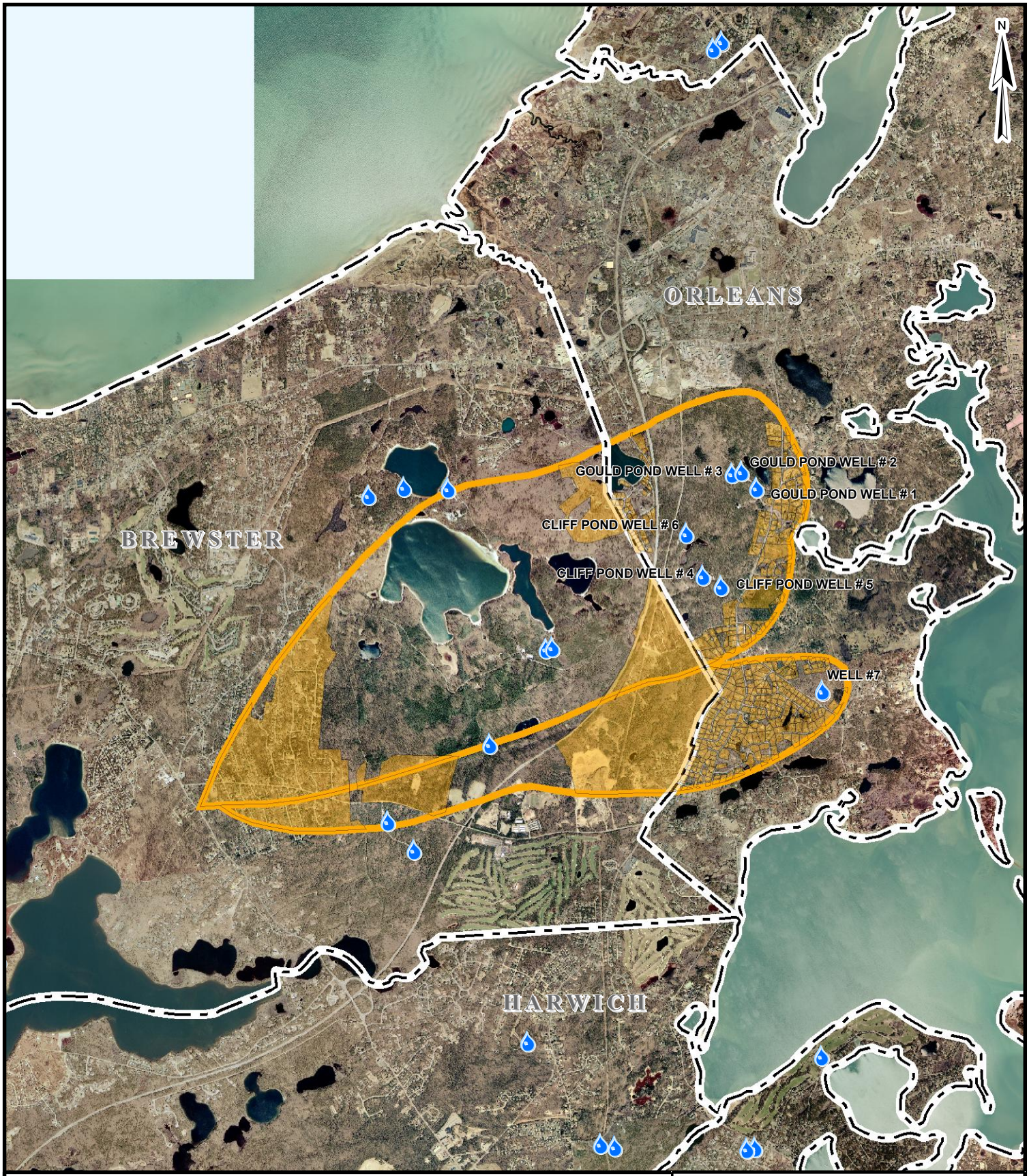
If there were problems with nearby septic systems impacting private potable wells, the elimination of those septic systems through public sewering might not be the best solution. Prior groundwater contamination would not be affected by the presence of a public sewer, and the private well owner would still be at risk. Therefore, the best solution, should such problems come to light in the future, would be to extend the public water supply to the affected properties. Given the fact that the Orleans water system extends to all areas of town, the cost of such an extension might be less than the cost of sewering. If a cluster or satellite wastewater treatment and disposal system were to be installed upgradient from a neighborhood served by private potable wells, it would be prudent to extend the public water supply systems to serve that neighborhood.

3.3.2 Public Wells

The Town of Orleans draws water from seven wells located in the southwesterly portion of town. Figure 3-6 shows the recharge areas of those wells under drought conditions, the DEP-approved Zone II areas. Most of the Town wells are located within a 500-acre wellfield located between Route 6 and Route 28. Well 7 is located in a largely developed area of South Orleans. The Zone II for Wells 1 through 6 extends westerly into Brewster and merges with the Zone IIs of several Brewster wells. The Zone II for Well 7 also extends well into Brewster and is somewhat distinct from the remaining Zone II area. Of the aggregate Zone II area for Brewster and Orleans wells, about 70% lies within the Town of Brewster.

The standard approach for judging development impacts on public water supply wells is a DEP-endorsed nitrogen loading model. This analytical model aggregates all of the nitrogen loads and compares them with the sum of all of the recharge sources within the Zone II. The result is an approximation of the wellhead nitrogen concentration that will eventually occur.

That model has been applied separately to the Zone II for Wells 1 through 6 and the Zone II for Well 7. The Planning Department's parcel-specific database was used to estimate nitrogen loads and recharge volumes in Orleans. For Brewster, where such parcel-specific data are not



Public Water Supply Wells

Developed Lots

Public Water Supply Zone II

Source: Parcel data obtained from Orleans Planning Dept. Aerial imagery Zone II and PWS provided by MassGIS.

0 4,000 8,000 Feet

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Developed Lots in Public Water Supply Zone IIs

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available, a nitrogen loading rate was applied that is consistent with a comparable density of development in Orleans.

The drinking water standard for nitrate, the most common form of nitrogen in groundwater, is 10 mg/l, established to protect infants from methemoglobinemia. Since wellhead concentrations should never exceed that level, a planning guideline of 5 mg/l has been established in the Cape Cod Commission's Regional Policy Plan for water supply protection. This modeling indicates that the wellhead nitrogen concentrations in the main wellfield will not exceed 1 mg/l and the comparable figure for Well 7 will be below 2 mg/l, even at build-out. (By comparison, current wellhead nitrogen concentrations are 0.1 to 0.2 mg/l in the main wellfield and 0.7 to 0.8 mg/l at Well 7). The presence of large tracts of undevelopable protected land in both Brewster and Orleans provide protection against development-related nitrogen problems. Therefore, there is no over-riding need for public sewers to protect public water supplies by eliminating septic systems in the Zone IIs.

(It is important to note that this analysis focuses on nitrate as a water supply contaminant. It has been found that nitrate also functions as a good surrogate for other contaminants that could reach the groundwater from septic systems. That is, low levels of nitrate typically reflect low levels of other parameters. Such a generalization does not apply, however, when there is a large point source of contamination within the watershed, such as a landfill and does not account for catastrophic spills. While this analysis addresses the nitrogen loading in the wellfields, it should not be considered as a full assessment of all water quality concerns.)

3.3.3 Overview of Water Supply Protection Needs

Based on the evaluations described above, the protection of water supplies, either public or private, is not a significant driving force in the provision of public sewers in Orleans. Should sewers be needed to limit nitrogen loading to Pleasant Bay, lots within the Zone II of Well 7 could be given priority to eliminate septic systems in that area as a pre-cautionary measure. This would provide some protection against contaminants of emerging concern, such as pharmaceuticals and personal care products, that are present in septic tank effluent.

3.4 SURFACE WATER PROTECTION

3.4.1 Freshwater Ponds

There are 63 freshwater lakes and ponds in Orleans, 25 of which have surface areas greater than one acre. Eight of the larger ponds and lakes were selected for evaluation as part of this CWMP. They are:

Bakers Pond	Ice House Pond
Bolands Pond	Pilgrim Lake
Cedar Pond	Sarah's Pond
Crystal Lake	Shoal Pond

These eight freshwater bodies (all called "ponds" in this report) account for two-thirds of the total pond surface area in Orleans, and include all of the freshwater ponds with public beaches and boat ramps.

One of the principal causes of water quality changes in freshwater ponds is increased loading of phosphorus. This nutrient can cause excessive growth of algae which degrades water quality and impairs human uses of the pond, in a manner analogous to the effects of excess nitrogen in the estuarine setting. Phosphorus sources include subsurface wastewater disposal, lawn fertilization, stormwater runoff, and release from bottom sediments. Travel time in the groundwater is significantly different for phosphorus than for nitrogen, however. Nitrogen is readily converted to the nitrate form which does not bind to particles and tends to move through the soil at the same speed as the groundwater. Under typical Cape Cod conditions, nitrogen will move about 300 feet in one year. In contrast, phosphorus tends to chemically bind to the soil and moves down-gradient only after soil uptake sites are exhausted. As a rule of thumb, phosphorus will take about 100 years to travel 300 feet, or about 100 times as long as nitrogen. Given the slow groundwater travel of phosphorus, stormwater runoff (both in general and especially from near-shore fertilized lawns) is often the first priority for lake protection, while septic systems represent a longer-term threat.

This CWMP is not intended to determine the magnitude and relative importance of all phosphorus sources to the major ponds in Orleans. However, it is important to determine if elimination of on-site wastewater disposal systems upgradient of major ponds is warranted.

As a first step in this evaluation, the project limnologist assembled and interpreted all readily available data on the eight selected ponds. This pond assessment, prepared by ENSR Corporation, is provided in Appendix A and summarized in Table 3-4. The trophic status (a relative measure of the productivity) of the eight ponds ranges from "oligotrophic" (least amount of biological growth) for Bakers Pond, through "mesotrophic" for Pilgrim to "eutrophic" (most amount of biological growth) for Bolands, Cedar and Shoal Ponds. Of the designated uses included in the state water quality standards, Cedar and Shoal Ponds are considered impaired with respect to swimming, while Bolands and Sarah's are occasionally impaired. All but Bakers Pond are considered potentially impaired with respect to maintenance of aquatic life (fisheries).

TABLE 3-4
POND TROPHIC STATUS, IMPAIRED USES AND WASTEWATER MANAGEMENT PRIORITIES

WATER BODY	TROPHIC STATUS	IMPAIRED USES	WASTEWATER MANAGEMENT PRIORITY
Bakers Pond	Oligotrophic	None	Second priority
Bolands Pond	Eutrophic	Aquatic life support Contact recreation	First priority
Cedar Pond	Eutrophic	Aquatic life support Contact recreation	Defer for MEP studies
Crystal Lake	Oligo-mesotrophic	Aquatic life support	First priority
Ice House Pond	Oligo-mesotrophic	None	Second priority
Pilgrim Lake	Mesotrophic	Aquatic life support	First priority
Sarah's Pond	Mesotrophic	Aquatic life support Contact recreation	No need
Shoal Pond	Eutrophic	Aquatic life support Contact recreation	Second priority

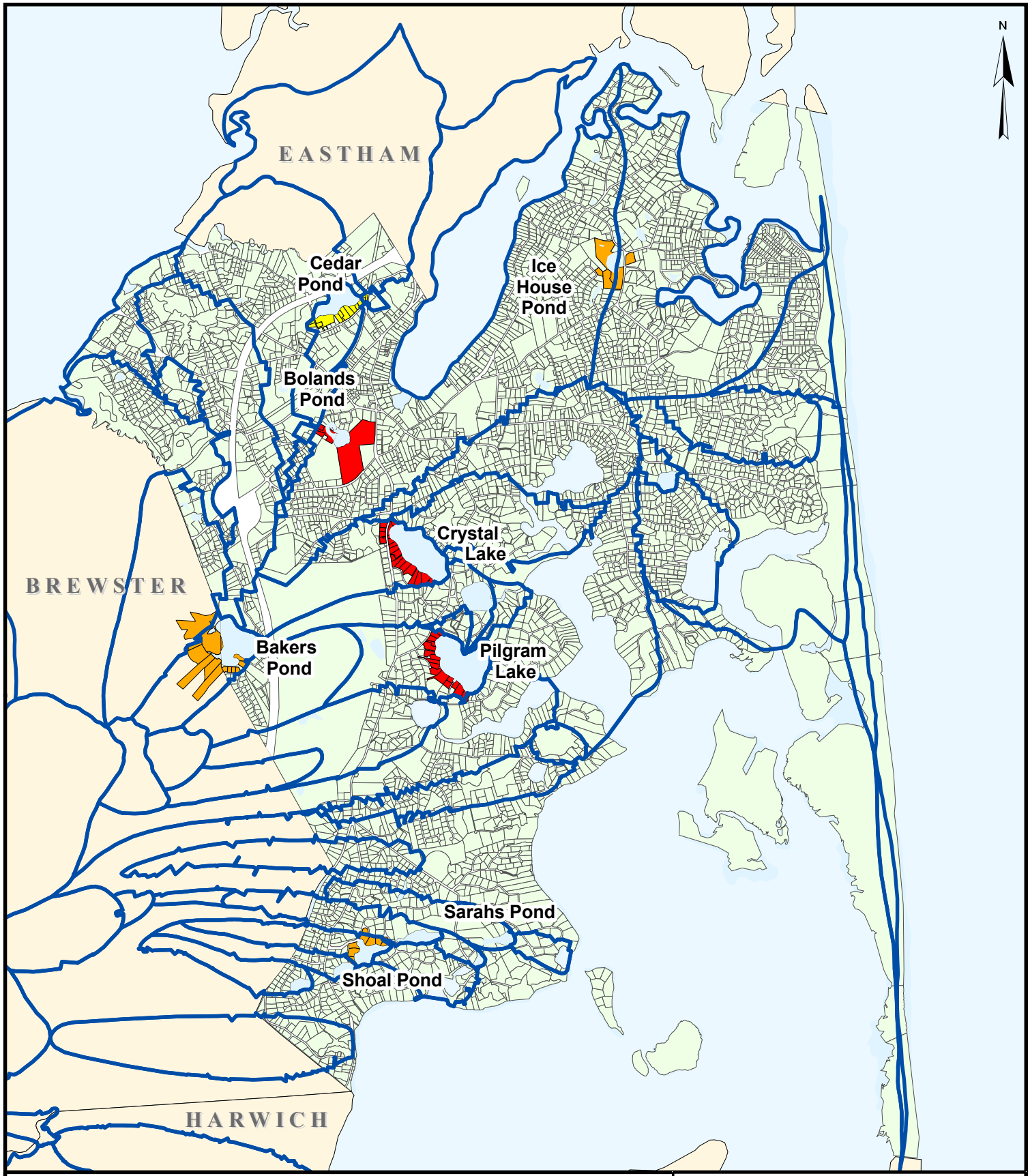
The number of developed properties upgradient of and within 300 feet of each pond was determined from the Town's Geographic Information System, and wastewater flows were

estimated from Town water use records. In the aggregate, there are 77 developed properties in the 300-foot upgradient areas of these eight ponds, with current wastewater flows of 8,800 gpd. These current wastewater flows represent 1.1% of the town-wide flows. (At the end of the planning period, those flows are projected to reach 14,300 gpd or 1.5% of the projected town-wide totals.)

Using current and project wastewater flows, the project limnologist then made an assessment of the likelihood that removal of septic phosphorus loads would be significant in terms of each pond's water quality and use impairment. For three ponds (Bolands, Crystal and Pilgrim), the removal of septic phosphorus loads within the 300-foot buffer is expected to provide some degree of protection from excessive phosphorus loading. For Cedar Pond, which may be nitrogen-limited, any such determination should be deferred until the results of the DEP investigations on the nature and extent of its nutrient sensitivity. For three of the ponds evaluated (Bakers, Ice House, and Shoal), there is insufficient linkage between pond quality and septic loading to warrant the elimination of septic systems in their watersheds without further evaluation. For Sarah's Pond, the characteristics of the pond and its protected watershed indicate no need for control of septic phosphorus loads.

Since septic systems are but one source of phosphorus and each pond has different characteristics with respect to phosphorus loading and recycling, the Town should conduct focused studies of feasible phosphorus control strategies for each of its major ponds. The Orleans wastewater plan should include, concurrent with these feasibility studies, provisions for collection and off-site disposal of wastewater currently discharged within the 300-foot upgradient areas for Bolands Pond, Crystal Lake and Pilgrim Lake. For the other three ponds, (Baker, Ice House and Shoal) those studies should be completed before formal actions are taken to eliminate septic systems, which could be included in later phase of a wastewater management program. In general, sewering of upgradient lots is a good long-term investment, but should not be undertaken without first having considered and addressed the stormwater loads, near-shore fertilization practices and establishment of shoreline vegetated buffers.

Figure 3-7 shows the parcels located in the upgradient 300-foot impact areas for the studied ponds. Table 3-5 summarizes the numbers of lots and wastewater flows in these areas. Figure



First Priority
Second Priority
Defer for DEP Results
Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept.

0 4,000 8,000 Feet

Orleans CWMP

Pond Protection Needs

PROJ NO:	DATE:	FIGURE:
10645G	Dec 2010	3-7

WRIGHT-PIERCE
Engineering a Better Environment

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3-7 includes the noted three ponds in the "second priority" category. Other significant Orleans ponds, although not evaluated in this assessment, should also be included in this category for future feasibility studies, including Uncle Seth's Pond, Deep Pond, Twinings Pond, Uncle Israel's Pond, Ruebens Pond and Uncle Harvey's Pond.

TABLE 3-5
WASTEWATER FLOWS UPGRADIENT OF EVALUATED PONDS

	MAJOR WATERSHED			
WATER BODY	**PLEASANT BAY**	**NAUSET SYSTEM**	**CAPE COD SYSTEM**	**TOTAL**
	300-ft Buffer	300-ft Buffer	300-ft Buffer	300-ft Buffer
Bolands Pond				
Number of Parcels		4		4
Current Flow, gpd		2,100		2,100
Ice House Pond				
Number of Parcels		5		5
Current Flow, gpd		300		300
Cedar Pond				
Number of Parcels			13	13
Current Flow, gpd			500	500
Pilgrim Lake				
Number of Parcels	16			16
Current Flow, gpd	1,500			1,500
Bakers Pond				
Number of Parcels	7			7
Current Flow, gpd	800			800
Crystal Lake				
Number of Parcels	20			20
Current Flow, gpd	2,300			2,300
Shoal Pond				
Number of Parcels	7			7
Current Flow, gpd	1,200			1,200
Sarah's Pond				
Number of Parcels	5			5
Current Flow, gpd	100			100
Total				
Number of Parcels	55	9	13	77
Current Flow, gpd	5,900	2,400	500	8,800

Note: Six parcels in Brewster upgradient of Bakers Pond are not included.

3.4.2 Estuaries

It has become widely accepted that residential and commercial development on Cape Cod has negatively impacted estuarine water quality. The contaminant of principal concern is nitrogen. Principal nitrogen sources include on-site wastewater disposal, lawn fertilization, stormwater disposal, atmospheric deposition and recycling from bottom sediments.

The Massachusetts Department of Environmental Protection, in conjunction with the University of Massachusetts at Dartmouth (School of Marine Science and Technology, or SMAST) is undertaking comprehensive studies of 89 embayments in southeastern Massachusetts as part of the Massachusetts Estuaries Program (MEP). Those studies will determine the degree of impairment, the magnitude of the nitrogen sources, and the degree of nitrogen reduction needed to restore water quality. Five MEP technical reports will cover the estuarine waters impacted by Orleans:

- Pleasant Bay;
- Nauset system; and
- Three Cape Cod Bay systems.

These technical reports will form the basis for the establishment of Total Maximum Daily Loads (TMDLs) for nitrogen. The TMDLs will formally establish the degree of nitrogen reduction required to restore estuarine water quality. In that on-site wastewater disposal is by far the largest controllable source of nitrogen to these estuaries, the TMDLs will constitute a significant driving force for wastewater collection treatment and disposal. Each of the MEP technical reports presents a summary of the scientific principles behind watershed nitrogen loading and estuarine response to this nutrient.

As of December 2010, MEP technical reports have been issued for Pleasant Bay (final, May 2006) and the three Cape Cod Bay systems (final, December 2008). The TMDL for Pleasant Bay was approved by EPA (based on the final MEP technical report) in October 2007. The last technical report of importance to Orleans, covering the Nauset system, has been repeatedly delayed and there is no firm schedule for its completion. Therefore, this needs assessment has addressed the nitrogen control needs in Pleasant Bay based on approved TMDLs, in Rock

Harbor based on published MEP reports, and on preliminary estimates for the Nauset system. Summary information from MEP technical reports is presented in Appendix G.

There are a variety of nitrogen sources and many ways to reduce the overall nitrogen loads from the watersheds in question. Later in this report, a broad range of nitrogen control strategies are identified and evaluated, including wastewater collection/treatment/disposal, management of fertilizer load, stormwater management, and enhancement of natural attenuation. In the Pleasant Bay and Rock Harbor watersheds, the required degree of nitrogen control is so large that wastewater collection and treatment must be the primary basis for control; that is, even the complete removal of other controllable sources of nitrogen will be insufficient to effect the overall nitrogen reduction needed.

This CWMP also involves the identification and evaluation of sites for wastewater treatment and disposal. The most prudent approach with respect to siting is to assume that all of the nitrogen control needs will be achieved via wastewater treatment and to look for sites large enough to handle the associated wastewater volumes. If other nitrogen control strategies are identified and found to be feasible, the volumes of wastewater to be treated can then be commensurately reduced. At the end of this planning process, the Town will have identified the best combination of nitrogen control steps that, once implemented, will reduce nitrogen loads to levels at or below the TMDLs. As nitrogen control measures are implemented, monitoring of water quality and estuarine habitats will be needed to confirm TMDL compliance.

Table 3-6 is a summary of the nitrogen loads reported in the MEP technical report for Pleasant Bay. This table includes both current loads (on the left) and the reduced loads necessary to restore water quality (on the right). Using Meetinghouse Pond as an example, the important findings are as follows. The total nitrogen load to the Pond is currently 21.15 kilograms per day (kg/day). Most of that load is released from bottom sediments (the "benthic load"). The benthic and atmospheric loads are largely uncontrollable, while the "watershed load" consists of controllable loads such as from on-site wastewater disposal (the "septic load"), fertilizer use and stormwater runoff. For Meetinghouse Pond, the watershed load is now about 30% of the total load (6.20 out of 21.15 kg/day), and 83% of the watershed load is from septic systems. The modeling conducted by the MEP technical team indicates that water quality goals will be

TABLE 3-6
REQUIRED NITROGEN LOAD REDUCTIONS
BY SUB-EMBAYMENTS OF PLEASANT BAY

Sub-Embayment	Other Towns In Watershed	Current Loads, kg/day			Target Loads kg/day		Required Percentage Reductions		
		Watershed	% Septic	Total	Watershed	Total	Overall	Watershed	Septic
Orleans-Only Watersheds									
Meetinghouse Pond	None	6.20	83	21.15	1.06	9.50	55	83	100
Paw Wah Pond	None	1.86	81	5.57	0.73	3.48	38	61	75
Pochet Neck	None	8.42	79	10.19	4.12	5.89	42	51	65
Subtotal		**16.48**	**79**	**36.91**	**5.91**	**18.87**	**49**	**64**	**80**
Watersheds Shared by Orleans									
Lonnies Pond	Brewster	2.44	67	4.26	1.63	3.16	26	33	50
The River-Upper	Brewster	2.77	75	9.32	1.74	6.13	34	37	50
The River-Lower	Brewster	3.88	74	16.60	2.44	13.20	20	37	50
Areys Pond	Brewster	1.31	60	7.49	0.92	6.03	19	30	50
Namequoit River	Brewster	2.74	73	17.83	1.73	14.47	19	37	50
Little Pleasant Bay	Brewster	8.14	61	69.46	5.88	65.19	6	28	45
Quanset Pond	Brewster	1.78	79	7.94	1.08	6.04	24	39	50
Pleasant Bay	Brew/Har/Chat	29.28	51	175.11	21.85	155.03	11	25	50
Subtotal		**52.34**	**56**	**308.01**	**37.27**	**269.25**	**13**	**29**	**49**
Watersheds Not Shared by Orleans									
Round Cove	Harwich/Brewster	4.22	75	12.81	2.96	9.87	23	30	40
Muddy Creek-Upper	Harwich/Chatham	9.99	72	14.71	4.61	7.47	49	54	75
Muddy Creek-Lower	Harwich/Chatham	8.48	75	8.69	2.14	2.35	73	75	100
Ryder Cove	Chatham	9.82	73	20.48	4.47	12.48	39	54	75
Frost Fish Creek	Chatham	2.90	76	3.00	0.70	0.80	73	76	100
Crows Pond	Chatham	4.22	79	6.22	4.22	6.22	0	0	0
Bassing Harbor	Chatham	1.67	84	2.74	1.67	2.74	0	0	0
Chatham Harbor	Chatham	17.10	83	31.25	17.1	31.25	0	0	0
Subtotal		**58.40**	**77**	**99.90**	**37.87**	**73.18**	**27**	**35**	**48**
Total		**127**	**70**	**445**	**81**	**361**	**19**	**36**	**52**

Note: The target nitrogen loads represent a single scenario; other combinations of nitrogen removal may also result in TMDL compliance.
Source: MEP technical report and TMDL document.

achieved if the total nitrogen load is reduced to 9.5 kg/day. By reducing the watershed load to 1.06 kg/day, the benthic load will eventually decline to 7.86 kg/day. Thus the total nitrogen load must be reduced by 55%, and to accomplish that overall reduction, the watershed load must be reduced by 83%. Since the septic load is 83% of the total watershed load, it is obvious that complete removal of the septic load is needed in this sub-watershed. Across most of Pleasant Bay, the large removal percentages that are required indicate that wastewater collection and treatment must be a large part of the solution.

Table 3-6 includes nitrogen load estimates and goals for 19 sub-embayments that comprise Pleasant Bay. Eleven of those sub-embayments are impacted by Orleans, of which three (Meetinghouse Pond, Pah Wah Pond and Pochet Neck) are impacted only by Orleans and six (The River, Lonnies Pond, Areys Pond, Namequoit River, Little Pleasant Bay, and Quanset Pond) receive a substantial nitrogen load from Orleans. The restoration of Pleasant Bay will be accomplished by nitrogen controls enacted by multiple towns, and the responsibility for the associated costs must be appropriately shared among Orleans, Brewster, Harwich and Chatham. Many of the most sensitive "headwaters" sub-embayments are most directly affected by Orleans, so the highest nitrogen removal percentages are associated with the "Orleans-only" watersheds.

As Orleans moves into later phases of the CWMP (including evaluation of nitrogen control alternatives and wastewater treatment site identification), it is prudent to assume that all of the nitrogen control needs will be accomplished by wastewater collection, treatment and disposal. (This assumption is to facilitate those later activities and is not intended to reflect a bias toward sewering as the best solution.) From Table 3-6, it has been assumed that the maximum quantities of collected wastewater can be determined by combining 80% of the wastewater generated in the Orleans-only watersheds and 49% of the wastewater generated in the watersheds Orleans shares with other towns. That combined percentage represents about 60% of the wastewater generated in the portions of Orleans in the Pleasant Bay watershed, assuming that the collected and treated wastewater is disposed of outside the Pleasant Bay watershed. If 90% nitrogen removal is effected through tertiary treatment, and the effluent is discharged within the Pleasant Bay watershed, then about 67% of Orleans' Pleasant Bay wastewater must be collected and treated.

As presented in Section 2 of this report, the current wastewater generation rate in the Pleasant Bay watershed is approximately 309,000 gpd on an annual average basis. Given the assumptions of this analysis, the nitrogen-control needs for this watershed can be expressed as 200,000 gpd of wastewater. At average per-lot generation rates, this translates to wastewater collection from approximately 1,500 parcels. (By selecting lots with above-average water use and nitrogen load, a sewer system would serve a somewhat lower number of parcels.)

The Cape Cod Commission, a participant in the MEP program, has determined that the current nitrogen loads to Pleasant Bay are distributed by town as follows:

Orleans	32%
Brewster	11%
Harwich	20%
Chatham	37%

As the Towns complete their CWMPs, it will be necessary to determine the optimum arrangement of nitrogen control strategies among the contributing towns. DEP has suggested that the distribution of current loads be used as the initial approach for allocating responsibility for nitrogen control. If Orleans removes, say, 60% of the nitrogen generated in its portion of the Pleasant Bay watershed, and Brewster removes an equal percentage, then each town is assuming responsibility in proportion to its current loads. It is feasible for one town to provide more than its fair share of nitrogen control, if that represents the most cost-effective regional approach, and to rely on cost sharing formulas to allocate the cost of the completed facilities. Such regional scenarios are considered in Section 9 of the CWMP.

In some of the other areas of wastewater needs, it is possible to identify specific parcels; for example, those with significant Title 5 variances, high water use, or frequent septage pumping. In the category of estuary water protection, the lot identity is less important. This is because nitrogen loading is a cumulative problem, and effecting the necessary overall nitrogen reduction is more important than the specific lot location. Lots will be identified based on their proximity to the Bay (restoration will occur faster if near-shore septic systems are eliminated), the water use (which is proportional to the wastewater volume), the density of development (it is more

cost-effective to build collection systems in areas of small lots), and their occupancy status (year-round homes produce more nitrogen than seasonal homes).

The MEP technical reports for the Cape Cod Bay systems document a broad range of nitrogen control needs; see Table 3-7. For the Namskaket and Little Namskaket systems, the current nitrogen loads are well below the estimated threshold loads. In contrast, the threshold loads are exceeded by current nitrogen inputs in the Rock Harbor system, indicating the need to remove 70% of the septic load. The MEP results for Rock Harbor translate to a wastewater flow of 52,000 gpd if all of the nitrogen removal is effected through sewering.

Given the fact that the MEP analyses for the Nauset systems has not been issued, only preliminary estimates can be made of the potential wastewater volumes that may need collection and treatment. The Town has requested from the MEP technical team an early estimate of the likely septic nitrogen control requirements in the Nauset system. That early appraisal has been based on several years of declining water quality in the Nauset system, past water quality studies (including the Woods Hole Oceanographic study in the 1980's), and comparison with over 30 completed or ongoing estuary studies. Given that MEP assessment of available data, wastewater planning in Orleans has proceeded based on 55% nitrogen control in the Nauset system. This percentage translates to 134,000 gpd of wastewater flow. No nitrogen control is expected to be necessary in the Atlantic Ocean watershed.

3.5 CONVENIENCE AND AESTHETICS

On-site wastewater disposal can be inconvenient and/or aesthetically displeasing to property owners or neighbors under certain circumstances. These instances are independent of public health issues or the protection or drinking water or surface waters. Based on discussion with Town officials and with the Wastewater Management Steering Committee, four types of convenience or aesthetic factors were identified:

- The presence of an enhanced (I/A) treatment system;
- A record of frequent septage pumping;
- A tight tank; or
- A mounded septic system.

TABLE 3-7
REQUIRED NITROGEN LOAD REDUCTIONS
BY SUB-EMBAYMENTS OF CAPE COD BAY AND THE NAUSET SYSTEM

Sub-Embayment	Other Towns In Watershed	Current Loads, kg/day			Target Loads kg/day		Required Percentage Reductions		
		Watershed	% Septic	Total	Watershed	Total	Overall	Watershed	Septic
Cape Cod Bay									
Namskaket									
Namskaket Marsh	Brewster	9.29	64	7.00	31.51	31.63	0	0	0
Namskaket Creek	Brewster	3.40	61	3.39	14.38	14.38	0	0	0
Total		**12.69**	**64**	**12.39**	**45.89**	**46.01**	**0**	**0**	**0**
Little Namskaket									
Little Namskaket Marsh	None	7.43	86	8.59	7.43	13.97	0	0	0
Little Namskaket Creek	None	0.28	79	0.28	0.28	0.36	0	0	0
Total		**7.71**	**86**	**8.87**	**8.87**	**14.33**	**0**	**0**	**0**
Rock Harbor									
Rock Harbor Creek	None	1.09	84	1.09	1.09	1.09	0	0	0
Rock Harbor	Eastham	7.98	85	9.44	2.63	3.92	58	67	79
Total		**9.07**	**85**	**10.53**	**3.72**	**5.01**	**0**	**0**	**70**
Nauset System									
Multiple	Eastham								55

Note:

Cape Cod Bay watersheds: The target nitrogen loads represent a single scenario; other combinations of nitrogen removal may also result in TMDL compliance. Source: MEP technical reports.

Nauset System: The target nitrogen load represents a placeholder estimate from MEP staff based on water quality data and complete and ongoing estuarine studies. As of December 2010, the MEP technical report and TMDL document have not been released for this watershed.

Some people do not like the appearance of above-grade private wastewater treatment systems (often called Innovative/Alternative or I/A systems). Further, these systems require regular sampling and monitoring that homeowners view as inconvenient or expensive. On-site systems that require frequent pumping of septage, or tight tanks that require frequent pumping of wastewater, can create impacts due to truck traffic, noise and odor. Mounded systems, particularly those associated with severe retaining walls and lack of landscaping, are often viewed as aesthetically displeasing by neighbors or passers-by. If lots with any of these characteristics were provided with off-site wastewater options, the property owners and/or neighbors would probably support the abandonment of the current system and participation in the off-lot option. (Conversely, property owners who have made a significant investment in an I/A system or mounded leaching field may not wish to abandon those facilities.)

Table 3-8 shows the number of properties and current wastewater flow in each of the four noted categories of convenience and aesthetic factors. The locations of these properties are shown town-wide in Figure 3-8.

The locations of enhanced treatment systems and tight tanks were determined from Health Department files, which was also the source of septage pumping volumes. The mounded systems are those identified by the Citizens Advisory Committee (CAC) during a survey conducted in March 2006. (That CAC survey was not intended to locate all mounded systems, but should have found most of the ones that are most visible from the street. Those not readily visible pose much less of a concern.) Figure 3-8 shows that these convenience and aesthetic issues are not widespread in Orleans. As predicted by the Health Agent, a large percentage of the identified lots are located in the northwesterly portion of town (in the Cape Cod Bay watersheds) and the westerly portion of the Nauset system. Note that some lots have two or three of the identifiers.

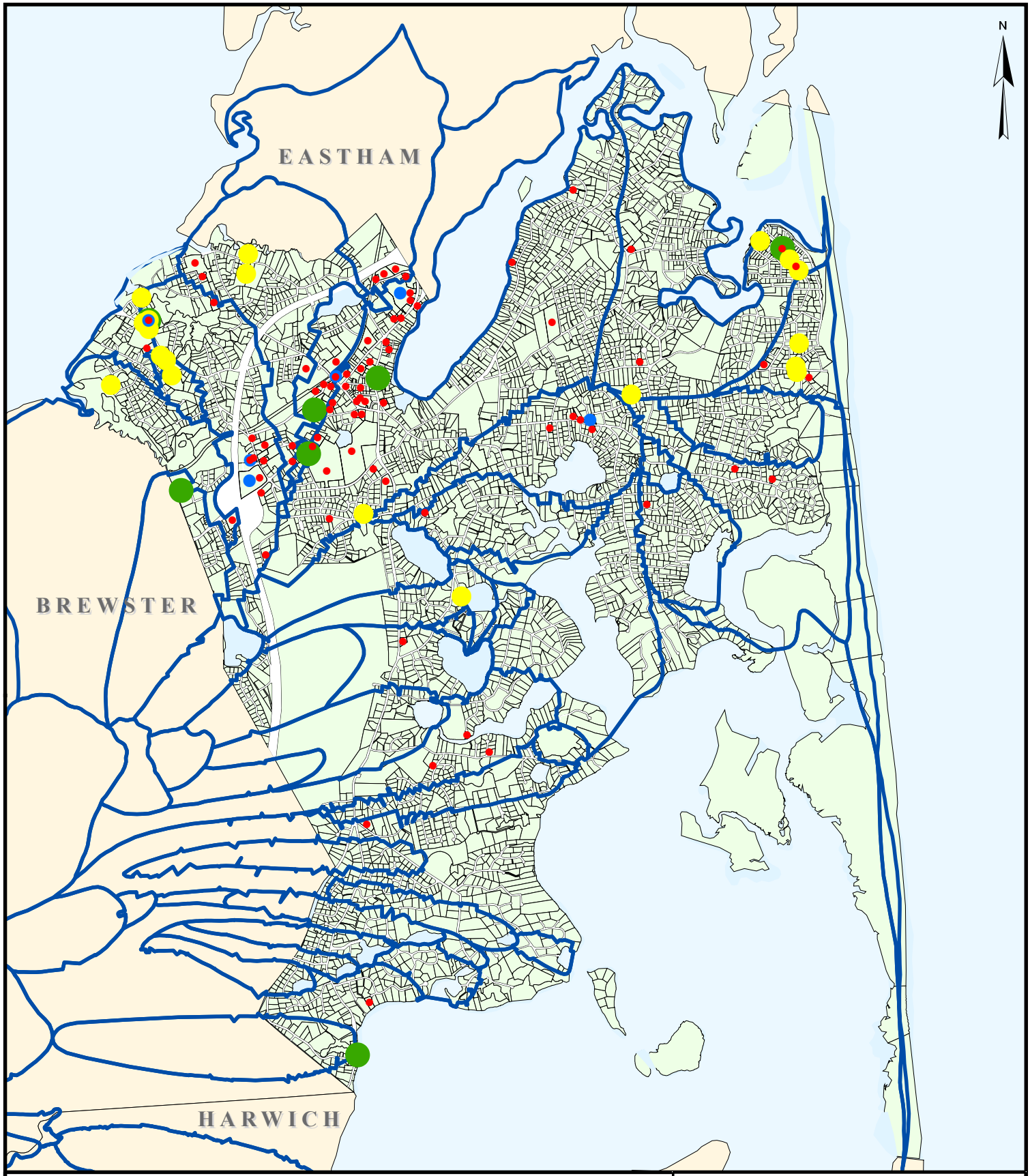
This analysis identified 120 lots with these concerns, with an aggregate flow (current annual average) of about 105,000 gallons per day. This flow represents 13% of the current town-wide average flow, so these properties include some of the larger water users in town. Many of these properties could be the first priority for providing public sewers.

TABLE 3-8

SUMMARY OF NEEDS ASSOCIATED WITH CONVENIENCE AND AESTHETIC FACTORS

	MAJOR WATERSHED				
NEED CATEGORY	**PLEASANT BAY**	**NAUSET SYSTEM**	**ATLANTIC OCEAN**	**CAPE COD BAY SYSTEMS**	**TOWN-WIDE**
Innovative/Alternative Systems					
Number of Parcels	14	3	0	10	27
Current Flow, gpd	4,800	3,200	0	10,000	18,000
Tight Tanks					
Number of Parcels	1	2	0	4	7
Current Flow, gpd	500	500	0	5,000	6,000
Frequent Septage Pumping					
Number of Parcels	14	31	3	30	78
Current Flow, gpd	7,200	35,300	4,300	50,900	97,700
Mounded Systems					
Number of Parcels	1	5	3	10	19
Current Flow, gpd	100	400	400	1,000	1,900
Total					
Number of Parcels	29	39	6	46	120
Current Flow, gpd	9,600	36,500	4,700	53,900	104,700

Note: Town-wide totals are additive across the row. Totals by major watershed are not additive by column. The category total by watershed accounts for parcels that have more than one need.
Sources: Orleans Health Department and Citizen Advisory Committee, 2005 and 2006.



Septage Pumping
4 or more times/yr

I/A Systems

Mounded Systems

Tight Tanks

Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept. Wastewater systems from Orleans Health Dept. Watershed boundaries from MEP.

0 4,000 8,000 Feet

Orleans CWMP

Convenience and Aesthetic Factors

PROJ NO:	DATE:	FIGURE:
10645G	Dec 2010	3-8

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3.6 ECONOMIC GROWTH

Some communities provide public sewerage in selected areas to promote more intense economic development than can be supported by on-site wastewater disposal. Typical examples include downtown commercial areas and industrial or office parks.

The Orleans Planning Board addressed this issue in the spring of 2006, as part of the build-out analysis (see Section 4). The Planning Board was asked to answer the following question:

> Should the Comprehensive Wastewater Management Plan include an allowance for sustainable economic growth, over and above the growth now expected under the current zoning bylaws?

This subject was debated and discussed at a Planning Board meeting on June 15, 2006, and the following conclusions were drawn:

- The Comprehensive Wastewater Management Plan should be "growth-neutral"; that is it should not promote more growth than would otherwise occur under the zoning bylaw.
- No expansions of commercially-zoned districts are warranted.
- Traffic, parking and other issues will limit commercial growth, and provision of off-site wastewater facilities will typically not result in significant added growth in commercially-zoned areas unless those other restrictions are lifted.

Affordable housing projects constructed under Chapter 40B of Massachusetts General Laws could result in a higher density than permitted under the zoning bylaw. (Approximately 8.5% of Orleans dwelling units are considered "affordable", below the 10% threshold established under Chapter 40B.)

An analysis by the Planning Department determined that approximately 200 apartments could be built in 40B projects before the 10% threshold is reached. Accordingly, an allowance of 17,000 gpd of wastewater flow has been included in the future flow projections, based on expected annual average flows from similar apartment units. The Planning Department projects that those 40B projects would most likely be located in the commercial zones, although they could occur

anywhere in Orleans. This allowance represents about 25% of the expected future growth in town-wide commercial flows.

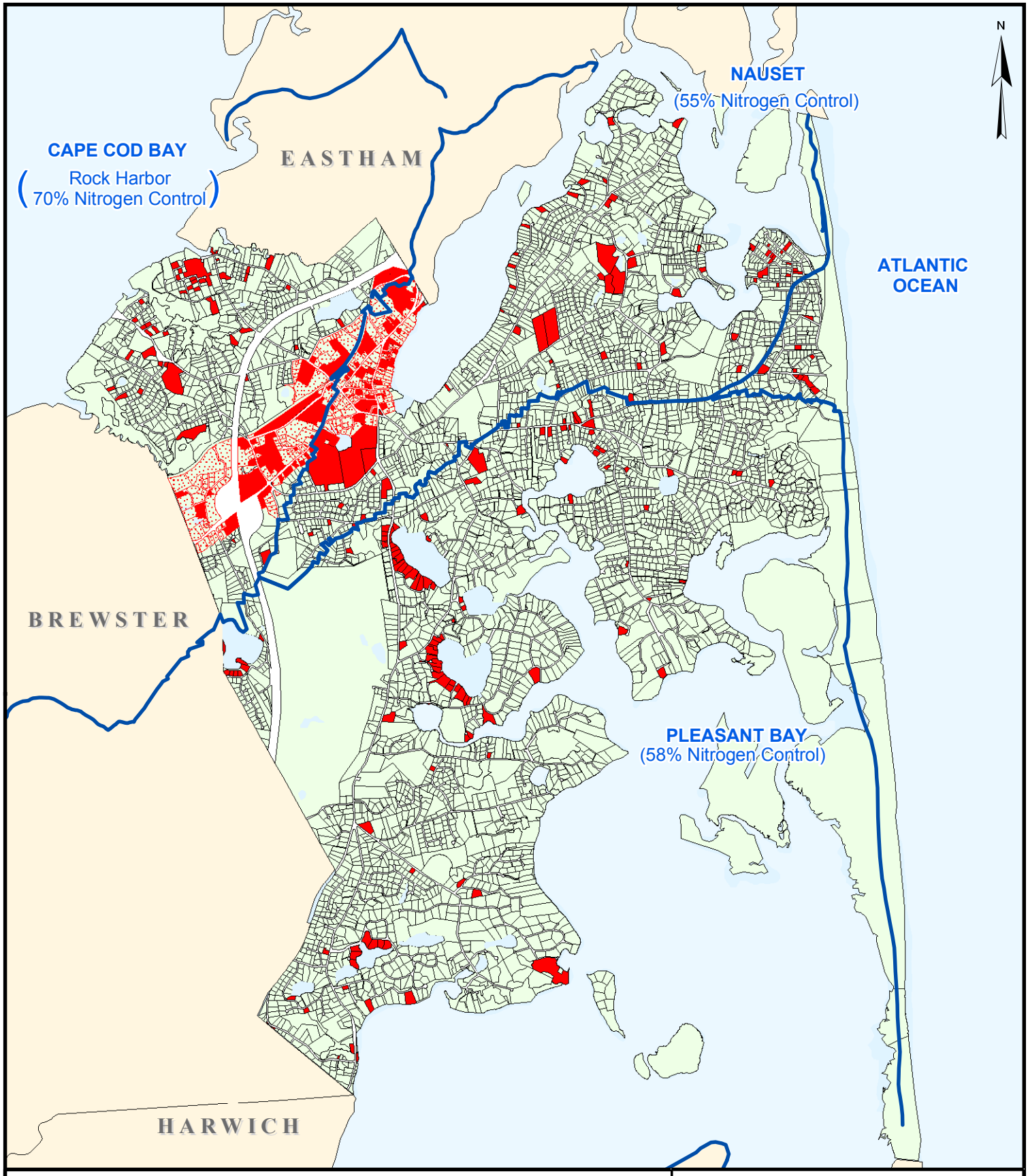
3.7 SUMMARY OF CURRENT NEEDS

Table 3-9 summarizes the results of this needs assessment in terms of both numbers of properties and annual average wastewater flow. Protection of surface waters from nutrient enrichment is by far the most important need in Orleans, affecting perhaps 50% to 55% of the developed lots. Needs associated with sanitary issues, convenience/aesthetics factors and economic development apply to only about 8% of the developed lots in town, in the aggregate.

Each of the five needs categories has been addressed separately in the paragraphs above. While it is important to characterize wastewater needs in these separate categories, it is also important to recognize that some properties in Orleans fall into more than one needs category. For example, a downtown commercial lot may have experienced high septage pumping (convenience/aesthetics need) and multiple Title 5 variances (sanitary need) and be located in an area where nitrogen control is needed and can be cost-effectively achieved (surface water protection). The summary block of data in Table 3-9 has been compiled to address this "overlap" of needs. Figure 3-9 shows the locations of individual lots in the sanitary, pond protection and convenience/aesthetics categories. This figure also depicts the commercial areas where economic development needs are expected, and the watersheds with different nitrogen control needs.

A review of Table 3-9 and Figure 3-9 reveals that the sanitary and convenience/aesthetics needs are concentrated in and near the downtown area. The completed MEP reports indicate that Rock Harbor and the "headwaters" systems in Pleasant Bay have the greatest need for nitrogen control.

Table 3-9 shows that the nitrogen control needs in the Pleasant Bay system exceed the needs in all other categories in that watershed. That is, should a public sewerage system be built to collect and treat wastewater from that watershed to reduce nitrogen loading, that sewerage system could also address most of the sanitary needs and the convenience/aesthetics issues.



Individual Parcel Needs

Commercial District

Watershed Boundaries

Source: Parcel data obtained from Orleans Planning Dept. Watershed boundaries from MEP.

0 4,000 8,000 Feet

Orleans CWMP

Aggregated Needs

PROJ NO: 10645G DATE: Dec 2010

WRIGHT-PIERCE Engineering a Better Environment

FIGURE: 3-9

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TABLE 3-9
SUMMARY OF CURRENT NEEDS IN ALL CATEGORIES

NEEDS CATEGORY	MAJOR WATERSHED				
	PLEASANT BAY	NAUSET SYSTEM	ATLANTIC OCEAN	CAPE COD BAY	TOWN-WIDE
Sanitary					
Number of Parcels	48	79	5	66	198
Current Wastewater Flow, gpd	16,100	63,500	3,900	78,900	162,400
Water Supply Protection					
Number of Parcels	0	0	0	0	0
Current Wastewater Flow, gpd	0	0	0	0	0
Surface Water Protection (ponds)					
Number of Parcels	50	9	0	0	59
Current Wastewater Flow, gpd	5,800	2,400	0	0	8,200
Surface Water Protection (estuaries)					
Number of Parcels	1,480	790	0	220	2,490
Current Flow, gpd	200,000	134,000	0	52,000	386,000
Convenience and Aesthetics					
Number of Parcels	29	39	6	40	120
Current Flow, gpd	9,600	36,500	4,700	53,900	104,700
Economic Development					
Number of Parcels	0	5	0	5	10
Current Flow, gpd	0	0	0	0	0
Total					
Number of Parcels	1,545	837	11	257	2,644
Current Flow, gpd	213,000	170,000	8,600	101,600	493,200

Note: Town-wide totals are additive across the row. Totals by major watershed are not additive by column. The category total by watershed accounts for parcels that have more than one need.

Those properties with sanitary needs or convenience/aesthetic issues could be among the first priorities when selecting the lots for nitrogen control. In the Nauset watershed, the same general conclusions can be drawn if actual nitrogen control needs are determined to be of the same magnitude as the placeholder values included in this report.

The MEP technical reports document water quality conditions and nitrogen loads that existed in the early to mid years of the 2000-2009 decade. While this report uses the term "current needs" to describe these conditions, it should be noted that growth in the community, although small, may have resulted in somewhat higher wastewater volumes and a few more developed parcels than reported herein.

In that about half of the Orleans septic systems can remain in use, long-term septage management must be provided for. The region is currently served by the Orleans-Brewster-Eastham Groundwater Protection District. The District's Tri-Town Septage Treatment Facility is reaching the end of its useful life. Either significant upgrading of aging components must be undertaken to maintain that facility's capabilities, or the septage management function must be incorporated into a new wastewater treatment facility.